

# STRUCTURAL CONDITION ASSESSMENT REPORT

**Property Address:** 178–180 Elm Street, Cambridge, MA

**Prepared By:** Charles E Michaud P.E.

**Date:** March 3<sup>rd</sup>, 2026

---

## 1. Purpose of Report

The purpose of this report is to document the structural condition of the existing residential building and evaluate the feasibility of rehabilitation in accordance with applicable building codes, including the Massachusetts State Building Code (780 CMR).

---

## 2. Building Description

The subject structure is a multi-family residential building constructed in the early 1900s, likely utilizing balloon-frame wood construction.

- **Stories:** 2.5
- **Framing:** Wood balloon framing
- **Foundation:** Rubble stone and brick mortar
- **Exterior:** Vinyl siding installed
- **Windows:** Partial replacement with vinyl units, resulting in inconsistent façade conditions

The structure has undergone multiple alterations that have diminished its architectural cohesion and historic integrity.

---

## 3. Site and Foundation Conditions

### 3.1 Foundation System

- Unreinforced rubble stone/brick foundation
- No modern continuous footings or frost protection (non-compliant with **780 CMR Section 1809 – Footings and Foundations**)
- Dirt-floor basement contributing to moisture migration and soil instability

### 3.2 Differential Settlement

- Approximate **4-inch differential settlement** observed along the right side

- Exceeds acceptable serviceability limits per standard engineering practice and indicates failure of bearing soils and/or foundation system

### **3.3 Environmental and Pest Intrusion**

- Active animal burrowing observed along foundation perimeter at grade level
- Burrows present beneath siding and at soil interface, contributing to localized undermining of foundation bearing conditions
- Evidence of nesting and infestation within building envelope, including **birds, squirrels, and mice**
- Openings in siding and degraded building envelope allowing pest intrusion

These conditions:

- Accelerate deterioration of structural materials
  - Contribute to moisture retention and insulation breakdown
  - Indicate prolonged failure of the exterior envelope system
- 

## **4. Structural Observations**

### **4.1 Superstructure**

- Sloped and uneven floor framing exceeding acceptable deflection limits
- Load-bearing walls out of plumb
- Evidence of racking and displacement

### **4.2 Load Path Deficiencies**

- Discontinuity in vertical load path from roof to foundation
- Misalignment of framing members due to settlement
- Non-compliance with **780 CMR Section 1604 – General Design Requirements** (structural stability and load path continuity)

### **4.3 Moisture and Material Degradation**

- Rot observed in sill plates, joist ends, and beam bearing points
- Persistent moisture exposure due to lack of slab and poor drainage
- Conditions inconsistent with **780 CMR Section 2304 – Protection of Wood and Wood-Based Products**

### **4.4 Lateral Stability Concerns**

- Structure exhibits reduced ability to resist lateral loads (wind)
- Potential non-compliance with **ASCE 7-16** load requirements as adopted by 780 CMR

---

## 5. Structural Analysis and Implications

The combined effects of foundation failure, differential settlement, pest-related soil disturbance, and moisture intrusion have resulted in:

- Compromised load transfer system
- Increased stress and deformation in framing members
- Reduced safety margin for both gravity and lateral loads
- Elevated risk of localized or progressive structural failure

---

## 6. Feasibility of Rehabilitation

Required repairs would include:

- Full building shoring and lifting operations
- Complete removal and replacement of foundation system (780 CMR Chapter 18 compliance)
- Installation of reinforced concrete footings and foundation walls
- Replacement of all deteriorated sill plates and framing
- Reconstruction of compromised structural systems to meet **780 CMR and ASCE 7** requirements
- Remediation of pest intrusion and full building envelope reconstruction

These interventions constitute a **full structural rebuild**, not a repair.

---

## 7. Historic Integrity Consideration

The structure has diminished historic value due to:

- Vinyl siding obscuring original materials
- Partial window replacement resulting in non-cohesive façade
- Loss of original detailing and craftsmanship

The remaining structure does not meaningfully represent its original architectural character.

---

## 8. Cost Considerations

Estimated structural rehabilitation costs exceed **\$150,000+**, excluding full architectural restoration and code compliance upgrades. The cost is disproportionate to the remaining structural and historic value.

---

## 9. Conclusions and Recommendations

Based on the above findings:

- The foundation system is structurally deficient and non-compliant with current code
- Differential settlement (~4") has caused significant structural deformation
- Moisture intrusion and pest infestation (birds, squirrels, mice) are actively contributing to deterioration
- Structural systems do not meet requirements of **780 CMR** or **ASCE 7**
- Rehabilitation would require near-complete reconstruction

### **Recommendation:**

It is my professional opinion that the building is **not a viable candidate for rehabilitation**. Demolition is recommended as the safest, most code-compliant, and economically reasonable course of action. A new structure can be designed to meet all current structural, safety, and energy code requirements while being contextually appropriate to the neighborhood.

---

## 10. Engineer Certification

I certify that this report reflects my professional assessment based on site observations and standard engineering practices.

**Charles E Michaud, P.E.**

54 Rocky Road  
Whitinsville, MA 01588  
Tel: (508) 769-4344





### **Overall Building Condition and Loss of Historic Integrity**

The image shows the front elevation of the primary structure, a multi-family residential building originally constructed in the early 1900s. While the overall massing and form of the building remain, the structure has undergone numerous alterations and repairs that have significantly diminished its historic integrity.

The exterior is clad in vinyl siding, which obscures original materials and detailing. The window assemblies consist largely of modern vinyl replacement units, with variations in size and configuration that are not consistent with the original design. This mix of alterations results in a façade that lacks architectural cohesion.

The front porch structure has been modified or reconstructed, with modern materials and detailing that differ from traditional historic construction. The cumulative effect of these changes—including siding replacement, window alterations, and porch modifications—has resulted in the loss of original craftsmanship, materials, and design intent.

Overall, while the building retains its general shape, it no longer conveys a strong sense of its original historic character. The extent of alterations and repairs has significantly reduced the structure's architectural integrity and its contribution to the historic context.



### **Exterior Envelope Deterioration and Pest Entry Points**

The image shows a close-up view of the upper exterior façade, specifically at the soffit and trim interface above a window. The vinyl siding and trim components exhibit visible separation, warping, and displacement. Gaps are present at multiple joints, particularly where trim members meet, indicating failure of fastening and/or underlying substrate deterioration.

There is clear evidence of openings at the soffit and trim connections, which create direct pathways into the building envelope. These gaps are consistent with observed pest intrusion conditions on site and provide access points for birds, squirrels, and rodents. Discoloration and staining along the soffit suggest prolonged moisture exposure and potential water infiltration.



### **Foundation Wall Deterioration and Masonry Failure**

The image shows a section of the exterior foundation wall constructed of brick masonry beneath vinyl siding. The brickwork exhibits significant deterioration, including mortar loss, joint erosion, and displacement of individual bricks. Several bricks appear loose and misaligned, with visible gaps and voids in the mortar joints.

The condition indicates long-term moisture exposure and degradation of the mortar matrix, resulting in a loss of structural cohesion within the wall assembly. The uneven courses and localized bulging suggest movement consistent with settlement and/or lateral pressure.

Additionally, the interface between the vinyl siding above and the masonry below lacks proper sealing, creating potential pathways for water infiltration and pest entry. The observed deterioration compromises the load-bearing capacity and overall stability of the foundation wall.



### **Foundation Wall Buckling and Displacement**

The image shows a section of the exterior brick foundation wall exhibiting visible deformation and displacement. The masonry courses are no longer level, with noticeable bulging and lateral movement of the wall plane. Several bricks are misaligned, and mortar joints show signs of separation and deterioration.

The wall appears to be bowing outward, consistent with structural distress caused by soil pressure, settlement, or loss of lateral support. The displacement is further evidenced by irregular joint spacing and localized rotation of individual bricks.

At the interface between the vinyl siding and the masonry foundation, there are gaps and misalignments, indicating differential movement between the superstructure and foundation. Adjacent site conditions, including uneven ground and debris accumulation, suggest poor drainage and potential contribution to ongoing foundation instability.

Overall, the observed conditions are indicative of foundation wall failure and compromised structural integrity, requiring full replacement rather than localized repair.



### **Accessory Structure (Barn) – Advanced Deterioration**

The image shows an existing detached wooden accessory structure (barn/garage) located at the rear of the property. The structure is wood-frame construction and is in a significantly deteriorating condition.

The exterior walls exhibit extensive weathering, material degradation, and loss of protective finishes. Portions of the wood siding are deteriorated, warped, or missing, exposing the underlying structure to the elements. The roof appears aged and inadequately maintained, with visible signs of wear that may allow water infiltration.

Based on site observations, the structure is supported on a primitive foundation system and includes a dirt floor, indicating the absence of a proper slab or modern foundation. This condition contributes to moisture intrusion, instability, and ongoing deterioration of structural members.

The overall condition of the structure suggests long-term neglect, exposure to environmental elements, and lack of structural integrity. Given the extent of deterioration, including compromised framing, lack of a proper foundation system, and continued exposure to moisture, the structure is considered beyond reasonable repair and not suitable for rehabilitation.



### **Foundation Cracking and Evidence of Repeated Repairs**

The image shows a section of the foundation wall and adjacent entry stairs where significant deterioration is present. The brick masonry foundation exhibits visible cracking, mortar loss, and localized displacement. Several areas show patching and repair attempts, indicated by inconsistent mortar joints and irregular surface finishes.

The concrete stair structure adjacent to the foundation also displays stress-related cracking, particularly along corners and bearing points, suggesting movement between the foundation and supported elements. The interface between the wood framing above and the masonry foundation shows deterioration, including peeling, rot, and separation, further indicating prolonged exposure to moisture and structural movement.

The presence of multiple repair attempts—evidenced by patched mortar joints, surface repairs, and mismatched materials—indicates ongoing and unresolved structural issues rather than isolated damage. These recurring repairs have not addressed the underlying causes, such as settlement and moisture intrusion.

Overall, the observed conditions are consistent with long-term structural distress, differential movement, and progressive degradation of both the foundation wall and supported elements.



### **Exterior Siding Deformation and Non-Historic Window Replacement**

The image shows a side elevation of the structure clad in vinyl siding with multiple vinyl replacement windows. The siding exhibits visible signs of deformation, including warping, lifting, and uneven alignment along several horizontal courses. These conditions suggest improper installation and/or underlying structural movement consistent with differential settlement.

At various locations, the siding appears to be pulling away from the substrate, creating gaps that are allowing moisture intrusion and pest entry. The base of the wall, where the siding meets the masonry foundation, shows irregular transitions and potential discontinuities in the building envelope.

The windows visible in this elevation are modern vinyl replacements, which are not consistent with the original historic construction. The combination of replacement windows and deteriorating vinyl siding contributes to a loss of architectural cohesion and diminishes the building's historic character.

Overall, the observed conditions indicate both material degradation and underlying structural movement, as well as a compromised exterior envelope.



### **Non-Compliant Stairway and Structural Deterioration**

The image shows an interior stairway leading to a lower level, exhibiting multiple deficiencies related to both code compliance and material condition. The stair geometry appears irregular, with steep pitch, inconsistent tread depths, and narrow walking surfaces, which are not compliant with modern building standards under **780 CMR Section 1011 – Stairways** (including minimum tread depth, maximum riser height, and uniformity requirements).

The stair treads and supporting wood components show visible signs of wear, deterioration, and rot, particularly along the walking surfaces. Surface damage, material breakdown, and lack of proper finishes indicate prolonged moisture exposure and deferred maintenance. The surrounding wall surfaces also show staining and discoloration consistent with moisture infiltration.

Additionally, the stairs lack modern safety features, including code-compliant handrails and proper headroom clearance, further contributing to unsafe conditions. The overall configuration and condition present a significant safety hazard and do not meet current life-safety requirements.

These conditions indicate that the stair system is not only functionally obsolete but also structurally compromised, requiring full replacement rather than repair to meet current code standards.



### **Ceiling and Wall Deterioration Due to Moisture Intrusion**

The image shows an interior room with visible signs of significant deterioration affecting both the ceiling and wall surfaces. The ceiling exhibits cracking, peeling paint, and localized surface delamination, indicating prolonged exposure to moisture and potential substrate failure.

The adjacent wall shows extensive water staining and material degradation, with clear evidence of active or historic moisture intrusion. The irregular staining pattern and discoloration suggest water infiltration from above, likely related to roofing or exterior envelope deficiencies. The wall finish appears compromised, with sections showing deterioration of the underlying plaster or wallboard.

These conditions are indicative of chronic moisture exposure, which can lead to deterioration of concealed structural elements, including framing members and ceiling joists. The presence of such damage raises concerns regarding potential rot, mold growth, and reduced structural integrity of the affected areas.

Overall, the observed ceiling and wall deficiencies reflect ongoing building envelope failure and deferred maintenance, contributing to the overall compromised condition of the structure.



### **Basement Conditions: Dirt Floor, Failing Masonry, and Deteriorated Stair System**

The image shows a basement area with exposed dirt flooring and an aging brick masonry foundation wall. The absence of a concrete slab indicates a non-modern foundation system, contributing to ongoing moisture migration and unstable soil conditions.

The brick foundation walls exhibit significant deterioration, including mortar loss, surface erosion, and localized displacement of bricks. Evidence of prior patching or repair attempts is visible; however, these repairs are inadequate and have not addressed the underlying structural deficiencies. The masonry system shows signs of long-term degradation and reduced load-bearing capacity.

The stair assembly leading to the basement is constructed of wood and is in an advanced state of deterioration. The treads and supports appear worn, uneven, and structurally compromised, with visible damage consistent with rot and prolonged exposure to moisture. The stair configuration is irregular and does not meet current safety or code requirements.

Overall, the combined conditions—dirt floor, failing masonry foundation, and deteriorated stair system—indicate a structurally deficient basement environment that is not suitable for rehabilitation without full replacement of major structural components.



### **Floor Slope and Structural Settlement**

The image shows an interior hallway with visibly uneven and sloping floor surfaces. The flooring exhibits noticeable deflection and variation in elevation between adjacent rooms, consistent with significant structural movement.

Field observations indicate an approximate elevation differential of **4 to 6 inches** across the floor plane between rooms. This degree of slope far exceeds acceptable serviceability limits and is indicative of substantial differential settlement of the foundation system.

The deformation shows that the supporting floor framing has shifted out of alignment due to uneven bearing conditions below. This has resulted in overstressed joists, compromised connections, and disruption of the intended load path.

Such conditions present both a structural concern and a life-safety hazard, as the floor system is no longer performing as designed. The extent of displacement is consistent with advanced foundation failure and supports the conclusion that the structure is not suitable for rehabilitation without complete reconstruction of the supporting system.