![TFM Structural Engineers logo]

Joe Perron   May 27, 2016
The East Lebanon Fire Department Corporation
3 Upper Cross Road
Lebanon, ME 04027

Re: Concrete Floor Slab
Lebanon Fire Department – Lebanon, ME
TFM Project #: 47197.00

Dear Mr. Perron:

On April 1, 2016, TFMoran Inc. (TFM) visited the Lebanon Fire Department located in Lebanon, Maine to observe and document the damage to the existing concrete slab within the kitchen, mechanical room, and meeting room. The purpose of the visit was to understand the overall condition of the slab and to provide recommendations for the repair of the slab where needed.

The building itself is approximately 40 years old constructed of Concrete Masonry Unit (CMU) blocks with clear spanning wood trusses. In general, the slab within the meeting room has settled significantly, causing cracks and complete collapse above sub-slab voids. It is our understanding that the settlement has occurred over the past 5 to 7 years. Sections of the meeting room slab have been partially removed exposing the soil conditions below. TFM measured a void below the slab of approximately 12", and a differential settlement of approximately 6" compared to a point along the exterior wall. The exterior CMU walls did not show any signs of cracking or settlement. TFM also investigated the minor slab cracking that is present within the apparatus bay. Soil conditions themselves were not investigated. The following photos depict the current conditions within the meeting room:

Based on our observations, it is our opinion that the soil sub-slab conditions are poor and have settled over time. It appears as though the settlement is limited to the areas observed, and has not impacted the overall stability of the building's superstructure (walls and roof). The extent of the settlement below the slab and whether or not the soil will continue to settlement is an unknown at this time. Because of the severity of the settlement and damage to the meeting room slab, repair recommendations are as follows:

1. Remove existing slab within the meeting room. Slabs within the kitchen and mechanical room can remain unless additional voids are found to exist after the removal of the meeting room slab.

2. Engage geotechnical engineer to investigate and evaluate the soil sub-slab conditions to determine if soils will continue to settle in the future. Depending on the results of this investigation, the following repair solutions may be appropriate:
   a. If soils are stable, properly compact and provide new structural fill up to underside of floor slab. Install vapor barrier and new 4" minimum concrete slab on grade reinforced with a steel wire mesh. Dowel new slab into existing slab at saw cut edges.
   b. If soils are unstable to a shallow depth, remove existing soils and replace with new structural fill up to the underside of floor slab. Install vapor barrier and new 4" minimum concrete slab on grade reinforced with a steel wire mesh. Dowel new slab into existing slab at saw cut edges.
   c. If soils are unstable below the bottom of existing exterior wall foundations, install steel shaft helical piles drilled down into proper subgrade (depth to be determined by geotechnical engineer and pile supplier). After pile installation, install vapor barrier and 6" minimum reinforced concrete slab spanning between piles. Dowel new slab into existing slab at saw cut edges.

3. Core existing slab within apparatus bay in a few locations to determine if voids are found to exist below the slab. This is a preventative scope item to determine if future problems could exist within this space.

In general, determination of the extent of voids beneath the slab along with the condition of the soil will help form a final understanding and help determine the most appropriate course of action. We can work closely with you and the geotechnical engineer that is engaged to further develop this plan at the appropriate time. Feel free to contact our office once repairs are underway.

Sincerely,
TFMoran, Inc.

Joaquín Denoya, PE
Senior Structural Engineer / Project Manager