

February 26, 2008
DRAFT LETTER
Project No. G080175PS

Ms. Gaylynn Rorabaugh, Director
Big Rapids Community Library
426 S. Michigan
Big Rapids, MI 49307

Re: Big Rapids Community Library • Structural Analysis

Dear Ms. Rorabaugh:

In response to our recent visit to the Big Rapids Community Library, we are pleased to submit to you the following results of our structural investigation.

The main purpose of our investigation was to examine the existing floor system of the building and determine the suitability for use as a library. The building was originally designed as a school and therefore was most likely not designed for the much higher loads expected from library use. A review of current building codes (Ref: 2003 Michigan Building Code) reveals that the live load requirement for a library stack room is 150 psf, while that of a school classroom is 40 psf.

Main Floor Framing

Several openings were provided in the basement level ceiling to determine the existing framing condition for the main floor of the library. The existing floor framing observed at all openings consisted of 2x12 wood joists at 12-inch spacing on center. Furthermore, in the northwest area of the basement, a steel beam has been added, spanning east/west to divide the overall floor span in half. This steel beam supports the floor joists for the stack area on the main floor. The addition of this beam decreased the span of the joists from approximately 24'-0" to 12'-0", which provides a substantial increase in the allowable floor load. However, apart from this steel beam, no other areas of the floor have been reinforced, and spans as long as 24'-0" were encountered using the same 2x12 floor joist construction.

To determine the allowable floor load, an approximate wood type and allowable load was assumed. Using the 2001 National Design Specification for Wood Construction, the allowable load for a Spruce-Pine-Fir 2x12 joist was used as a baseline for the load calculations. Based on a maximum span of 24'-0", the total allowable live load for the existing framing was determined to be approximately 40 psf. This is well below the necessary requirement of 150 psf for a library stack room and also below the code requirement of 60 psf for a library reading room. In the area where the steel beam reinforcement is provided, the allowable live load was determined to be within the code requirement for stack areas. Furthermore, the central area of the building, which houses the circulation desk and entryways, is also acceptable for library stack room live load as the maximum joist span in this area is approximately 12'-0".

Second Floor Framing

The framing members for the second floor were observed through multiple openings provided in the main floor ceiling. As was encountered in the main floor framing, the second floor is

supported by 2x12 wood joists spaced 12 inches on center. Again, the clear spans for the second floor framing are at a maximum of 24'-0", resulting in an allowable floor live load of 40 psf in these areas, consisting of the "Michigan" Room and the second floor reading room / stack rooms. The central corridor area and office area are acceptable for a live loading of 150 psf as the joist spans are substantially shorter in these areas (approximately 12'-0").
Ms. Gaylynn Rorabaugh

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Recommendations

Based on the structural investigation and the results presented herein, the majority of the existing building floor system is substantially below code requirements and is not advisable for continued use as a library space without significant reinforcement and/or structural alterations. It is also our understanding that the "Michigan" Room on the second floor has previously been used for large meetings and activities, often with as many as 250 attendees. The code suggests that areas used for assembly with moveable seats be designed for a live load of 100 psf. Practically, however, seating arranged in a "classroom" type manner, or rows of seating arranged at a normal row spacing (~2-foot clear space between rows) would be satisfactory considering the capacity of the floor. With this distribution in mind, dense concentration of adults, whether seated or standing, at any location within the rooms is not recommended. Along the same lines, children seated on the floor in a group setting would approximate a 40 psf live load and would therefore not be limited by the floor capacity.

Additionally, it was observed that many book shelves had been relocated to the perimeter of the room in several locations. While this is good practice, care must be taken when positioning the shelves. With the wood floor joists spanning in the north-south direction, it is not advisable to locate shelves parallel to the span of the joists. When shelves are positioned along the perimeter of the room, it is our recommendation that they be relocated to the walls spanning in the east-west direction and therefore perpendicular to the span of the joists.

We appreciate the opportunity to assist you in the structural analysis of the Big Rapids Community Library. We hope that our findings help determine the long term use of this site and suitability for the community's needs, and we look forward to potential collaborations with you in the future. If you have any questions or concerns regarding the findings of this investigation, please do not hesitate to contact our office.

Sincerely,
FISHBECK, THOMPSON, CARR & HUBER, INC.
Ryan R. Eversole, P.E.

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cc: Mr. Stephen Sobers, City Manager – City of Big Rapids
Mr. Daniel E. Durkee, AIA, LEED® AP – FTC&H
Mr. Daniel J. Vos, P.E. – FTC&H