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December 8, 2014 Job No. 34278

Bob Easton Architects
1505 East Valley Rd.
Montecito, CA 93108

Re: All Saints-by-the-Sea Episcopal Church
Schematic Structural Assessment

Dear Bob,

At your request, we have performed a Schematic Structural Assessment of the existing All Saints-by-the-Sea Episcopal Church located at 83 Eucalyptus Lane, Santa Barbara, California. The evaluation took place during our meeting at the site with you on November 4, 2014.

The primary purpose of the assessment is to evaluate the overall structural condition of the church, to identify any significant structural concerns, and to provide recommendations for structural strengthening as required.

This assessment is similar in scope and intention to the Structural Survey requirements of Section 8-703 of the 2010 California Historical Building Code. While the building is not yet a designated historical building, it is in the process of qualifying as a County historical and architecturally significant building. The Code provides a good guideline for the assessment of the church, since the original portions of the church were built in 1900.

STRUCTURE DESCRIPTION

The structure is primarily a single story wood framed building with wood stud bearing walls, and some interior steel beams and columns. Decorative wood trusses support the roof in the central nave portion of the church.

It is our understanding that the original portion of the church structure was built in 1900. There is also a stone bell tower at the front of the church that was built at this time.

The floor framing of the church is a raised wood floor. Based on our conversation at the site, in the original portion of the church, the perimeter footings for the building are stone foundations. The interior of the first floor is supported on a series of posts and piers.

It appears that the church was been remodeled and expanded several times over its lifetime. Some architectural and structural drawings from a 1960 remodel were made available for our review. These drawings show the expansion of the building towards the east. The drawings show a partial basement, and the extension of the roof. Steel trusses are used in this area to copy the original wood trusses. Several steel beams and columns were also added.

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In the expansion areas shown on the plans, some of the floors are raised wood floors, and others are concrete slabs on grade. In all of these areas, the perimeter footings are concrete footings. The basement retaining walls are concrete walls.

The seismic force resisting system for the building is not specifically shown. No steel moment frames are seen in the drawings, and no plywood shear walls are indicted. It is our assumption that the existing wood bearing walls, along with their interior and exterior finishes, are acting as shear walls to provide lateral resistance in the event of any earthquake.

At the front of the church is a tall stone bell tower. This structure appears to be part of the original construction of the church. Based on our meeting at the site, it is our understanding that the two piers which make up the bell tower are built of stacked stone construction with a hollow space within the piers. There is no steel reinforcing used in the construction. It is also our understanding that the base of the bell tower is supported on a stone foundation which flares out underground to create a wider base than the footprint of the tower. It is also assumed that the foundation is unreinforced.

STRUCTURAL REVIEW

Overall, the church structure appeared to be in relatively good condition. No significant cracks were seen in the architectural finishes in the interior or the exterior.

The raised wood floors in the nave, however, appeared to slope downwards 2” to 3” towards the north and south perimeter walls.

The bell tower showed some signs of cracking and of previous repair work. Some cracks were visible in the mortar joints in the archway that connects the two piers of the tower. Additionally, it appeared that some of the mortar between the stones had been previously removed and replaced. It also appeared that some of the stones had been repaired. It is likely that these repairs were required due to movement in the tower or weathering of the materials.

PRIMARY STRUCTURAL RECOMMENDATIONS

Based on our review of the building, it is our opinion that there are two primary areas of structural concern in the church which should be addressed first.

Stone Bell Tower

The first area of concern is the stone bell tower. The bell tower is a tall narrow structure, built of unreinforced stone construction. This makes it highly susceptible to significant damage or collapse in an earthquake. Based on historical evidence of other earthquakes, unreinforced stone and masonry construction is one of the first types of construction to fail in an earthquake. The tall, narrow shape of the bell tower makes this problem even worse.

Additionally, the tower is supported on a stone foundation, and there are already visible cracks in the mortar joints and evidence of previous repairs. This all creates further cause for concern. In the event of a partial or total collapse of the bell tower in an earthquake, the weight of the falling stones could cause serious or fatal injuries to anyone in the immediate area of the tower.

In order to mitigate the potential seismic hazard from the bell tower, it is our recommendation that the tower be completely taken down and rebuilt.

The new tower should be designed to meet the current seismic codes. The new tower would likely be constructed of a structural steel superstructure, supported on a concrete foundation. If desired, the tower could be clad in a stone veneer to match the look of the original tower.

Until the new tower is built, it is our recommendation that the tower be monitored on an ongoing basis to determine if any of the cracks in the stone and mortar are growing or changing. Any such movement could be an indication of potential problems.

Additionally, since the tower is located at the main entry to the church, it is our recommendation that a seismic safety plan for the church be put in place which requires anyone in the church to exit out of the back of the church in the event of an earthquake. The specifics of such a plan can be discussed with the church leadership.

<u>Stone Foundations</u>

The second area of structural concern for the building are the stone foundations at the perimeter of the original building. As with the bell tower, the stone foundations are likely unreinforced, and it is unlikely that there is any significant structural connection from the wood framing to the stone foundation.

In the event of a major earthquake, the stone foundations could crack and fail. Additionally, the lack of connection to the foundations could allow the wood building to move off of the foundations. This could lead to significant damage or a partial collapse of the building.

In order to mitigate the potential seismic hazard from the stone foundations, it is our recommendation that the foundations be removed and replaced with new concrete foundations. The new foundations and the new connections to the foundations should be designed to meet the current code requirements. In areas where the stone is currently exposed, a stone veneer could be installed on the foundation walls if desired.

The removal and replacement of the foundations will require temporary shoring of the church structure. The extent of the shoring will be determined by the contractor depending on their construction methods and sequencing.

Structural plans and calculations would be required and building permits would need to be obtained before any of work on the bell tower and the foundations could be done. The existing soils report would be the basis for the design of the foundations.

SECONDARY STRUCTURAL RECOMMENDATIONS

The seismic codes have changed considerably since the building and the additions were built, so it is likely that the building does not meet the current seismic code requirements.

Since the building is primarily a single story, wood framed structure, no specific seismic retrofitting is required.

However, in order to provide additional seismic resistance to the structure there are several items which could be considered.

First, new plywood shear walls could be added to the building. This would be done be adding plywood on top of the existing wood framed walls. The existing wall finishes would have to be removed and replaced in these areas so the plywood could be attached directly to the wood studs. This solution is most feasible where there are significant portions of solid wall, and the wall extends up to the roof. For example, this would make sense at the front, west wall of the church.

In areas where there is not enough potential shear wall, it would be best to add a steel moment frame or a steel braced frame. Specifically, steel moment frames could be added on the north and south sides of the alter area towards the back of the church. The connections of the steel beams along these framing lines would likely be reinforced to help drag the seismic loads to the new frames.

In the other direction, steel braced frames could be added on the north and south sides of the nave to help buttress the building. Connections would have to be made to drag the loads into these frames as well. Where new steel frames are added, it is likely that new foundations would be added as well.

Lastly, it is unclear if the existing roof is sheathed with plywood sheathing. If not, adding plywood roof sheathing over the existing roof framing would create a better roof diaphragm. This would help distribute the earthquake loads to the different seismic elements, and would help to keep the building tied together overall.

The specifics of any seismic strengthening or retrofit would need to be coordinated with the architect and the church, so that an optimal layout of the structural elements could be chosen.

CONCLUSION

Overall, the church appears to in good structural condition. The only signs of some structural distress were the cracks in the bell tower, and the unevenness in the nave floor.

Since the building is a single story wood framed building, there are no requirements for mandatory seismic retrofits.

However, as noted above, it is our opinion that the unreinforced stone bell tower and the unreinforced stone foundations present significant seismic risks and should be removed and rebuilt.

If it is desired to expedite the permits required for this work, it may be possible to present this scope of work as a voluntary seismic retrofit for high risk elements. In some cases, this may simplify the Planning Department approval process for the permits.

Additional seismic retrofit measures are noted above, including new plywood shear walls, new steel frames, and new plywood roof sheathing. These items would all help the overall performance of the building in an earthquake, but in our opinion, they are not as important as the replacement of the bell tower and foundation

The opinion expressed here is based solely on our visual inspection of the structure. No physical testing of materials or structural calculations were done. This report is not intended to be a complete and thorough structural survey of the property and does not guarantee the structure against any future problems that may occur.

We hope that we have been of service to you in this matter and should you have any further questions, please do not hesitate to call.

Sincerely,

PARKER·RESNICK STRUCTURAL ENGINEERING, INC.

Bruce D. Resnick, S.E. No. 3293