



RECON
Wall Systems™

// DOCUMENTS

Wall Design Charts

Use these design charts as a guide to quickly determine the wall height capabilities of the Recon systems in varying site and soil conditions.

Gravity and Reinforced Retaining Wall Charts

Metric Units

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Gravity Retaining Wall Chart Overview

Recon's Gravity Wall Charts have been prepared to demonstrate the capabilities of the Recon Wall System in a variety of assumed conditions. Walls are shown using the loading assumptions on each of the chart pages. A number of assumptions have been made in the preparation of the charts. It is important to read the notes to understand these assumptions. These wall charts are not intended for construction or bidding purposes. All wall sections should be designed by a professional engineer that is familiar with the project, using site specific conditions.

Steps to Using Recon Gravity Wall Charts

Step 1.

Estimate the loading condition. Choose from the following options:

1. Level (no surcharge) - Use chart on page 4
2. 12 kN/m² Surcharge (level backslope with vehicular load) - Use chart on page 5
3. 3H:1V Backslope (use for 3H:1V backslopes or flatter) - Use chart on page 6

Step 2.

Estimate the retained soil type. Choose from the following options:

1. Lean Clay or Silt (assumes $\phi=26^\circ$) - Use top section of chart
2. Silty Sand (assumes $\phi=30^\circ$) - Use middle section of chart
3. Sand or Gravel (assumes $\phi=34^\circ$) - Use lower section of chart

Step 3.

Estimate the maximum wall height. Use the following equation:

3a. Determine Exposed Wall Height and Embedment

Exposed Wall Height = [Finished Grade Elevation at Top] - [Finished Grade Elevation at Bottom]

and

Embedment = 0.15m or 5% of Wall Height (whichever is greater)

Note: For lean clay or silt use 10% of wall height when determining embedment.

3b. Determine the Total Wall Height, H

$H = \text{Exposed Wall Height} + \text{Embedment}$

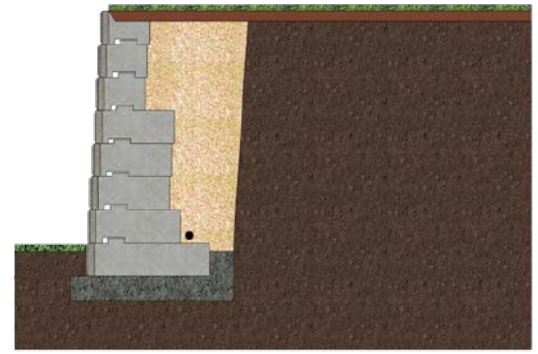
3c. Round H up to the nearest block increment in the chart

The preliminary **gravity** design section is listed in the column below the total wall height, H. The Recon block sizes are listed starting from the base course.

Recon Gravity Wall Charts - Level Backslope

3.6-degree Batter - 25 mm Setback per Block Course

Flat Backslope - No Surcharge



Level Backslope - No Surcharge

Retained Soil Type		LEAN CLAY or SILT, PHI=26°										
Wall Height (m)		1.62	2.03	2.44†	2.84†	3.25†	3.66†	4.06†	4.47†	4.88††	5.28††	5.69
Block Depth Make-Up for Wall Cross Section (cm)	COURSE 13										60	
	COURSE 12									60	60	
	COURSE 11								60	60	60	
	COURSE 10							60	60	60	60	
	COURSE 9						60	60	60	60	100	
	COURSE 8					60	60	60	60	100	100	
	COURSE 7				60	60	60	60	100	100	115	
	COURSE 6			60	60	60	60	100	100	115	115	
	COURSE 5		60	60	60	60	100	100	115	115	150	
	COURSE 4	60	60	60	60	100	100	115	150	150	150	
	COURSE 3	60	60	60	100	100	115	150	150	150	165	
	COURSE 2	60	60	100	100	115	150	150	165	165	195	
	BASE COURSE	60	100	100	115	150	165	180	210	195	210	

Contact a Professional Engineer
for Preliminary Wall Section

Retained Soil Type		SILTY SAND, PHI=30°										
Wall Height (m)		1.62	2.03	2.44	2.84	3.25†	3.66†	4.06†	4.47†	4.88†	5.28†	5.69
Block Depth Make-Up for Wall Cross Section (cm)	COURSE 13										60	
	COURSE 12									60	60	
	COURSE 11								60	60	60	
	COURSE 10							60	60	60	60	
	COURSE 9						60	60	60	60	100	
	COURSE 8					60	60	60	60	100	100	
	COURSE 7				60	60	60	60	100	100	115	
	COURSE 6			60	60	60	60	100	100	115	115	
	COURSE 5		60	60	60	60	100	100	115	115	150	
	COURSE 4	60	60	60	60	100	100	115	115	150	150	
	COURSE 3	60	60	60	100	100	115	115	150	150	165	
	COURSE 2	60	60	100	100	115	115	150	150	165	195	
	BASE COURSE	60	100	100	115	115	150	150	165	195	210	

Contact a Professional Engineer
for Preliminary Wall Section

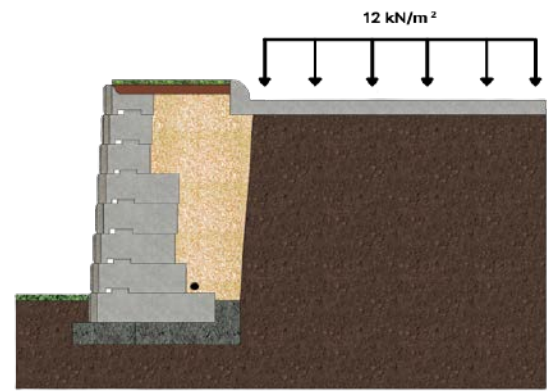
Retained Soil Type		SAND or GRAVEL, PHI=34°										
Wall Height (m)		1.62	2.03	2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69
Block Depth Make-Up for Wall Cross Section (cm)	COURSE 14											60
	COURSE 13										60	60
	COURSE 12									60	60	60
	COURSE 11								60	60	60	60
	COURSE 10							60	60	60	60	100
	COURSE 9						60	60	60	60	100	100
	COURSE 8					60	60	60	60	100	100	115
	COURSE 7				60	60	60	60	100	100	115	115
	COURSE 6			60	60	60	60	100	100	115	115	150
	COURSE 5		60	60	60	60	100	100	115	115	150	150
	COURSE 4	60	60	60	60	100	100	115	115	150	150	165
	COURSE 3	60	60	60	100	100	115	115	150	150	165	180
	COURSE 2	60	60	100	100	115	115	150	150	165	180	195
	BASE COURSE	60	100	100	115	115	150	150	165	180	195	210

- † Wall embedment and leveling pad thickness increased beyond minimums, up to 10% and 30-cm respectively, in order to increase sliding resistance and/or bearing capacity
- †† Wall embedment and leveling pad thickness increased beyond minimums, up to 10% and 60-cm respectively, in order to increase sliding resistance and/or bearing capacity. Crushed stone over blocks backfill design method is assumed.

Recon Gravity Wall Charts - 12kN/m²

3.6-degree Batter - 25 mm Setback per Block Course

Flat Backslope - 12kN/m² Surcharge
(1-meter from back of wall)



Flat Backslope - 12kN/m² Surcharge

Retained Soil Type		LEAN CLAY or SILT, PHI=26°											
Wall Height (m)		1.62	2.03†	2.44†	2.84†	3.25†	3.66†	4.06†	4.47††	4.88††	5.28	5.69	
Block Depth Make-Up for Wall Cross Section (cm)	COURSE 13												
	COURSE 12									60			
	COURSE 11								60	60			
	COURSE 10							60	60	60			
	COURSE 9						60	60	60	60			
	COURSE 8					60	60	60	60	100			
	COURSE 7				60	60	60	60	100	100			
	COURSE 6			60	60	60	60	100	100	100	150		
	COURSE 5		60	60	60	60	100	100	100	150	150		
	COURSE 4	60	60	60	60	100	115	115	150	150			
	COURSE 3	60	60	60	100	115	150	150	180	180	195		
	COURSE 2	60	60	100	115	150	150	180	180	195			
	BASE COURSE	100	100	115	150	165	195	210	195	210			
											Contact a Professional Engineer for Preliminary Wall Section	Contact a Professional Engineer for Preliminary Wall Section	

Retained Soil Type		SILTY SAND, PHI=30°											
Wall Height (m)		1.62	2.03	2.44	2.84	3.25	3.66†	4.06†	4.47†	4.88†	5.28	5.69	
Block Depth Make-Up for Wall Cross Section (cm)	COURSE 13												
	COURSE 12									60			
	COURSE 11								60	60			
	COURSE 10							60	60	60			
	COURSE 9						60	60	60	60			
	COURSE 8					60	60	60	60	100			
	COURSE 7				60	60	60	60	100	100			
	COURSE 6			60	60	60	60	100	100	100	150		
	COURSE 5		60	60	60	60	100	100	100	150	150		
	COURSE 4	60	60	60	60	100	100	150	150	150			
	COURSE 3	60	60	60	100	100	150	150	180	180	195		
	COURSE 2	60	60	100	100	150	150	180	180	195			
	BASE COURSE	60	100	100	150	150	150	180	195	210			
											Contact a Professional Engineer for Preliminary Wall Section	Contact a Professional Engineer for Preliminary Wall Section	

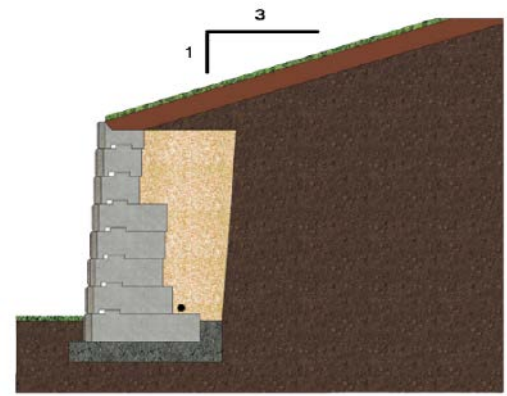
Retained Soil Type		SAND or GRAVEL, PHI=34°										
Wall Height (m)		1.62	2.03	2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69
Block Depth Make-Up for Wall Cross Section (cm)	COURSE 14											
	COURSE 13										60	
	COURSE 12									60	60	
	COURSE 11								60	60	60	
	COURSE 10							60	60	60	60	
	COURSE 9						60	60	60	60	100	
	COURSE 8					60	60	60	60	100	100	
	COURSE 7				60	60	60	60	100	100	115	
	COURSE 6			60	60	60	60	100	100	115	150	
	COURSE 5		60	60	60	60	100	100	115	150	150	
	COURSE 4	60	60	60	60	100	100	115	150	150	150	
	COURSE 3	60	60	60	100	100	115	150	150	165	180	
	COURSE 2	60	60	100	100	115	150	150	165	180	195	
	BASE COURSE	60	100	100	115	150	150	165	180	195	210	
											Contact a Professional Engineer for Preliminary Wall Section	

- † Wall embedment and leveling pad thickness increased beyond minimums, up to 10% and 30-cm respectively, in order to increase sliding resistance and/or bearing capacity
- †† Wall embedment and leveling pad thickness increased beyond minimums, up to 10% and 60-cm respectively, in order to increase sliding resistance and/or bearing capacity. Crushed stone over blocks backfill design method is assumed.

Recon Gravity Wall Charts - 3H:1V

3.6-degree Batter - 25 mm Setback per Block Course

3H:1V Backslope - No Surcharge
(measured from back of top block)



3H:1V Backslope - No Surcharge

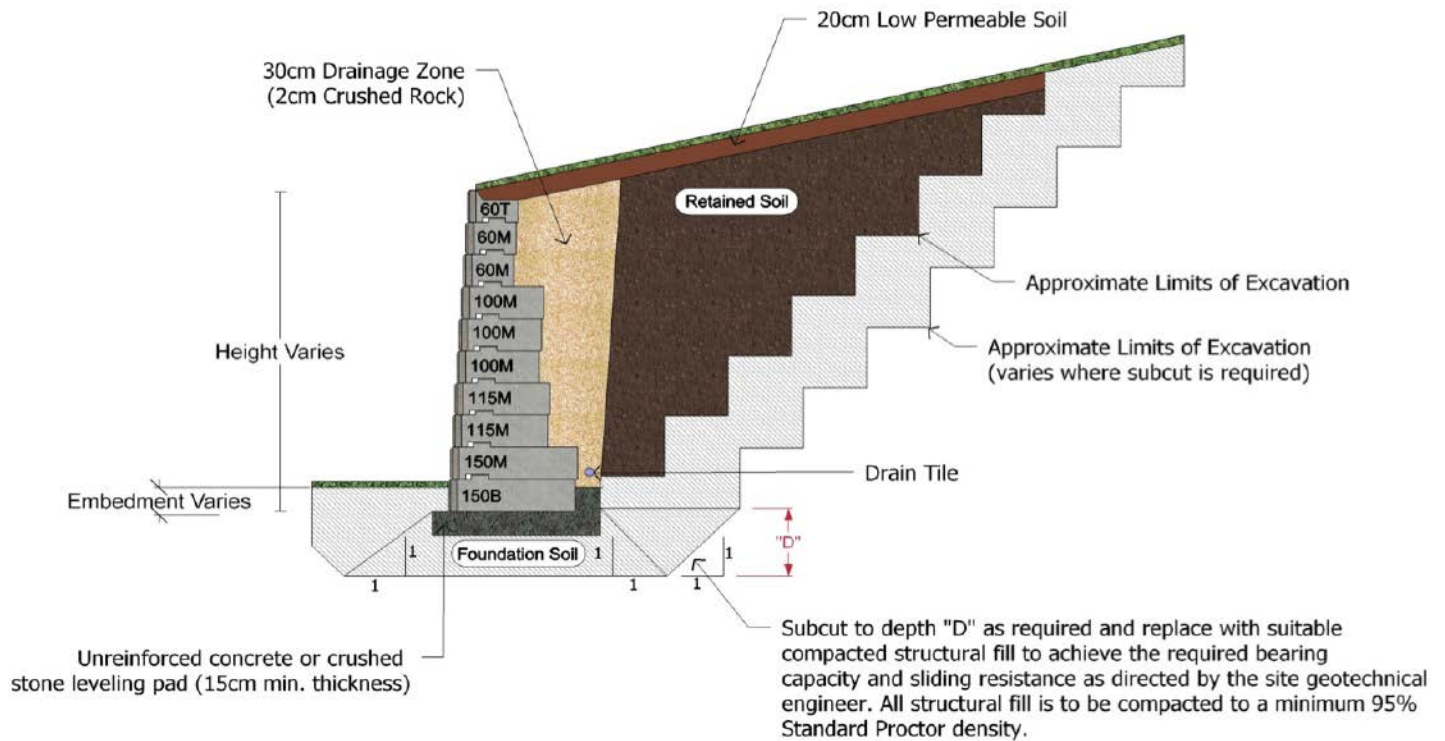
Retained Soil Type		LEAN CLAY or SILT, PHI=26°										
Wall Height (m)		1.62	2.03	2.44†	2.84†	3.25†	3.66††	4.06††	4.47	4.88	5.28	5.69
Block Depth Make-Up for Wall Cross Section (cm)	↑ COURSE 13											
	COURSE 12											
	COURSE 11											
	COURSE 10											
	COURSE 9							60				
	COURSE 8					60	60	60				
	COURSE 7				60	60	60	60				
	COURSE 6			60	60	60	60	100				
	COURSE 5		60	60	60	60	100	100				
	COURSE 4	60	60	60	60	100	100	150				
	COURSE 3	60	60	60	100	115	150	150				
	COURSE 2	60	60	100	115	150	150	150				
	BASE COURSE	100	100	150	165	195	180	210		Contact a Professional Engineer for Preliminary Wall Section	Contact a Professional Engineer for Preliminary Wall Section	Contact a Professional Engineer for Preliminary Wall Section

Retained Soil Type		SILTY SAND, PHI=30°										
Wall Height (m)		1.62	2.03	2.44	2.84	3.25†	3.66	4.06†	4.47†	4.88	5.28	5.69
Block Depth Make-Up for Wall Cross Section (cm)	↑ COURSE 13											
	COURSE 12											
	COURSE 11								60			
	COURSE 10							60	60			
	COURSE 9						60	60	60			
	COURSE 8					60	60	60	60			
	COURSE 7				60	60	60	60	100			
	COURSE 6			60	60	60	60	100	100			
	COURSE 5		60	60	60	60	100	100	115			
	COURSE 4	60	60	60	60	100	100	115	150			
	COURSE 3	60	60	60	100	100	115	150	150			
	COURSE 2	60	60	100	100	115	150	150	180			
	BASE COURSE	60	100	100	115	150	165	195	210	Contact a Professional Engineer for Preliminary Wall Section	Contact a Professional Engineer for Preliminary Wall Section	Contact a Professional Engineer for Preliminary Wall Section

Retained Soil Type		SAND or GRAVEL, PHI=34°										
Wall Height (m)		1.62	2.03	2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69
Block Depth Make-Up for Wall Cross Section (cm)	↑ COURSE 14											
	COURSE 13										60	
	COURSE 12									60	60	
	COURSE 11								60	60	60	
	COURSE 10							60	60	60	60	
	COURSE 9						60	60	60	60	100	
	COURSE 8					60	60	60	60	100	100	
	COURSE 7				60	60	60	60	100	100	115	
	COURSE 6			60	60	60	60	100	100	115	115	
	COURSE 5		60	60	60	60	100	100	115	115	150	
	COURSE 4	60	60	60	60	100	100	115	115	150	150	
	COURSE 3	60	60	60	100	100	115	115	150	150	180	
	COURSE 2	60	60	100	100	115	115	150	150	180	195	
BASE COURSE	60	100	100	115	115	150	150	180	195	210	Contact a Professional Engineer for Preliminary Wall Section	

- † Wall embedment and leveling pad thickness increased beyond minimums, up to 10% and 30-cm respectively, in order to increase sliding resistance and/or bearing capacity
- †† Wall embedment and leveling pad thickness increased beyond minimums, up to 10% and 60-cm respectively, in order to increase sliding resistance and/or bearing capacity. Crushed stone over blocks backfill design method is assumed.

Typical Gravity Wall Cross Section



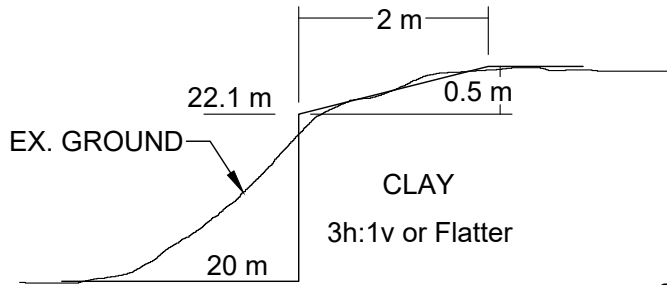
Notes: Typical Gravity Wall Cross Section

1. Wall height is the total height from top of leveling pad to top of wall.
2. Minimum wall embedment is typically 15cm or 5% of the total wall height, whichever is greater (walls with a level toeslope). Refer to Recon's Embedment Recommendation document for additional information for walls with a toeslope condition.
3. Leveling pad material assumed to have an internal frictional angle equal to 40-degrees.
4. Subsurface material (foundation soils) shall be capable of supporting the wall system.
5. Finished grade at top and bottom of wall shall provide positive drainage.
6. Drainage zone material shall be free-draining granular material such as 2cm crushed stone.
7. All retained backfill materials shall be compacted to a minimum 95% standard proctor density.

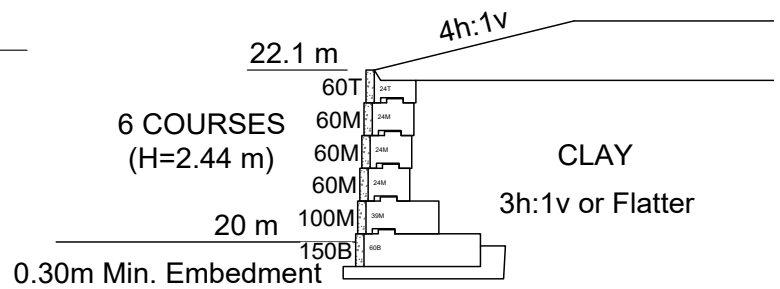
Notes: Gravity Wall Charts

1. The gravity wall charts have been prepared with calculations that utilize both the horizontal and vertical components of Coulomb earth pressure.
2. NCMA minimum factors of safety for overturning, sliding and bearing are 1.5, 1.5, and 2.0 respectively. AASHTO minimum factors of safety for overturning, sliding and bearing translate to 2.0, 1.5, and 3.0 respectively. The selection of the appropriate factors of safety should be based on the certainty with which design parameters and the consequences of failure are known.
3. The values shown in these charts reflect minimum factors of safety for overturning, sliding and bearing of 1.5, 1.5, and 2.0 respectively.
4. Sliding has been calculated between the base block and the leveling pad as well as between the leveling pad and foundation soils.
5. Global stability has not been addressed in preparation of these charts.
6. The values shown in the charts assume that the phi angle is the same for both the foundation and the retained soils and that both soils have a weight of 18.8 kN/m³.
7. Installation shall follow Recon's installation instructions and any additional instructions or guidance provided as a part of the final engineered stamped and site specific plans.

Gravity Example 1



GEOMETRY AND SOILS



PRELIMINARY SECTION

Step 1.

The slope above the wall goes 2m back and is 0.5m tall. That is a 3h:1v or flatter loading condition, use chart on page 6.

Step 2.

Clay retained soils, use the upper section of the chart.

Step 3.

3a.

The finished grade at the top of the wall is 22.1m.

The finished grade at the bottom of the wall is 20m.

Exposed Wall Height = $22.1 - 20 = 2.1\text{m}$

Embedment = 30cm or $2.1\text{m} \times 0.10$ (whichever is greater) = $\max[0.30\text{m}, 0.21\text{m}] = 0.30\text{m}$
(Clay requires embedment is 30cm minimum or 10% of the wall height)

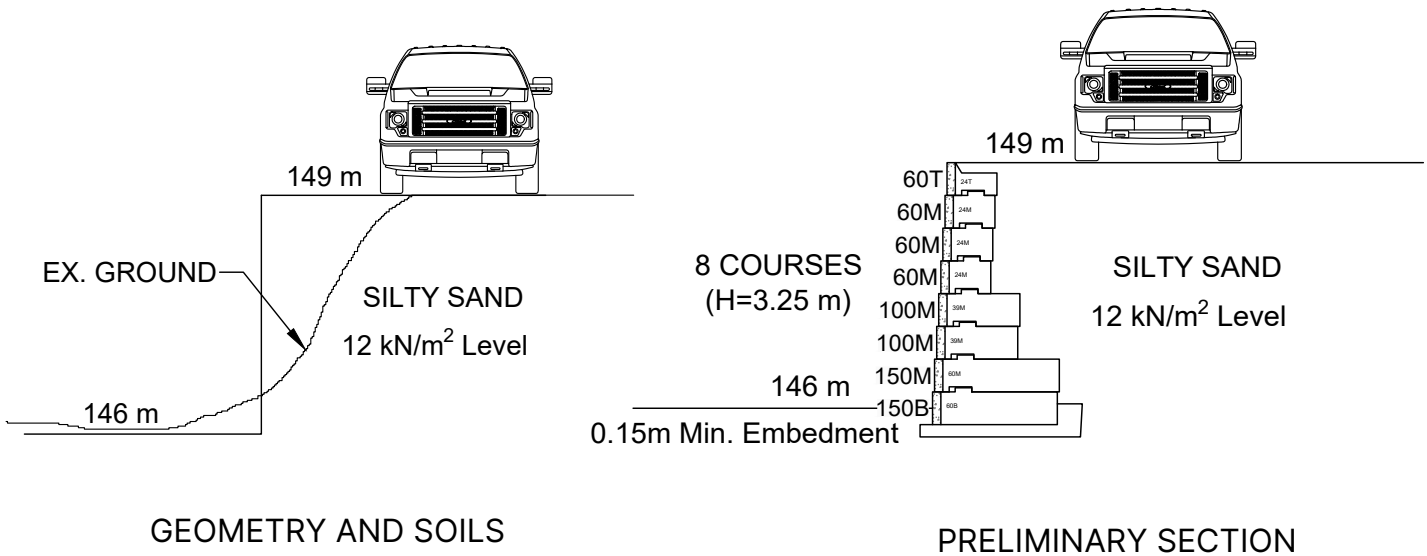
3b.

$H = 2.10\text{m} + 0.30\text{m} = 2.40\text{m}$

3c.

Round H up to the nearest block increment on the chart so $H = 2.40\text{m}$,
100, 100, 60, 60, 60, 60

Gravity Example 2



Step 1.

The wall supports a driveway. That is a 12 kN/m² loading condition, use chart on page 5.

Step 2.

Silty Sand retained soils, use the middle section of the chart.

Step 3.

3a.

The finished grade at the top of the wall is 149m.

The finished grade at the bottom of the wall is 146m.

Exposed Wall Height = 149 – 146 = 3m

Embedment = 15cm or 3m*0.05 (whichever is greater) = max[0.15m, 0.15m] = 0.15m

3b.

$H = 3\text{m} + 0.15\text{m} = 3.15\text{m}$

3c.

Round H up to the nearest block increment on the chart so $H = 3.25\text{m}$,

150, 150, 100, 100, 100, 60, 60, 60

Geogrid Reinforced Retaining Wall Chart Overview

Recon's Reinforced Geogrid Wall Charts have been prepared to demonstrate the capabilities of the Recon Wall System in a variety of assumed conditions. Walls are shown using the loading assumptions on each of the chart pages. A number of assumptions have been made in the preparation of the charts. It is important to read the notes to understand these assumptions. These wall charts are not intended for construction or bidding purposes. All wall sections should be designed by a professional engineer that is familiar with the project, using site specific conditions.

Steps to Using Recon Geogrid Reinforced Wall Charts

Step 1

Estimate the Loading Condition. Choose from the following options:

1. Level (no surcharge) - Use chart on page 11
2. 12 kN/m² Surcharge (level backslope with vehicular load) - Use chart on page 12
3. 3H:1V Backslope (use for 3H:1V backslopes or flatter) - Use chart on page 13

Step 2

Estimate the Retained Soil Type. Choose from the following options:

1. Lean Clay or Silt (assumes $\phi=26^\circ$) -Use top section of chart
2. Silty Sand (assumes $\phi=30^\circ$) - Use middle section of chart
3. Sand or Gravel (assumes $\phi=34^\circ$) - Use lower section of chart

Step 3

Estimate the maximum wall height. Use the following equation:

3a. Determine Exposed Wall Height and Embedment

Exposed Wall Height = [Finished Grade Elevation at Top] – [Finished Grade Elevation at Bottom]

and

Embedment = 15cm or 5% of Wall Height (whichever is greater)

Note: For lean clay or silt use 10% of wall height when determining embedment.

3b. Determine the Total Wall Height, H

H = Exposed Wall Height + Embedment

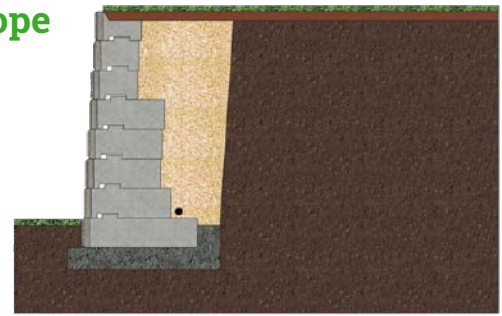
3c. Round H up to the nearest block increment in the chart

The preliminary **geogrid** design section is listed in the column below the total wall height, H. The minimum geogrid length is given, and geogrid layers must be installed at the elevations on the left side of the chart.

Recon Geogrid Reinforced Wall Charts - Level Backslope

3.6-degree Batter - 25 mm Setback per Block Course

Flat Backslope - No Surcharge



Level Backslope - No Surcharge

Minimum Required Geogrid Lengths by Elevation (m)

	Grid Elev. (m)	Wall Height (m)										
		2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69	6.10	
Soil Phi Angle = 26-degree	5.69											5.18
	5.28									4.88		-
	4.88								4.57	-		5.18
	4.47							4.57	-	4.88		-
	4.06						4.27	-	4.57	-		5.18
	3.66					3.96	-	4.57	-	4.88		-
	3.25				3.66	-	4.27	-	4.57	-		5.18
	2.84			3.35	-	3.96	-	4.57	-	4.88		-
	2.44		3.05	-	3.66	-	4.27	-	4.57	-		5.18
	2.03	2.74	-	3.35	-	3.96	-	4.57	-	4.88		5.18
	1.62	-	3.05	-	3.66	-	4.27	-	4.57	4.88		5.18
	1.22	2.74	-	3.35	-	3.96	-	4.57	4.57	4.88		5.18
	0.81	-	3.05	-	3.66	-	4.27	4.57	4.57	4.88		5.18
0.41	2.74	-	3.35	-	3.96	4.27	4.57	4.57	4.88		5.18	

Minimum Required Geogrid Lengths by Elevation (m)

	Grid Elev. (m)	Wall Height (m)										
		2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69	6.10	
Soil Phi Angle = 30-degree	5.69											4.88
	5.28									4.57		-
	4.88								4.27	-		4.88
	4.47							3.96	-	4.57		-
	4.06						3.96	-	4.27	-		4.88
	3.66					3.35	-	3.96	-	4.57		-
	3.25				3.35	-	3.96	-	4.27	-		4.88
	2.84			3.05	-	3.35	-	3.96	-	4.57		-
	2.44		2.74	-	3.35	-	3.96	-	4.27	-		4.88
	2.03	2.44	-	3.05	-	3.35	-	3.96	-	4.57		-
	1.62	-	2.74	-	3.35	-	3.96	-	4.27	-		4.88
	1.22	2.44	-	3.05	-	3.35	-	3.96	-	4.57		4.88
	0.81	-	2.74	-	3.35	-	3.96	-	4.27	4.57		4.88
0.41	2.44	-	3.05	-	3.35	-	3.96	4.27	4.57		4.88	

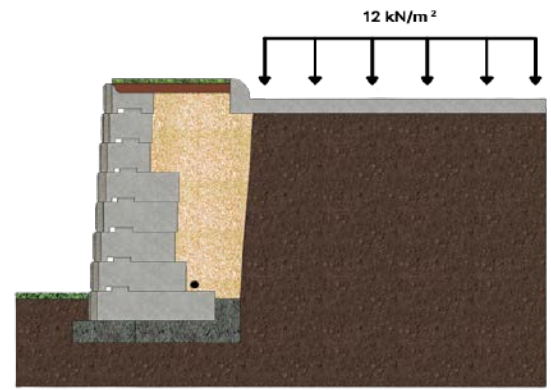
Minimum Required Geogrid Lengths by Elevation (m)

	Grid Elev. (m)	Wall Height (m)										
		2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69	6.10	
Soil Phi Angle = 34-degree	5.69											4.27
	5.28									4.27		-
	4.88								3.96	-		4.27
	4.47							3.66	-	4.27		-
	4.06						3.35	-	3.96	-		4.27
	3.66					3.35	-	3.66	-	4.27		-
	3.25				3.05	-	3.35	-	3.96	-		4.27
	2.84			2.74	-	3.35	-	3.66	-	4.27		-
	2.44		2.44	-	3.05	-	3.35	-	3.96	-		4.27
	2.03	2.13	-	2.74	-	3.35	-	3.66	-	4.27		-
	1.62	-	2.44	-	3.05	-	3.35	-	3.96	-		4.27
	1.22	2.13	-	2.74	-	3.35	-	3.66	-	4.27		-
	0.81	-	2.44	-	3.05	-	3.35	-	3.96	-		4.27
0.41	2.13	-	2.74	-	3.35	-	3.66	-	4.27		4.27	

Recon Geogrid Reinforced Wall Charts - 12kN/m²

3.6-degree Batter - 25 mm Setback per Block Course

Flat Backslope - 12 kN/m² Surcharge
(1-meter from back of wall)



Flat Backslope - 12kN/m² Surcharge

Minimum Required Geogrid Lengths by Elevation (m)

	Grid Elev. (m)	Wall Height (m)										
		2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69	6.10	
Soil Phi Angle = 26-degree	5.69											5.79
	5.28										5.48	-
	4.88								5.18	-	5.79	-
	4.47							4.88	-	5.48	-	-
	4.06						4.57	-	5.18	-	5.79	-
	3.66					4.27	-	4.88	-	5.48	-	-
	3.25				3.96	-	4.57	-	5.18	-	5.79	-
	2.84			3.66	-	4.27	-	4.88	-	5.48	5.79	-
	2.44		3.35	-	3.96	-	4.57	-	5.18	5.48	5.79	-
	2.03	3.05	-	3.66	-	4.27	-	4.88	5.18	5.48	5.79	-
	1.62	-	3.35	-	3.96	-	4.57	4.88	5.18	5.48	5.79	-
	1.22	3.05	-	3.66	-	4.27	4.57	4.88	5.18	5.48	5.79	-
	0.81	-	3.35	-	3.96	4.27	4.57	4.88	5.18	5.48	5.79	-
0.41	3.05	-	3.66	3.96	4.27	4.57	4.88	5.18	5.48	5.79	-	

Minimum Required Geogrid Lengths by Elevation (m)

	Grid Elev. (m)	Wall Height (m)										
		2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69	6.10	
Soil Phi Angle = 30-degree	5.69											4.88
	5.28										4.88	-
	4.88								4.57	-	4.88	-
	4.47							4.27	-	4.88	-	-
	4.06						3.96	-	4.57	-	4.88	-
	3.66					3.66	-	4.27	-	4.88	-	-
	3.25				3.35	-	3.96	-	4.57	-	4.88	-
	2.84			3.05	-	3.66	-	4.27	-	4.88	-	-
	2.44		2.74	-	3.35	-	3.96	-	4.57	-	4.88	-
	2.03	2.74	-	3.05	-	3.66	-	4.27	-	4.88	4.88	-
	1.62	-	2.74	-	3.35	-	3.96	-	4.57	4.88	4.88	-
	1.22	2.74	-	3.05	-	3.66	-	4.27	4.57	4.88	4.88	-
	0.81	-	2.74	-	3.35	-	3.96	4.27	4.57	4.88	4.88	-
0.41	2.74	-	3.05	-	3.66	3.96	4.27	4.57	4.88	4.88	-	

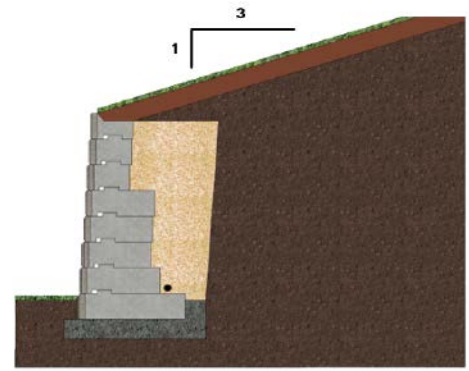
Minimum Required Geogrid Lengths by Elevation (m)

	Grid Elev. (m)	Wall Height (m)										
		2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69	6.10	
Soil Phi Angle = 34-degree	5.69											4.57
	5.28										4.27	-
	4.88								3.96	-	4.57	-
	4.47							3.66	-	4.27	-	-
	4.06						3.66	-	3.96	-	4.57	-
	3.66					3.35	-	3.66	-	4.27	-	-
	3.25				3.05	-	3.66	-	3.96	-	4.57	-
	2.84			2.74	-	3.35	-	3.66	-	4.27	-	-
	2.44		2.74	-	3.05	-	3.66	-	3.96	-	4.57	-
	2.03	2.44	-	2.74	-	3.35	-	3.66	-	4.27	-	-
	1.62	-	2.74	-	3.05	-	3.66	-	3.96	-	4.57	-
	1.22	2.44	-	2.74	-	3.35	-	3.66	-	4.27	-	-
	0.81	-	2.74	-	3.05	-	3.66	-	3.96	-	4.57	-
0.41	2.44	-	2.74	-	3.35	-	3.66	-	4.27	4.57	-	

Recon Geogrid Reinforced Wall Charts - 3H:1V

3.6-degree Batter - 1 inch Setback per Block Course

3H:1V Backslope - No Surcharge
(measured from back of top block)



3H:1V Backslope - No Surcharge

Minimum Required Geogrid Lengths by Elevation (m)

	Grid Elev. (m)	Wall Height (m)									
		2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69	6.10
Soil Phi Angle = 26-degree	5.69										6.71
	5.28									6.40	-
	4.88								5.79	-	6.71
	4.47							5.48	-	6.40	-
	4.06						5.18	-	5.79	-	6.71
	3.66					4.57	-	5.48	-	6.40	6.71
	3.25				4.27	-	5.18	-	5.79	6.40	6.71
	2.84			3.96	-	4.57	-	5.48	5.79	6.40	6.71
	2.44		3.35	-	4.27	-	5.18	5.48	5.79	6.40	6.71
	2.03	3.05	-	3.96	-	4.57	5.18	5.48	5.79	6.40	6.71
	1.62	-	3.35	-	4.27	4.57	5.18	5.48	5.79	6.40	6.71
	1.22	3.05	-	3.96	4.27	4.57	5.18	5.48	5.79	6.40	6.71
	0.81	-	3.35	3.96	4.27	4.57	5.18	5.48	5.79	6.40	6.71
0.41	3.05	3.35	3.96	4.27	4.57	5.18	5.48	5.79	6.40	6.71	

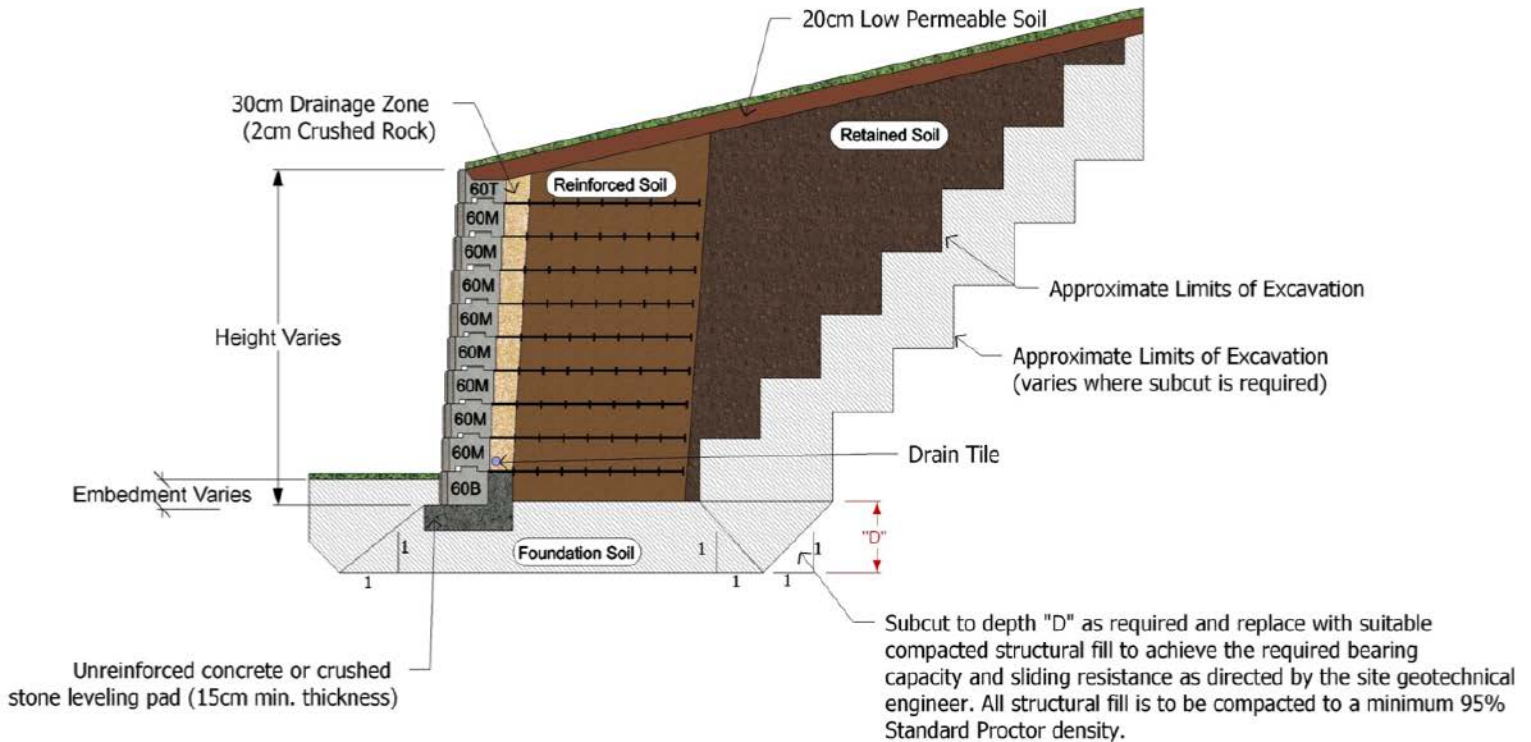
Minimum Required Geogrid Lengths by Elevation (m)

	Grid Elev. (m)	Wall Height (m)									
		2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69	6.10
Soil Phi Angle = 30-degree	5.69										5.79
	5.28									5.48	-
	4.88								5.18	-	5.79
	4.47							4.88	-	5.48	-
	4.06						4.27	-	5.18	-	5.79
	3.66					3.96	-	4.88	-	5.48	-
	3.25				3.66	-	4.27	-	5.18	-	5.79
	2.84			3.35	-	3.96	-	4.88	-	5.48	5.79
	2.44		3.05	-	3.66	-	4.27	-	5.18	5.48	5.79
	2.03	2.74	-	3.35	-	3.96	-	4.88	5.18	5.48	5.79
	1.62	-	3.05	-	3.66	-	4.27	4.88	5.18	5.48	5.79
	1.22	2.74	-	3.35	-	3.96	4.27	4.88	5.18	5.48	5.79
	0.81	-	3.05	-	3.66	3.96	4.27	4.88	5.18	5.48	5.79
0.41	2.74	-	3.35	3.66	3.96	4.27	4.88	5.18	5.48	5.79	

Minimum Required Geogrid Lengths by Elevation (m)

	Grid Elev. (m)	Wall Height (m)									
		2.44	2.84	3.25	3.66	4.06	4.47	4.88	5.28	5.69	6.10
Soil Phi Angle = 34-degree	5.69										5.18
	5.28									4.88	-
	4.88								4.57	-	5.18
	4.47							4.27	-	4.88	-
	4.06						3.96	-	4.57	-	5.18
	3.66					3.66	-	4.27	-	4.88	-
	3.25				3.35	-	3.96	-	4.57	-	5.18
	2.84			3.05	-	3.66	-	4.27	-	4.88	-
	2.44		2.74	-	3.35	-	3.96	-	4.57	-	5.18
	2.03	2.44	-	3.05	-	3.66	-	4.27	-	4.88	-
	1.62	-	2.74	-	3.35	-	3.96	-	4.57	-	5.18
	1.22	2.44	-	3.05	-	3.66	-	4.27	-	4.88	5.18
	0.81	-	2.74	-	3.35	-	3.96	-	4.57	4.88	5.18
0.41	2.44	-	3.05	-	3.66	-	4.27	4.57	4.88	5.18	

Typical Geogrid Reinforced Wall Cross Section



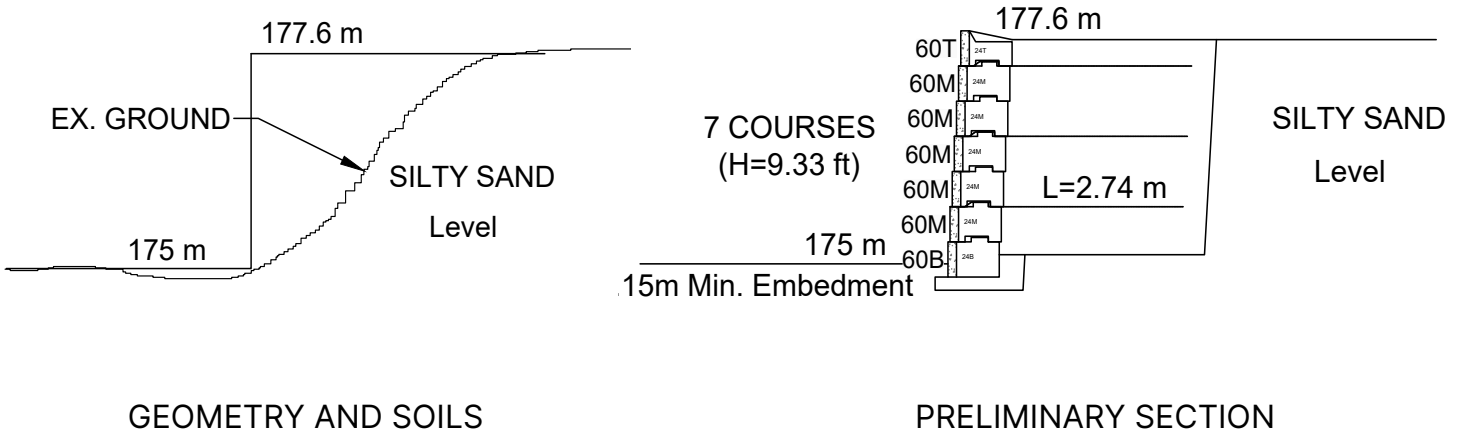
Notes: Typical Geogrid Reinforced Wall Cross Section

1. Wall height is the total height from top of leveling pad to top of wall.
2. Geogrid length is measured from the front face of the block.
3. Minimum wall embedment is typically 15cm or 5% of the total wall height, whichever is greater (walls with a level toeslope). Refer to Recon's Embedment Recommendation document for additional information for walls with a toeslope condition.
4. Leveling pad material assumed to have an internal frictional angle equal to 40-degrees.
5. Subsurface material (foundation soils) shall be capable of supporting the wall system.
6. Finished grade at top and bottom of wall shall provide positive drainage.
7. Drainage zone material shall be free-draining granular material such as 2cm crushed stone.
8. All reinforced and retained backfill materials shall be compacted to a minimum 95% standard proctor density.

Notes: Geogrid Reinforced Wall Charts

1. The Geogrid Reinforced wall charts have been prepared per the NCMA Design Manual for Segmental Retaining Walls – 3rd Edition.
2. The values shown in these charts reflect minimum factors of safety for overturning, sliding and bearing of 1.5, 1.5, and 2.0 respectively. Additionally, a factor of safety of 1.5 has been used for geogrid strength, connection and pullout.
3. Values in the charts assume a minimum long-term allowable geogrid design strength of 36.5kN/m.
4. Global stability has not been addressed in preparation of these charts.
5. The values shown in the charts assume that the phi angle is the same for the foundation, reinforced and retained soils. All soils are assumed to have a unit weight of 18.8 kN/m³.
6. Installation shall follow ReCon's Installation Instructions and any additional instruction or guidance provided as a part of the final engineered stamped and site specific plans.
7. Installation shall follow Recon's installation instructions and any additional instructions or guidance provided as a part of the final engineered stamped and site specific plans.

Reinforced Example 1



Step 1.

It is level behind the wall with no surcharge. That is a level loading condition, use chart on page 11.

Step 2.

Silty Sand retained soils, use the middle section of the chart.

Step 3.

3a.

The finished grade at the top of the wall is 177.6m.

The finished grade at the bottom of the wall is 175m.

Exposed Wall Height = $177.6 - 175 = 2.6\text{m}$

Embedment = 15cm or $2.6\text{m} \times 0.05$ (whichever is greater) = $\max[0.15\text{m}, 0.13\text{m}] = 0.15\text{m}$

3b.

$H = 2.6\text{m} + 0.15\text{m} = 2.75\text{m}$

3c.

Round H up to the nearest block increment on the chart so $H = 2.84\text{m}$,

Minimum Geogrid Length = 2.74m (with layers at elevations 0.81m, 1.62m and 2.44m)

(Reinforced earth walls typically use all 24" deep Recon units or all 16" deep lipped Recon units)

Disclaimer

The Recon Wall Charts were prepared by Recon Wall Systems, Inc. and to the best of Recon's knowledge accurately represent the product use in the application illustrated. These charts are for conceptual and instructional purposes only. Anyone making use of these charts does so at their own risk and assumes all liability for such use. Final design, for construction purposes, must be done by a registered professional engineer who is familiar with the project and who has considered the specific site conditions. These charts should be used in conjunction with the previously stated notes and cross section information.