



March 3, 2010

Mr. Thomas Mathison
Tower Pinkster
678 Front Avenue, NW Suite 255
Grand Rapids, MI 49504-5323

RE: Muskegon Community College
Master Plan Review - Floor Structure Cracks
JDH File 0912-015

Dear Tom:

In conjunction with the facility assessment, concrete cracks in the floor structure over the corridor at Rooms 230 to 240 were reviewed. Observations were compared with information contained on the original design drawings and with a report prepared by Fleis and Vandenbrink Engineering, Inc., dated October 21, 2009.

The floor structure consists of a monolithic concrete slab and joist system supported by steel beams. Cracks were observed running parallel to the hallway and steel support beams, perpendicular to the joist span, located approximately three feet from the beams, extending from the slab into the joists. The cracks seem to be limited to this particular area, ending at the ends of the corridor where a steel beam indicates a change in direction. Cracks were not observed in the floor areas adjacent to the hallway, nor in the walls; cracks of comparable magnitude were not apparent in the slab below this level.

After review of the Fleis and Vandenbrink report, our findings generally concur with that report's conclusion that the cracks are the result of internal tension forces generated by negative moment through the joists and slab across the support beam. Reinforcement designations on the design drawings are somewhat unclear in terms of whether continuous reinforcements were required at this location, and the contractor's interpretation of construction is unknown.

It is possible that the cracks occurred shortly after construction and the condition largely unnoticed. It was reported that the concern arose when an uneven top surface was noted after flooring replacement.

We evaluated the joists over the corridor as a single span, using the joist schedule information on the original drawings. That evaluation indicates sufficient capacity to support normal corridor loading. The probability is that the concrete has reached a level of stability such that the cracks will not increase noticeably; in that regard, combined with the result that there is sufficient capacity, it is our opinion that supplemental structure is not required. It is recommended, however, that markings placed by Fleis and Vandenbrink be noted for any potential change. If there is no evidence of change, the recommendation will be that the cracks be cleaned and injected with an epoxy repair material.

Please feel free to call with any questions.

Sincerely,

JDH ENGINEERING, INC.

A handwritten signature in black ink, appearing to read 'Larry A. Hulst', is written over the typed name.

Larry A. Hulst, PE, SECB

LAH/In g:\09jobs\12-015\Floor Crack Review
Copy- Ron Boezwinkle, Tower Pinkster



FLEIS & VANDENBRINK
ENGINEERING, INC.

Offices in Michigan and Indiana

October 21, 2009

Mr. Gerald Nyland, Maintenance Supervisor
Muskegon Community College
221 S Quarterline Road
Muskegon, MI 49442

Re: Structural Investigation of Several Campus Buildings – Updated per Req. #6663

Dear Mr. Nyland:

We have completed our review of the three items identified in our proposal dated April 16, 2009. A summary of our review is as follows:

Item No. 1 – Cracking in T-slab of Main Building

The first area of concern is in the classroom area of the main building. The 3rd floor concrete joists and flooring above the hallway adjoining Room 230 to 240 exhibit severe cracking. The main framing in this area consists of steel beams running parallel with the hallway located in the partition walls separating the hallway from the classroom areas. These beams are supported by steel columns, which carry the loads to the foundation. The steel beams, in turn, support a series of concrete joists and integral concrete floor. The concrete joists are oriented perpendicular to the hallway. We have attached a schematic of the area for your reference. The cracks are primarily located within 3 feet of the steel beams supporting the hallway and oriented parallel to the hallway. The cracks range from hairline cracking at the bottom of the concrete joists to approximately 0.1" or more in the floor slab. There is additional secondary cracking radiating from the main crack with concrete spalling. Based on a limited review of the surrounding area, the cracking observed appears to be concentrated in the hallway location.

We initially considered settlement of the building or parts thereof as a cause for the cracking. During our site visit, we discussed historic periods of sand migration through the drain tile system for the building. Based on the construction drawings we were provided, most of the columns in the area are supported by pile foundations, which would not typically be susceptible to settlement from a loss of soil through the drainage system. Additionally, we did not note cracking in the adjacent partition walls or racking of the doors or windows, which would be expected with building settlement. Also, the joists and flooring between the 1st and 2nd floors show limited cracking, minor in comparison to the area in question and more significant cracking would be expected in the other floors if foundation settlement were a primary cause of the cracking.