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MEMORANDUM

TO: Robert Quinn, Director of Facilities, Town of Medfield

FROM: Jim Martin, P.E., Senior Structural Engineer, Woodard & Curran

DATE: November 15, 2024

RE: Town of Medfield, MA
Limited Structural Condition Assessment of PFAFF Building Exterior Masonry Walls

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1.0 Introduction

The Town of Medfield (Town) requested that Woodard & Curran (W&C) conduct a limited structural condition assessment of the PFAFF Center Building, located at 124 North Street. This assessment was limited to evaluating the condition of the exterior masonry walls, which have visible cracking and damage. Interior spaces of the building are excluded from the scope of this assessment.

In general, we believe that the observed damage is significant to the heavily corroded steel lintels over windows and doors as well as the brick masonry above and adjacent to those lintels. The structural integrity of these steel lintels and surrounding masonry is poor and, due to this damage, they are well past their service life. While much of the lintel conditions are concealed by masonry, it is evident that the steel lintels have severe corrosion and their load carrying capacity is compromised. Therefore, we feel that in their current condition these areas pose a risk of structural failure and compromise the overall safety of the building.

On November 6, 2024, W&C Senior Structural Engineer Jim Martin made a site visit to conduct a structural condition assessment of the building's exterior brick masonry walls. He met on site with several Town representatives, including Director of Facilities Robert Quinn. Most of the visual inspection was performed from grade with an 11-foot ladder. A Town Fire Department ladder truck was used to provide access to and from the roof. This Memorandum presents our findings in the following sections: Existing Construction; Observations & Recommendations with Photos; and Conclusions. Four general photos of the building exterior are shown below.

North Elevation of PFAFF Building

Partial East Elevation of PFAFF Building

South Elevation of PFAFF Building

Partial West Elevation of PFAFF Building

2.0 Existing Construction

The building was originally constructed in 1927, making it almost 100 years old. It initially served as the Town's high school and later became its elementary and middle school. After schools were relocated it was repurposed as the PFAFF Community Center, where in recent years it has housed the Town Parks & Recreation Department. Recently, this space has been used as an after-school day care and summer camp for kids. Original record drawings of the building were requested, but the Town has said no drawings are available.

The single-story building consists of solid 3-wythe brick masonry walls for a total wall width of approx. 12 inches with vinyl, double-hung windows and sloped brick windowsills. The building has a concrete foundation, a brick chimney, and brick masonry parapets surrounding the perimeter of the building and extending 14 to 26 inches above the roof surface. The parapets are capped with what appears to be metal/copper coping with several transverse seams. The roofing system appears to be an EPDM (rubber) membrane with tapered insulation sloping to four, somewhat centrally located roof drains. The rubber membrane extends up the interior faces of the parapets and under the metal coping. While the interior spaces were not included in the scope of this assessment, we understand the building has rough sawn timber roof framing members with a wooden deck. The first-floor framing consists of rough sawn timber floor joists (2" – 2 ¾" x 11" members, spaced at 16 inches on center), that span in an east-west direction. Most likely, the roof framing system (discussed above) is very similar based upon typical construction techniques that were used when the structure was originally built. The basement beneath the structure consisted of a full height basement space for approximately half of the structure's length (approximately 60 feet) under the northern end of the building, and a crawl space beneath the remaining part of the building footprint on the southern end. A concrete ramp, located on the western side of the building, sloped down from the southern end of building, northward to an entry to the full basement below. On the west side of the concrete ramp, a concrete retaining wall finished off its west edge.

Each side of the building has a row of similar-sized windows; some windows have almost six feet between them and many have only 12 inches between them. The building has steel lintels and decorative brick soldier course headers (vertical brick) above each window. There is continuous through-wall flashing running horizontally in a mortar joint located approximately 16 inches above the top of the windows, which appears to coincide with the base of the roof parapet; the extreme outer edge of this flashing is visible on the brick exterior. There are no vertical expansion joints in the building walls.

Though not confirmed and excluded from our scope, we understand that noticeable sagging and deflection have been observed over the years for the building floors over the basement crawl spaces. Similarly, during winters with heavy snow, noticeable sagging of the roof members prompted the Town to shovel off the built-up snow from the roof.

3.0 Observations & Recommendations

The following observations were made while conducting a visual inspection of the building exterior. Observations were limited to those areas that were exposed to view, and no destructive methods were used to expose areas concealed by finish construction. Below are more detailed observations, presented by area with numbered items for each repair issue identified:

Item #1 – Roof Membrane

Location: Entire flat roof area

Observations: The existing adhered, non-ballasted EPDM roof system is in fair condition with no obvious signs of damage to the membrane, flashing, sealants or other components. The roof is approximately 15 years old (according to Town staff), with no reported roof leaks. The membrane extends up the parapet interior faces and underneath the metal coping atop the parapet walls. The metal coping has transverse seams (approximately 8 feet on center) that exhibit signs of cracking and separation to varying degrees, which provides an avenue for moisture to penetrate down through the coping and into the brick wall system. There is a brick chimney in the northwestern portion of the roof which extends several feet above the roof level; the chimney is in fair condition, with several mortar joints showing signs of deterioration, efflorescence, and moisture damage.

Recommendations: This roof is at or approaching the end of its expected useful design life and should be replaced with a new EPDM roofing system with tapered insulation. As further outlined below, the upper brick masonry walls and parapets should be demolished and rebuilt only to the roof level (not parapet level) with a typical metal edge flashing over pressure treated edge blocking. The brick chimney above roof level should be pressure washed and have minor repointing of mortar joints and receive a protective water repellent. See below for photos of the roof area.

Typical view of EPDM Roofing

Typical view of Roof Parapet Coping Seam

Item #2 – East Wall

Location: East side of the building

Observations:

- Concrete foundations: approximately 1′-4″ exposed above grade; fair and sound condition with minor shrinkage cracks and localized spalling.
- Lower brick band below windowsills: approximately 3′-6″ above top of foundation wall; fair and sound condition; minor dark algae stains and minor deterioration of mortar joints.
- Center brick band between windowsills and window headers: approximately 7′-0″ above top of windowsills; fair and sound condition; minor vertical and diagonal joint cracking; vinyl, double-hung windows are in fair condition.
- Upper brick band between window headers and parapet: approximately 5′-4″ to 7-6″ above top of window lintel up to top of parapet walls; poor, unsound condition with many areas with cracked and unsound brick, deteriorated mortar joints, some out-of-plane movement, especially close to window lintel; all brick coursing across east wall (vertical soldier and horizontal running bond) between top of windows up to parapet wall flashing is completely cracked. Approximate horizontal and vertical crack widths were measured from ½″ to 1″. The distance measured from the exterior brick wall face at the top of the parapet wall to the exterior face of the bottom of the vertical soldier course above the windows was measured to be outward by up to a full 1″.
- Window & door steel lintels: mostly concealed by brick; exposed-to-view bottom flanges of exterior face lintels appear to have extensive, severe corrosion; this corrosion has resulted in expansion of the steel (in layers), compromised load carrying capacity due to varying degrees of apparent material loss, and damage to adjacent brick in the form of cracking, out-of-plane movement, freeze-thaw damage, etc.
- Horizontal flashing at parapet roof level: only the outer edge of the through-wall flashing is visible, but evidence of dark algae staining, moss growth from trapped moisture within walls, and mortar joint deterioration.

Recommendations:

- Concrete foundations: Pressure wash (PW); provide crack rout, seal repair and water repellant to approximately 10% of exposed face of foundation wall above grade. Contractor should field verify this quantity before beginning any work.
- Lower brick band below windowsills: PW all brick to remove stains; repoint any cracks or deteriorated mortar joints and brick cracks; apply water repellent.
- Center brick band between windowsills and window headers: PW all brick to remove stains; repoint any cracks or deteriorated mortar joints, windowsills, and brick cracks; apply water repellent.
- Upper brick band between window headers and parapet: Provide continuous temporary structural shoring of all roof framing along the inside perimeter of the building; demolish all brick walls above window & door lintels and eliminate the masonry parapets; replace lintels with new steel lintels (see below); rebuild brick walls to roof level with no parapets (which would lower the building height as viewed from the exterior by 14 to 26 inches); apply water repellent.
- Window & door lintels: Demolish all corroded steel lintels and replace them with new engineered, hot-dip galvanized steel lintels with through-wall flashing and weep holes.

- Horizontal flashing at parapet roof level: This flashing should be demolished and need not be replaced, since the masonry parapets will be demolished and not replaced.

See photos below:

Typical East Wall Masonry Cracking

Typical East Wall Lintel Corrosion

Typical East Wall Masonry Cracking

Typical East Wall Lintel Corrosion

Item #3 – West Wall

Location: West side of the building

Observations:

Due to the symmetry of this building when comparing wall sizes and extents, all the same items that have been observed with the East wall (discussed above), pertain to the West wall but just to a slightly lesser degree. The West wall appears to face more directly into the sun than the East wall, which would result in this wall being somewhat drier (on average) than the East wall throughout the year. Similar results of steel corrosion and brick cracking would take place from items such as re-occurring [rain and snow] storm events and the freeze/thaw cycle that follows as the seasons change. Observations and recommendations listed below mimic the East wall:

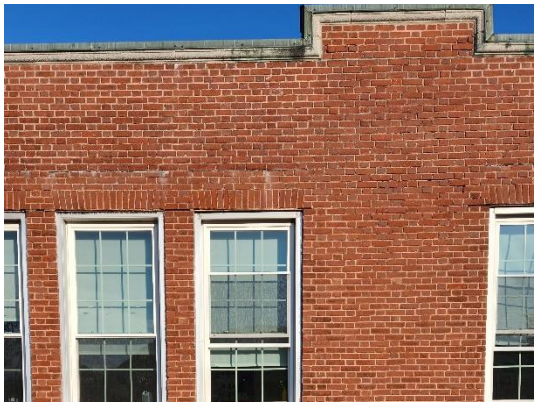
- Concrete foundations: approximately 1′-4″ exposed above grade; fair and sound condition with minor shrinkage cracks and localized spalling.
- Lower brick band below windowsills: approximately 3′-6″ above top of foundation wall; fair and sound condition; minor dark algae stains and minor deterioration of mortar joints.

- Center brick band between windowsills and window headers: approximately 7′-0″ above top of windowsills; fair and sound condition; minor vertical and diagonal joint cracking; vinyl, double-hung windows are in fair condition.
- Upper brick band between window headers and parapet: approximately 5′-4″ to 7-6″ above top of window lintel up to top of parapet walls; poor, unsound condition with many areas with cracked and unsound brick, deteriorated mortar joints, some out-of-plane movement, especially close to window lintel; all brick coursing across east wall (vertical soldier and horizontal running bond) between top of windows up to parapet wall flashing is completely cracked. Approximate horizontal and vertical crack widths were measured from ½″ to 1″. The distance measured from the exterior brick wall face at the top of the parapet wall to the exterior face of the bottom of the vertical soldier course above the windows was measured to be outward by up to a full 1″.
- Window & door steel lintels: mostly concealed by brick; exposed-to-view bottom flanges of exterior face lintels appear to have extensive, severe corrosion; this corrosion has resulted in expansion of the steel (in layers), compromised load carrying capacity due to varying degrees of apparent material loss, and damage to adjacent brick in the form of cracking, out-of-plane movement, freeze-thaw damage, etc.
- Horizontal flashing at parapet roof level: only the outer edge of the through-wall flashing is visible, but evidence of dark algae staining, moss growth from trapped moisture within walls, and mortar joint deterioration.

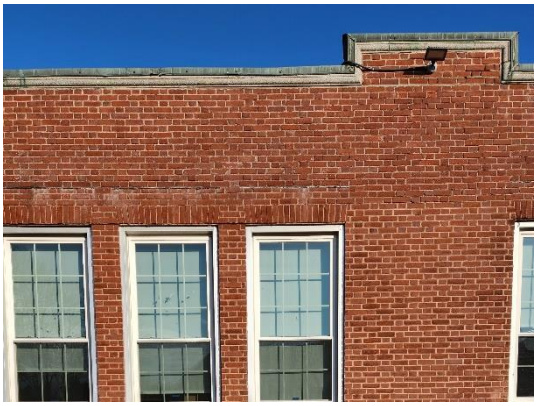
Recommendations:

- Concrete foundations: Pressure wash (PW); provide crack rout, seal repair and water repellant to approximately 10% of exposed face of foundation wall above grade. Contractor should field verify this quantity before beginning any work.
- Lower brick band below windowsills: PW all brick to remove stains; repoint any cracks or deteriorated mortar joints and brick cracks; apply water repellent.
- Center brick band between windowsills and window headers: PW all brick to remove stains; repoint any cracks or deteriorated mortar joints, windowsills, and brick cracks; apply water repellent.
- Upper brick band between window headers and parapet: Provide continuous temporary structural shoring of all roof framing along the inside perimeter of the building; demolish all brick walls above window & door lintels and eliminate the masonry parapets; replace lintels with new steel lintels (see below); rebuild brick walls to roof level with no parapets (which would lower the building height as viewed from the exterior by 14 to 26 inches); apply water repellent.
- Window & door lintels: Demolish all corroded steel lintels and replace them with new engineered, hot-dip galvanized steel lintels with through-wall flashing and weep holes.
- Horizontal flashing at parapet roof level: This flashing should be demolished and need not be replaced, since the masonry parapets will be demolished and not replaced.

See photos below:



Typical West Wall Masonry Cracking



Typical West Wall Masonry Cracking

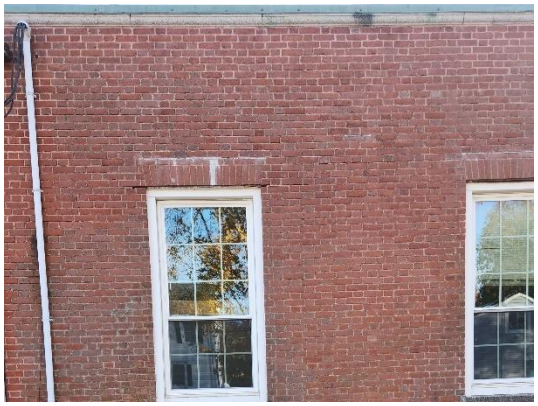
Items #4 & #5 – North & South Walls

Location: North & South sides of the building

Observations:

Due to the symmetry of this building when comparing wall sizes and extents, all the same items observed with the East & West walls pertain to the North and South walls but vary to a lesser degree because of a smaller wall size and less window openings. With these walls, the South wall appears to face more directly into the sun than the North wall, which would result in this wall being somewhat drier (on average) than the North wall throughout the year. Similar results of steel corrosion and brick cracking would take place from items such as re-occurring [rain and snow] storm events and the freeze/thaw cycle that follows as the seasons change. Observations and recommendations are very similar to the East and West walls.

See photos below:



Typ. North Wall Lintel Corrosion & Cracking

Typ. South Wall Lintel Corrosion & Cracking

4.0 Conclusions

Based on our limited assessment of the exterior of the building, we believe the upper portions of the masonry walls (including the steel lintels over windows and doors) are structurally compromised and their structural integrity is in question. This upper brick masonry has sustained significant damage from several contributing factors: steel lintel corrosion, swelling, and rust jacking; moisture penetration into the brick walls through open cracks and mortar joints, especially above and along lintels; moisture penetration along the wall-to-parapet

interface at the through-wall flashing; moisture penetration through roofing and metal parapet coping seams. The various cracking and gaps that have developed have compromised the building envelope's weather tightness and made the wall more susceptible to freeze-thaw cycle damage caused by entrapped water.

Though much of the steel lintels are concealed by brick wall construction, the following major concerns were identified relative to the steel lintels: age of the unprotected steel lintels; heavy corrosion of [at least] the exposed-to-view portions of steel lintels; visible swelling of steel lintels, causing cracking and separation of up to one inch in thickness between lower and upper brick bands along the lintel joint; probable loss of steel lintel material thickness due to corrosion, which reduces the structural load carrying capacity and ultimate the safety of the lintels supporting the brick walls and parapets above. With no record drawings and much of the lintel sections concealed, the size of the existing lintels is not known; however, given the observed damage to the lintels and adjacent masonry, it appears that the lintels are well beyond their useful service life. In the current condition, the building walls are vulnerable to failure involving the lintels and/or the masonry above the lintels. The specific timing and probability of any potential failure is unknown and cannot be predicted with visual inspection alone, but the existing warning signs are evident.

While beyond the scope of this assessment, the 2017 Capital Plan Report and input provide by the Town indicate there are also major concerns with the structural adequacy and building code compliance of the interior of the building such as sagging and undersized floor joist framing and roof framing. The interior floor joists reportedly experience noticeable deflection when walking on the floors, and the roof reportedly visibly deflects under heavy snow loading. These interior concerns further compound the exterior masonry wall problems identified above.

If the Town wants to explore repairing the building, the following action items are recommended:

1. Complete a structural condition assessment of the entire building to include interior areas beyond the scope of this assessment such as: interior foundations, floor construction, wall construction, and roof construction.
2. Combine the interior assessment observations and recommendations with that of this exterior assessment.
3. If a repair solution is still feasible and desired by the Town, W&C can put together a proposal to renovate the entire building.
4. For only the exterior improvements recommended in this report (including temporary shoring of roof framing system, reroofing, demolishing upper masonry walls and parapets, and rebuilding upper brick walls with new lintels), we recommend a budget in the range of $600,000 to $700,000 including engineering design and construction. Construction phase engineering services shall be additional, depending on whether the Town requires those types of services. However, since this is a difficult type of construction to estimate and volatility in the construction market, we further recommend that a cost opinion also be obtained from a local building contractor with experience in this type of masonry restoration.

This building is nearly 100 years old and is well beyond its expected useful life. The building requires extensive repairs to rehabilitate the building for safe occupancy and likely has numerous elements in multiple trades that are not code compliant (structural, architectural, civil/site, energy efficiency, electrical, plumbing, HVAC, fire safety, etc.). Given these concerns,

the Town may want to consider demolishing this building and replacing it with a new, modern, code-compliant building that can be designed to better align with their future vision for this space.

Woodard & Curran appreciates this opportunity to provide continued engineering support to the Town of Medfield. If the Town would like further evaluation of the building interior, we would be happy to prepare a proposal for that effort. We could also meet with the Town to further discuss either repair or replacement options to best suit the needs of the community.