



LEA Consulting Ltd.

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October 23, 2017

Our Ref.: 17180

City of Markham
Planning & Urban Design Department
Anthony Roman Centre
101 Town Centre Boulevard
Markham ON L3R 9W3

Attn: Mr. Regan Hutchinson,
Manager of Heritage Planning

Email: rhutcheson@markham.ca

Re: 9900 Markham Rd., Markham

Dear Mr. Hutchinson,

As authorized by Mr. George Duncan of City of Markham, we visited the house on October 7, 2016 at 9900 Markham road to carry out a structural evaluation. The building is a two storey and one storey structure with partial basement along the east side and crawl space under the one storey portion. Our visit was visual where the structure was exposed and with no destructive testing was carried out. In addition, we carried out calculations to determine the capacity of the certain structural components.

Limitations

- No party other than the Client shall rely on the Consultant's work without the express written consent of the Consultant. The scope of work and related responsibilities are defined in the report. Any use which a third party makes of this work, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Decisions made or actions taken as a result of our work shall be the responsibility of the parties directly involved in the decisions or actions. Any third-party user of this report specifically denies any right to any claims, whether in contract, tort and/or any other cause of action in law, against the Consultant (including Sub-Consultants, their officers, agents and employees).
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- This work does not wholly eliminate uncertainty regarding the potential for existing or

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- Only the specific information identified has been reviewed. The Consultant is not obligated to identify mistakes or insufficiencies in the information obtained from the various sources or to verify the accuracy of the information.
- LEA Consulting Ltd. is not investigating or providing advice about pollutants, contaminants or hazardous materials. This work is included only in the mandate of the environmental consultant.
- Budget figures are our opinion of a probable current dollar value of the work and are provided for approximate budget purposes only. Accurate figures can only be obtained by establishing a scope of work and receiving quotes from suitable contractors.

1.0 General

We understand that the house was constructed in mid 19th century. The building has been vacant for sometime and there are obvious signs of vandalism which resulted in water infiltration in the house causing further deterioration. The house is constructed with brick walls, rubble and stone foundations and wood floors and joists.

We have performed calculation on representative joists. We used current code for the loads; live load 40 psf. and design snow load of 30 psf.

2.0 Observations

2.1 Roof

The roof is sloped as shown in the attached plan sketches. The roof joists consist of 4 ½" by 4" wood rafters spanning in the EW direction at 24" on centre. There appears to be collar ties at the ceiling level that support the ceiling and ties the roof rafters. There is no ridge beam at the peak of the roof which creates stability issues. The roof sheathing is wood decking with extensive sign of moisture damage and rot. Daylight can be seen in certain areas and a large tarp is placed to reduce water penetration. The finishes have been damaged extensively. We used a drill and screw driver to determine the condition of the wood. The outer ¼" appeared to be soft in certain areas. This is a sign of rot over the years.

2.2 Second Floor Level

There is a low roof at the second-floor level at the west side. The rest of the area is bedrooms and hallways. The floor framing is captured in the attached sketch plan. the floor joists are primarily 3" by 8" (full size) sawn lumber spaced at 24" on centre. The floor deck is wood decking spanning between the joists. Over the living room and kitchen, the drywall was in place in most areas and limited review was possible. The framing is unusual and doesn't appear to have been constructed by qualified contractors. It is unusual to see floor joist spaced this far and spanning in the longer direction.

The low roof comprises of 2" by 6" (full size) spaced at 16" on centre spanning the full 20' distance in the NS direction. The roof showed signs of leakage and deterioration in various areas.

2.3 Ground Floor

The ground floor in the east wing consist of 3" by 9" and 3" by 8" joists spanning in EW direction and spaced at 24" on centre. There is a wood beam supported on sporadic make shift posts at random locations. The beam was in poor condition and signs of crushing at the post locations can be seen. The joists over the crawl space consist of 3" by 8" sawn lumber spanning in the EW direction and spaced at 24" on centre. We couldn't get close to the joists in the crawl space but in the basement area, we observed signs of rot on the joists. The joists seem to have been painted in the past and all the paint is peeling and the wood is rotting. The rot was measure about ¼" from the outer surface.

2.4 Foundation Walls

The basement walls are constructed with rubble. We were not able to see any footings under the perimeter wall. In older houses, it is common that walls are constructed of flat stone. The mortar in many areas have deteriorated and is soft when poked with a screwdriver. In many areas, the stones have dislodged and cracked. Efflorescent is present in many areas which is a sign of water leakage.

2.5 Perimeter Building Walls

The outside walls consist of double wyths of red brick. There are many locations where the bricks have been significantly deteriorated to a point where we could poke a screw driver right through the brick and mortar joints. These are areas near eave of the roof where water has been infiltrating. At the corners of the house there are many step cracking which is an indication of settlement or heave. Since the building has been unheated and unprotected, chances are that freezing conditions caused heaving and movements in the foundations. The lintels are either wood or brick arches and have cracked due to movements.

3. Recommendations

The roof rafters in both low and high roof are under sized for current snow loads. In the past, buildings were not properly insulated and as a result snow accumulation tends to be small. If the house is renovated and properly insulated, the roofs must be able to support current snow loads prescribed in Ontario building Code. The roof rafters on the high roof are 115% utilized and have L/80 deflection performance. The low roof joists are 228% utilized under design snow loads (no snow accumulation has been considered). Therefore, both roof structures will require reinforcing. The existing rafters can remain in place but in our opinion, it may be more economical to remove the roof structure and replace with new joist, decking and roofing. If existing structure is to remain, the new decking would be required and new joists/ rafters would have to be added in between existing ones.

The second-floor joists over the living room area are about 110% utilized have a L/110 live load deflection under design live load. This area would require new joists in between existing ones. The decking also need repairs, either full removal or additional ¾" plywood over the existing floors. The joists over the dining room and kitchen have shorter spans and are adequate. However, the deck would have to be either reinforced or replace.

The beam in the ground floor needs replacement and new piers and footings are needed. The floor joists are anywhere from 114% to 123% utilized fail in deflection criteria. The floor decking needs replacement or reinforcing and joists would require installation of new ones in between the existing joists.

The outside masonry walls require replacement and repointing in many areas. The long-term exposure to the elements have deteriorated the mortar and bricks in locations. For purpose of pricing, we estimate that 60% of the walls will require replacement or repointing. There appears that thick parging and in some locations insulation were added without proper vapour barrier. This can trap moisture and would not allow the wall to breath and dry off causing deterioration of the brick and mortar.

Similarly, the foundations walls need repointing and replacement in some areas. We have assumed that 50% of the wall will require repointing and repair. If the wall is going to be reused, the exterior of the wall will require moisture protection. This would require excavation around the house and waterproofing applied. We would recommend adding 6" concrete wall against the foundation walls. Since there is shifting of the footings, the foundation will likely require underpinning to ensure the wall is bearing on solid bearing surface. Alternatively, helical piles can be added along with a new layer of foundation wall.

4. Opinion of Cost

In driving an opinion of cost, we assumed that the existing structural members will remain in place where they are sound and additional joists, studs, rafters, deck etc. will be added as needed. We assumed that the new structural elements will be modern materials. Based on these assumption, it is our opinion that the cost for repair of the structure will be in order of \$400,000. If the material for the repairs are to match existing construction such as the brick and sawn lumber, we estimate that the premium would be in the order of 20%. It is possible that some items may not even be possible such as matching the existing brick and the rubble foundations. Some of the costs would not change such as underpinning. The interior finishes and services will also require complete overhaul. This is outside of our scope and expertise and are not included in the opinion of cost.

5. Conclusion

The building structure is in dire condition and requires extensive structural remedial work. We don't believe that the house is in an imminent collapsing condition but it will require appropriate safety measures during construction. We have provided an opinion of cost for the structural cost. This is an order of magnitude opinion of cost and the exact cost can be determined once a scope is defined and a contractor is able to price the work.

We trust this is sufficient, please do not hesitate to contact us for any further information.

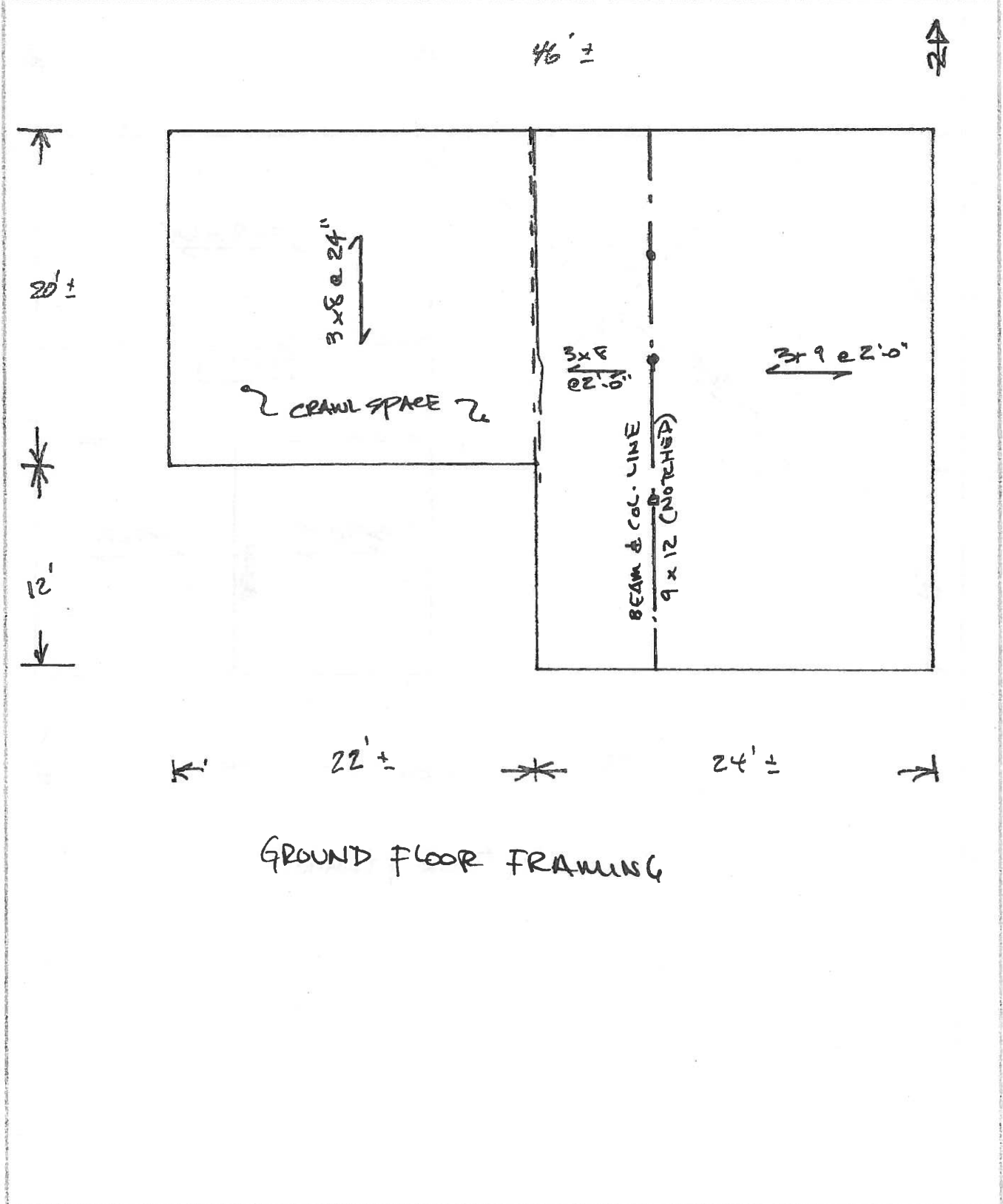
Yours very truly
LEA Consulting Ltd.



Shahe Sagharian, P. Eng.
Project Manager

Attachment: Limitations, Sketch Plans, Photographs
Cc: George Duncan gduncan@markham.ca

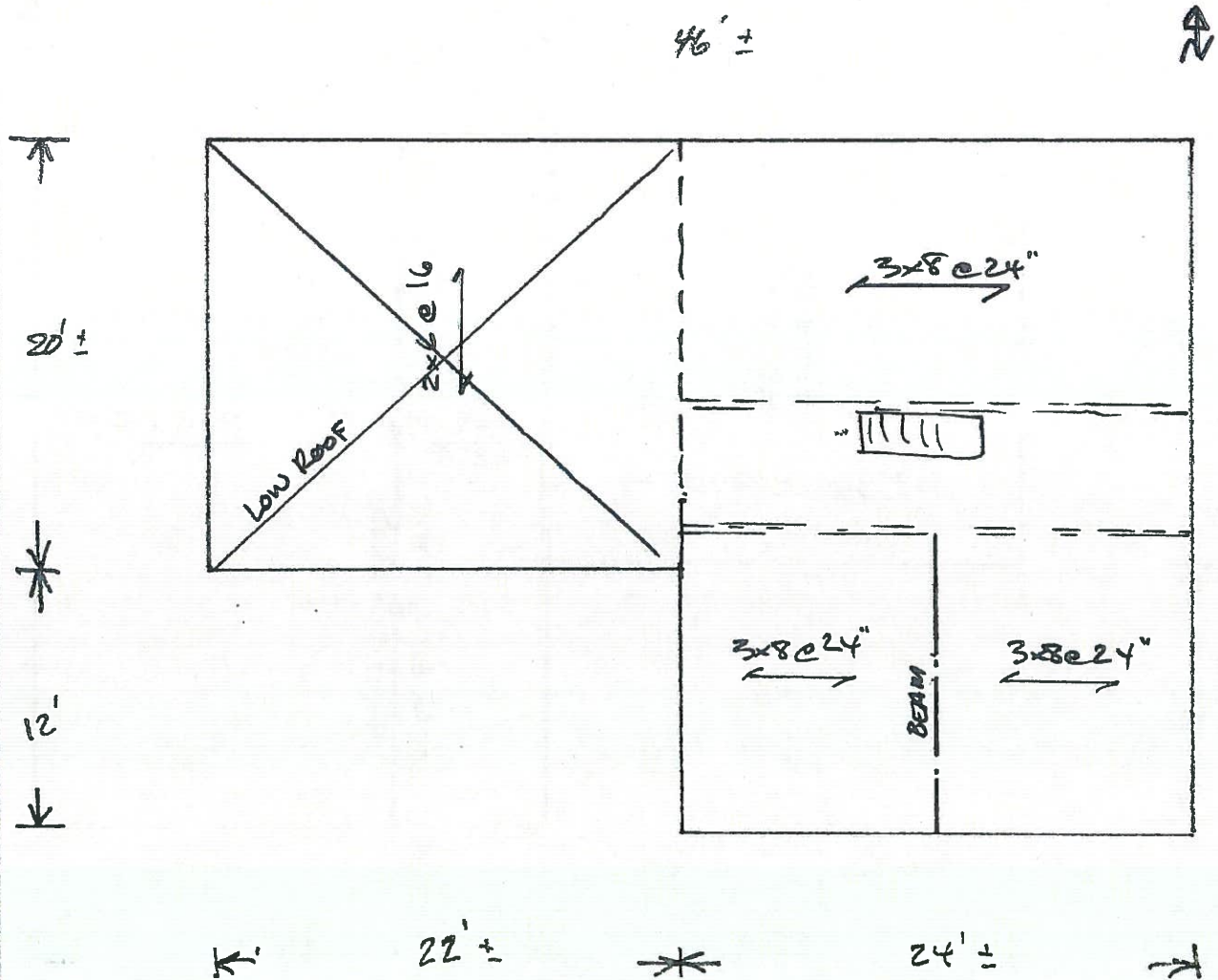
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GROUND FLOOR FRAMING



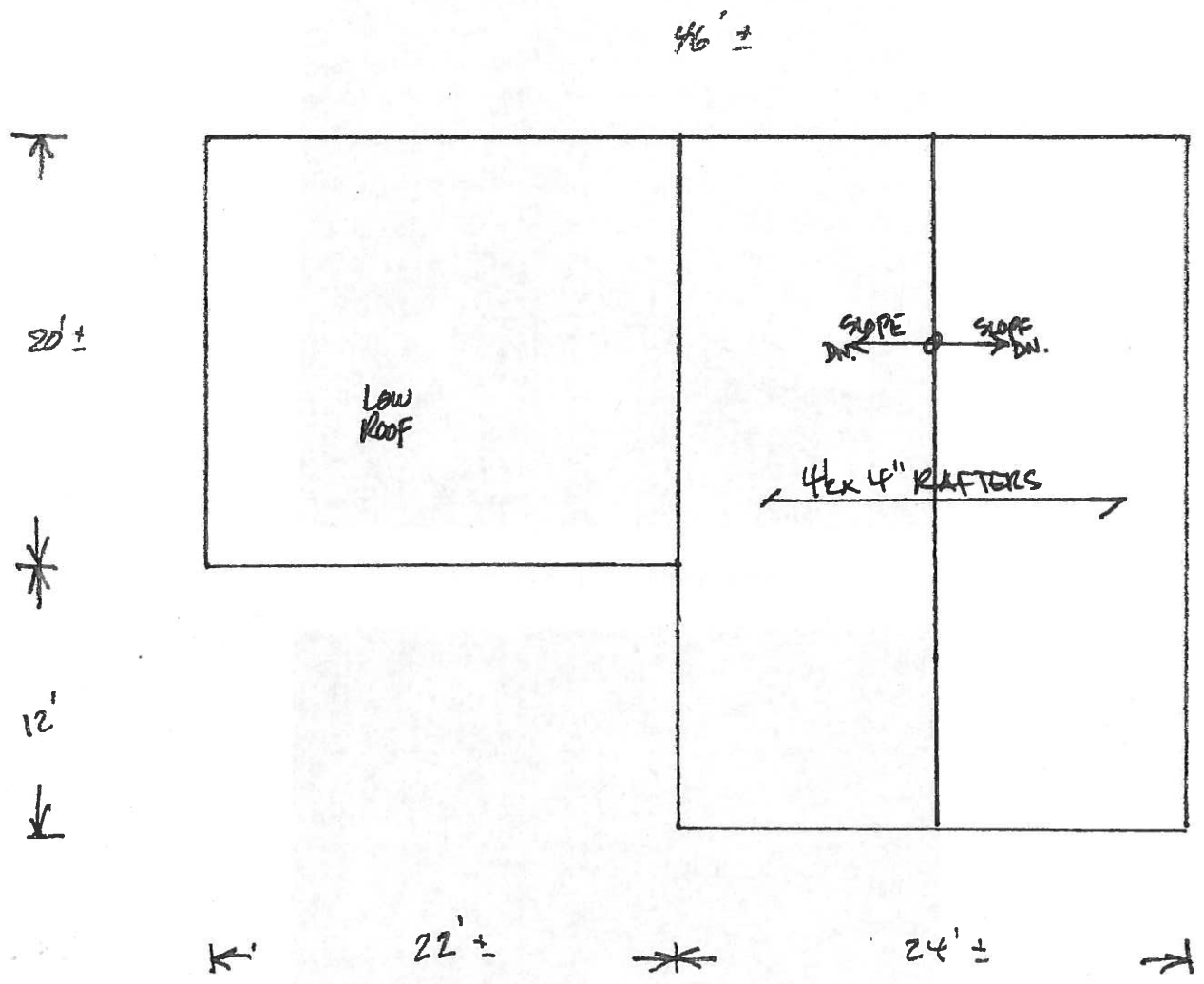
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SECOND FLOOR FRAMING



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ROOF FRAMING PLAN





Main wood beam in basement



Main wood beam in basement



Brick pier under the beam in basement



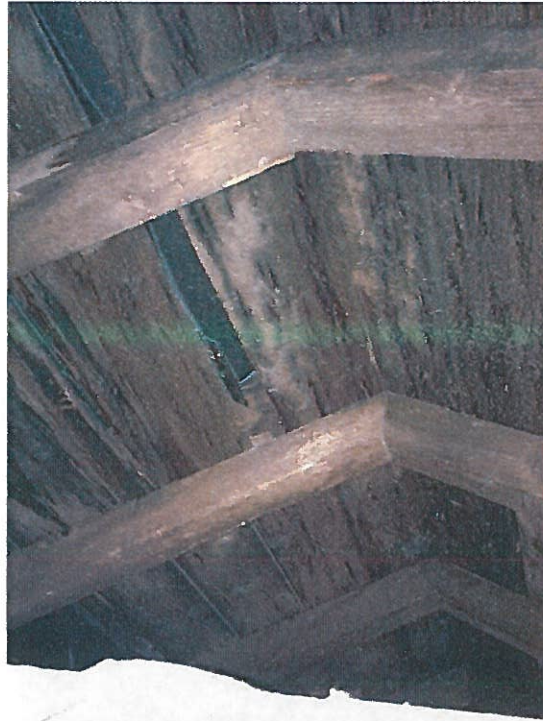
Steel post crushing into beam (no footing can be seen)



Foundation wall in basement (Screwdriver through mortar)



Deterioration of basement wall



Roof rafters



Wall at dormer location



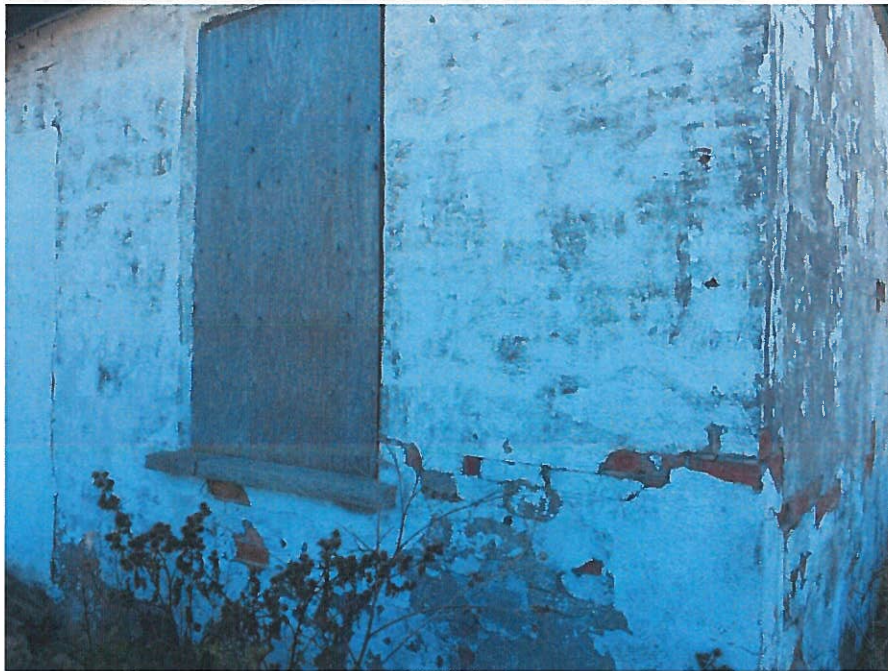
Roof joists at low roof



Exterior wall cracking at lintels



Typical cracking at corners



Typical cracking at corners



Typical cracking at corners