Renovations for Memorial Hall

A FEASIBILITY STUDY

Presented to the Shelburne Select Board and Finance Committee
March 4, 2019

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**Cost Estimate**: Separate
Summary

The Memorial Hall building in Shelburne Falls contains Town Offices, Police Headquarters and Dispatch, and a Historic Theater, currently used for movies, concerts, and simulcast productions, as well as a town meeting space. The theater plays a key part of the fabric of the village, serving as its main entertainment venue since it was built in 1897. The Memorial Hall Association (hereafter MHA), the organization that operates the Memorial Hall Theater (MHT) as an entertainment venue, hired J Coleman + Company Architects to provide a feasibility study for improvements to the MHT.

As a tenant in the building, the MHA rents the MHT from the Town of Shelburne. In the course of making recommendations for improvements to the theater, most improvements were specific to the theater itself. Other improvements relate to the building in general and as such are not strictly speaking the focus of this report; they are enumerated but cost estimates were not provided. Also identified are some mandated building code improvements and deferred maintenance.

The principal areas to be addressed for the MHA were:
- New Seating – the old wooden seating is both uncomfortable and in need of repair.
- Upgrade/improve the HVAC system, which is noisy, and is ineffective in heating mode.

Secondary issues to be addressed for the MHA were:
- Explore the feasibility of restoring as many historic features as is realistically feasible.
- Improve the house lighting.
- Improve the Green Room area, including the addition of sinks and a lavatory.
- Summarize recommendations for improving the stage lighting.
- Explore the thermal performance of the space.
- Explore reduction of electric demand charges, which inflate the cost of electric usage.

A part of the feasibility study included a Code Review for the proposed improvements. This generated additional recommendations for items that would be required for the proposed changes to move forward. The actual code requirements might vary according to the amount of work being done. As the work is likely to exceed 30% of the appraised value of the building, the building must be brought into conformance with ADA accessibility requirements per 521 CMR of the Massachusetts building code statute. Principal ADA upgrades are:
- Provide a vertical platform lift to the stage.
- Provide guardrails, and compliant handrails at all stairs.
- Provide ramps to accommodate the change in elevation of the Green Room area.
- Related items (see CODE REVIEW section).

An additional code-mandated requirement was identified which is required as of June 2018:
- Make assistive listening devices available to the public

Other code-mandated requirements related to the new seating include:
- Provide compliant stair and aisle lighting within the auditorium.
- Provide guards at the foot of the balcony aisles.
There were other issues identified as needing attention that are outside the specific scope of this report. These include:

- Much of the brick on the front façade is in need of re-pointing.
- The construction of the cast iron balcony is causing damage to the front façade; this can be remedied.
- Some of the pieces of the granite base are working loose and should be reset.

Features that are strictly speaking operational preferences of the MHA, such as projection and sound equipment and controls, and specific performance lighting upgrades, were not included in this report.
**Historic Interior Features**

The Memorial Hall building was constructed in 1897 to provide a space for meetings, housing for veterans, and a theater for musical and theatrical events. The first opera to be held in the space was performed in the year following its construction. The hall suffered a major fire in 1928 and was rebuilt and reopened in 1929.

Judging from historic photos, one can see some changes made after the 1929 re-construction of Memorial Hall. Notable are the following:

1. **Proscenium arch.** The original proscenium arch, although not overly ornate, was rendered in a plaster relief with rolls at the perimeter. It was painted a medium-hued color with decorative floral elements in a lighter color. They must have produced a lively effect. By contrast, the post 1929 proscenium arch features a single roll at the exterior folded planes, and extends back towards the stage. It is painted a uniform white.

2. **Ceiling and Wall Decorative Motifs.** The original ceiling featured large rectangular troffers running north-south across the ceiling, with the expressed beams falling at the structural beam locations. The central panels featured large plaster expanses with painted medallions at each end; the paint probably reflected the lively scheme from the proscenium arch. The expressed beams themselves had stamped metal cove moldings, also painted with a mid-hue background and a bright tone on the raised stamped motifs. The tops of the walls featured a painted neo-classical floral festoon.

   The 1929 re-construction dropped the troffered ceiling from the original building and replaced it with a stamped metal ceiling. Large stamped metal cove moldings surround the ceiling at its perimeter. The entirety is painted white.

   Pediments were placed over the double exit doors flanking the stage, very much out of keeping with the original style and the original flat panel doors. Old photos of the original show large registers in the upper corners of the south wall. These probably admitted fan-driven chilled air from blocks of ice that were placed behind them.

   Decorative painting – in a historically compatible color scheme - of the stamped metal ceiling and cornice, as well as the proscenium arch, would be a terrific addition to the theater renovation.

3. **Lighting.** Although it is not clear exactly when electric lighting was first installed, pre-fire photos shows a single brass 20-lamp chandelier with small Victorian scalloped shades, suspended from the center of the hall. Additionally, the engaged pilasters at the hall sides were fitted with dual-shade up-light fixtures, and these were also place against the north wall.

   After the fire, six new school house fixtures were provided, as well as single-lamp fixtures at the pilaster locations which have single bare bulbs, and no shades.

4. **Seating.** The original seats were wood. In the 1929 renovation, used theater seats were purchased and installed. These were wood-backed, cushioned, folding seats which are now in serious disrepair. The seats are uncomfortable and narrow by today's theater seating expectations.
5. **Flooring.** The flooring post-1929 is 2 1/4" tongue and groove yellow birch. This floor has buckled in places due to a lack of expansion gaps, however it is salvageable by removing the longitudinal humps, providing expansion space, replacing maple hardwood strips (installed as a repair) with 2 1/4" yellow birch, replacing buckled sections, re-nailing as necessary and re-finishing.

6. **Ceiling in the Auditorium.** The auditorium ceiling is damaged in places and is repairable. The entire ceiling needs to be repainted, and the time to do it is after the seating is removed but before it has been replaced, so that rolling staging can be used for the work.

Of the improvements noted above, the floor repair is required and must be sequenced with the seat installation. Seating and Lighting improvements (aisle and house) are included. It is recommended that the post 1929 pediments flanking the stage be removed and replaced with a historically more appropriate design.
CODE REVIEW and MANDATES

The renovation is subject to the requirements of the Ninth Edition of the Existing Building Code of Massachusetts (EBCM9). The EBCM9 includes:

- 2015 IEBC International Existing Building Code
- Massachusetts amendments to the 2015 IEBC in 780 CMR 34.00
- 780 CMR Mass State Building Code, 9th edition
- 2015 IBC International Building Code with Massachusetts Amendments
- 521 CMR Massachusetts Architectural Access Board Regulations (MAAB)
- 248 CMR MA plumbing Code

The principal conclusions derived from the Code Review follow. It is anticipated that these would be the responsibility of the Town of Shelburne and not the MHA, except as noted:

1. The scope of work described in this study will be governed by the requirements of an IEBC Level 1 Alteration. If the renovations were to rise to a level 2 Alteration, significant upgrades to the building would be mandated, most notably a fire protection system (sprinklers) throughout the entire building, per Table 903.2 of the Massachusetts Amendments. Level 2 would be triggered, for instance, if a radiant floor heating and cooling system were to be installed, an approach which was considered by the MHA. However the proposed work is consistent with Level 1 regulations.

2. There is an improvement required by the current ADA which was to have been implemented as of June 2, 2018, disregarding any other improvements:
   a. Provide an assistive listening system.

3. 521 CMR (Massachusetts State Building Code) requires that a building be brought into full compliance with the ADA if improvements exceed 30% of the assessed value of the building. The assessed value of Memorial Hall is $888,000. If the proposed improvements exceed 30% of that value ($266,400), full compliance will be required as follows:
   a. Accessibility Renovations:
      i. Provide access to the stage via a Vertical Platform Lift.
      ii. Provide ramped access to the backstage Green Room area (each side).
      iii. Provide compliant handrails at the existing stairs.
      iv. Replace existing door latch sets on the second floor (and the door at the bottom of the main stairs) with compliant latch sets, or obtain a variance to allow the existing to remain.
      v. Obtain a historic variance to allow the existing doors less than 36" in width to remain (it is not anticipated this will be a problem).
      vi. Note that the entire building must be made compliant. A survey indicates that accessibility work on the first floor (Town Offices) is complete, or if not, only minor improvements would be required.

4. There are other life-safety improvements that should be addressed as soon as possible:
   a. Replace the black-out curtain on the stage with non-flammable fabric.
   b. Replace the existing fused panels in the stage area with breaker panels.
5. Other code-related improvements include:
   a. Install guards at the base of the aisles in the balcony.
   b. Provide aisle lighting for the theater, and stair lighting for the stairs to the balcony and for the balcony aisles; provide nosing strips on stairs to balcony.
   c. Provide nosing strips on stairs to second floor.

   These improvements will be sequenced with the seat replacement work.
Seating

The main impetus for improvements to the Memorial Hall theater was replacement of the seating. The existing seats are uncomfortable, with badly worn cushions, and many are broken. The seats are too narrow by current standards.

The drawings (fold out at Appendices) show the existing and proposed seating arrangements.

Seating Capacity:
There are currently 304 seats on the main floor and 114 seats in the balcony for a total seating capacity of 418 seats. This includes broken chairs.

In the proposed seating plan, there are 289 seats on the main floor and 114 seats in the balcony, for a total capacity of 403 seats. In addition, there are 6 (required) wheelchair spaces on the main floor. In other words, the seating capacity is only diminished by 15 seats, despite increasing the seat width from 19" to a range of 20" – 22" in width. On the main floor, seats were gained by proposing to hang a new truss for stage lighting from the ceiling (they are right below a structural truss), creating space for 8 seats, and fully loading the side seating banks. The truss will provide an improved condition for lighting the stage. In the balcony, seating remains constant by better utilizing the available area even though aisles were widened to meet code.

Seating Sizes:
There is a mix of seat widths from 20" to 22". These are typical widths for current theater seating, and the mix allows sight lines to be staggered.

Seat and Standard Selection:
In a previous look at seating replacement, the MHA saw seats at the Colonial Theater in Pittsfield and these are considered the preferred option for Memorial Hall:
This preferred seat is available from Irwin, the "Emerson", in a variety of wood stains and fabric choices:

**EMERSON**

Evocative of “opera” chairs from the early 1900’s, the Emerson features a scalloped upholstery pad attached with exposed tamper-resistant hardware. When paired with the No. 15 seat and a cast aisle end standard, the Emerson becomes an accurate replica.

69.15.137.8 Emerson

- 34” back height
- No. 15 self rising wood bottom seat
- No. 137 period style cast aisle end standards
- No. 8 chair platform with scrolled solid hardwood armrests
The aisle standard shown may or may not be the preferred option, but there are other aisle standards available (painted per owner’s spec). These can be provided with concealed aisle lighting and would be representative of an appropriate historic era.
Seating Accessibility:
(6) Wheelchair spaces are required (301 to 500 seating capacity), with companion seating (Table 221.2.1 of the ADA).

Designated aisle seats (4) per 221.4 and 802.4 are provided (folding armrests.)

Seats from 1929 Rebuild. They were second-hand then, and haven't improved with age.
**Heating, Ventilation and Air Conditioning:**

**Overview:**
The existing HVAC system is not well suited for heating (noisy and ineffective) or cooling (noisy) the Memorial Hall theater. The system was installed in the late 90's.

There are two HVAC units on the roof, propane-fired for heat and electric-powered for cooling. The smaller rooftop unit supplies the area above the balcony through ceiling diffusers and a ceiling return grill. The thermostat for this unit is located on the rear wall under the balcony behind the main hall. The second rooftop unit, which is larger (10 or 12 tons), supplies the main hall. The thermostat is wall-mounted audience right of the proscenium at the front of the stage. The return air grills are located in the front of the stage and air is delivered through ceiling diffusers overhead.

The rooftop HVAC units have at most 5 years of service based on their installation date (c. 2000).

**Deficiencies:**
The deficiencies with the existing HVAC system are:
1. The main seating area does not get sufficiently warm, while the balcony tends to overheat.
2. The air movement through the ductwork and out through the ceiling diffusers is noisy.

The balcony overheats because the hot air from diffusers in the ceiling blows into the space at a high temperature that tends to stratify near the ceiling due to its buoyancy, while the air speed, already noisy, is not forceful enough to force the air down and mix throughout the hall. Thus, hot air collects at the ceiling. In cooling mode, the cooling effect is satisfactory because the loads are less and the cooler air, being denser, falls downwards onto the audience level. Noise is still a problem.

The duct noise is principally caused by air moving at high velocity through the ductwork feeding the air diffusers, and down into the conditioned space.

**Recommendations:**
Several systems were considered for the HVAC System. These included a radiant floor heating and cooling system combined with new ventilation in conjunction with a roof-mounted Dedicated Outdoor Air System (DOAS) and Energy Recover Unit (ERV), and a mini-split heat pump array combined with a roof-mounted ERU for ventilation. Both systems would have utilized the existing ductwork in the ceiling for ventilation.

These systems were rejected on various counts including:
1. Complexity of controls, and as such not readily serviceable by local HVAC technicians
2. Danger of leaks in the radiant tubing causing damage to the offices below
3. High cost of implementation
The preferred option is configured as follows:

1. Provide one or two instantaneous propane-fired boilers in the basement. They are quite small and are usually wall-hung. These boilers will feed fin-tube radiation units located along the outside walls for heating. An additional benefit here is that the actual interior wall temperature will be warmer than the other options considered, reducing radiant coolness felt by audience members along the outside of the building.

2. Use the existing rooftop units for cooling, reducing the airflow to as much as possible. This will be sufficient for cooling and may reduce the duct noise level to an acceptable level. The existing ceiling diffusers will continue to supply the conditioned air. If the air speed can't be reduced enough, new rooftop units capable of lower air speeds would be provided. The existing units are perhaps 5 years from the end of their life in any case.

3. Continue using the existing fresh air ventilation system and re-configure the controls so that winter function continues at an acceptable air temperature. The movement of air from the ceiling to the return air grills at the floor level below the stage will ensure a steady mixing of heated air into the space below. The lower temperature and floor level delivery heated air via radiators (compared to the high temperatures now being provided at the ceiling) will prevent hot air from pooling near the ceiling.

It should be noted that the ductwork above the ceiling is not readily accessible. Reconfiguring the ventilation and air conditioning will require an investigation of this ductwork which is beyond the scope of this Feasibility Study. The system should be engineered by a firm experienced with similar projects.

This approach has the following advantages:

1. It addresses all the identified problems with the existing HVAC system.
2. It is, relatively speaking, inexpensive.
3. It is known technology, easily maintained and serviced by HVAC contractors.
4. It can maintain appropriate ventilation levels.

**Green Room Improvements, Add Lavatory:**

The Green Room is located in a wooden shed, attached to the brick rear façade, behind the stage. The floor level is 4" higher than the floor of the stage. Access occurs through two doors from stage level. New sinks will be provided for the two Green Room dressing areas as well.

The ask is to provide a full lavatory in this space, with a men's and women's Green Room area to either side of it with a sink in each. A unisex lavatory is possible, located in the center of the wood addition. 521 CMR will require ramped access (1:20). This in turn requires moving the Green Room access door on the east end of the stage.

In terms of the consequent design, the situation is reasonably straightforward. The existing conditions and proposed changes can be viewed in the Drawings.
**House Lighting:**

House lighting is minimal. There are six pendent schoolhouse fixtures, and there are sconces (basically bare bulbs) on the engaged pilasters along the sides of the hall. There are some recessed ceiling- fixtures under the balcony. The switching for these fixtures is haphazard.

**Recommendations for House Lighting:**

1. The existing schoolhouse fixtures were part of the 1929 renovation. They are not overly attractive and could be replaced with another period lighting fixture if desired. A new fixture would be a dimmable LED type. If the existing shades are retained, the recommendation is to re-lamp them with dimmable LEDs, with two or three 100W equivalent LED bulbs per fixture, to provide higher levels of illumination at full illumination level while having a dimmer mode for event illumination. A cost allowance per fixture has been incorporated.

2. In general, the switching for the various fixture locations are somewhat random. The recommendation is to re-wire the switching for the overhead fixtures so that they can be turned on, grouped (4) front and the (2) over the balcony and with dimmer controls, as follows:
   a. Switch for all OH hall and balcony fixtures at the double door entry to the hall
   b. Switch for all OH hall and balcony fixtures at control station backstage
   c. Switch for balcony fixtures at top of stairs to balcony on control room partition.
   d. All lighting can be controlled from lighting control board panel in control room.

3. Provide (6) new dimmable LED lighting fixtures to replace the fixtures now mounted on the sides of the Hall. Controls for these would be identical to the OH lighting described in item 2, above. They should be historically sympathetic to the 1920's. Although it is not necessary to select a fixture at this time (a reasonable cost allowance is required), two fixture possibilities are shown below.

4. Replace the recessed lighting under the balcony with historically-appropriate flush-mounted dimmable LED fixtures. Switching would be ganged with switches for OH and sidewall fixtures at the double door entrance to the hall.

5. Provide aisle lighting to comply with code, mounted on the seat stanchions. These are furnished as part of the seating package.

6. Provide code-compliant stair lighting for the balcony stairs. A typical example is shown below.

A sample lighting and switching plan is shown in the drawings (See Appendices).
A possible lighting sconce for the auditorium walls

Another possible lighting sconce for the auditorium walls

Possible lighting sconce/ceiling below balcony

Another possible lighting sconce/ceiling below balcony

Example of aisle and stair lighting, stairs to the balcony. This is a lighting strip mounted 12” above and parallel to the stairs
New Load Panels and Outlets:

Wiring, load panels, utility lighting.
There are fuse boxes behind the stage which should be replaced with circuit breaking load panels. An electrician should review the general state of the wiring, panels and service and suggest other recommendations as appropriate.

New Outlets and Utility
The Hall lacks sufficient electrical outlets generally. Following is a list of needed outlets by area:

1. Entry Foyer. There is a duplex outlet on the north wall at 48". A new outlet at 24" in one of the sidewalls should be added.
2. Ticket Office. New outlets are shown in the plan.
3. Main Hall. There are no outlets in the main Hall, with the exception of 3 duplex outlets mounted on the front of the stage. More are suggested as follows:
   a. For general usage (cleaning for example) add (2) outlets on each sidewall, and (2) on the rear wall of the hall.
   b. Provide a quadlex outlet and a twist lock/cam lock outlet for rental client power usage. This would be located at the area designate for client board control, probably audience right front of house.
4. Stage.
   a. Provide (3) duplex outlets stage left and right.
   b. Provide (4) duplex outlets spaced evenly at rear of stage on existing east wall.
5. Green Rooms, New Lav:
   a. Provide basic outlets and lighting as appropriate and shown in the plans.
6. Projection Room.
   a. Provide new outlets and lighting as shown.
Stage Lighting and Curtains:

Overview:
Currently, there are three general locations for stage lighting. There is a truss over the stage, two light poles on the sides of the auditorium, and footlights at the front of the stage.

A recommendation of this study, if the budget allows, is to remove the light poles on the auditorium sides and replace them with a single lighting truss located below one of the existing ceiling/roof trusses as shown. LED stage lighting will be provided. Removal of the light standards will optimize the seating layout (quite a few seats are taken out of circulation as a result of the existing layout), and the truss will provide greater flexibility for stage illumination. Raising and lowering the truss will be accomplished by electric pulleys. If the lighting truss is either too expensive or structurally difficult, the existing light pole standards can remain.

The existing truss over the stage should be renovated. The rope pulleys are in disrepair and potentially dangerous. The new truss will be automated and controllable from the stage or the projection booth control panel. New LED fixtures should be provided.

There is a bank of 30 footlights at the front of the stage, consisting of lightbulbs in cast aluminum sockets. Many of these sockets have cracked. It is recommended that all of the cast sockets be replaced, and that the replacement bulbs be LED.

A benefit to switching over to LED stage lighting is that overall electrical load will be reduced, creating greater capacity for the existing wiring. This will allow for future expansion while minimizing requirements for new service wiring.

Dimmable work lights will be provided on the walls behind the stage curtain.

The stage main curtain should be replaced with a fire-resistant fabric.

Electric control panels can be provided, to control lighting and sound from either the projection booth or the stage.
**Projection Booth, Acoustic Upgrades, Lighting Controls, and Related:**

MHA directors and event technicians provided a list of items to be addressed in the Projection Booth. There are a number of related asks that are incorporated into this section of the report. In general, these items are specialized upgrades to the projection, acoustic and lighting systems which are client-driven.

**Projection Booth:**
The following is a list of improvements requested for the Projection Booth (see the floor plans).

1. Remove and seal off the vent that moves air from the ceiling to the roof, and from the exterior north wall to the floor. Patch to match. Booth ventilation will be provided as part of the new HVAC upgrade.
2. Remove the existing shuttered projection windows, patch to match. Provide a single 2 way glass projection window with a privacy curtain.
3. Provide a new tech table across the front of the booth.
4. Provide 4 separate 20 amp circuits to the booth.
5. Provide conduits through the ceiling for communication to the stage, the two green rooms, and the tech bays.

**Future changes that are not part of this study include:**

1. Provide a new programmable lighting/audio/curtain control panel.
   a. Simple Extron or similar control system
   b. Audio/VGA/HDMI patch panel from and to the stage
   c. Electric screen control
   d. Electric stage curtain control
2. Ceiling mount the projector (possibly upgrade to a laser unit).
3. Provide an A/V Rack to one side.

**Stage Area, items not specified in the report:**

1. Install sub-woofer under stage.
2. Provide a wheel-mounted audio system, and a designated out of use storage area.
3. Provide a cable/GAK storage locker.
4. Provide a smaller screen above the stage for client use.
5. Provide a patch bay for the main audio system – short jumper harness to 3 speakers.
7. Provide an Audio/HDMI/VGA patch panel to and from the projection booth.
8. Provide new soft goods.

**Related:**

1. Provide a blackout curtain for the front of house, so the hall doors can be open without affecting the projection screen.
2. Provide 2 Client Tech Bay areas, for concert tech use.
3. Provide removable chairs in front of stage for dancing, if a location can be found to store these when they are removed.
**Electric Demand Charges**

Overview:
Memorial Hall has historically high electric bills for the summer months – specifically, the average cost for the years 2014 – 2017 for June through September is $548 per month. Nick Hill of Energy Management Associates (EMA) recently performed an energy audit for Memorial Hall for the Town of Shelburne and points out: "The driving force behind Memorial Hall's high electric costs is the demand charge associated with the HVAC system. Demand charges are the costs associated with the maximum one-time power draw from the building over the month. The load factor … is the percentage that the building is operating at peak power draw. The load factors show that the electric usage is generally low, but when certain equipment kicks on, it causes short-term usage spikes." As a result, cooling needs when the hall is opened overwhelm any other source of electric usage. Just a few short hours of high usage will cost hundreds of dollars.

Prior to any HVAC improvements being made, a possible interim strategy for reducing demand charges is to start the cooling of the hall prior to an event two or three days beforehand, and initially setting the thermostat just below the point at which the cooling function for the HVAC unit will be triggered. Then the set point can be gradually reduced as the event approaches, possibly reducing the demand spike that arises from turning the unit on full blast prior to opening the hall.

The proposed HVAC renovation, once implemented, will greatly mitigate the high demand charges.

Another interim approach would be to install new rooftop units that respond to cooling loads by using less energy when the cooling load is low. For cooling only air speeds can be low enough to eliminate the noise problem in cooling mode. This could reduce the demand charges that currently exist. However, this approach would not address the problem of a noisy heating system, which governs the situation for the majority of the year.

Relevant sections from the EMA report are included in the Appendices.
Other Work/Conditions Noted in the Course of Building Observations

Note, this section provides general observations, and some recommended work outside of the purview of the MHA identified during the course of the Feasibility Study. This work is not part of the proposed renovations to the hall proper.

Iron Balcony. The iron balcony projecting over the entrance increases water penetration into the masonry façade in two ways. First, water collects on the balcony and drips down to the concrete stoop in front of the entrance. This concentrates water splash onto the nearby masonry, accelerating mortar deterioration there. Also, water penetration into the masonry occurs where the iron touches the building, exacerbating mortar degradation there as well.

The solution to this would be to deck the balcony with a membrane, and flash that into the building. That would eliminate water penetration into the walls of the structure and throw the drip line well away from the base of the building. It would also provide a bit of rain protection for persons coming and going into the Town Offices and the Memorial Hall building.

Re-pointing Required. In many places, especially on the lower portions of parts of the entry and rear façades, the mortar in the masonry wall has started to deteriorate. It is time to begin monitoring the situation, and to schedule maintenance as required. As always, a soft mortar, compatible with the hardness of the old brick, must be used.

Base Stones in Need of Adjustment and Repair. Some of the base stones at the west end of the front façade have been leveraged out of position, as a result of freeze-thaw cycles of water penetrating the façade. These should be re-positioned, and the sources of water intrusion identified and remedied.

Attic Insulation:
The attic is insulated with approximately 12” of blown in cellulose insulation. This is an adequate level of insulation, and no additional attic insulation is recommended.

Wall Insulation
Memorial Hall is a brick structure. Engaged pilasters protrude into the space at regular intervals to add additional support for the steel trusses above the ceiling, lending a rhythmic accent to the interior. It appears that plaster lath is attached to the brick wall via strapping, and then plastered, so there is a small air space between the plaster interior and the brick. The foundation is stone and concrete. The foundation is in good condition on the interior, with new brick load carrying support piers and a good concrete slab.

Insulating a structural brick wall on the interior is potentially problematic because it will result in a dew point forming inside the brick wall. Condensation can form in the brick and mortar as a result, encouraging spalling and, when the condensed water freezes and expands, destruction to the brick and mortar. For this reason, it is best to insulate the masonry wall on the exterior, if it is to be insulated at all.
Historic considerations preclude insulating the exterior of the structure where it faces Bridge Street. Insulating the building on the east and west sides, and possibly on the back as well, is viable. The sides of the structure are accessible via alleys separating the Memorial Hall building from the adjacent buildings, and it appears there is sufficient room to work there. The rear of the building can be insulated below the projecting wood shed which contains the Green Rooms.

Wall insulation would be accomplished by adding an exterior wall insulation system (EWIS) over the brick. There are several commercially-available systems available and current practice includes detailing which allows water which does penetrate the system to escape, providing a durable installation. The eave overhangs at Memorial Hall will be helpful in this regard.

However, the cost of wall insulation could not be amortized by reduced energy costs over any reasonable time frame. The fact that the hall is often not heated or cooled at all is the primary reason. Insulating the walls is not recommended.

Blueprint of the original design. The roof trusses, now metal, originally were wood timbers.
Appendix 1: Energy Use Analysis by Energy Management Associates, Inc.

Propane Usage exported from the MEI Database and as reported by the facility

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<td>109.4</td>
<td>1,523</td>
</tr>
<tr>
<td></td>
<td>$31</td>
<td>$362</td>
<td>$1,286</td>
<td>$368</td>
<td>$270</td>
<td>$135</td>
<td>$2,451</td>
</tr>
<tr>
<td></td>
<td>$1.37</td>
<td>$1.47</td>
<td>$1.84</td>
<td>$1.52</td>
<td>$1.31</td>
<td>$1.24</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>138.6</td>
</tr>
</tbody>
</table>

From vendor
From vendor
From vendor
From vendor
From vendor
From vendor
From vendor

Average annual propane usage over the past 4 years is 1,379 gallons, or 125.5 mmBtu.

Annual Electric Usage

<table>
<thead>
<tr>
<th>Meter Read</th>
<th>kWh</th>
<th>kw Demand</th>
<th>KWH/Day</th>
<th>Total Cost</th>
<th>Demand Cost</th>
<th>Load Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/14/2017</td>
<td>251</td>
<td>40.5</td>
<td>8.4</td>
<td>$718</td>
<td>$618</td>
<td>0.9%</td>
</tr>
<tr>
<td>8/15/2017</td>
<td>204</td>
<td>40.0</td>
<td>6.4</td>
<td>$704</td>
<td>$610</td>
<td>0.7%</td>
</tr>
<tr>
<td>9/14/2017</td>
<td>230</td>
<td>18.5</td>
<td>7.7</td>
<td>$340</td>
<td>$265</td>
<td>1.7%</td>
</tr>
<tr>
<td>10/13/2017</td>
<td>353</td>
<td>24.5</td>
<td>12.2</td>
<td>$457</td>
<td>$361</td>
<td>2.1%</td>
</tr>
<tr>
<td>11/13/2017</td>
<td>246</td>
<td>12.5</td>
<td>7.9</td>
<td>$239</td>
<td>$169</td>
<td>2.6%</td>
</tr>
<tr>
<td>12/13/2017</td>
<td>243</td>
<td>7.5</td>
<td>8.1</td>
<td>$154</td>
<td>$88</td>
<td>4.5%</td>
</tr>
<tr>
<td>1/15/2018</td>
<td>926</td>
<td>6.0</td>
<td>28.1</td>
<td>$224</td>
<td>$64</td>
<td>19.5%</td>
</tr>
<tr>
<td>2/13/2018</td>
<td>312</td>
<td>8.0</td>
<td>10.8</td>
<td>$183</td>
<td>$98</td>
<td>5.6%</td>
</tr>
<tr>
<td>3/15/2018</td>
<td>226</td>
<td>9.5</td>
<td>7.5</td>
<td>$197</td>
<td>$124</td>
<td>3.3%</td>
</tr>
<tr>
<td>4/17/2018</td>
<td>397</td>
<td>11.0</td>
<td>12.0</td>
<td>$250</td>
<td>$149</td>
<td>4.6%</td>
</tr>
<tr>
<td>5/15/2018</td>
<td>184</td>
<td>9.5</td>
<td>6.6</td>
<td>$190</td>
<td>$124</td>
<td>2.9%</td>
</tr>
<tr>
<td>6/14/2018</td>
<td>399</td>
<td>37.0</td>
<td>13.3</td>
<td>$707</td>
<td>$579</td>
<td>1.5%</td>
</tr>
<tr>
<td>Total KWH</td>
<td>3,971</td>
<td></td>
<td>10.9</td>
<td>$4,363</td>
<td>$3,250</td>
<td></td>
</tr>
</tbody>
</table>

Avg $/kWh $1.10  Avg $/kWh w/o demand charges $0.1895

The driving force behind Memorial Hall’s high electricity costs is the demand charges associated with the HVAC system. Demand charges are the costs associated with the maximum one-time power draw from the building over the month. The load factor, shown in the table above, is the percentage that the building is
operating at peak power draw. The very low load factors show that the electricity usage is generally low, but when certain equipment kicks on, it causes short-term usage spikes. We believe that the HVAC equipment is the source of this problem. The ‘shark fin” pattern in the charts from our eQuest energy model show how cooling needs on performance days overwhelm any other source of electricity usage. Just a few short hours of high usage will cost several hundred dollars. Simply put, demand charges are a killer.

The chart above shows the hourly demand profile on a peak August day. The chart below shows that short term demand spikes override any monthly usage patterns.
Utilities - Electric Disaggregation

<table>
<thead>
<tr>
<th></th>
<th>KWH</th>
<th>% of Usage</th>
<th>kW Demand</th>
<th>% of Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting</td>
<td>1300</td>
<td>33%</td>
<td>1.4 kW</td>
<td>3%</td>
</tr>
<tr>
<td>Cooling</td>
<td>1178</td>
<td>30%</td>
<td>31.5 kW</td>
<td>78%</td>
</tr>
<tr>
<td>Misc. Equipment (incl. projector &amp; stage lights)</td>
<td>1,040</td>
<td>26%</td>
<td>0.9 kW</td>
<td>2%</td>
</tr>
<tr>
<td>Ventilation &amp; Fans</td>
<td>454</td>
<td>11%</td>
<td>6.7 kW</td>
<td>17%</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td><strong>3,971</strong></td>
<td></td>
<td><strong>40.5 kW</strong></td>
<td></td>
</tr>
</tbody>
</table>

![Electricity Usage](image-url)
Summary of Building Code Requirements
Existing Building Code of Massachusetts

Renovations and Alterations
Memorial Hall, Shelburne Falls, MA

It is proposed to perform limited renovations and alterations affecting the Theater in Memorial Hall at 51 Bridge Street in Shelburne Falls. The proposed work will take place within the existing building envelope without a change of the occupancy of the building and without expansion of the building. The proposed project will not include work in the Town Offices, the Police Headquarters and the Public Safety Dispatch Center that are located on the First Floor of the building.

The proposed project is subject to the requirements of the Ninth Edition of the Existing Building Code of Massachusetts (EBCM9). The EBCM9 consists of the 2015 Edition of the International Existing Building Code and the Massachusetts amendments to that code in 780 CMR 34.00. In addition, the EBCM9 cites the Ninth Edition of the Massachusetts State Building Code (MSBC9 or 780 CMR). The MSBC9 consists of the 2015 Edition of the International Building Code with Massachusetts’ amendments.

The existing and proposed conditions in the building are described in Section 1 below. The requirements of the Existing Building Code of Massachusetts for a project involving limited renovations and alterations without expansion and without change of occupancy are summarized in Section 2 below. The requirements of the MSBC9 for specific new construction elements of the shall be determined from that Code.
Section 1
Existing and Proposed Conditions

This Code Summary for proposed renovations and alterations without a change of occupancy classification and without expansion of the existing Shelburne Falls Memorial Hall at 51 Bridge Street is based upon the Existing Building Code of Massachusetts (EBCM9). The EBCM9 consists of the 2015 Edition of the International Existing Building Code and the Massachusetts amendments to that code in 780 CMR 34.00. In addition, the EBCM9 cites the Ninth Edition of the Massachusetts State Building Code (MSBC9) or 780 CMR. The MSBC9 consists of the 2015 Edition of the International Building Code with Massachusetts’ amendments.

Basic data concerning the existing conditions in the Memorial Hall building at 51 Bridge Street and the proposed alterations and renovations of that building are provided below.

Existing Building Description

The existing structure consists of a single tenant (the town of Shelburne Falls) building that is not subdivided by firewalls. The proposed work is in space operated by the Memorial Hall Association that utilizes the Second Floor and balcony as a tenant. That building has the following basic characteristics.

Building Height

The building has two stories above grade plus a balcony (mezzanine) within the Second Floor auditorium and a basement primarily below grade but with a door to the exterior at grade.

The height to the highest point of the flat roof of the building is approximately 40.67 feet above the average grade plane.

Building Area

The building area is approximately 4,400 sf based on the area of the First Floor of the building inside the exterior walls. The aggregate area of the building on all levels including the mezzanine is 9,192 sf.

Occupancy Classification

The present occupancy classifications of the building are Use Group B (municipal offices), Use Group A-1 (assembly, theater), A-3 (assembly, meeting rooms) and Use Group S-1 (storage). The spaces of Use Group S-1 (storage) are considered accessory uses of the other primary uses of the building.

Construction Type
The original portion of the building is of Type IIIB, unprotected, non-combustible/combustible construction based on its masonry exterior walls having two-hours fire resistance and interior wood framed floors and roof.

The Green Room addition is of Type VB, unprotected combustible construction.

The building as a whole must be assigned to Type VB, unprotected combustible construction.

**Fire Protection**

The building is not sprinklered. The building does have a fire alarm system.

**Proposed Work**

The principal areas to be addressed for Memorial Hall Theater are the following:

- New auditorium seating
- HVAC system upgrades

Secondary project objectives that may be addressed for Memorial Hall include:

- Restoration of many historic features as is realistically feasible
- Improvement of the house lighting
- Improvement the Green Room area, including the addition of a lavatory
- Improvement of the stage lighting
- Improvement of acoustics in the auditorium
- Evaluation of the thermal performance of the space
- Identification of opportunities for reduction of electric demand charges
- Installation of a vertical platform lift to the stage, if required by 521 CMR
- Installation of compliant handrails at all stairs
- Installation of assistive listening devices
- Improvement stair and aisle lighting
- Installation guards at the foot of the balcony aisles

The actual percentage of the building that may be reconfigured will be minor.

The proposed project will not result in a change of occupancy in the building from the existing use groups and will not result in an increase in the height and/or area of the building.
Section 2
Building Code Requirements for Existing Buildings

The alteration, repair, addition, and change of occupancy of existing buildings shall be controlled by the provisions of the 2015 Edition of the International Existing Building Code (IEBC 2015) and its appendices as modified by Massachusetts Amendments. Those documents, taken together, are identified as the Existing Building Code of Massachusetts (EBCM9). The requirements of the EBCM9 specifically applicable to the proposed alterations renovations, expansion and change of occupancy except those related to the structural system are summarized below.

Basic EBCM9 Requirements

The EBCM9 offers three alternatives for regulation of work in existing buildings: (1) the “Prescriptive Compliance Method”, (2) “Work Area Compliance Method” and (3) the “Performance Compliance Method”. These three approaches are considered mutually exclusive: that is, one must select one method and complete the requirements applicable to that method. It is proposed to regulate the proposed project using the Work Area Compliance Method as the most appropriate of the three options. As the proposed reconfiguration of the existing portions of the building will take place in much less than 50% of the aggregate area of the existing building, the project will be a Level 2 alteration subject to the requirements of EBCM9 Chapters 7 and 8.

The requirements of these separate EBCM9 chapters as applied to the current project are summarized below.

Level 1 Alterations Requirements

1. An existing building or portion thereof shall not be altered such that the building becomes less safe than its existing condition
   Exception: Where the current level of safety or sanitation is proposed to be reduced, the portion altered shall conform to the requirements of EBCM9.
   (701.2)

The proposed renovations will maintain or improve the level of safety provided by existing conditions in the building.

Interior finishes

2. All newly installed interior finishes and trim shall comply with the flame-spread requirements of the EBCM9. (702.1)

3. New carpeting used as an interior floor finish material shall comply with the radiant flux requirements of the MSBC9. (702.2)
New interior wall and ceiling finishes in the work area will comply with the new code requirements for Class A interior finish within enclosed exit stairs and in corridors and Class B or better interior finish in rooms or enclosed spaces of an unsprinklered building of Use Group A-1 occupancy. Existing hard surface floor finishes and possible installations of carpeting having a Class II critical radiant flux rating will comply with the floor finish requirements of the code for new construction.

Materials and methods

(4) All new work shall comply with materials and methods requirements in the Massachusetts Electrical Code, MSBC9, International Energy Conservation Code, International Mechanical Code, and Massachusetts Plumbing Code, as applicable, that specify material standards, detail of installation and connection, joints, penetrations, and continuity of any element, component, or system in the building. (702.3)

New work will comply with the MSBC9 provisions and its referenced codes and regulations for new construction.

Fire Protection

(5) Alterations shall be done in a manner that maintains the level of fire protection provided. (703.1)

The existing building does not have sprinkler protection.

The existing fire alarm system will be maintained in this project and upgraded as required by the limited reconfiguration of spaces.

Means of Egress

(6) Alterations shall be done in a manner that maintains the level of protection provided for the means of egress. (704.1)

The basic elements of the means of egress from the Second Floor include the following:

- One unenclosed exit access stair from the balcony to the Second Floor Foyer
- One unenclosed exit access stair from the balcony to the Second Floor Theater
- One unenclosed exit access stair from the Second Floor Foyer to the First Floor Entry Hall at the front, north side of the Second Floor
- Two fire escapes from accessible from the south (stage) end of the Theater.

Access to those means of egress elements will be provided by aisles, lobbies and vestibules of the Second Floor.
The use of the unenclosed stair as a means of egress stair (exit access) in a two-story building is permitted by the new construction requirements of MSBC9 Section 1019.3, Exception 1.

The First Floor is provided with doors directly to the exterior from the aisles and corridors on that level.

In areas that are reconfigured, the means of egress will comply with the requirements of the MSBC9 for new construction.

**Accessibility**

(7) Provide an accessible entrance and accessibility to all altered spaces that are to be open to the public, if any. (705.2)

Most portions of the building are already accessible to the public including the main entrance and the Second Floor Theater. In addition, an accessible toilet is provided on the First Floor. Assuming the project cost does not exceed 30% of the assessed valuation of the building, the building would be in compliance with the existing building requirements of the Regulations of the MA Architectural Access Board (521 CMR). No further upgrades would be required.

(8) Reroof all or portions of the roof in accordance with the requirements of Section 706. (706.1)

The current project will not include a reroofing project.

(9) Upgrade the building structure in accordance with EBCM9 Section 707 when alteration work includes replacement of equipment that is supported by the building or where a reroofing permit is required. (707.1)

The project will include replacement of existing equipment supported by the building structure. The potential impact on the structure and necessary upgrades will be evaluated by a structural engineer.

**Energy Conservation**

(10) Level 1 alterations to existing buildings or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the *International Energy Conservation Code*. The alterations shall conform to the energy requirements of the *International Energy Conservation Code* as they relate to new construction only. (607.1)

All new work that affects the building envelope and modifications of existing mechanical and electrical systems will comply with the IECC provisions for new construction. If the proposed project will include modification of the building envelope with respect to energy conservation features as a result of other work that affects the building envelope in localized areas, those
modifications will be made in compliance with the provisions covering existing construction in IECC Chapter 5.

**Level 2 Alterations Requirements**

(11) All new construction elements, components, systems, and spaces shall comply with the requirements of the MSBC9.

Exceptions:
1. Windows may be added without requiring compliance with the light and ventilation requirements of the International Energy Conservation Code.
2. Newly installed electrical equipment shall comply with the requirements of Section 708.
3. The length of dead-end corridors in newly constructed spaces shall only be required to comply with the provisions of Section 705.6.
4. The minimum ceiling height of the newly created habitable and occupiable spaces and corridors shall be 7 feet (2134 mm).

(801.3)

All new work will comply with the MSBC9 provisions for new construction.

**Existing vertical openings**

(12) All existing interior vertical openings connecting two or more floors shall be enclosed with approved assemblies having a fire-resistance rating of not less than 1 hour with approved opening protective. (803.2.1)

Exceptions:
1. Where vertical opening enclosure is not required by the MSBC9 or the *International Fire Code*.
2. Exceptions 2 through 14. Not applicable

There are existing unenclosed vertical openings in the building (exit access stairs) that will be retained. Those two-story unenclosed stairs may be justified in accordance with MSBC9 Section 1019.3, Exception 1. That Exception to the standard enclosure requirement states:

Exit access stairways and ramps that serve or atmospherically communicate between only two stories. Such interconnected stories shall not be open to other stories.

**Interior finish**

(13) The interior finish of walls and ceilings in exits and corridors in any work area shall comply with the requirements of the *International Building Code*.

Exception: Existing interior finish materials that do not comply with the interior finish requirements of the *International Building Code* shall be permitted to be treated with an approved fire-retardant coating in accordance with the manufacturer’s instructions to
achieve the required rating. (803.4)

Interior wall, ceiling and floor finishes throughout the work area will comply with MSBC9 requirements for new construction (See comment under Items 2 and 3 above).

Guards

(14) Every portion of a floor in the work area, such as a balcony or a loading dock, that is more than 30 inches (762 mm) above the floor or grade below and is not provided with guards, or those in which the existing guards are judged to be in danger of collapsing, shall be provided with guards. (803.5.1)

(15) Where there are no guards or where existing guards must be replaced, the guards shall be designed and installed in accordance with the MSBC9. (803.5.2)

There are stairway and balcony conditions that require guards within the building. Those locations will be properly guarded by walls or guards as required for new construction.

Fire Protection

(16) In buildings with occupancies in Groups A, E, F-1, H, I, M, R-1, R-2, R-4, S-1, and S-2, work areas that include exits or corridors shared by more than one tenant or that serve an occupant load greater than 30 shall be provided with automatic sprinkler protection where all of the following conditions occur:

1. The work area is required to be provided with automatic sprinkler protection in accordance with the MSBC9 as applicable to new construction;
2. The work area exceeds 50 percent of the floor area; and
3. The building has sufficient municipal water supply for design of a fire sprinkler system available to the floor without installation of a new fire pump. (804.2.2)

The existing building is not protected by a sprinkler system. Retroactive installation of a sprinkler system will not be required because Condition 2 above will not be satisfied in the current project. The work area (area being reconfigured) will be much less than 50% of the Second Floor area.

The project will also not be subject to the requirement of Massachusetts General Laws, Chapter 148, Section 26G for sprinklers throughout the building because the work will not be a “major” alteration of the building.

(17) Provide supervision of the existing sprinkler system by an:

1. Approved central station system in accordance with NFPA 72;
2. Approved proprietary system in accordance with
NFPA 72;
3. Approved remote station system of the jurisdiction in accordance with NFPA 72; or
4. Approved local alarm service that will cause the sounding of an alarm in accordance with NFPA 72.
(804.2.5)

As there is no existing sprinkler system, the requirement of Item 17 is not applicable to the project.

(18) Maintain the existing fire detection and alarm equipment associated. (804.4)

The existing fire alarm system will be maintained and modified as required by the limited reconfiguration in the building.

Means of Egress

(19) Every story utilized for human occupancy on which there is a work area that includes exits or corridors shared by more than one tenant within the work area shall be provided with the minimum number of exits based on the occupancy and the occupant load in accordance with the MSBC9. (805.3.1)

The occupant load of the Second Floor Theater will include 403 persons in the fixed seating of the main floor and balcony and 52 persons based on the 780 sf stage and an occupant load factor of 15 sf/p for stages. The total Second Floor occupant load will be 455 persons.

The front (north) stair will have a capacity of 20 persons based on a minimum width of 60 inches for which credit is allowed when there is no center handrail and an egress capacity factor of 0.30 in./p. for stairs in an unsprinklered building. The two rear fire escapes will each have a capacity of 200 persons based on their minimum widths of 60 inches and an egress capacity factor of 0.30 in./p. The total egress capacity of 600 persons will be sufficient for the calculated occupant load of 455 persons.

The moderate occupant load of the First Floor in which no work is planned will be adequately served by the double doors to the exterior at the front of the building and a single door to the exterior at the rear of the building.

Therefore, there will be more than sufficient egress capacity for the calculated occupant loads of the primary levels of this building provided by the existing exits.

(20) In any work area, all rooms and spaces having an occupant load greater than 50 or in which the travel distance to an exit exceeds 75 feet (22 860 mm) shall have a minimum of two egress doorways.
Exceptions:
1. Storage rooms having a maximum occupant load of 10.
2. Where the work area is served by a single exit in accordance with Section 805.3.1.1. (805.4.1.1)

The Theater is provided with three means of egress and Balcony is provided with a two means of egress. The number of means of egress requirement of Item 20 is therefore satisfied.

(21) In the work area and in the egress path from any work area to the exit discharge, all egress doors serving an occupant load greater than 50 shall swing in the direction of exit travel. (805.4.2)
Where the work area exceeds 50 percent of the floor area, door swing shall comply with Section 705.4.2 throughout the floor. (805.4.2.1)

All doors in the means of egress within and from the work area to the exit doors to the exterior that serve more than 50 persons currently swing in the direction of egress travel.

(22) In any work area, all doors opening onto an exit passageway at grade or an exit stair shall be self-closing or automatically closing by listed closing devices. (805.4.3)

There are no enclosed exit stairs or exit passageways to which Item 22 is applicable.

(23) Dead-end corridors in any work area shall not exceed 35 feet (10 670 mm) except where dead end corridors of greater length are permitted by the MSBC9. (805.6)

There are no dead end corridors in the Second Floor work area.

(24) Means of egress in all work areas shall be provided with artificial lighting in accordance with the requirements of the MSBC9. (805.7.1)

Artificial lighting as required by the code for new construction will be provided in the means of egress of the work area.

(25) Means of egress in all work areas shall be provided with exit signs in accordance with the requirements of the EBCM9. (805.8.1.)

Exit signs as required by the code for new construction will be provided in the means of egress of the work area where exit access paths are modified.

(26) Every required exit stairway that is part of the means of egress for any work area and that has three or more risers and is not provided with at least one handrail, or in which the existing handrails are judged to be in danger of collapsing, shall be provided with handrails for the full length of the run of steps on at least one side. All exit stairways with
a required egress width of more than 66 inches (1676 mm) shall have handrails on both sides. (805.9.1)

(27) Handrails required in accordance with Section 805.9.1 shall be designed and installed in accordance with the provisions of the EBCM9. (805.9.2)

(28) The requirements of Sections 805.11.1 and 805.11.2 shall apply to guards from the work area floor to the level of exit discharge but shall be confined to the egress path of any work area. (805.11)

(29) Every open portion of a stair, landing, or balcony that is more than 30 inches (762 mm) above the floor or grade below and is not provided with guards, or those portions in which existing guards are judged to be in danger of collapsing, shall be provided with guards. (805.11.1)

(30) Guards required in accordance with Section 805.11.1 shall be designed and installed in accordance with the EBCM9. (805.11.2)

The requirements for handrails and guard of Items 26 through 30 will be satisfied by existing or upgraded conditions.

**Structural System**

(31) Upgrade the structural system in accordance with Section 807 when the alterations result in any of the following:

- Installation of new structural members (807.1)
- Reduction of the capacity of existing gravity load-carrying structural members (807.4)
- Addition of any structural load to existing gravity load-carrying structural members (807.4)
- An increase in the design lateral load (807.5)
- A decrease in the capacity of any existing lateral load resisting element (807.5)
- An increase in the demand-capacity ratio of an existing lateral load-resisting structural element is more than 10 percent greater than its demand-capacity ratio with the alteration ignored (807.5)
- A structural irregularity as defined in ASCE 7 (807.5)

The structural upgrades required as a result of the current project will be addressed in plans and specifications by the project’s structural engineer.

**Mechanical**

(32) All reconfigured spaces intended for occupancy and all spaces converted to habitable or occupiable space in any work area shall be provided with natural or mechanical
ventilation in accordance with the *International Mechanical Code.*

Exception: Existing mechanical ventilation systems shall comply with the requirements of Section 809.2. (809.1)

(33) In mechanically ventilated spaces, existing mechanical ventilation systems that are altered, reconfigured, or extended shall provide not less than 5 cubic feet per minute (cfm) (0.0024m³/s) per person of outdoor air and not less than 15 cfm (0.0071 m³/s) of ventilation air per person; or not less than the amount of ventilation air determined by the Indoor Air Quality Procedure of ASHRAE 62. (809.2)

The modified mechanical system for the work area will comply with the requirements of Items 32 or 33, as required.

(34) All newly introduced devices, equipment, or operations that produce airborne particulate matter, odors, fumes, vapor, combustion products, gaseous contaminants, pathogenic and allergenic organisms, and microbial contaminants in such quantities as to affect adversely or impair health or cause discomfort to occupants shall be provided with local exhaust. (809.3)

There are not anticipated to be any operations or activities in the building that would be subject to the requirements of Section 809.3 (Item 34).

**Plumbing Code**

(35) Provide toilet fixtures in numbers as required for by the MA Plumbing Code (248 CMR). (710.1)

As the occupant load of the building is not to be increased as a result of the limited renovations and alterations, the existing number of toilet facilities will continue to be acceptable.

**Energy Conservation**

(36) Level 2 alterations to existing buildings or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the *International Energy Conservation Code.* The alterations shall conform to the energy requirements of the *International Energy Conservation Code* as they relate to new construction only. (811.1)

Compliance with the requirements of the Energy Conservation Code is discussed above under Item 10.

**Other Work Area Compliance Method Requirements**
The “Work Area Compliance Method” requires that repairs, alterations, additions, changes in occupancy and relocated buildings shall comply with the applicable requirements of Chapters 5 through 13 of the code. The provisions of Chapter 5 (classification of work), Chapter 6 (repairs), Chapter 7 (Level 1 alterations), Chapter 8 (Level 2 alterations), Chapter 9 (Level 3 alterations), Chapter 10 (change of occupancy and Chapter 11 (additions) except those requirements related to the structural system have been summarized above.

Requirements concerning the structural system related to Levels 1 and 2 alterations are provided in Sections 706 and 807 respectively. Those sections are modified by the MSBC9 amendments of the IEBC. Those requirements shall be addressed by the project’s structural engineer.

The applicability of the requirements of the other chapters of the Work Area Compliance Method are summarized below:

- Chapter 6 concerning repairs shall be applicable to existing building features that are to be simply maintained as part of the current project.
- Chapter 9 concerning Level 3 Alterations is not applicable because the work area of the current project will not exceed 50% of the aggregate area of the building on both levels.
- Chapter 10 concerning changes of occupancy is not applicable as there is to be no change of occupancy as a result of the current project.
- Chapter 11 concerning additions is not applicable as the current project does not include expansion of the height or area of the building.
- Chapter 12 (historic buildings) is not applicable as the building is not an historic building.
- Chapter 13 is not applicable as the building is not be moved or relocated.
SECOND FLOOR PLAN - EXISTING (324 seats)