STRUCTURAL REVIEW OF EXISTING BUILDINGS

Existing Barns at KVCC Hinkley Campus
Fairfield, Maine

S.I. Job # 13-0081

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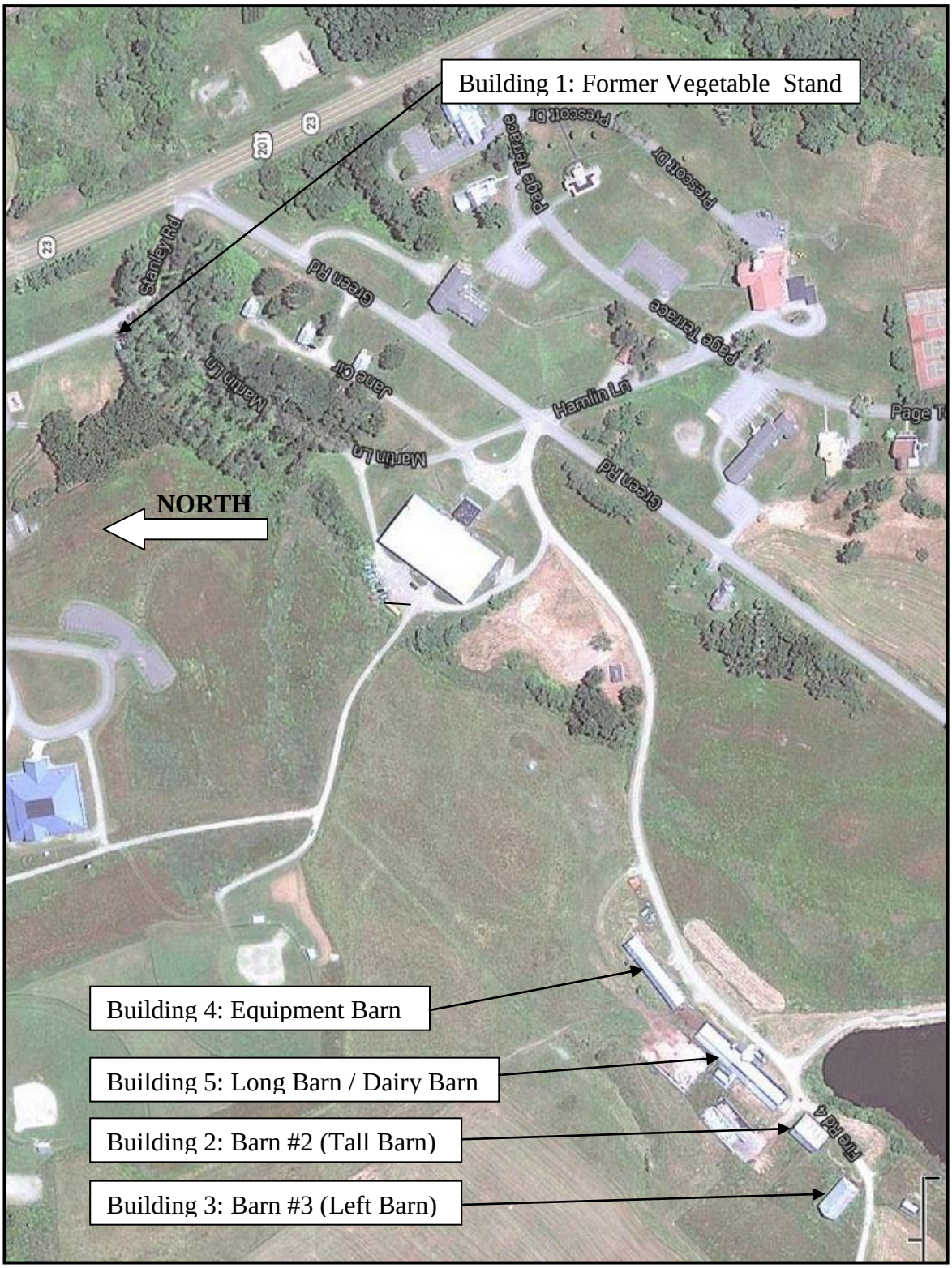

Figure 1: Building Map Key Plan

Report Abstract:

We have completed the evaluation of the existing five buildings at the referenced site. The opinions and comments contained herein are based on visual observations made during our multiple visits to the site. Architectural, mechanical, electrical, and plumbing conditions are not included in this report. No warranty expressed or implied, as to the condition of the complete structure, is intended.

We observed the five buildings in question at KVCC Hinkley campus on 05/10/2013 and 07/12/2013. These buildings are shown in Figure 1 and include:

Building 1: Former Vegetable Stand
Approximate Footprint: 20ft x 40ft

Building 2: Barn # 2, (Tall Barn)
Approximate Footprint: 43ft x 62ft

Building 3: Barn # 3, (Left Barn)
Approximate Footprint: 40ft x 72ft

Building 4: Equipment Barn
Approximate Footprint: 30ft x 176ft

Building 5: Long Barn/Dairy Barn
Approximate Footprint: 38ft x 225ft + side buildings

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Building #1 Former Vegetable Stand

Figure 2: Front Face of Former Vegetable Stand

Based on our observation of the existing building, the vegetable stand is a typical construction, wood framed building, that rests on 8" diameter concrete piers in an approximately 10'-0" sq. pattern. The floor construction is 2x8 joists @ 16" o.c. on a 2x3 ledger attached to 6x10 beams at the center line and side walls. The floor joists can adequately support the min design floor load of 40psf that is suitable for classroom space. The 6x10 beam along the center of the structure spans a greater distance than the others and cannot support this required load.

The exterior deck (2x8's @ 16" o.c.) in front of the building appears to be in good condition, made of appropriate materials, sufficiently braced and assembled with solid connections. This area does not appear to require additional work.

The wall construction appears to be 2x4 @ 2'-0" with board exterior sheathing, and is sufficient to carry the roof. The only issue found with the walls appears at the gable end where the wall was stack framed, leaving a "hinge" at the top plate of the main walls as seen in Figure 4. This will require a girt to stiffen the wall and transfer horizontal loads through it to the corners. This could be a light shelf etc.

The cantilevered loft above the back room appears to be suitable for light storage purposes and is adequately bracing the back wall top plate "hinge." This area should remain or a new girt should be added similar to the front wall.

The roof construction is gable style 2x6 rafters @ 2'-0" with 2x6 ties @ 10'-0" spacing as shown in Figure 3. With the given spans the rafters are currently able to hold a maximum of 20psf uniform snow load, which is well shy of the required 67psf snow load. They should be sistered with deeper members at a tighter spacing. Additional ties are also required @ 4'-0" max between the existing to resist the trust from the roof.

We also understand that this building may be placed on a new frost protected concrete foundation. Since floor and walls are adequate, we see this as a viable option for this building. The center beam line in the floor could be corrected at that time.

In general, the structure does not meet the required snow loads and will need roof reinforcement to be able to meet modern snow load requirements. Also a horizontal girt at the front wall, several new rafter ties and added supports at the center beam line will be needed. We estimate the costs of these structural improvements not including a new foundation to be approximately $15,000. A new foundation for this structure would be approximately $15,000 and the cost of jacking approximately $8,000.

If this building is to serve a heavier occupancy, such as assembly or retail space, floor strengthening would also be required. This might be the tipping point to consider a new structure. The costs of a new foundation and floor and roof improvements for assembly or other heavy use would likely exceed the cost of a new similar structure.

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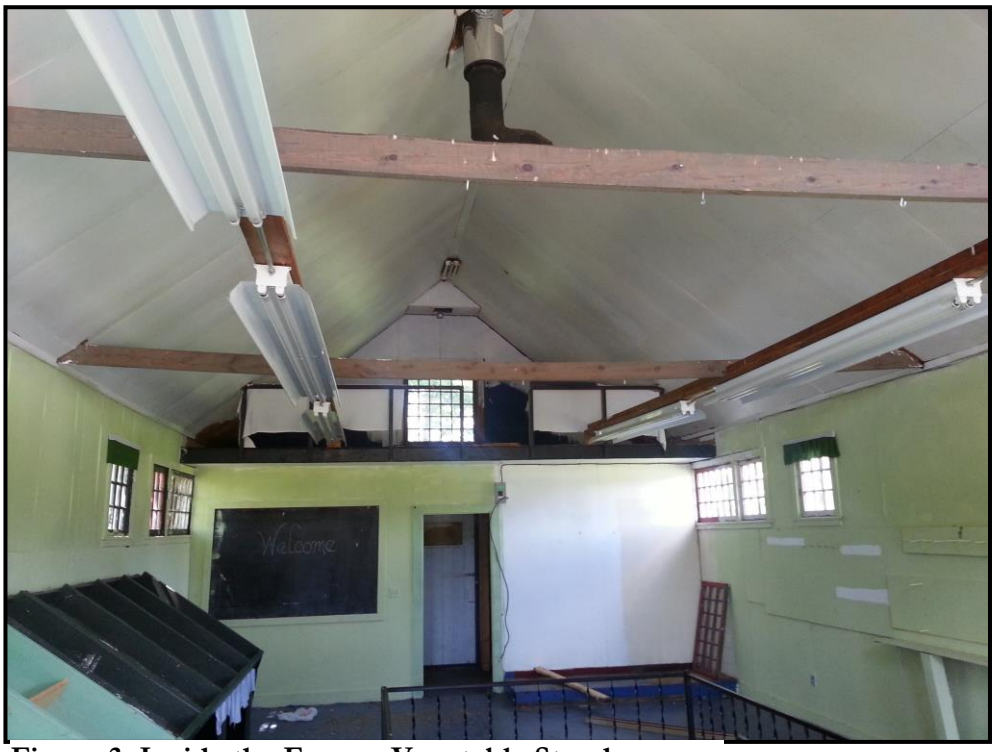

Figure 3: Inside the Former Vegetable Stand

Figure 4: Interior Front Wall Picture

Building #4: Equipment Barn

Figure 11: North View of Existing Equipment Barn

This pole barn is constructed with high pitch roof trusses, built of 2x4 and metal truss plates and can currently support 20psf snow load, which is just shy of the 25psf requirement for the current usage. Additional truss bracing along the bottom chord and longer web members in the open portion of the building in combination with strengthened heel connections will bring the roof into code compliance.

The enclosed portions of are constructed with 2x6 framed walls between timber poles. However, the timber poles in the open portion do not appear to be able to support the required wind loads. Adding sheathing to the north side end wall will help to reduce the dependence on the poles for lateral stability and bring those into a safe working range regarding wind loading.

Additionally, our limit excavation around a few pole revealed that the treated poles are not yet showing signs of significant decay or rot. A full depth exploration as to the depth of the poles and any footings should be investigated to confirm frost protect during a design for reuse

The existing headers between poles on the door side can currently support only 10 psf of snow load and will need to be strengthened with additional beams to meet the required loads if the barn is to be rehabilitated.

The slab floor at the enclosed portion of the building has heaved and settled as much as 8" in spots. At a minimum, the slab at the south west corner of the building will need to be removed as it is severely undermined. A new concrete frost wall and slab will be needed at the areas to be enclosed for conditioned use.

It is our recommendation to demolish the entire existing slab, cast new concrete frost protected foundation walls, and pour a new slab as replacement. The new foundation wall and slab would best prepare this building

for any potential change in use to conditioned class room or prep space. The roof over this area is of concern and will need to be additional reinforced to take the increased snow loads related to this conditioned space.

In general, the structure does not currently meet the required snow and wind loads, but with the issues mentioned above resolved this building could be rehabilitated and purposed for conditioned usage. We estimate the cost of the structural roof repairs and end wall bracing to be approximately $45,000. This outweighs the cost of building new equipment shed. The conditioned areas would be fairly pricy due to the need for new frost walls and slabs. We anticipate the concrete work; wall framing and roof reinforcing at the conditioned spaces will cost approximately $50.00 per square foot of conditioned space.

Figure 12: Settled / Undercut Slab Near West Corner.

Figure 13: View Looking North Inside Open Portion of Existing Equipment Barn

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Building #5: Dairy Barn

Figure 14: South View of New Addition of the Existing Dairy Barn

Based on our observations of the existing dairy barn building consists multiple additions of similar structure. The main portion of the building, where the bulk of the cattle were held, is a 225ft long building with two slightly different editions. The older 150ft long portion is built of 2x trusses bearing on an the exterior walls around the perimeter and on two rows of interior 5" diameter sleeved pipe columns at the interior.

The newer addition can be seen in Figure 14 and is similar to the older portion with the exception that the trusses span the full width of the building without the any interior supports.

The roof trusses over the pipe columns can carry approximately 20psf and are limited by the 2x6 top chord members. Once the top chord members are reinforced or additional web members are introduced the truss should be able to withstand the required combined wind and snow load of 53psf. This reinforcing is time consuming.

The perimeter wall construction appears to be in good shape and will most likely not need any additional reinforcement. However, the interior pipe columns have rusted and corroded over the years and will need to be inspected individually for soundness at the time of design. Of the specific column members we looked at the pipe columns appeared of sufficient integrity to support said roof loads.

In several locations however pipe columns were missing and should be replaced. There are two locations in which a make-shift load transfer truss was constructed to carry the missing column load, as seen in Figure 16 and 17. This transfer truss appears of decent quality and has the potential to support upward of 5,000lb, where 3,000lb are required, but the beam (tie-chord) below is split at center span below, see Figure 16. Without reinforcing the connection can only support 2,000lb. Rehabilitation of these special transfer trusses could be as simple as an additional sistered on an additional member.

The triple 2x6 beams that span 8ft between the pipe columns and carry the roof trusses can carry 18 psf. This is less than the required 32psf and, depending on the new configuration of the reinforced truss, will need to be reinforced or replaced with engineered lumber. When this is complete the spans could be adjusted.

The slab in the main portion of the building appears to be in good condition, except for the damaged section along the north wall, where heaving has cracked and crumbled portions. This will need to be cleared out and replaced.

In general, the main structure does not currently meet the required snow and wind loads, but with the issues mentioned above resolved this building could be repurposed for classroom usage. A new slab on grade would be needed and the remaining head room would be less than 8'-0". This building is only a viable candidate for rehabilitation and reuse if the cost of environmental remediation is less than the cost to demo the structure. We estimate the cost of these structural repairs and new slab to be approximately $250,000. This may cost slightly less than the cost of building a new structure of similar size and capacity and should be examined as such.

The two wing additions off the main structure to the east and west appear to be of similar construction, but lack the inherent quality the main building has. It is for this reason that we recommend the wings be rebuilt.

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Figure 15: North View of Older Addition of the Existing Dairy Barn

Figure 16: Transfer Truss Where Column Removed Below.

Figure 17: Bottom of Existing Transfer Truss