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April 30, 2007

Town of Hollis
7 Monument Square
Hollis, NH 03049

Attention: Ms. Catharine W. Hallsworth

Re: Structural Review
The Farley Building
Hollis, NH

Dear Ms. Hallsworth,

In addition to the Phase I walk-thru (see our attached report dated February 1, 2007), finishes were removed by your staff as required for our office to complete our study.

We were able to determine extent of previous reinforcing and verify existing member sizing and better compare most existing conditions and existing reinforcing to the Structural Engineering report dated January 14, 1991 and related drawings as prepared by Mr. George Horowitz.

It was determined during this phase that some reinforcing has been installed and that it is also different than the suggested reinforcing prepared by Mr. Horowitz. We have analyzed the building as is and have provided drawings S1 thru S4 dated April 30, 2007, for reference to reflect current existing conditions and also to show new required reinforcing. Our report herein describes some of the reinforcing and also indicates allowable load capacities of existing conditions as well.

It shall be noted that this report was limited to the major areas of framing and that the framing areas around the stairs, the corridors, the west end addition structure and the fire escapes were not investigated for this report nor did the inspection include review for hidden rot or deterioration.

For reference, the front porch is assumed to be the building's east side and the rear addition is the west side.

Roof Framing - viewed from attic floor (Drawing S4)

Area over Room #27:

- An access hole was provided through the ceiling to view the flat roof framing. It was determined that the area was not reframed as previously recommended, instead the span of the existing hip and some of the existing rafters have been shortened by adding new LVL supports and is still inadequate to support current snow loads and snow drifting from the adjacent higher pitched roofs.
- The adjacent roof rafters are severely undersized for their span and in need of reinforcing or replacement.

Area over Corridor (outside of Room #27):

- New (2) 1.75x7.25 LVL's were added under the rafters tails and bearing over the attic floor joists.
- Add Simpson twist straps between the roof rafters, attic floor joists and the new (2) LVL's to better connect the existing framing to the LVL's.

Area over Room #25:

- The line of (2) LVL's installed under the intersection between the roof rafter and the collar ties in the north-south direction along the east side are currently insufficient but if the building is kept heated, they are adequate, see summary below.
- Simpson twist straps shall be added at each rafter/collar tie and connected to the LVL to better connect the existing framing to the LVL's and reduce the unbraced length of the LVL's
- The new 4x4 center column under the LVL's is insufficient based on its unbraced length and needs to be reinforced. Apply a new full height 2x4 to each side of the 4" face and extend up to the top of the new LVL's. Face nail with 2 rows of 16d nails at 16" o.c. – full height.
- The center column is supported by a triple LVL bearing on the attic floor and appears to be spanning from the exterior wall to the column in the middle of room #25 below.

Area over Room #24 and #26:

- The two lines of (2) LVL's installed under the intersection between the roof rafter and the collar ties in the east-west direction are currently insufficient but if the building is kept heated, they are adequate, see summary below.
- Simpson twist straps shall be added at each rafter/collar tie and connected to the LVL to better connect the existing framing to the LVL's and reduce the unbraced length of the LVL's
- The new 4x6 columns under the LVL's are insufficient based on their unbraced length and need to be reinforced. Apply a new full height 2x6 to each side of the 6" face and extend up to the top of the new LVL's. Face nail with 2 rows of 16d nails at 16" o.c. – full height.
- The 4x6 columns appear to align over the existing building columns in the Rooms #24 and #26 below.

Roof framing summary:

- Upon our review, the building appeared to be heated but kept slightly above freezing. The Building Code recognizes snow loads differently for a heated building and one where the building is kept just above freezing. The Building Code calculations determine that the roof snow loads based on roof pitch and ground snow loads for the Town of Hollis to be 35 pounds per square foot (psf) if the building is a heated structure and 51 psf if the building is kept just above freezing. The installed LVL roof reinforcing is currently insufficient if the building is continued to be kept at "above freezing" we therefore recommend that the building be heated.
- The framing of the flat roof area is not adequate.
- Add Simpson twist straps where noted.
- Reinforce existing 4x4 and 4x6 posts as described.

Attic Floor Framing - viewed from second floor (Drawing S3)

The beams and columns are original and were not reinforced with steel channels as per the 1991 repairs. The tin wall sheathing was intact and therefore the recommendations to add wood posts or TS8x4 columns within the wall under existing beams were not added.

Below, the 2nd floor ceiling finishes, attached to the floor joists, appear to have been built up to consist of combinations of gypsum board, strapping, lath and plaster, 1x6 T&G boards and also a tin ceiling.

Area over Room #25:

- This area of attic floor is framed with rough sawn 2x7 joists spaced at an average of 17" o.c. and spanning approximately 13.5 feet. The joists are supported by rough sawn 7x7 beams and connected to the beams by a mortise and tenon joint.
- Assuming generous design values for the grade of wood, the joists will safely support a total load of 56 psf. Subtracting approximately 20 psf for dead load (weight of construction) the remaining load capacity is a 36 psf live load. However, the longest beam will only support a total load of about 22 psf, or a 2 psf. live load. Therefore the allowable load capacity of the attic floor framing is limited by 7x7 beams.

Area over Rooms #24 and #26:

- This area of attic floor is framed with rough sawn 2x7 joists spaced at an average of 18" o.c. and spanning approximately 12 and 14 feet. The joists are supported by rough sawn 7x7 beams and connected to the beams by a mortise and tenon joint.
- Assuming generous design values for the grade of wood, the joists will safely support a total load of 66 psf and 49 psf respectively. Subtracting approximately 20 psf for dead load (weight of construction) the remaining load capacity is a 46 psf live load and 29 psf live load at the 14 foot span. However, the beams will only support a total load of about 26 psf, or a 6 psf live load. Therefore the allowable load capacity of the attic floor framing is limited by 7x7 beams.

Attic floor framing summary:

- The allowable load capacity of the attic is very low and therefore should remain unoccupied without reinforcing the beams that support the floor joists.

Second Floor Framing - viewed from first floor (Drawing S2)

The columns are original and were not reinforced with steel channels and also the existing beams and joist seats were not reinforced as per the 1991 repairs.

New W6 steel beams have been added under the existing 8x8 wood floor beams, attaching to the existing columns with a small beam seat and pocketed into the existing walls.

The tin wall sheathing was intact and therefore the recommendations to add wood posts or TS8x4 columns within the wall under existing beams were not added.

Below, the 1st floor ceiling finishes, attached to the floor joists, appear to have been built up to consist of combinations of gypsum board, strapping, lath and plaster, 1x6 T&G boards and also a tin ceiling.

Area under Room #25 and #27:

- This area of floor is framed with rough sawn 2x8 joists spaced at an average of 16" o.c. and spanning approximately 13.5 feet. The joists are supported by rough sawn 8x8 beams and connected to the beams by a mortise and tenon joint.
- Assuming generous design values for the grade of wood, the joists will safely support a total load of 80 psf. However the strength of the joist is limited by the mortised and tenon connection to the beams and therefore the capacity of this joint is about 70 psf. Subtracting approximately 20 psf for dead load (weight of construction) the remaining load capacity is a 50 psf live load.
- The 8x8 beams, spanning 13.5 feet, if un-notched for the mortised and tenon construction, will only support a total load of about 28 psf, or an 8 psf live load, less with notches. The beams have been reinforced with a W6x9 installed underneath the existing 8x8 that will only support a total load of about 36 psf or 16 psf live load.

Area under Rooms #24 and #26:

- This area of floor is framed with rough sawn 2x8 joists spaced at an average of 16" o.c. and spanning approximately 12 and 14 feet. The joists are supported by rough sawn 8x8 beams and connected to the beams by a mortise and tenon joint.
- Assuming generous design values for the grade of wood, the joists will safely support a total load of 100 psf and 75 psf respectively. However the strength of the joist is limited by the mortised and tenon connection to the beams and therefore the capacity of this joint is about 70 psf. Subtracting approximately 20 psf for dead load (weight of construction) the remaining load capacity is a 50 psf live load.
- The 8x8 beams, spanning 12 feet, if un-notched for the mortised and tenon construction, will only support a total load of about 40 psf, or a 20 psf live load, less with notches. The beams have been reinforced with a W6x9 installed underneath the existing 8x8 that will only support a total load of about 47 psf or 27 psf live load.

Second Floor Framing summary:

- The 2000 International Building Code indicates that framing shall be designed to safely support a live load of 40 psf for classrooms and 50 psf for offices.
- The allowable load capacity of the 2nd floor framing is limited by beams and well below the current code.
- The new W6x9 steel beams are not adequately sized nor attached to the 8x8 beams and column and therefore do not provide much advantage. New beams or reinforcing could be sized to suit occupancy load, once the intended use of the building is determined.
- However the existing mortised joist to beam connections were not inspected and may have dried or cracked and may need joist hangers for full bearing support or inspection of each.
- The existing columns within the middle of each of the four classrooms are adequate if the attic remains unoccupied and the building is kept heated to reduce the roof load. The beams bearing onto the partition walls and the exterior walls do not have adequate bearing or connection. The recommendations to add TS8x4 columns within the wall under existing beams were not added.

First Floor Framing - viewed from basement (Drawing S1)

The majority of the basement ceiling has been covered with sheet rock, holes were provided to confirm first floor beam and joist sizes.

It appears that the additional columns and footings were added as noted.

Access was limited through a few holes in the drywall ceiling. We did not review the floor framing under the rear addition.

Area under South-East Class Room:

- This area of floor is framed with rough sawn 2x8 joists spaced at an average of 16" o.c. and spanning approximately 12 and 14 feet. The joists are supported by rough sawn 8x8 beams and connected to the beams by a mortise and tenon joint.
- Assuming generous design values for the grade of wood, the joists will safely support a total load of 100 psf and 75 psf respectively. However the strength of the joist is limited by the mortised and tenon connection to the beams and therefore the capacity of this joint is about 70 psf. Subtracting approximately 20 psf for dead load (weight of construction) the remaining load capacity is a 50 psf live load.
- The 8x8 beams, with an average span of 6 feet and notched for the mortised and tenon construction, will adequately support a 50 psf live load.

Area under South-West Class Room (over Boiler Room):

- This area of floor framing over the boiler room had limited access due to the drywall ceiling and numerous conduits. The viewed framing was charred and also reinforced. The joists are a combination of rough sawn and newer nominal 2x8 joists spaced at an average of 10" o.c. and

spanning approximately 12 feet. Assuming this area is typically framed, the joists are probably adequate.

Area under North Class Rooms:

- This area of floor is framed with rough sawn 2x8 joists spaced at an average of 16" o.c. and spanning approximately 13.5 feet. The joists are supported by a pair of rough sawn beams. Joists are connected to an 8x9 beam under the middle of the classroom by a mortise and tenon joint and joists frame over 8x8 beams under the corridor wall at the south wall of the classroom.
- Assuming generous design values for the grade of wood, the joists will safely support a total load of 80 psf. However the strength of the joist is limited by the mortised and tenon connection to the beams and therefore the capacity of this joint is about 70 psf. Subtracting approximately 20 psf. for dead load (weight of construction) the remaining load capacity is a 50 psf. live load.
- The 8x9 beams, with an average span of 7 feet and notched for the mortised and tenon construction, will adequately support a 50 psf live load.
- The 8x8 beams, with an average span of 7 feet, are located at the south wall of the classrooms, support the corridor wall above which supports bearings walls for both the attic and 2nd floor framing. The beam is adequate.

First Floor Framing summary:

- The 2000 International Building Code indicates that framing shall be designed to safely support a live load of 40 psf for classrooms and 50 psf for offices.
- The allowable load capacity of the 1st floor framing is limited by the notched joists and is adequate for either occupancy. However the existing mortised joist to beam connections were not inspected and may have dried or cracked and may need joist hangers for full bearing support or inspection of each.
- The existing columns and footings for the columns located under the middle of each of the four classrooms are highly loaded and do not show any signs of failure, and appear adequate if the attic remains unoccupied and the building is kept heated to reduce the roof load. Prior to being occupied, the size of the footing should be verified under each of these columns.

For the building to remain in its current unoccupied state the heat needs to be maintained and the roof columns need to be reinforced. It is our opinion that from a structural stand point that the building could become occupied again with the additional reinforcing outlined within, adding or reinforcing beams and columns, maintaining an unoccupied attic space and heating the structure to reduce the snow loads described. Naturally a full review would be required for architectural, mechanical and electrical feasibility and code compliance.

Further studies could be preformed by our office once the Town determines what the use of the building would be and at that time we could size and detail and fully analyze the building for current building codes.

Please advise our office on how you would like us to proceed.

Thank you for this opportunity to be of service to you. If you have any questions or comments, please do not hesitate to call or write.

Sincerely,

Peter H. Steffensen, P.E.