structural[design]group

June 8, 2014

Mr. Forrest Siebken
City of Milford
505 1st Street
Milford, Nebraska 68405

RE: **City of Milford Building**
Roof Observation Letter

Mr. Siebken,

Pursuant to your request, structural[design]group, performed an observation of the existing building roof. The purpose of the visit was to provide information pertaining to the current condition of the existing roof and its supporting joist system.

It should be noted during this visual observation that no attempt was made to review components that were not readily viewable and that the opinions and conclusions stated herein are based on information available as of this writing. It is conceivable that additional information may be forthcoming which bears on these opinions and conclusions. The right is reserved to review and modify all opinions and conclusions at any future point in time should additional information become available.

DESCRIPTION

This report could be considered a follow up to an original report that was produced on July 26, 2006. This original report dealt with the buildings' basement settlement and deterioration of the masonry perimeter walls and floor joist bearing which excluded the roof framing portion of the building. It is my understanding that up to this point no remedial measures have been taken in reference to the original report.

The existing building consists of an original building that has had three additions placed onto it to the south. The original building, approximately 24'-0"x35'-0", has roof, ceiling, and floor framing which span east/west and are supported by load bearing brick masonry walls on the east and west. In addition to these perimeter walls the floor joist are supported around the concrete vault along with some center bearing that occurs in the crawl space area towards the north end of the building. The first addition, approximately 24'-0"x18'-0", was placed directly to the south of the original building with roof, ceiling and floor framing which span east/west. The support for the roof occurs at the east and west brick masonry walls along with the

interior wood framed corridor hallway walls. In addition to the perimeter walls the floor joist are supported around the concrete vault area. The second addition, approximately 24'-0"x30'-0", has roof joist that span north/south and bear on the existing 1st addition south masonry wall, an interior stud/header wall and the south wall. The ceiling and floor joist span east/west and are supported at the perimeter masonry walls and down the center at a wood header system. The final addition was a recent garage addition to the south.

OBSERVATIONS

At the roof, the existing roof membrane is in need of repair. The roof termination locations were deteriorating and it was indicated that the roof had been leaking from a recent wind storm that tore the membrane loose from the perimeter walls at the northwest building corner. In walking around on the roof there were a couple of locations that the roof structure felt soft, but most felt in good condition. There were some electrical lines, existing roof top units and roof penetrations that will need to be worked around if the roofing system is to be replaced.

In observing the existing roof structure in the original building, 1x decking was supported by 2x10 joist, clear spanning the building east/west, at 1'-4" o.c. Insulation screws were observed penetrating the 1x decking along with wood cross bracing providing lateral support for the joist. Some efforescence was observed on the masonry walls, however the joist bearing locations appeared to be in good condition. 2x8 ceiling joist, spanning east/west at 1'-4", supported the original wood lath and plaster ceiling system along with a newer acoustical tile ceiling system.

The first addition roof structure was similar to the original building, however additional support was provided to the roof and ceiling joist by the interior load bearing hallway walls. 2x6 roof and ceiling joist were spanning east/west at 1'-4" o.c. Each were supporting the same secondary systems with the only difference being at the ceiling joist. Instead of the lay-in acoustical tile ceiling system, wood furring had been attached to the plaster and fiber tiles were attached for the ceiling system.

The second addition roof structure was constructed with 2x8 roof joist spanning north/south at 1'-4" o.c. The joist attached to the 1st addition south masonry wall with face hangers and had an intermediate bearing location at roughly 17'-0" from the masonry wall before terminating at the south wall of the addition. A short portion of a bearing header had been placed roughly 5'-0" from the first addition south masonry wall for the center roof joist. The main interior bearing condition, located at 17'-0" form the masonry wall, consisted of a (2)2x8 header that was supported down the wood framed wall located where the interior hallway terminated. At this location, in the floor framing, a (2) 2x10 floor joist had been located. The ceiling joist were

2x6 joist spanning east/west at 1'-4" o.c. and supported the same system as described in the 1st addition.

CONCLUSIONS

The existing roof membrane is in need of replacement. The difficult portion of this project is the termination locations for this membrane when you are dealing with older masonry walls and parapets. Until the existing membrane has been removed a large percentage of the existing wall condition will be unknown. From the visible portion of the wall system in the roof cavity and the exterior front facade, it appears to be in relatively good condition, however it is common to find substantial deterioration behind the membrane once it is removed.

Using the required ground snow load from the IBC 2009 for the area, a snow roof live load was determined and an appropriate dead load was assigned to each area. For any member to pass the design standards they must meet both the stress requirements for load and the serviceability requirements of allowable deflection according to the type of load. The roof joist in the original building are currently 25% overstressed and do not meet the serviceability deflection requirements. Remedial action to correct this would be to sister another joist alongside these joist or place a kicker, at a 45 degree angle, from the ceiling joist bearing point to the roof joist to cut down the span. The ceiling joist in this area meet the required stress for amount of load, however they are currently failing the deflection criteria. Remedial action would require the removal of the lath and plaster system or the sistering of another joist to the current 2x8.

At the 1st addition the roof and ceiling framing meet the load and deflection requirements. Since the hallway walls provide interior support for the roof and ceiling, this load is transferred down to the 2x12 floor joist. A few of the floor joist on the north side of the addition, prior to the west clay tile wall providing addition support would need to be reinforcing with the sistering of another joist alongside the existing 2x12's.

The second addition has the roof framing system running north/south. The 2x8 roof joist are currently 20% overstressed, on the north span, and would require another joist to be sistered alongside. In addition to this joist I would recommend that wood blocking be placed at third points along the span of the joist and the face hanger connections to the first addition masonry wall be review for adequacy. The interior load bearing wall for these joist currently is supported by a (2) 2x10 floor joist that would need to be replaced with a (3) LVL beam to appropriately transfer the load.

At the window in the north exterior wall, it is my opinion that the window did not have adequate backing behind the flashing recess. In reviewing this area, the flat flashing

portions can easily be depressed and that there are openings in the sealant and caulking that are allowing the moisture to get inside the masonry wall. This area should be repaired so to prevent the further infiltration of moisture.

Finally, it is my opinion that if the decision is to move forward with the remedial measures described in this report and the original from July 2006, that an experienced contractor be engaged to perform the work. Further, a structural engineer should be involved to develop the required framing plans and connections to meet the current load conditions.

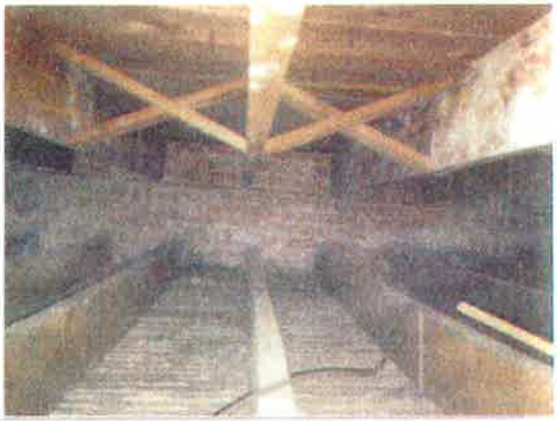
Thank you for the opportunity to provide you with this observation letter. Please do not hesitate to contact me with any questions you may have relating to this correspondence or if I may be of further service to you.

Respectfully,

Jason Suelter, S.E. E-11025
Senior Engineer – SDG

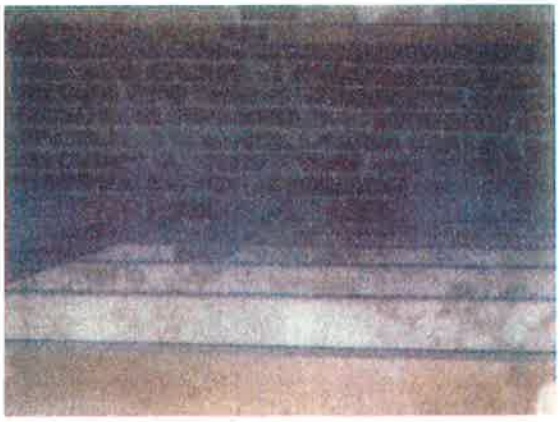
Original Building Roof & Ceiling Joist

1st Add. Roof & Ceiling Joist at Corridor Wall



Original Building Roof & Ceiling Joist

1st Add. Roof & Ceiling Joist at Corridor Wall

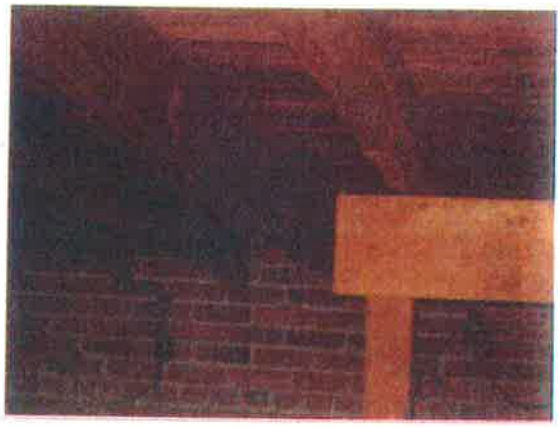


Original Building North Endwall

1st Add. Roof at Exterior Wall

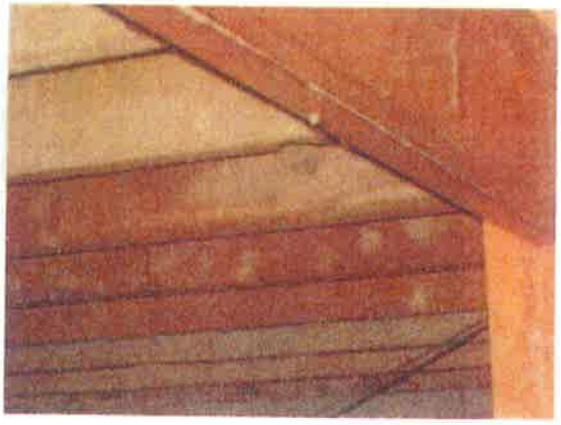
2nd Add. Roof & Ceiling Joist

Window at North Exterior Wall



2nd Add. Roof Joist Bearing at Masonry Wall

North Exterior Wall Elevation



2nd Add. Roof Joist Bearing at (2) 2x8 Hdr.

Window Stone Sill at North Exterior Wall