

re: Geotechnical Recommendations
Reinforced Slope Details
Proposed Commercial Building
2510 Walkley Road - Ottawa

to: Christopher Simmonds Architect Inc. - **Ms. Samantha Schneider** -
samantha@csarchitect.com

date: February 5, 2018

file: PG2903-MEMO.02

Further to your request and authorization, Paterson Group (Paterson) prepared the current memorandum to provide geotechnical recommendations regarding reinforcing a slope within the south portion of the subject site.

Background

It is understood that a gas main runs south to north across the subject site. Due to the 1.8 m difference in elevation between the proposed development and the neighbouring property along the south border, a retaining wall was proposed. However, due to Enbridge Gas regulations, permanent structures are not allowed to be constructed above the gas lines. Therefore, Paterson suggested an alternative solution consisting of a geogrid reinforced slope.

As part of the assessment, Paterson reviewed the following grading plan prepared by D. B. Gray Engineering Inc. regarding the aforementioned development:

- Grading Plan - Drawing No. C-2 - Project 12075 - Revision 1 dated January 30, 2018.

The following summarizes our recommendations for constructing the proposed reinforced slope.

Reinforced Slope Design

As previously noted, the reinforced slope was designed to replace any permanent structures above the existing gas lines. The proposed slope will consist of a stack of a geogrid wrapped granular fill (cells). A minimum 4.6 m horizontal length (at the bottom of the slope) of uniaxial geogrid, such as Tensar UX1600 or equivalent, should continuously wrap up the slope face (0.45 m high per cell) with a minimum 1.5 m horizontal overlap between reinforced cells. The cells should be backfilled with OPSS Granular B Type II or an approved alternative, compacted to a minimum 95% of the material's SPMDD. Details of the proposed design are presented in the attached Figure 1 - Reinforced Slope Detail.

Geoweb System

A geoweb system by Presto should be installed over the slope face with an adequate topsoil mix placed as per Presto specifications. The geoweb system is designed to improve the long-term stability of shallow slopes. Based on the slope profile, a Geoweb GW30V (150 mm deep) would provide sufficient support of the proposed slope. Specifications and details of the Geoweb system are attached to the present report.

Periodic Inspections

It is recommended that Paterson conduct periodic inspections during the construction of the reinforced slope and complete compaction testing of the granular backfill. Furthermore, any alternative products to be used should be reviewed and approved by Paterson.

We trust that this information satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.



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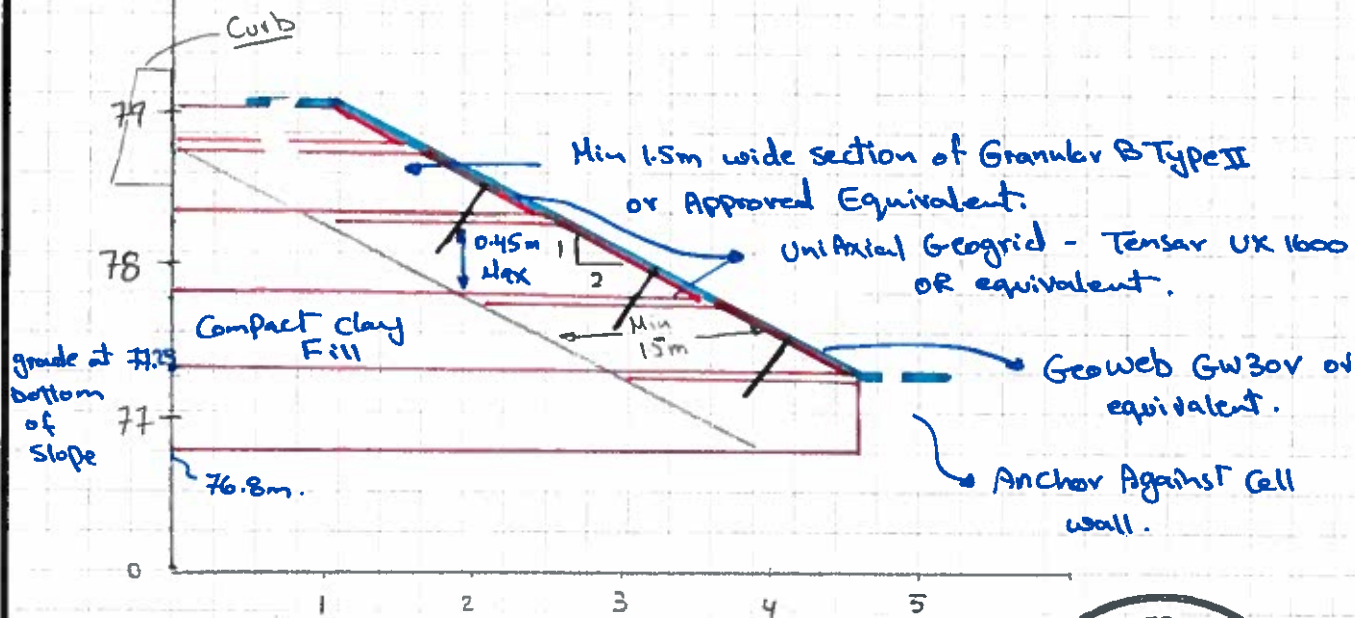
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Figure 1: Reinforced Slope Detail.

Notes:

- Minimum 4.6m horizontal length of uniaxial geogrid (at the bottom of slope) continuously wrapped up the slope face (max 0.45m high) with a min 1.5m overlap.
- Geoweb system to be installed over the slope face topped with an adequate topsoil mix placed as per Presto Specs.
- Field work must be reviewed by Paterson personnel at the time of construction.








Property		Value			Test Method	
Base Material	Material Composition	Polymer – Polyethylene with density of 58.4 - 60.2 lb/ft ³ (0.935 – 0.965 g/cm ³)			ASTM D 1505	
	Color	Black - from Carbon Black	Tan, Green, Other colors with no heavy metal content		N/A	
	Stabilizer	Carbon black content 1.5% - 2% by weight	Hindered amine light stabilizer (HALS) 1.0% by weight of carrier		N/A	
	Minimum ESCR	5000 hr			ASTM D 1693	
	Sheet Thickness	50 mil -5% +10% (1.27 mm -5% +10%)			ASTM D 5199	
Strip Properties	Surface Treatment	Performance: The polyethylene strips shall be textured and perforated such that the peak friction angle between the surface of the textured / perforated plastic and #40 silica sand at 100% relative density shall be no less than 85% of the peak friction angle of the silica sand in isolation when tested by the direct shear method per ASTM D 5321.		Material: The polyethylene strips shall be textured with a multitude of rhomboidal (diamond shape) indentations. The rhomboidal indentations shall have a surface density of 140 – 200 per in ² (22 – 31 per cm ²). In addition, the strips shall be perforated with horizontal rows of 0.4 in (10 mm) diameter holes. Perforations within each row shall be 0.75 in (19 mm) on-center. Horizontal rows shall be staggered and separated 0.50 in (12 mm) relative to the hole centers. The edge of strip to the nearest edge of perforation shall be 0.3 in (8 mm) minimum and the centerline of the weld to the nearest edge of perforation shall be 0.7 in (18 mm) minimum. A slot with a dimension of 3/8 in x 1 3/8 in (10 mm x 35 mm) is standard in the center of the non-perforated areas and at the center of each weld.		
		Cell Details	Percent Cell Wall Open Area	Nominal Dimensions ±10%		Density per yd ² (m ²)
			Length	Width		
	GW20V	21.2% ± 1.0%	8.8 in (224 mm)	10.2 in (259 mm)	28.9 yd ² (34.6 m ²)	44.8 in ² (289 cm ²)
	GW30V	16.8% ± 1.0%	11.3 in (287 mm)	12.6 in (320 mm)	18.2 yd ² (21.7 m ²)	71.3 in ² (460 cm ²)
	GW40V	19.89% ± 1.0%	18.7 in (475 mm)	20.0 in (508 mm)	6.9 yd ² (8.3 m ²)	187.0 in ² (1,206 cm ²)
Cell & Seam Properties	Short-term Seam Peel Strength	Cell Depth		Minimum Certified Cell Seam Strength		
		3 in (75 mm)		240 lbf (1060 N)		
		4 in (100 mm)		320 lbf (1420 N)		
		6 in (150 mm)		480 lbf (2130 N)		
	8 in (200 mm)		640 lbf (2840 N)			
Long-term Seam Peel Strength	Long term seam peel-strength test shall be performed on all resin or pre-manufactured sheet or strips. A 4.0 in (100 mm) wide seam sample shall support a 160 lb (72.5 kg) load for a period of 168 hours (7 days) minimum in a temperature-controlled environment undergoing a temperature change on a 1-hour cycle from ambient room to 130°F (54°C). Ambient room temperature is per ASTM E 41.					
10,000 hour Seam Peel Strength Certification	Presto shall provide data showing that the high-density polyethylene resin used to produce the GEOWEB® sections has been tested using an appropriate number of seam samples and varying loads to generate data indicating that the seam peel strength shall survive a loading of at least 209 lbf (95 kg) for a minimum of 10,000 hours.					
Section Properties	Section Dimension	Section Width		Section Length Range (Cells Long: 18, 21, 25, 29, 34)		
		Variable		Minimum		Maximum
	GW20V	7.7 ft (2.3 m) to 9.2 ft (2.8 m)		12.0 ft (3.7 m)		27.3 ft (8.3 m)
	GW30V			15.4 ft (4.7 m)		35.1 ft (10.7 m)
GW40V	25.4 ft (7.7 m)			58.2 ft (17.8 m)		

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GW/G000(M)-Oct 2013 AP-3639 R7 ©Oct 2013

The GEOWEB® Cell Dimensions

Relative Size ¹				
Name	GW20V (small cell)	GW30V (mid cell) For all other Applications For Earth Retention ⁴		GW40V (large cell)
Nominal Length x Width ²	8.8 x 10.2 in (224 x 259 mm)	11.3 x 12.6 in (287 x 320 mm)	10.5 x 13.0 in (267 x 330 mm)	18.7 x 20.0 in (475 x 508 mm)
Nominal Area ³	44.8 in ² (289 cm ²)	71.3 in ² (460 cm ²)	68.3 in ² (440 cm ²)	187.0 in ² (1206 cm ²)
Cells per yd ² (m ²)	28.9 (34.6)	18.2 (21.7)	NA	6.9 (8.3)
Nominal Depths	3 in (75 mm), 4 in (100 mm), 6 in (150 mm), and 8 in (200 mm) for all cells			

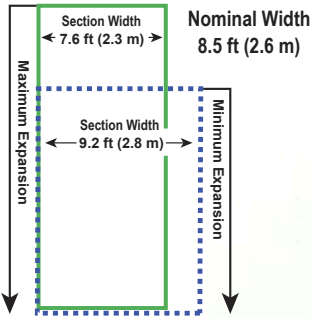
1 All details and dimensions are nominal and subject to manufacturing tolerances.

2 Cell length and width will vary approximately ±10% through the recommended expansion range.

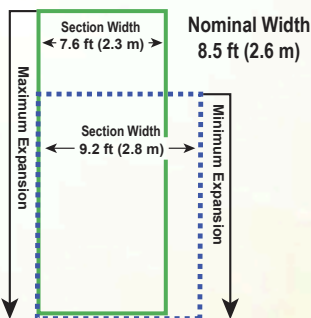
3 Cell area will vary only ±1% through the recommended section expansion range.

4 Cell dimensions for Earth Retention sections are fixed and NOT variable or nominal.

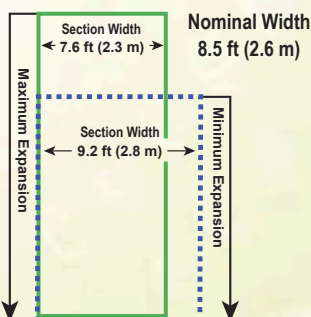
The GW20V Section Dimensions

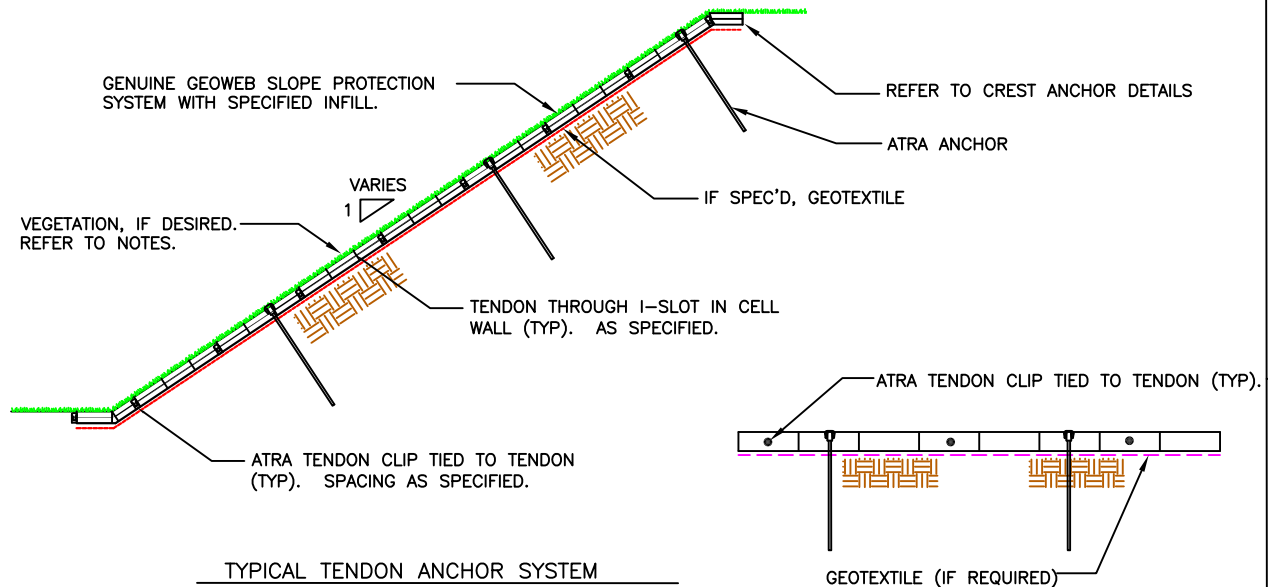
	Cells Long	Length Minimum Expansion	Nominal Length	Length Maximum Expansion	Nominal Area
	18	12.0 ft (3.7 m)	13 ft (4.0 m)	14.5 ft (4.4 m)	112 ft ² (10.4 m ²)
	21	4.0 ft (4.3 m)	15 ft (4.7 m)	16.9 ft (5.1 m)	131 ft ² (12.1 m ²)
	25	6.7 ft (5.1 m)	18 ft (5.6 m)	20.1 ft (6.1 m)	156 ft ² (14.5 m ²)
	29	9.4 ft (5.9 m)	21 ft (6.5 m)	23.3 ft (7.1 m)	181 ft ² (16.8 m ²)
	34	22.7 ft (6.9 m)	25 ft (7.6 m)	27.3 ft (8.3 m)	212 ft ² (19.7 m ²)

The GW30V Section Dimensions

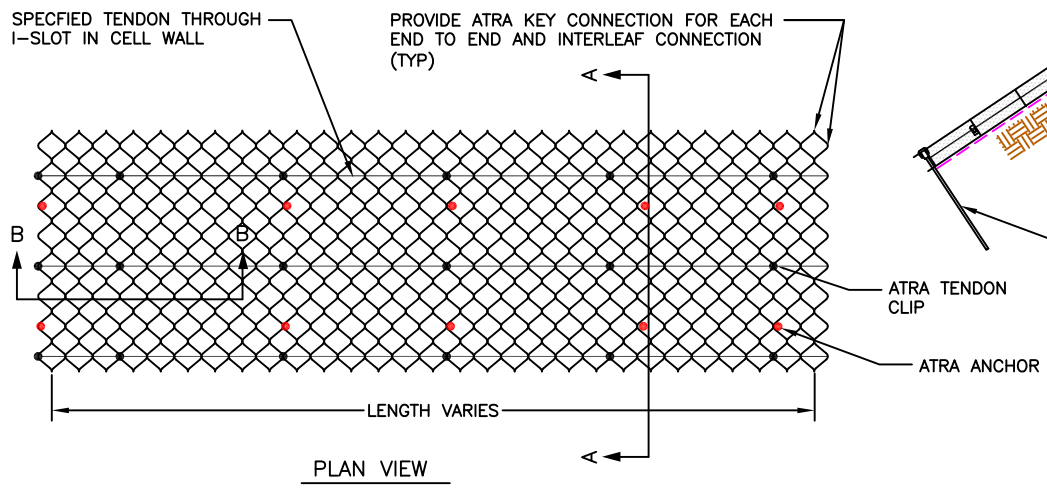
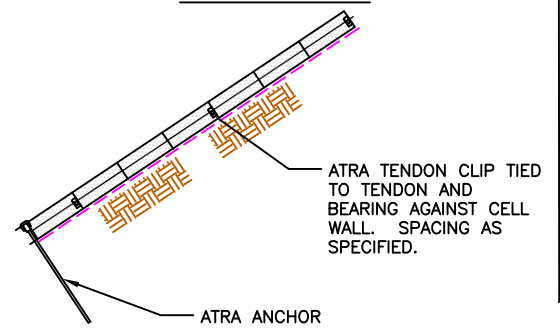
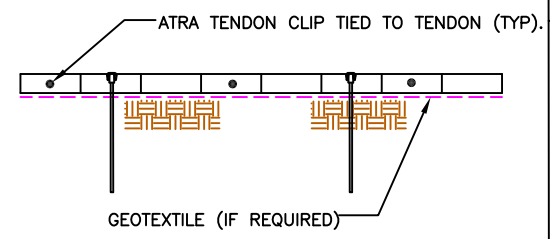
	Cells Long	Length Minimum Expansion	Nominal Length	Length Maximum Expansion	Nominal Area
	18	15.4 ft (4.7 m)	17 ft (5.1 m)	18.6 ft (5.7 m)	143 ft ² (13.3 m ²)
	21	18.0 ft (5.5 m)	20 ft (6.0 m)	21.7 ft (6.6 m)	167 ft ² (15.5 m ²)
	25	21.4 ft (6.5 m)	23 ft (7.1 m)	25.8 ft (7.9 m)	198 ft ² (18.4 m ²)
	29	24.8 ft (7.6 m)	27 ft (8.2 m)	30.0 ft (9.1 m)	230 ft ² (21.4 m ²)
	34	29.1 ft (8.9 m)	32 ft (9.6 m)	35.1 ft (10.7 m)	270 ft ² (25.0 m ²)

The GW40V Section Dimensions

	Cells Long	Length Minimum Expansion	Nominal Length	Length Maximum Expansion	Nominal Area
	18	25.4 ft (7.7 m)	28 ft (8.3 m)	30.8 ft (9.4 m)	234 ft ² (21.7 m ²)
	21	29.6 ft (9.0 m)	32 ft (9.7 m)	36.0 ft (11.0 m)	273 ft ² (25.3 m ²)
	25	35.2 ft (10.7 m)	38 ft (11.6 m)	42.8 ft (13.1 m)	325 ft ² (30.2 m ²)
	29	40.9 ft (12.5 m)	44 ft (13.5 m)	49.7 ft (15.1 m)	377 ft ² (35.0 m ²)
	34	47.9 ft (14.6 m)	52 ft (15.8 m)	58.2 ft (17.8 m)	441 ft ² (41.0 m ²)



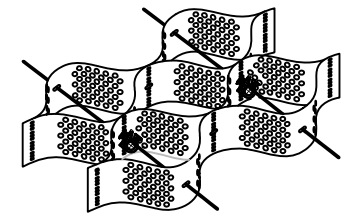
TYPICAL TENDON ANCHOR SYSTEM



PLAN VIEW

- NOTES:
1. THE TYPE AND QUANTITY OF TENDONS AND ATRA ANCHORS SHALL BE AS SPECIFIED.
 2. THE GEOWEB SHALL BE FILLED WITH THE SPECIFIED MATERIAL (TOPSOIL, STONE, OR CONCRETE) AND SHALL BE SUITABLE TO WITHSTAND THE APPLICABLE HYDRAULIC CONDITIONS.
 3. THE GEOWEB SECTIONS SHALL BE ANCHORED TO RESIST SLIDING DUE TO DRIVING AND HYDRAULIC FORCES.
 4. IF VEGETATION IS DESIRED, PROVIDE AN EROSION CONTROL BLANKET OR TURF REINFORCEMENT MAT IF THERE IS A POTENTIAL FOR WASH-OUT PRIOR TO ESTABLISHING VEGETATION.
 5. THE GEOWEB PANELS SHALL BE CONNECTED WITH ATRA KEYS AT EACH INTERLEAF AND END TO END CONNECTION.
 6. REFER TO THE GENERAL DETAIL DRAWINGS FOR ANCHOR DETAILS.

TENDON DATA		
TENDON TYPE	WIDTH, IN(MM)	BREAK STRENGTH, LBF (KN)
POLYESTER		
TP-31	0.50 (13)	700 (3.11)
TP-67	0.75 (19)	1506 (6.70)
TP-93	0.75 (19)	2090 (9.30)
KEVLAR		
TK-89	0.375 (10)	2000 (8.90)
TK-133	0.625 (16)	3000 (13.34)
TK-189	0.75 (19)	4000 (17.8)



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GENUINE GEOWEB[®]
SLOPE - TENDON/ATRA ANCHORAGE

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