

May 24, 2022

Kevin Zoll
Building Official
County of Mathews Building Inspections Department
50 Brickbat Road
Mathews, VA 23109

Re: Mathews County/384 Old Ferry Road
TSG No. VA22105.FOR

Dear Mr. Zoll:

With your authorization, we performed a limited forensic structural review of the one (1) story, approximately 1,260 square foot, commercial building located at 384 Old Ferry Road within Mathews County, Virginia. The purpose of our review was to determine if the as-built construction of the raised foundation met the construction documents and specifications submitted to Mathews County.

Our site visit was conducted on Wednesday morning, May 11, 2022, in your company. During our site visit, we reviewed the as-built construction of the raised foundation of the structure, cataloging areas of distress noted. For the purpose of clarity, we have included photographs of the representative observations noted during our site visit in the Observations section below.

The commercial structure is a one (1) story timber framed restaurant structure with attached elevated decks utilized for outdoor dining, kitchen equipment, storage, and HVAC equipment. The roof of the restaurant structure consists of a gable A-framed roof surfaced with composite asphalt shingles. The roof over the outdoor dining area and kitchen equipment is a low sloped roof, also surfaced with composite asphalt shingles. A front elevation view of the structure is shown in **Photo No. 1**.



BACKGROUND

It is our understating that the commercial restaurant structure located along Whare Creek within Mathews County was to be elevated from a concrete slab on grade finish floor level of 3.65' to a finish floor elevation of 9.3'. Construction drawings and material specifications to elevate this structure were prepared by Bay Design Group of Glens, Virginia. These documents, which included Sheets S1-S3, were signed and sealed by William B. Burton, P.E. on March 20, 2017. We note that these construction documents denoted the proposed foundations and first floor framing needed to lift the existing 63' x 20' restaurant from a concrete slab on grade and constructing a new elevated timber frame deck addition approximately 42' x 18' with a single set of entrance stairs along the front elevation.

RESEARCH

At the time the construction documents were prepared in March of 2017, the 2012 Edition of the Virginia Uniform Statewide Building Code (VUSBC) was in effect. The 2012 VUSBC adopted and amended the 2012 International Building Code (IBC).

Based on our review on the 2012 VUSBC. The restaurant use of this facility requires the design floor live load to be 100 psf. The design wind speed for this area was denoted as 115 mph and the ground snow load is denoted as 15 psf. According to our research, the structure is located within the AE (LMWA) zone with a flood plain elevation of 7'. The County of Mathews zoning ordinances does not require a free board, in excess of building code flood plain design requirements.

OBSERVATIONS

Our site visit observations revealed that additions had been constructed onto the existing restaurant and exterior deck, which were not shown on the construction documents provided by Bay Design. We noted that an open air and partially enclosed timber framed HVAC equipment/storage platform had been constructed along the rear elevation of the restaurant. Additionally, we noted that an enclosed and covered kitchen equipment/freezer timber framed addition had been added to the left elevation of the restaurant. Further, we noted that a single sloped timber framed roof had been installed over the front elevation exterior deck area. (See Photos No. 2, 3, and 4.)



Photo No. 2



Photo No. 3



Photo No. 4

A review of the first floor framing below the restaurant structure revealed the floor joists to be 2 x 10 at 16" on center which spanned front to rear approximately 10'-6" between three (3) parallel multi-ply 2 x 12 girder lines. This framing layout matched the construction drawings provided by Bay Design. Further, these girders were supported by 16" x 16" grouted masonry piers spaced at approximately 7'-9" on center. The location of these CMU piers also matched the construction drawings provide by Bay Design. However, we noted that 5/8" on center lag bolts had been used in the hold-downs. (See Photo No. 5.)



Photo No. 5

We also noted the specified Simpson HL53 hold-down angles had been installed to each side of the girders below the restaurant. However, we noted the installation of a single 2 x 8 treated plate rather than the specified double 2 x 8 plate on top of the CMU below these girders. Our review also revealed these 2 x 8 plates and Simpson angles were attached with two (2) 5/8" diameter anchor bolts. However, closer review revealed the outermost bolt to be a 5/8" diameter lag bolt that could be removed by hand. (See Photo No. 6.)



Our review of the timber framing of the exterior deck revealed it was not framed as per the construction documents. Rather, than installing three (3) ply 2 x 8 girders running left to right with 2 x 8 joists at 16" on center, front to rear, as shown on the construction documents, we noted that the framing consisted of two (2) ply 2 x 12's spanning, front to rear at each exterior 8" x 8" post line. Closer review revealed the two (2) ply 2 x 12's spanned 12'-0" from the exterior two (2) ply 2 x 12 band board to the masonry piers below the front elevation wall of the main entrance. We noted the exterior deck floor joists were 2 x 12's at 16" on center spanning approximately 7'-9" left to right. Closer review revealed the absence of an intermediate pier and girder line, as shown on the construction documents provided by Bay Design. (See Photo No. 7)

Additionally, we noted that a 4'-0" cantilevered extension had been constructed along the right elevation rather than the 2'-8" extension shown on the construction documents provided by Bay Design. Closer review revealed the 4'-0" extension along the restaurant was supported by 4" x 4" posts bearing directly onto the existing slab on grade without anchorage, see Photo No. 8

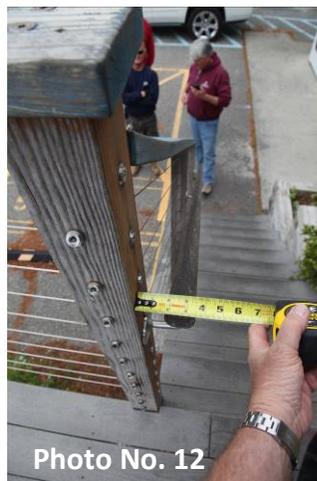




Excavation of the exterior footings below the deck revealed the bottom of the footings were located approximately 1'-0" below the exterior finish grade rather than the specified 2'-0" depth. We also noted that these footings were approximately 1'-6" in diameter rather than 1' x 6" x 1' x 6" square. However, we also noted a 12" diameter sonotube had been placed on top of this footing where the 8 x 8 timber post was anchored. **(See Photo No. 9.)**



Our review of the entrance stairs revealed the stairs were constructed with four (4) 2 x 12 stringers and open risers. **(See Photo No. 10.)** We noted the stringers were split at each of the tread fasteners. The height of the risers varied from the first riser height of 7 1/4" at the bottom with the remaining riser heights ranging from 6 5/8" to 6 7/8". **(See Photo No. 11.)** We noted the stairway was approximately 36" in width with a single guardrail assembly and handrail on the right side. Closer review revealed the handrail did not extend beyond the bottom or top riser. **(See Photo No. 12.)**



Further review revealed the top rail of the deck and stair were constructed with flat 2 x 6 with the intermediate railing consisting of horizontal stainless steel cables. While the cables were spaced at 4" on center, with a span of 6'-1" the cables could easily be pushed by hand to create a space greater than 4". **(See Photo No. 13)**



BEARING SOIL ANALYSIS

Following our site visit, we requested the geotechnical engineering firm, ECS LTD, to provide an evaluation of the soil and groundwater conditions at the site. ECS provide provided hand augers and dynamic cone penetrometer (DCP) testing to determine in situ, the soil bearing capacity, ground water, and subsurface soil conditions. Two (2) hand augers and two (2) DCP tests were completed near the existing footing excavations.

The results of ECS hand augers revealed the soils adjacent to the existing footings consisted of approximately 2'-0" of fill material consisting of silty sand (SM-Fill) with trace organics. Ground water was encountered at 24" below the existing grade.

The DCP testing indicated the minimum bearing capacity of the natural soils below the fill material was 1,500 psf. If new footings are proposed ES recommended removal of the fill material and replacing with #57 stone, flowable fill, or with additional concrete of the footing. ECS further recommended that the ground water be pumped from the new footing excavations prior to placing the footings.

CONCLUSIONS AND RECOMMENDATIONS

Based on our research, site visit observations and structural analysis, we have provided the following conclusions. For clarity, we have separated our conclusions by Additions, Restaurant, and Exterior Decking.

ADDITIONS

- With the exception of the single sloped roof above the exterior deck, the kitchen equipment addition on the left elevation and the HVAC equipment platform and shed on the rear elevation were constructed without plans, specifications, and building permits.

RESTAURANT AND MAIN ENTRANCE

- The as-built timber framing below the restaurant and main entrance matches the construction documents prepared by Bay Design.
- The three (3) ply 2 x 12 center girder below the restaurant is not structurally adequate to support the required 100 psf floor live load and actual dead loads of the restaurant for the 7'-9" spans.
- The as-built hold-down anchors of the three (3) ply 2 x 12 girders supporting the restaurant structure are inadequate as constructed and can be removed with little effort by hand.
- The use of a single guardrail and along the entrance stairway handrail is not permitted for this commercial space.
- The handrail terminations do not have the minimum required 12" extension at top and bottom.
- The height of the first riser of the entrance stairway violates the minimum building code requirements for commercial stairs.

EXTERIOR DECK

- The as-built timber framing of the exterior elevated deck does not match the construction documents prepared by Bay Design.
- The two (2) ply 2 x 12 flush girders spanning 12'-0" are not structurally adequate to support the required 100 psf live load. The stringers steel cable horizontal railing will not maintain the required maximum 4" spacing when pushed upon.
- The 1,500 psf actual bearing pressure of the soil below the footings is below the minimum allowable soil bearing pressure that the footings were designed for.

In summary it is our opinion that the size and depth of the existing foundations of the restaurant as well as the exterior deck on the front elevation, the HVAC platform on the rear elevation, and kitchen equipment on the left elevations are inadequate for the actual soil bearing capacity and the required design loads on the commercial structure. Further, it is our opinion that the hold-down anchorage is also inadequately constructed at this location.

Therefore, we recommend that the first floor framing of the restaurant, front elevation exterior deck, rear elevation HVAC platform, and left elevation kitchen addition should be supported in place while the CMU piers, posts, and footing are removed and replaced with approximately designed footings, CMU piers, and hold-down anchorage. This would also allow the inadequate temporary posts, CMU piers, and footing below these additions to be properly designed and constructed.

Once these foundation issues are designed and corrected, we recommend that a redesign of the entrance stairway be provided. At that time, an approximately designed and constructed guardrail assembly can also be constructed.

We appreciate the opportunity to be of service in this matter. If you have any questions, please feel free to contact our office.

Sincerely,
The Structures Group, Inc.



Michael A. Matthews, P.E.
President/CEO

MAM/dlm

