Historic Building Assessment

Mason Hall, Mason, NH

Submitted January 2019 by Weller & Michal Architects Inc.

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Historical Background

The Town of Mason has a long history, having been a very early settlement in colonial New England – over 150 years prior to the Revolutionary War and the founding of the United States.

> *"…The Town of Mason is situated in the county of Hillsborough, in the State of New Hampshire. It lies upon the southern border of the State, about midway between the eastern and western extremities of its southern boundary. On the south it bounds upon Townsend and Ashby, on the west upon New Ipswich, on the north upon Temple and Wilton and on the east upon Milford and Brookline. It is in that portion of the State of New Hampshire which was granted by the council of Plymouth in 1621 to Capt. John Mason.*
> *…*
> *With that intent he procured from the council of Plymouth, in March, 1621, a grant of " all the lands from the river Naumkeag," now Salem, " round Cape Ann to the river Merrimack, and up each of those rivers to the farthest heads thereof, then to cross over from the head of one to the head of the other, with all the islands lying within three miles of the coast."*
>
> *This district was called Marianna. This was the first territorial grant made by the Plymouth council. It bears date March 9, 1621. Those to Plymouth colony are dated in 1621 and 1623; that to Massachusetts, March 19, 1627, all subsequent to Mason's. Of these last, each was granted to a company or association, or to an individual in trust for a company. Mason undertook his enterprise alone and single handed. No individual can be found, who exhibited more courage and perseverance in the cause, or more confidence in its ultimate success, or who expended his means with a more liberal hand, or in larger amount, in promoting the settlement of the country…"*[1]

In the same history from which the above was taken can be found many references to the establishment and use of meeting houses.

> *In the year 1790, when almost the whole town undertook to build a meeting house, it was with many discouragements and fears. They felt poor and weak -handed for such an undertaking. The house was built and remains the meeting house of the town. And now, besides this, we have three meeting houses, and three religious societies, and probably each society equally able to build their house, as was the first…..*
> *A new society having been formed in connection with the church, a new meeting house was built in 1837, leaving the old one to stand unoccupied, and Mr. Hill took leave of the place where he had spent so many happy Sabbaths.*

Mason's early proprietors voted in 1751 that a meetinghouse be built 30' long and 24' or 26' wide near the top of today's Meetinghouse Hill Road. It was to be "for the public worship of God" and contain a "convenient place for the minister to stand in preach in."[2] The dimensions were later changed to be 40' by 30' with a completion date of November 1753. Finishing the meetinghouse took several years, however, and the interior was likely not complete until 1760.[3]

Warrant articles through 1767 talk of pew arrangements, with the best seats going to "first setelers [sic] and highest payers…provided they seal the meeting house to the girts by October next."[4] In 1769, this meetinghouse was given to the town, with the pew privileges remaining with the church. In the ensuing

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[1] From John B. Hill, comp. History of the town of Mason, New Hampshire, from the First Grant in 1749, to the Year 1858. Boston, MA, USA: Lucius A. Elliot & Co., 1858.

[2] John B. Hill, History of the Town of Mason, N. H. from the first grant in 1749, to the year 1858 (Boston: L. A. Elliot; Bangor, D. Bugbee, 1858), 39.

[3] Ibid, 45.

[4] Ibid, 50.

years, the town finished the exterior of the meetinghouse, propped up the galleries, and built horse sheds across the road.

This first meetinghouse was not well constructed, it was reported, and dissuaded many ministers from accepting the town's calling. In 1784, taxpayers approved the construction of a second meetinghouse after a storm blew off the roof the previous year. This second meetinghouse was to be constructed near the first one with dimensions of 45' by 55' with a height "in proportion to the bigness." The new site would afford views "hardly to be surpassed in New England," including of the Nashua River valley, Mt. Monadnock, and central Massachusetts. Debate quickly arose about this new meetinghouse – especially its location and whether or not dissenting Baptists would be taxed to pay for the Congregationalist minister – and one decade passed before the new meetinghouse was dedicated in November 1795. (Perhaps in retaliation, the town voted in 1819 to not allow the Baptists use of the meetinghouse.) An illustration of the meetinghouse shows this new meetinghouse to be a twin porch design with seven bays and galleries on three sides of the interior. The interior included paneling and columns with Ionic capitals.

With the passage of the Toleration Act of 1819, separation of church and state forbade using public money for paying ministers. In rural towns, it sometimes took decades for this legislation to take effect. In Mason, the contract between the town and the Rev. Ebenezer Hill was not dissolved until 1835, though the town did offer the meetinghouse to the Congregational Society for use as their church (in return for their maintenance and occasional usage for town meetings). At this point, the Congregationalists opted to construct their own meetinghouse, which they completed in 1837. The second meetinghouse stood largely empty for the next decade.

The old meeting house, being no longer occupied for public worship by any society, was fast falling into decay. It was exposed to depredations, the windows were broken, the doors were often found open, exposing the building to the effects of storms. The location was unsuitable and inconvenient for town meetings to be held there, and therefore it was concluded to dispose of the old house, and build a town house.

May 23d, 1848. A meeting was called, to hear the report of the committee, to see if the town would build a town house, to fix its location, and to raise money to build, or purchase a town house. At the meeting, Voted, "To accept the report of the committee. Voted, To build a town house. Voted, To locate it at the centre of Mason. Voted, To raise $1000 to build the house. Voted, To appropriate the balance of the sale of the old meeting house, for the building of the town house. Voted, That the expense is not to exceed $1200. Chose Jonathan Bachelder, Charles Scripture, Willis Johnson, Asher Peabody and Samuel Smith, Jr., a committee for building the town house." The town house was so far completed, that a town meeting was held in it, November 7th, 1848.

The frame of the old meeting house, was used and worked up into the frame of the saw and grist mill, built by Mason mill company, near the centre of the town.

Figure 1 - Page from an early History of Mason

The current Town Hall structure is the one voted by the Town in May of 1848 to be built in the "centre of Mason", as described in this extract from the above referenced history (see Figure 1 - Page from an early History of Mason). . The second meetinghouse was sold and deconstructed, with the timbers being recycled for a saw and grist mill nearby. The new town house (more commonly referred to as the town hall) was occupied by November of that year. Town reports in the decades after suggest no further turmoil – instead, warrant articles and budgeted items include maintenance (painting, shingling, window repair, etc.).

The nature of the building changed substantially after 1885, when the local Grange (The Fruitdale Grange No. 106 formed in 1885 with thirty-one charter members) helped pay for renovations at the town hall to accommodate a second floor. According to the recollections of Nellie Armadin in 1920,

> *We purchased new scenery and were the means of having the stage built; some of you probably remember when there was only a small platform just about big enough for moderator and town clerk. And you can also remember when there was nothing but an open gallery upstairs with loose boards for a floor of the Grange and one had to be careful where they stepped. I started the ball rolling and the town fathers saw that the work was done and the means furnished, so now we have a pleasant banquet hall and kitchen.*[5]

Between 1924 and 1969, Mason Hall was used for graduation ceremonies for high school students and other social organizations, including the Beck-Elliot Post 1088, Good Fellowship Club, Woman's Club, Andy's Summer Playhouse (until that organization moved to Wilton Center), and Fruitdale Grange – which used the town hall most.

The building was accepted and placed on the N.H. Register of Historic Places, the N.H. Division of Historical Resources in 2018, making the property eligible for grant funding from the N.H. Conservation License Plate and the N.H. Land and Community Heritage Investment programs.

Figure 2 – Location Map

[5] Nellie Armadin, speech given to Grange members, May 19, 1920.

Architectural Description and Comparative Evaluation

Mason Hall, is a 1 ½ story Greek Revival building oriented on an approximately East West axis, built sometime after May, 1848.

The New Hampshire Division of Historical Resources individual Inventory Form for Mason Town Hall[6] offers the following:

> *The Mason Town Hall is a good example of a vernacular Greek Revival town house, as seen in other New Hampshire communities, including Enfield Center (1845), Bristol (1848), Lyman (1860), Dalton (1845), Northwood (1847), Campton (1855), Danbury (1856), and Piermont (now private). Its façade treatment, however, with the four pilasters and wide trim boards, show great effort and attention to design elements. It is likely that there are more similar comparable town houses nearby in Massachusetts.*
> *….*
>
> *The Mason Town House is significant for its contributions to the residents of Mason. The building's multi-purpose use as a place for local governance and chapters of social organizations, particularly the Fruitdale Grange, highlights the importance of such activities in the century following the Civil War. The building continues to be used for town and social functions, much as it was intended*
> *….*
> *`The Mason Town Hall is a wood framed, gable front building located on the town common in the rural village of Mason, New Hampshire. The common is defined by the junction of Meetinghouse Hill Road, Darling Hill Road, and NH Route 123. An adjacent lot to the north, now merged with the town hall property, serves as a parking lot for the town hall and elementary school.*

Figure 3 - Site Plan

[6] Mason Town Hall NH DHR Individual Inventory Form MAS003, prepared by Julie Carwellos and Andrew Cushing, April 2018.

Figure 4 –Primary Façade Facing Common

Figure 5 – Rear (East) Elevation

Architectural Style

Although built long after the predominant period of the Greek Revival style (1770-1830) Mason Hall is in the simple common vernacular version of that architectural form.

It is characterized by:

- Formal symmetrical design, usually with center door
- Front facade colums or pilasters
- Front facing gable on main roof
- Decorative door surrounds, columns, or sidelights
- Rectangular double hung windows

This style is characterized by simple pure rectangular massing of classical (or near classical) proportions, having little of no ornament, and the moving away from the earlier system for placing windows that is characteristic of the Georgian and Federal styles. Gable and eave roof edges are expressed and developed with classical moldings and given some visual weight. The eave and gable roof edges have the same moldings and overhangs, which is common to the style.

Figure 6 – Pilaster detail at corner and roof cornice/soffits

Figure 7 – Heavy 13-inch wide corner boards

Figure 8 – Watertable with approximately 14 inch height

Figure 9 – Beveled clapboard siding with approximately 3 ¾" exposure

Figure 10 – View of Main Hall

Preservation Objectives

The historic preservation value in this building does not revolve around single details or a fundamentally unique architectural or historical aspect, but rather the overall integrity of a mid-19th century community hall. The building, if restored, can continue to serve the public good in much the same manner as originally intended.

The Mason Town Hall is in its original location as built in 1848 and continues to showcase its original design, materials, and workmanship on the exterior, as well as alterations made to the interior as1885 r. Despite alterations made in past decades, including kitchen modernizations on the second level, the addition of a fiberboard ceiling in the main hall, the replacement of the exterior doors, and the addition of new toilet facilities and a handicap ramp and porch covering on the northern elevation, the building continues to represent a well-preserved rural town hall designed in the Greek Revival style and used for multiple social purposes.

The future of this building depends on preventing further structural deterioration brought about by ill-conceived alterations dating from the Grange period, and the building having a useful public purpose.

The Preservation Objectives for this project should be to resolve fundamental structural concerns and eliminate fire-safety concerns without obscuring or removing primary character defining elements to the greatest extent possible, while restoring and maintaining original materials and finishes. In this way Mason Hall can continue to serve the town without being stripped of its character.

Part Two –Existing Conditions Assessment

Located at 7 Meetinghouse Hill Road at tax map E41, Mason Hall occupies an approximately two-acre lot in a village center setting adjacent to a small town-commons. The building sits on a split-granite capped stone foundation, with clapboard cladding over timber frame, and features an asphalt shingled (originally slate-shingled?) roof, a prominent front gable, and originally fifteen double hung twelve over twelve windows at the ground floor.

Figure 11 – East 'Back' Elevation of Mason Hall

Key architectural features are the pedimented west façade, or elevation, that faces the common and Meetinghouse Hill Road. The façade is framed by a wide water table, continuous frieze band, and rake boards in the gable end. Four pilasters divide the ground level into three bays, the central of which is the entrance. (The west door is steel and was likely replaced in the 1980s or 1990s.) Each flanking bay contains a 12/12 double hung window with aluminum storm, while the gable pediment contains a pair of 6/6 windows. The entranceway and all windows have a slightly pedimented entablature, a subtle but consistent design choice seen in vernacular Greek Revival buildings. On the main entrance's entablature, painted letters read: "Mason Town Hall 1848." A goose necked barn light is affixed above the lettering.

With the exception of the roof, (see Figure 12 - Current Day View looking at north side of roof, below) the building's shell is in reasonably good condition, with relatively minor exterior alterations from the original architecture, notably an accessible entrance ramp located against the north façade and new exterior doors, including a second exit on the south side. Interior historic details remain intact. Gross floor area totals approximately 2,150 square feet on the first floor and 1,150 on a second level.

Other alterations to date have been limited, but key to the continued use of the building. These include relatively new mechanical systems (forced hot air furnace and propane fired hot-water heater).

The building's foundation consists of rubble field stone and cut granite, with rubble piers placed regularly under the summer beams. There is no basement – only a poorly drained crawlspace accessible through two openings in the rubble field stone and cut granite foundation. The building has an asphalt three tab shingle roof; one interior brick chimney that extends from the northern slope; and is sided with wood clapboards, painted white.

Figure 12 - Current Day North Side of Roof

Figure 13 – View from West

Figure 14 - View from South West

Figure 15 – View of Secondary Exit

The rear elevation is architecturally simpler than the other elevation. The gable end, without wide rake boards or a continuous return, contains one window and a doorway/fire escape in the other original window's location. Only one window remains of the three original window locations on the first floor. Casings from a central window remain and reveals where the original interior selectmen's platform was located. The northeast window was removed and infilled for an exit door located at the stage level, perhaps in the mid-1900s. Clapboard discoloration below the window sills reveal where a ladder storage shed was recently removed.

Floor Plans – Existing Conditions

The building is reasonably well laid out to support the intended public uses of public assembly, discourse and entertainment, not dissimilar from those for which the building was original constructed.

The first floor is mostly dedicated to the main hall, an elevated stage at the east end thought to be the result of the c. 1885 renovations, and small anterooms at the original primary entrance façade.

Today these anterooms consist of two contemporary restrooms, one of which is designated as handicapped accessible, a mechanical room accessible only from the exterior, an office with a small vault, and a stairwell leading to the second level.

The main hall is finished with narrow strip maple flooring, with plaster walls above the wide horizontal board wainscot. The main hall's ceiling is covered with 12x12 fiberboard tiles, probably dating to the 1960's. Surface applied fluorescent lighting fixtures supplements a Victorian-era chandelier which hangs from the center of the ceiling.

The stage is constructed about two steps above the main floor and includes a simple proscenium arch. Two stepped doorways at the far end of the stage allow access.

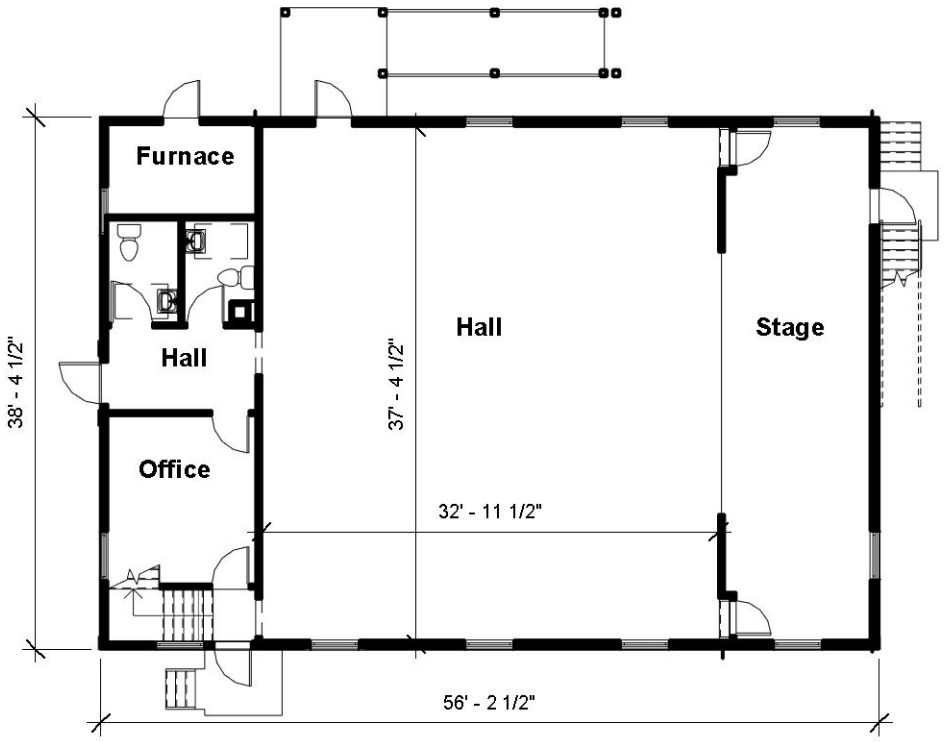


Figure 16 –First Floor Plan – Current Conditions

Original Balcony Framing

The second floor was, until c.1885, apparently a gallery or balcony overlooking the main room. The 1885 Grange modifications were made to this simple meeting hall structure, consisting of a west facing entry vestibule (and possible side rooms) and a single primary meeting room, with a ceiling at roughly 12 feet 10 inches above finish floor.

Figure 17 – First Floor Office with sloped ceiling from original Balcony framing

The western-most structural bay – between the west gable wall and the first primary structural line - appears to have been constructed with a sloping balcony overlook the main room. It is not clear how much of the existing stair well in the south-west corner is part of the original access to this structure.

The balcony no longer exists, having been built over as part of the Grange remodeling. Evidence of framing of the original balcony is seen above the ceiling of the first-floor mechanical room, as residual inclined wood base on plaster at the back of a closet in the Grange kitchen (see Figure 18Figure 18), and by the sloped ceiling planes noted in first floor front entry hall and adjacent 'office'.

Figure 18 – Original sloped balcony baseboard visible at Grange kitchen level

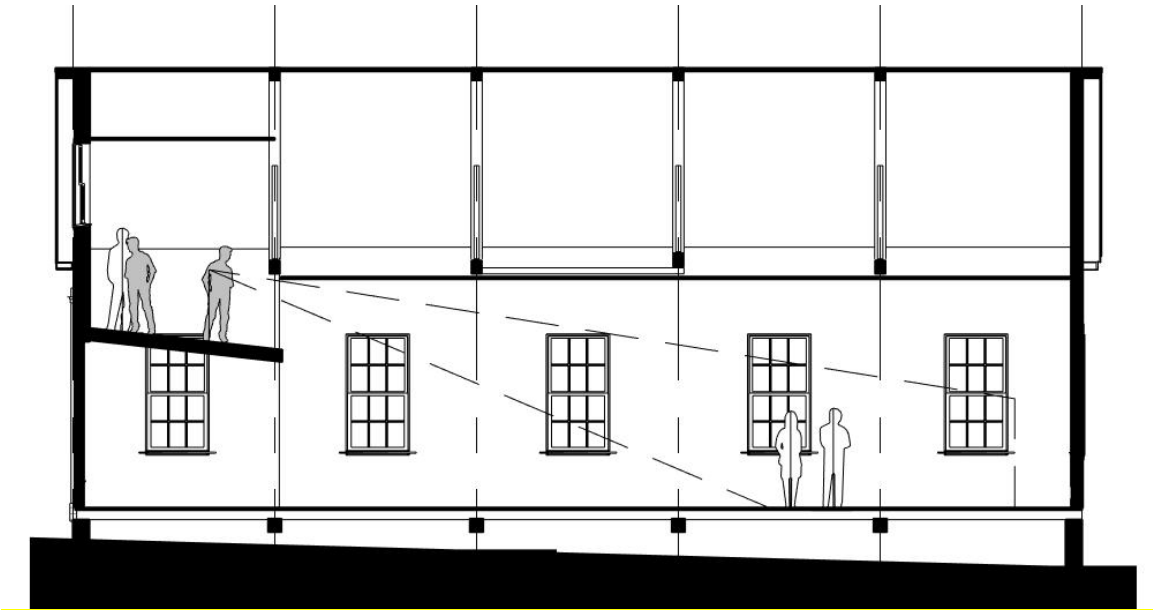


Figure 19 - Speculative Illustration of 1848 Balcony

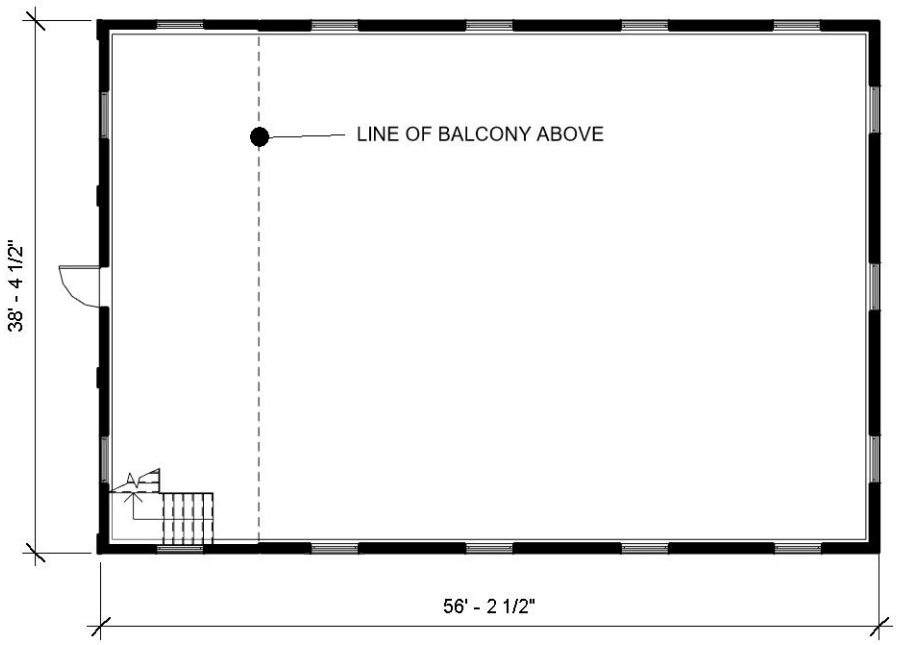


Figure 20 – Probable First Floor Plan – Prior to 1885 Grange Renovations

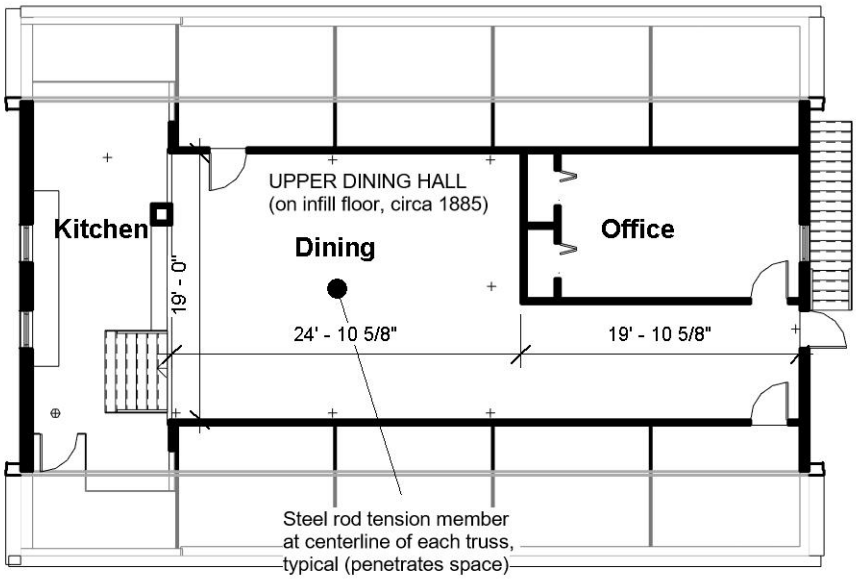


Figure 21 – Second Floor Plan – Current conditions

During the Grange renovations, the former gallery bay became a service space, which has been modernized since the 1960s and currently contains kitchen equipment. A wide set of seven allows access to the inserted second floor suspended from the roof structure and above the original ceiling plane.

This space - a low-ceilinged, windowless room interrupted by the iron tie rods of original king-post trusses, functioned as a dining room, a child-care space, and a corner office, occupied at times by the police department and recreation committee. A rear doorway connects to the exterior steel fire escape.

Fire and Building Codes

We recommend the use of the International Existing Building Code 2009 (IEBC 2009) in evaluating code compliance of planned building renovations. The IEBC allows for options in historic buildings for controlled departure from full compliance with the International Codes dealing with new construction, while maintaining basic levels for fire prevention, structural and life safety features of the renovated/rehabilitated building.

Both State Fire codes and local building codes apply to this project. The determination of the applicable codes to apply is up the local AHJ (authority having jurisdiction).

The desired project that would restore public uses of all of Mason Hall would be categorized under the international Existing Building Code as primarily Level 1 (Repair) scope. Level 1 alterations include the removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose. Some planned improvements may be considered Level 2 alterations – work that includes 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.

Allowable Height and Area

We reviewed key elements (primarily fire and life-safety related) of the International Building Code (IBC-2009), the International Existing Buildings Code (IEBC 2009), and portions of the Life Safety Code (NFPA 101 2012 Chapter 13-Existing Assembly Occupancies and Chapter 43-Building Rehabilitation) as they affect Mason Hall. These Codes classify buildings by the type of use and the form of construction, and

apply specific requirements based on these classifications. There are key limitations given to height, number of stories and floor area for each combination of use and construction type.

The codes categorize the intended building uses as an **Assembly** use (under NFPA 101) and as an **A-3** use under IBC 2009. The Construction Type classification for Mason Hall is **5B** under BOCA and **V(000)** under NFPA 101. This construction is 'un-protected wood frame'.

The prescriptive code requirement for assembly uses in an un-protected wood frame building of two stories is to provide a sprinkler system[7].

Under NFPA 101, a sprinklered type V(000) building of two stories may have assembly uses with an occupant load not exceeding 300. Sprinklers are not required in a one-story structure unless the occupant load exceed 1,000. Under current conditions (un-sprinklered) the building's construction type and use classification limits the allowable ground floor area to 6,000 square feet and the number of stories to one.

A key portion of the Life Safety Code (NFPA 101) states:

> *13.1.1.4 An existing building housing an assembly occupancy established prior to the effective date of this Code shall be permitted to be approved for continued use if it conforms to, or is made to conform to, the provisions of this Code to the extent that, in the opinion of the authority having jurisdiction, reasonable life safety against the hazards of fire, explosion, and panic is provided and maintained.*

Because town (public) water supplies to the building do not have the flow capacity for a sprinkler system, any sprinkler system would require a fire pump and static (stored) water supply would be required. A full coverage, NFPA-13 compliant installation will be very costly.

Occupant Load and Exit Capacity

The occupant load, in number of persons for whom means of egress and other provisions are required, is determined based on Code mandated occupant load factors that are characteristic of the use of the space, or can be determined as the maximum probable population of the space under consideration, whichever is greater.

Occupant loads for Mason Hall have been calculated based on 15 square feet net area per person (less concentrated use and no fixed seating) in the first floor hall, the stage, the second level dining area, and on 100 square feet net per person in all other rooms.

The resulting calculation for Fire Safety purposes is 26 people on the stage, 82 people in the auditorium, and 50 people in other rooms, for a maximum total of 158 people. (If upstairs is closed to assembly occupancy, then occupancy is 110 people or less.) Exits from the upper level, including the 'kitchen', need to accommodate at most 50 people if the 'dining' room is used for tables and chairs.

The egress capacity from spaces is established by the width available from doors and stairwells serving the spaces. The egress capacity of the upper infill floor (Grange 1885) is limited by the single internal stair serving that level, which is 42 inches wide. Dividing the total clear width of the stairwell by the 0.3 inches per person capacity factor for stairwells results in an exit capacity of 70 people. Because the stairs themselves do not meet contemporary standards, it is reasonable to reduce their capacity further for the purposes of calculations.

Other relevant code language to be considered includes:

> *13.2.3.7 Other Exits. Each level of an assembly occupancy shall have access to the main entrance/exit and shall be provided with additional exits of a width to accommodate not less than one-half of the total occupant load served by that level.*

[7] See Table 13.1.6 Construction Type Limitations in NFPA 101.

The requirement of 13.2.2.2.3 for panic hardware applies as the hall and stage is an area having an occupant load of 100 or more persons. Existing exit doors leading from the hall currently are equipped with exit devices complying with the code.

Protection of Vertical Openings

Preventing the spread of smoke and fire between building levels is a key component of the Life Safety and Building codes. At a minimum, smoke enclosures are required at the stairwells. For instance IEBC 703.2.1, "Existing Vertical Openings", states that

> *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 protectives.*

Currently there is no rated separation at the stairwell leading to the second level. An open door frame at the first floor leads to the stair, and a plain board door without true stops partially encloses the upper end of the stair.

Figure 22 – Unenclosed Stair to Kitchen Level

At Mason Hall we can apply the Exception #4 to IEBC 703.2.1, which states:

> *4. In Group A occupancies, a minimum 30-minute enclosure shall be provided to protect all vertical openings not exceeding three stories.*

Figure 23 – Window Blocked at Stage below Fire Escape

Barrier-Free Access

The Mason Town Hall has always been a building intended for public meeting uses. While it has not truly undergone a 'change of occupancy', the language of the International Building Code for Existing Buildings is a good reference for what is appropriate. That Code reads in part:

> *Where an entire building undergoes a change of occupancy, it shall comply with Section 310.4.1 and shall have all of the following accessible features:*
>
> *1. At least one accessible building entrance.*
> *2. At least one accessible route from an accessible building entrance to primary function areas.*
> *3. Signage complying with Section 1110 of the International Building Code.*
> *4. Accessible parking, where parking is being provided.*
> *5. At least one accessible passenger loading zone, when loading zones are provided.*
> *6. At least one accessible route connecting accessible parking and accessible passenger loading zones to an accessible entrance.*

Alterations have already been made to the building which address barrier free access issues and improve accessibility for continued public use as an assembly occupancy. These alterations involved creating a new north side entrance to the main hall with an exterior door replacing an original window, and the construction of a wooden ramp intended to comply with ADA regulations for wheelchair access.

Figure 24 - ADA Compliant Ramp at NW Corner

Asbestos and Lead Paint Hazardous Materials

State of New Hampshire Department of Environmental Services (NH DES) Env-A 1804.01 regulations require a thorough inspection for Asbestos Containing Materials (ACBM) be conducted prior to any demolition/renovation of a facility. For our assessment, we engaged a Health and Safety (H&S) Consultant accredited within the State of New Hampshire to survey the building interior for the presence of lead paint or asbestos.

Their report[8] states that no ACBM were found samples taken from exploratory demolition in representative locations where hidden ACM may be present. These materials included:

1. 12 x 12 'off White' Floor Tile and Associated Mastic (2nd Floor)
2. Ceiling Tiles (1st Floor Ceiling)
3. Gypsum Ceiling Board (2nd Floor Ceiling)
4. Plaster Ceiling (2nd Floor Ceiling - Top Layer)
5. Gypsum Wall Board/Joint Compound (2nd Floor)
6. Blown-in Insulation (2nd Floor Crawl Space)

[8] Asbestos & Lead Survey - Mason Town Hall / The Lawson Group, TLG File Number 18-5899. Oct 12, 2018

Samples were taken of white wall paint, tan trim pain, brown/red floor paints and white railing paint used in the building. The inspection allows Occupational Safety and Health Administration (OSHA) compliance relative to worker exposure during renovation of Mason Hall.

Since the buildings future proposed uses do not include residential or child-care use risking children with long exposure, removal of the lead finishes is not required. However, OSHAE regulations and lead-abatement processes will need to be followed during further renovations and alterations.

Only the white paint found on stair/mezzanine railings (Figure 25) exceeded the State of New Hampshire and the U.S. Housing and Urban Development (HUD1) guideline for Lead (greater than 0.5 percent [> 0.5%] Lead by dry weight).

Mason Hall will need to be repainted on the exterior by a professional subcontractor using current-day (non-lead) paints. The painting subcontractor must use industry standard practices in preparing the building for repainting, as the existing exterior paint is reasonably assumed to contain lead.

Figure 25 – Railings at Upper 'Kitchen' to 'Dining'

Structural Conditions

Mason Hall is wood-framed construction, with sawn lumber wall and floor framing combined with larger hewn wood timbers. Interior finishes are carried by sawn wood lath on wood studs. The building is supported on a mortared stone foundation and stone piers.

Major structural deficiencies exist in the structure; made evident by the deflection of roof framing, resulting in the spreading eaves and sagging ridge seen in Figure 26 below. The cause of this condition has been traced to the added building loads created by the Grange period (c. 1898) alterations to the original building (see Original Balcony Framing on page 13).

The roof is carried by five original 38-foot span wood trusses spaced about 11 feet 3 inches apart. These trusses supporting purlins parallel to the ridge line. Secondary rough-sawn rafters (nominally 3x6) span about 10 feet between purlins and ridge boards between trusses in each structural bay. Rafters are notched and rabbeted into the purlins and appear to be simply cut and nailed at the wall plate (or top girt). Wind-bracing in the plane of the roof sheathing is provided by angled timber braces let into both top chord and purlin.

Figure 26 – Sagging Ridge

Roof Framing

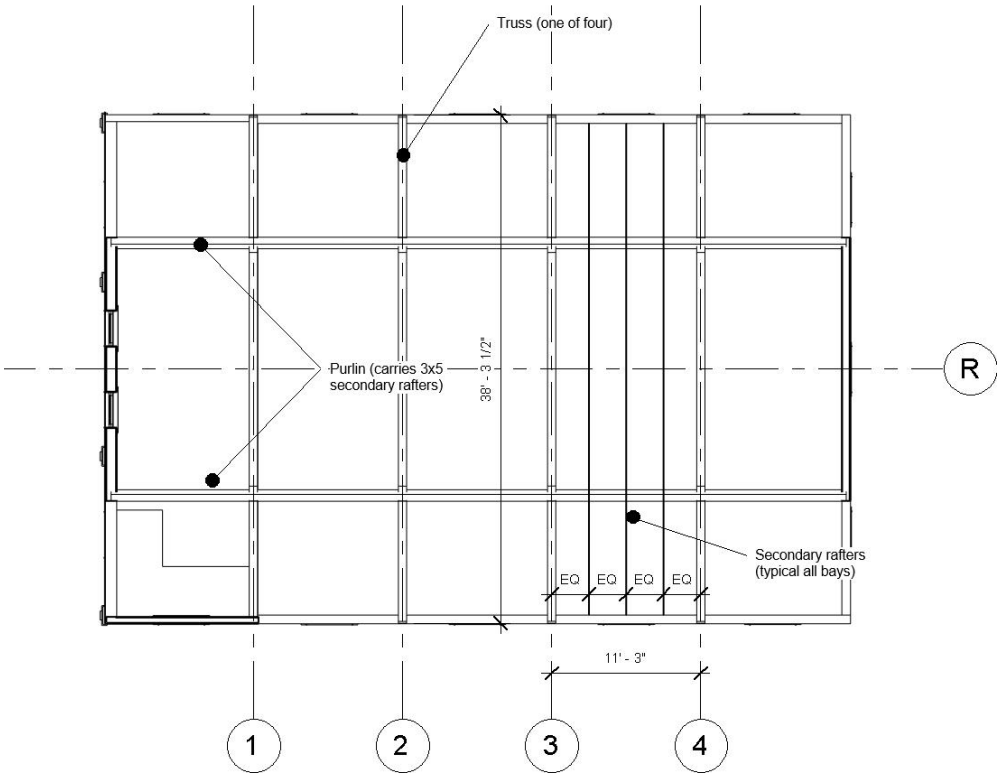


Figure 27 – Secondary rafters and wind-brace let into timber purlin

The original 1848 configuration of rafters, ceiling framing and trusses is illustrated in Figure 28 – Original 1848 truss diagram. Each truss supported at least 430 square feet of structure. The sloped upper truss chord (a nominal 8x8 member) is placed into compression by the truss action, and in bending from the transferred purlin roof loads. The lower chord (nominally 8x10) is placed into tension

by the primary truss geometry and is secondarily placed in bending by the applied gravity (dead) load of the original plaster ceiling and by purlin loads transferred through two struts. A vertical 1-inch diameter iron rod acts in tension at the center of the truss, and the thrust action of the top chords at the left and right ends of the truss is resisted by shearing actions against a thru-bolt of steel and most likely a tenon wood joint between upper and lower timber chord.

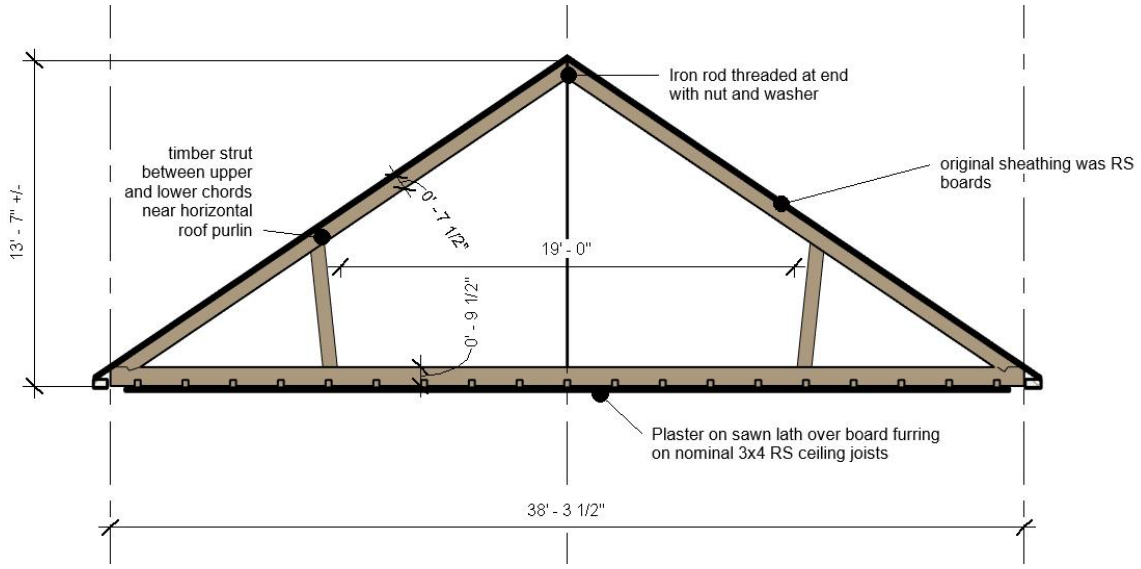


Figure 28 – Original 1848 truss diagram

The original truss withstood three primary loads – the seasonally applied load of snow, the constant 'dead' load of the truss, rafters, roof sheathing and most likely slate roofing, and finally the constant 'dead' load of a ceiling supported by the bottom truss chord – consisting of ceiling joists (nominal 3x4) carrying a strapped lath and plaster ceiling above the original main floor, at nearly 13 feet above finished floor.

Our architectural estimate of the original total constant gravity load on each truss is just over 4 1/2 tons:

slate roofing	4,000 lbs
board sheathing	400 lbs
primary roof framing	500 lbs
truss weight	1,900 lbs
secondary ceiling framing	1,200 lbs
ceiling lath and plaster	4,300 lbs

Seasonal snow loads building up on the intermittently heated structure would increase this load, possibly adding at times as much as 10 tons (20,000 pounds) to each truss.

Without any snow loads, the axial thrust of the top chord against the end bearing panel point would be around 8,300 pounds. The horizontal component parallel to the wood grain of the bottom chord to be restrained by bolts and tenons (in the original) would be around 6,900 pounds – increasing to 20,700 pounds under snow load conditions.

In 1885 the Grange renovations introduced significant new loads into this structural system. The Grange inserted a new floor above the original hall ceiling and between all the trusses and the easterly end wall above the stage. Access to this floor was (and is) on a short but wide open stair leading from the prior balcony level. The added new 'dead' loads consist of the floor framing, floor (subfloor and finish floor), a second lath and plaster ceiling and plaster knee walls, plus the activity of occupancy on this new level.

A conservative estimate of the added total constant gravity load on each truss is about 2 tons:

added floor framing	1,200 lbs
plaster and lath ceiling	2,000 lbs
plastered knee walls	1,800 lbs
furniture	1,000 lbs

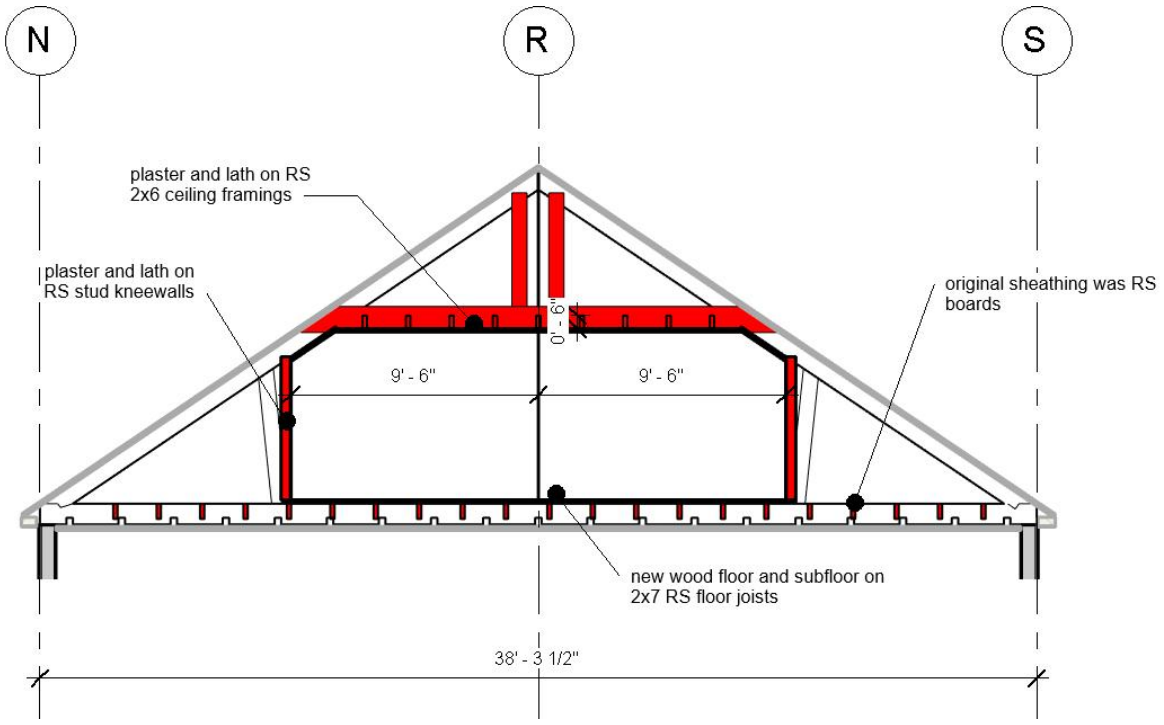


Figure 29 – 1885 remodeling superimposed on truss diagram

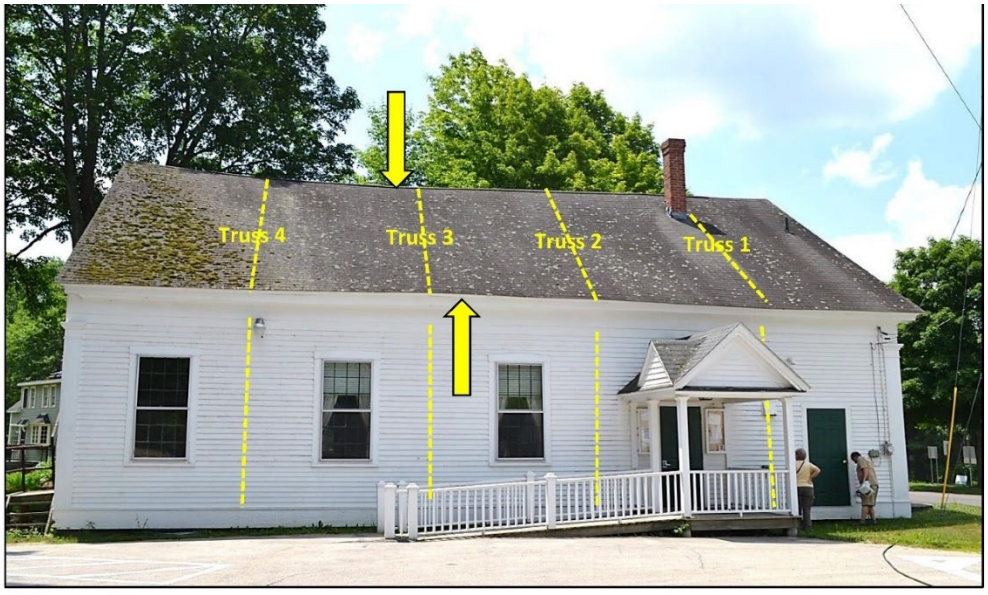
Figure 30 - 1885 Grange ceiling framing with 20th century ceiling insulation

Figure 31 – 1885 Grange truss modifications

Figure 32 –1885 Grange alterations showing ceiling hung from top chord

This has overloaded the original construction and led to failures at multiple roof trusses. Attempts seem to have been made at different times to reverse or slow the failure by the introduction of secondary elements. These 'repairs' are not structurally informed and have actually contributed to the severe deflection and deformation of the roof line (see Figure 26 and Figure 33).

Figure 33 – Distortion at Eaves



North elevation of Mason Town Hall, showing subsidence of the ridge line and deformation of the eaves (arrows). The yellow dashed lines represent the locations of the principal wall framing bents and of the roof trusses above the bents.

Figure 34 – Truss locations superimposed on façade photograph

Distortion at the eaves and visual evidence in the attic (see Figure 36 and Figure 37) suggests that the failing trusses have not pushed the north and south walls apart. No evidence of significant wall movement from plumb was detected by field measurements. The outward movement of both rafters and upper truss chords has pushed the soffit and roof fascia trim into a bow.

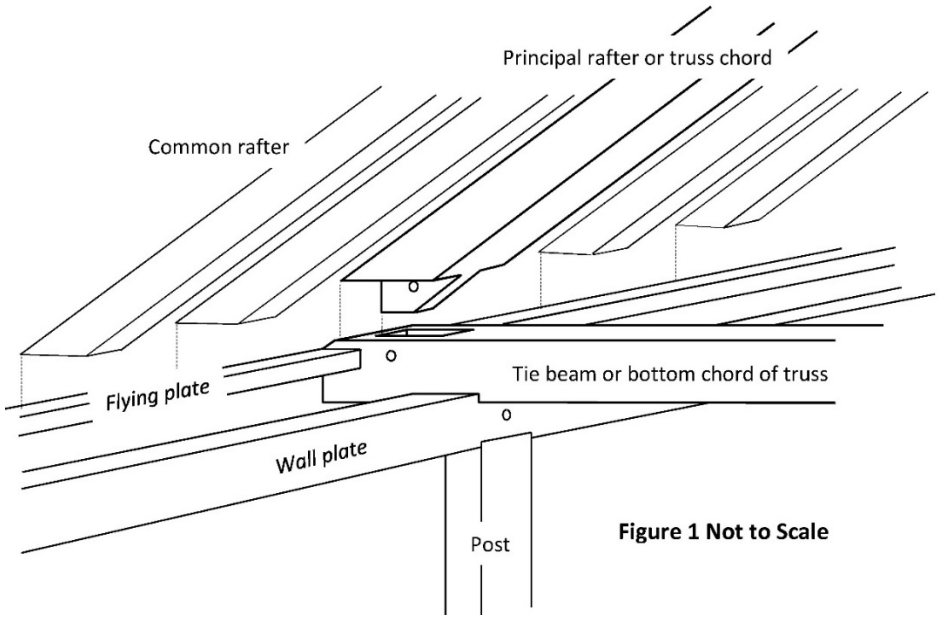


Figure 35 – diagram of rafter connections to wall plate

The following extract[9] of the observations by James Garvin, Architectural Historian, who toured the building with Charles Michal of Weller & Michal Architects succinctly describes the situation:

> *In summary, the reason for the deflections of the roof is a failure in the joints at the feet of the principal rafters of the building, which are the top chords of a series of kingpost trusses. This failure led to the subsequent outward slippage of the feet of these rafters or upper truss chords. Movement of the upper truss chords (principal rafters) has caused subsidence of the purlins that span the intervals between these principal rafters or chords. Downward movement of the purlins, in turn, caused outward slippage of the feet of common rafters, which have followed the feet of the principal rafters or truss chords in moving outward. The results have been the dropping of the ridge of the roof toward the eastern end of the building and the outward bulging of the eaves cornices of the structure as the rafter feet have spread.*

Mr. Garvin is of the opinion that the failure occurred prior to the 1885 Grange modifications and that thru-bolts at the heel of the trusses were attempts to correct and restrain further slippage. Alternatively, the bolts could be original to the 1848 construction of the Howe king-post truss, as are the vertical iron rods which are the principal vertical tension members. Figure 40 – 19th century Howe Truss detail showing strut 'heel' mortised into bottom chord and bolted (from Grasmere Grange – Goffstown Town

[9] NOTES ON THE MASON TOWN HALL (1848) 7 MEETINGHOUSE HILL ROAD MASON, NEW HAMPSHIRE July 7, 2018 by James L. Garvin

Hall c.1889) and Figure 41 – 19th century truss details illustrate how early trusses incorporated a shallow mortised joint tied by iron bolts.[10]

Figure 36 – Common rafters slipping outward over wall plate

Figure 37 –Truss upper chord slipping outward over bottom chord

[10] See also Structural Analysis of Historic Buildings, J. Stanley Rabun, © 2000 by John Wiley & Sons

Figure 38 – fractures in plaster knee wall in 1885 dining area

Figure 39 – 19th century Howe Truss detail (Grasmere Grange, Goffstown c.1889)

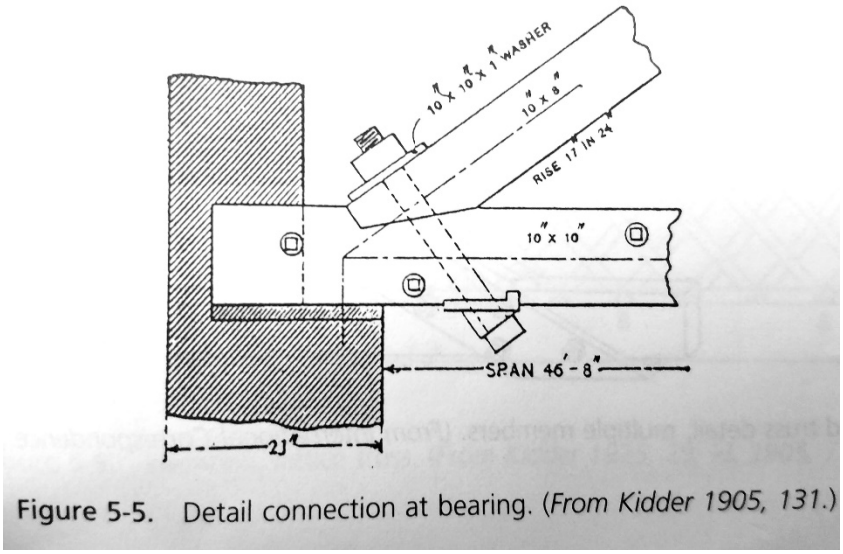


Figure 5-5. Detail connection at bearing. (*From Kidder 1905, 131.*)

Figure 40 – 19th century truss details

Floor Framing

First floor framing that is visible in the dirt-floored crawl space consists of partially hewn heavy joists spanning about 11 feet between floor beams (8x8?) wood beams which are carried on perimeter stone foundation walls.

Structural deficiencies at the roof level may have been exacerbated by paving and grading changes in the immediate vicinity of the building, which appear to have directed all water runoff to the crawl space below the building, with no easy outlet. As a result this area is flooded, and allowances should be made to correct problems such as collapsing stone rubble foundation elements and rotting timbers (see Figure 43 - Flooded Crawl Space).

Figure 41 – Crawlspace and First Floor Framing

Figure 42 - Flooded Crawl Space

These foundation issues and structural settlement problems can be seen at the main hall level, where the undulating floor structure is prominently seen along the face of the platform stage.

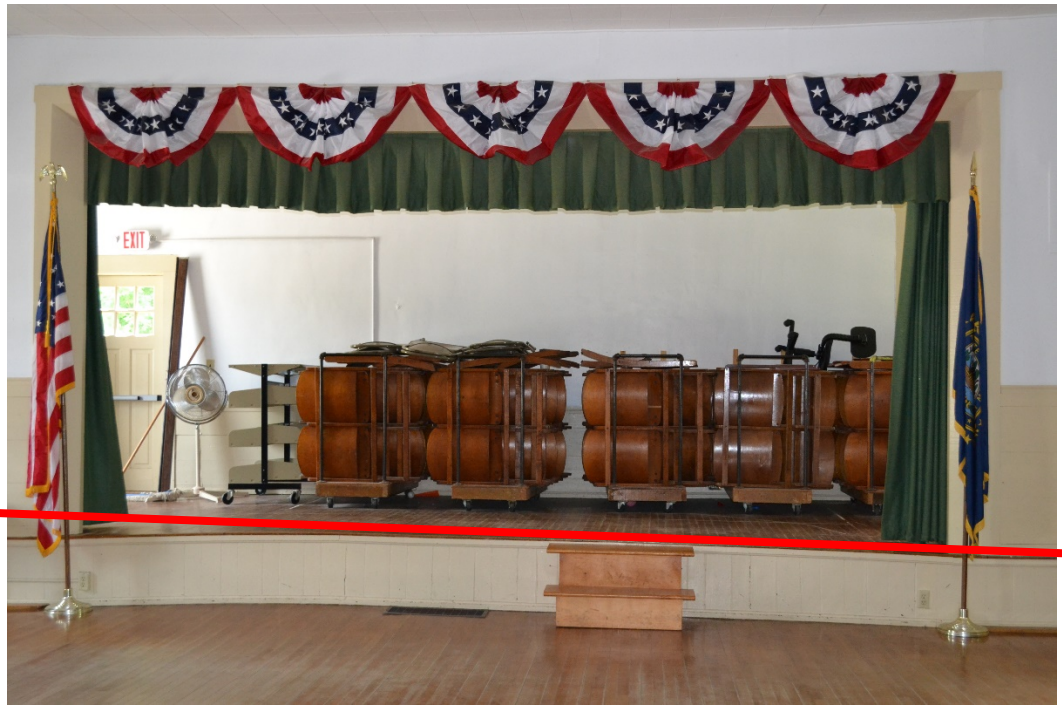


Figure 43 – View of stage with severe drop in floor level to NE corner

Foundation settlement and/or pier collapse in the north-east corner has resulted in a floor level drop of 2 ½ inches over a horizontal span of only 8 feet at the left side of the stage.

Stairways

Stairs in historical building seldom meet current life safety standards for public buildings. Mason Hall is no exception. Stair rise and run are almost always steeper than the current code, which limits riser heights to 7 inches and requires a 11-inch tread surface. (With a one-inch nosing, this requires a 7:10 pitch for the staircase.) Furthermore, current standards for handrails (on both sides of the stair, continuous between flights, and 34-36 inches above the tread) are cannot be met by typical historical stair details.

Figure 44 - Steep stair to 'Kitchen' level

The upper level is served by one steep stairway with 8 3/8" risers and 8 1/2" treads. No handrails are provided. This stair is 44 inches wide.

Fortunately, "*Existing stairways in an existing structure shall not be required to comply with the requirements of a new stairway as outlined in Section 1009 of the International Building Code where the existing space and construction will not allow a reduction in pitch or slope.*[11]

Figure 45 – Flooring change from hall to stage

[11] From 2009 IEBC

Windows and Doors

The windows appear to be original single glazed wood double hung with twelve over twelve sashes, with friction slides between applied stops. The lower sash is operational and held in one of two open positions by simple wooden devices. The windows have been fitted with exterior aluminum storms.

The few Interior doors are almost all contemporary replacements. Exterior doors are residential grade steel faced reproductions.

Little original door hardware remains.

Interior Finishes

Interior finishes consist of painted wide pine boards used as wall finishes and wainscots, pine casings and trim at windows and doors. Ceilings are variously drywall, plaster or acoustical tiles. Wall finishes are painted drywall or painted lath and plaster.

The first-floor finish in the relatively recent bathrooms is vinyl tile, and the main hall is T&G hardwood.

Generally, on the first floor, interior woodwork and finishes are in good restorable condition, given the age of the building. Little evidence of multiple applications of paint or other applied finishes exist, and original materials are clearly evident. The original ceiling is obscured by a application of acoustical tile – most likely installed on wooden furring directly below the original plaster and lath.

The original interior plaster finish on walls and ceilings is a (3 coat???) plaster system (scratch, brown and finish) on lath. There is evidence of split lath in the vicinity of the original stair to the original gallery/balcony level, but the majority of the partitioning that are part the 'Grange' renovations incorporate sawn lath.

Figure 46 - Grange era lath and plaster

The lower meeting room has wainscoting of horizontal wide-pine boards, which are painted. The chair rail at the top of the wainscoting is aligned with the window sills at the windows. This was a traditional treatment of interior trim at the time.

Figure 47 – First floor wainscote

Figure 48 – Dining Hall level lath and plaster partition stress cracking

Figure 49 – 12x12 ceiling tile applied to sloped framing of original balcony

Building Systems

Lighting is a mixture of commodity fluorescent fixtures and reproduction incandescent suspended ‘chandeliers’ in the main hall.

Figure 50 –Lighting at Front Hall

Space heating is supplied by a propane fired forced-air furnace installed in a partitioned room accessible only from the building’s exterior.

Figure 51 – Gas fired furnace

Figure 52 – Fire safety devices in furnace room

Original knob and post wiring has been disconnected, and in most instance removed.

Figure 53 – Water supply in crawl space

Plumbing fixtures in the serving kitchen and public restrooms are in excellent condition, having been newly installed during prior phase efforts to restore the Hall.

Figure 54 – One of Two Toilet Rooms

Insulation

The Mason Energy Commission has been tracking energy use in Town buildings, including the Town Hall. Work of the Commission includes thermal imaging of the Mason Town Hall completed by Garth Fletcher in March of 2018. (see http://masonnh.us/wp-content/uploads/Town_Hall_review.pdf) The report images would indicate that there is a very slight amount of insulation in the stud framed exterior walls at the lower level of the building, but none in walls above the first floor, including the west facing gable end wall at the kitchen level.

The building does not have a vapor barrier at the interior, and there is no reason to believe the exterior walls are insulated.

The ceilings above the second level (the 1885 Grange dining room level) are insulated at the upper attic/ceiling level with fiberglass batts loosely laid between 3x4 RS ceiling framing.

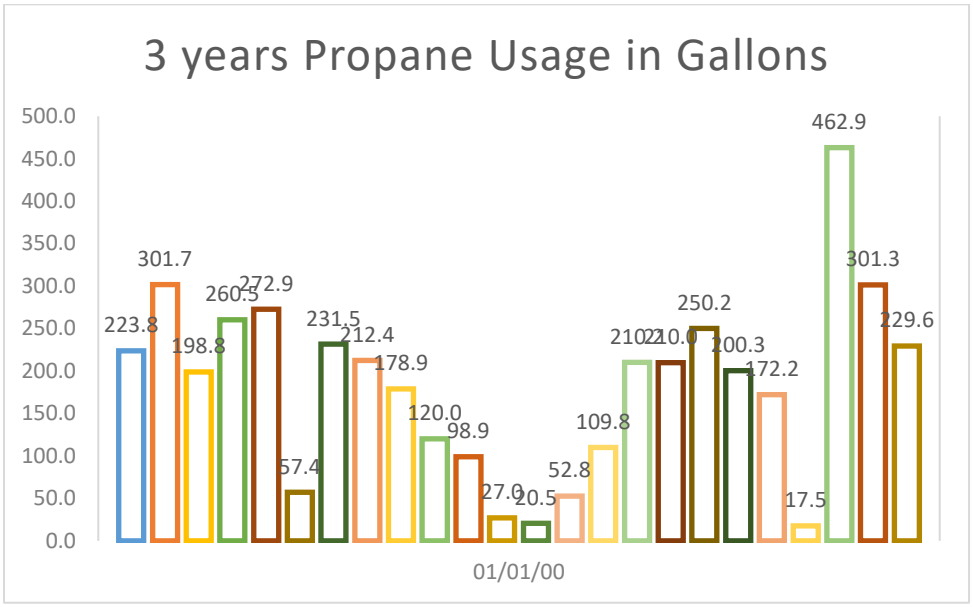


Figure 55 - Propane Usage for Heating

Propane use for heating between January 2015 and March 2018 totaled 4,420 gallons – a rough average of 1,400 gallons per year (equivalent to 406 million BTU) Mason averages about 6,900 degree-days per heating season, so the energy use intensity of the existing 2,150 square foot building is 27 Btu/sf/DD. This is quite high, and we would anticipate a reduction in usage after removing the upper dining room' infill and re-insulating the restored attic.

Roofing

The existing asphalt shingled roof is failing. Heavy moss growth obscures shingles on the northeast side of the roof. Evidence visible in the attic suggests that a contemporary plywood roof sheathing, probably ½", has been applied over the original wood sheathing boards. Both the plywood and underlying original sheathing have been distorted by structural movement in the building frame and from the progressive failure of primary roof trusses.

While funds have been appropriated toward roof replacement, significant structural repairs must be made before a new roof is installed.

Figure 56 – Roof Sheathing at Truss and Ridgeline

Figure 57 - Moss covered asphalt shingles

Part Three– Recommendations and Cost Estimate

Structural Renovations

In our opinion the excessive loading conditions and original truss system failures observed (see Structural Conditions page 21) cannot reasonably be resolved and repaired without eliminating the inserted floor level in the four truss bays over the main hall.

A meeting arranged by the Andrew Cushing of the Historic Preservation Trust allowed for further input from a structural engineer well versed in heavy-timber joinery (Annette Dey, PE). Ms. Dey provided some independent calculations (see Figure 60 - Structural Analysis) confirming the heavy loadings efforts to retain the Grange level infill placed on the structure, with over 18,000 pounds of horizontal thrust to be carried at the truss heels at the eave joints.

Repairs contemplated by Ms. Dey would salvage the structural function of original truss members by modifying each truss with additional framing above the upper ceiling line and by opening up the roof to rebuild and reinforce each heel joint.

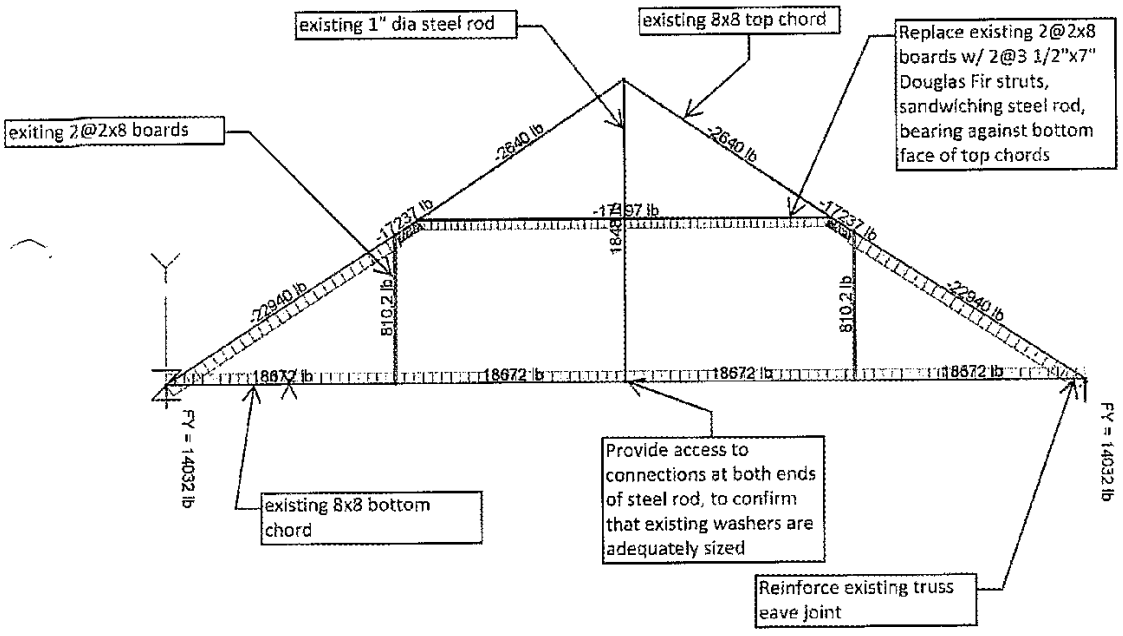


Figure 58 - Structural Analysis by Annette Dey PE

The consensus of those involved (Annette Dey PE, Andrew Cushing, Mason Town representatives and Architect Charles Michal) was that removal of the 1885 construction was necessary and would allow the opportunity to either re-build the trusses or otherwise provide a structurally sound roof. As much dead-load (of building materials) as possible should be removed.

The first step in restoring the building is to demolish all construction dating from 1885 at the upper level, leaving only the Grange kitchen area built just above the original sloped gallery floor. This demolition work should be done selectively and carefully, so as to retain the original hall plaster ceiling and its framing, which is separate from the floors in question. The east gable end wall can be opened up to provide a easy path for demolished materials to be deposited into a haul-off dumpster.

Once that is accomplished we recommend removing all sheathing, both plywood overlays and original board sheathing, from the original rafters and trusses. This must be done in the eastern four of the five truss bays. (This can be done sequentially if necessary to reduce the exposure of the building to the weather. Within reason, each bay can be treated separately.)

Once the sheathing in a bay section is removed, the horizontal roof purlins and secondary rafters would be removed. Conventional wood metal-plate connected trusses on nominal dimensional lumber can then be inserted to span from exterior wall to exterior wall, and sit above the original ceiling framing, leaving it undisturbed.

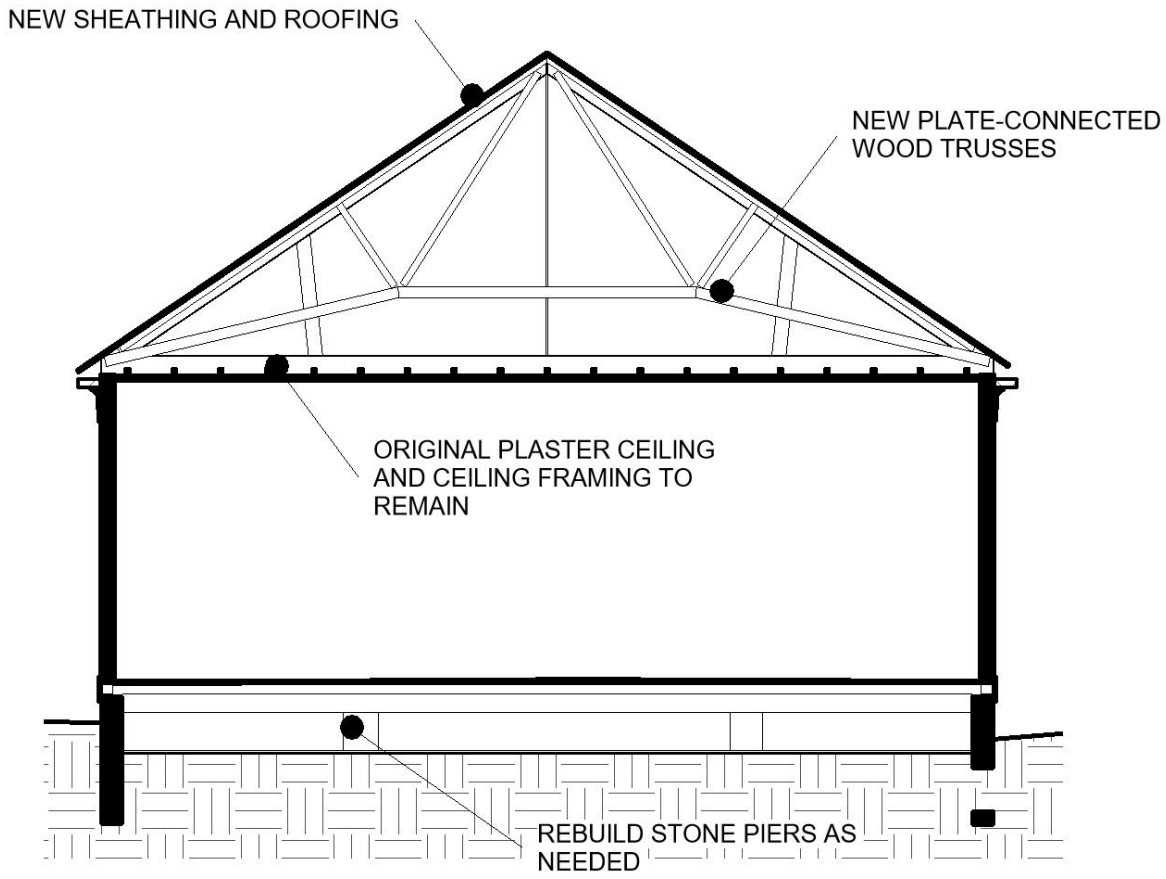
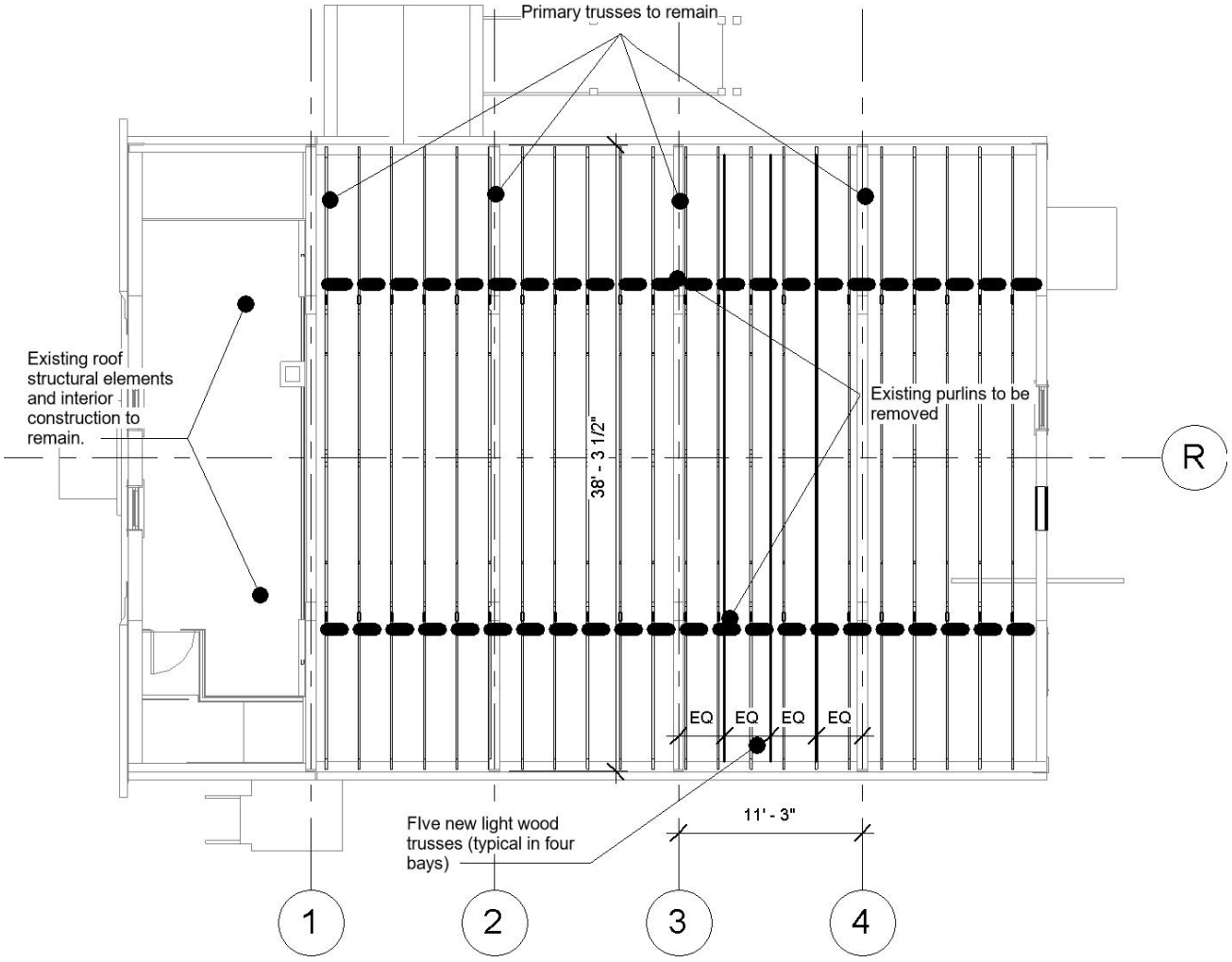


Figure 59 - Reconstructed Roof Section



Exterior Architectural Work

Poor drainage around the building needs to be addressed. Our recommendation is that the perimeter around the north, east and south sides of existing rubble stone foundation be excavated to allow a French drain system to be installed, to be connected to new storm drainage extended west from the site across and below adjacent roadways, to drain to daylight on the commons. Figure 62 - Site Spot Grades – illustrates how approximately 130 feet of storm drain installed under the street may be possible.

Drainage on the north side can run some distance parallel to the foundation, so not to force reconstruction of the ADA entry ramp. Cutting and patching of asphalt at the drive and parking should be anticipated. The extremely low, locally depressed ground to the south side should be drained with some permanent drainage structures to daylight or other functioning storm drainage in the vicinity.

With the exception of the roof structure, the existing exterior is in reasonable shape, and will benefit primarily from new paint work and window work.

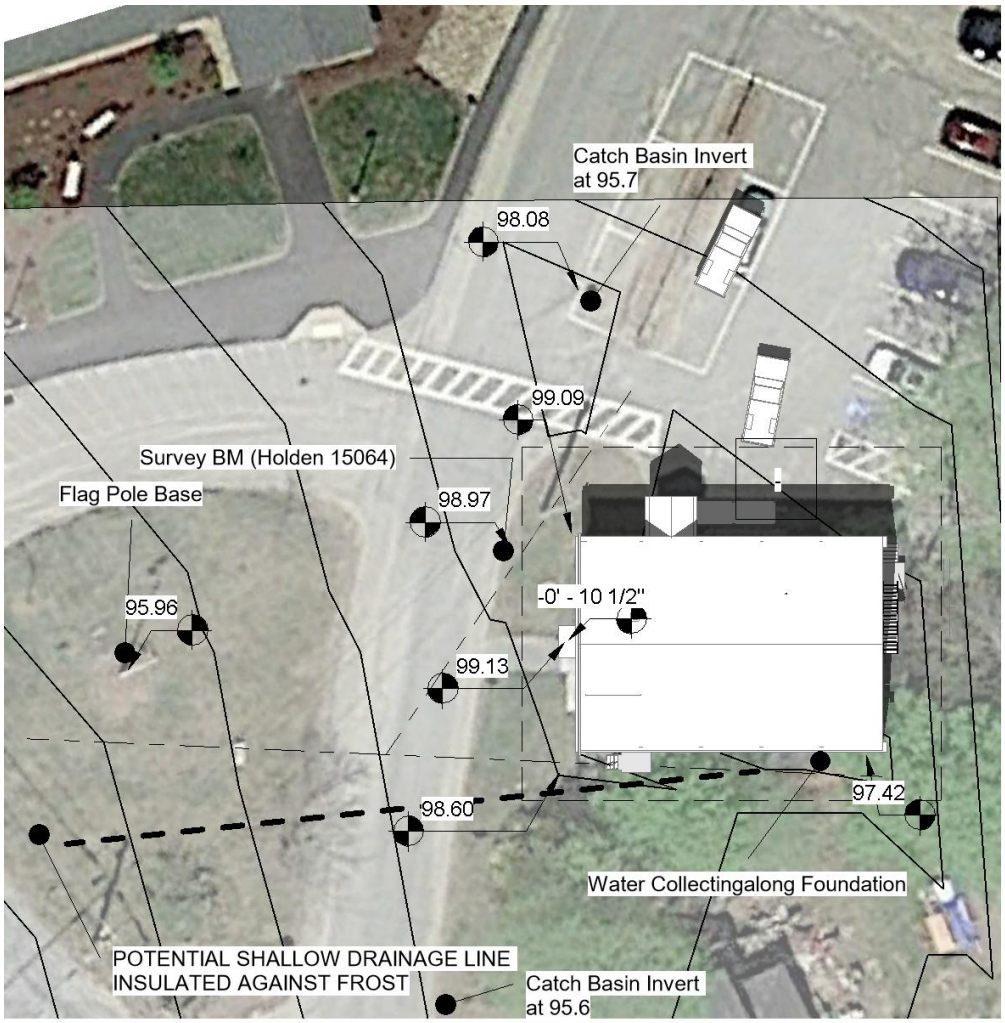


Figure 60 - Site Spot Grades

Interior Architectural Renovations

The attic level Grange dining hall and other attic storage room will be removed as part of recommended structural demolition, and that portion of the building returned to its original unoccupied attic state. New attic insulation, this time at the first floor ceiling level, will increase the energy efficiency of the structure.

The original gallery, which does not hang from the roof above but is supported by first floor walls, would be retained. Recommended plan changes at this level are to use the former Grange kitchen area as an office/small meeting room. Repair and restoration of existing painted finishes is to be expected, as well as new partitions to isolate this partial floor from the re-created attic.

Primary first floor renovations involve restoring the plaster ceiling above hall and stage and re-configuring the current small office to accommodate a small warming kitchen to support public use of the main room. This is shown is Figure 63 – Proposed First . . Removal of one door will improve the usability of the space. General interior repainting and floor refinishing can be budgeted as well.

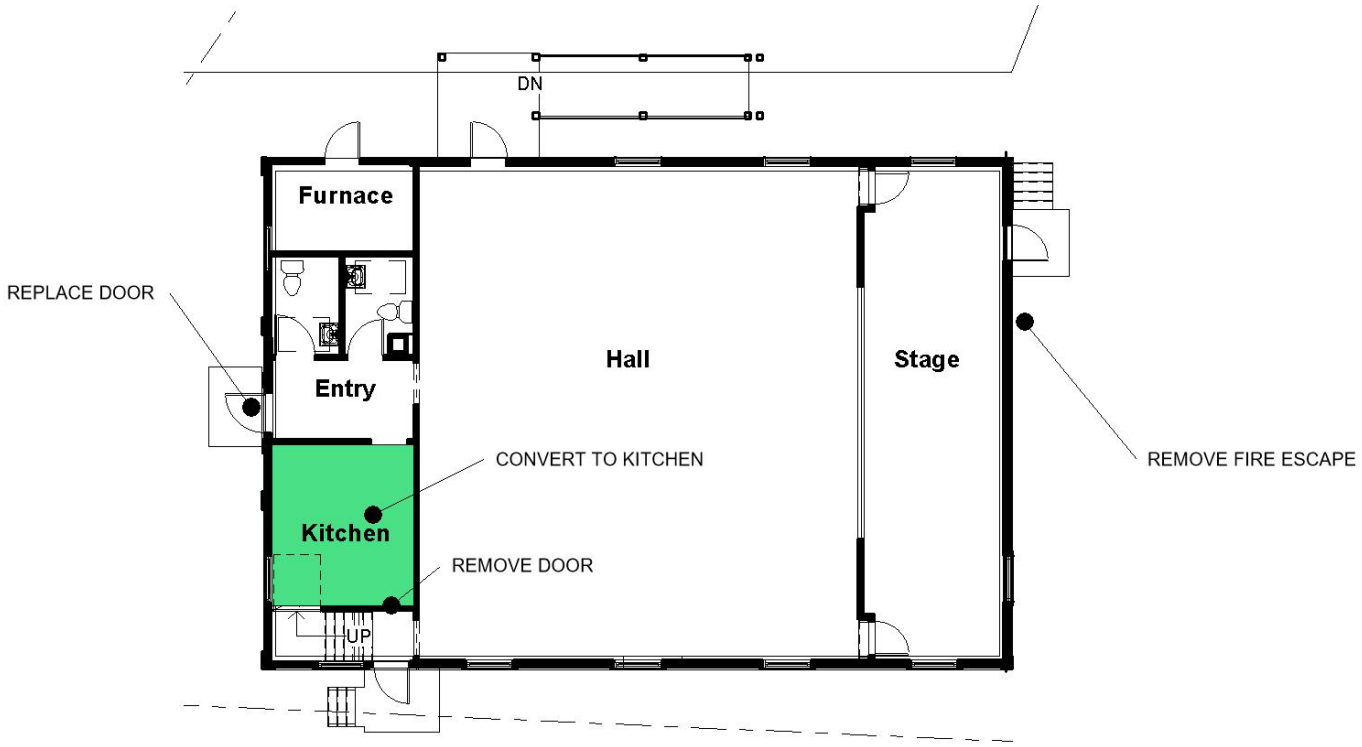


Figure 61 – Proposed First Floor Plan

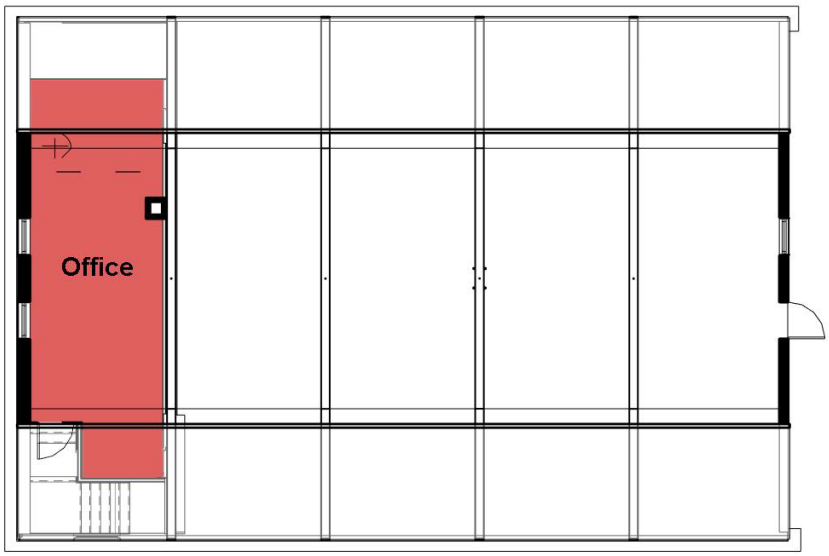


Figure 62 –Proposed Upper Level Plan

Cost Estimates

The recommended Project Budget is $262,000, which includes architectural and engineering fees and construction contingences. The base construction budget estimated at current day prices to be $236,000. An escalator for construction cost inflation of 4% per year should be carried. If the project is undertaken two years from now, costs of $280,000 should be expected.

Key elements of the total recommended budget are:

Demolition and staging	$35,000
Site drainage and paving and foundation work	$22,000
Structural reconstruction of roof and floors	$31,000
Roofing	$17,000
Window repairs	$17,000
Siding repairs and exterior painting	$18,000
Interior finishes	$15,000

General Contractor's general conditions, overhead and profit of approximately $36,000 should be expected. Contingency allowances (both for final design and during construction) totaling $33,000 are recommended, along with architect and engineering fees of $26,000.

Work Scope			unit cost	estimate	cost /SF GFA	percent of cost
DEMOLITION and STAGING	1	LS	$35,400	$35,400	$14.49	21%
EXCAVATION and SITE WORK	1	LS	$19,200	$19,200	$7.86	12%
FOUNDATION REPAIRS	1	LS	$3,200	$3,200	$1.31	2%
PRIMARY STRUCTURE and FLOORS	1	LS	$6,500	$6,500	$2.66	4%
ROOF STRUCTURE	1	LS	$23,400	$23,400	$9.58	14%
EXTERIOR CARPENTRY	1	LS	$9,300	$9,300	$3.81	6%
EXTERIOR PAINTING	1	LS	$8,000	$8,000	$3.27	5%
EXTERIOR DOORS	1	LS	$1,600	$1,600	$0.65	1%
ROOFING	1	LS	$16,600	$16,600	$6.79	10%
PARTITIONS / INTERIOR	1	LS	$2,000	$2,000	$0.82	1%
INSULATION (Wall and Roof)	1	LS	$4,200	$4,200	$1.72	3%
WALL FINISHES	1	LS	$4,400	$4,400	$1.80	3%
INTERIOR DOORS	1	LS	$2,300	$2,300	$0.94	1%
FLOOR FINISHES	1	LS	$6,000	$6,000	$2.46	4%
CEILING FINISHES	1	LS	$3,000	$3,000	$1.23	2%
LIGHTING, SWITCHING AND RECEPTACLES	1	LS	$2,900	$2,900	$1.19	2%
FIRE DETECTION and ALARM	1	LS	$1,900	$1,900	$0.78	1%
PAVING and FLATWORK	1	LS	$14,000	$14,000	$5.73	8%
EXTERIOR STEPS, RAMPS and RETAINING WALLS	1	LS	$1,000	$1,000	$0.41	1%
					NA	NA
		sum of cost items		$164,900	$67	100%
				cost per SF GFA	$67	
			cost per SF assigned area		$76	
adjustment for market conditions	100%			$0		
GEN. CONDITIONS	12%	percent		$19,800	$8.10	
CONTRACTOR'S FEE or PROFIT	10%	percent		$16,500	$6.75	
BONDS and PERMITS	1.0%	percent		$1,700	$0.70	
DESIGN and BIDDING CONTINGENCY	10%	percent		$16,500	$6.75	
A&E FEES	11%	percent		$26,000	$10.64	
CONSTRUCTION CONTINGENCY	10%	percent		$16,500	$6.75	
		sum of cost items		$261,900	$107	

Exhibits

Relevant Preservation Briefs

The Town should review available guidelines during the final design and execution of a restoration project for Mason Hall. Applicable materials available from the US Department of Interior National Park Service include:

#14: New Exterior Additions to Historic Buildings: Preservation Concerns

#32: Making Historic Properties Accessible

#47: Maintaining the Exterior of Small and Medium Size Historic Buildings

#49: Historic Decorative Metal Ceilings and Walls: Use, Repair, and Replacement

Secretary of the Interior Standards

The Secretary of the Interior's Standards for Rehabilitation are:

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

The full Secretary of the Interior's Standards and Guidelines are found on the National Park Service website at this link - https://www.nps.gov/tps/standards.htm.