09/03/2023 Geofoam Addendum

STRUCTURAL CALCULATIONS

Upper House
4276 East Mercer Way
Mercer Island, WA - 98040

Javid Abdi, PE, SE
6810 NE 149th St.
Kenmore, WA – 98028
Atlas.CSE@gmail.com
206-427-7233

ATLAS CONSULTING ENGINEERS INC.

Project:	4273 East Mercer Way	By:	JDA
Proj No:	165-2021	Date:	09/03/2023

Summary

To minimize amount of soil needed to be imported and trucked to site to be used as backfill, contractor has elected to use expanded polystyrene (EPS) geofoam. As directed by the geotechnical engineer (see pages 2 - 3), using geofoam blocks in the 1:1 influence zone from the footing will negate soil pressure against foundation walls and minimize design load to 5 psf. Atlas has updated the wall and footing designs for the walls that have a raised slab on grade and low exterior footing (see details 4/S3.2; as well as details 7/S3.1, 8/S3.1, 3/S3.2, 6/S3.2, and 8/S3.2. Table below shows moment and shear of walls in both the temporary cantilevered condition, and permanent braced condition (braced by the high slab on grade). As shown, stability of the walls is well over 1.5 for both sliding and overturning in the worst case temporary condition without requiring bracing.

Height	M (lb-ft)		V (lb)		Retaining Wall Stability							Wall Strength			
	Cant	Braced	Cant	Braced	Wall (lb-ft)	Footing (lb-ft)	Toe (lb-ft)	Passive	Friction	OT	Sliding	a	As	ϕMn	ϕVc
4.5	50.63	12.66	22.5	11.25	525	340	109	1,944	351	19.24	102.01	0.3	0.2	1,668	3600
6	90	22.5	30	15	700	340	260	1,944	403	14.45	78.26	0.3	0.2	1,668	3600
8	160	40	40	20	933	340	260	1,944	473	9.59	60.44	0.3	0.2	1,668	3600
10	250	62.5	50	25	1,167	340	260	1,944	543	7.07	49.75	0.3	0.2	1,668	3600
12	360	90	60	30	1,400	340	260	1,944	613	5.56	42.63	0.3	0.2	1,668	3600
14	490	122.5	70	35	1,633	340	260	1,944	683	4.56	37.54	0.3	0.2	1,668	3600
16	640	160	80	40	1,867	340	260	1,944	753	3.86	33.72	0.3	0.2	1,668	3600
18	810	202.5	90	45	2,100	340	260	1,944	823	3.33	30.75	0.3	0.2	1,668	3600

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists
& Environmental Specialists

August 25, 2023 G-4638

Mr. Farzad Ghazvinian
Millad Homes
7683 SE 27th St, #178
Mercer Island, WA 98040
Also via email: newhomes@millad.net

Subject: ADDENDUM LETTER 14
PROPOSED DEVELOPMENT – UPPER BUILDING
4276 EAST MERCER WAY
MERCER ISLAND, WA

References: See End of Letter

Dear Mr. Ghazvinian:

We were asked in an email from August 23, 2023 to opine on the use of geofoam at slab support areas within the backfill zone for the upper building foundation/stem retaining walls at the subject site. It is understood that the intention is to limit the amount of fill needed for import and potentially also minimize the need for temporary bracing at the slab-restrained concrete retaining walls. We have prepared the following letter to provide an addendum to the referenced geotechnical report and addenda.

Introduction

From review of the approved building plans, we understand relatively large slab-restrained conventional retaining walls are proposed at the downhill sides of the building, including at the pipe pile supported garage foundation/stem walls. Current planning is for these walls to be temporarily restrained with bracing until the slab can provide restraint at the top of the retaining walls. These walls are to have drainage mat at the backside of the walls and footing drains at the base.

In an email dated August 23, 2023 your structural engineer, Mr. Javid Abdi, suggested the use of EPS15 geofoam having a unit weight of 0.9 pcf and compressive strength of 10.2 psi for the backfill behind the retaining walls and support below the slab-on-grade floors.

Based upon discussion with you we understand that the wall geofoam backfill will extend from the back side of the wall beyond a 1H:1V plane projected upward from the base of the wall footing.

Conclusions and Recommendations

Geofoam is acceptable for use as structural fill below the slabs and behind retaining walls provided that the drainage mat and footing drain remains. At any location, such as the garage, where there is a potential for fuel spills, we recommend that the geofoam is properly protected via the use of a PVC liner.

For the proposed configuration noted above we anticipate that the designer may assume a uniform lateral load equal to 5 psf imparted to the wall from the geofoam backfill. Accordingly, there is expected to be savings related to reinforcement and concrete wall width, if the walls are re-designed. And of course, the need for temporary bracing is not likely to be necessary, subject to the structural engineer's design.

Pea gravel or free-draining sand filler may be placed at minor (< 1-inch wide) gaps between geofoam blocks.

We appreciate the opportunity to provide geotechnical consulting regarding the proposed development. Please contact us if there are any questions or concerns.

Sincerely,
GEO GROUP NORTHWEST, INC.

8-25-2023

Adam Gaston
Project Engineer

William Chang, P.E.
Principal

REFERENCES

"Addendum Letter 13, Proposed Development – Upper Building, 4276 East Mercer way, Mercer Island, WA", GEO Group Northwest, November 22, 2021.

"Addendum Letter 12, Proposed Development – Lower Building, 4270 East Mercer way, Mercer Island, WA", GEO Group Northwest, November 8, 2021.

"Addendum Letter 11, Proposed Development – Upper Building, 4276 East Mercer Way, Mercer Island, WA", GEO Group Northwest, November 3, 2021.

"Addendum Letter #10 With Plan Review Statement, Proposed Development – Upper Building, 4276 East Mercer Way, Mercer Island, WA", GEO Group Northwest, Sept. 2, 2021.

"Addendum Letter 9, Proposed Development – Upper Building, 4276 East Mercer Way, Mercer Island, WA", GEO Group Northwest, July 22, 2021.

"Addendum Letter 8, Proposed Development – Lower Building, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, May 21, 2021.

"Addendum Letter 7, Proposed Development – Upper Building, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, Mar. 3, 2021.

"Addendum Letter 6 – Response to Plan Review Comments, Proposed Development – Lower Building, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, Nov. 13, 2020.

"Addendum Letter 5 - Response to Plan Review Comments, Proposed Development - Lower Building, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, June 9, 2020.

"Addendum Letter #4, Lower Building Development, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, Nov. 4, 2019.

"Addendum Letter – Response to Sept. 4, 2019 Review, Proposed Development, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, Oct. 18, 2019.

"Addendum Letter – Response to 3rd Party Review, Proposed Development, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, Aug. 16, 2019.

"Addendum Letter, Proposed Development, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, December 27, 2018.

"Geotechnical Report, Proposed Development, 4270 East Mercer Way, Mercer Island, Washington", GEO Group Northwest, July 13, 2018.