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December 12, 2016
January 2, 2018 (Revised)

Mr. J. Stewart Roberts A.I.A.
Johnson Roberts Associates Inc.
15 Propezzi Way
Somerville, MA 02143

Reference: Belmont Public Library-Belmont, MA
Proposed Renovations/Additions

Dear Stew;

This letter summarizes our recommendations for the building structure of the existing Belmont Public Library in Belmont, Massachusetts as relates to the proposed renovations and additions. These recommendations are based on information provided to us by your office, as well as, our review of the existing buildings drawings. We have been provided with a partial set of Architectural and Structural drawings for this building (some drawings regarding roof framing were missing as of the original letter, but were provided to us in the fall of 2017), and as such, our comments are based on a good understanding of the building's structural system. Our comments here are preliminary, as we do not have final architectural plans, and have not done a detailed analysis or design to determine sizes.

Existing Conditions

The existing Belmont Public Library building, built in 1964, is a three story, plus roof, framed structure with brick masonry veneer, which was designed and is used as a public library. The building is "H" shaped, with a center bar section and a perpendicular wing at each end of the center section. The Ground floor (over a crawl space) is framed with a combination of both 18" deep precast concrete double T's and 6" deep precast concrete planks with a 2" thick topping slab. This framing is supported by concrete foundation walls and spread footings. The First floor is framed with a 3" thick concrete slab on form deck, supported by open web steel joists and structural steel wide flange beams and girders. The Balcony level framing is similar to the first floor framing in the center section of the building, and is framed with the bottom chord of wood trusses in the wings. The roof is a series of gables with frame overs at the intersecting gables. The wings are framed with wood roof trusses, and the central section appears to be stick framed with 2x10's (based on recently provided drawings). The roofing is slate over 1x boards. According to the original structural drawings, the spread footings are designed for an allowable soil bearing capacity of 3,000 PSF. The Ground floor was designed for a live load of 125 PSF (except the boiler room at 175 PSF), while the First floor and Balcony level were designed for a live load of 100 PSF, all of which are lower than the code required live load of 150 PSF for library stack rooms. The original structural drawings stated that the roofs were designed for a live load (snow) of 15 PSF, (which is apparently incorrect) based on the framing information recently provided. The exterior walls are 8" unreinforced CMU with brick veneer, and in addition to being bearing walls and carrying the buildings gravity loadings, these masonry walls act as shear walls to provide lateral stability for the building under wind and seismic loadings. Steel lintels span all masonry openings.

Future Use-Addition/Renovation

It is our understanding that the Town of Belmont is interested a couple of renovation options. Option A would

be a complete gut renovation of the existing building, while Option B would be a complete gut renovation of the existing building with an addition. Any addition would be separated from the existing structure by an expansion joint, and then the new addition could be as large as desired and not impact the existing strucutre. For either option, our review of the existing structure in conjunction with the prevailing codes (International building Code IBC2009; International Existing Building Code-2009 (IEBC2009); along with the Massachusetts State Building Code-Eight Edition, Chapter 34-Existing Structures-Supplements to the IEBC 2009), indicate that this is an Occupancy Category II building with unreinforced masonry shear walls (URM), and that you are proposing a Level III Alteration. This level of alteration will require that the renovated structure comply with the gravity, wind, and reduced seismic loads of today's code. As stated above, the existing framing of the floors is not acceptable for carrying the code mandated live loads for library stack rooms. The existing roof framing (which we originally felt was so undersized that it would have to be removed and completely replaced), appears to be adequate for the code mandated snow loads of 30 PSF for Belmont (based on the newly provided framing plans). We performed an analysis of the existing building's lateral load resisting system for code mandated wind and reduced seismic loadings, and found that the existing unreinforced masonry walls are overstressed for the seismic loads.

Based on the above findings, it is our opinion that this building is a poor choice for renovations, as the structural deficiencies are so many and severe that to make the required structural upgrades would be prohibitively expensive. It might be possible to relegate the stack areas to a new addition, which could alleviate the need to strengthen/upgrade the floors. It is also possible to either add a new lateral load resisting system by installing new structural steel braced frames throughout the building or to reinforce the present masonry shear walls by shotcreting reinforced concrete to their inside faces, but either solution to the lateral loading issue is extremely disruptive, takes up additional space in the building, and is very expensive. Numerous studies have shown that the costs to upgrade lateral systems is generally higher than constructing a new code compliant building.

If you have any further questions, or if we can be of any further assistance, please do not hesitate to call.

Very truly yours,
Roome & Guarracino, LLC

Reginald Roome II

Reginald Roome II, P.E.
Partner