40 & 42 DUKE STREET

OLD FIRE HALL BUILDING ENVELOPE CONDITION ASSESSMENT

Lunenburg, Nova Scotia

Prepared for:

Town of Lunenburg
177 Cumberland Street
Lunenburg NS B0J 2C0

Prepared by:

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TOR.140136.0001

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EXECUTIVE SUMMARY

As requested, Read Jones Christoffersen Ltd. (RJC) has completed a building envelope condition assessment of the Old Fire Hall located at 40 & 42 Duke Street in Lunenburg, Nova Scotia for the Town of Lunenburg. The intent of the study was to conduct a review of the visible and accessible portions of the Old Fire Hall building envelope components to identify any visually obvious areas of leakage, and deterioration to determine the likely cause of the noted distresses in order to provide recommendations for the future repair.

The Old Fire Hall, constructed in 1928, is located on the east side of Duke Street, between Townsend Street and Cumberland Street. It is a two storey, structural clay tile and brick structure with concrete foundation walls and footings, and a flat wood truss roofing system. We understand that the building has been vacant since late 2021.

Based on our visual review, the brick exterior is in good to fair condition, the roofing materials appear in poor condition, and the windows and doors appear in good to fair condition. Two exploratory brick openings were reviewed to determine the condition and composition of the building envelope. Various locations of leakage were observed inside the Old Fire Hall, and localized areas of brick deterioration and mortar step cracking were noted. Repairs should be targeted based on the intended future use of the building, but at a minimum, the roofing membrane requires replacement, the wood cornices should be repaired and repainting and resealing should be done at window and door frames in the near-term to limit leaks and prevent structural deterioration.

The table below summarizes the recommended repair options and opinion of probable costs:

SUMMARY OF RECOMMENDED REPAIR		
	Timeline	**Cost (Excluding HST)**
Near-Term Repairs and Rehabilitation	Within 2 years	$200,000 to $250,000
Long-Term Repair and Retrofit Considerations	TBD	$60,00 to $80,000
Total Opinion of Probable Construction Cost:		**$260,000 to $330,000**

1.0 INTRODUCTION

Read Jones Christoffersen Ltd. (RJC) was retained by the Town of Lunenburg to perform a building envelope condition assessment of the Old Fire Hall located at 40 & 42 Duke Street in Lunenburg, Nova Scotia *(Refer to Photo 1 to Photo 3 in Appendix A)* as outlined in our revised proposal dated August 19, 2024. The intent of the review was to conduct a survey of the visible and accessible portions of the building envelope to identify any visually obvious leakages, deterioration or deficiencies and determine the likely cause of the noted distress in order to provide recommendations for future repair.

A brief description of the scope of the review undertaken by RJC is as follows:

.1 Review of available drawings provided to RJC by the Town of Lunenburg.

.2 An interview with Town personnel familiar with the history and usage of the structure.

.3 Exploratory removal and replacement of exterior brick masonry at a sample of locations to expose the condition and composition of the concealed elements of the building enclosure. To facilitate the review of the exploratory openings on the exterior brick, RJC retained the services of a restoration Contractor for the openings.

.4 Visual review from ground level, roof level and the building's interior of the accessible portions of the brick exterior, doors, windows and roof.

The date and weather conditions at the time of our visits were as follows:

October 21, 2024, Mostly Clear, 20°C

Leigh Besanger, BEng, P.Eng. performed the assessment for RJC.

This report was prepared in accordance with generally accepted engineering practices. No other warranties, either expressed or implied are made as to the professional services provided under the terms of our contract and included in this report.

Services performed and outlined in this report were based, in part, upon visual observations of the site and attendant structures. Our opinion cannot be extended to portions of the structure that were not reviewed by RJC.

This report is exclusively for the use and benefit of the client identified on the first page of this report and is not for the use and benefit of, nor may it be relied upon by, any other person or entity. The contents of this report may not be quoted in whole or in part or distributed to any person or entity other than the client.

2.0 DESCRIPTION & BACKGROUND

The Old Fire Hall is a two storey, structural clay tile and brick structure with concrete foundation walls and footings, and a flat wood truss roofing system. Available drawings are undated but a stone engravement on the southwest corner of the building indicates: constructed circa 1928, built by R.E. Corkum, and designed by Leslie R. Fairn Architects. We understand that the building was most recently occupied by the Nova Scotia College of Art and Design (NSCAD) until 2021 but their lease was not renewed and the building has been vacant since.

Based upon our review of available drawings and our visual review, the Old Fire Hall building enclosure is generally comprised of:

.1 The building footprint is approximately 3,400 sq. ft. overall.

.2 Approximately 16" thick concrete foundation walls. No reinforcing steel is detailed on the drawings.

.3 4" thick exterior brick cladding, with a multi-wythe structural clay tile back up wall.

.4 Wood-framed windows and doors.

.5 The original or existing roofing membrane type is not indicated on available drawings, but we understand the wood truss roof system was re-strengthened in 2017 by others.

2.1 DOCUMENT REVIEW

The following drawing sets were provided to RJC as part of our review:

.1 Firemens Building, Lunenburg, N.S. drawings, prepared by Leslie R. Fairn Architects and undated.

.2 Roof Strengthening Old Fire Hall, Lunenburg Issued for Tender Drawings, prepared by Eastpoint Engineering and dated May 24, 2017.

2.2 INTERVIEW WITH TOWN PERSONNEL

The following information was obtained through interviews with the Town of Lunenburg personnel during our review:

.1 The Town of Lunenburg is considering the future use of this building with potential options including office space, workshop space and/or storage space.

3.0 OBSERVATIONS

This section summarizes our observations of our visual review from ground and roof level, and interior spaces. A representative from the Town of Lunenburg facilitated our review of the interior spaces and highlighted known areas of leakage, distress, and deterioration. Photographs and key figures from our review have been included in Appendix A of this report.

3.1 FOUNDATION WALLS

.1 The above grade surfaces of the concrete foundation wall appeared in good condition, as visible from the building exterior and basement area.

3.2 EXTERIOR BRICK

.1 Overall, the exterior brick masonry cladding of the Old Fire Hall remains in good condition with localized areas appearing in fair condition. Localized deterioration was observed in the form of brick cracking and mortar joint step cracking. Touch-up sealant repair attempts were noted at areas of step cracking which is not a recommended repair method *(Refer to Photo 4 to Photo 5 in Appendix A)*.

.2 The brick masonry cladding is constructed in a common bond pattern with five stretcher courses and one header course spaced every sixth course *(Refer to Photo 6 in Appendix A)*.

.3 It appears that the brick masonry cladding is intended to be a mass wall system that is undrained and face-sealed.

.4 Brick-infilled openings exist on the lower portion of the north elevation. Soldier course brick exists above these openings and it is evident that mortar was installed over the lintel shelf angles *(Refer to Photo 6 in Appendix A)*.

.5 The configuration of the west elevation bay doors has been altered since original construction. Bricks dissimilar in appearance, exist around the four bay doors – the original drawings show three bay doors with windows in between *(Refer to Figure 1 and Photo 2 in Appendix A)*.

3.3 STRUCTURAL CLAY TILE

.1 Where visible from inside the building, the structural clay tiles appeared in good condition. No areas of significant cracking or deterioration were noted *(Refer to Photo 7 in Appendix A)*.

.2 Where visible, the typical structural clay tile bond pattern appeared to alternate between two courses on edge, and one course on bed *(Refer to Photo 7 in Appendix A)*. Available drawings indicate the ground level wall thickness as 16", the second floor wall thickness as 12", and the attic space wall thickness as 8". As such, in addition to the exterior brick masonry and air space, the ground floor likely has three wythes of structural clay tile, the second floor wall has two, and the attic space wall one wythe.

.3 The original drawings detail plaster installed on the structural clay tiles inside the building. No insulation is shown on the drawings and based on our visual survey, the original wall thicknesses appear to correspond to existing conditions.

3.4 BAY AND ACCESS DOORS

.1 There are four bay doors on the west elevation and one bay door on the east elevation and they all appeared in fair condition, and it is our understanding they perform as intended *(Refer to Photo 8 in Appendix A)*. However, if the Town is considering converting this building to occupied space, it is anticipated that these doors will negatively affect the overall thermal performance of the building and the general comfort of the occupants.

.2 Two access doors exist off Duke Street (west elevation), one exists off Townsend Street (north elevation), and two exist off the rear (east elevation).

.3 Except for the north elevation door which appeared newer and in good condition, the other older doors were observed to be in fair to poor condition. Furthermore, the wood door frames at all locations need rejuvenation, resealing and repainting *(Refer to Photo 9, Photo 10 and Photo 11 in Appendix A)*.

3.5 WINDOWS

.1 The vinyl windows throughout the building appear newer and in good condition. However, the vinyl windows were installed into the original wood window openings which are in poor condition and require repairs, resealing and repainting *(Refer to Photo 12 and Photo 13 in Appendix A)*.

3.6 ROOFING ASSEMBLY

.1 The existing roof membrane, which appeared to be a modified bitumen sheet roofing overlain with a liquid-applied membrane, appeared deteriorated and in poor condition. Blistering, debonded areas and alligator cracking were noted and tie-ins at roof projects also appeared deteriorated *(Refer to Photo 14, Photo 15 and Photo 16 in Appendix A).* Given the recent investment into roof re-strengthening, it is recommended that the roofing membrane be removed and replaced to protect the underlying structural system and prevent leaks into the building.

.2 From ground level, failing paint finish and areas of splitting and warping were noted on the underside of the wood cornices on the north, west and south elevation walls (located approximately 600 mm below the roof edge) *(Refer to Photo 17 in Appendix A).* The top surfaces of the cornices were not accessible for our review, but based on how the cornices are detailed on the original drawings, there is the potential for moisture ingress into the wall assembly if waterproofing and watershed are not maintained on the cornices *(Refer to Figure 2 in Appendix A)*.

3.7 EXPLORATORY OPENINGS IN EXTERIOR BRICK

Two exploratory openings were created in the brick cladding to allow for a localized sample review of the concealed elements of the building enclosure *(Refer to Photo 18 and Photo 19 in Appendix A).* The exploratory openings were approximately 24" by 18" in size and were performed to examine the condition and composition of the building envelope.

.1 In general, the condition and composition at both exploratory openings were observed to be the same. The following wall construction was observed (from exterior to interior):

- Clay masonry brick (4")
- Air space (1/2")
- Structural clay tile back up wall (thickness varies)

.2 Membrane was not observed on the structural clay tile back up wall at either exploratory opening.

.3 Brick ties were not observed at either opening exploratory openings, which is typical for brick mass masonry cladding constructed with the observed bond pattern.

.4 The removed brick was reinstated.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our visual review, the Old Fire Hall building envelope appears in fair condition with the existing roofing membrane and the wood framing around doors and windows in poor condition. We understand that the extent of rehabilitation and upgrades is largely dependent on the outcome and future use of the space. As such, near-term repair and rehabilitation recommendations are presented below assuming no change in layout or function and long-term repair and retrofitting recommendations are presented for the Town's consideration and planning for the future use of the building.

4.1 NEAR-TERM REPAIRS AND REHABILITATION

If the Town anticipates that the future use of the space will not be decided for some time, extending beyond a period of 2 to 3 years, then as a starting point, it is recommended that the following repairs be performed in the near-term to prevent continued structural/building envelope deterioration and leaks:

.1 Removal and replacement of the roofing membrane. Roof insulation could also be added or upgraded during replacement of the membrane and this should be confirmed pending space use.

.2 Removal and replacement of waterproofing/flashings and repainting on the wood cornices

.3 Localized repointing on brick cladding, and

.4 Repainting and resealing of wood framing around the window and door openings.

4.2 LONG-TERM REPAIRS AND RETROFITTING

If the Town desires to upgrade the building envelope for long-term use of the space, then it is recommended to complete the above noted repairs in combination with considering the following improvements:

.1 Removal and replacement of exterior access doors – two on east elevation, two on west elevation.

.2 Removal or retrofitting of the existing bay doors – one on the east elevation, four on west elevation.

Note, for cold climates, numerous studies have determined that the optimal window-to-wall ratio (WWR) for energy performance is approximately 25% to 35%. With the bay doors considered as "windows" in this determination, the west elevation WWR is calculated to be approximately 28%. In

general, retrofits would upgrade the air and moisture control at the bay doors, improve localized thermal performance, and allow for the overall aesthetic of the building to remain intact.

If changing the building's exterior aesthetic is not an option due to the Town's heritage conservation policies, then hygrothermal analysis of the structural clay tile and brick masonry wall is recommended to study the impacts of insulating the walls from the inside, with spray foam or otherwise. Without first assessing the critical freeze-thaw saturation point of the masonry, insulating the building from the inside has the potential to initiate rapid deterioration of the masonry wall structure by reducing the drying potential of the wall assembly and increasing freeze-thaw risk. In general, a hygrothermal analysis and assessing the feasibility of insulation upgrades are considered beyond the scope of this report. As such, the associated costs have not been included in our Opinion of Probable Construction Costs presented in Section 5.2.

5.0 OPINION OF PROBABLE CONSTRUCTION COSTS

The following cost estimates presented for the repair and upgrade of the Old Fire Hall represent our opinion of the probable construction cost based on the limited information obtained during this condition survey assessment. The final costs will not be known until such time that the work is tendered and completed. It is not possible to accurately forecast the final bid unit prices that may be tendered for the work because they are directly related to the construction climate at the time of tendering. The costs noted below should be treated as "ball-park" or Class D[1] (+/- 25%) figures only and cannot be guaranteed accurate.

5.1 NEAR-TERM REPAIRS AND REHABILITATION

The probable construction cost for the above noted repairs and rehabilitation program, assuming all the work is performed in one phase, is in the order of approximately $200,000 to $250,000 plus H.S.T., in 2025 dollars, excluding engineering fees, soft costs, and material testing costs.

5.2 LONG-TERM REPAIRS AND RETROFITTING

The probable construction cost for above noted repairs and rehabilitation program, assuming all the work is performed in one phase, is in the order of approximately $60,000 to $80,000 plus H.S.T., in 2025 dollars, excluding engineering fees, soft costs, and material testing costs.

SUMMARY OF RECOMMENDED REPAIR		
	Timeline	**Cost (Excluding HST)**
Near-Term Repairs and Rehabilitation	Within 2 years	$200,000 to $250,000
Long-Term Repair and Retrofit Considerations	TBD	$60,00 to $80,000
Total Opinion of Probable Construction Cost:		**$260,000 to $330,000[2]**

[1] Class "D" probable costs – a statement of general requirements and an outline of a solution (degree of accuracy +/- 25%). Probable Construction Costs are in 2025 dollars and do not include soft costs, engineering fees, material testing, permits or HST unless noted otherwise. Furthermore, probable costs do not include any direct or indirect costs associated with potential trade tariffs, as the impact referpotential trade tariffs will have on the costs for the recommended repairs cannot be accurately forecasted.

[2] Opinion of Probable Costs do not include for the remediation, abatement, and disposal of any hazardous materials such as lead, asbestos, or otherwise.

6.0 CLOSING REMARKS

Thank you for selecting Read Jones Christoffersen Ltd. for this assessment. RJC would be pleased to assist you with the implementation of our recommendations. Should you have any questions or concerns, please do not hesitate to contact this office.

Yours truly,

READ JONES CHRISTOFFERSEN LTD.

Leigh Besanger, BEng, P.Eng.
Project Engineer

Reviewed by:

Duncan Rowe, BASc, MEng, P.Eng., LEED® AP, BECxP, CPHC
Principal

Engineers

APPENDIX A

PHOTOGRAPHS & FIGURES

January 24, 2025
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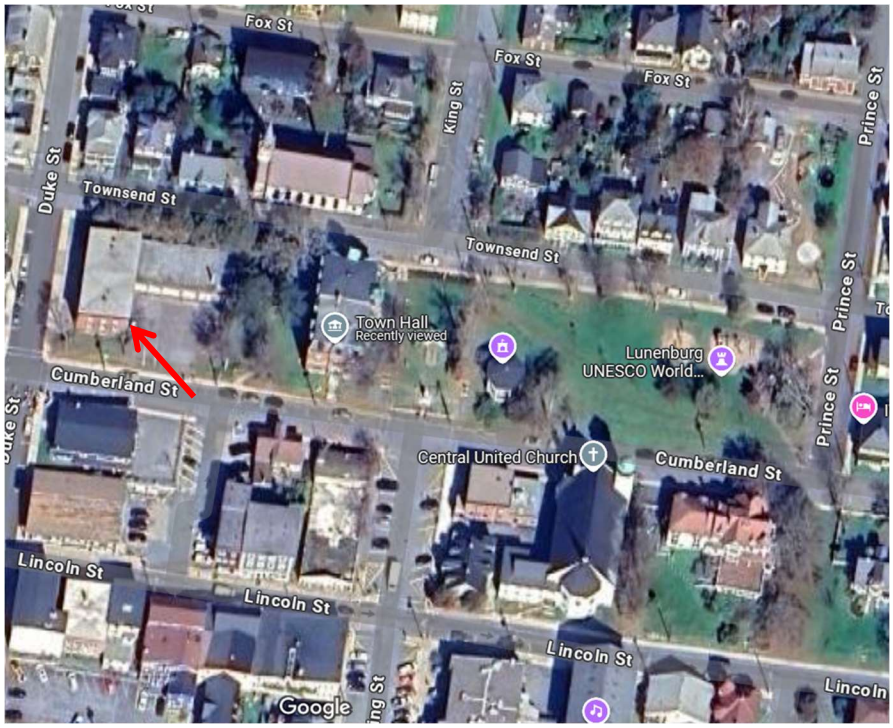

Photo 1: Google Maps aerial view excerpt of the Old Fire Hall located at 40 & 42 Duke Street

Photo 2: Overview of Old Fire Hall north and west elevation

Photo 3: Overview of Old Fire Hall east elevation

Photo 4: Localized step cracking with touch-up sealant repair attempts

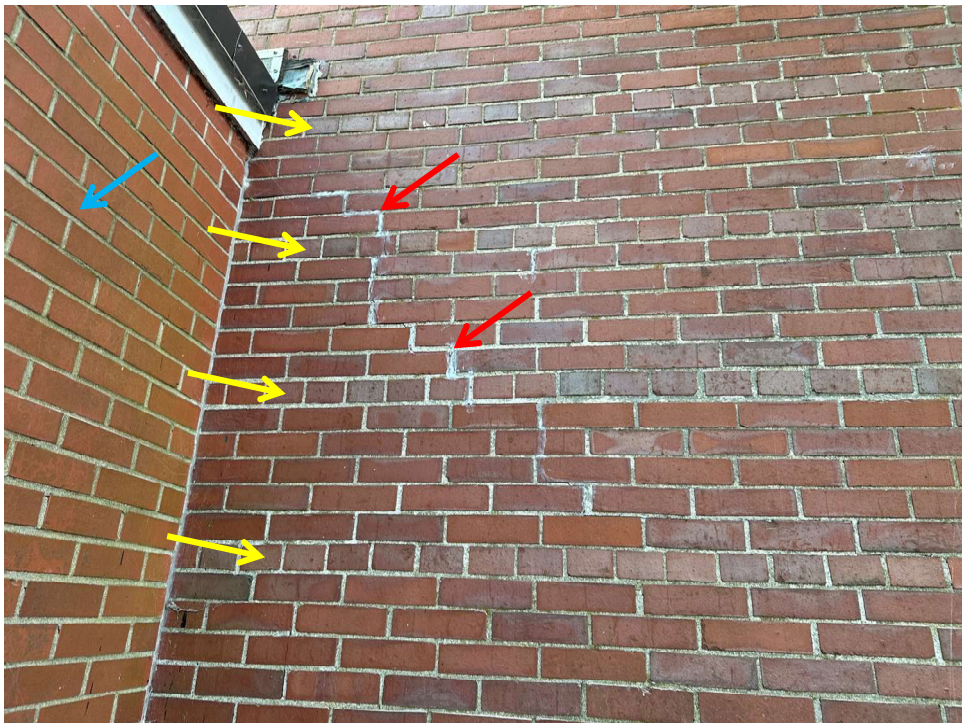

Photo 5: Typical brick masonry bond pattern. Yellow arrows at header courses. Red arrow at step cracking with touch up sealant repair attempt. Blue arrow on west wall of Electric Light Shop

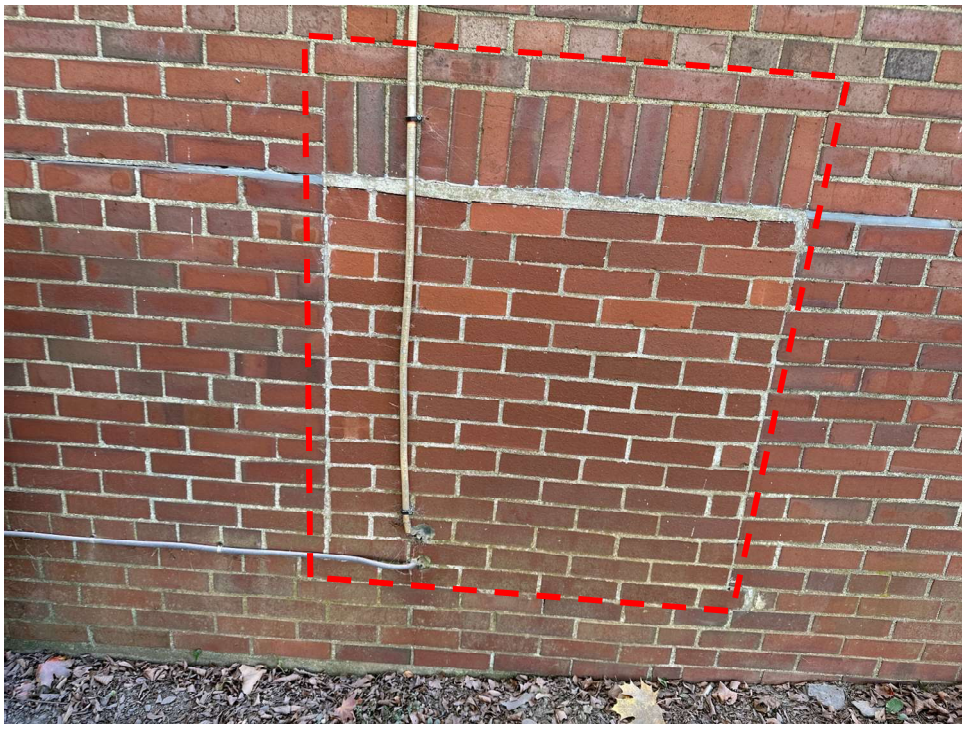

Photo 6: Brick infill at pre-existing window opening (typ. at two locations)

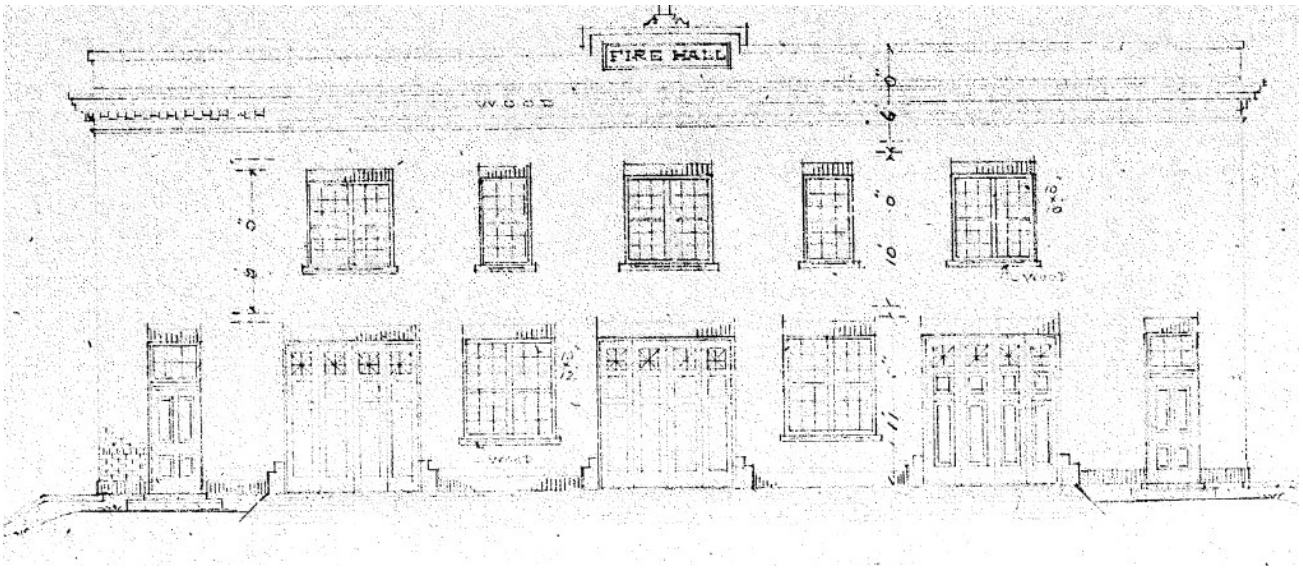

Figure 1: Original (circa 1928) bay door configuration on east elevation from circa 1928 drawings

Photo 7: Structural clay tile as visible from building basement. Yellow arrows at on bed courses

Photo 8: West elevation bay door interior (one of four)

Photo 9: Basement access doors and bay door on east elevation (rear of building). Blue arrow on south wall of Electric Light Shop

Photo 10: Close up of east elevation door with deteriorated wood threshold and failing paint finish

Photo 11: Close up of west elevation door with failing paint finish near southwest corner of building

Photo 12: Interior close up of newer vinyl window (typ. throughout building) set in original wood frame in fair to poor condition

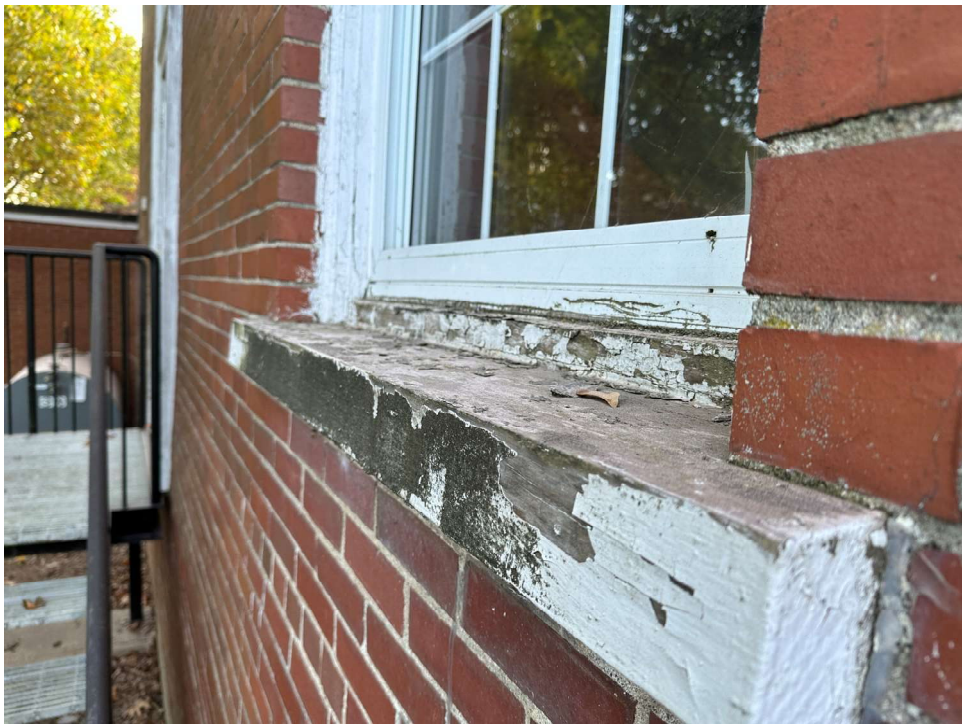

Photo 13: Failing paint finish on exterior window sill (typ. condition at others)

Photo 14: Overview of existing roofing membrane

Photo 15: Close up of deteriorated roofing membrane that had a coating applied overtop

Photo 16: Alligator cracking on roofing membrane telescoping through the coating at north chimney

Photo 17: Failing paint finish and deterioration on underside of wood cornice at southeast corner

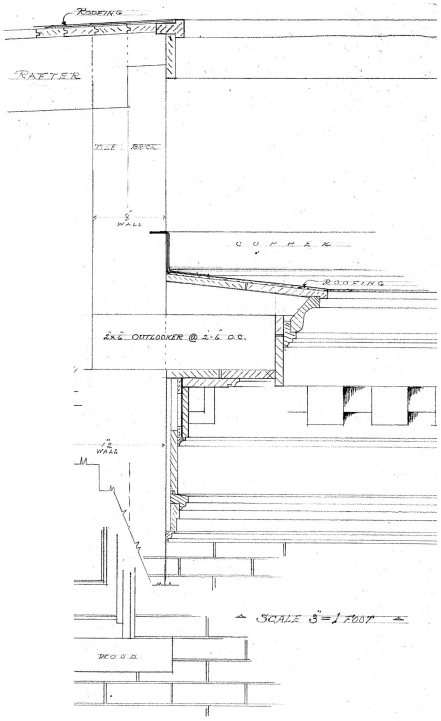

Figure 2: Original (circa 1928) typical cornice detail. Note, moisture ingress has potential to deteriorate "outlooker" and wall cavity if the cornice detailing is poor

Photo 18: Exploratory brick opening on north elevation

Photo 19: Exploratory brick opening on south elevation