Geogrid Estimating Charts

These pre-engineered tables provide an accurate **estimate** for geogrid reinforcement. To use the tables, follow these simple steps:

1) Verify that the site condition of your retaining wall matches the table being used.
2) Verify that the soil conditions at your site match the description given.
3) Choose the wall height needed for your site and read across to find the number of grid layers, embedment length and grid locations.
4) Verify that excessive water runoff, or a high water table, is not present.

Design Parameters

Factors of Safety

Sliding	=1.5
Overturning	=2.0
Grid Pullout	=1.5
Grid Rupture	=1.5

Assumed Unit Weights

Earth Backfill	=120 lbs/ft^3 *(19 kN/m^3)*
Filled weight of AB	=131 lbs/ft^3 *(20.5 kN/m^3)*
Allan Block	=135 lbs/ft^3 *(21.1 kN/m^3)*

General

Proper drainage provided.
Grid meets ASTM D-4595.

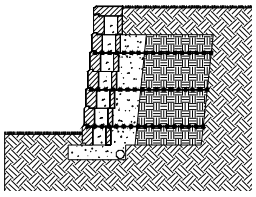
Assumed Soil Capacities

Cohesion	= 0 psf (0 *kPa*)
Bearing Capacity **36° (Ref)**	≥ 4,000 psf *(191.520 kPa)*
Bearing Capacity **32° (Ref)**	≥ 3,500 psf *(167.580 kPa)*
Bearing Capacity **27° (Ref)**	≥ 2,500 psf *(119.700kPa)*

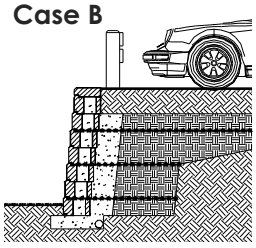
Grid

Long Term Allowable Design Strength (LTADS) ≥ 700 lbs/ft. *(10,200 N/m)*

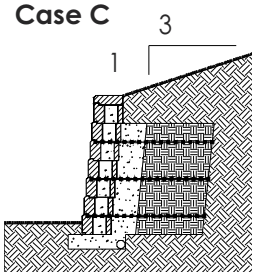
Case A



Case B



Case C



These charts should be used for **estimating** grid quantities for projects which match the site and soil descriptions provided, and only for projects which use grid strengths of 700 lbs/ft. (*10,200 N/m)* or higher. **No provision or analysis for global stability or seismic activity are provided**.

Reference Guide

1) **R0904** Allan Block Engineering Manual, June 2010
2) **R0901** Allan Block Spec Book, March 2009
3) **R0903** Allan Block Seismic Testing Executive Summary, November 2003
4) **ICC Legacy Report #ER-5087** Allan Block ICC Evaluation Service, Published March 2006
5) **ASTM C90** Load Bearing Concrete Masonry Units
6) **ASTM C140** Sampling and Testing, Concrete Masonry Units
7) **UBC 21** Hollow and Solid Load Bearing Concrete Masonry Units
8) **ASTM C1372** Standard Specification for Segmental Retaining Wall Units
9) **ASTM C1262** Evaluating Freeze Thaw Durability
10) **ACI 318** Building Code Requirements for Reinforced Concrete
11) **ASTM D6916** Standard Test Method for Determining the Shear Strength between Segmental Concrete Units
12) **ASTM D6638** Standard Test Method for Determining Connection Strength between Geosynthetic Reinforcement and Segmental Concrete Units
13) **FHWA-NHI-02-011** Mechanically Stabilized Earth Walls and Reinforced Soil Slopes
14) Jones, Colin JFP, Earth Reinforcement and Soil Structures, Butterworths, London, England (1985)
15) Mitchell, J K, et. al. Reinforcement of Earth Slopes and Embankments, NCHRP Report 290, Transportation Research Board, Washington, DC (1987)
16) Task Force 27, In-Situ Soil Improvement Techniques, "Design Guidelines for Use of Extensible Reinforcements for Mechanically Stabilized Earth Walls in Permanent Applications," Joint Committee of AASHTO-AGC-ARTBA, AASHTO, Washington, DC (1990)
17) Terzaghi, K, and Peck, R B, Soil Mechanics in Engineering Practice, John Wiley and Sons, Inc., New York, NY (1967)
18) GRI Standard Practice, GG4 : Determination of Long-Term Design Strength of Geogrids, Geosynthetic Research Institute, Drexel University, Philadelphia, PA (1991)
19) Hoe I. Ling, et. al. Large-Scale Shaking Table Tests on Modular-Block Reinforced Soil Retaining Walls, Tsukuba, Japan (2005)

The charts below assume for geogrid reinforced walls, that the reinforcement starts on the first course of block, and then every second course thereafter. The charts below are for material estimates only, contact your local engineer for wall design.

Geogrid Chart **AB Stones - 12°**					*Soil Types: Coarse to medium sands, clean sand and gravel, little or no fines - ϕ = 36°*			*Soil Types: Uniform to well graded sands, silty sands - ϕ = 32°*			*Soil Types: Sand-Silt-Clay mix, Clayey sands - ϕ = 27°*		
Condition Above Wall	**Wall Height**		**Buried Block**		**# of grid layers**	**Grid Lengths**		**# of grid layers**	**Grid Lengths**		**# of grid layers**	**Grid Lengths**	
	ft	**m**	**in**	**cm**		**ft**	**m**		**ft**	**m**		**ft**	**m**
Case A Level Slope Above the Wall	3	0.9	3	8	0	-	-	0	-	-	0	-	-
	4	1.2	4	10	0	-	-	0	-	-	3	3	1
	5	1.5	5	13	0	-	-	0	-	-	4	3.5	1.1
	6	1.8	6	15	5	4	1.3	5	4	1.3	5	4	1.3
	7	2.1	7	18	6	5	1.6	6	5	1.6	6	5	1.6
	8	2.4	8	20	7	5.5	1.7	7	5.5	1.7	7	5.5	1.7
	9	2.7	9	23	7	6	1.9	7	6	1.9	7	6	1.9
	10	3.0	10	25	8	6.5	2	8	6.5	2	8	6.5	2
Case B 100 psf Surcharge* (4.7 kPa) Above the Wall Top grid layer must extend an extra 3 ft (0.9 m)	3	0.9	3	8	0	-	-	0	-	-	2	3	1
	4	1.2	4	10	0	-	-	0	-	-	3	3	1
	5	1.5	6	15	4	3.5	1.1	4	3.5	1.1	4	3.5	1.1
	6	1.8	6	15	5	4	1.3	5	4	1.3	5	4	1.3
	7	2.1	7	18	6	5	1.6	6	5	1.6	6	5	1.6
	8	2.4	8	20	7	5.5	1.7	7	5.5	1.7	7	5.5	1.7
	9	2.7	9	23	7	6	1.9	7	6	1.9	7	6	1.9
	10	3.0	10	25	8	6.5	2	8	6.5	2	8	6.5	2
Case C 3H:1V Slope Above the Wall	3	0.9	3	8	0	-	-	0	-	-	2	3	1
	4	1.2	4	10	0	-	-	0	-	-	3	3	1
	5	1.5	5	13	0	-	-	0	-	-	4	3.5	1.1
	6	1.8	6	15	5	4	1.3	5	4	1.3	5	4	1.3
	7	2.1	7	18	6	5	1.6	6	5	1.6	6	5	1.6
	8	2.4	8	20	7	5.5	1.7	7	5.5	1.7	7	5.5	1.7
	9	2.7	9	23	7	6	1.9	7	6	1.9	7	6	1.9
	10	3.0	10	25	8	6.5	2	8	6.5	2	9**	6.5	2

Geogrid Chart **AB Classic - 6°, Patterned Walls - 6°, AB Fieldstone - 6° & AB Vertical - 3°**					*Soil Types: Coarse to medium sands, clean sand and gravel, little or no fines - ϕ = 36°*			*Soil Types: Uniform to well graded sands, silty sands - ϕ = 32°*			*Soil Types: Sand-Silt-Clay mix, Clayey sands - ϕ = 27°*		
Condition Above Wall	**Wall Height**		**Buried Block**		**# of grid layers**	**Grid Lengths**		**# of grid layers**	**Grid Lengths**		**# of grid layers**	**Grid Lengths**	
	ft	**m**	**in**	**cm**		**ft**	**m**		**ft**	**m**		**ft**	**m**
Case A Level Slope Above the Wall	3	0.9	3	8	0	-	-	0	-	-	2	3	1
	4	1.2	6	15	3	3.5	1.1	3	3.5	1.1	3	3.5	1.1
	5	1.5	6	15	4	4	1.3	4	4	1.3	4	4	1.3
	6	1.8	6	15	5	5	1.6	5	5	1.6	5	5	1.6
	7	2.1	7	18	6	5.5	1.7	6	5.5	1.7	6	5.5	1.7
	8	2.4	8	20	7	6.5	2	7	6.5	2	7	6.5	2
	9	2.7	9	23	7	7	2.2	7	7	2.2	7	7	2.2
	10	3.0	10	25	8	7.5	2.3	8	7.5	2.3	8	7.5	2.3
Case B 100 psf Surcharge* (4.7 kPa) Above the Wall Top grid layer must extend an extra 3 ft (0.9 m)	3	0.9	6	15	2	3	1	2	3	1	2	3	1
	4	1.2	6	15	3	3.5	1.1	3	3.5	1.1	3	3.5	1.1
	5	1.5	6	15	4	4	1.3	4	4	1.3	4	4	1.3
	6	1.8	6	15	5	5	1.6	5	5	1.6	5	5	1.6
	7	2.1	7	18	6	5.5	1.7	6	5.5	1.7	6	5.5	1.7
	8	2.4	8	20	7	6.5	2	7	6.5	2	7	6.5	2
	9	2.7	9	23	7	7	2.2	7	7	2.2	7	7	2.2
	10	3.0	10	25	8	7.5	2.3	8	7.5	2.3	9**	7.5	2.3
Case C 3H:1V Slope Above the Wall	3	0.9	3	8	0	-	-	0	-	-	2	3	1
	4	1.2	6	15	3	3.5	1.1	3	3.5	1.1	3	3.5	1.1
	5	1.5	6	15	4	4	1.3	4	4	1.3	4	4	1.3
	6	1.8	6	15	5	5	1.6	5	5	1.6	5	5	1.6
	7	2.1	7	18	6	5.5	1.7	6	5.5	1.7	6	5.5	1.7
	8	2.4	8	20	7	6.5	2	7	6.5	2	8**	6.5	2
	9	2.7	9	23	7	7	2.2	7	7	2.2	8**	7.5	2.3
	10	3.0	10	25	8	7.5	2.3	9**	7.5	2.3	10***	8.5	2.6

Note: All walls which require geogrid reinforcement shall have a minimum of 6 in. (150 mm) of buried block.
Table 6.2 is based on Clay soil having an internal friction angle of 27° (Ref) or better and a Sandy soil having an internal friction angle of 32° (Ref) or better and a Sand/Gravel soils having an internal friction angle of 36° (Ref) or better. All setbacks and dimensions are approximate. The wall heights shown above do not account for seismic loading. Check with a local engineer for assistance if you are in a seismic area. Final designs for construction purposes must be performed by a local registered Professional Engineer, using the actual conditions of the proposed site. *The Surcharge loading category above assumes a solid surface such as concrete, asphalt or pavers having a suitable supporting subgrade. ** 1 course spacing for first 3 layers of grid. *** 1 course spacing for first 4 layers of grid.