BBFM Engineers Inc.

510 L Street Suite 200
Anchorage, AK 99501
(907) 274-2236
(907) 274-2520 Fax
www.bbfm.com

# St. George's Church Site Visit Report

On March 15, 2019, I inspected St. George's Church in order to identify and prioritize structural deficiencies so that upcoming rehabilitation work can be applied in the most beneficial manner. The next phase of this investigation is to perform a structural analysis to evaluate the most serious deficiencies and suggest stabilization/reinforcement schemes. However, during my site visit it became readily apparent that the most pressing need is a new roof for the building. The next engineering phase will be delayed so that all future funding can be applied toward providing a new roof. Therefore this is a preliminary report to document significant findings.

## GENERAL

The building was constructed in 1918-1919 and is on the National Register of Historic Places. It is a rectangular 24'x38' wood stick framed one story structure with an 8'x12' entry vestibule on the north side. The building features a gable roof with a bell tower and steeple towards the north end and a partial basement under the south half of the building that is constructed with concrete walls and concrete slab on grade. A covered entry was added over the southwest basement door.

The National Park Service (NPS) completed an Historic American Buildings Survey (HABS) set of scaled drawings in 2014. The drawings include plans, elevations and sections. I found this information to be accurate and it will not be repeated in this report.

Overall the building structure is in good condition considering its age, construction type, and the climate where it is located. On the day of my site visit it was very windy with heavy rain and the following day it rained over an inch while the wind continued to blow. The climate in Cordova is very wet and windy and it is critical that the building envelope be properly maintained to combat the harsh environment that this building is located in.

## ROOF

The roofing is wood shake shingles over building paper over board sheathing. The roof is at the end of its useful life and needs to be replaced. There is excessive moss growth and areas with missing or deteriorated shingles, reference Photo 1. The building is in dire need of a new roof and this should be the top priority for future maintenance. The only active roof leaks detected were at the top of the steeple. Wood framing was damp where the bell tower meets the main roof but did not appear to be actively leaking at the time of my site visit. Numerous other spots were observed that have leaked in the past and will leak in the future with prolonged exposure to rain and snow on the roof.

The roof structure is built with "scissor trusses" spaced at 24"oc, reference Figure 1. The top chord (roof rafters) are 1 ½ x 5 ½ at a 12/12 pitch. Many of the rafters have been reinforced with various size wood joists, reference Photo 2. The bottom chord (ceiling joists) are a 1 ¾ x 5 ¾ plus a 1 ¾ x 3 ¾ member at a 7/12 pitch. Across the top of ceiling at a height of 16.4'

above the floor is a horizontal “collar tie” consisting of a 1 ¾ x 5 ½ member at 48” oc so collar ties are only present on every other truss. Original roof sheathing is ¾” boards but most of this has been replaced with plywood. All board sheathing south of the bell tower has been replaced with plywood and some of the lower sections adjacent to bell tower have been replaced with plywood. Many of the original roof rafters have a noticeable sag (up to 1 ½”) in them. Most had been reinforced with a 1 ½ x 7 ¼ (conventional 2x8) joist nailed to the rafter with the sag of original rafter still in place. Some rafters had been cut and then reinforced with a 1 ½ x 7 ¼.

The bell tower and steeple are framed with 1 ¾ x 3 ¾ studs and rafters at 24”oc. The bell tower walls have metal louvers and the east louver has been covered with sheet metal. Prevailing wind is from the south and east and this sheet metal was presumably added to prevent wind driven rain and snow from entering the louver. The sheet metal has blown loose and some of the louver slats have dislodged. The louver slats should be re-installed and the sheet metal re-attached with screws so it does not loosen again. The south louver sill was wet on the inside and had obviously leaked in the past.

The top of the steeple has been leaking for some time and the wood appeared very rotten and in need of replacement, reference Photo 3. The top of steeple was too high to allow testing of the wood members but an inspection with a flashlight indicated wet and rotted wood. The steeple framing should be replaced at the time the building is re-roofed.

WALLS

The wall studs were covered with finishes and could not be inspected. The top of east and west walls are leaning out by up to 4”. This is most likely caused by the roof trusses pushing the wall outward as the truss loads up with snow and deflects. The walls do not lean out at locations where a perpendicular wall restrains it. I did a site visit on August 7, 2014 (to inspect the neighboring Red Dragon building) and measured the church wall deflection then. The deflection has not increased in the last 4 ½ years so this situation does not seem to be getting worse. This situation should be addressed and the next phase of the BBFM scope of work is to do a roof truss structural analysis and wall analysis to address and fix this condition, but at this point it is, in my opinion, for important to install a new roof on the building. This is not to say that a heavy snow year could not cause further deflections or other problems (up to and including roof collapse), but all things considered I recommend spending available funds on a new roof rather than engineering analysis of the roof trusses and walls which have been standing for 100 years.

One simple and inexpensive measure that should be taken to mitigate further wall and truss deflections is to add additional collar ties as shown in Figure 1. Currently every other truss has a collar tie and adding collar ties to the remaining trusses will strengthen and stiffen the trusses and reduce further wall deflections.

One of the exterior wall “pilasters” was partially dismantled so it could be inspected for the possibility of using it for added reinforcement to restrain walls from leaning outwards. We choose the wettest pilaster for inspection to give a worst as scenario observation. All wood sheathing and framing under the shake shingle siding was dry and in good condition, reference Photo 4.

FLOOR

Floor framing was inspected from the underside crawl space and appeared to be in good condition, reference Photo 5. Calculations indicate an allowable floor live loading of approximately 25 pounds per square foot (psf). By modern building codes the occupancy would be considered assembly with fixed seating and would have a minimum design live load of 60 psf. This deficiency is not unusual for a structure of this vintage but is an indication that the church should not be used to accommodate large gatherings. 25 psf distributed over the seating area of the church equates to approximately 80 people.

A floor elevation survey was conducted with a laser level. The floor was level within plus or minus 1" of the average elevation with the lowest area near the entry vestibule and the highest near the middle of the building next to basement wall. This amount of floor elevation variation is normal for a wood framed building of this age.

FOUNDATIONS

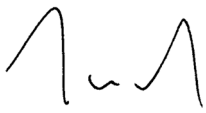
Foundations under north half of the building are concrete piers presumably founded on concrete spread footings. The south half of the building is concrete basement walls and a concrete basement slab on grade. The portions of the foundation that were visible were in fair condition. There is considerable degradation and loss of concrete where the piers meet grade, reference Photo 6. This situation needs to be addressed in order to restore the structural integrity and esthetic appearance of the piers.

The wood skirting between piers is in poor condition and needs to be replaced. Reference Photo 7.

SUMMARY AND CONCLUSIONS

The building is in overall good condition considering its age and location. However the roof is in poor condition and is starting to leak and desperately needs to be replaced. Roof replacement should be the number one priority in order to protect this historic structure. Roof replacement will most likely require a total or partial re-build of the steeple faming and cross. Other items that should be addressed in the short term include:

1. Repair steeple louver slats.
2. Re- attach sheet metal over east steeple louver opening.
3. Add collar ties at 48" on center to roof trusses as indicated in Figure 1.



Troy Feller, PE, SE

Photo 1 - Roof

Photo 2 – Roof Rafter Reinforcement

Photo 3 – Steeple Framing

Photo 4 – Exterior Pilaster Wood Framing

Photo 5 – Floor Framing

Photo 6 – Concrete Pier at Grade

Photo 7 – Crawl Space Skirting

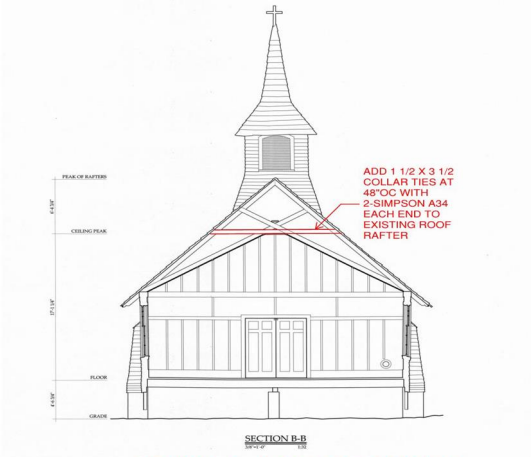



FIGURE 1 - ADD COLLAR TIES

Figure 1 – Building Section