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04/23/2018
Mr. Noah Taylor
Engineered Foundation Construction
Shawnee, KS 66286

Re: Pier Design and Site Observation- 4071 NE Timberlake Drive Lee's Summit, MO 64064

Dear Mr. Taylor:

Per PTM's request, RTE engineers visited the site located at 4071 NE Timberlake Drive Lee's Summit, MO 64064 and designed the foundation system for the proposed house. Following is our report about the site observation and the details of the foundation design.

1. Site Inspection

RTE engineers observed the site located at the address of 4071 NE Timberlake Drive Lee's Summit, MO, 64064. Based on the site observation and local experience, we made the following assumptions about the soil properties
Bedrock depth: 20-35 ft
Overburden soil of bedrock: CH and/or Shale, SPT = 10-20, undrained shear strength = 1,250-2,000 psf, effective friction angle = 25-30 deg., unit weight = 110-120 pcf.

2. Foundation Recommendations

- **Auger Pile Foundation**

To accommodate the gravity loads, RTE recommends the following items for the foundation system:

(1) The foundation will be Auger piles with a diameter of 18'' and the layout of piles attached to this report.

(2) Auger piles are required to socket into hard layer (limestone, sandstone, or shale) for typically 3 ft, and the embedment depth may increase if the top of hard layer is highly weathered.
(3) Several piles shall be drilled first at corners of the house to detect any misunderstanding about the soil conditions and modify the assumption above accordingly.
(4) Reinforcement for the pile shall be (4)#4 vertical bars on for the whole length of piles.
(5) Special inspection about piles per PTM's request.

When the installation of the piles completed, the foundation footings, walls, and slab walls shall be placed over the piles. If the city approved plans do not exceed the following minimum specification, then, as needed, the foundation is recommended as follows:

(1) 3,000 psi concrete, Grade 40 or Grade 60 reinforcing steel, lap splices min. 40 times bar diameter
(2) The footing shall be a minimum of 16''x 8'' with (2)#4 bars continuous
(3) The wall shall be a minimum of 8'' thick with #4 vertical bars at 12''O.C. and #4 horizontal bars at 24''O.C. centered in the wall
(4) The walkout frost trench shall be a minimum of 12'' wide by 36'' deep with (2)#4 bars continuous top and bottom
(5) Grade beams/thickened slabs shall be a minimum of 16'' wide by 12'' deep with (3)#4 bars continuous top and bottom
(6) The garage and basement slabs shall be structural
(7) Place 5'' concrete slab with #4 bars at 12''O.C. each way on 1-1/2'' chairs. Cut control joints in a 10'x10' square pattern 1'' deep.
(8) Place (2)#4 60'' long at re-enter corners.
(9) Add (4) 96'' long #4 bars each way over the column pads and slab support piles on 3-1/2'' chairs. Details per attached drawings.
(10) Use #4 bent bars to connect piles with footings, grade beam and slab.
(11) Place Min. 4'' thick ¾'' clean aggregate under the slab for drainage purpose.
(12) Add 8'' wide curb at the end of the slab with reinforcing of (2)#4 continuous if necessary.
(13) #4- 36'' long bars with 12'' O.C. is used to connect the slab with foundation walls. The bar embedment depth is 5'' min., and grout with EPCON C6.

It should be clear that the foundation system recommended by RTE is based on the bearing capacity only. The following conditions were NOT considered in the design:

(1) Lateral load on piles caused by any possible slope movement or failure
(2) Possible shrinkage and swell of possible expansive soil. (Drainage system (i.e., sump and pump) shall be installed if expansive soil is encountered.)
(3) Global slope stability. Slope stability is the responsibility of others. (The contractor shall take the necessary steps to stabilize the slope. RTE would be happy to help to analyze the slope stability and offer possible reinforcing methodologies per requests.)

3. Limitations

It has to be noted that the pile foundation was designed based on the assumption of soil properties per our visual observation and local experience. NO soil report and/or soil test results were provided to RTE. It should be clearly understood that the design could change if additional information is available. The scope of our services does not include any environmental assessment (such as, but not limited to mold, mildew, presence of hazardous or toxic materials in the soil, surface water, ground water, etc.). An environmental specialist should be consulted for these types of issues. Please contact RTE, if any future assistance.

Thank you for providing this opportunity to perform the service for PTM.

Ryan Corey, Ph.D., P.E.
Vice President

Fei Wang, Ph.D., P.E.
Geotechnical Engineer

cc: City of Lee's Summit; Capital Construction Service