



May 20, 2022

Gale Homes II, Inc.
400 SW Longview Blvd, Suite 210
Lee's Summit MO 64081

Re: 185 SW Winter Rd
Lot 1605 The Ridge at Winterset
Lee's Summit Permit # PRRES20221450

Apex Engineers, Inc. observed the excavation for the proposed house located at the address above. The sub-grade bearing conditions were evaluated.

The house's sub-grade terminates on black shale and imported soil. Both soils are inadequate for foundation support. Test pits indicate that the black shale has a depth of around 24". The black shale shall be removed and replaced with a low volume change soil.

The footings for the garage/sport court foundation terminate on weathered limestone. The limestone closest to the edge/cliff has likely been undermined by the weathering process.

Based on our observations, the variations in the sub-grade are inadequate for supporting the proposed house. Our firm recommends the following:

1. Controlled-Fill/AB-3: The house site shall be further excavated by removing the black shale. The depth of the additional excavation shall be a minimum of 24" deep, shall extend through the black shale, and shall be approved by the geotechnical firm performing the AB-3 compaction testing. The excavation shall then be filled to the desired sub-grade elevation with AB-3 limestone or equal, compacted to 95% standard density. The geotechnical firm shall also verify the proper placement of the engineered fill.
2. Drilled Concrete Piers: Due to the variation in soil bearing conditions and the proximity of the foundation to the cliff, our firm recommends that the house is supported on concrete piers drilled to competent original limestone, or sandstone. The piers shall bear on the same material. The pier design shall be prepared by the engineer-of-record for the house plans.
 - a. A structural garage and basement slab shall also be required.
 - b. The piers within 15'-0" of the limestone edge shall be drilled through the limestone layer to verify adequate bearing conditions.

The above recommendation is based on bearing capacity only. Our firm has not been retained to determine the shrink/swell capacity of the soil and therefore cannot be held responsible for the volumetric changes of the soil (including below the basement slab).

Slope stability and final grading shall be the responsibility of others. The contractor shall take the necessary steps to stabilize the lot (i.e. proper grading & slope per code, retaining walls, etc.).

As with all houses on clay soils, the following precautions shall be followed to mitigate the potential for expansive clay issues. Install a sump pit and pump connected to the exterior

foundation drain. Isolate the basement steel column to the concrete pad connection from the basement slab. Non-load-bearing basement stud walls shall be framed to allow 1" of vertical movement.

Please call if Apex Engineers, Inc. can be of further assistance.

RECOMMENDATIONS

The surface drainage must be designed to effectively move water away from the home and prevent ponding. Poor drainage near a structure can also contribute to settlement problems. The failure to control drainage can result in the saturation and weakening of the surrounding soil causing settlement. A proper drain system, consisting of a drain tile draining to a sump pit and pump shall be installed and maintained in compliance with Sections R405 and R406 of the 2006 IRC. A build-up of water beneath the foundation can cause heaving of the foundation (pier pads) and basement slab resulting in sheetrock cracks and damage to the structure.

Due to the unpredictable nature of expansive clay soils, no guarantees can be made as to if and when future movement may occur. However, precautionary measures can be taken. Poor drainage increases the stresses on foundation walls, and therefore, a proper grade must be maintained away from the foundation. A positive slope of 1 inch per foot drop for 6 to 10 feet away from the house is required. Rain gutters and downspouts with extensions should be installed to direct water safe distances away from the house and from existing structures that could be adversely affected. Proper watering of the foundation system should also be maintained throughout the year, especially during extremely dry periods. In addition, all permanent slopes should be no steeper than 3:1 (horizontal to vertical) to help ensure their future stability and the accommodation of normal mowing equipment.

Apex Engineers, Inc. cannot be held responsible for the impact and/or damages caused to the structure of the aforementioned recommendations that are not followed and maintained.

LIMITATIONS

The scope of our services was only to visually observe and report the existing bearing conditions (capacity only) beneath the foundation elements for the new home. When making visual observations, it should be clearly understood that certain assumptions must be made regarding the existing conditions without the aid of drilling and/or testing, which could reveal additional information that could change the recommendations and conclusions given in this report. No evaluation of slope stability, foundation wall backfill, slab-on-grade support, pavements, retaining wall structures, or the suitability of any material removed from the basement excavation for any particular purpose was made unless specifically addressed herein. As a result, Apex Engineers, Inc. cannot be held responsible for the impact of those conditions on the project or the future performance of the structure. Finally, a standard footing inspection should be made to verify the actual bearing conditions before the placement of reinforcing steel and concrete.

Shrink, and swell characteristics are inherent with all clay soils and can adversely affect or jeopardize the performance of the foundation system. Apex Engineers, Inc. has not been retained to evaluate the potential expansive properties of any existing bearing material(s). Apex Engineers, Inc.'s services are not insurance, nor can they guarantee or predict future movement caused by the natural movement attributed to the shrinking and swelling of clay

subsoils. Therefore, Apex Engineers, Inc. cannot be held responsible for future movement and/or damage to the structure associated with such movement (including, but not limited to, foundations elements supported by continuous strip footings, isolated pier pads, or drilled piers). The contractor shall retain sole liability and responsibility for the quality of work, for adhering to plans, specifications, and appropriate codes, and for repairing defects, deficiencies, or damages regardless of cause and/or when they are found. Apex Engineers, Inc. has performed our services in a manner consistent with the standard of care and skill ordinarily exercised by firms of our type practicing under similar conditions at this time and locality.

To the fullest extent permitted and allowed by law, Apex Engineers, Inc.'s client shall indemnify and hold harmless Apex Engineers, Inc. and sub-consultants from and against all damage, liability, and costs, including reasonable attorney's fees and cost of defense, to the extent caused by the performance of the services under this report, excepting only those damages, liabilities or costs attributable to the sole negligence or willful misconduct of Apex Engineers, Inc.

The recommendations and conclusions given in this report are based on the observed conditions at the time of this site visit. These conditions may be altered over time and/or with changes in the weather. If groundwater ponds are in the basement excavation, soft soil conditions may require further excavation and/or filling to provide uniform support beneath all the footings and floor slabs. Therefore, if water ponds in this excavation or other changes occur that could affect any of the recommendations given in this report, Apex Engineers, Inc. shall be called back and allowed to re-evaluate our previous recommendations and/or conclusions. If changes in the condition of the site occur and Apex Engineers, Inc. is not allowed the opportunity to re-evaluate the site to respond to any of these changes, our firm cannot be responsible for the effect of any of the conditions that differed from those reported herein.

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, groundwater, etc.). An environmental specialist should be consulted for these types of issues.

Best Regards,
Apex Engineers, Inc.

Clayton J. Hess, P.E.
Principal

