

New Fairfield Creamery

Structural Engineering Assessment

31 Route 37
New Fairfield, Connecticut

Prepared for:

Town of New Fairfield

Funded by:

Department of Economic and
Community Development

State Historic Preservation Office

Connecticut
still revolutionary



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EXECUTIVE SUMMARY

The Creamery is a two-story historic structure located in the town of New Fairfield, Connecticut. The building is listed on the State Register of Historic Places (SR), and is generally regarded as one of few remaining visual references to New Fairfield's agricultural past. The history of the building is not certain, but portions of the structure include timber frame elements that date back as far as the mid-1800's. Town records indicate that the structure served as a creamery from 1904 until it was converted to a single family residence in 1939. It remained a residence until 1989, after which the building was subdivided into two apartments. The building has been unoccupied and fallen into disrepair in the intervening years since the subdivision.

In December of 2013, Hudson Valley Preservation Corp. was hired to perform an architectural assessment and historical analysis of the building. This report described the conditions encountered in the building and included a study of town records and historical aerial photographs to create a speculative timeline of the building's life. The report concluded that the building cannot be salvaged in its current form and its only historic value lies in its individual elements, which can be repurposed in a new structure. The report does not include any numerical analysis of the structural capacity of the building in its current form, so the town, through a grant from the National Park Services through the Connecticut State Historic Preservation Office, has commissioned this structural engineering assessment of the building. The objective of this assessment is to determine the suitability of the structure for continued use by the town for offices.

The current structural assessment has identified that the historically significant portion of the building is limited to less than one half of the building, at the center of the eastern end. Specifically, the walls and second floor framing of this portion of the structure include timber elements that likely existed in place at the turn of the 20th century. The remainder of the structure, including the kitchen, enclosed porch, covered deck, garage bays and the entire roof, all appear to have been constructed later. Although all elements of the building were examined for structural integrity, the focus of this study has been the historic portion of the building.

Unfortunately, the sizes and condition of the second floor framing in the historic portion of the building are such that they cannot be used in their current configuration to support an office floor. In general, the elements are undersized to support office loading in accordance with the current Connecticut State Building Code, and many elements have been notched, damaged or deteriorated to further diminish their capacity. It is feasible to reinforce the floor, but such modifications would compromise the aesthetic benefit of leaving the historic structures exposed. Most of the historic vertical elements, however, including wood posts and some of the original wood siding, does appear to be suitable for re-use.

There are several strategies that would permit limited re-use of the second floor timber framing. One strategy is to simply disassemble the structure and salvage as much material as possible to be used in a new exposed floor structure, using modern subflooring. Another approach could be to maintain the existing second floor entirely as ceiling construction, and build a second floor structure above it to carry the floor loads and suspend the historic structure. This would allow the second floor structure to remain visible in its current configuration, and also permit removal of non-historic reinforcing elements from view.

INTRODUCTION

Task:

Freeman Companies has been retained by the Town of New Fairfield to perform a structural engineering assessment of the Creamery at 31 Rte 37 in New Fairfield. The building is listed on the State Register of Historic Places (SR), and this study was funded through a grant from the National Park Services through the Connecticut State Historic Preservation Office (SHPO). The study includes visual inspection and measurement of the accessible floor, roof and wall structures and evaluation of these elements with respect to building code requirements for office use. A previous Architectural Conditions Assessment report prepared by Hudson Valley Preservation Corp. in December 2013 was available that reviews the ownership history of the building and speculates about its evolution to its current state. The building has been unoccupied for some time and is clearly in a state of disrepair, but the town is interested in determining the current condition and capacity of the structure, and how to best preserve and utilize its historical value. The intent of this report is to supplement the Hudson Valley report with a structural engineering perspective and emphasis.

The Town of New Fairfield received support for this project from the Department of Economic and Community Development with federal funds from the Historic Preservation Fund of the National Park Service, US Dept. of the Interior.

However, the contents and opinions do not necessarily reflect the views or policies of the Department or the Department of the Interior, nor does the mention of trade names or commercial products constitute endorsement or recommendation by the Department or the Department of the Interior.

This program receives Federal financial assistance through the Department for identification and protection of historic properties. Under Title VI of the Civil Rights Act of 1964 and Section 504 of the Rehabilitation Act of 1973, the U.S. Department of the Interior prohibits discrimination on the basis of race, color, sex, national origin, or handicap in its federally assisted programs. If you believe that you have been discriminated against in any program, activity, or facility described above, please write to: Office of Equal Opportunity, U.S. National Park Service, 1849 C Street, NW, Washington, DC 20240.

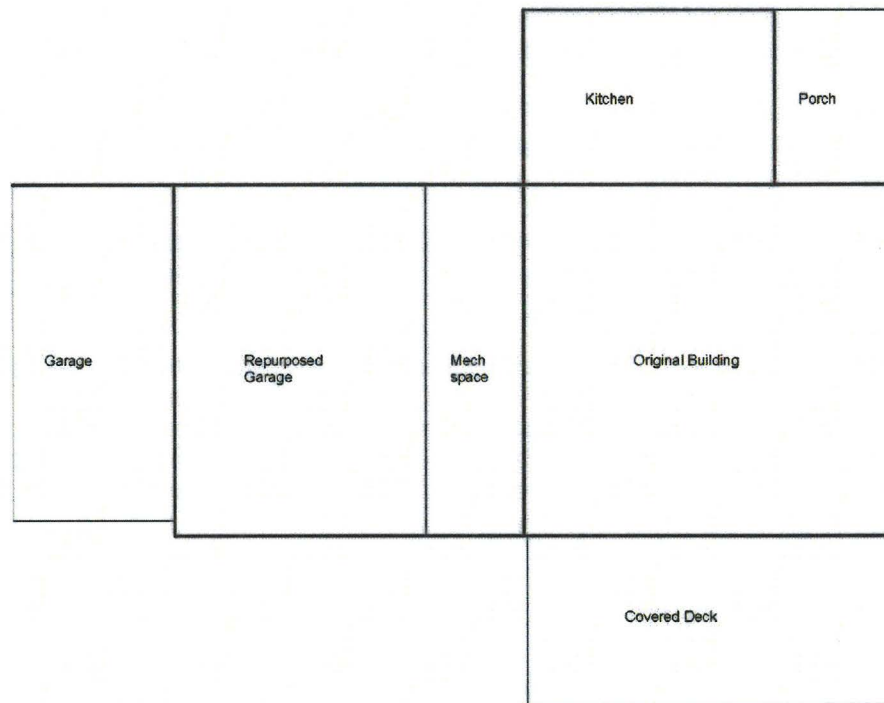
Procedure:

The current task required that a structural engineer from Freeman Companies review all available documentation, visit the building, visually observe conditions, take samples of framing materials, measure all relevant structural members and configurations, interview town personnel regarding the building's history, perform calculations to evaluate member capacities, review building code requirements for office environments, and render opinions with regard to the conditions noted, capacity of the structure, and how to maximize the historic value of the building and its components. A subconsultant, Cory Attra of Kevcor, was engaged to assist with material evaluation.

It is important to note the limitations of this procedure. Hazardous materials are known to exist throughout the building, so finish materials were generally not disturbed. Most of the floor framing in the historic portion of the structure was already exposed and could be observed and measured, but access to the structure was very limited in other portions of the building. Only limited probes and material evaluations were conducted. This report describes the observable conditions only at the time of inspection. The inspection provides no guarantee or warranty of the premises or any of its systems, components or elements.

GENERAL BUILDING INFORMATION

The building is a two story structure with a main roof gable running lengthwise from east to west. The original structure, which is the focus of this report, is limited to the center portion below the main gable at the east end, as shown on the diagram below. The area defined as "repurposed garage" appears to be a garage bay from the exterior, but is a large open living space on the interior with a stair up to the second level at the east end just behind the front door.



The two-story portion of the building is limited to the original structure, mechanical space and repurposed garage. The garage bay at the west end and kitchen are formed with single story gable roofs, with shed roofs over the rear deck and enclosed porch (see photos #1 and 2). Overall dimensions of the original structure are approximately 24' x 26'.

All structures of the building are framed with wood. The second floor of the original building is supported by 4x6 rough hewn timbers at 2' on center carried on ledgers mounted to rough hewn 6x8 girders on 8x8 posts. In the mechanical space, the second floor framing above consisted of more modern 2x10 joists at 16" on center. In the repurposed garage, 2x8 joists were found at the second floor, supported by a triple 2x8 girder supported on perpendicular walls and a screw jack post 4'-8" from the west wall. 2x6 ceiling joists were found at the kitchen, with 2x6 roof rafters at the porch and deck canopy.

The main gable roof was only marginally accessible through a ceiling hatch and pull-down stair, but clearly is a relatively modern reconstruction, consisting of 2x8 rafters supporting wood sheathing. The low gables over the kitchen was not accessible, but the roof of the west garage bay utilizes modern rafters and is clearly not part of the original building.

The first floor of the original building consists of wood joists and furring over a crawlspace. The depth of the crawlspace varies, presumably to accommodate creamery equipment and access points that have been removed or covered. Cuts in the floor on the east side of the building show soil only several inches below the floor, but at openings in two central closets, a mud slab was found 19" below the floor, with floor framing supported on wood posts. The other portions of the structure appear to have slabs on grade at the first floor level.

Foundations are not clearly visible, but many variations in materials were found around the exterior perimeter of the building, including concrete masonry and cast in place concrete. Cast in place concrete walls and piers were found in sections below the original building, but it is likely these were modifications to the original foundations.

OBSERVATIONS

The following observations were made at the project site:

Original Building

1. Much of the walls of the lower level and the majority of the second floor walls and ceiling were concealed by plaster finishes. The second floor framing, however, was exposed to view for most of the original building area, partially concealed by a modern wood ceiling grid (see photos #3 and #4). The framing was whitewashed, likely in conjunction with its conversion to a creamery in the early 20th century. The framing details, however, suggest that the framing may have been reclaimed from other sites. Members generally have been modified to fit the dimensions of the building, and many revisions and retrofits to the original structure were apparent.
2. The second floor framing in the original building consists of two bays of 4x6 joists supported on ledgers mounted on each side of a 6x8 central girder. The ledgers are whitewashed, indicating that although they may have been added to the girders at some point, they were part of the Creamery construction. All but one of the 4x6 joists in the north bay have a $\frac{3}{4}$ " deep notch in the bottom near the center of the span (see photo #5), presumably to permit passage of wiring without encroaching on the ceiling.
3. At several locations, mortises were found in the second floor girders oriented along the length of the member (see photo #4). This suggests that either a post had been positioned at this location in the past, or more likely, these members were reclaimed from other structures. Similar details were found at posts.
4. The girders supporting second floor joists each have a 2x4 ledger mounted on each side to support the joists (see photo #6). This further suggests that the framing is not original to the building.
5. Near the center of the north bay, a girder runs east to west that receives framing around what is likely an old stair location. This girder is badly deteriorated near the north end, and the bearing detail has been modified by the addition of a diagonal member to connect into a notch in the post (see photo #7).
6. Supplementary framing has been added over the years to the second floor structure, including sister joists (see photo #8) and additional lumber posts added to walls (see photo #7).
7. At isolated locations, the original wall construction was visible (see photo #9). The wall construction consisted of horizontal rough hewn timbers spanning between posts and supporting exterior wall boards. The horizontal boards had unused mortises on top and bottom surfaces, suggesting that they were also reclaimed from other sites.
8. At the second floor, sections of the original wall structure were visible, but it was clear that the ceiling and roof structure over the original second floor are not original. Roof rafters that form the full gable over both the original building and reclaimed garage appear to all have been added at a later time, possibly more recent than the garage (see photo #10).

9. The first floor of the original building is built on a wood framed floor on joists and furring set on shims directly on the ground in the northern portion, but the floor framing is set 19 inches above a mud slab in the center of the original building (see photo #11). The floor in this area is supported on wood posts and concrete walls, which were clearly part of building retrofits. It is not clear how much variation there is elsewhere in the building, but most of the remainder of the first floor appears to be on a slab on grade.
10. At the bases of two of the exposed posts in the original building, a concrete pier was found (see photos #12 and 13). It appears that the bases of these posts were reinforced or reconstructed at some point during the life of the building.
11. Two samples of the floor joists were cut from the ends of a beam to be sampled and evaluated. The material was determined to be gray elm, but it is expected that a variety of wood species were used in the structure, especially considering that some, if not all, the materials appear to have been reclaimed from other sites.

Kitchen

1. The finishes of the kitchen are essentially intact, but one section of the wall was demolished to reveal what appears to be the exterior face of the original building (see photo #13).
2. A probe in the kitchen ceiling reveals modern 2x6 ceiling joists (see photo #14).
3. The floor of the kitchen appears to be elevated above the ground. It is not clear how foundations are constructed in this area, but it is likely to consist of discrete piers supporting wood floor framing (see photo #15).

Mechanical Area

1. The mechanical area lies just to the west of the original building. The stair up to the second floor of the original building extends over the rear (north) section of the mechanical area. The modern nature of the second floor framing above the mechanical space suggests that this was not the location of the original stair to the upper level. A framed area near the northeast corner of the original building appears to be the original stair location.
2. The second floor framing in this area consists of 2x10 joists at 16" on center spanning from the south exterior wall to a header at the stair opening (see photo #16).
3. The stair at the rear of the mechanical space is very narrow and steep and likely does not conform to current building code requirements for interior stairs.

Repurposed Garage

1. The area noted as the Repurposed Garage appears to be a garage bay with a pass door on the exterior, but the pass door functions as the main entrance to the building, and this area is a large open room extending the full width of the building. A stair near the front entrance leads to the western half of the upper level.
2. The rear (south) wall of this element appears to be bulging out near the bottom, as though it was struck by a vehicle at some point (see photo #17).
3. A triple 2x8 girder supports the second floor joists across the center of this space. A screw jack has been inserted 4'-8" from the west wall to support this member (see photo #18), presumably in response to noticeable distress or excessive deflection in the member.

4. The ceiling construction includes an exposed timber member that appears to be a reclaimed column (see photo #19). The member projects below a modern gypsum board ceiling.
5. A steel tie rod was found below the second floor ceiling, presumably part of a retrofit to address spreading of the eaves of the main gable (see photo #19).
6. The second floor framing is mostly concealed in this area, but modern 2x8 joists were found in a ceiling probe, indicating that this is not part of the original construction.

West Garage

1. The west garage bay is a single story element that is constructed with modern lumber. The roof is framed with 2x6 rafters, with 2x6 ceiling joists providing ties at the attic level.
2. The wall between the reclaimed garage and west garage bay appears to be sheathed as an exterior wall, indicating that the west bay was added at a later date.

Enclosed Porch

1. The porch floor appears to be constructed on wood framing, which is settling and feels spongy. There is likely significant deterioration in the floor.
2. The porch roof is framed with 2x6 rafters at 18" on center. Visible access to the roof framing was limited, but it appears to be in adequate condition.
3. The exterior window wall of the porch is supported on a split face concrete masonry wall (see photo #20). The wall is damaged in some areas, and has undergone repairs in the past that are beginning to fail.

Covered Deck

1. A wood deck with a wood framed canopy above was added to the east end of the south face of the building subsequent to the original construction (see photo #2).
2. The canopy is framed with 2x6 rafters running down the slope, supported on the main structure and a perimeter 4x6 girders over wood posts.
3. One of the posts has a splice and a notch approximately 2 feet from the top (see photo #21). The splice detail does not appear capable of providing stability.
4. The details where the rafters are supported by the girder along the lower edge appear to be deteriorated at some locations.
5. The structure of the deck floor could not be observed directly, but appears to be deteriorating. Deflection and sponginess were detected.

Other Issues

1. The building is reported to have been built in a flood plain, and in fact has been flooded in the past. The concrete construction noted at the lower portions of the first floor of the original building suggests that this may have been added in response to degradation of the lower portions of the original posts and walls due to water exposure. FEMA flood maps indicate that the building is in an AE zone with flood elevation of 591 feet, but the first floor elevation is unknown. This is an important consideration for the development of any building on the site.

2. Significant regrading appears to have been done around the building, including work performed in conjunction with the creation of the current route 37. A stone wall separates the Creamery property from the road, which lies at an elevation about 4-5 feet above. It is likely that the original Creamery building was constructed on the same level as the road that existed at that time. The regrading likely affected drainage in the area, which may have exacerbated water conditions at the first floor level.

ANALYSIS

Quantitative evaluations were performed for all elements of the building that could be observed and measured, with special emphasis placed on the original building area. The results of this analysis follows:

1. The second floor framing of the existing building is significantly overstressed under building code prescribed office floor loads, using relatively conservative strength values for historic gray elm timber, which is generally much stronger than modern lumber. Considering that the majority of these elements are notched and/or deteriorated in part, the floor members are not viable for continued use in their current configuration. This conclusion applies to both the joists and the girders. The members also have insufficient stiffness due to their shallow depth relative to the spans, which results in excessive bounce and deflection when subject to an office floor load.
2. In general, posts and walls in the original building are in fair conditions and are adequately sized to resist code-prescribed office loads as currently configured. In some cases, however, existing mortises and deterioration render these members inadequate. A more thorough review would have to be done following removal of all wall finishes in order to fully assess the viability of reusing these members, but it is anticipated that many would be acceptable.
3. The second floor joists above the mechanical space appear to be adequately sized and in good condition based on visual observation from below. Many of these members should be salvageable and may be used in their current configuration.
4. The second floor framing at the repurposed garage includes a large opening in the middle of the floor, and while not directly visible, the noticeable bounce and deflection in the floor, combined with the use of a screw jack bolster for the central girder, suggest that the floor members are inadequate. In any case, this section of the building does not appear to have historical value.
5. Although the main attic was found to have been infested with rodents (droppings likely due to bats were found throughout), the large gable roof rafters do appear to be in adequate condition to serve to support the roof. However, since it is unlikely that even the configuration of this roof matches the original building, it has no historic value. In addition, the additional members that were added to tie the eaves of the roof suggest that movements were detected in the past.
6. The 2x6 rafter framing at the enclosed porch and canopy over the deck appear to be adequate and functioning, but limited access to the connection details in both areas revealed flaws that are likely repeated elsewhere. Therefore, these areas are likely not suitable for reuse.
7. Insufficient information was found regarding foundations to perform numerical evaluation, but other than settlements noted at the porch and deck, the main building structure appears to be adequately supported. Concrete piers and walls that were found all appeared to be in sound condition.

DISCUSSION AND RECOMMENDATIONS

The Creamery has a long and interesting history, much of which will likely remain a mystery forever. It is clear that the structure has been modified many times over the course of the past 150 years. It also appears that portions of the building, in fact the majority of it, were added, while other portions of the original building, such as the roof, have been replaced entirely. Nevertheless, the building continues to serve as an important link to the agricultural heritage of the Town of New Fairfield, and there is great interest in retaining the historic components of the structure as much as possible.

In terms of historical interest and value, the only structural elements that appear to be relevant and worthy of consideration reside in the area referred to in this report as the original building: the whitewashed structural floor and wall framing that clearly were part of the Creamery. Although some of these members appear to have been modified and reclaimed prior to their use in the Creamery, this just endows them with more historical interest. Clearly, today's green movement and interest in adaptive reuse are not something so recent after all.

Unfortunately, the second floor framing is too aggressively sized, too deteriorated, and has undergone too many modifications to be used in its current configuration. It is possible to reinforce and upgrade the capacity of the floor framing, but steps to do so would have a negative architectural impact and likely destroy the historical interest that the floor would otherwise have. Fortunately, there are options that can be considered for reuse and celebration of these components other than using them as a floor structure as currently configured. The first option is to disassemble the building and save as many of the beams and girders as possible for use in smaller spans, possibly featured as an area of exposed framing within a larger structure. The second option is to maintain the second floor in its entirety or in part, and use it as a suspended ceiling supported by a new floor structure above. This way, the structure can be viewed and enjoyed by users occupying the space below, it can conceal modern mechanical and electrical systems, and it can be supported as needed by a new structure so that all supplementary elements that have been added over the life of the floor can be removed.

The posts and walls of the original building have more potential for reuse in their current form and configuration than the floor, but four walls alone are not sufficient to create an interesting structure. Ideally, the posts and walls could be featured as interior columns and partitions within a new structure, and could even be part of a new structure to support the Creamery floor framing repurposed as ceiling construction.

Regardless of the approach selected, all elements proposed for reuse must be thoroughly inspected and evaluated. The first step in demolition of the existing Creamery is remediation of hazardous materials. Once complete, selective demolition of finishes, subflooring and sheathing can begin, which could potentially reveal additional deterioration of wood members in contact with these surfaces. It is likely that there will be more deterioration found at that point, but based on the observations made in conjunction with this study, it is expected that there will be enough materials suitable for reuse to make this effort worthwhile. Ideally, the result will be a series of structural elements that can be used to create an element of historical interest within a new town building on the same site.

PHOTOGRAPHS



Photo #1 – Roof forms at north side



Photo #2 – Roof forms at south side



Photo #3 – Second floor framing at original building



Photo #4 – Second floor framing at original building with mortise at bottom of girder



Photo #5 – Notch in second floor joists



Photo #6 – Bearing at joists on ledger mounted to perimeter girder



Photo #7 – Damaged and modified bearing detail at girder and supplementary posts



Photo #8 – Sister joists at second floor



Photo #9 – Original wall framing



Photo #10 – Roof framing at main gable



Photo #11 – Supported first floor and mud slab



Photo #12 – Concrete pier at base of post



Photo #13 – Exterior wall viewed from kitchen



Photo #14 – Ceiling joists at kitchen



Photo #15 – Support of first floor and foundations at kitchen



Photo #16 – Second floor framing above mechanical space



Photo #17 – Bulge in wall at rear of repurposed garage

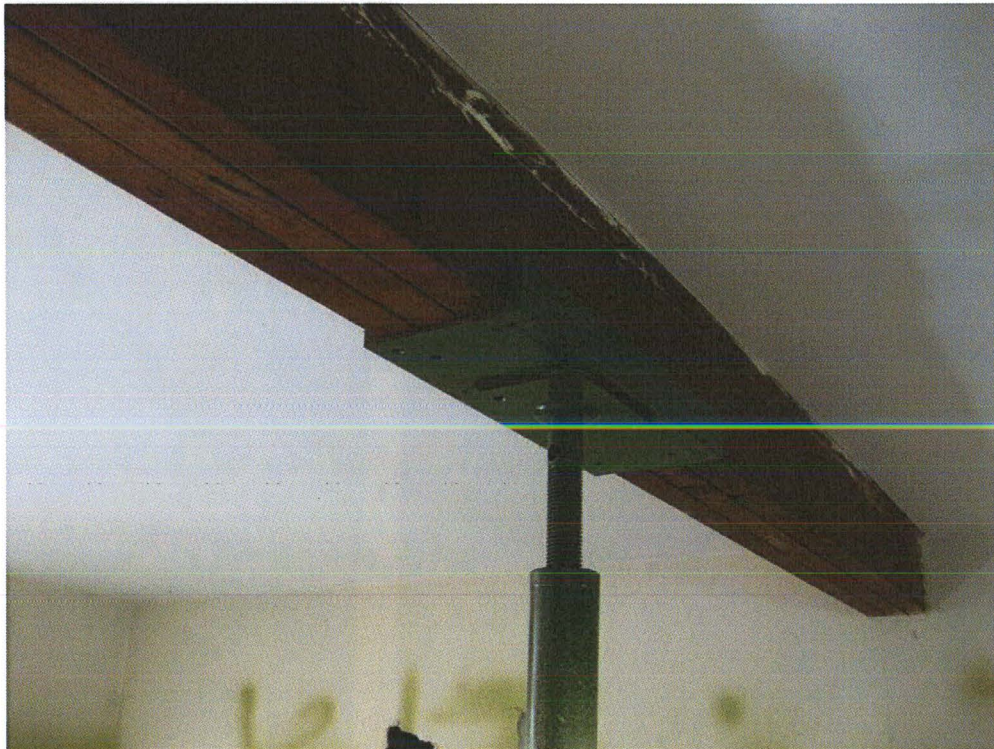


Photo #18 – Screw jack supporting girder at repurposed garage



Photo #19 – Reclaimed ceiling girder and tie rod at second floor



Photo #20 – Split face block knee wall at enclosed porch



Photo #21 – Splice and notch at canopy post