

December 5, 2018

Brooks Academy Museum Report

Exterior Assessment & Concept Design Study



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Architecture | Planning | Experience Design

Brooks Academy Museum Report

Exterior Assessment & Concept Design Study

Town of Harwich - Project Participants

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Introduction

OBJECTIVES

BIA.studio was retained by the Town of Harwich to provide analysis and concept design studies for improvements to the Brooks Academy Museum (BAM). The scope of work addressed in this report is in response to the March 21, 2018 RFP for Architectural Services, and subsequent April 6, 2018 Addendum.

BIA.studio has worked in close consultation with Mr. David Spitz, Chair of the Brooks Academy Museum Commission and the Brooks Academy Museum staff in developing this Report.

The scope delineated in the RFP states three focus areas:

1 Expanded On-Site Collection Storage

"The evaluation shall consider the suitability of the basement and/or second floor for storage. In the basement, the Architect/Engineer shall address whether some walls may be safely removed to open up storage space. The basement is damp and not well ventilated, and the study shall consider proper humidity control and ventilation to improve conditions. The current basement floor area is only about 40% of the area of the first floor. The balance of the basement has a crawl space. The evaluation shall consider whether it is feasible to create additional usable basement area.

The second floor record storage places floor loadings that may exceed original design parameters. The study shall evaluate whether structural modifications are necessary to accommodate record storage."

2 Accessible Vertical Circulation

"The existing basement is not accessible according to ADA standards. ADA accessibility for the second floor is provided solely via a motorized chair lift. The Architect/Engineer shall consider the ability to install a lift or elevator serving both the basement and the second floor."

3 Exterior Envelope Maintenance

"The Architect/Engineer also shall evaluate the exterior condition of the building as addressed in previous studies including but not limited to: Structural adequacy including the building foundation, exterior windows, exterior siding, and columns."

ACKNOWLEDGMENTS

PROCESS

Exterior Assessment

BIA spent several hours over 3 days investigating both exterior and interior conditions of the existing structure. The exterior assessment section of this report documents our visual assessment of each separate exterior components of the building. Where deficiencies were noted we have indicated remedial steps to be taken.

Some elements of the exterior may be altered as part of one or more of the renovation concepts and associated costs are part of the cost estimate.

The remainder of exterior conditions are maintenance-related and as such were not cost estimated as part of a publicly-bid procurement for construction services.

Stakeholder Input

BIA.studio met with Mr. Spitz, museum staff and representatives of the Harwich Historic Society on two occasions to gain their input on important issues and concerns, and to learn of their near-term and long-term desired outcomes. The conceptual design studies developed for this report are a direct outgrowth of those conversations.

The results of our meetings were processed into our OutcomeTracker application which identifies all important functional and experiential outcomes identified by the stakeholders. This checklist is valuable for providing a systematic reference to all the considerations that have a bearing on success.

Concept Design Study

The design team developed a viable approach for excavating beneath the main building to create a new basement-level climate-controlled collection space.

To address vertical accessibility, the design team developed a cost-effective and visually unobtrusive solution for inserting an small-footprint LULA elevator into the existing annex wing, linking all three floors of the building.

As part of this study the design team also investigated the feasibility of relocating the main entry to the front portico, and reconfiguring the layout of museum exhibit and staff support spaces to improve functionality.

Cost Estimate

DG Jones prepared a concept level cost estimate based on the concept designs developed by BIA.studio. The estimate breaks out the basement excavation project as a separate component to enable the stakeholder team to make informed decisions about the project components to include.

Code Summary

BIA.studio also performed a preliminary code review to determine the main parameters applicable to the renovation of the museum.

Exterior Assessment

EXISTING CONDITIONS

The original Greek Revival Brooks Academy building was built in 1844 and subsequently lengthened in 1909. 18 years later, in 1927, a second addition was built (referred to in this report as the Annex), resulting in an “L” shaped configuration of 6,500 net square feet over two floors. The wood-frame structure includes three main exhibit galleries totaling roughly 2,000 SF, a multi-purpose meeting/exhibit room, and additional spaces for collection storage, gift shop, research, office, kitchen, and a unisex restroom. The building comprises two stories of occupied space with a partial full-height basement and low-height attic space.



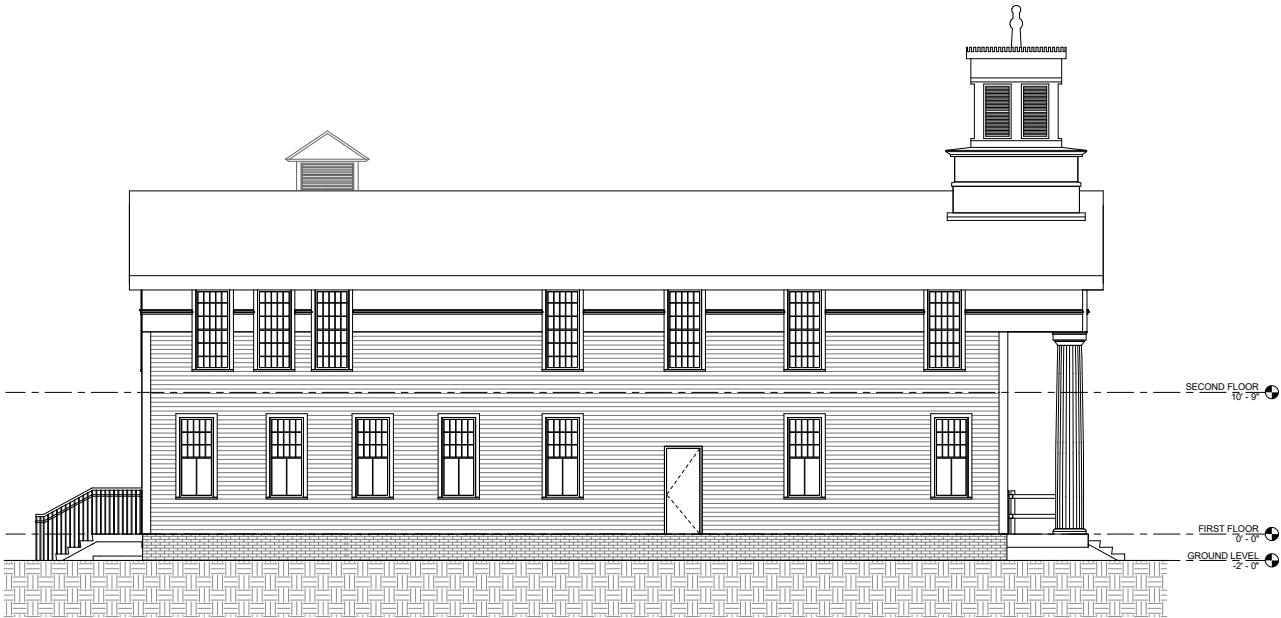
For the purpose of reference within this assessment report, the Original Brooks Academy Building and the first addition of 1909 (joined together under a single gable roof) are referred to as the “Main Building.” The attached 1927 addition containing the stairs, halls, full basement, and support spaces is referred to as the “Annex.”

Because the building is entirely clad in painted and stained wood elements - siding, trim, cornices, and portico porch - any lapse in maintenance is apparent in the condition of these finishes. As this report finds, many areas of the building are in good condition, but there are also areas that show the advance of deterioration.





North Elevation



East Elevation

This report is limited to our visual inspection of the building's exterior as seen from ground level, and observations made from the interior spaces (basement, first floor, second floor and attic).

No invasive exploration has been undertaken and all recommendations are based on what is visible. In some instances, our recommendations will require further physical investigation of conditions that are hidden from view to determine the course of action to take.

The following pages describe the conditions of each separate component of the building's exterior, including:

- Foundation walls
- Areaways and basement windows
- Wood siding and trim
- Windows and doors
- Ramp and landings
- Front Portico
- Cupola
- Exterior lighting





South Elevation



West Elevation

FOUNDATION WALLS

Observations

Existing foundations are common red brick, laid in a running bond pattern. We observed a compromised foundation wall along the east side of the main building where water from the roof appears to cascade down to a gravel bed along the foundation wall. This allows water to splash back up on the wall, causing joint deterioration. This wall is visibly stained with dirt and hosts an algae coat. The brick is also painted which acts to trap moisture in the bricks, further jeopardizing the integrity of the material.

The 1999 Architectural Conservation Assessment (1999 ACA) similarly reported that the distance between grade and the exterior woodwork was inadequate in some places, noting that rainwater runoff from the roof eave was causing saturation of the foundation wall with water making its way into the basement. Water ponding was observed inside the basement mechanical room 2 on the east side of the building, indicating that water is still intruding into the basement on this side of the building. Existing documents and visual observation do not indicate the presence of any type of foundation drain system around the building.

At the south east corner of the building the foundation wall has settled slightly, and at the northwestern corner of the portico, foundation bricks have fallen away and the foundation is no longer supporting this corner of the building.

During rainstorms water can be seen to cascade directly down from the disconnected downspout at the gutter. This deluge of water is likely responsible for the deterioration of this brick foundation corner.

Recommendations

In the event that the Brooks Academy Museum elects to move forward with excavation of a full basement under the Main Building, the existing foundations would be removed and replaced with a new, deeper, full floor-height exterior foundation wall system. The new foundation walls would be faced with salvaged or matching brick to maintain the historic material character of the original.

Rainwater damage caused by water falling directly from the Main Building roof eave, or through downspouts that deposit gutter runoff directly against the building, needs to be corrected so that rain water is either collected or directed away from the building's foundations (see gutter and downspout section following for details).

Once the roof rainwater runoff problems are resolved, the foundations need to have paint coatings removed, brick repaired where damaged, and repointed throughout.



AREAWAYS / BASEMENT WINDOW WELLS

Observations

Main Building: Two areaway wells are located on east side of Main Building providing fresh air access to mechanical room 2. From inside mechanical room 2 there is evidence of standing water which is likely gaining entry through the areaway opening in the foundation wall that lack weathertight louvers or closure panels. There are other problems associated with mechanical room 2 and the supply shafts that rise from it along the east side of the Main Building which are discussed later in this report. The water penetration at this location needs to be analyzed in further detail and remedied before further damage occurs.

Annex: Eight areaway wells are located on the south, west and north sides of the Annex. The 1999 ACA advised that these masonry wells were crumbling and filled with leaves and other debris. In our visual inspection these appear be concrete block are not crumbling, but vegetation and debris persists. We observed that gratings on the north side are in poor condition and have caved in. These same three wells also have fern plants growing in them.

Recommendations

The areaway wells along the east side of the Main Building would likely be eliminated if a full basement is constructed. Fresh air supply would be delivered to the new Main Building basement by way of new HVAC unit(s) located the Annex basement. If a new basement is not constructed then it is imperative that rainwater runoff and basement water infiltration be addressed.

For areaways at the Annex, conduct a cleanout and inspection of each well to determine if repairs are warranted and if drainage is effective. Remove plants and debris. Repair or replace steel grates that are damaged or in poor state of repair.

BULKHEAD ACCESSWAY

Observations

Bulkhead door is comprised of a single sheet of painted plywood, hinged to the clapboard siding. The paint on the plywood is beginning to peel off. The interior of the bulkhead is in good condition and requires no attention at this time.

Recommendations

Bulkhead door requires repainting. The accessway requires no repairs.



WOOD SIDING AND TRIM

Observations

The 1999 ACA identified areas of vinyl siding to be removed, which was done. The exterior wood clapboards and trim that clad the entire structure appear to be in good condition, with some exceptions:

1. Paint on entire east side of Main Building is peeling, apparently due to rainwater runoff from the roof running down the face. With the exception of this side of the building, wood trim and clapboards appear to be in adequate physical condition for refinishing once dry.

2. A portion of the east side of the Main Building clapboards, between the third and fourth windows from the south, around sill height, are displaced outward. We believe that this may be the result of warm damp air rising in the interior heating duct shafts located on this wall (which may not be lined), migrating to the exterior by air pressure, and condensing on the inside surface of the clapboards. In sub-zero weather this would freeze and expand, causing the displacement we observe on the exterior. Without the ability to see inside these shafts it is not certain that this is the cause, but it seems likely given the wet conditions in mechanical room 2 and the general dampness of the basement crawlspace that this system is open to. This condition needs to be addressed promptly to avoid further deterioration.

Other clapboards running at sill height across the length of this façade are also visibly displaced and

out of alignment to a lesser degree. It cannot be determined if this is from exterior water exposure or interior moisture migration.

Recommendations

1. East: large portions of this side of the Main Building are peeling and should be scraped and prepared for repainting. The areas where clapboards are bulging out should be investigated for causes and repaired as feasible. This may entail interior renovations to the heating duct shafts on this exterior wall

2. South: generally in good physical condition – no action required at this time

3. West (Annex): generally in good physical condition – no action required at this time

4. West (Main Building): needs repainting at eave, upper frieze, and corner board

5. North (Annex): various clapboard areas require scraping and repainting.

6. North (Main Building) – see Portico section

If the current entrance is moved to the portico and a new elevator installed in what is currently the entrance hall, we would advise that the entry canopy, door and window above all be removed and replaced with clapboard and frieze infill.



WINDOWS

Observations

White painted aluminum storm windows cover double hung, painted wood single-pane windows. The wood window sash are observed to be in poor repair and in need of upgrades to improve operability and weatherproofing.

The center bay of the portico once had a window in it, but that has since been replaced with a solid wood infill panel and a lower recess panel that does not match the double recess panels of the adjacent doors.

Recommendations

Due to the historic significance of the structure it is advisable to repair the existing wood double hung windows; replace missing glazing putty, repaint, improve operability of sashes, and improve weather stripping.

South: this serves as the staff entry and is comprised of a stylized residential aluminum storm door and a wood paneled door. These doors are both serviceable, but the storm door detracts from the authentic historic character of the building.

North (Annex): Currently serves as the main entrance and like the south is comprised of a residential aluminum storm door and wood paneled door. These doors are both serviceable, but the storm door detracts from the authentic historic character of the building.

North Portico (Main Building): Two four-panel wood doors at either end are present but neither is in use. The center bay is occupied with a solid infill panel which does not match the historic character of the original center bay. These door thresholds are also approximately 2 ½" above the portico porch, which presents a challenge to accessibility.

DOORS

Observations

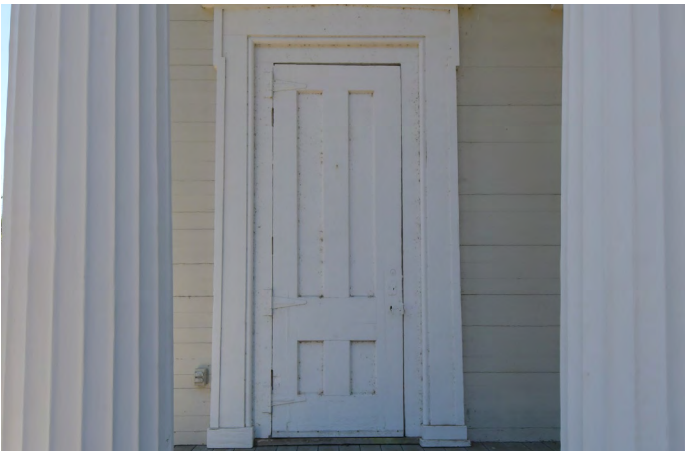
East: the front "Cranberry" room has a boarded up former emergency exit door that is no longer functional. The plywood panel that fills this location is in poor condition and detracts from the character of the exterior. There is also an oversized piece of metal flashing that projects out below the lower trim board that should be removed. The 1999 ACA states that this opening was not original and should be replaced with a window to match the others in this room.

Recommendations

East: we concur with the 1999 ACA recommendation of removing this door opening and replacing with a window unit identical to the others in this room. Extend clapboard siding beneath to complete the restoration.

South: replace storm door with a simple rectangular aluminum frame unit that is not "stylized."

North: remove existing entrance door as part of new elevator installation and re-clad with clapboards cut to match existing profiles.



DOORS (CONTINUED)

North Portico: restore left door, including hardware and weather-stripping, to serve as the new main entry; restore right door, including hardware and weather-stripping, to serve as an emergency exit. To enable both doors to be accessible we propose elevating the porch surface +/-2" higher which will place the porch walking surface within ½" of the door thresholds. We note that the porch floor already cuts around the column bases and it would be relatively easy to install a new porch floor in a similar manner to achieve accessible doorways.

RAMP AND LANDINGS

Observations

The existing wood ramp provides a functional and accessible path of travel from the parking lot to the main entry of the building. However, the ramp materials and design are not sympathetic to the building's historic character.

Recommendations

Demolish the wood ramp and concrete apron at the current entrance door. Create a new accessible ramp connecting the portico to the parking lot. Materials and details of the ramp should be sympathetic to the character of the building and landscape.

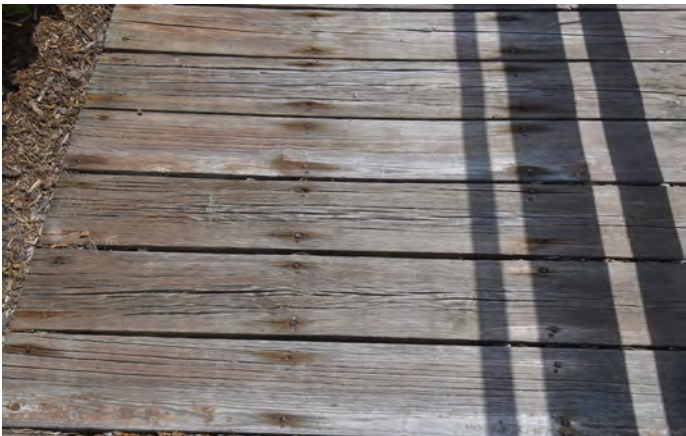
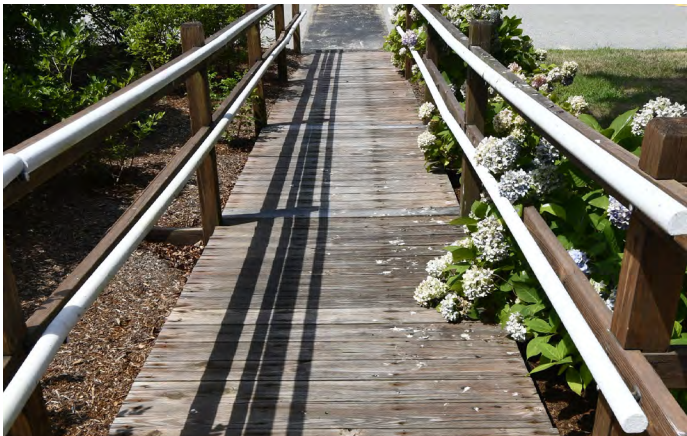
FRONT PORTICO PORCH & STEPS

Observations

The porch and step treads are made of 5/4 fir planks, stained gray. Some areas of the steps exposed to rain and snow (falling from the roof above most likely) are disintegrating and need replacement, and the stain has largely worn off leaving a distressed appearance. The porch sides and step risers are clad with painted pine boards that extend almost to the ground. Due to exposure, the wood has become quite dirty and is in need refinishing.

Recommendations

1. Minimal improvements include replacement of damaged treads risers and refinishing of wood with gray stain and white paint.
2. If a new entrance is to be created, the porch and steps should be rebuilt approximately 2" higher to create an accessible entrance. The wood columns have a steel core and can remain in place with the porch built around as they are today.



PORTICO COLUMNS

Observations

The 1999 ACA identified the need to replace all four fluted Doric wood columns across the front of the building due to water damage at their bases. Consistent with the Greek Doric Order upon which these are modeled, the columns originally (and up until 1999) rested directly on the wood deck "plinth." Sometime after 1999 the wood columns were removed and replaced with new replicas, set on new hybrid shaped wood bases (breaking with the Greek Doric order in order to functionally elevate the bottom of the wood columns above the deck to help minimize damage from standing water).

However, this new column and base system has not completely solved the water problem as now both the bases and column bottoms are damp which is leading to peeling paint and wood softening. Part of the reason is that the upper circular portion of the base is dead level and any water that lands there does not drain off. As a result water can be absorbed by the wood material of the base and column..

The Greek Doric order was conceived by the Greeks as a stone architecture. The typical US Greek Revival architecture building could not religiously follow this system in wood because of the material vulnerability of wood to water, which does not occur as readily with stone. Unfortunately, the modification of the last renovation failed to stem the negative effects of water.

Recommendations

Redesign the column bases to pitch away from the columns, minimizing the degree to which water can accumulate at the bottom of each column. Because this is all wood construction it is imperative that annual inspection and upkeep be conducted to prolong the life of these elements. Consideration may also be given to a custom carved stone bases as a way to improve durability and resistance to water damage.

ROOF

Observations

The two gable roofs are finished in gray asphalt shingles. The low slope hip roof section on the north side of the Annex is appears to be a membrane roof. The age of the roof is not known, but judging from the lack of any recent roof replacement work it may be reaching the end of its service life.

At the front portico, paint is observed peeling off of the raking cornices and the entablature (horizontal trim band above the columns). The tympanum and lunette appear to be in good condition. Flashing over the top of each column capital also appears to be functioning well and there is no sign of damage on the column capitals below.

Recommendations

Scrape, prepare and repaint sections of the raking cornices and entablature that require refinishing.



CUPOLA

Observations

The cupola roofs have very small surface areas and appear from the ground to be in relatively good condition. While the components of the cupola show little sign of deterioration, paint is starting to peel in a few areas.

Recommendations

Touch up paint as needed.

West (Main Building): aluminum gutter extends entire length with single downspout attached to corner board at portico. As on the south side, water is deposited directly on the ground next to the foundation. Water also appears to be finding its way behind the gutter where it stains the fascia trim.

Recommendations

We concur with the recommendations of the 1999 ACA, and suggest replacing the entire system with copper gutters and downspouts connected to an underground perimeter collection pipe system.

GUTTERS AND DOWNSPOUTS

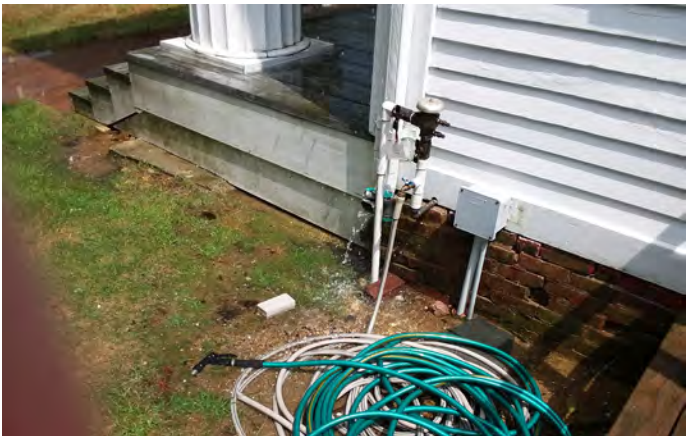
Observations

In general, we concur with the 1999 ACA, which found the aluminum gutter and downspout system to be functionally compromised and visually inconsistent with the historic character of the building. Specifically:

East: no gutter present, resulting in water damage to cladding and foundations

South: aluminum gutter across Annex front drains to two downspouts, each of which deposits water directly on the ground at the foundations.

West (Annex): no gutters - gable end sends water to either side; flat roof portion exhibits some signs of staining on the upper trim boards due to water breaking over this edge.



EXTERIOR LIGHTING

Observations

Each Annex entrance door has a glass globe light above. On the west and north sides of the Annex there are also present two security lights at the cornice. These appear to be newer installations and are angled down to minimize light spill to neighboring properties at night. There is one flood light centered in the ceiling of the portico.

Recommendations

Replace light fixtures with energy efficient LED fixtures; aesthetics should be sympathetic to the historic character of the building.





Stakeholder Input

PROCESS

Introduction

On July 10, 2018, BIA visited the Brooks Academy Museum to begin our investigation into the existing facility conditions, as well as to conduct a group interview with the museum stakeholder group.

Prior to this meeting, a list of interview questions was distributed to allow interviewees the opportunity to reflect and prepare thoughtful responses. The interview was conducted with the entire group of stakeholders at once, and the productive discussion provided a thorough overview of the Brooks Academy Museum's existing state, future challenges, and goals. Several attendees commented on the interview process being the first time all of these stakeholders had gathered together, and the value of the diverse range of input.

BIA's notes and audio recording of the interview were used to produce a list of all relevant statements and remarks - totalling 70 comments in all. This stakeholder input was then organized and consolidated into a list of Functional and Experiential Outcomes that capture the complete picture of the Brooks Academy Museum's Needs.

(See page 11 - Outcome Tracker)

Attendees

Taffy Aldrovandi	David Spitz
Vicki Kennelly	Sandy Hall
Janet Cassidy	Carole DeChristopher
Sally Gormier	Debora Miller
Barry Knowles	

INTERVIEW QUESTIONS

General Questions

- Describe the overall organizational structure of the Brooks Academy Museum and Harwich Historical Society (Org chart would be helpful).
- Describe the relationship between the Brooks Academy Museum and the Harwich Historical Society.
- What are the expectations and concerns of the town of Harwich at large ?

1 Mission

- How would you describe the mission of the Brooks Academy Museum?
- How well has the museum been able to deliver on the mission?
- People are invited to come to the museum to do research - how is that facilitated?
- Where does the museum hope to be in 5-10 years time?

2 People

- Describe the activities you are in charge of
- Who do you work with, and what kinds of interactions do you have?
- What are your personal concerns and challenges?

3 Collection

- Describe the main categories of the Collection (documents/books, furniture, clothing, textiles, paintings, photographs, etc).

- Describe the methods the museum has undertaken to document its collection. Have these methods been successful?
 - Does the entire collection need to reside within the museum, or are there other off site storage options?
 - Describe what currently works well about the existing collection storage.
 - Describe the primary concerns/issues with the existing collection storage.
 - Estimate the annual increase of each category of the collection as a percentage.
- 4 Facility
- Describe the main strengths of the building as it exists today.
 - Describe the main shortcomings/issues with the building as it exists today.
 - What spaces (if any) in the building are currently insufficient / over-taxed?
 - What spaces (if any) in the building are currently under-utilized?
 - What spaces do you wish the building had that it currently does not?
- 5 Strengths: What works well at the museum:
- What are the museum's top strengths/assets?
 - What do you think should be maintained as working well?
 - What positive feedback to you get from visitors?
- 6 Problems: What are the biggest problems with the existing museum:
- What are the museum's top challenges?
 - What negative feedback do you get from visitors?
- 7 Solutions: How do you think the problems should be addressed?
- 8 Personal Success Metrics: How can you tell that you are being successful?
- 9 Facility Success Metrics: When you imagine the future, what do you think will be your top 3 indicators of success?
- 10 Sustainable design: Any specific objectives?
- 11 Other: Anything else you think we should know about that has not been covered.

Stakeholder Outcomes

OUTCOME TRACKER

Introduction

The following chart includes the primary outcomes distilled from the stakeholder group. These outcomes have been organized into two categories, sorted by priority ranking.

This list is included to provide a total picture of all outcomes that were identified during the interview with stakeholders; however not all outcomes can be accomplished within the scope of this report.







Functional Outcomes

Functional outcomes describe the physical and operational characteristics of the Brooks Academy Museum.

Experience Outcomes

Experiential Outcomes describe characteristics that impact the quality of experiencing the Brooks Academy Museum.

LEGEND

	par	Parameter - denotes a binary outcome that must be achieved
	max	Maximize - outcomes optimized by increasing impact
	min	Minimize - outcomes optimized by reducing impact
		Indicates if the corresponding stakeholder group has an interest in the outcome
	critical	Priority ranking indicates how critical each outcome is relative to the overall mission
	none	

OUTCOMETracker™

BIA.studio Architecture | Planning | Experience Design

PROJECT: Brooks Academy Museum, Harwich, MA

CLIENT: Town of Harwich

VERSION: 18.07.11

INTERVIEW MASTER LIST

PARTICIPANTS: Brooks Academy Museum Commission (BAMC), Brooks Academy Museum Staff (BAM), Harwich Historical Society (HHS)

DESIRED OUTCOMES				HARWICH HISTORICAL SOCIETY	BROOKS ACADEMY MUSEUM	VISITORS	PRIORITY (4 HIGH - 1 LOW)
FUNCTIONAL OUTCOMES							
F1	Storage	— par	provide sufficient dedicated space to accommodate on-site collection storage; collection storage and general storage should be segregated.	●	●		
F2	Security	— par	provide controlled access to all collection storage areas, with additional levels of security for high value objects.	●	●		
F3	Collection Storage Environment	— par	provide collection storage area with industry standard HVAC environmental controls to ensure appropriate storage conditions for preserving the collection.	●	●		
F4	Cost	▲ max	the framing of the proposed project(s) to pursue grant funding opportunities.	●	●		
F5	Building Environment	— par	upgrade the building HVAC systems to achieve an evenly regulated interior environment for occupant comfort and artifact stability.	●	●		
F6	Support Spaces	— par	provide dedicated, non public collection support and exhibit support spaces.	●	●		
F7	Envelope	— par	identify and prioritize exterior envelope issues to be stabilized / restored.	●	●		
F8	Vertical Circulation	▲ max	the efficiency and cost effectiveness of moving people and objects between floors.		●		
F9	Storage Expansion	▲ max	the ability of the collection storage area to accommodate future storage needs.	●	●		
F10	Staffing	▼ min	the number of staff needed to operate the facility.		●		
F11	Electrical & Lighting	— par	upgrade the electrical and lighting distribution to meet the needs all spaces within the museum. Provide backup generator to ensure continuous operation.	●	●		
F12	Events	▲ max	the ease of hosting public programs and events in the public events / meeting room.	●	●	●	
EXPERIENCE OUTCOMES							
E1	Accessibility	▲ max	the ability of visitors to access all public areas in the museum.	●	●	●	
E2	Character	▼ min	negative impacts to the original historic character of the building.	●	●	●	
E3	Entry	▲ max	the positive impression visitors experience when approaching and entering the building.	●	●	●	
E4	Historic Spaces	▲ max	the use of the building's most historic rooms for exhibits and public uses.	●	●	●	
E5	Story	▲ max	visitor engagement by leveraging the Harwich story through the building, exhibits, and docent interactions.	●	●	●	
E6	Learning	▲ max	the ability for visitors to dig deeper and undertake research to explore the collection under staff supervision.	●	●	●	
E7	Changing Exhibits	▼ min	the disruption to the visitor experience and exhibit path while exhibits are changed in the main galleries.	●	●	●	

Concept Design Study

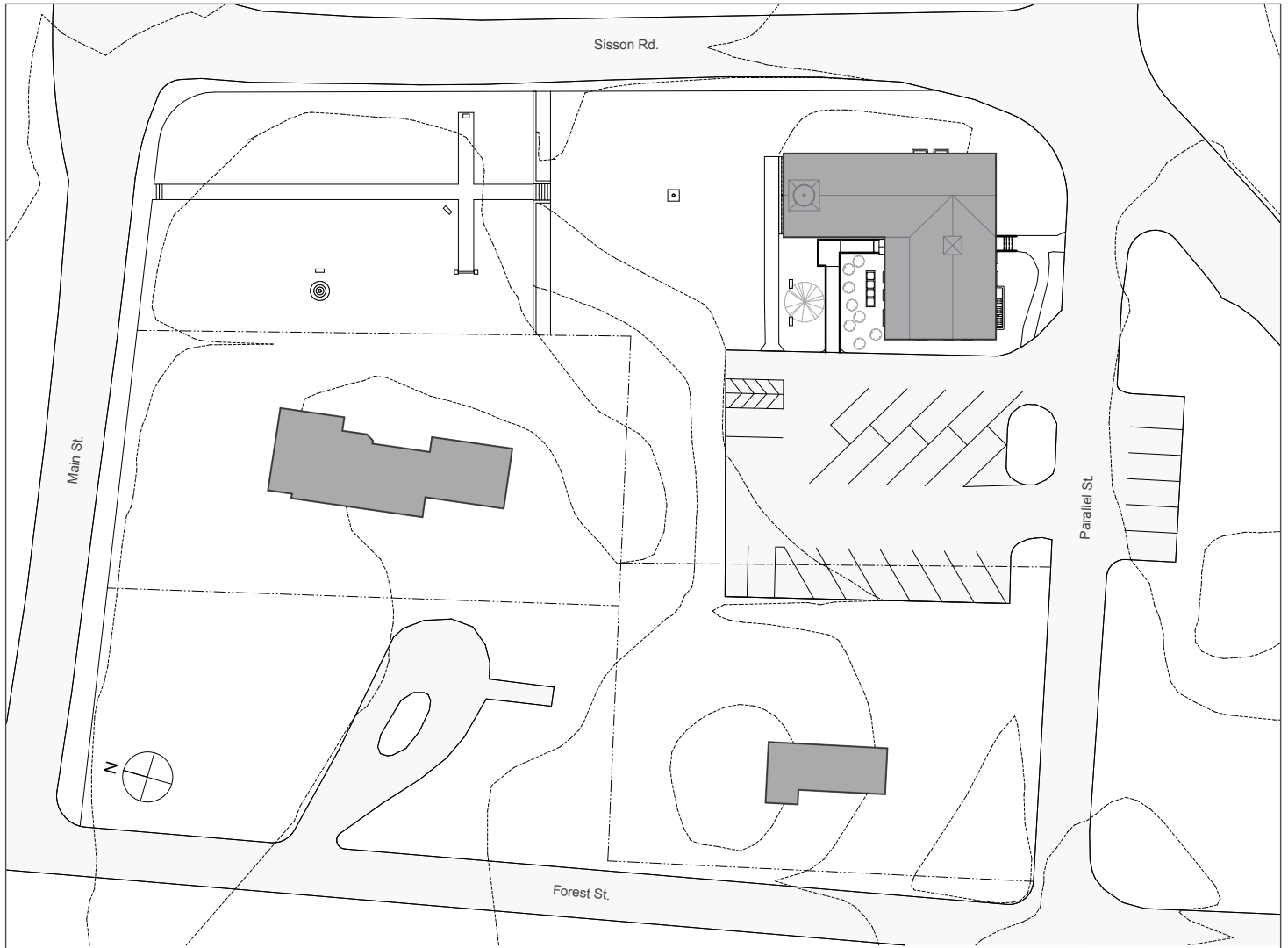
INTRODUCTION

Based upon the Outcomes that were identified in the stakeholder input process, BIA.studio developed a detailed concept design study for upgrading collection storage, improving vertical accessibility, and optimizing the layout of the public and private components of the museum.

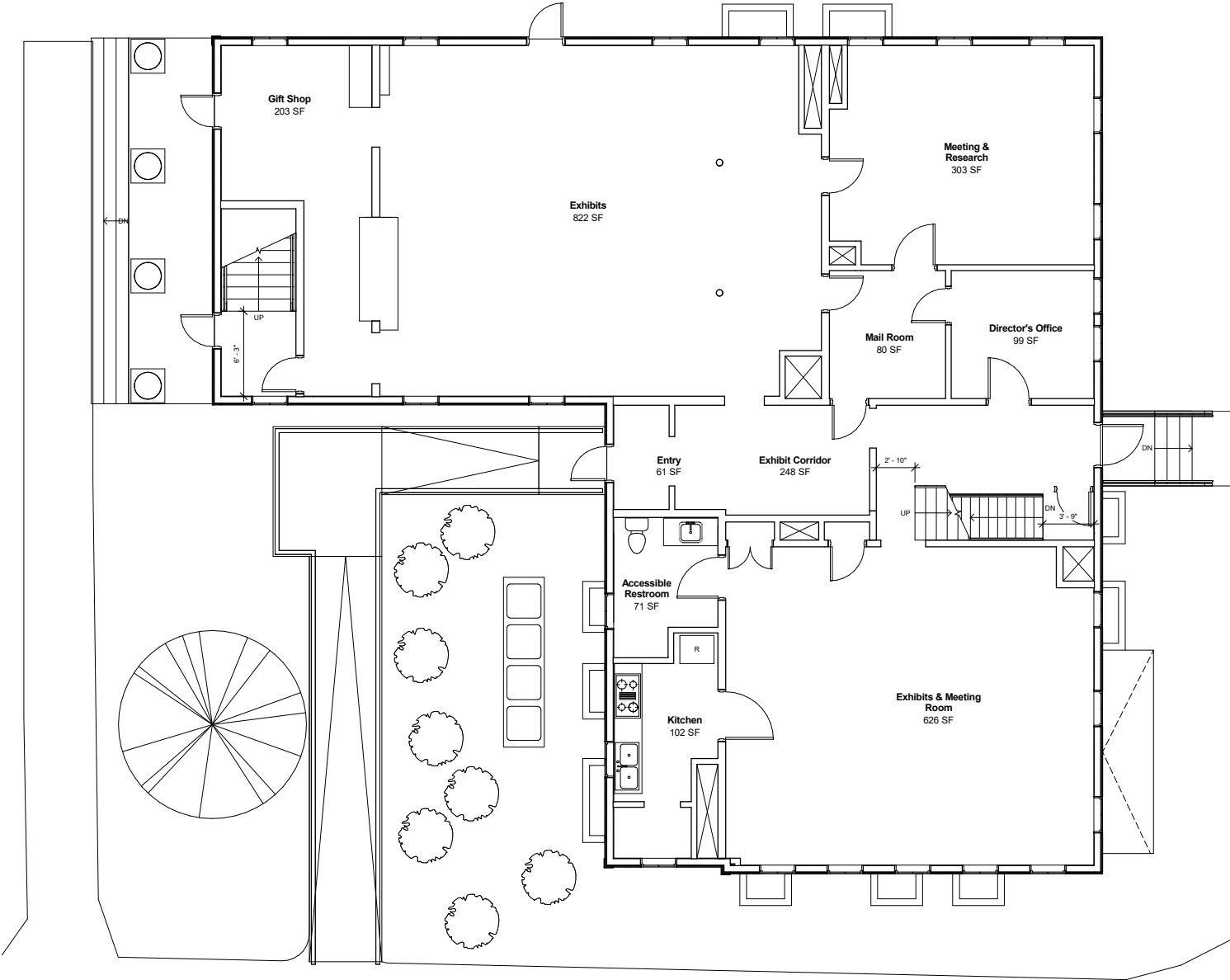
Our assessment began by thoroughly documenting the existing building physical conditions, including photographs and measurements, which are documented in the existing conditions pages following. BIA.studio also performed a thorough review of these previous studies and reports:

- 1989 Inspection Report prepared by the Preservation Partnership,
- 1999 Architectural Conservation Assessment prepared by Philip Cryan Marshall,
- 2004 Design Drawings prepared by Coastal Engineering Company, Inc. for the portico restoration and other structural reinforcements, and
- 2013 funding request application to the Harwich Community Preservation Committee.

The concept design recommendations developed by the design team are intended to address the high-priority desired outcomes of the Brooks Academy Museum stakeholders.

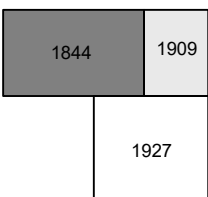
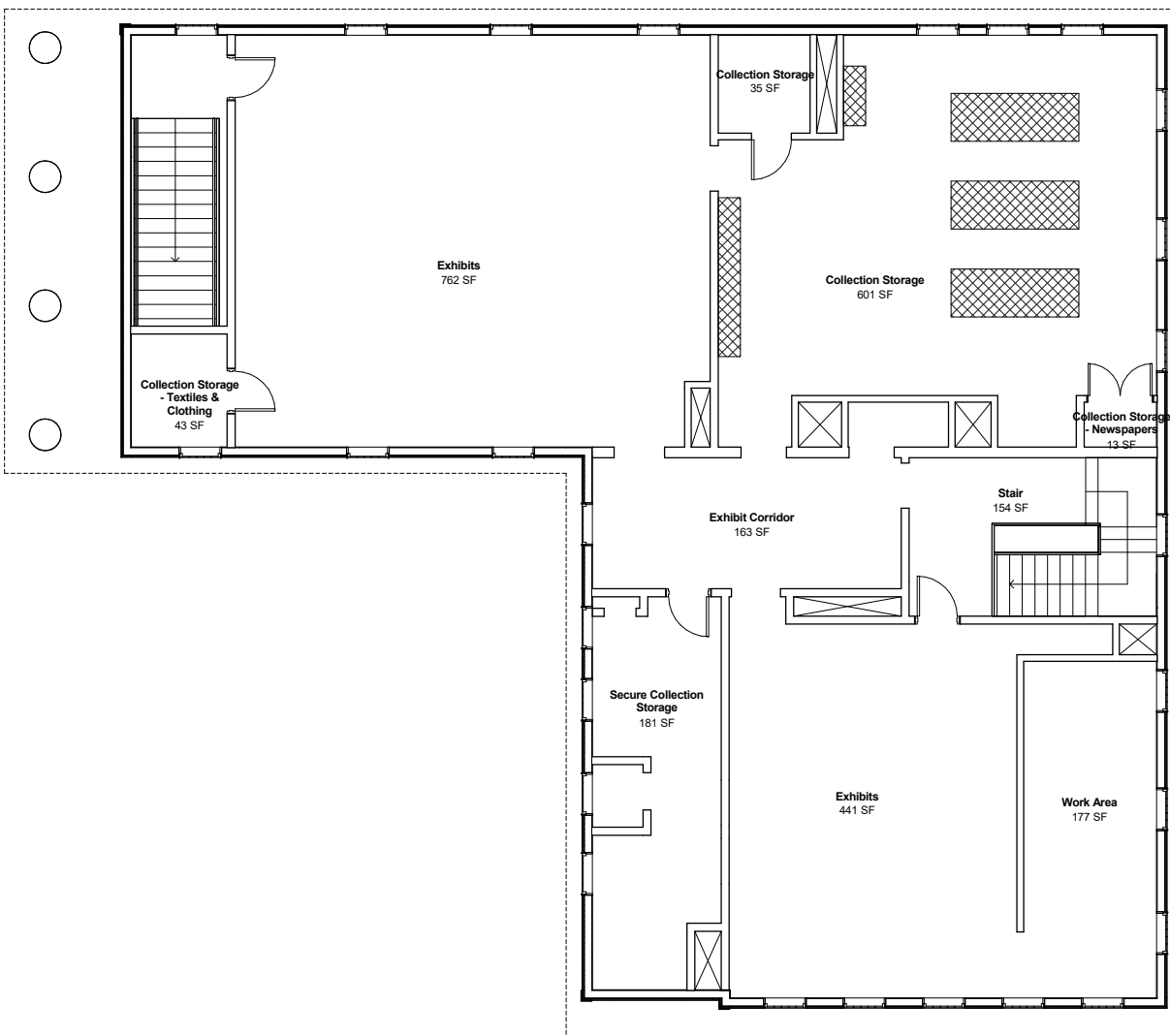


Site Plan - Existing

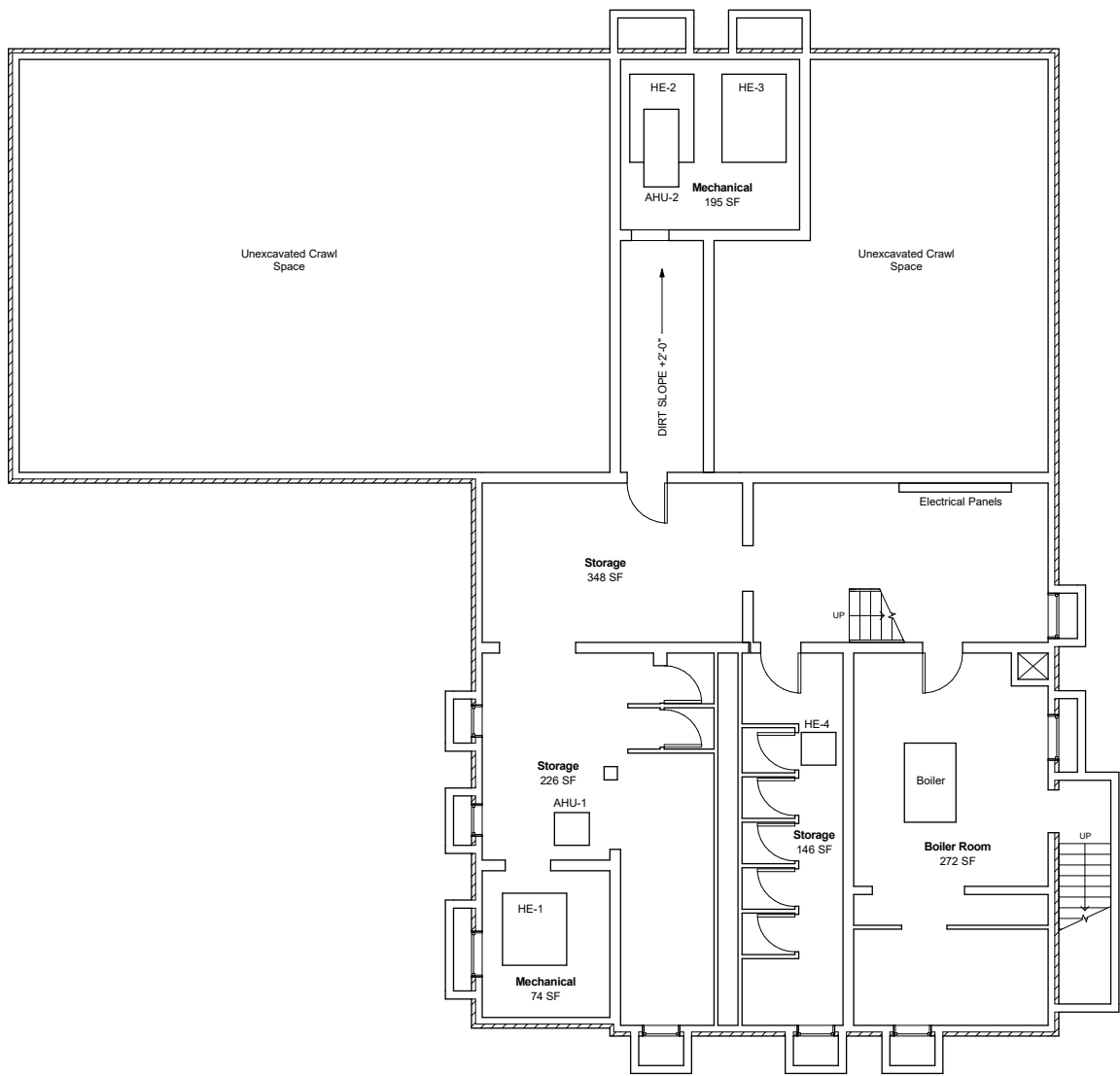


First Floor Plan - Existing

1844	1909
1927	



Second Floor Plan - Existing



1844	1909
1927	

Basement Plan - Existing

Historic District Considerations

HISTORIC BROOKS ACADEMY

The Brooks Academy Museum is located in the Harwich Historic District, the first district on Cape Cod to be accepted into the National Register of Historic Places.

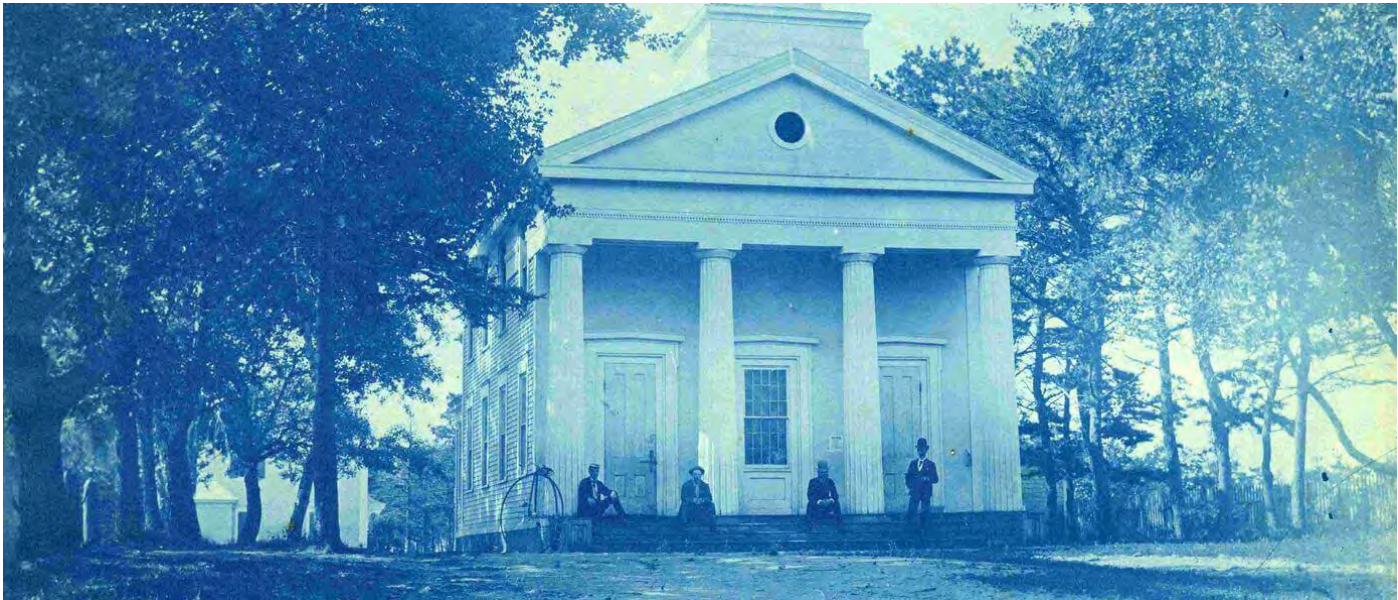
Due to the historic nature of the building and its prominent role in this Historic District, the recommendations in this report have been carefully considered to follow the guidelines of the Town of Harwich Historic District Commission. Additionally, all recommendations have been developed to ensure the original character of the building is preserved while simultaneously achieving the outcomes identified by stakeholders.

All proposed work will adhere to material and detail requirements to ensure that restored and preserved spaces blend seamlessly with the original architectural elements. Where possible, existing materials will be salvaged and re-used as appropriate.

RECOMMENDATIONS

These recommendations, to be outlined on the following pages, specifically relate to the preservation of the original historic structure:

- Restore the north portico to its original function and character as the building's main entrance
- Insert an accessible elevator within the footprint of the newest addition of the building 'annex'
- Remove storage and facility uses from historic spaces in the original 1844 Academy
- Stabilize and preserve the historic collection of the Harwich Historical Society, including the building itself, without impacting the original character of the building



Town of Harwich

Harwich Center Historic District and Commercial Village Zoning District Boundary Lines



Concept Design

FIRST FLOOR

Entry

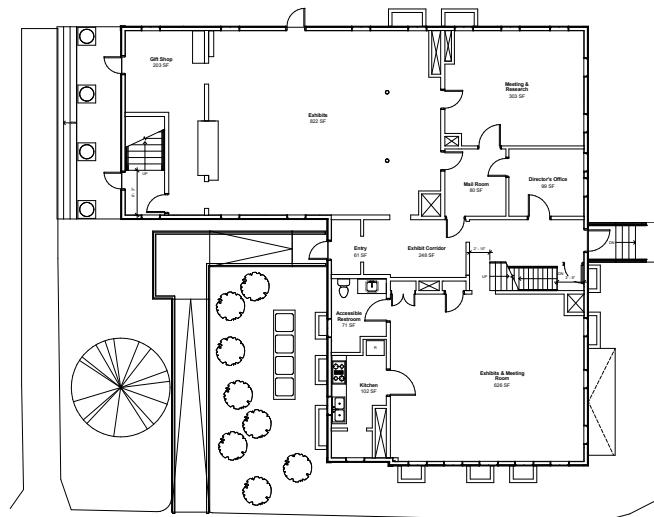
1. Construct a new entry ramp & landing connecting the parking lot to the front portico. The ramp will be detailed to complement the historic character of the building, but will be visually distinguishable as new construction.
2. Rebuild the portico landing to raise it 1.5" enabling an accessible transition to the interior. The existing porch and steps were re-constructed in 2007 and are not historically significant. The restored portico landing will utilize a new column base detail that better matches the original building and addresses moisture related deterioration.
3. Construct a new entry and ticketing counter combined with existing gift shop.

Exhibit Room

4. Remove non-original interior walls and convert to exhibit gallery space.

Foyer

5. Install a limited use limited access (LULA) elevator located within building footprint of 1927 annex addition.
6. Enlarge the doorway opening between the elevator and rear foyer. Add a partition & doorway below the staircase to separate the basement stair.



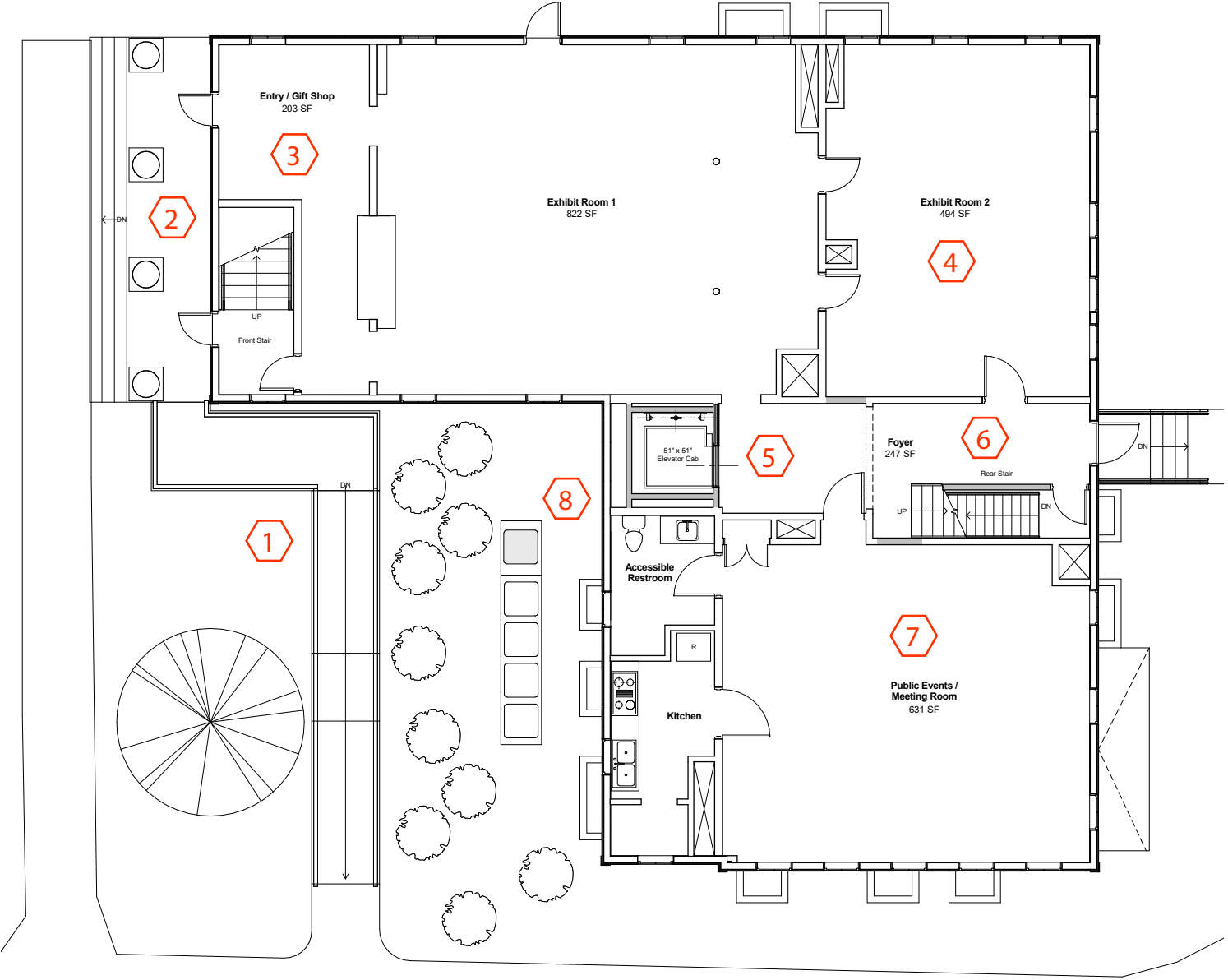
Existing

Public Events / Meeting Room

7. Infill the doorway between the Foyer and Meeting Room. The Public Events/Meeting Room no longer functions as exhibit space, but remains open to the public.

Building Systems

8. Install a new condensing unit adjacent to existing units (concealed by plantings).



First Floor Plan - Proposed

- Existing Wall
- New Wall

1844	1909
1927	

Concept Design

SECOND FLOOR

Stair Hall

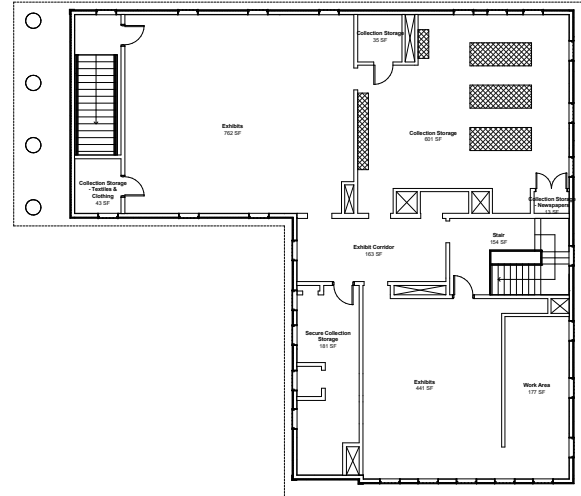
9. Enlarge doorway opening between elevator and stair landing
10. Install a limited use limited access (LULA) elevator. Remove the existing chair lift from the original historic stairway.

Exhibits

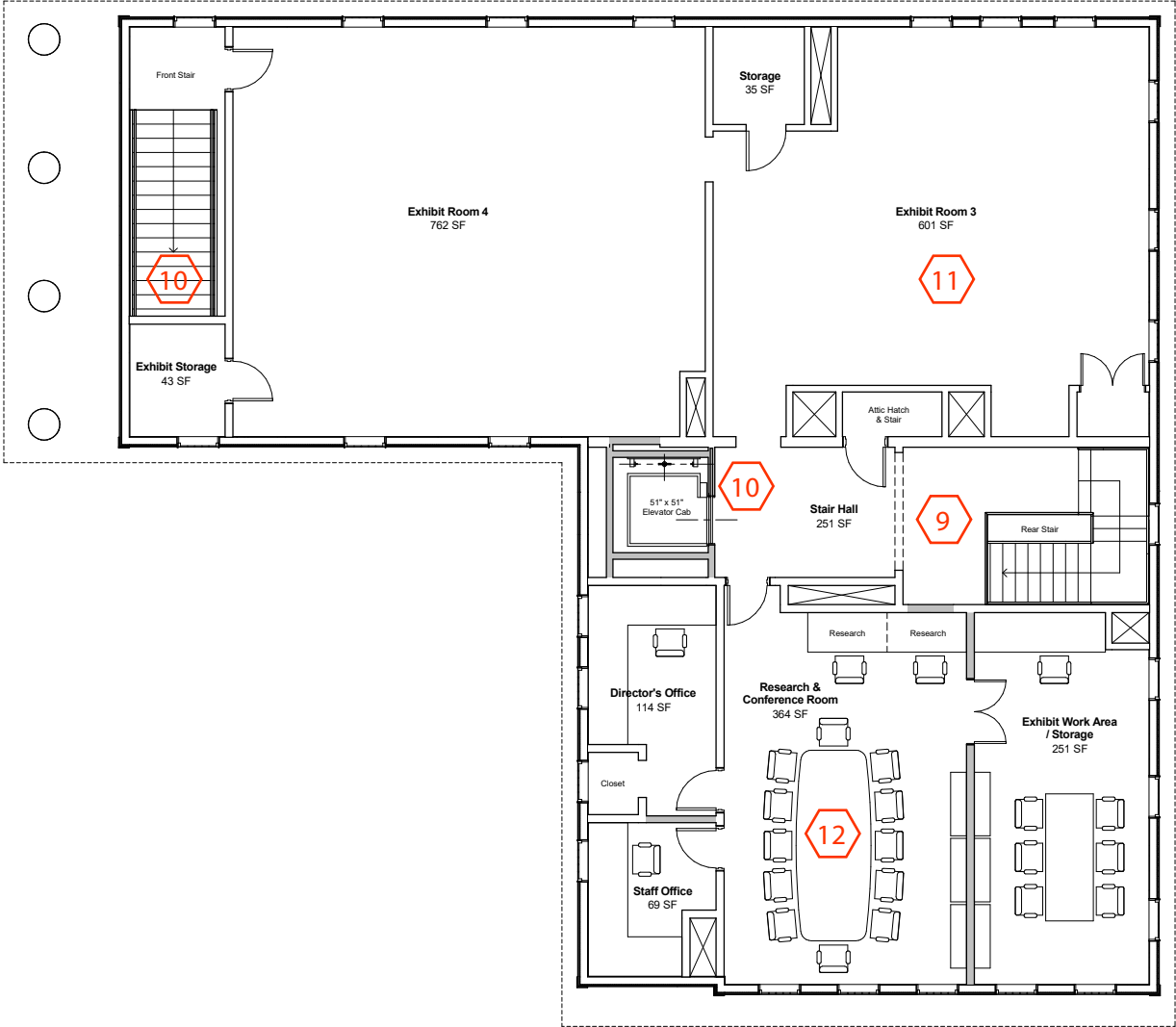
11. Convert the collections storage room into new exhibit gallery space.

Administrative Offices

12. Construct new administration spaces in the 1927 'annex' addition.



Existing



Second Floor Plan - Proposed

- Existing Wall
- New Wall



Concept Design

BASEMENT

Elevator / Stair Corridor

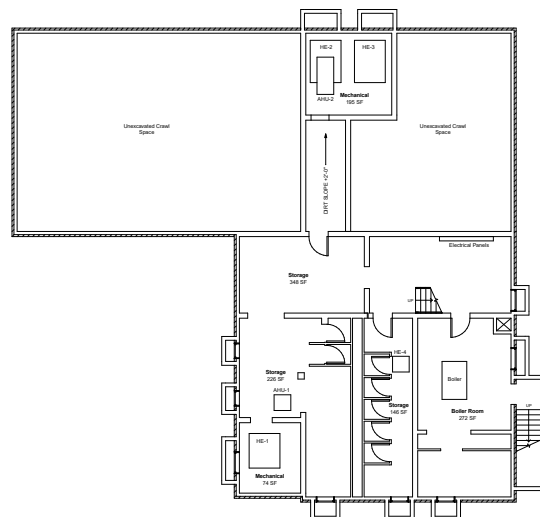
13. Install a new limited use limited access (LULA) elevator

Collection Storage Area

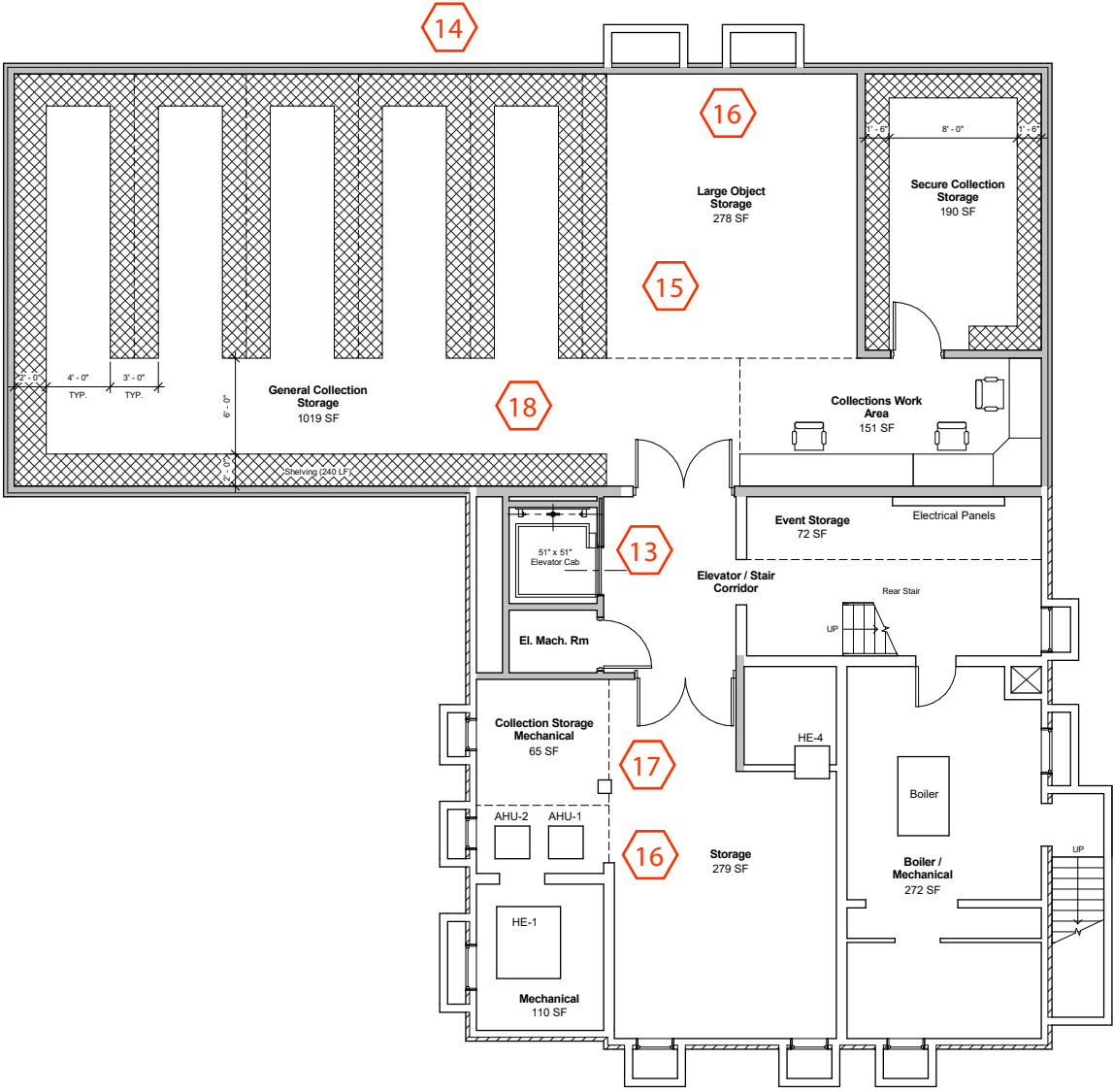
14. Construct a new full height perimeter foundation wall to replace the deteriorating existing brick foundation. Exterior foundation facing will be brick to match original, and existing foundation bricks will be salvaged during demolition and re-used if possible. Finished foundation brick facing and mortar are to be historically accurate to the original foundation.
15. Construct a new collection storage area with environmental controls for collection preservation.

Building Systems




16. Re-locate AH-3 from crawl space and remove all legacy steam piping and duct work.
17. Install a new package unit for heating, cooling, and humidity control for collections storage area.
18. Install new supply and return ducts serving the new basement area as well as to connect to the existing floor nozzles in the first floor.



Existing



Basement Plan - Proposed

-  Shelving System
-  Existing Wall
-  New Wall



Collection Storage

CURRENT CONDITIONS

Storage Shortage

The Brooks Academy Museum facility is currently deficient in both the quality and the amount of space available for collection storage. In addition to the dedicated storage rooms on the second floor, collections are currently stored throughout the facility wherever shelving space could be allocated. This includes closets, corridors, bathrooms, and assorted locations in nearly every room in the museum. As a result, storage conditions vary greatly throughout the facility. A majority of the collection is not secured, and also contends with variable environmental conditions.

Collections Storage Deficiencies

The primary collections storage area is filled beyond capacity. All available space has been utilized, and minimal area remains for staff to perform the various tasks needed for managing the collection. The collections storage room also has no security to speak of, with only a curtain with ad-hoc signage indicating the area is for staff only. Staff also indicated that the room is subject to frequent temperature shifts based on the season and time of day. This is attributable to the aspect of the room, the large number of windows, and the nature of the historic building's exterior wall construction. The result is a space that is not conducive to long term storage of sensitive objects. In recognition of this issue, all shelving and object storage has been located away from the exterior walls by necessity. This a highly inefficient use of the space, and further limits the useful capacity of the available floor area.

High value collections objects have been stored in a separate room that has keyed access. This room is also filled to capacity, and similarly suffers from numerous windows and exterior wall concerns. A clear example of this is the shelves holding prints and artwork that are directly exposed to natural light. These objects are highly sensitive to UV damage, and will likely deteriorate if they continue to be stored in this manner.

Due to the nature of the historic building, it would be cost prohibitive to renovate the existing collections storage space on the second floor and bring it up to the environmental standards needed for long term collection storage. In addition, a renovated second floor space would still not be large enough to address all of the collection storage needs, and would require alterations to the character of the windows that would be inappropriate given the historic significance.

Additional Collections Storage

Collections are currently being stored in myriad other spaces throughout the facility, including:

- Meeting & Research Room
- Mail Room
- Closets
- Basement Storage Area
- Boiler Room

Due to this variety, the environmental and security conditions of objects in the collection vary greatly from location to location.



Collection Storage

RECOMMENDATIONS

On Site Collection Storage

During discussion with stakeholders, a strong preference was identified for keeping the entire collection together in one location - on site. This is in part driven by the fact that there is no other ideal environmentally controlled space available within the town.

To maximize the long term preservation of the collection, a new environmentally controlled, securable, and dedicated space is needed that does not overlap with other functional needs or uses. Given the nature of the historic building, retrofitting the collections storage into the existing building is sub-optimal due to challenges related to creating an ideal storage environment. Contributing to these challenges are the numerous large windows, minimally insulated exterior walls, and air infiltration issues.

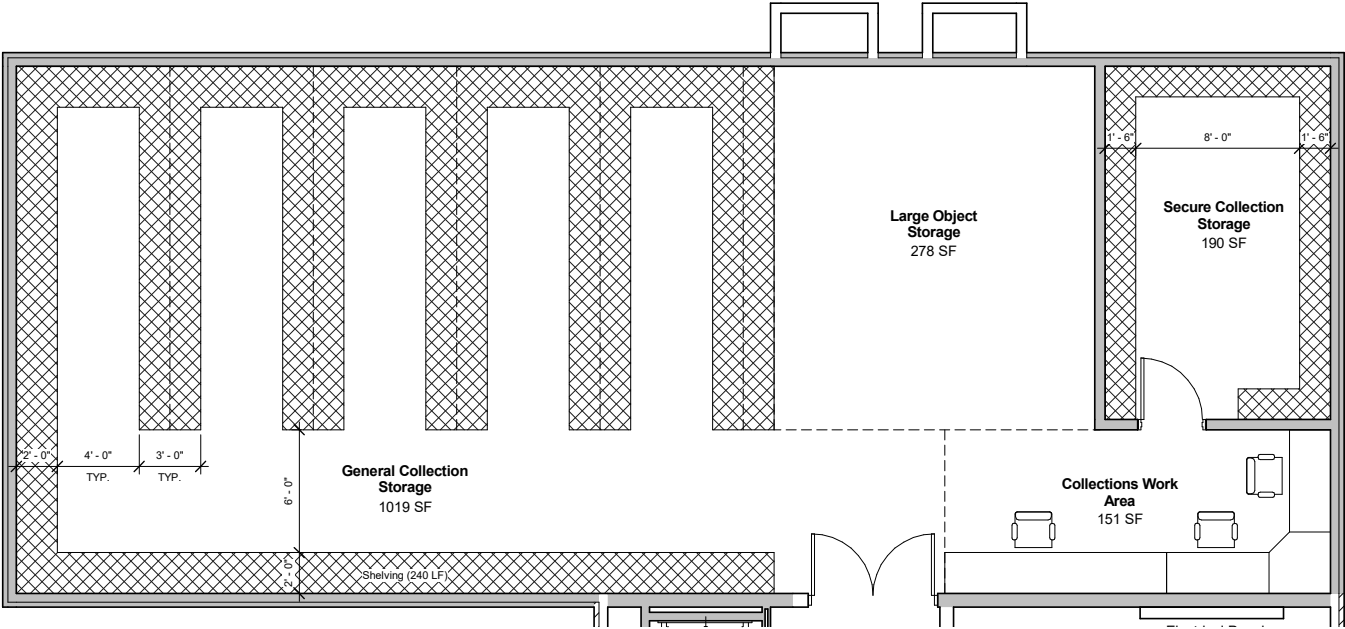
The proposed solution recommends a new basement expansion utilizing the unexcavated areas below the original building. This newly constructed space can easily be built with optimal thermal and air impermeable materials to create an ideal collection storage environment. Furthermore, the new basement walls can be faced with original brick ensuring no visible impact to the historic building. The lack of windows eliminates UV infiltration issues and also enables highly efficient use of the space in laying out shelving, storage, and work areas. Given the low water table, the basement can be built to ensure that water infiltration is not an issue.

The resultant area is self contained, with a direct connection to a dedicated environmental control system. This space can be configured in numerous ways. The plan on the opposite page shows one possible configuration, which clearly illustrates the efficiency possible as compared with the existing storage space.

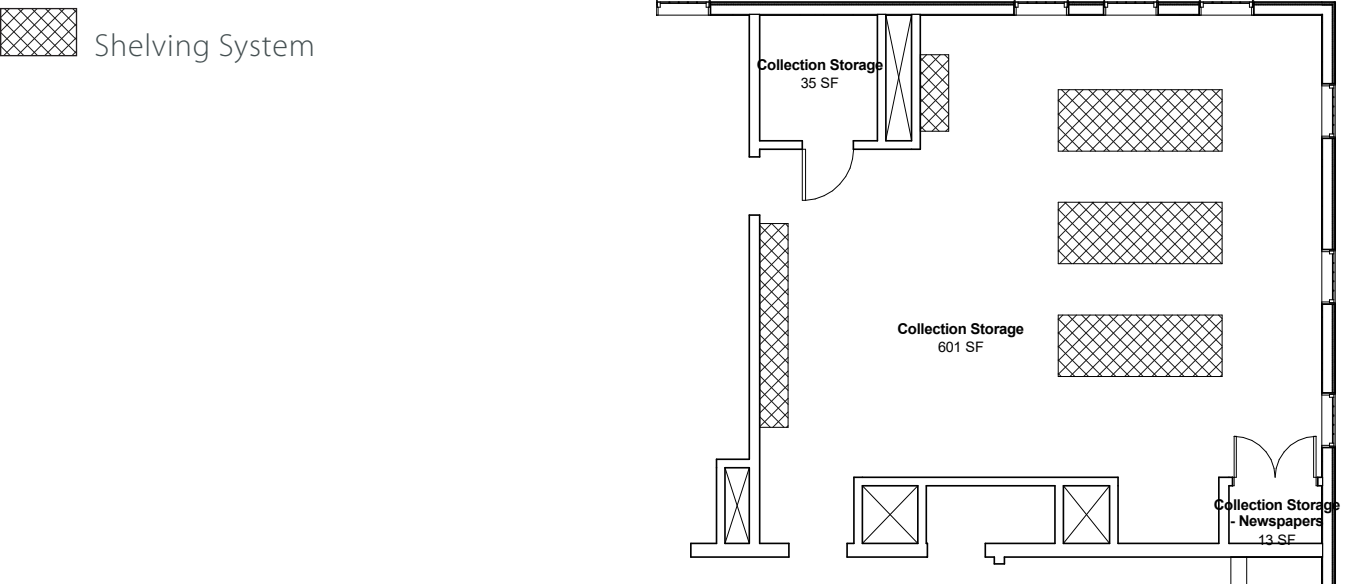
This new collections storage area will allow the Brooks Academy Museum to bring the entire collection into one consolidated space that simplifies the curatorial process and ensures uniformly optimal storage conditions. An added benefit in moving the collections areas out of the original structure is that historic spaces are freed to be utilized for more suitable uses.

Environmental Standards

While no industry-wide standards exist for museum collections storage, storage criteria guidelines have been assembled by UNESCO, US Dept. of the Interior, and the National Park Service. The chart on the following page outlines generally accepted industry standards derived from these organizations. Only BAM curatorial staff can identify which criteria are appropriate for each object.



Proposed Collections Storage



Existing Collections Storage

Collection Storage Criteria

Category	Storage Criteria / Sensitivity									
Category	Light	Humidity	Temperature	Air Pollutant	Storage Stresses	Incompatible Material:	Insect/Vermin	Vibration	Flamability	Mould
Architectural Elements		●				●				
Artifacts / Archeological Materials	●	●	●	●	●	●	●			●
Audiovisual	●	●								●
Clothing & Textiles	●	●	●	●	●	●	●		●	●
Documents, Books, Manuscripts, Newspapers	●	●	●	●		●			●	●
Film & Color Photographic Materials	●	●	●	●		●			●	●
Furniture		●	●						●	
Household Objects (Ceramics, glass)		●	●							
Musical Instruments		●			●					
Natural History Specimens	●	●		●		●	●		●	●
Photographs, Prints, Paintings, Maps	●	●	●	●	●	●		●	●	●
Recreational Artifacts		●								
Tools & Equipment		●	●							

Storage Guidelines

Temperature	Humidity	Comments	System Type
-	-	Material dependent	Adjustable Shelving
70° F ± 2°	50% RH ± 5%	As dry as possible	
-	-	Material dependent	
70° F ± 2°	50% RH ± 5%		
70° F ± 2°	50% RH ± 5%		
≤ 34° F	30 - 40% RH		Dedicated storage refrigerator with humidity control
70° F ± 2°	50% RH ± 5%		
70° F ± 2°	50% RH ± 5%		
70° F ± 2°	50% RH ± 5%		
70° F ± 2°	50% RH ± 5%		
70° F ± 2°	50% RH ± 5%		
70° F ± 2°	50% RH ± 5%		Rack Storage, Flat Open Drawers
-	-	Material dependent	
-	-	Material dependent	

Building Systems

CURRENT CONDITIONS

Cooling System - Existing

The building's cooling system consists of four air handling units, each of which serves a separate zone of the building. Each unit is paired with an exterior DX condensing unit on the north side of the Annex, and serves the corresponding zone with ducted forced air that is supplied by nozzle diffusers.

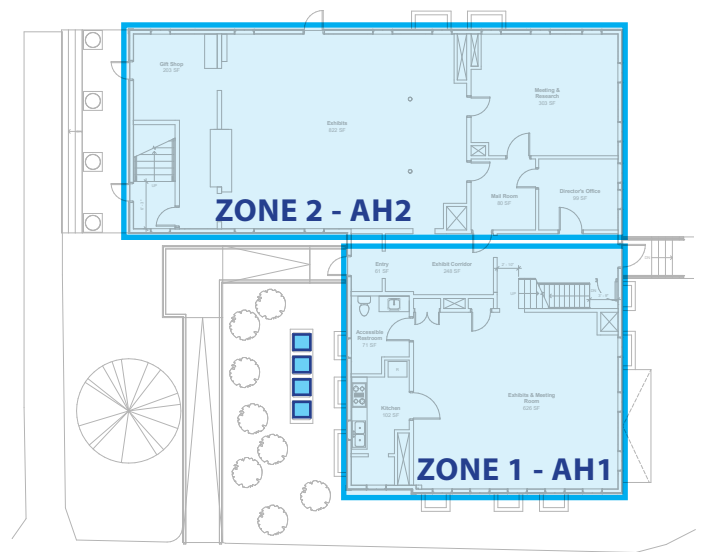
Two air handlers in the basement (AH1 & AH2) deliver conditioned air through a network of ducts that emit through floor nozzles in the first floor. Each air handler unit is located adjacent to legacy heat exchanger units that are no longer operational. The return air duct for each air handling unit appears to be connected to a legacy heating duct that draws return air from the zone served.

Two air handlers in the attic (AH3 & AH4) deliver conditioned air through a network of ducts that emit through ceiling nozzles in the second floor ceilings of the Main Building and Annex. The return air duct for each of these AC units appears to be connected into legacy heating ducts, similar to the basement level.

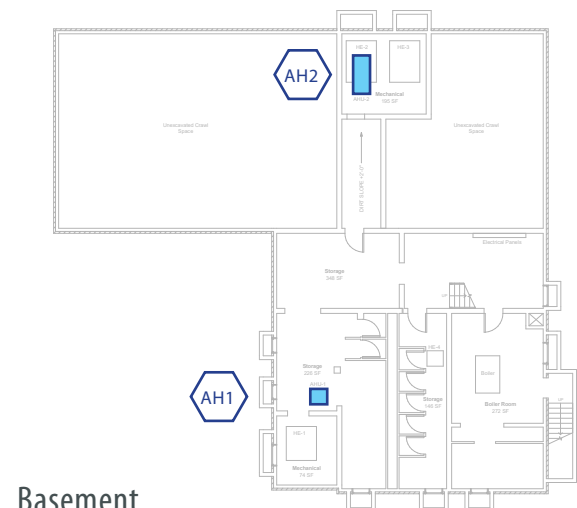


Note: AH3 & AH4 located in attic

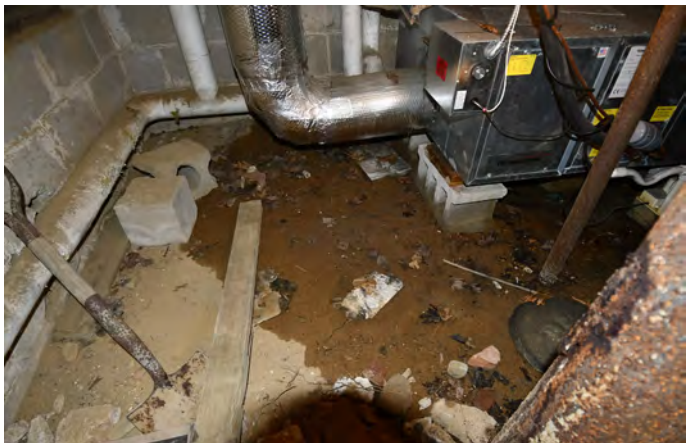
Second Floor



First Floor



Basement



Building Systems

Heating System - Existing

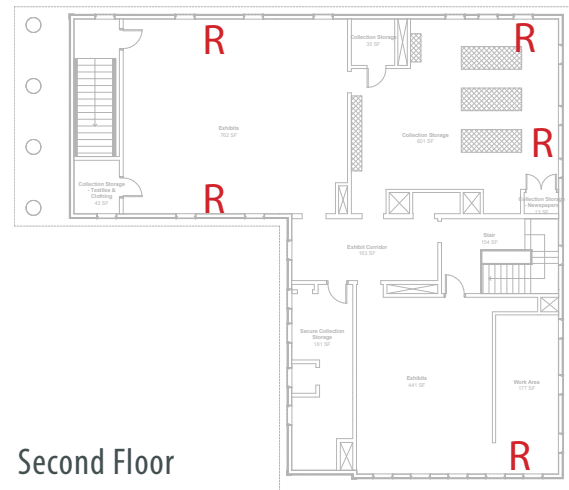
The building's heating system is a gas fired steam boiler located in the basement that feeds radiators located throughout the building.

In addition, a legacy gravity feed heating system exists but is no longer utilized. This system is connected to the same steam boiler, but has been valved off. The valved off steam lines serve three gravity fed heat exchanger ducts from two locations (ducts open on the bottom to the basement with a cast iron heat exchanger; and completely open to the attic). One is located along the east wall of the Main Building (2 ducts), and one is located in the northwest corner of the Annex.

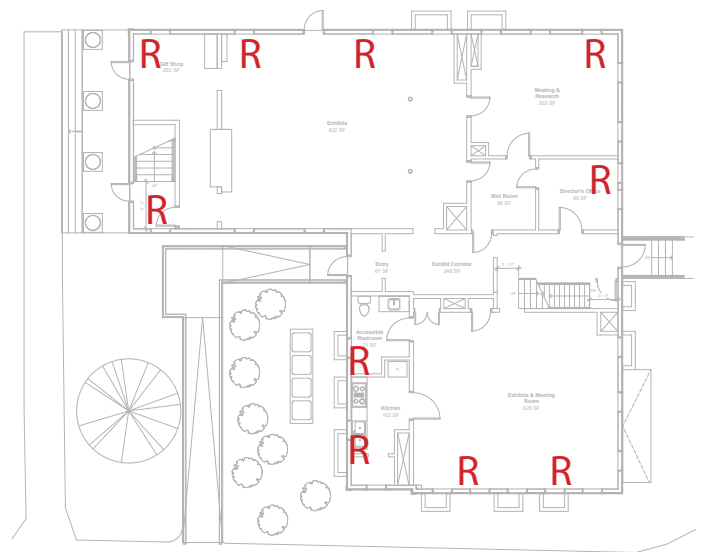
Ducts - Supply & Return

The intermixing of supply and return air ducts, and what appears to be a direct open chase connection between the basement and attic requires a more thorough investigation by an HVAC engineer to accurately document the configuration and functionality of the overall system. We heard in our interviews with BAM staff that heating and cooling is inconsistent throughout the building and is hard to control.

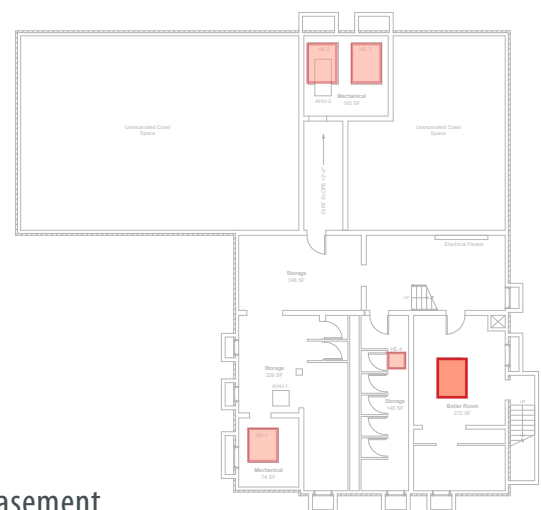
Ductwork and piping in the crawl space beneath the Main Building was installed without consideration for future alterations to create occupied basement space. In excavating these spaces to create a full basement, the heating/cooling plants and duct distribution system will need to be replaced. The nozzle system may be reusable, but the overhead ductwork would need to be retrofitted with flattened ductwork in order to maximize headroom.



Second Floor



First Floor



Basement

RECOMMENDATIONS

As part of the basement excavation project we estimate that the following would need to be undertaken. These are to be considered placeholders for the purpose of estimating, no HVAC engineering has been undertaken as part of this study.

Heating System

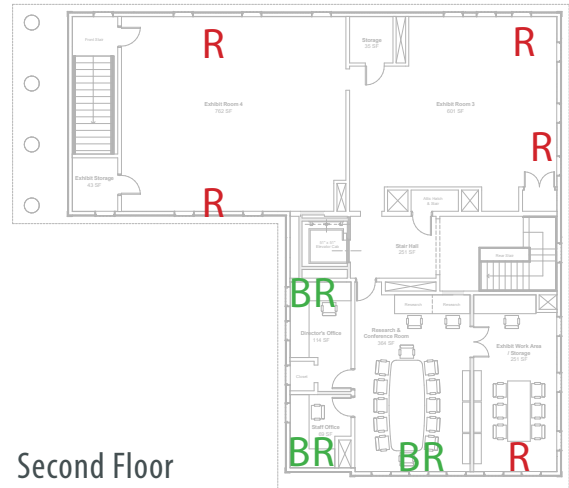
The existing steam fed radiator heating system will remain unchanged. Additional baseboard radiators will be required to provide sufficient heating in the administrative spaces.

In the basement, all legacy steam piping routed between the boiler and gravity feed heating system will be removed to ensure clear headroom space in the new collection storage area.

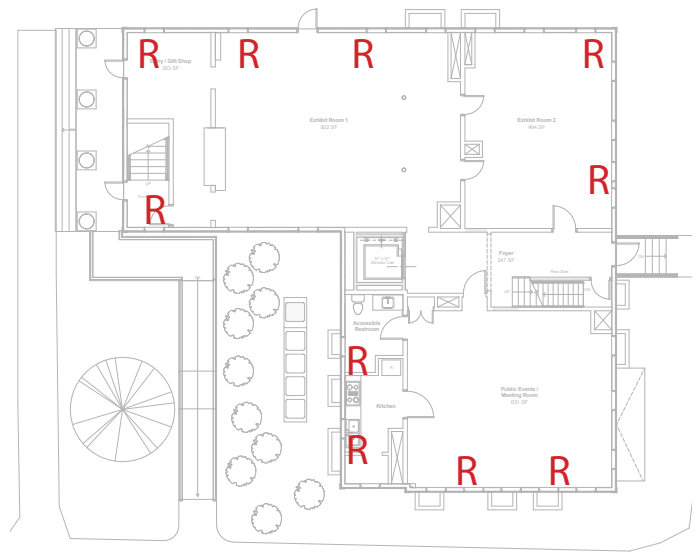


Legacy steam piping to be removed

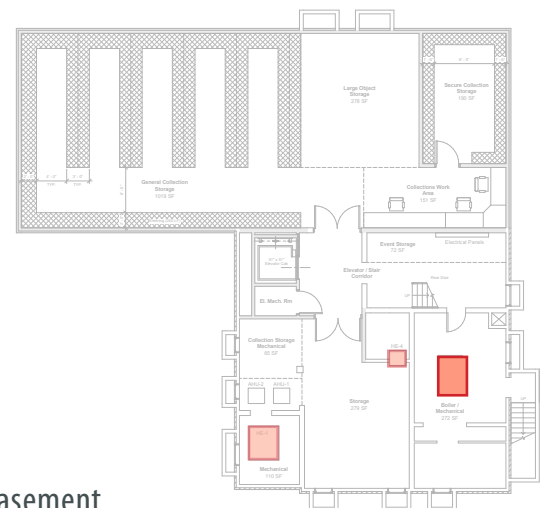
- R** Existing Radiator
- BR** New Baseboard Radiator



Second Floor



First Floor



Basement

Building Systems

RECOMMENDATIONS, CONTINUED

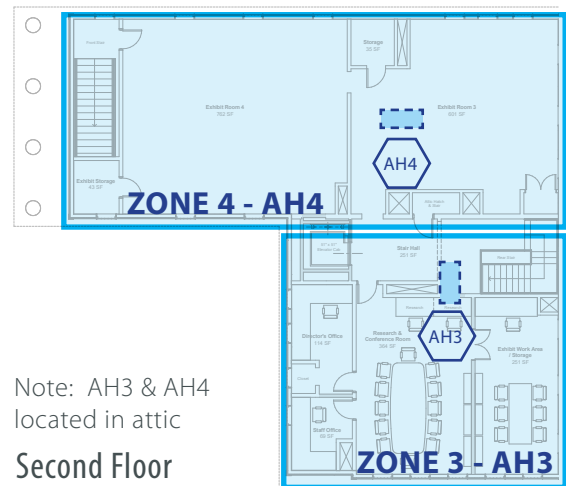
Cooling System

The building's existing cooling system is to remain largely unchanged. In order to facilitate the excavation of the basement, AH2 will be re-located adjacent to AH1 in the basement annex. New ductwork will need to be installed to connect supply and return air from AH2 to the existing nozzle diffusers in Zone 2. The ducting for these two systems will be coordinated to minimize duct crossings that would require additional depth. The remainder of the existing cooling system will be left as is, however some nozzle diffusers may need to be relocated on the second floor based on the new layout in the administrative spaces.

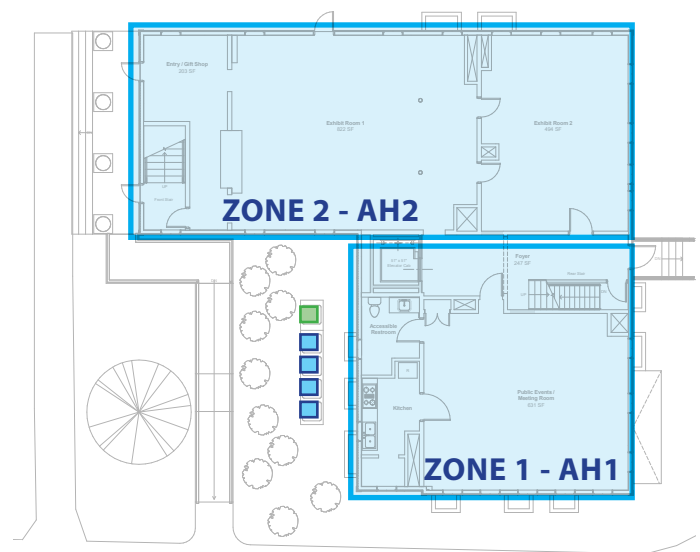
In addition, a new air handling unit AH5 will be located in the annex basement. This unit will be paired with a new exterior DX condenser to be located on the north side of the annex. This new package unit will supply conditioned air for heating, cooling, and humidification to the new basement level collection storage area; for the purpose of this study we assume that the system will be laid out with a perimeter duct distribution configuration.

Sprinkler System

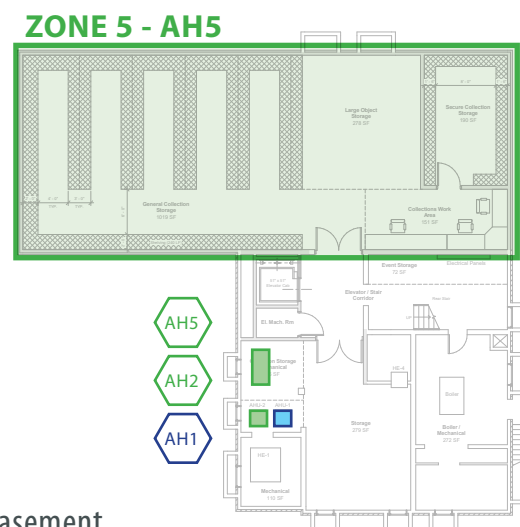
A dry-action sprinkler system will be installed in the new basement collection storage area. Existing sprinkler lines and sprinkler heads will require selective re-configuration to provide sufficient coverage in the new second floor administrative suite. All other areas of the building will remain unchanged.



Second Floor



First Floor



Basement

Vertical Circulation

ACCESSIBLE ELEVATOR

Vertical access at the Brooks Academy Museum has three primary objectives :

- Access to all three floors
- Limited impact on historic character of building
- Ability to move objects between all floors

Shown in the proposed plans is a limited use limited access elevator (LULA). This type of elevator functions similarly to a traditional elevator, except it is smaller in size and requires a smaller hoistway. The proposed plan includes a 51" x 60" elevator cab, requiring a 72" x 72" hoistway. This elevator is able to utilize a 14" pit and only requires 120" of overhead clearance at the top story. These requirements can be accommodated with minimal visual impact to the exterior.

CODE COMPLIANCE

LULA Elevators are allowed by code under specific circumstances. Refer to the code summary section for the complete code review.

- 521 CMR 28.12.1.d - 'Limited use elevators may be used as a part of an *accessible route* of travel in lieu of an elevator under any of the following circumstances. d. In existing buildings of less than three stories in height or that have less than 3000 square feet per story unless the building is a shopping center, a shopping mall, or the professional office of a health care provider.'



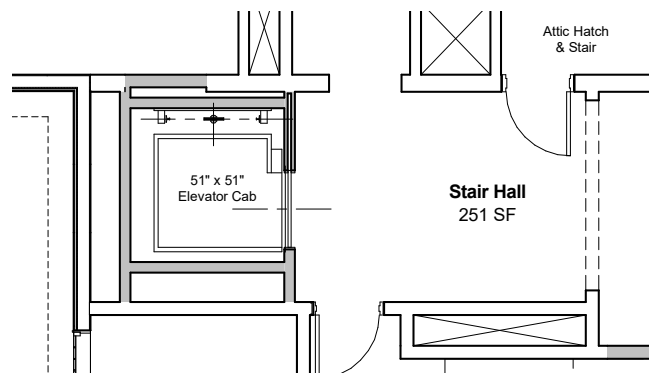
LULA Elevator

ELEVATOR IN HISTORIC STRUCTURE

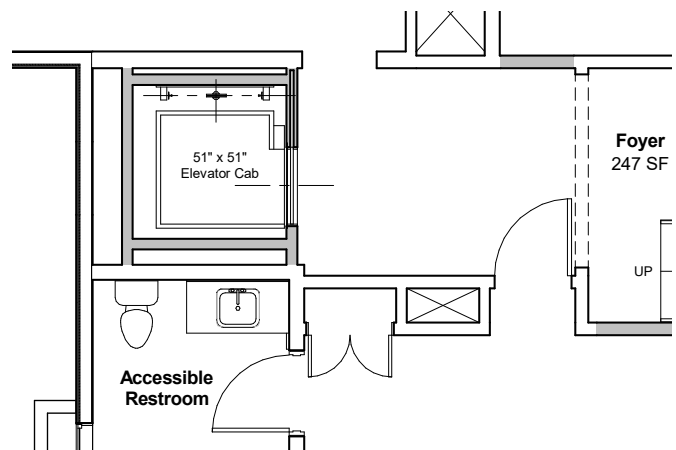
The proposed location for the LULA Elevator is in the existing entry foyer / vestibule. This location allows for a minimal disruption to the surrounding building, and readily accommodates the needed hoistway and elevator machine room.

The new hoistway is constructed with shaft walls that are positioned inboard of adjacent existing walls, eliminating the need to modify existing partition construction to achieve a rated shaft. The exterior wall has a door, awning, and window which will be removed and filled in with new siding to match the rest of the exterior wall. A new mechanical chase is created between the exterior wall and the hoistway shaft to allow for easy ducting between AH2 & AH5 to the basement and first floor of the original building. An elevator machine room is located adjacent to the hoistway on the basement level.

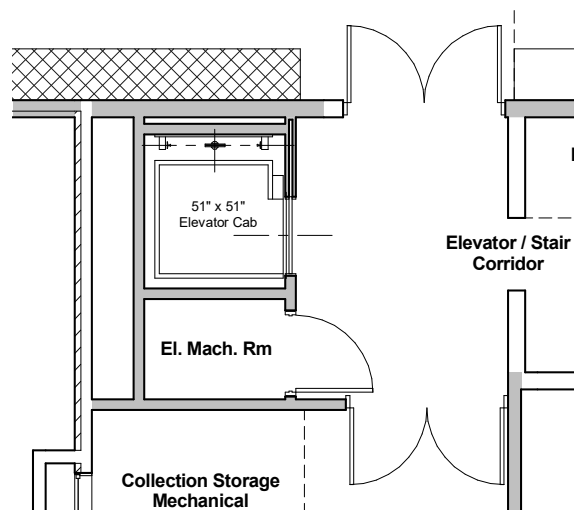
The new hoistway requires a 14" pit as well as a 120" overrun clearance. To accommodate these, the hoistway will have a new concrete elevator pit and foundation that will support the hoistway shaft construction. The flat roof above the elevator will need to be raised slightly to fit the overrun clearance, but will be detailed to minimize the sightline.



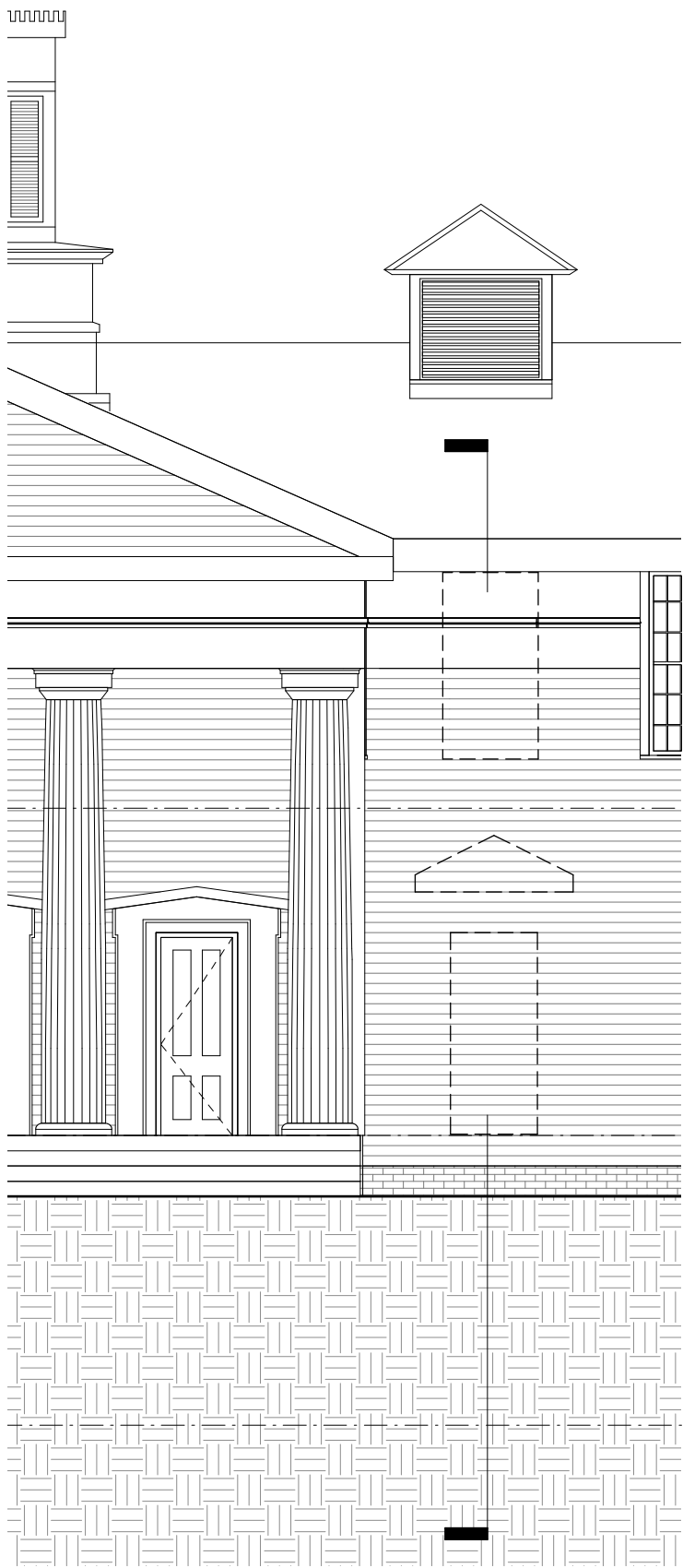
Second Floor



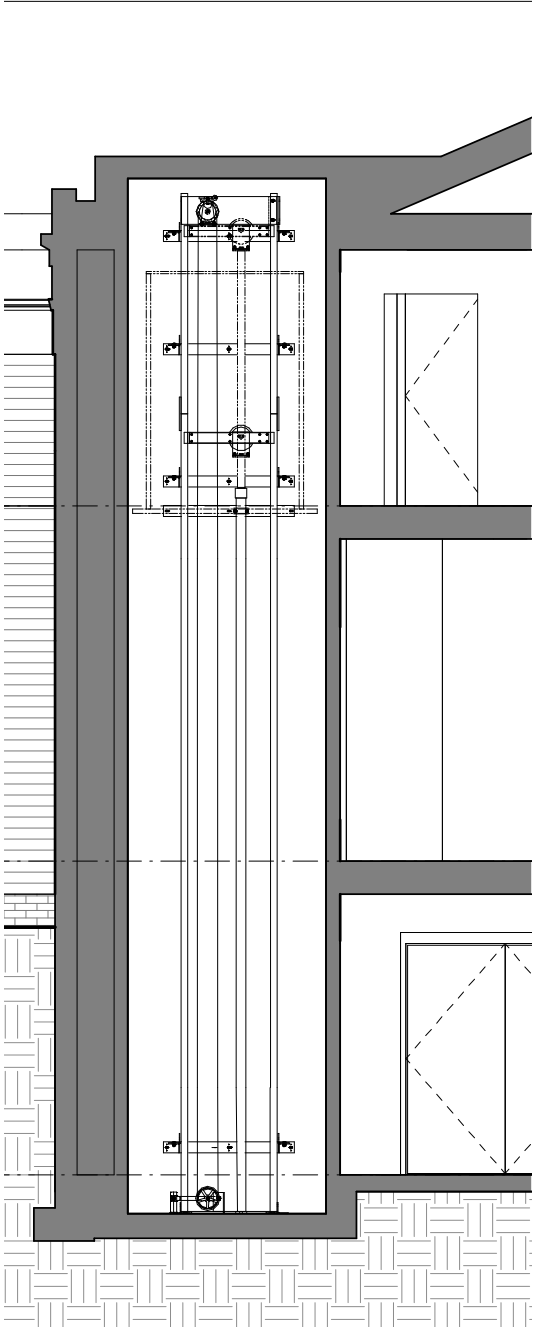
First Floor



Basement



North Elevation



Section

Program Comparison

NEW EXPANSION

The proposed basement expansion adds 1,500 gsf to the overall building area, as well as an interior reorganization that is enabled by the new entry and circulation pattern. The comparison of floor plan areas is broken down by program component in the table opposite.

Visitor Services

Entering through the main portico allows the gift shop to be part of the entrance/exit experience and reduces the staffing need of the current split arrangement, allowing one staff member to manage the entry and gift shop. This arrangement also improves the welcoming of visitors by giving them an immediate interaction with staff upon entering the museum. As a result, the LULA elevator can take the place of the existing entrance without sacrificing valuable space.

Exhibit Areas

The overall exhibit areas have been reorganized within the original 1844 building. The result is an equal amount of exhibit space compared to the existing program, but in a simpler layout that offers a clearer path for visitors to navigate. This layout can also be operated with fewer staff.

Collection Storage

The collection storage areas have been increased by a net 600 sf. This 57% increase in storage space is in fact even more substantial than the program indicates. For example, the new collections storage area includes a large objects storage area, as well as an increase in shelving area from the current 70

linear feet to over 240. This is due to the fact that the current collection storage areas are inefficient and must also accommodate curatorial and exhibit staff work areas.

Events Space

The Meeting Room is converted from a multi-function exhibit area to a dedicated events space. This gives BAM the ability to stage the space for events without needing to re-set exhibit spaces or move events furniture on a regular basis. BAM would also have the ability to convert this space in the future to serve as an additional changing exhibit gallery without impacting existing exhibit spaces.

Administrative

The current lack of functional storage space and administrative work areas is directly related to the shortage of collection storage space. The new program enlarges the available staff work areas to provide for operational and exhibit related needs. Separating these spaces from the collection storage is also a key factor in improving the collection storage functionality.

Storage / Mechanical

The new program increases the amount of mechanical space, but shows a net reduction overall compared with the existing. This is due to the fact that the existing multi-use storage spaces have been consolidated and largely addressed in other program components. The remaining storage space is no longer dual function, and would only be used for facility maintenance storage.

Existing Program

(Net Square Feet)

Flr	Room	SF
Visitor Services		
1	Entry	61
1	Gift Shop	203
1	Accessible Restroom	71
	<i>Subtotal</i>	<i>335</i>
Exhibit Areas		
1	Exhibit Area	822
1	Exhibit / Meeting Room	626
1	Exhibit Corridor	248
2	Stair Hall	154
2	Exhibit Corridor	163
2	Exhibits	762
2	Exhibits	441
	<i>Subtotal</i>	<i>3,216</i>
Collection Storage		
2	Work Area	175
2	General Collection Storage	601
2	Secure Collection Storage	181
2	Ceramics & Glasses	35
2	Textiles & Clothing	43
2	Newspapers	13
	<i>Subtotal</i>	<i>1,048</i>
Events		
1	Meeting Room (Including Exhibits)	-
1	Kitchen	102
B	Events Storage	-
	<i>Subtotal</i>	<i>102</i>
Administrative		
1	Director's Office	99
1	Mail Room	80
1	Research Room / Meeting Room	303
	<i>Subtotal</i>	<i>482</i>
Storage / Mechanical		
B	Storage / Stair Corridor	348
B	Storage	226
B	Storage	146
B	Boiler Room	272
B	Mechanical	195
B	Mechanical	74
	<i>Subtotal</i>	<i>1,261</i>
Total Net Area		6,444
Total Gross Area		7,593
	<i>Baseme</i>	<i>1,527</i>
	<i>First Floor</i>	<i>3,033</i>
	<i>Second Floor</i>	<i>3,033</i>
	<i>Net to Gross</i>	<i>0.85</i>

Proposed Program

(Net Square Feet)

Flr	Room	SF
Visitor Services		
1	Entry	-
1	Gift Shop	203
1	Accessible Restroom	71
	<i>Subtotal</i>	<i>274</i>
Exhibit Areas		
1	Exhibit Room 1	822
1	Exhibit Room 2	494
1	Foyer	247
2	Stair Hall	251
2	Exhibit Room 3	601
2	Exhibit Room 4	762
	<i>Subtotal</i>	<i>3,177</i>
Collection Storage		
B	Collections Work Area	151
B	General Collection Storage	1,019
B	Secure Collection Storage	190
B	Ceramics & Glasses (Incl. in GCS)	-
B	Textiles & Clothing (Incl. in GCS)	-
B	Newspapers (Incl. in GCS)	-
B	Large Objects Storage	278
	<i>Subtotal</i>	<i>1,638</i>
Events		
1	Public Events / Meeting Room	631
1	Kitchen	102
B	Events Storage	72
	<i>Subtotal</i>	<i>805</i>
Administrative		
2	Director's Office	114
2	Staff Office	69
2	Research & Conference Room	364
2	Exhibit Work Area / Storage	251
2	Exhibit Storage	35
2	Exhibit Storage	43
	<i>Subtotal</i>	<i>876</i>
Storage / Mechanical		
B	Elevator / Stair Corridor	203
B	Storage	320
B	Boiler Room	272
B	Mechanical	110
B	Mechanical	65
B	Elevator Machine Room	50
	<i>Subtotal</i>	<i>1,020</i>
Total Net Area		7,790
Total Gross Area		9,099
	<i>Baseme</i>	<i>3,033</i>
	<i>First Floor</i>	<i>3,033</i>
	<i>Second Floor</i>	<i>3,033</i>
	<i>Net to Gross</i>	<i>0.86</i>

Structural Narrative



September 13, 2018

Brooks Academy Museum – Harwich, MA

Structural Narrative

The existing structure is a two story, wood framed building with a partial basement and attics. It is considered historic with two additions built onto the oldest portion. The Museum has identified storage space and an elevator addition as the most critical elements for this renovation.

The structure at the oldest portion appears to consist of beams spanning the short direction of the building, approximately 27 feet, with joists spanning between the beams. At the first floor, some of these beams have been reinforced and multiple support points have been provided, some with the original construction and some at a later date. Joists in some areas have also been sistered. The sill plate appears to be heavy timber, possibly with notched cuts where joists frame in. While some of the structure is visible below the first floor, the second-floor structure is not visible. We have assumed that the framing is similar due to the large open space at the first floor. Due to the orientation of the roof ridge, it is assumed that the roof rafters span to the long, exterior walls and the attic rafters also serve as roof ties. The depth of the foundation walls is unknown. These walls appear to brick. Footings below are unknown. The crawl space

below this portion of the building is quite shallow.

The first addition is in line with the original building and appears to be constructed similarly except that the beams and joists are oriented perpendicular to those in the original portion. Foundations are constructed similarly to the original structure.

Limited information is available at the newest addition since it has a full basement with a finished ceiling. The foundation in this area appears to be cinder block or concrete masonry units with brick at the top.

1. Storage

In collaboration with the stakeholders, the design team has identified the crawl space below the oldest two portions of the building as potential space to be reclaimed. This will require creating a new basement below the existing structure while leaving the building in place. The proposed sequence for this work would be:

1. Provide temporary, steel shoring beams on either side of the existing beams. These would span the full width of the existing building where possible and bear on 22" diameter temporary concrete drilled piers, extending approximately 2 to 4 feet below the proposed depth of excavation. Additional temporary bracing may be required to stabilize these supports.

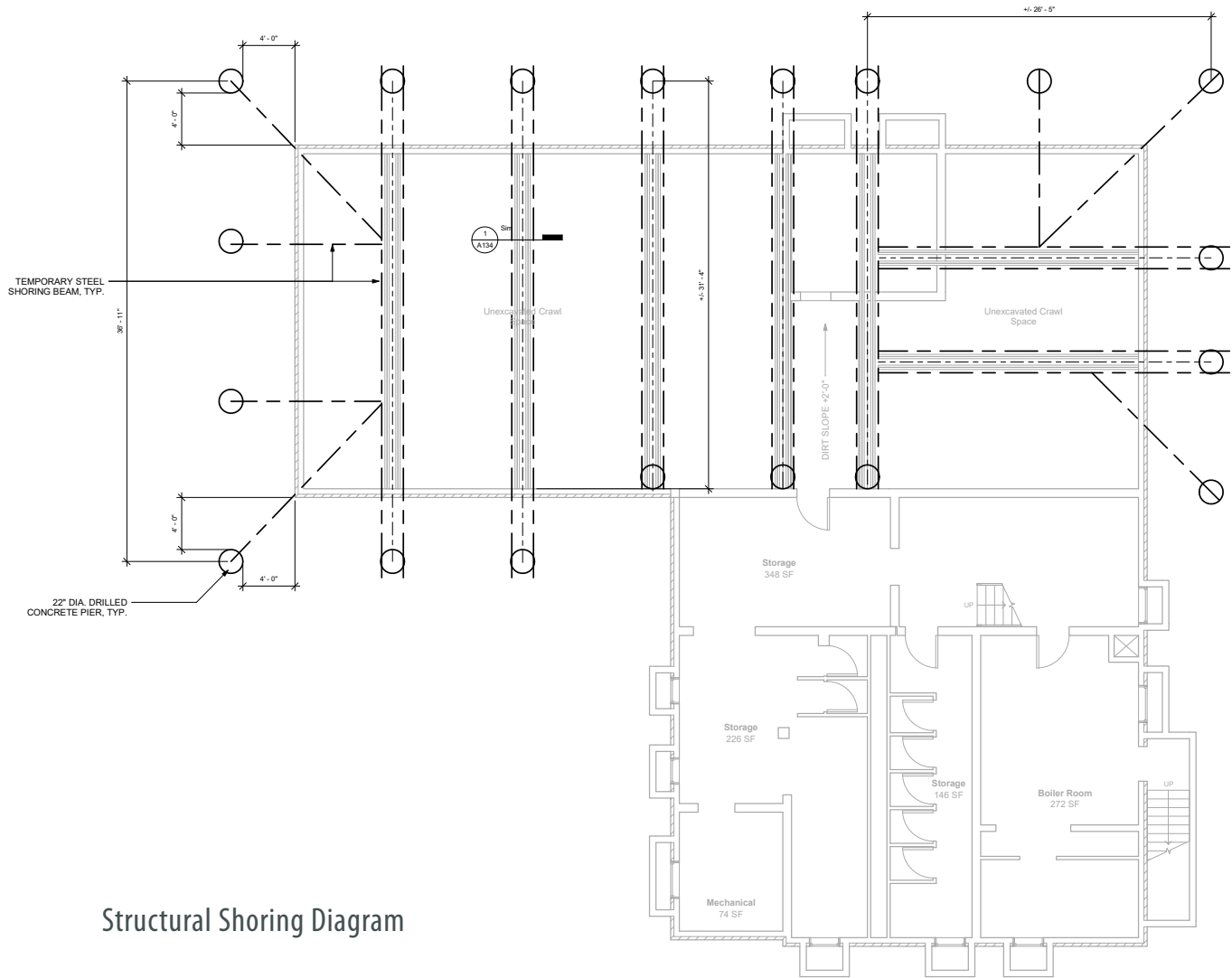
2. Once the existing building has been supported by the shoring elements, the existing foundations will be demolished and the area below the building will be excavated to allow for construction of a new foundation.
3. New foundation walls and footings will be constructed with leave-outs at the temporary shoring locations. This will be a 10" reinforced concrete wall on a 2 foot wide by 1 foot deep continuous wall footing. A shelf will be cast in the top 24" off the wall to receive load bearing brick masonry to match the existing brick and preserve the historic character. The taller portion of the wall will be held 2" below the wood structure.
4. Existing wood beams will be removed and existing joists will be cut back to allow for installation of new, W14 steel beams. Steel beams will be fully blocked at the web and existing joists will be connected to steel beams with face mounted hangers. Steel beams will bear predominantly on concrete pilasters at the foundation walls, with steel columns located mid span and at the interface between the original building and the first addition.
5. Load bearing brick will be placed at the shelf in the concrete wall with brick ties anchoring it into the concrete stem wall behind. Hold the top of the brick 2" down from the underside of the existing sill plate and drypack this gap tightly to ensure proper bearing on the brick.
6. The temporary shoring beams will be removed and the leave-outs at the foundation walls will be infilled.
7. Once the concrete at the foundation walls has reach 75% of its design strength, the 2" gap between the existing wood framing and the new foundation wall will be dry packed.
8. A positive connection will be made to anchor the existing structure to the foundations.
9. Waterproofing and perimeter drainage can be placed on the exterior of the new foundation wall prior to backfilling.

2. Elevator

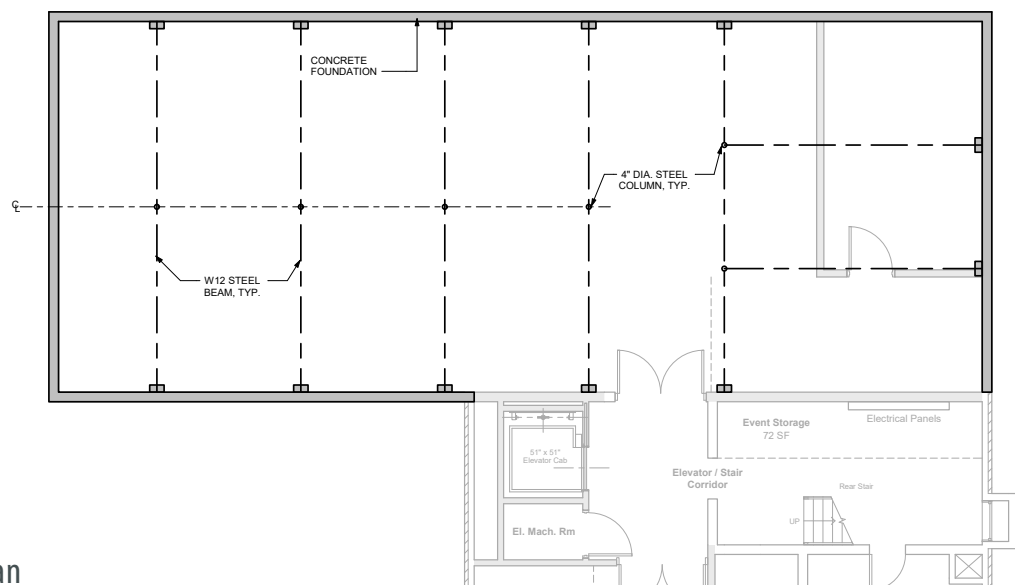
The proposed elevator hoist way will be located so as to minimize impact on beams and bearing walls, but local reframing will be required to provide the new opening. The elevator will have a minimal pit, but some underpinning may be required locally. Extent of underpinning will be confirmed once further investigation has taken place.

3. Limitations

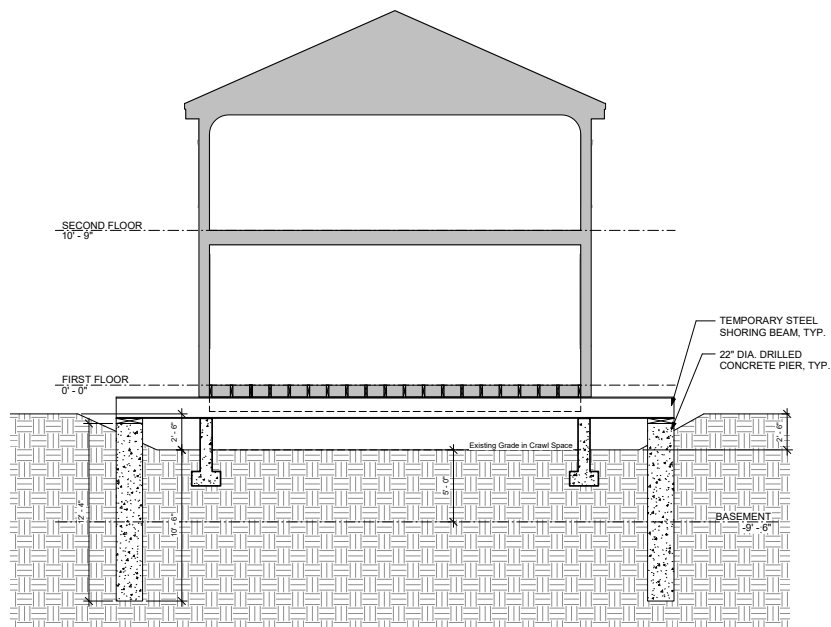
Further investigation will be required to confirm that existing structural framing and the depth of the existing foundations. It should also be noted that there is currently limited space below the original building and the first addition so work performed in this area will be challenging due to the very low head room.



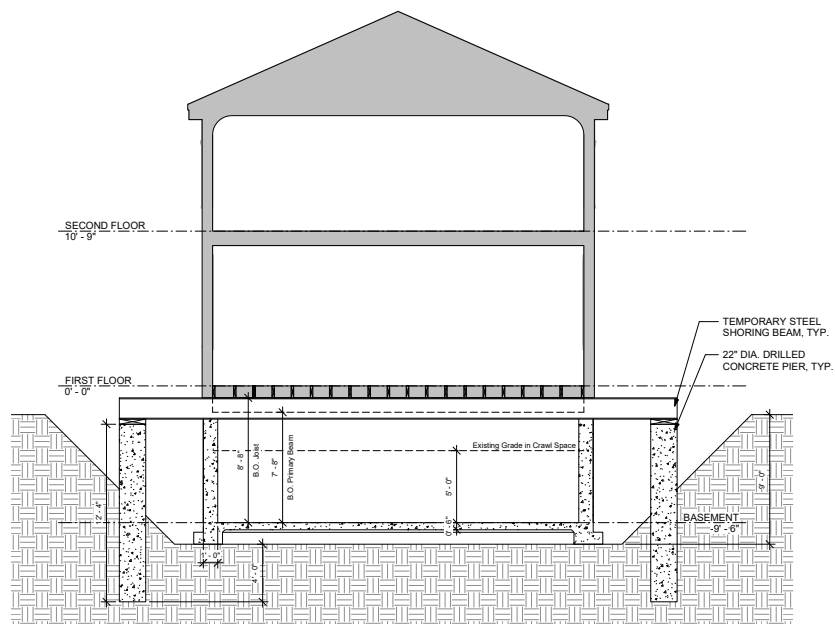
Structural Shoring Diagram



Structural Plan



① SHORING SECTION - EXISTING FOUNDATION
1/4" = 1'-0"



② SHORING SECTION - NEW CONSTRUCTION
1/4" = 1'-0"

Outline Specification Narrative

LULA ELEVATOR

Demolition:

- Demolish exterior entrance door, entrance canopy and window at level 2
- Cut elevator shaft openings in first floor, second floor, and roof; reinforce exterior wall
- Demolish concrete slab for hoist pit
- Slight rerouting of basement ceiling mounted water supply, electrical conduit, sprinkler lines around new shaft (CMI_1151.jpg and 1152.jpg)

Construction:

- Construct new steel stud elevator hoistway shaft wall connecting Basement, 1st and 2nd floors.
- Construct new elevator machine room
- Refinish interior of adjoining spaces with GWB + plaster finish and wood door surrounds to match existing
- Patch wood flooring to match existing pine
- Patch ceilings to match existing plaster
- Install LULA elevator (3 stops / 20'-3" Vertical Travel)
- Close in openings in exterior wall, add batt insulation, and install new painted clapboard siding to match existing historic cedar clapboards (thicker than current off the shelf clapboards)
- New insulated roof for elevator overrun with exhaust vent louver. PVC membrane roof tied into existing flat roof and sloped to perimeter gutter. Aluminum flashing as needed at intersection of overrun roof and existing sloped asphalt shingle roof.

NEW ENTRANCE

Demolition:

- Selectively demolish existing front porch decking, stairs, and column bases. Existing wood column covers, steel structure, and concrete foundations to remain.
- Demolish existing wood ramp, railings, and concrete landing

Construction:

- Restore existing historic oversized wood panel doors (2) at new entrance. Install new thresholds and hardware to make doorways fully accessible and gasketed for weather sealing.
- Restore center false door panel to match 2 flanking doors
- Re-construct front porch and steps with lpe deck boards to conform with accessibility codes.
- Refinish column bases with new stainless steel flashing
- Install new lpe landing and ramp with glass guardrails and accessible handrails
- Re-landscape areas of former ramp and front of new ramp
- Allowances for: Power, Lighting, Security, Landscaping Irrigation

NEW BASEMENT EXCAVATION - COLLECTION STORAGE SPACE

Demolition and Excavation:

- Relocate AH2 from main building partial basement to annex adjacent to AH1.
- Remove AH2's associated supply ductwork feeding nozzles in first floor Zone 2 and return ductwork connected to east side vertical shafts
- Remove legacy steam piping feeding gravity heating system at east side of main building
- Install temporary shoring as required for structural work
- Excavate entire crawlspace below main building and demolish existing CMU mechanical room and sloped dirt floor accessway. Excavation material estimated to be under 300 cubic yards
- Demolish 150 linear feet of existing perimeter foundation wall below the main building. Salvage original foundation brick for re-use as facing on new foundation.
- Demolish 2 areaways at east side of building.

Construction:

- New 8" thick CIP concrete foundation walls with interior Rigid insulation and GWB; exterior waterproofing membrane with salvaged brick cladding to 12" below grade
- New 6" polished concrete floor with rigid insulation and vapor barrier.
- Install new steel beam supports for first floor.
- New fiberglass batt insulation between first floor joists and GWB ceiling on wood strapping

- Interior walls: steel stud with GWB and fiberglass batt insulation
- Doors: gasketed hollow metal door and frame with large glass lite
- Install new AH5 package unit to provide heating, cooling, and humidity control system for new basement collections space (connect to new outside air supply)
- Install new ducts connecting relocated AH2 with existing first floor diffuser nozzles in Zone 2. Connect to return air and new outside air supply.
- Allowances for: Power, Lighting, Security, Sprinkler System, shelving and work counters

INTERIOR ALTERATIONS

Demolition:

- Remove interior non-load bearing partitions as indicated in plans. Patch and repair ceilings, floors, and walls as required to match existing.

Construction:

- New walls and doorway infills are to be metal stud with fiberglass batt insulation and gwb finish. Paint, trim, and patch adjacent plaster to match existing.

Cost Estimate

COST BREAKDOWN

Basement

(Excavation, New Foundation, and New Collection Storage Area)

Trade Costs (58%)	\$345,232
Attendant Costs (42%)	<u>\$248,567</u>
Construction Cost	\$593,799

Accessibility & Renovation

(Elevator, Front Portico Restoration, New Entry, Interior Renovation)

Trade Costs (58%)	\$505,708
Attendant Costs (42%)	<u>\$366,203</u>
Construction Cost	\$871,911

Totals

Trade Costs (58%)	\$851,736
Attendant Costs (42%)	<u>\$613,794</u>
Total Construction Cost	\$1,465,710

Gross Floor Area (sf)		9,099		
		<u>Elements (\$)</u>	<u>\$/sf</u>	<u>%</u>
Trade Costs	A Substructure	239,309	26.30	28.10%
	A10 Foundations	17,941	1.97	2.11%
	A20 Basement Construction	221,367	24.33	25.99%
	B Shell	125,516	13.79	14.74%
	B10 Superstructure	82,576	9.08	9.70%
	B20 Exterior Enclosure	41,283	4.54	4.85%
	B30 Roofing	1,656	0.18	0.19%
	C Interiors	130,258	14.32	15.29%
	C10 Interior Construction	78,954	8.68	9.27%
	C20 Stairs	0	0.00	0.00%
	C30 Interior Finishes	51,304	5.64	6.02%
	D Services	273,446	30.05	32.10%
	D10 Conveying Systems	64,923	7.14	7.62%
	D20 Plumbing	5,874	0.65	0.69%
	D30 Heating, Ventilating and Air Conditioning (HVAC)	113,277	12.45	13.30%
	D40 Fire Protection Systems	15,735	1.73	1.85%
	D 50 Electrical Systems	73,637	8.09	8.65%
	E Equipment and Furnishings	5,225	0.57	0.61%
	E10 Equipment	0	0.00	0.00%
	E 20 Furnishings	5,225	0.57	0.61%
	F Special Construction and Demolition	22,517	2.47	2.64%
	F10 Special Construction	0	0.00	0.00%
	F20 Selective Demolition	22,517	2.47	2.64%
	G Building Sitework	55,466	6.10	6.51%
	G10 Site Preparation	3,924	0.43	0.46%
	G20 Site Improvements	51,542	5.66	6.05%
	G30 Site Civil/Mechanical Utilities	0	0.00	0.00%
	G40 Site Electrical Utilities	0	0.00	0.00%
	G90 Other Site Construction	0	0.00	0.00%
	Sub Total Construction	851,736	93.61	100.00%
Attendant Costs	General Requirements/General Conditions	170,347	18.72	
	Bonds	1.00%	10,221	1.12
	Insurance	1.15%	11,871	1.30
	Builders Risk Insurance		By Owner	
	Permit Fee		Excluded	
	Escalation to mid-point of construction 2Q2021	11.40%	119,086	13.09
	Design Contingency	20.00%	232,652	25.57
	GC's Fee	5.00%	69,796	7.67
	Construction Contingency		By Owner	
	Total Construction Cost	1,465,710	161.08	

NOTES

1. Brief project description: Basement addition, new elevator and minor renovation.
2. The estimate is based on the following:
 - Prevailing wage rates.
 - GC type project.
 - Receipt of 3# bona fide bids.
 - Single contract, no phasing.
 - Construction start 3Q2020.
 - Construction period 18 months.
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3. The gross floor areas are based on the following:
 - Measurement is taken to the outside face of the exterior wall, measured through all stair wells, elevator shafts and ducts.
4. Story heights: Varies.
5. General Conditions/Requirements for this project are priced as a percentage on the Summary pages.
6. Special Conditions for this project are not applicable.
7. Escalation to the mid-point of construction taken at 4% per annum to the mid-point of construction (2Q2021).
8. Estimating contingency is an allowance for future design modifications/additions, which alter the cost of the building as the design progresses, this percentage reduces as the design develops. It is based on a percentage of the sum of Sub-Total Construction, General Conditions/Requirements and Escalation. For this level of estimate the following has been included: 20.00%
9. Construction contingency is an allowance for scope/design modifications made by the owner during construction and also for any unforeseen circumstances. It is based on a percentage of the sum of Sub-Total Construction, General Conditions/Requirements, Escalation and Estimating Contingency. The following has been included: By Owner
10. This estimate has been prepared from the following design information:
 - Architectural drawings dated 06/27/2018.
 - Structural drawings dated 09/14/2018
 - Project scope/narratives dated September 2018.
 - Telephone conversations and meeting with BIA. studio.
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11. The estimate includes the following: See estimate.

12. The estimate excludes the following:

- Utility company backcharges
- Design consultants fees
- Owner's project manager
- Owner's construction clerk
- Owner's construction contingency
- Sales Tax
- Permits
- Testing
- Insurance
- Commissioning
- Emergency Generator
- Building Permit Fees
- Fire Pump
- Hazardous Material Removal
- Furnishings & equipment
- Decontamination of soil
- Removal of Contaminated Soil Material
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13. Allowances:-- See Estimate.

14. Assumptions:-- See Estimate.

15. Estimates by other firms:-- None

16. Common abbreviations included in this estimate:

cd = construction documents

cf = cubic foot

cte = connect to existing.

cy = cubic yard

dd = design development.

ea = each

eo = extra over

extg = existing

flr = floor

gfa = gross floor area

lb = pound

lf = linear foot

ls = lump sum

ly = linear yard

mg = make good

opg = opening

rsr = riser

sd = schematic design

sf = square foot

sy = square yard

tn = ton

17. Builders work in connection (BWIC) with conveying, mechanical and electrical systems includes the following:

- Drilling and coring.
- Chasing.
- Cutting and patching

Description	Qty	Unit	Rate	Amount	Total
Summary					
A Substructure					
A10 Foundations				17,941	
A20 Basement Construction				221,367	
B Shell					
B10 Superstructure				82,576	
B20 Exterior Enclosure				41,283	
B30 Roofing				1,656	
C Interiors					
C10 Interior Construction				78,954	
C20 Stairs				0	
C30 Interior Finishes				51,304	
D Services					
D10 Conveying Systems				64,923	
D20 Plumbing				5,874	
D30 Heating, Ventilating and Air Conditioning (HVAC)				113,277	
D40 Fire Protection Systems				15,735	
D 50 Electrical Systems				73,637	
E Equipment and Furnishings					
E10 Equipment				0	
E 20 Furnishings				5,225	
F Special Construction and Demolition					
F10 Special Construction				0	
F20 Selective Demolition				22,517	
G Building Sitework					
G10 Site Preparation				3,924	
G20 Site Improvements				51,542	
G30 Site Civil/Mechanical Utilities				0	
G40 Site Electrical Utilities				0	
G90 Other Site Construction				0	
Sub-Total Building				851,736	

A10 Foundations**Cast-In-Place Concrete**

Elevator

Elevator pit wall & slab	1	ls	5,688.04	5,688	
Waterproofing to exterior face for Elevator pit wall				Included Above	
Vapor barrier & insulation below slab				Included Above	5,688

Other Items

Existing Areaways

Clean, patch & repair areaways (assumed 5' 0" high)	61	lf	123.50	7,534	
Replace steel grates at areaways	69	sf	66.50	4,589	
Clean debris at areaways	69	sf	1.90	131	12,253

A10 Foundations

Total				17,941	17,941
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A20 Basement Construction**Demolition**

Remove & Dispose

R&D : Basement, including excavation & foundation	1,784	sf	15.31	27,315	
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Description	Qty	Unit	Rate	Amount	Total
R&D : Temporary support	1	ls	18,433.60	18,434	45,749
Temporary Support					
22" dia. drilled concrete pier - 13' 0" long	16	ea	2,885.93	46,175	
Temporary steel shoring	1,784	sf	28.50	50,844	97,019
Foundation					
Basement foundation, including following	1,784	sf	37.06	66,114	
Foundation footing - 2' 0" x 1' 0" thick				Included Above	
Foundation wall - 7' 9" high x 8" thick, rigid insulation and GWB				Included Above	
Slab on grade - 6" thick, polished, rigid insulation and vapor barrier				Included Above	
Salvaged brick to face of new foundation	441	sf	15.57	6,867	
New fiberglass batt insulation between first floor joist	3,033	sf	1.85	5,619	78,599
A20 Basement Construction	Total			221,367	221,367

B10 Superstructure**B1010 Structural Framing**

Structural Steel members					
Structural support at new Basement for structure above - allow 15lb/sf	1,784	sf	35.63	63,555	
4" dia. steel column				Included w/Allowance	
W12 steel beam				Included w/Allowance	
Allow for structural steel connections, fittings, etc. allow 7.5% of structural steel				Included w/Allowance	
Shear studs				Not Required	
Moment connection				Included w/Allowance	
Base plate	6	ea	332.50	1,995	
EO for shop paint and field touch-up paint after steel installation	1	ls	392.45	392	
Miscellaneous Structural Items					
Loose steel to elevator hoistway, allow	1	ea	2,850.00	2,850	
Steel supports for elevator openings	81	lf	71.25	5,771	
Steel supports for mechanical equipment				Not Required	
Miscellaneous steel frames, assemblies, etc	1	ton	4,750.00	4,750	
Relieving angles/bent plates at exterior wall				Not Required	
Lintels over windows				Not Required	79,314

B1020 Floor and Roof Framing

Suspended floor deck				ETR	0
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B1030 Structural Fireproofing

Structural Fireproofing					
Fire protection (allow in Basement addition, gfa)	1,784	sf		Not Required	
Fire protection (adapt/amend existing, gfa)	7,315	sf		Not Required	
Intumescent paint to exposed steel, allow				Not Required	
Firestopping (allow in Basement addition, gfa)	1,784	sf	0.86	1,525	
Firestopping (adapt/amend existing, gfa)	7,315	sf	0.24	1,737	3,263

B10 Superstructure	Total			82,576	82,576
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B20 Exterior Enclosure**B2010 Exterior Wall**

Repair Existing Siding					
Repair siding, allow 20% (East)	218	sf		Not Required	
Repair siding (North)				Not Required	
Repair siding at eve (West)	83	sf		Not Required	

Description	Qty	Unit	Rate	Amount	Total
Repair siding (South)				Not Required	
Patch wall where ramp & canopy removed	1	ls		Not Required	
Infill Wall					
Infill wall where SL door removed	21	sf	35.55	747	
Infill wall where window removed	15	sf	35.55	533	
Infill wall where plywood removed	7	sf	35.55	249	
Scrape & Paint Existing Siding					
Scrape & paint extg siding (East)	1,088	sf	3.33	3,618	
Scrape & paint extg siding, allow 50% (North)	570	sf	3.33	1,895	
Scrape & paint extg siding (West)				Not Required	
Paint siding after repair (West)	83	sf	1.90	158	
Scrape & paint extg siding (South)				Not Required	
New elevator wall	54	sf	35.55	1,920	
Trim					
Repair corner board (West)	39	lf	6.65	259	
Repair upper frieze (West)	32	lf	8.55	274	
Column base detail to extg column, stainless steel flashing	40	lf	19.95	798	10,450
Roof Screen					
Mechanical equipment roof screen system				Not Required	0
B2020 Exterior Window					
New Window					
Wood double hung window - 2' 6" x 6' 0"	1	ea	1,211.25	1,211	
Replace missing glazing putty, repaint, improve operability of sashes & improve weather stripping					
Repair existing wood double hung window - 2' 0" x 4' 0" high assumed	2	ea		Not Required	
Repair existing wood double hung window - 2' 10" x 4' 0" high assumed	3	ea		Not Required	
Repair existing wood double hung window - 2' 6" x 4' 0" high assumed	3	ea		Not Required	
Repair existing wood double hung window - 2' 6" x 6' 0"	51	ea		Not Required	
Trim to New Window					
Window trim to new window	15	lf	11.40	171	
Window sill to new window	3	lf	14.25	43	
Louver					
Exhaust vent louver - 4' 0" x 2' 0"	2	ea	456.00	912	
Exhaust vent louver - 4' 0" x 3' 6"	2	ea	798.00	1,596	3,933
B2030 Exterior Doors					
New Door					
SL storm door with a simple rectangular aluminum frame unit	1	ea		Not Required	
Existing Doors					
Restore center false door panel - 5' 6" x 8' 3"	1	ea	855.00	855	
Restore existing historic wood panel door - 5' 6" x 8' 3"	2	ea	1,710.00	3,420	
Door hardware & gasket to historic doors	2	ea	627.00	1,254	
Install new threshold to historic doors	5	lf	33.25	166	
Paint bulkhead door	63	sf	4.75	299	5,995
General Items					
Staging/Scaffolding	5,610	sf	3.33	18,653	
Exterior wall flashings	88	lf	8.55	752	
Exterior wall caulking and sealant	176	lf	2.52	443	
Exterior wall wood blocking	352	lf	3.00	1,057	
Expansion, control & isolation joints				Not Required	20,905
B20 Exterior Enclosure	Total			41,283	41,283

B30 Roofing

Description	Qty	Unit	Rate	Amount	Total
B3000 Roof Coverings					
Elevator Roof					
PVC membrane & insulation	46	sf	24.23	1,114	
Existing Roof				No Work Required	
Existing Roof Trim					
Scrape, prepare and repaint cornices and entablature	255	lf		Not Required	
Cupola					
Touch up paint as needed - 10' 6" x 10' 6" x 13' 0" high	1	ea		Not Required	
Gutter and Downspouts					
Copper gutter	181	lf		Not Required	
Copper downspout	184	lf		Not Required	1,114
B3020 Roof Openings					
Skylight System				Not Required	0
General Items					
Roof accessories, allow					
Roof Hatch System				Not Required	
Miscellaneous flashings	27	lf	8.55	231	
Sealant	27	lf	2.52	68	
Blocking	81	lf	3.00	243	542
B30 Roofing	Total			1,656	1,656

C10 Interior Construction**Partitions**

Interior Partitions					
Interior partition : MetalStd - GWB 5/8" 1 layer each side	978	sf	8.79	8,594	
Elevator shaft wall	892	sf	19.00	16,948	
Stair shaft wall	151	sf	15.20	2,295	
Infill wall at existing opening	118	sf	15.38	1,815	
Infill wall where door removed	79	sf	15.38	1,215	
Connect new wall to extg	183	lf	6.65	1,217	
Patch adjacent plaster to match extg	1,464	sf	2.85	4,172	
EO for ditto being:-					
Fire rated	1,011	sf	1.43	1,441	
Bearing wall				Included w/Partitions	
Impact resistant gwb	404	sf	0.62	249	
Batt insulation	2,021	sf	1.57	3,168	
Moisture resistant gwb	303	sf	0.48	144	
Sealant	752	lf	1.19	893	
Blocking	376	lf	2.52	947	43,098

Interior Window/Glazing

Interior glazing				Not Required	0
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C1020 Doors

HM interior doors complete w/frame, hardware, paint, etc					
Interior DL Door - 6' 0" x 7' 0" high	3	ea	2,992.50	8,978	
Interior SL Door - 3' 0" x 7' 0" high	7	ea	1,596.00	11,172	
EO - Large glass lite	218	sf	28.50	6,224	
Door gasket	179	lf	9.50	1,701	
Wood door surrounds	358	lf	14.25	5,102	
Sealant at openings	358	lf	1.19	425	
Blocking at openings	179	lf	2.52	451	34,052

Description	Qty	Unit	Rate	Amount	Total
Fittings					
Visual Display Surfaces, allow					
Porcelain enamel marker boards				Not Required	
Tack boards				Not Required	
Toilet Enclosures				Not Required	
Bathroom Accessories				ETR	
Building Signage, allow					
Door signage to new doors	10	ea	95.00	950	
Interior Directional Signage	1	ls	475.00	475	
Exterior Building Signage				Excluded	
Metal lockers				Not Required	
Fire Extinguisher in Basement Addition					
Fire extinguisher complete w/cabinet & mounting hardware, allow	2	ea	109.25	219	
Fire extinguisher complete w/ mounting hardware, allow	2	ea	80.75	162	1,805
C10 Interior Construction	Total			78,954	78,954
C20 Stairs					
Stair Construction					
Rebuild front porch stairs with IPE boards - 27' 0" x 3# risers				Included w/Sitework	
C20 Stairs	Total			0	0
C30 Interior Finishes					
C3010 Interior Wall Finish					
Interior Wall Finish					
Paint to new wall	5,032	sf	0.95	4,780	
Paint to wall after patching	1,464	sf	0.95	1,391	
Paint to existing wall				Not Required	6,171
C3020 Interior Floor Finish					
Interior Floor Finish					
Concrete sealant to Basement addition	1,637	sf	1.43	2,333	
Patch wood flooring at renovation areas, allow	1,000	sf	9.50	9,500	
Refinish wood flooring (First floor, Exhibit 1 & 2)	1,311	sf	5.70	7,473	
Refinish wood flooring (Second floor, Exhibit 3 & 4)	1,372	sf	5.70	7,820	
Floor finish to remaining areas				Not Required	
Moisture mitigation Allowance				Not Required	
Leveling & Protection to interior floors	1,637	sf	0.71	1,166	
Interior Base Finish					
Wall base to Basement addition	215	lf	4.28	919	
Wood wall base to new walls	286	lf	8.55	2,445	
Wall base to extg walls				Not Required	31,657
C3030 Interior Ceiling Finish					
Ceiling Finish					
2x2 acoustic panel to Basement addition	1,637	sf	4.75	7,776	
Patch existing plaster & paint at renovation areas, allow	1,000	sf	5.70	5,700	
Soffits					
GWB soffit				Not Required	13,476
C30 Interior Finishes	Total			51,304	51,304

Description	Qty	Unit	Rate	Amount	Total
D10 Conveying Systems					
Conveying Systems					
Lula Passenger Elevator					
Passenger elevator, 3 stops front entry, 20' 3" travel	1	ea	63,650.00	63,650	63,650
Sub-Contractor Bid	Total			63,650	63,650
Builders work in connection with Conveying	1	ls	1,273.00	1,273	
General Contractor's overhead and profit			Included on Summary page		1,273
D10 Conveying Systems	Total			64,923	64,923
D20 Plumbing					
Plumbing Fixtures					
Plumbing Fixtures				Not Required	0
Plumbing Fixture Piping					
Reroute basement ceiling mounted water supply, allow	75	lf	44.33	3,325	
Piping Fittings	1	ls	789.69	790	
Piping Valves & Accessories	1	ls	568.58	569	
Piping Insulation	75	lf	9.50	713	5,396
Underground Pipework					
Underground pipework				Not Required	0
Natural Gas System					
Gas system				Not Required	0
Storm Water System					
Rainwater systems				Not Required	
General					
Allow for seismic restraint & vibration isolation	1	ls	250.00	250	
Permit fees				Not Required	
Test & balance	1	ls	112.92	113	363
Sub Bid	Total			5,759	5,759
Builders work in connection with Plumbing @ 2%	1	ls	115.17	115	
General Contractor's overhead and profit			GC Fee Carried in Summary		115
D20 Plumbing	Total			5,874	5,874
D 30 Heating, Ventilating, and Air Conditioning (HVAC)					
Demolition					
Disconnect utilities and make safe prior to commencement of work	1	ls	750.00	750	
Remove and Dispose					
R&D : All steam piping routed between boiler & gravity feed heating system	1	ls	800.00	800	
R&D : All ductwork, piping in crawl space, allow	1,784	sf	2.00	3,568	
Allow for					
Miscellaneous demolition	1	ls	255.90	256	

Description	Qty	Unit	Rate	Amount	Total
Removal of rubbish off site	1	ls	323.67	324	5,698
Equipment					
Baseboard radiator in Administrative Suite	3	ea	900.00	2,700	
Remove & relocate AH2	1	ea	1,170.00	1,170	
Conditioned air for heating, cooling, and humidification to Basement addition					
New air handling unit AH5	1	ea	7,475.00	7,475	
New exterior condenser	1	ea	Included Above		11,345
Ductwork					
Galvanized steel ductwork w/accessories, fittings, hangers, etc (22ga):-					
Supply & return air from AH2 to extg nozzle diffusers (total 250 lf allow)	1,944	lb	9.98	19,391	
Perimeter duct distribution system to Basement addition	1,757	lb	9.98	17,526	
Duct Fittings/Waste	925	lb	9.98	9,227	
Insulation to supply/return duct	2,856	sf	4.28	12,209	
Connect to extg diffuser, allow	8	ea	142.50	1,140	
EO for stainless steel ductwork				Not Required	
EO for black steel to Kitchen ductwork				Not Required	
Air Distribution Devices					
Remove & relocate diffuser at 2-nd floor, allow	4	ea	133.00	532	
Linear diffuser to Basement addition, allow	12	ea	332.50	3,990	
Dampers, allow					
Volume	12	ea	118.75	1,425	
Fire	1	ea	237.50	238	
Smoke	1	ea	807.50	808	66,486
Pipework					
HVAC Piping System					
Refrigerant piping	80	lf	19.00	1,520	
Hot water piping	150	lf	38.00	5,700	
Condensate piping	25	lf	30.40	760	
Allow for: -					
Pipe Fittings	1	ls	1,895.25	1,895	
Piping Accessories	1	ls	1,516.20	1,516	
Piping Insulation	255	lf	9.50	2,423	13,814
Automatic Control System					
Automatic Temperature Control System to new equipment	1	ls	9,690.00	9,690	
Connect to extg system	1	ls	1,187.50	1,188	10,878
General					
Commissioning by Third Party	1	ls	256.31	256	
Allow for seismic restraint & vibration isolation	1	ls	513.89	514	
Test & balance	1	ls	2,065.85	2,066	2,836
Sub Bid	Total			111,056	111,056
Builders work in connection with HVAC	1	ls	2,221.12	2,221	
General Contractor's overhead and profit			GC Fee Carried in Summary		2,221
D 30 Heating, Ventilating, and Air Conditioning (HVAC)	Total			113,277	113,277
D40 Fire Protection Systems					
Fire Protection Systems					
Wet sprinkler system				ETR	
Wet sprinkler system to Basement addition	1,784	sf	4.75	8,474	

Description	Qty	Unit	Rate	Amount	Total
Reroute basement ceiling mounted sprinkler line, allow	75	lf	44.33	3,325	
Reconfigure extg sprinkler system to suit new architectural layout, allow	1	ls	2,850.00	2,850	
Fire Pump				Excluded	
Allow for seismic restraint	1	ls	475.00	475	
Permit fees				Not Required	
Test and balance	1	ls	302.48	302	15,426
Sub Bid	Total			15,426	15,426
Builders work in connection with F. Protection	1	ls	308.53	309	
General Contractor's overhead and profit			GC Fee Carried in Summary		309
D40 Fire Protection Systems	Total			15,735	15,735
D50 Electrical Systems					
Demolition					
Disconnect utilities and make safe prior to commencement of work	1	ls	750.00	750	
Remove and Dispose					
Exterior lighting fixture	3	ea	50.00	150	
Allow for					
Miscellaneous demolition	1	ls	500.00	500	
Removal of rubbish off site	1	ls	45.50	46	1,446
Equipment, Panelboards, etc.					
Panelboards				ETR	0
Feeders					
Reroute basement ceiling mounted electrical conduit, allow	75	lf	25.00	1,875	1,875
Small Power					
Small Power					
Receptacle in Basement addition, allow	1,784	sf	0.95	1,695	
Reconfigure extg/new receptacles to suit new architectural layout, allow	1	ls	2,137.50	2,138	
Electrical power to					
Lula Passenger Elevator	1	ea	4,750.00	4,750	
HVAC Equipment	1	ls	1,616.66	1,617	
Plumbing Equipment				Not Required	
Other Miscellaneous Equipment	1	ls	1,425.00	1,425	11,624
Lighting					
Lighting System					
Lighting in Basement addition, allow	1,784	sf	4.75	8,474	
Reconfigure extg lighting fixtures to suit new architectural layout, allow	1	ls	4,750.00	4,750	
Exterior LED lighting with historic character in extg location	3	ea	902.50	2,708	
Lighting controls in Basement addition, allow	1,784	sf	0.48	847	16,779
Fire Alarm					
Fire alarm devices in Basement addition, allow	1,784	sf	1.43	2,542	
Reconfigure extg devices to suit new architectural layout, allow	1	ls	712.50	713	3,255
Security System					
Security system allowance including following	7,315	sf	3.33	24,322	
UPS to power locks, sensors and cameras	1	ea	Included w/Allowance		
Controlled access to storage areas w/additional security for high value objects			Included w/Allowance		
Security camera	6	ea	Included w/Allowance		
Security system in Basement addition, allow	1,784	sf	3.33	5,932	30,254

Description	Qty	Unit	Rate	Amount	Total
Communications System					
Data outlet in Basement addition, allow	1,784	sf	0.95	1,695	
Reconfigure extg/new data outlet to suit new architectural layout, allow	1	ls	2,375.00	2,375	4,070
Audio Visual (Empty Conduit System)					
Audio Visual				Not Required	0
General					
Allow for:-					
Lightning protection in Basement addition, allow	1,784	sf	0.29	508	
Grounding in Basement addition, allow	1,784	sf	0.14	254	
Seismic bracing	1	ls	712.50	713	
Commissioning by Third Party	1	ls	166.40	166	
Permit fees				Not Required	
Testing	1	ls	1,320.46	1,320	2,962
Sub Bid	Total			72,264	72,264
Builders work in connection with Electrical	1	ls	1,373.02	1,373	
General Contractor's overhead and profit			GC Fee Carried in Summary		1,373
D50 Electrical Systems	Total			73,637	73,637
E10 Equipment					
Commercial Equipment					
Food Service Equipment				Not Required	0
Theater Equipment					
Not Required				Not Required	0
Residential Appliances					
Kitchen					
Refrigerator				ETR	
Microwave				ETR	
Stove				ETR	
Dishwasher				ETR	0
Projector Screens					
Projector Screens				Not Required	0
Audio Visual					
Audio Visual Equipment				Not Required	0
E10 Equipment	Total			0	0
E20 Furnishings					
Roller Shades					
Mechoshades - manual				Excluded	0
Casework					
Basement					
Work counter at Collections Work Area - 2' 0" wide	25	lf		NIC	

Description	Qty	Unit	Rate	Amount	Total
Shelving at Secure Collection Storage - 1' 6" wide	46	lf		NIC	
Shelving at General Collection Storage - 1' 6" wide	158	lf		NIC	
Shelving at General Collection Storage - 2' 0" wide	96	lf		NIC	
First Floor					
New entry & ticketing counter combined w/existing gift shop, allow	11	lf	475.00	5,225	
Second Floor					
Work counter at Director's Office - 2' 6" wide	16	lf		NIC	
Work counter at Exhibit Work Area/Storage - 2' 6" wide	8	lf		NIC	
Work counter at Research & Conference Room - 2' 6" wide	10	lf		NIC	
Work counter at Staff Office - 2' 6" wide	13	lf		NIC	
Shelving at Exhibit Work Area/Storage - 1' 0" wide	12	lf		NIC	
Shelving at Research & Conference Room - 1' 0" wide	12	lf		NIC	5,225
Entry Mats					
Walk-off matt at main entrance foyer				Not Required	0
E20 Furnishings	Total			5,225	5,225

F10 Special Construction**No Work in This Element**

F10 Special Construction	Total			0	0
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F20 Selective Demolition**Selective Demolition**

R&D : Basement, including excavation & foundation	1,784	sf	Included w/Basement	
Remove and Dispose - Exterior				
R&D : Areaway at East (assumed 5' 0" high)	18	lf	28.50	513
R&D : SL door	2	ea	90.25	181
R&D : Window - 2' 6" x 6' 0"	1	ea	71.25	71
R&D : Canopy	25	sf	9.50	238
R&D : Ramp	320	sf	4.75	1,520
R&D : Guardrail to ramp	118	lf	4.75	561
R&D : Column base	40	lf	2.14	86
R&D : Plywood at former emergency door	19	sf	0.95	18
R&D : Front porch stairs - 27' 0" x 3# risers	1	ea	1,154.25	1,154
R&D : Front porch decking	166	sf	4.75	789
R&D : Gutter	72	lf	2.64	190
R&D : Downspout	92	lf	2.64	243
Remove and Dispose - Interior				
R&D : SL door	8	ea	90.25	722
R&D : Storage cubicle	7	ea	137.75	964
R&D : Wall	1,408	sf	1.90	2,675
Opening - Exterior				
Enlarge extg opening for (1) new window				
Sawcut wall	17	lf	7.60	129
Remove wall	15	sf	2.85	43
Make edges good	17	lf	9.50	162
Opening - Interior				
Opening in interior wall for connection				
Sawcut wall	72	lf	7.60	547
Remove wall	158	sf	2.85	450
Make edges good	72	lf	9.50	684

Description	Qty	Unit	Rate	Amount	Total
Opening in interior wall for (3) SL door					
Sawcut wall	66	lf	7.60	502	
Remove wall	79	sf	2.85	225	
Make edges good	66	lf	9.50	627	
Remove slab for elevator pit					
Sawcut slab	59	lf	11.40	673	
Remove slab	218	sf	4.75	1,036	
Excavate	16	cy	23.75	380	
Make edges good	59	lf	9.50	561	
New slab after foundation work	32	sf	19.00	608	
Opening in 1-st & 2-nd floor for elevator					
Sawcut floor	54	lf	9.50	513	
Remove floor	92	sf	3.80	350	
Make edges good	54	lf	9.50	513	
Opening in roof for elevator					
Sawcut roof	27	lf	7.60	205	
Remove roof	46	sf	3.80	175	
Make edges good	27	lf	9.50	257	
MEP/FP demolition			Included w/Trades		
Allow for					
Miscellaneous demolition	1	ls	881.65	882	
Terminating & capping extg utilities			Included w/Trades		
Temporary screens and barriers	1	ls	1,781.25	1,781	
Removal of rubbish off site	1	ls	1,292.94	1,293	22,517
Hazardous Material Removal					
Hazardous Material Removal				Excluded	0
F20 Selective Demolition	Total			22,517	22,517
G10 Site Preparation					
Remove and Dispose				Included w/Selective Demolition	0
Temporary work					
Construction fence	265	lf	11.40	3,021	
EO DL gate	1	ea	902.50	903	
Site Entrance and access road during construction				Not Required	
Sediment & erosion control along temporary swale				Not Required	3,924
Earthwork				Not Required	
G10 Site Preparation	Total			3,924	3,924
G20 Site Improvements					
Exterior Improvements					
Rebuild front porch stairs with IPE boards - 27' 0" x 3# risers	1	ea	6,540.75	6,541	
Rebuild Portico with IPE deck boards	166	sf	12.40	2,059	
New IPE landing and ramp	251	sf	15.50	3,891	
Glass guardrail & accessible handrail to ramp	96	lf	332.50	31,920	
Concrete pad to HVAC unit	12	sf	14.25	171	44,581
Landscaping					
Re-landscape areas of former ramp & front of new ramp	480	sf	4.75	2,280	
Lawn do disturbed areas	1,470	sf	0.71	1,047	
Landscaping irrigation, allow	1	ls	3,633.75	3,634	6,961

Description	Qty	Unit	Rate	Amount	Total
G20 Site Improvements	Total			51,542	51,542
G30 Site Civil/Mechanical Utilities					
No Work in This Element					
G30 Site Civil/Mechanical Utilities	Total			0	0
G40 Site Electrical Utilities					
No Work in This Element					
G40 Site Electrical Utilities	Total			0	0
G90 Other Site Construction					
No Work in This Element					
G90 Other Site Construction	Total			0	0

Gross Floor Areas

	<u>GFA (sf)</u>	<u>Perimeter (lf)</u>
Basement	3,033	255
First Floor	3,033	255
Second Floor	3,033	255
Total	9,099	

Code Summary

PRIMARY CODE ISSUES

This review is based on the current applicable codes (see opposite), and is subject to change dependent upon the active codes in use at the time of construction. As detailed in the following pages, these improvements are classified as a Level 2 Alteration. Several key factors to be highlighted include:

- Only the new construction elements must meet the current building code (i.e. the basement collection storage area and new elevator hoistway).
- At the code official's discretion, a new toilet room may be required to serve the expanded basement space. In this case, a staff toilet room can be located in the basement in the location of the existing mens bathroom stalls.
- An accessible pathway and toilet room are required for this level of alteration. The existing toilet room satisfies this requirement. The restored front portico entrance will be fully accessible.

PROJECT DESCRIPTION

Location: Harwich, MA
 Client: Town of Harwich
 Description: 3 Story Museum & Historical Society - 7,055 Gross Square Feet

CODE	YEAR	TITLE	APPLICABLE
			Y/N
IBC	2015	International Existing Building Code	Y
780 CMR		Massachusetts State Building Code 780 CMR 9th Edition Amendments to IBC	Y
248 CMR		Massachusetts Board of State Examiners of Plumbers and Gas Fitters	Y
NFPA-1	2012	National Fire Protection Association (NFPA-1 2012 Edition)	Y
527 CMR 1		Massachusetts Comprehensive Fire Safety Code Amendments to NFPA-1	Y
NFPA-70	2014	2014 National Electrical Code - National Fire Protection Association (NFPA-70 2014 Edition)	Y
527 CMR 12		Massachusetts Electrical Code Amendments to NFPA-70	Y
IECC	2015	International Energy Conservation Code	Y
IMC	2015	International Mechanical Code	Y
310 CMR		Massachusetts Department of Environmental Protection	Y
ASME A17.1	2004	Safety Code for Elevators and Escalators	Y
524 CMR		Massachusetts Board of Elevator Regulations	Y
521 CMR		Massachusetts Architectural Access Board	Y
ADA	2010	Americans with Disabilities Act	Y
ICC/ANSI A117.1	2009	International Code Council/American National Standards Institute	Y
Chapter 325		Town of Harwich Zoning Code	Y

REGULATORY AGENCY ROLES

The regulatory requirements for design, construction, and occupancy of the project are reviewed and enforced by the following local and state officials:

State Building Code: Commonwealth of Massachusetts Department of Public Safety
 Elevator: Commonwealth of Massachusetts Department of Public Safety
 Mechanical: Commonwealth of Massachusetts Department of Public Safety
 Plumbing: Commonwealth of Massachusetts Department of Public Safety
 Electrical: Local Electrical Building Inspector
 Fire Protection: Commonwealth of Massachusetts Department of Public Safety, State Fire Marshall and Falmouth Fire Department
 Historic: Harwich Historic Commission
 Accessibility: Commonwealth of Massachusetts Department of Public Safety

ANALYSIS

The purpose of this Code Analysis is to determine the basic requirements for life safety and accessibility. Complete code requirements regarding technical, engineered components, materials, etc. are not covered by this analysis but must be incorporated into the design of the project by the applicable design discipline.

Many Codes and Standards are applicable to the project. Where differences occur between applicable codes and standards the follow standard hierarchy shall apply:

Building General:

- 1 International Building Code
- 2 Massachusetts State Building Code 780 CMR 9th Edition Amendments to IBC
- 3 Massachusetts Comprehensive Fire Safety Code Amendments to NFPA-1
- 4 Safety Code for Elevators and Escalators

Accessibility:

- 1 Massachusetts Architectural Access Board
- 2 Americans with Disabilities Act
- 3 International Code Council/American National Standards Institute

Note: Conflicts between the Codes shall be resolved by acceptance of the stricter code provision regardless of which adopted code contains the stricter provision.

CODE ANALYSIS

Date: 09/17/18

Brooks Academy Museum Improvements

LEVEL	CODE	REFERENCE	TOPIC	CODE DESCRIPTION	ANALYSIS
A Administration					
B Existing Building Code					
1	IEBC	504	Alteration - Level 2	504.1 Level 2 alterations include the reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment	Project is a Level 2 alteration. Level 2 alterations shall comply with the provisions of Chapter 7 for Level 1 alterations as well as the provisions of Chapter 8
1	IEBC	507	Additions	507.1 Provisions for additions shall apply where work is classified as an addition as defined in Chapter 2	Project qualifies as an addition
1	IEBC	507	Additions	507.2 Additions to existing buildings shall comply with the provisions of Chapter 11	Project qualifies as an addition to an existing building
1	IEBC	508	Historic Buildings	508.1 Historic Buildings shall apply to buildings classified as historic as defined in Chapter 2	Project qualifies as an Historic Building
1	IEBC	508	Historic Buildings	508.2 Except as specifically provided for in Chapter 12, historic buildings shall comply with the applicable provisions of this code for the type of work being performed.	Project qualifies as an Historic Building
1	IEBC	701	Alterations - Level 1	701.1 Scope. Level 1 alterations as described in Section 503 shall comply with the requirements of this chapter. Level 1 alterations to historic buildings shall comply with this chapter, except as modified in Chapter 12	
1	IEBC	801	Alterations - Level 2	801.3 All new construction elements, components, systems, and spaces shall comply with the requirements of the International Building Code. Exceptions: 1. Windows may be added without requiring compliance with the light and ventilation requirements of the IBC 2. Newly installed electrical equipment shall comply with the requirements of Section 808.1. 3. The length of dead end corridors in newly constructed spaces shall only be required to comply with the provisions of Section 805 4. The minimum ceiling height of the newly created habitable and occupiable spaces and corridors shall be 7 feet	All new construction must comply with the 2015 IBC. Occupiable space in the basement can be 7 feet high
1	IEBC	803	Alterations - Level 2 Building Elements and Materials	803.1 The requirements of this section are limited to work areas in which Level 2 alterations are being performed and shall apply beyond the work area where specified 803.2.1 All existing interior vertical openings connecting two or more floors shall be enclosed with approved assemblies	
1	IEBC	1101	Additions	1101.1 An addition to a building or structure shall comply with the International Codes as adopted for new construction without requiring the existing building or structure to comply with any requirements of those codes or of the same provisions, except as required by this chapter. Where an addition impacts the existing building or structure, that portion shall comply with this code.	
1	IEBC	1102	Heights and Areas	1102.2 No addition shall increase the area of an existing building beyond that permitted under the applicable provisions of Chapter 5 of the IBC for new buildings unless fire separation as required by the IBC is provided	Additional area falls within these limitations. See Section D of Code Analysis for detail
1	IEBC	1105	Accessibility	1105.1 Accessibility provisions for new construction shall apply to additions	
1	IEBC	1200	Historic Buildings	1201.1 It is the intent of this chapter to provide a means for the preservation of historic buildings. Historic buildings shall comply with the provisions of this chapter relating to their repair, alteration, relocation and change of occupancy	
		1202	Repairs	1202.1 Repairs to any portion of an historic building structure shall be permitted with original or like materials and original methods of construction	
		1203	Fire Safety	1203.5 The existing finishes of walls and ceilings shall be accepted when it is demonstrated that they are the historic finishes 1203.6 In buildings of three stories or less, exit enclosure construction shall limit the spread of smoke by the use of tight fitting doors and solid elements. Such elements are not required to have a fire-resistance rating	Fire resistance ratings are not required for exit enclosure construction

CODE ANALYSIS

Date: 09/17/18

Brooks Academy Museum Improvements

LEVEL	CODE	REFERENCE	TOPIC	CODE DESCRIPTION	ANALYSIS
				1203.7 Where 1-hour fire-resistance rated construction is required, it need not be provided, regardless of construction or occupancy, where the existing wall and ceiling finish is wood or metal lath and plaster	
				1203.9 Grand stairways shall be accepted without complying with the handrail and guard requirements	Existing stair railings need not be modified
				1203.11 Where exit sign or egress path marking location would damage the historic character of the building, alternative exit signs are permitted with approval of the code official. Alternative signs shall identify the exits and egress path	Alternative egress signage will be used
1	IEBC	1204	Accessibility Requirements	1204.1 Accessibility requirements. The provisions of Sections 705, 806, and 906, as applicable, shall apply to facilities designated as historic structures that undergo alterations, unless technically infeasible. Where compliance with the requirements for accessible routes entrances or toilet rooms would threaten or destroy historic significance of the building or facility, as determined by the code official, the alternative requirements of 1204.1.1 through 1204.1.4 for that element shall be permitted	
				1204.1.2 Multilevel buildings and facilities. An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided	
				1204.1.3 Entrances. At least one main entrance shall be accessible. Exceptions: 1. If the main entrance cannot be made accessible, an accessible nonpublic entrance that is unlocked while the building is occupied shall be provided; or 2. If a main entrance cannot be made accessible, a locked accessible entrance with a notification system or remote monitoring shall be provided	The new main entrance will be accessible
				1204.1.4 Toilet and bathing facilities. Where toilet rooms are provided, at least one accessible family or assisted-use toilet room complying with Section 1109.2.1 of the IBC shall be provided	The existing toilet room complies with this requirement
1	IEBC	1205	Change of Occupancy	1205.6 Means of Egress. Existing door openings and corridor and stairway widths less than those that would be acceptable for nonhistoric buildings under these provisions shall be approved, provided that, in the opinion of the code official, there is sufficient width and height for a person to pass through the opening	
1	780 CMR	34	Performance Compliance Methods - Applicability	1401.2 Applicability. The provisions of sections 1401.2.1 through 1401.2.5 shall apply to existing occupancies that will continue to be, or are proposed to be, in Groups A, B, E, F, I-2, M, R and S. These provisions shall not apply to buildings with occupancies in Group H or I-1, I-3 or I-4.	These sections will apply due to group A, B, M, and S occupancies
C Use/Occupancy, Area & Height, Construction Type					
1	IBC	300	Use and Occupancy Classifications	303.4 Assembly Group A-3. Museums	Assembly Group A-3 Occupancies: Exhibit Areas Meeting Room
				304.1 Business Group B. Occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts.	Business Group B Occupancies: Offices Kitchen Collections Work Area
				309.1 Mercantile Group M. Retail stores	Mercantile Group M Occupancies: Gift Shop
				311.1.1 Accessory Storage Spaces. A room or space used for storage purposes that is less than 100 square feet in area and accessory to another occupancy shall be classified as part of that occupancy.	Storage Group S-1 Occupancies: Collections Storage General Storage
				311.2 Moderate-hazard storage, Group S-1.	
1	IBC	506	Building Area	506.1.3 Basements	Existing Basement - will be expanded

CODE ANALYSIS

Date: 09/17/18

Brooks Academy Museum Improvements

LEVEL	CODE	REFERENCE	TOPIC	CODE DESCRIPTION	ANALYSIS
1	IBC	506.2.4	Mixed-occupancy, multistory buildings	<p>$A_a = [A_t + (NS \times I_f)]$, where: A_a = allowable area (sf) A_t = tabular allowable area factor in accordance with Tbl 506.2 NS = tabular allowable area factor in accordance with Tbl 506.2 for a nonsprinklered building (regardless of whether building is sprinklered) I_f = area factor increase due to frontage (%) as calculated in accordance with Section 506.3</p> <p>$I_f = [F/P - 0.25]W/30$ $W = (L_1 \times w_1 + L_2 \times w_2 + L_3 \times w_3 + L_4 \times w_4)/F$</p>	<p>A-3, SM, Type VB $A_a = 22,500$ sf</p> <p>$A_a = [18,000 + (6,000 \times 0.75)] = 22,500$ $W = (120 \times 120 + 54 \times 54 + 120 \times 120 + 54 \times 54)/348$ $W = 30$ $I_f = [348/348 - 0.25]30/30 = 0.75$</p>
1	IBC	507	Unlimited Area Buildings	507.6 & 507.7 Group A-3 Buildings	N/A - Building cannot be unlimited area due to being greater than 1 story above the grade plane
2	IBC	508	Mixed Use and Occupancy	<p>508.1 Mixed Use and Occupancy. Each portion of a building shall be individually classified in accordance with Section 302.1</p> <p>508.2 Accessory Occupancies. Accessory occupancies are those occupancies that are ancillary to the main occupancy of the building or portion thereof.</p> <p>508.3 Nonseparated occupancies Buildings or portions of buildings that comply with the provisions of this section shall be considered as nonseparated occupancies.</p> <p>508.3.2 Allowable building area and height. The allowable building area and height of the building or portion thereof shall be based on the most restrictive allowances for the occupancy groups under consideration for the type of construction of the building in accordance with Section 503.1.</p>	<p>Building is Mixed Use and Occupancy</p> <p>Mechanical, Electrical, Janitor Closets to be classified as Accessory Occupancies</p> <p>Building to be classified as Nonseparated Occupancy. No separation is required between nonseparated occupancies</p> <p>Allowable building area and height calculations are to be based off of the most restrictive use; A-3 occupancy</p>
3	780 CMR	501	Amendments		No applicable amendments
D Fire Resistance					
1	IBC	602	Construction Classification	602.5 Type V	Type VB
1	IBC	Tbl 601	Fire-Resistance Rating Requirements for Building Elements	<p>Tbl 601 Fire-Resistance Rating Requirements for Building Elements (Hours).</p> <p>Type VB: 0</p>	Construction Type VB has no fire-resistance rating requirements for primary structural frame, bearing walls, interior partitions, floor construction or roof construction
1	IBC	Tbl 602	Fire-Resistance Rating Requirements for Exterior Walls	Tbl 602 Fire-Resistance Rating Requirements for Exterior Walls Based on Fire Separation Distance. $X > 30$ ft	No fire-resistance rating requirements for exterior walls regardless of Occupancy Group or Type of Construction
2	IBC	704	Structural Member Requirements	704.1 Fire-Resistance Rating of Structural Members. The fire-resistance ratings of structural members and assemblies shall comply with this section and the requirements for the type of construction as specified in Table 601. The fire-resistance ratings shall be not less than the ratings required for the fire-resistance-rated assemblies supported by the structural members.	No fire-resistance rating requirements for structural members
2	IBC	705	Exterior Wall Requirements	<p>705.5 Fire-Resistance Ratings. Exterior walls shall be fire-resistance rated in accordance with Tables 601 and 602 and this section. The required fire-resistance rating of exterior walls with a fire separation distance of greater than 10 ft shall be rated for exposure to fire from the inside.</p> <p>705.8.1 Allowable Area of Openings. The maximum of unprotected and protected openings permitted in an exterior wall in any story of a building shall not exceed the percentages specified in Table 705.8.</p> <p>Exceptions: 2. Buildings whose exterior bearing walls, exterior nonbearing walls and exterior primary structure are not required to be fire-resistance rated shall be permitted to have unlimited unprotected openings.</p>	<p>No fire-resistance rating requirements for exterior walls.</p> <p>Unlimited unprotected openings allowed.</p>
2	IBC	707	Fire Barriers		Elevator hoistway enclosure shall be constructed as a fire barrier
2	IBC	711	Horizontal Assemblies	711.3.1 Materials. Assemblies shall be of materials permitted by the building type of construction	Building Construction Type VB

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2	IBC	712	Vertical Openings	711.3.2 Continuity. Assemblies shall be continuous without vertical openings, except as permitted by Section 712	See 712
				712.1.1 Shaft enclosures. Vertical openings contained entirely within a shaft enclosure complying with Section 713 shall be permitted	Elevator hoistway is a shaft enclosure
				712.1.4 Penetrations. Penetrations, concealed and uncealed, shall be permitted where protected in accordance with Section 714	See 714
2	IBC	713	Shaft Enclosures	712.1.5.2 Joints in or between nonfire-resistance-rated floor assemblies. Joints in or between floor assemblies without a required fire-resistance rating shall be permitted where they comply with one of the following: 1. The joint shall be concealed within the cavity of a wall 2. The joint shall be located above a ceiling 3. The joint shall be sealed, treated or covered with an approved material or system to resist the free passage of flame and the products of combustion	Building has nonfire-resistance-rated floor assemblies. All joints shall comply with these provisions
				713.1 Shaft Enclosures. The provisions of this section shall apply to shafts required to protect openings and penetrations through floor/ceiling and roof/ceiling assemblies. Interior exit stairways and ramps shall be enclosed in accordance with Section 1023.	The elevator hoistway enclosure shall be a shaft enclosure
				713.2. Construction. Shaft enclosures shall be constructed as fire barriers in accordance with Section 707 or horizontal assemblies in accordance with Section 711, or both.	The elevator hoistway enclosure shall be a shaft enclosure
2	IBC	714	Penetrations	713.4 Fire-resistance Rating. Shaft enclosures shall have a fire-resistance rating of not less than 2 hours where connecting four stories or more, and not less than 1 hour where connecting less than four stories. The number of stories connected by the shaft enclosure shall include any basements but not any mezzanines. Shaft enclosures shall have a fire-resistance rating not less than the floor assembly penetrated, but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.1.	1 hour fire-resistance rated shaft enclosures
				714.1. The provisions of this section shall govern the materials and methods of construction used to protect through penetrations and membrane penetrations of horizontal assemblies and fire-resistance-rated wall assemblies.	Penetrations of rated assemblies (including ducts and air transfer openings) shall comply with this section.
				714.5.2 Penetrating items. Penetrating items that connect not more than two stories are permitted, provided that the annular space is filled with an approved material to resist the free passage of flame and the products of combustion	Building is 2 stories; through-penetration firestop systems are not required. All penetrations must have annular space filled with approved material.
2	IBC	715-716	Fire-resistant joint systems, Opening protectives	N/A	N/A
2	IBC	717	Ducts and Air Transfer Openings	717.5.3 Shaft enclosures. Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with approved fire and smoke dampers installed in accordance with their listing	Ducts to elevator hoistway shall be protected
2	IBC	717	Ducts and Air Transfer Openings	717.6.3 Nonfire-resistance-rated Floor Assemblies. Duct systems constructed of approved materials in accordance with the IMC that penetrate nonfire-resistance-rated floor assemblies shall be protected by any of the following methods: 1. A shaft enclosure in accordance with Section 713. 2. The duct connects not more than two stories, and the annular space around the penetrating duct is protected with an approved noncombustible material that resists the free passage of flame and the products of combustion	Building is 2 stories
3	IBC	718	Concealed Spaces	718.2 Fireblocking. In combustible construction, fireblocking shall be installed to cut off concealed draft openings (both vertical and horizontal) and shall form an effective barrier between floors, between a top story and a roof or attic space. Fireblocking shall be installed in the locations specified in Sections 718.2.2 through 718.2.7	Fireblocking is required in accordance with this section
				718.4.3 Draftstopping / Other groups. Draftstopping shall be installed in attics and concealed roof spaces, such that any horizontal area does not exceed 3,000 sf	Attic / concealed roof spaces will be separated

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1	IBC	Tbl 803.11	Interior Wall and Ceiling Finish Requirements	Tbl 803.11 Interior Wall and Ceiling Finish Requirements By Occupancy. Group B, with automatic sprinkler system: Interior exit stairways: Class B Corridors and enclosure for exit access stairways: Class C Rooms and enclosed spaces: Class C Group A-3, with automatic sprinkler system: Interior exit stairways: B Corridors: B Rooms and enclosed spaces: C	Finish classes depend upon occupancy
3	780 CMR	806	Interior Finish Amendments	806.3 Combustible decorative materials. In all occupancies, curtains, draperies, fabric hangings and similar combustible decorative materials suspended from walls or ceilings shall comply with 527 CMR	Window shades shall comply with 527 CMR
1	IBC	Tbl 1020.1	Corridor Fire-Resistance Rating	Tbl 1020.1 Corridor Fire-Resistance Rating. Group A and B Occupancies, with automatic sprinkler system: For corridors served by >30: 0	No fire-resistance rating requirements for corridors.
E Fire Protection Systems					
3	780 CMR	901	Fire Protection System Amendments		Automatic Sprinkler System will be provided and will comply with 780 CMR amendments
1	IBC	903	Automatic Sprinkler Systems	903.2 Where Required. Approved automatic sprinkler systems in new buildings and structures shall be provided in locations described in Sections 903.2.1 - 903.2.12	Automatic Sprinkler System will be provided
	IBC	903	Automatic Sprinkler Systems Where Required Group A-3	An automatic sprinkler system shall be provided for fire areas containing Group A-3 occupancies and intervening floors of the building where one of the following conditions exists: 1. The fire area exceeds 12,000 square feet (1115 m2). 2. The fire area has an occupant load of 300 or more. 3. The fire area is located on a floor other than a level of exit discharge serving such occupancies.	Automatic Sprinkler System will be provided
2	780 CMR	903	Automatic Sprinkler System Amendments	903.2 Where Required. Note: Automatic sprinkler systems may be required by M.G.L. c. 148, § 26A, 26A½, 26G, 26G½, 26H or 26I, or M.G.L. c. 272 §§ 86 through 86d M.G.L. c. 148 26G Every building or structure, including any additions or major alterations thereto, which totals, in the aggregate, more than 7,500 gross square feet in floor area shall be protected throughout with an adequate system of automatic sprinklers in accordance with the provisions of the state building code.	
2	IBC	904	Alternative Fire-Extinguishing Systems	Where permitted. Automatic fire-extinguishing systems installed as an alternative to the required automatic sprinkler systems of Section 903 shall be approved by the fire code official.	N/A
2	780 CMR	904	Alternative Fire-Extinguishing System Amendments		There are no relevant amendments for this section
2	IBC	905	Standpipe Systems	Class III standpipe systems shall be installed throughout buildings where the floor level of the highest story is located more than 30 feet (9144 mm) above the lowest level of fire department vehicle access, above the lowest level of fire department vehicle access.	Standpipes with hose connection are not required
2	780 CMR	905	Standpipe System Amendments		There are no relevant amendments for this section
3	IBC	906	Fire Extinguishers	906.1 Portable fire extinguishers shall be installed in all of the following locations: 1. Group A,B,E,F,H,I,M,R-1,R-2,R-4 and S occupancies 2. Within 30 feet of commercial cooking equipment 5. Where required by the IFC sections indicated in Table 906.1 6. Special-hazard areas, including but not limited to laboratories, computer rooms and generator rooms	Portable fire extinguishers will be provided

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1	IBC	907	Fire Alarm/Detection Systems	907.2 Where required - new buildings and structures An approved fire alarm system installed in accordance with the provisions of this code and NFPA 72 shall be provided in new buildings and structures in accordance with Sections 907.2.1 through 907.2.23 and provide occupant notification in accordance with Section 907.5, unless other requirements are provided by another section of this code. Not fewer than one manual fire alarm box shall be provided in an approved location to initiate a fire alarm signal for fire alarm systems employing automatic fire detectors or waterflow detection devices. Where other sections of this code allow elimination of fire alarm boxes due to sprinklers, a single fire alarm box shall be installed	A single fire alarm box shall be installed
1	IBC	907	Fire Alarm/Detection Systems	907.2.1 Group A. A manual fire alarm system that activates the occupant notification system in accordance with section 907.5 shall be installed in Group A occupancies where the occupant load due to the assembly occupancy is 300 or more.	A manual fire alarm is not required
1	IBC	907	Fire Alarm/Detection Systems	907.2.2 Group B. A manual fire alarm system shall be in installed in Group B occupancies where one of the following conditions exists: 1. The combined Group B occupant load of all floors is 500 or more. 2. The Group B occupant load is more than 100 persons above or below the lowest level of exit discharge. 3. The fire area contains an ambulatory care facility.	A manual fire alarm is not required
2	780 CMR	907	Fire Alarm/Detection System Amendments		There are no relevant amendments for this section
2	IBC	908-910	Emergency Alarm, Smoke Control, and Smoke/Heat Removal Systems		Emergency alarm and smoke control systems are not required for group B occupancies
2	780 CMR	909	Smoke Control System Amendments		There are no relevant amendments for this section
2	IBC	911	Fire Command Center	General. Where required by other sections of this code and in buildings classified as high-rise buildings by this code, a fire command center for fire department operations shall be provided and shall comply with sections 911.1.1 through 911.1.6	Fire command center is not required for this building type of size.
2	IBC	912	Fire Department Connections	Installation. Fire department connections shall be installed in accordance with the NFPA standard applicable to the system design and shall comply with sections 912.2 through 912.6	Fire department connection(s) shall be provided for the building on the street side of the building.
2	IBC	913	Fire Pumps	General. Where provided, fire pumps shall be installed in accordance with this section and NFPA 20.	The requirement of the installation of a fire pump is pending water flow test information
3	IBC	914	Emergency Responder safety features		
3	780 CMR	912-914	Fire Department/Emergency Responder Amendments		
2	IBC	915	Carbon Monoxide Protection	General. Carbon monoxide detection shall be installed in new buildings in accordance with sections 915.1.1 through 915.6.	Carbon monoxide detection system is not required for this building.
2	780 CMR	916-917	Additional Requirements (Emergency Responder Radio Coverage, Private Underground Fire Mains/Yard Hydrants)	General. Emergency responder radio coverage shall be provided in all new buildings in accordance with section 510 of the international fire code	Emergency responder radio system will be provided for this building, unless determined by the fire code official that a radio coverage system is not required.
1	NFPA-1		Fire Code	Chapter 10 General Safety Requirements, Chapter 11 Building services, Chapter 12 Features of Fire Protection, Chapter 13 Fire Protection systems,	The design of the building systems shall follow the requirements of the applicable chapters.
2	527 CMR 1		Fire Safety Code Amendments	527 CMR 1.00 adopts and incorporates, the provisions of (National Fire Protection Association) NFPA 1 - 2012 edition as modified by 527 CMR 1.05	

F Occupant Load, Egress

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1	IBC	Tbl 1004.1.2	Occupant Load	Tbl 1004.1.2 Maximum Floor Area Allowances Per Occupant. Exhibit gallery and museum: 30 net Assembly (Concentrated): 7 net Business areas: 100 gross Kitchens, commercial: 200 gross Mercantile: 60 gross Accessory storage areas, mechanical: 300 gross	Total occupant load = 166 occupants Basement occupant load = 9 occ Storage / Mech (2,335 gsf) = 8 occ Business (100 gsf) = 1 occ Level 1 occupant load = 98 occ Mercantile (203 gsf) = 4 occ Exhibit (1,316 nsf) = 44 occ Kitchen (102 gsf) = 1 occ Assembly (631 nsf) = 49 occ Level 2 occupant load = 56 occ Exhibit (1,363 nsf) = 46 occ Business (844 gsf) = 9 occ Storage (96 gsf) = 1 occ
				1005.3.2 Other Egress Components. The capacity, in inches, of means of egress components other than stairways shall be calculated by multiplying the occupant load served by such component by a means of egress capacity factor of 0.2 inch per occupant.	Door width = 0.2" / occupant
1	IBC	1006	Number of Exits and Exit Access Doorways	Tbl 1006.2.1 Spaces With One Exit or Exit Access Doorway Group A Occupancy, with automatic sprinkler system: Maximum occupant load of space: 49 Maximum common path of egress travel distance: 75ft	Occupancy of events / meeting room must be limited to 49
				Tbl 1006.2.1 Spaces With One Exit or Exit Access Doorway Group B Occupancy, with automatic sprinkler system: Maximum occupant load of space: 49 Maximum common path of egress travel distance: 100ft	Common path of egress travel distances for Group B occupancy spaces on 2nd floor exceeds the maximum values for one exit or exit access doorway. The 2nd floor will have 2 exits
				Tbl 1006.3.2 Single Exits	The basement qualifies for 1 exit per table 1006.3.2(2)
				N/A 1009.4 Elevators. In order to be considered part of an accessible means of egress. . . The elevator shall be accessed from an area of refuge complying with Section 1009.6 Exceptions: 2. Areas of refuge are not required at stairways in buildings equipped throughout with an automatic sprinkler system	The elevator will meet the requirements for an accessible means of egress.
				1010.1.2.1 Direction of Swing. Pivot or side-hinged swinging doors shall swing in the direction of egress travel where serving an occupant load of 50 or more persons	Only stairway doors and exit doors, not doors to individual spaces, required to swing in the direction of egress travel.
3	780 CMR	1008-1015	Egress Requirement Amendments (Doors, Exit Signs)		
	IBC	1009	Two-Way Communication	1009.8 A two-way communication system complying with Sections 1009.8 and 1009.8.2 shall be provided at the landing serving each elevator or bank of elevators on each accessible floor that is one or more stories above or below the level of exit discharge. 1009.8.1 System Requirements. Two-way communication systems shall provide communication between each required location and the fire command center or a central control point location approved by the fire department. Where the central control point is not a constantly attended location, a two-way communication systems shall have a timed automatic telephone dial-out capability to a monitoring location or 9-1-1. The two-way communication system shall include both audible and visible signals. 1009.8.2 Directions. Directions for the use of the two-way communication system, instructions for summoning assistance via the two-way communication system and written identification of the location shall be posted adjacent to the two-way communication system. Signage shall comply with the ICC A117.1 requirements for visual characters. 1016.2.3 An exit access shall not pass through a room that can be locked to prevent egress	Required on Level 2 at elevator landing
1	IBC	1017	Exit Access and Travel Distance Requirements	Tbl 1017.2 Exit Access Travel Distance. Group B Occupancy, with automatic sprinkler system: 300 ft Group A Occupancy, with automatic sprinkler system: 250 ft	Maximum travel distance within the exit access portion of means of egress system is 300 ft.

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				1017.3 Measurement. Exit access travel distance shall be measured from the most remote point within a story along the natural and unobstructed path of horizontal and vertical egress travel to the entrance to an exit.	Exit access travel distance from the most remote point on Level 2 via Stair 1 is 110 ft, which is within limitations.
2	IBC	1018-1021	Aisles, Exit Access Stairways and Ramps, Corridors, and Egress Balcony Requirements	1019.1 Exit Access Stairways and Ramps General. Exit access stairways and ramps serving as an exit access component in a means of egress system shall comply with the requirements of this section. The number of stories connected by exit access stairways and ramps shall include basements, but not mezzanines. 1019.3 Occupancies other than Groups I-2 and I-3. Floor openings containing exit access stairways that do not comply with one of the conditions listed in this section shall be enclosed with a shaft enclosure constructed in accordance with Section 713. 1. Exit access stairways and ramps that serve or atmospherically communicate between only two stories. Such interconnected stories shall not be open to other stories.	Stair 1 & 2 both qualify as exit access stairways Both stairs 1 and 2 comply with condition 1 Therefore, Stair 1 & Stair 2 do not require rated shaft enclosures
2	IBC	1020	Corridors	1020.4 Dead Ends. Where more than one exit or exit access doorway is required, the exit access shall be arranged such that there are no dead ends in corridors more than 20 ft in length.	No dead end corridors exist
2	IBC	1029	Assembly	1029.1 Assembly. A room or space used for assembly purposes that contains seats, tables, displays, equipment or other material shall comply with this section. 1029.7 Travel Distance. Exits and aisles shall be so located that the travel distance to an exit door shall be not greater than 200 feet measured along the line of travel in nonsprinklered buildings. Travel distance shall not be more than 250 feet in sprinklered buildings. Where aisles are provided for seating, the distance shall be measured along the aisles and aisle accessways without travel over or on the seats. 1029.8 Common Path of Egress Travel. The common path of egress travel shall not exceed 30 ft from any seat to a point where an occupant has a choice of two paths of egress travel to two exits.	Events / Meeting Room will comply with the requirements of this section. Travel distance to exit door less than 250 feet. The common path of travel through the exit access doorways to a choice of two exits does not exceed 30 ft.
G Accessibility					
2	IBC	1104	Accessible Route	1104.4 Multistory buildings and facilities. At least one accessible route shall connect each accessible story and mezzanine in multilevel buildings and facilities. Exceptions: 1.3 Passenger transportation facilities and airports (Group A-3 or B)	Both stairs qualify as accessible routes
1	521 CMR	3	Jurisdiction	3.2 New Construction. All new construction of public buildings/facilities shall comply fully with 521 CMR. 5.0 Definitions. Public Building: a. A building privately or publicly financed that is open to and used by the public. . . B. A building constructed by the Commonwealth or any political subdivision thereof with public funds and open to public use. . .	The building will comply with the requirements of 521 CMR. The building meets the definition of a public building.
1	521 CMR	7-19	Building Type Requirements	11.1 Commercial Buildings. The design of commercial buildings shall comply with 521 CMR except as specified or modified in 521 CMR 11.00. Commercial buildings are public buildings as defined in 521 CMR and shall include but not be limited to: the parts or parts of buildings where a service or product is offered to the public and into which a member of the public may enter 11.4 Public Toilets. Wherever public toilets are provided for customers, visitors or clientele of said business, they are required to comply fully with 521 CMR 30: Public Toilets.	The building will comply with the requirements of 521 CMR. The current toilet room complies with 521 CMR 30.
1	ADA	201-243	Scope	201.1 Scope. All areas of newly designed and newly constructed buildings and facilities and altered portions of existing buildings and facilities shall comply with these requirements.	The newly constructed space will comply with the requirements of all applicable sections of ADA.

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				203.5 Machinery Spaces. Spaces frequented only by service personnel for maintenance, repair, or occasional monitoring of equipment shall not be required to comply with these requirements or to be on an accessible route. Machinery spaces include, but are not limited to, elevator pits or elevator penthouses; mechanical, electrical or communications equipment rooms; piping or equipment catwalks; water or sewage treatment pump rooms and stations; electric substations and transformer vaults; and highway and tunnel utility facilities.	Machinery spaces, including elevator machine room, mechanical spaces, electrical room, data/telecom center, and electrical closets, are not required to comply with ADA requirements.
				203.9 Employee Work Areas. Spaces and elements within employee work areas shall only be required to comply with 206.2.8, 207.1, and 215.3 and shall be designed and constructed so that individuals with disabilities can approach, enter, and exit the employee work area.	Employee work areas will comply with these requirements.
				204 Protruding Objects, 206 Accessible Routes, 207 Accessible Means of Egress, 208 Parking Spaces, 210 Stairways, 211 Drinking Fountains, 212 Kitchens, Kitchenettes and Sinks, 213 Toilet Facilities and Bathing Facilities, 215 Fire Alarm Systems, 216 Signs, 255 Storage, 226 Dining Surfaces and Work Surfaces, 230 Two-Way Communications Systems	The newly constructed space will comply with the requirements of all applicable sections of ADA.
2	521 CMR	20-23	Exterior Element Requirements	20.00 Accessible Route, 21.00 Curb Cuts, 22.00 Walkways, 23.00 Parking and Passenger Loading Zones	The exterior elements will comply with the requirements of the applicable sections of 521 CMR.
				23.2.1 Accessible spaces shall be provided as follows: 76-100 total parking in lot: 4 required minimum number of accessible spaces	Same as ADA requirements above.
				23.2.2 One in every eight accessible spaces, but not less than one, shall be van accessible	1 van accessible space required.
2	521 CMR	24-41	Interior Element Requirements	25.00 Entrances, 26.00 Doors and Doorways, 27.00 Stairs, 28.00 Elevators, 29.00 Floor Surfaces, 30.00 Public Toilet Room, 32.00 Kitchens, 34.00 Storage, 35.00 Tables and Seating, 36.00 Drinking Fountains, 39.00 Controls, 40.00 Alarms, 41.00 Signage	The newly constructed space will comply with the requirements of all applicable sections of ADA.
2	ADA	401-410	Accessible Route Requirements	402 Accessible Routes, 403 Walking Surfaces, 404 Doors, Doorways and Gates, 406 Curb Ramps, 407 Elevators	The accessible route elements will comply with the requirements of the applicable sections of ADA.
2	ADA	501-505	Site and Building Elements Requirements	502 Parking Spaces, 504 Stairways 505 Handrails	The site and building elements will comply with the requirements of the applicable sections of ADA.
2	ADA	601-612	Plumbing Element Requirements	602 Drinking Fountains, 603 Toilet and Bathing Rooms, 604 Water Closets and Toilet Compartments, 605 Urinals, 606 Lavatories and Sinks, 609 Grab Bars	The plumbing elements will comply with the requirements of the applicable sections of ADA.
2	ADA	701-708	Communication Element Requirements	702 Fire Alarm Systems, 703 Signs, 708 Two-Way Communication Systems	The communications elements will comply with the requirements of the applicable sections of ADA.
2	ADA	801-904	Special Spaces and Element Requirements	804 Kitchens and Kitchenettes, 811 Storage, 902 Dining Surfaces and Work Surfaces	The special spaces and elements will comply with the requirements of the applicable sections of ADA.
H Interior Environment					
2	IBC	1203-1205	Ventilation, Temperature Control, Lighting	The provisions of this chapter shall govern ventilation, temperature control, lighting, yards and courts, sound transmission, room dimensions, surrounding materials and rodent proofing associated with the interior spaces of buildings.	The design of the mechanical and lighting systems shall follow the requirements of the applicable chapters.
3	IBC	1206	Yards or Courts	N/A	N/A
2	IBC	1208	Interior Space Dimensions	1208.1 Minimum Room Widths. Habitable spaces, other than a kitchen, shall be not less than 7 feet in any plan dimension.	All rooms comply with minimum room width of 7 ft.
I Exterior Envelope					
2	IBC	1404-1406	Exterior Walls	1403.2 Weather Protection- performance requirements for creating a weather resistant exterior wall envelope 1404 Materials Describes performance requirements for typical exterior wall assembly components typically referring to ASTM standards.	Design of exterior wall assembly for new basement will comply with chapter 14

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				1404.2 Water Resistive Barrier	When specifying water-resistive barrier ensure compliance with section 1404.2
3	780 CMR	1403	Performance Requirement Amendments		
J	Structure				
K	Materials				
L	Systems				
2	IBC	2702	Emergency/Standby Power Systems	Where required. Emergency and standee power systems shall be installed where required by sections 2702.2.1 through 2702.2.16	Emergency/standby power systems are not required for this building
1	NFPA-70		National Electrical Code	This code covers the installation of electrical conductors, equipment, and raceways; signaling and communication conductors, equipment and raceways; and optical fiber cables and raceways	The design of the electrical systems shall follow the requirements of the applicable chapters.
1	527 CMR 12		Electrical Code Amendments	The 2002 Massachusetts Electrical Code (527 CMR 12.00) of the Board of Fire Prevention Regulations shall be the 2002 National Electrical Code	The design of the electrical systems shall follow the requirements of the applicable chapters.
1	IMC		International Mechanical Code	Chapter 4, 5, 6, 7, 10, 12	The design of the mechanical systems shall follow the requirements of the applicable chapters.
1	248 CMR	3.00	State Plumbing Code	The provisions of 248 CMR 3.00 govern the administrative requirements regarding the construction, removal, alteration, repair, and inspection of all plumbing and gas fitting work pursuant to MGL 142, 13 & 21	The design of the plumbing systems shall follow the requirements of 248 CMR.
1	248 CMR	10.10 (18) Tbl 1	Minimum Plumbing Facilities	<p>Office Building: Female Toilets: 1 per 20 Male Toilets: 1 per 25 Urinals: 33% * Lavatories per Sex: 1 per 50 Drinking Fountains: 1 per floor Service Sink: 1 per floor * may be substituted for toilets</p> <p>Assembly: Female Toilets: 1 per 35 Male Toilets: 1 per 75 Urinals Male: 50% Lavatories per sex: 1 per 200 Drinking Fountain: 1 per 500 pertinant regulations: (b), (m), (n), (p)</p>	<p>Minimum Fixtures Required (Total) Female Toilets: 4 (1 provided) Male Toilets: 3 (0 provided) Lavatories (Female): 3 (1 provided) Lavatories (Male): 3 (0 provided) Drinking Fountains: 2 (1 per floor) Service Sink: 2 (1 per floor)</p> <p>Basement Occupant Load = 10 (5 each female/male occupants) Female Toilets: 1 Male Toilets: 1 Lavatories (Female/Male Each): 1</p> <p>First Floor Occupant Load = 98 (49 each female/male occupants) Female Toilets: 2 Male Toilets: 1 Lavatories (Female/Male Each): 1</p> <p>Second Floor Occupant Load = 56 (28 each female/male occupants) Female Toilets: 1 Male Toilets: 1</p>

CODE ANALYSIS

Date: 09/17/18

Brooks Academy Museum Improvements

LEVEL	CODE	REFERENCE	TOPIC	CODE DESCRIPTION	ANALYSIS
1	IEBC	810	Plumbing	810.1 Minimum fixtures Where the occupant load of the story is increased by more than 20 percent, plumbing fixtures for the story shall be provided in the quantities specified in the International Plumbing Code based on the increased occupant load	Basement Occupancy: Existing (1,890 sf / 300 occ/sf) = 7 occ New = 9 occ Overall occupancy in the basement is increased by 28%; this occupancy increase exceeds the 20% threshold, however the increase is marginal and BIA believes this increase follows the intent of the code. The code official should be consulted to request a determination. Should the official determine additional fixtures are required, only the basement level will be required to meet the fixture count requirement.
				10.10 (18)(m) Handicap Toilet Facility Requirement i. Plumbing fixtures shall be installed in conformance with 521 CMR 30.0: Public Toilets (for fixture dimension requirements only)	Plumbing fixtures will comply with 521 CMR 30.0.
				10.10 (18)(m) Handicap Toilet Facility Requirement iii. Unisex handicap toilet facilities may be allowed by the Board by the variance process as outlined in 248 CMR: i. A variance is not required if the fixtures in an existing or proposed men's and women's toilet facility and the fixtures in a unisex handicapped toilet facility meet the minimum fixture requirements of 248 CMR 10.10(18): Table 1. A unisex toilet may be counted only one time toward the total minimum fixture requirements.	Unisex handicap toilet facilities allowed, no variance required.
				10.10 (18)(m) Handicap Toilet Facility Requirement iv. Wherever drinking fountains are provided, a drinking fountain shall accessible to the physically impaired.	Drinking fountains will be accessible and will comply with 521 CMR.
				10.10 (18)(n) Toilet Facilities General	Toilet facilities will comply with the requirements of 248 CMR.
1	248 CMR	10.10 (5-16)	Fixture Requirements	10.10 (5) Toilets, 10.10 (6) Urinals, 10.10 (8) Food-waste Grinder Units, 10.10 (9) Drinking Fountains, 10.10 (10) Floor/Trough Drains, 10.10 (11) Dishwashing Machines	Plumbing fixtures will comply with the requirements of 248 CMR.
2	IBC	3000	Elevators and Conveying Systems	3002.1 Hoistway Enclosure Protection. Elevator, dumbwaiter and other hoistway enclosures shall be shaft enclosures complying with Section 713. 3002.4 Elevator Car to Accommodate Ambulance Stretcher. Where elevators are provided in buildings four or more stories above, or four or more stories below, grade plane, not fewer than one elevator shall be provided for fire department emergency access to all floors. 3005 Machine Rooms	The elevator hoistway enclosure will comply with the requirements of 713. Note that 2015 IBC does not require venting of hoistways. Elevator not required to accommodate ambulance stretcher. The elevator machine room will comply with the requirements of 3005 (Access, Venting, Pressurization, etc.)
				3006.2 Hoistway Opening Protection Required. Elevator hoistway door openings shall be protected in accordance with Section 3006.2 where an elevator hoistway connections more than three stories, in required to be enclosed within a shaft enclosure in accordance with Section 712.1.1 and any of the following conditions apply: 1. The building is not protected throughout with an automatic sprinkler system 2. The building contains a Group I-1 Condition 2 occupancy 3. The building contains a Group I-2 occupancy 4. The building contains a Group I-3 occupancy 5. The building is a high rise and the elevator hoistway ins more than 75 feet in height.	The elevator hoistway door opening is not required to be protected as it does not meet the conditions listed.
1	780 CMR	3000	Elevators and Conveying Systems Amendments	3001.3 Accessibility. Passenger elevators required to be accessible or to serve as part of an accessible means of egress shall comply with this code and 521 CMR (not Section 1009)	The design of the elevator shall follow the requirements of Section 3000 and 521 CMR.
1	ASME A17.1		Safety Code for Elevators/Escalators	Provides requirements applying to the design, construction, installation, operation, testing, inspection, maintenance, alteration and repair of elevators, escalators, dumbwaiters, moving walks and material lifts.	The design of the elevator shall comply with the requirements of the applicable sections.

CODE ANALYSIS

Date: 09/17/18

Brooks Academy Museum Improvements

LEVEL	CODE	REFERENCE	TOPIC	CODE DESCRIPTION	ANALYSIS
1	524 CMR		Elevator Regulations	The provisions of 524 CMR shall control the design, construction, installation, relocation, alteration or material change, maintenance and operation of all elevators, escalators, lifts, dumbwaiters, moving walks, and special hoisting equipment, covered herein in all buildings and structures.	The design of the elevator shall follow the requirements of 524 CMR.
M	Special Construction				
N	Existing Structures				
O	Appendixes				
P	Energy Conservation				
1	IECC	Chapter 4	Commercial Energy Efficiency	<p>Tbl C402.1 Envelope R-Values</p> <p>Climate Zone 5 and Marine- Minimum R-Values, Roof- R30 continuous(cj), Opaque Wood Frame walls- R13+ R3.8ci or R20, Opaque Metal Frames walls-R13+R7.5ci, Below Grade walls R7.5ci, Floor over unconditioned space R10ci, Slab on grade- N/A*, Opaque Doors- R4.75,</p> <p>Tbl C402.4 Fenestration U-Values</p> <p>Fixed Glazing Maximum U-Factor 0.38, SHGC for North facing fenestration 0.53, and for all other orientations 0.40.</p> <p>Maximum vertical fenestration area 30% of gross above grade wall area.</p> <p>C402.5 Air Leakage-Thermal Envelope</p> <p>Description of prescriptive requirements for a continuous air barrier including list of materials meeting the maximum allowable permeability</p>	
Q	Environmental Protection				

Addendum

REDUCED SCOPE OPTION

At the request of David Spitz, BIA developed a reduced scope option that utilizes existing space in the basement for collection storage. This option is detailed on the following pages.

Chris Iwerks' email to David Spitz, 10/11/18

David:

Here are our ideas for each of the topics we discussed. [Caveat: the construction costs that we are listing for each scope element do not contain soft costs and are based on a very quick assessment of the abbreviated work to be accomplished. Our cost calculations are extrapolated from the estimate prepared by DG Jones for the whole project. Due to the interconnectedness of systems in the building, these costs should be understood as conceptual in nature and subject to modification as more detailed design information is developed].

1. Vertical Access

BAM already has an accessibility accommodation for public spaces on level 2, so adding an LULA elevator is a betterment for the public and a new functional solution for non-public basement access.

Alternatives to the location we proposed in the report are described following. We do not believe there would be any savings for these, however. It is our sense that the scope involved with each would likely cost more:

A. Exterior elevator next to the existing entry: requires oversized excavation (elevator shaft and lobby on each level would all be new to avoid needing to alter the existing toilet room); new

foundation walls and footings; new exterior enclosure, MEP systems.

B. Locate elevator to right of entrance in what is currently the only restroom. This solution would require demolishing the restroom and kitchen and rebuilding them next to the new LULA elevator. This location also requires extensive reworking of basement mech systems and renovations on levels 1 and 2.

C. Locate elevator within the multipurpose exhibit room, on the shaft wall adjacent to the main hall. This solution impinges on the 1 and 2nd floor rooms and is not as easily accessed from the entry. The amount of MEP system work that would need to be addressed is not known.

The least expensive solution is the one contained in the report. If the work was limited to just the LULA elevator, entry ramp and front portico alterations to become the new entrance, we estimate that the cost would be in the range of \$325,000 (breakdown attached).

2. Basement Storage

BAM currently stores sensitive portions of its collection in areas that are not climate controlled, leading to collection deterioration. In order to be able to preserve the most vulnerable pieces of the collection, BAM proposed to rehabilitate a portion of the full height Annex basement to become a climate controlled space storage space. This space is centrally located between the gas-fired heating system on the south and HVAC systems on the north. This space of approximately 420 square feet currently contains an abandon student toilet room and residual spaces adjacent to mechanical equipment. In rehabilitating this space to house the most sensitive elements of the collection, the museum will have the ability to reliably preserve valuable resources for future generations of visitors and researchers.

We estimate that this scope will be in the vicinity of \$130,000 (breakdown attached)

3. Restoration (between preservation and rehabilitation).

A. Water-related damage should be your highest priority (to prevent conditions from advancing to rehabilitation, which is more expensive). These should all be on the list (we do not have cost data available for these components):

- Foundation wall repairs
- Basement window wells
- Peeling paint (exterior walls and column bases)
- Gutters and downspouts (add and repair)

B. Secondary Priority

- Window sash and frame restoration

4. Rehabilitation

Remove exterior door on east wall and reside to original appearance

Concept Design - Reduced Scope Option

FIRST FLOOR

Entry

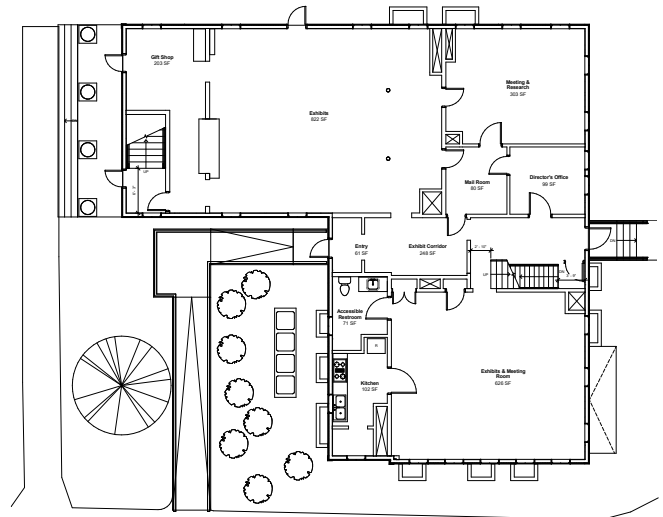
1. Construct a new entry ramp & landing connecting the parking lot to the front portico. The ramp will be detailed to complement the historic character of the building, but will be visually distinguishable as new construction.
2. Rebuild the portico landing to raise it 1.5" enabling an accessible transition to the interior. The existing porch and steps were re-constructed in 2007 and are not historically significant. The restored portico landing will utilize a new column base detail that better matches the original building and addresses moisture related deterioration.
3. Construct a new entry and ticketing counter combined with existing gift shop.

Exhibit Room

4. Remove non-original interior walls and convert to exhibit gallery space.

Foyer

5. Install a limited use limited access (LULA) elevator located within building footprint of 1927 annex addition.
6. Enlarge the doorway opening between the elevator and rear foyer. Add a partition & doorway below the staircase to separate the basement stair.



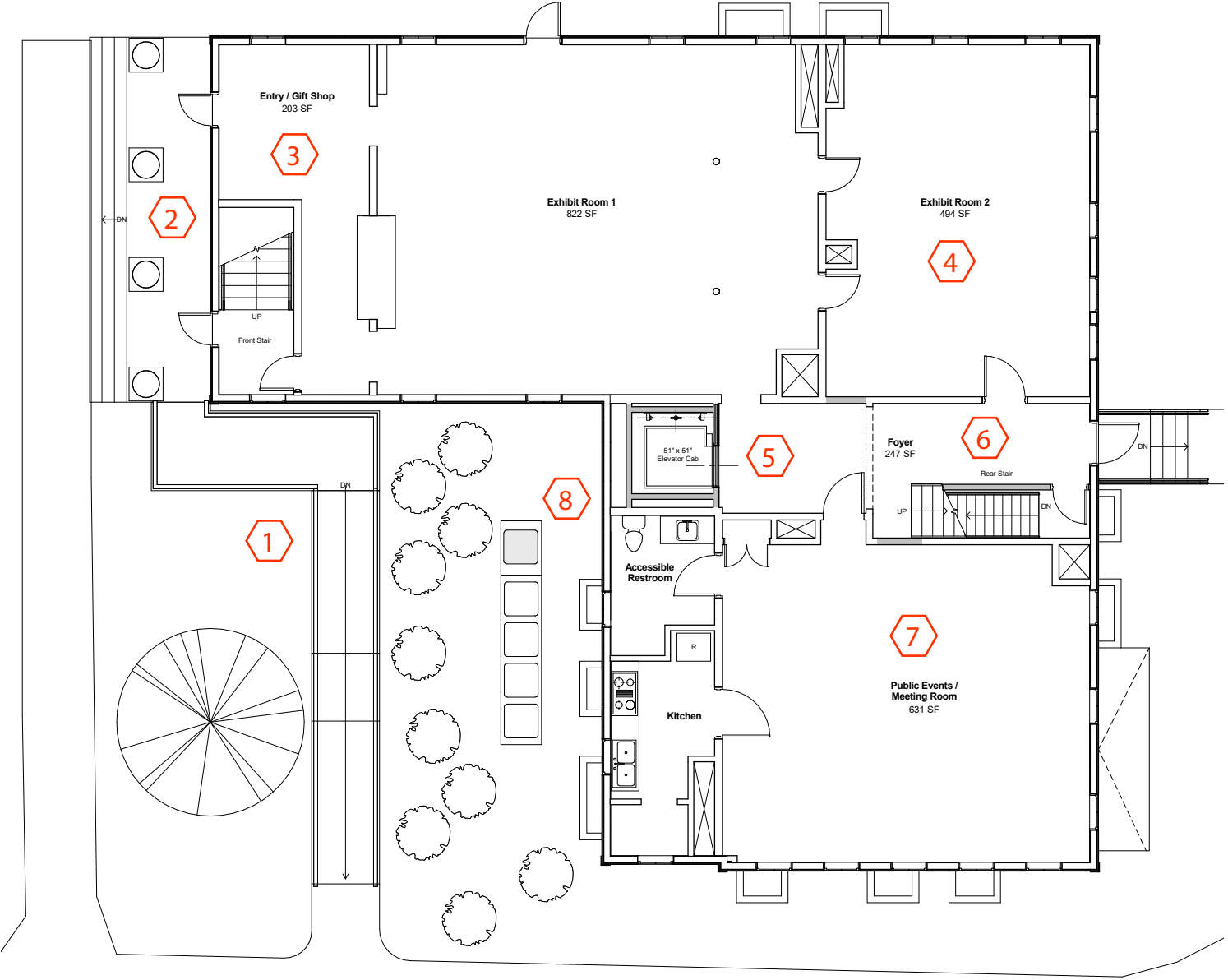
Existing

Public Events / Meeting Room

7. Infill the doorway between the Foyer and Meeting Room. The Public Events/Meeting Room no longer functions as exhibit space, but remains open to the public.

Building Systems

8. Install a new condensing unit adjacent to existing units (concealed by plantings).



First Floor Plan - Proposed

- Existing Wall
- New Wall

1844	1909
1927	

Concept Design - Reduced Scope Option

BASEMENT

Elevator / Stair Corridor

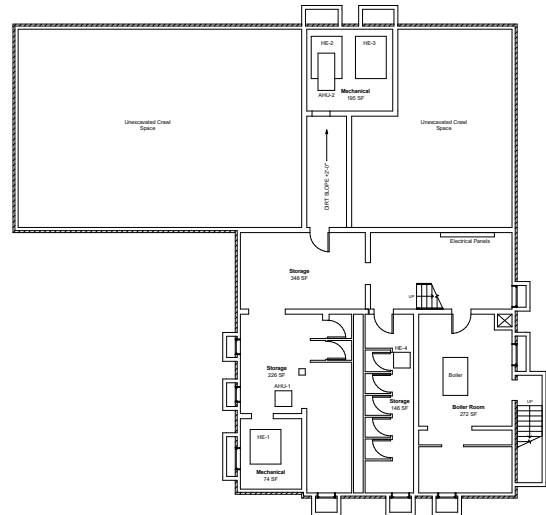
9. Install a new limited use limited access (LULA) elevator

Collection Storage Area

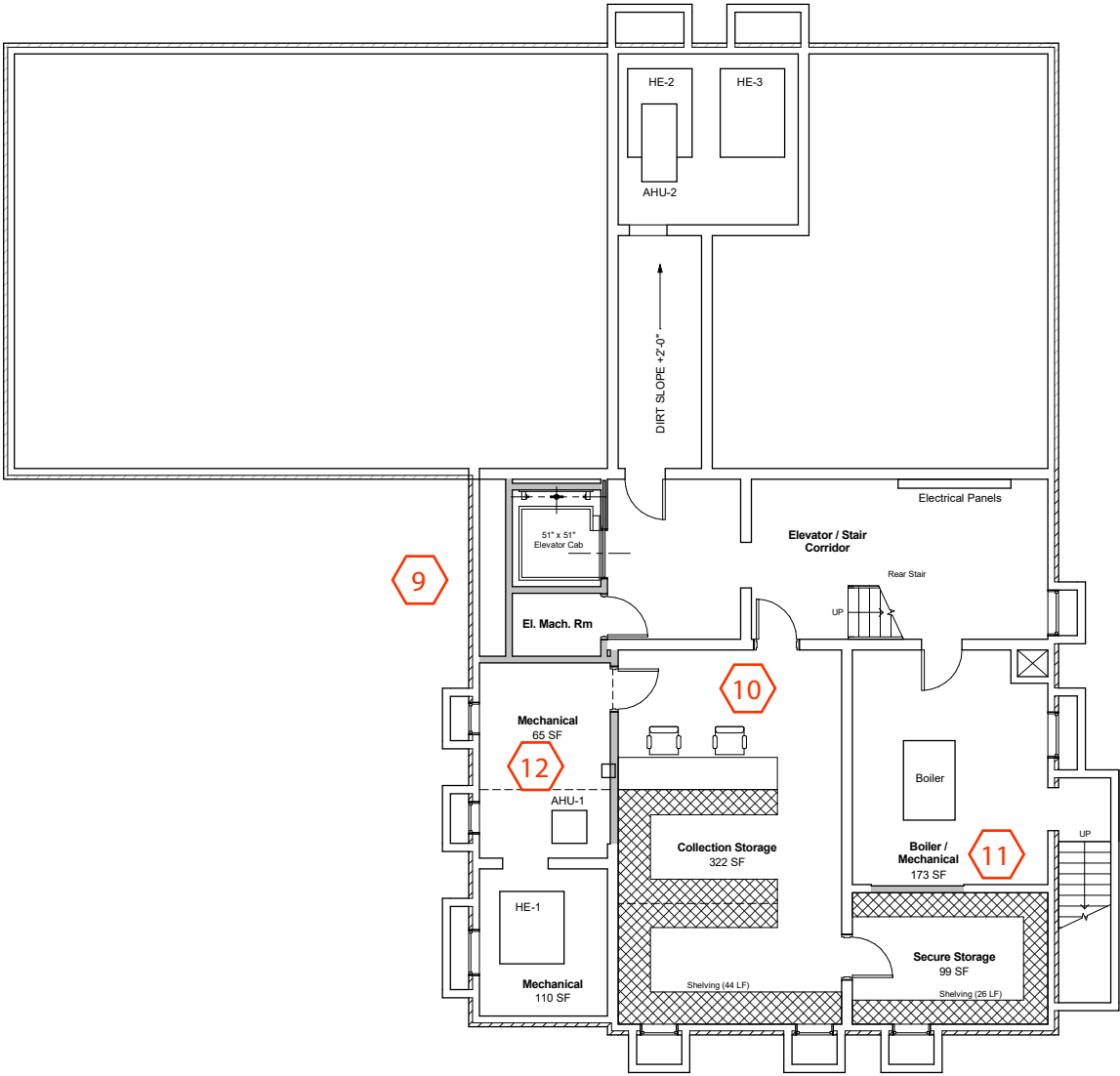
10. Construct a new collection storage area with environmental controls for collection preservation.
11. Enclose storage room behind the existing boiler room, and add a doorway to the new collection storage area to create a secure storage room.

Building Systems




12. Install a new package unit for heating, cooling, and humidity control for collections storage area.



Existing



Basement Plan - Proposed

-  Shelving System
-  Existing Wall
-  New Wall

1844	1909
1927	

Concept Design - Reduced Scope Option

SECOND FLOOR

Stair Hall

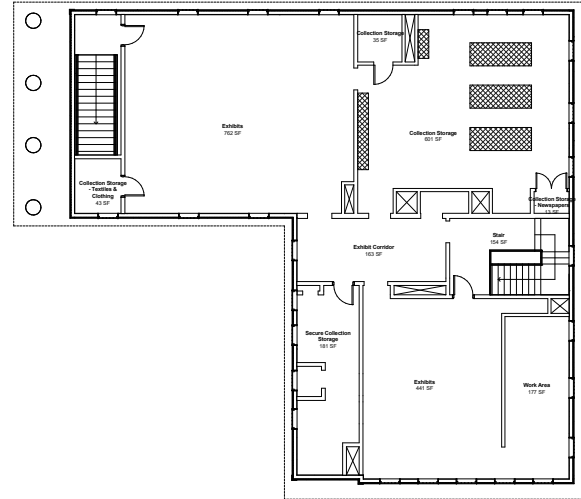
13. Enlarge doorway opening between elevator and stair landing
14. Install a limited use limited access (LULA) elevator. Remove the existing chair lift from the original historic stairway.

Exhibits

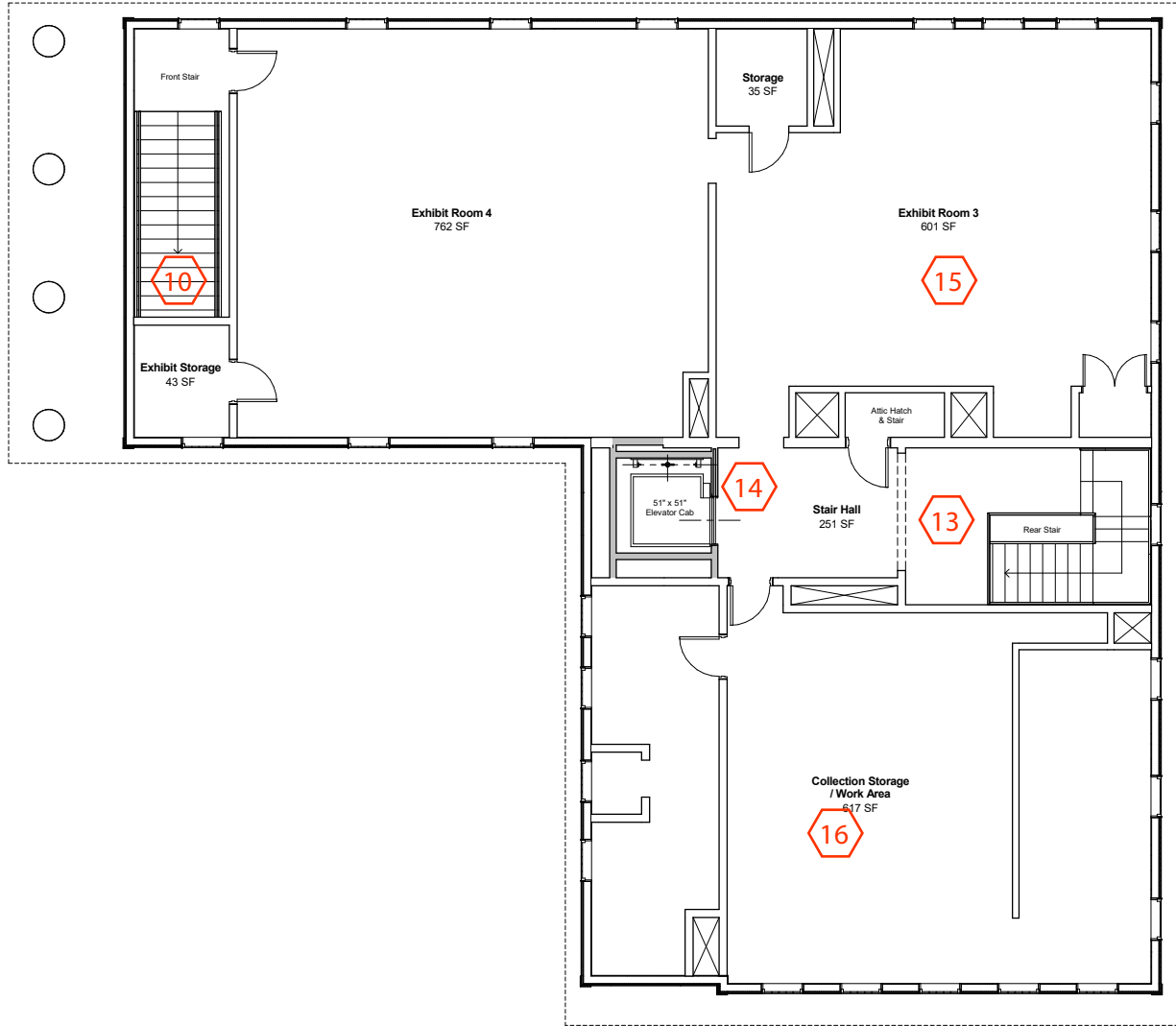
15. Convert the collections storage room into new exhibit gallery space.

Administrative Offices

16. Existing exhibit room converted to Collection Storage and Work Area for non sensitive collections that do not require environmental control



Existing



Second Floor Plan - Proposed

- Existing Wall
- New Wall



Cost Estimate

		Combined	
		<u>Elements (\$)</u>	<u>%</u>
Trade Costs	<u>A Substructure</u>	23,688	8.32%
	A10 Foundations	23,688	8.32%
	A20 Basement Construction	0	0.00%
	<u>B Shell</u>	18,480	6.49%
	B10 Superstructure	8,621	3.03%
	B20 Exterior Vertical Enclosure	8,203	2.88%
	B30 Exterior Roofing	1,656	0.58%
	<u>C Interiors</u>	36,489	12.82%
	C10 Interior Construction	27,540	9.67%
	C20 Stairs	0	0.00%
	C30 Interior Finishes	8,949	3.14%
	<u>D Services</u>	123,516	43.38%
	D10 Conveying Systems	64,923	22.80%
	D20 Plumbing	5,874	2.06%
	D 30 Heating, Ventilating, and Air Conditioning (HVAC)	13,173	4.63%
	D40 Fire Protection Systems	15,735	5.53%
	D50 Electrical Systems	23,811	8.36%
	<u>E Equipment and Furnishings</u>	5,225	1.84%
	E10 Equipment	0	0.00%
	E20 Furnishings	5,225	1.84%
	<u>F Special Construction and Demolition</u>	21,869	7.68%
Attendant Costs	F10 Special Construction	0	0.00%
	F20 Selective Demolition	21,869	7.68%
	F30 Demolition	0	0.00%
	<u>G Site Improvements</u>	55,466	19.48%
	G10 Site Preparation	3,924	1.38%
	G20 Site Improvements	51,542	18.10%
	Building Subtotal	\$284,732.50	
	Sub Total Construction	284,733	
	General Requirements/General Conditions, Bonds & Insurance	20.00%	56,947
	Bonds	1.00%	2,847
	Insurance	1.15%	3,274
	Builders Risk Insurance		By Owner
	Permit Fee		Excluded
	Escalation to mid-point of construction 2Q2021	11.40%	32,460
	Design Contingency - Sitework (2016 SD Estimate)	20.00%	56,947
	GC Fee	5.00%	14,237
	Construction Contingency		By Owner
	Total Construction Cost	\$451,443.38	

**Escalation is based on a average of 3.5% per annum*

LULA		Entry		Basement Rennovation	
Elements (\$)	%	Elements (\$)	%	Elements (\$)	%
5,688	2.00%	0	0.00%	18,000	6.32%
5,688	2.00%	0	0.00%	18,000	6.32%
0	0.00%	0	0.00%	0	0.00%
12,785	4.49%	5,695	2.00%	0	0.00%
8,621	3.03%	0	0.00%	0	0.00%
2,508	0.88%	5,695	2.00%	0	0.00%
1,656	0.58%	0	0.00%	0	0.00%
23,328	8.19%	0	0.00%	13,161	4.62%
19,759	6.94%	0	0.00%	7,781	2.73%
0	0.00%	0	0.00%	0	0.00%
3,569	1.25%	0	0.00%	5,380	1.89%
76,993	27.04%	2,708	0.95%	43,815	15.39%
64,923	22.80%	0	0.00%	0	0.00%
5,874	2.06%	0	0.00%	0	0.00%
0	0.00%	0	0.00%	13,173	4.63%
0	0.00%	0	0.00%	15,735	5.53%
6,196	2.18%	2,708	0.95%	14,907	5.24%
0	0.00%	5,225	1.84%	0	0.00%
0	0.00%	0	0.00%	0	0.00%
0	0.00%	5,225	1.84%	0	0.00%
11,584	4.07%	4,243	1.49%	6,042	2.12%
0	0.00%	0	0.00%	0	0.00%
11,584	4.07%	4,243	1.49%	6,042	2.12%
0	0.00%	0	0.00%	0	0.00%
0	0.00%	55,466	19.48%	0	0.00%
0	0.00%	3,924	1.38%	0	0.00%
0	0.00%	51,542	18.10%	0	0.00%
\$130,378.00		\$73,337.00		\$81,017.50	
130,378		73,337		81,018	
26,076		14,667		16,204	
1,304		733		810	
1,499		843		932	
By Owner		By Owner		By Owner	
Excluded		Excluded		Excluded	
14,863		8,360		9,236	
26,076		14,667		16,204	
6,519		3,667		4,051	
By Owner		By Owner		By Owner	
\$206,714.32		\$116,275.81		\$128,453.25	

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