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July 31, 2024
Project No. 1003.056

Ventura College
Facilities, Maintenance & Operations
4667 Telegraph Road
Ventura, California 93003

Attention: Mr. Jess Sluder, Director of Facilities, Maintenance & Operations

Subject: STEM Modular Classroom, Ventura College, Ventura, California

Dear Mr. Sluder:

This letter report provides recommendations for improvements associated with the proposed STEM modular classroom building to be located east of Multidisciplinary Classroom East ("MCE" which was formerly referred to as the Advanced TechnologyGeneral Purpose Classrooms ["AT/GPC" complex]) and north of the northeast corner of the east parking lot at Ventura College, in Ventura, California.

Our recommendations have been prepared based on a review of boring logs, and field and laboratory data from studies and construction-era field observations for adjacent campus development at the surrounding Health Sciences and AT/GPC Complex[1], East Parking Lot[2], and Maintenance and Operations Facility[3].

Proposed Project

The proposed STEM modular classroom building footprint is about 2,880 square feet and will be constructed in a vacant unimproved storage area that will be excavated between about 1½ to 3 feet from the south to the north, respectively, to create a relatively level building pad. The single-story modular classroom building will be constructed on a permanent concrete foundation in a recessed excavation covered with a 2-inch thick concrete 'mud mat' about 2 feet below the proposed modular finish floor elevation of about 269.7 feet (above MSL). Three uniformly-spaced area drains are planned within the building footprint to collect and convey water within the recessed building crawl space. Applied loads from the modular building are not anticipated to exceed 1,000 psf.

Site Subgrade Preparation Recommendations

Existing Underground Utilities. Prior to subgrade preparation, fill placement, or trench excavation, the locations of existing underground utilities should be verified by the Contractor[4]

[1] Fugro West, Inc. (2006), Geotechnical Study, Health Sciences Complex and Advanced Technology/General Purpose Classrooms, Ventura, California, FWI Project No. 3123.015, dated February.
[2] _____ (2004), "Limited Geotechnical Study, East and West Campus Parking Lot Renovation, Ventura College, Ventura, California," Project No. 3123.001.04, dated February 3.
[3] Geotechniques (2013), "Geotechnical Study, Maintenance and Operations Facility Improvements, Ventura College, Ventura, California," Project No. 1003.019, dated March 22.
[4] Contractor also is responsible for notifying Underground Service Alert (811) at least 2 business days prior to excavation.

by potholing. Conflicts should be brought to the attention of the College before proceeding with excavation.

Site Clearing. Debris and vegetation should be stripped from the site, including roots/entire root mat, and those organic materials should be wasted offsite.

Building Area. The building area should be excavated to the proposed subgrade elevation for the foundation. The exposed surface should be observed by Geotechniques prior to scarification of the upper 1 foot of the newly-exposed subgrade. Any fill exposed in the cut subgrade surface should be removed. After observation by Geotechniques, the exposed cut surface should be scarified 1 foot, moisture conditioned to between 0 and 2 percent over optimum moisture content, and reduced to pea-sized consistency prior to applying compactive effort. Once adequately processed in terms of moisture content and consistency, the fill should be compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D1557, latest edition.

Footing Areas. The upper 1 foot of footing subgrade should be scarified and reduced (processed), as-needed, to achieve optimum moisture content and a minimum of 95 percent of the maximum dry density.

Slope Subgrade Under Raised Floor to Drain. Compacted subgrade in a recessed excavation beneath the modular footprint should be sloping at a minimum 1 percent gradient to convey runoff into an area drain inlet to the nearest storm drain. Subgrade shall be covered with a 2-inch thick concrete 'mud mat.'

Areas to Receive Fill. Areas to receive fill should be stripped of vegetation and root mat. The upper 1 foot of the exposed surface also should be scarified and compacted to 95 percent of the maximum dry density prior to placing additional lifts of fill.

Areas to Receive Exterior On-Grade Concrete. The upper 1 foot of subgrade for on-grade concrete for sidewalks, drainage devices, concrete utility vaults/boxes, ramps, and stairs should be moisture-conditioned, processed, and compacted to a minimum of 95 percent of the maximum dry density in accordance with the "Fill Placement and Compaction" section presented subsequently.

Fill Placement and Compaction

Onsite soils are anticipated to consist of clayey silt with sand and lean clay which may be used as general fill once cleared of organic material, demolition or other debris, and any oversized rock. Fill materials should be compacted to a minimum of 95 percent of the maximum dry density determined from ASTM D1557.

Rock, gravel and other oversized material greater than 3 inches in diameter, should be removed from the subgrade and fill material being placed. Rock less than 3 inches in diameter should not be nested and voids caused by inclusion of rock in the fill should be filled with sand or other approved material. All roots larger than ½-inch diameter should be removed and discarded.

All subgrade and fill materials, including scarified materials, should be thoroughly processed to pea-sized or finer consistency or finer and spread evenly in loose lifts no thicker than 8 inches prior to applying compactive effort. When the moisture content of the fill material is below that sufficient to achieve the recommended compaction, water should be added to the

fill during processing. While water is being added, the soil should be bladed and mixed to provide relatively uniform moisture content throughout the material. When the moisture content of the fill material is excessive, the fill material should be aerated by blading or other methods. Soft or yielding materials should be removed and be replaced with properly compacted fill material, prior to placing the next layer.

Fill Materials

Fill should be free of organics, asphalt, oversize material (e.g., greater than 3 inches in maximum dimension), trash and debris, and other deleterious material. The expansion index of imported materials or clayey onsite materials used as general fill should be tested, as necessary, during earthmoving operations to verify that the expansion index of the material is suitable for its use as general fill.

General Fill. General fill materials should meet the fill requirements above and should have an expansion index less than or equal to 50. If necessary, general fill may be blended with sand or dry cement to reduce the expansion index.

There is a potential that silty and clayey onsite general fill materials could be sensitive to changes in moisture content. Control of moisture content and compaction layer thickness will likely be necessary to achieve the recommended compaction.

Imported Fill. Imported fill should be non-expansive (with an Expansion Index less than 20) and should be observed and tested by Geotechniques prior to being brought to the site.

Aggregate Base. Aggregate base materials should consist of imported material conforming to Caltrans Standard Specifications for Class 2 aggregate base, Section 26-1.02B, ¾-inch max. [Caltrans, 2022] or Section 200-2.4 of the "Greenbook" (International Conference of Building Officials [ICBO], latest edition) for Crushed Miscellaneous Base (CMB). However, Class 2 aggregate base or CMB placed under new on-grade concrete in unpaved areas **shall not contain recycled asphalt materials**.

Bedding Sand in Utility Trenches. Sand used as bedding and pipe zone sand in utility trenches should have a Sand Equivalent (SE) of at least 30 and conform to Caltrans Standard Specifications for sand bedding, Section 19-3.02F(2) (2022). The sand should have a gradation that allows the material to maintain a compacted surface condition during construction operations until concrete placement or until pipe and/or subsequent lift placement (i.e., as bedding or pipe zone sand in utility trench).

Utility Trenches and Excavations

Utility trenches and excavations should be braced or sloped in accordance with the requirements of (Cal) OSHA. Utility trench backfill should be governed by the provisions of this report relating to minimum compaction recommendations.

Utility excavations should be observed by the Geotechnical representative prior to the placement of fill or below-grade structures. All excavations should be sufficiently wide to accommodate compacting equipment. Alternatively, a 1½-sack cement/sand slurry may be used as backfill after observation by the Geotechnical representative.

Earth materials used for trench or excavation backfill should be moisture conditioned between 0 and 2 percent over optimum moisture content prior to placing in trench. Backfill

should be compacted to a minimum of 93 percent relative compaction as determined from ASTM D1557, and a minimum of 95 percent relative compaction within the upper 2 feet of finish subgrade.

Rock larger than 3 inches in maximum dimension should be excluded from backfill. Jetting of trench backfill materials should not be permitted.

Trench backfill materials should consist of bedding and pipe zone sand placed 4 inches below the pipe invert and to a height of 12 inches above the top of the pipe. Bedding and pipe zone sand should consist of fine to medium or coarse sand with a minimum sand equivalent (SE) of 30. General or select fill or pipe zone sand should be placed as backfill above the pipe zone in 8-inch loose lifts and compacted to the minimum relative compaction summarized above. Pipe zone backfill may require mounding above finish subgrade where the top of pipe is too shallow to compact without risking damage to the pipe. Other alternatives should be evaluated on a case-by-case basis considering the pipe strength, fill thickness below finish grade, or pavement section thickness.

General backfill materials should meet the preceding recommendations of this report, “Fill Placement and Compaction” and “Fill Materials.”

Site Drainage

Site improvements and future attentive building maintenance program should minimize or prevent the infiltration of water into the building area subgrade. Hardscape and well-drained on-grade improvements surrounding the structure shall be maintained to intercept and/or expeditiously convey water away from the foundation area. Downspouts shall be connected to the storm drain. Additionally, the concrete mud mat and its sloping surface to three area drains shall collect and convey any water that accumulates under the building footprint into the storm drain. Ongoing building maintenance should be attentive to leak detection of wet utilities and immediate repair, and in maintaining positive drainage in the building pad and immediately surrounding area.

Leaks and other means of deep saturation of soils in foundation areas may result in settlement in excess of that estimated subsequently for applied structural loads (see “Estimated Settlement,” subsequently) that may require re-leveling modular and/or its shallow foundation.

ASCE 7-16 Seismic Design Parameters / 2022 California Building Code Seismic Parameters

Seismic design parameters were generated for the project using site coordinates 34.2780˚ N, -119.2290˚W, and in accordance with ASCE 7-16. Soil conditions in the upper 100 feet are based on the generalized conditions summarized above and, in accordance with Table 20.3-1 in Chapter 20 of ASCE 7-16, are anticipated to be consistent with Site Class “D.”

The following seismic parameters are recommended for design for Risk Category II and consistent with the 2022 CBC and ASCE 7-16 for Site Class “D” soil profile:

Seismic Parameter	Value	CBC Source	ASCE 7-16 Source
Mapped Spectral Response Acceleration			
S_s	1.993 g	Figure 1613.2.1 (1)	Figure 22-1
S_1	0.749 g	Figure 1613.2.1 (2)	Figure 22-2
S_{MS}	2.392 g	Equation 16-20	Equation 11.4-1
S_{M1}	1.273 g	Equation 16-21	Equation 11.4-2
Design Spectral Response Acceleration			
S_{DS}	1.594 g	Equation 16-22	Equation 11.4-3
S_{D1}	0.849 g	Equation 16-23	Equation 11.4-4
PGA/PGA_M	0.88/1.05 g		Figure 22-9

[1] S_{M1} , S_{D1} were calculated per Table 1613.2.3(2) in Section 16.4.4 of the 2022 CBC, using F_v = 1.7 and assuming that a site-specific ground motion hazards analysis is not required per ASCE 7-16 Supplement 3, Sec. 11.4.8.1 exception 1.: site-specific ground motion hazard analysis not required where the above values of S_{M1} and S_{D1} are increased by 50%.

Ref: https://ascehazardtool.org

Shallow Footings for Modular Classroom Building

Permanent concrete foundations for the STEM Modular Classroom building should be bottomed a minimum of 15 inches below lowest adjacent grade. Footing excavations should be observed by the Geotechnical representative. Loose or soft soils may warrant localized deepening of the footing excavation. At a minimum, the bottom of all footing excavations should be moisture conditioned and compacted with several passes with a wacker (or sheepsfoot wheel followed by wacker) so that a minimum of 95 percent of the maximum dry density at between 0 and 2 percent over optimum moisture content is achieved in the upper 1 foot of soils below the footing bottom.

Allowable Bearing Pressure. Footings may be designed for maximum allowable bearing pressure of 1,500 pounds per square foot (psf). The recommended allowable bearing pressure provides a factor of safety against shear failure in excess of 3.

Estimated Settlement. On the basis of the foregoing, we estimate that post-construction settlement from structural loads should be less than 1 inch. For design purposes, foundations should be designed to accommodate differential settlement of about ½ inch over a distance of 20 feet, or a distortion ratio of about 1/480.

On-Grade Concrete

Exterior on-grade concrete in non-traffic areas should, at a minimum, be underlain by 4 inches of aggregate base (Class 2 or CMB) containing no recycled asphalt. The base should be moisture conditioned to optimum moisture content and compacted to a minimum of 95 percent of the maximum dry density determined by ASTM D1557.

Sliding and Passive Resistance

Ultimate sliding resistance generated through a soil/concrete interface may be estimated by multiplying the total dead weight structural loads by a coefficient of 0.35. Ultimate passive resistance developed from lateral bearing of footings bearing against compacted backfill below a depth of 1 foot below the lowest adjacent grade may be estimated using an equivalent fluid weight of 250 pounds per cubic foot (pcf). Sliding and passive resistance may be combined without reduction, when used with the safety factors of 1.5 for overturning and 2.0 for sliding. The safety factor for sliding can be reduced to 1.5 if passive resistance is neglected. The factor of safety for transient conditions should be at least 1.1.

Corrosivity of Soils

Corrosivity tests were performed on bulk samples obtained from the upper 5 feet of soils at the adjacent Health Sciences Center (HSC) and AT/GPC (MCE) site[1] and the M&O site[3]. Results of pH, soluble chloride, soluble sulfate, and resistivity tests are presented as follows:

Summary of Chemical Test Results

Depth (feet)	Material Description	Sulfates %	Chlorides %	Resistivity (ohm-cm)	pH
MCE 0-5’	Lean clay (CL)	0.0119	0.012	3,630	8.05
M&O 1-5’	Clayey Silt (ML)	0.0025	0.0003	2,440	7.9

The resistivity values suggest that clayey soil materials are corrosive to underground steel. The test results should be evaluated by a corrosion engineer to determine how underground utilities should be protected from corrosion.

The cement type should be selected with consideration of the sulfate content of the soils tested. The low sulfate results suggest, in accordance with ACI 318-19, Type II cement can be used for concrete that will be in contact with onsite soil materials.

Closure

The recommendations in this letter are specific to the scope of the proposed STEM modular classroom building and immediately-surrounding on-grade improvements. We appreciate the opportunity to be of service to Ventura College. Please call if you have any questions concerning this letter.

Sincerely,

Geotechniques

Carole Wockner, P.E.
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