

RETAINING WALL



BUILD A RETAINING WALL

1. BASE PREPERATION

- Dig out trench approximately 250mm deep, with 600mm width.
- Compact 150mm to 200mm of fine crushed rock (gravel)
- This base thickness depends on the wall height e.g. 150mm thick for 1 metre high. Extra thickness may be required for higher walls.



2. SAND BED

- Spread 25mm of either sharp sand or metal dust over the compacted base.
- Ensure this is in a staright line and check with a level.
- If wall is stepped start at lowest point.



3. LAYING FIRST COURSE

- Use level and string to ensure the first course is laid correctly
- For walls up to 1 metre high, make at least 100mm of the first block course is buried below the finished ground level. For walls over 1 metre high allow approximately 200mm, and 300mm for walls over 2 metres high.
- Compact gravel along the front of the blocks to stabilise.



RETAINING WALL

4. DRAINAGE & BACKFILL

- Place P.V.C. ag-pipe with a geotextile sock drain behind the wall, with a 1 in 100 fall.
- Backfill behind the blocks approximately 200-300mm, using 10-20mm clean, free-draining material (e.g. blue metal). Ensure each block is well filled with free draining material.
- Backfill behind drainage layer with chosen backfill material in a maximum of 200mm layers.
- Compaction rate of 95% must be achieved, using only hand operated plate compactors close to wall.
- Do not use soft or wet clay to backfill



5. LAYING GEOGRID

- Clean all debris off top of wall to ensure next layer sits perfectly.
- Roll geogrid perpendicular to wall, pull tight and cut required length.
- Geogrid must sit within 15mm of the face of the block, in order for the purpose made connecting lugs to interlock.
- Butt-join the geogrid along the length of the wall.
- Place the next course on top of the geogrid.



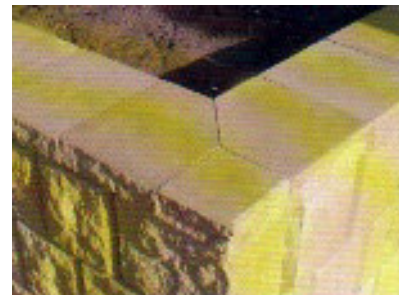
6. LAYING ADDITIONAL COURSES

- Lay next courses to a string line following same procedure, as outlined previously, ensuring backfill is compacted to 95%.



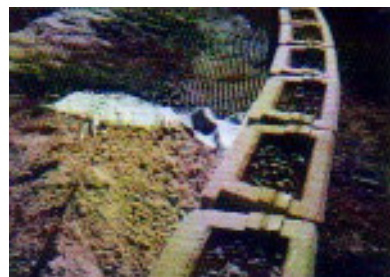
7. LAYING CAPPING UNITS




- Once is backfilling and cleaning is completed as per step 5, fix the blocks with adhesive.
 - For domestic situations, a waterproof construction adhesive is recommended.
 - For high use areas, a 2-part epoxy is preferred.



8. SURFACE DRAINAGE LAYER

- Care should be taken wherever possible to divert water away from the wall face. If unable to do so, place a 100-150mm clay (or similar) impermeable layer on top of the wall fill, as shown in figure 2.
- If soil is used on top of a wall, a layer of geotextile must be used to stop any soil filtering down through the drainage layer (see figure 1).



CURVES	CORNERS	STEPS
<p>For convex curved walls simply knock the back fin off the block with a hammer.</p> <p><u>Minimum Radius</u></p> <p>Tasman Blocks: 2170mm</p> <p>Tasman ½ Blocks: 1070mm</p> 	<p>Corners are built by adhesively fixing the purpose made corner blocks to alternate courses.</p> <p>Allowances should be made for a 10mm step back per course.</p> 	<p>Steps can be easily built using a combination of Tasman blocks and capping units.</p> <p>The step risers are built with Tasman blocks</p> <p>The capping units are then adhered to the top of the blocks to form the treads.</p> 

MAXIMUM WALL HEIGHTS FOR BLOCK GRAVITY RETAINING WALLS

- Retaining walls that comply with the maximum wall heights shown in table 1 can be built as gravity walls.
- Retaining walls exceeding the height of table 1 will require Fortrac® geogrid soil reinforcement (see Table 2). Walls together with Fortrac® geogrids locked into the patented interlocking blocks, provide a reinforced soil mass for walls up to 6 metres high.

UNREINFORCED RETAINING WALLS

(See Figure 1)

MAXIMUM WALL HEIGHT 'H' (m)*			
Backslope Conditions/Loadings	Backfill/Retained Soil Types		
	Type 1	Type 2	Type 3
Level, with:			
NO Surcharge	0.7	1.0	1.0
Domestic Vehicles	0.5	0.7	0.7
1:4, with:			
No Surcharge	0.7	0.9	0.9
Domestic Vehicles	0.5	0.7	0.7

SOIL TYPE DESCRIPTIONS	
Type 1 Soils	Includes soft & firm clay, fine sands, silty clays Internal Friction Angle $\geq 20 - 24^\circ$.
Type 2 Soils	Includes stiff sandy clays and gravelly clays Internal Friction Angle $\geq 25 - 30^\circ$
Type 3 Soils	Includes FCR, rock, sandstone and gravels Internal Friction Angle $\geq 30^\circ+$

UNREINFORCED RETAINING WALLS

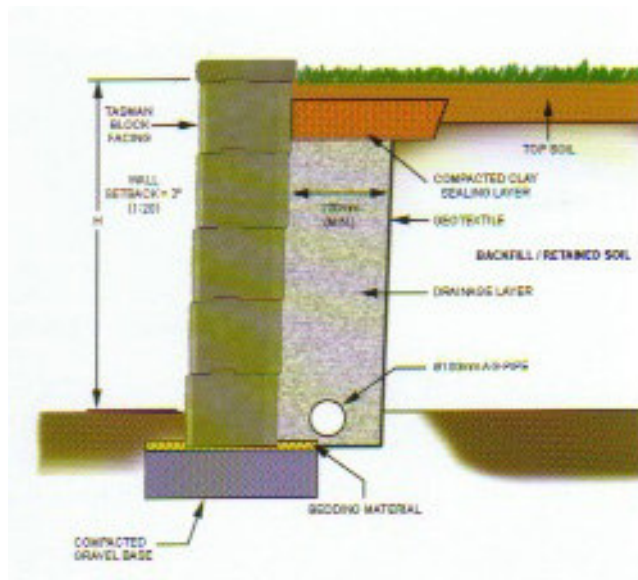


Figure 1

REINFORCED RETAINING WALLS

(See Figure 2)

(Type A Infil Soil)			Level Backslope				1:4 Backstage			
			Without Surcharge		Domestic Vehicle Surcharge		Without Surcharge		Domestic Vehicle Surcharge	
Wall Height 'H' (m)	# Layers of GeoGrid	Spacing 's' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)
0.8	2	0.4	35/20-20	1.6	-	-	-	-	-	-
1.2	3	0.4	35/20-20	1.8	-	-	-	-	-	-
1.6	4	0.4	35/20-20	1.9	55/30-20	2.5	-	-	-	-
2.0	5	0.4	55/20-20	2.2	55/30-20	2.8	-	-	-	-
2.4	6	0.4	55/20-20	2.6	55/30-20	3.3	-	-	-	-
2.8	7	0.4	55/20-20	3.1	-	-	-	-	-	-

(Type B Infil Soil)			Level Backslope				1:4 Backslope			
			Without Surcharge		Domestic Vehicle Surcharge		Without Surcharge		Domestic Vehicle Surcharge	
Wall Height 'H' (m)	# Layers of GeoGrid	Spacing 's' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)
0.8	2	0.4	-	-	35/20-20	1.0	-	-	35/20-20	1.6
1.2	3	0.4	35/20-20	1.0	35/20-20	1.1	35/20-20	1.3	35/20-20	1.9
1.6	3	0.6	35/20-20	1.3	35/20-20	1.3	35/20-20	1.6	55/30-20	2.1
2.0	4	0.6	35/20-20	1.5	55/30-20	1.5	55/30-20	1.8	55/30-20	2.4
2.4	6	0.4	55/30-20	1.8	55/30-20	1.8	55/30-20	2.2	55/30-20	3.0
2.8	7	0.4	55/30-20	2.1	55/30-20	2.4	55/30-20	2.5	-	-

(Type C Infil Soil)			Level Backslope				1:4 Backslope			
			Without Surcharge		Domestic Vehicle Surcharge		Without Surcharge		Domestic Vehicle Surcharge	
Wall Height 'H' (m)	# Layers of GeoGrid	Spacing 's' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)	Type of Geogrid	Geogrid Lengths 'L' (m)
0.8	2	0.4	-	-	35/20-20	0.9	-	-	35/20-20	1.5
1.2	3	0.4	35/20-20	1.0	35/20-20	1.1	35/20-20	1.3	35/20-20	1.9
1.6	3	0.6	35/20-20	1.3	35/20-20	1.4	35/20-20	1.6	35/20-20	2.3
2.0	4	0.6	35/20-20	1.5	35/20-20	1.6	35/20-20	1.9	35/20-20	2.5
2.4	5	0.6	35/20-20	1.8	35/20-20	1.8	35/20-20	2.3	55/30-20	2.9
2.8	5	0.6	35/20-20	2.1	55/30-20	2.2	55/30-20	2.7	55/30-20	3.3

UNREINFORCED RETAINING WALLS

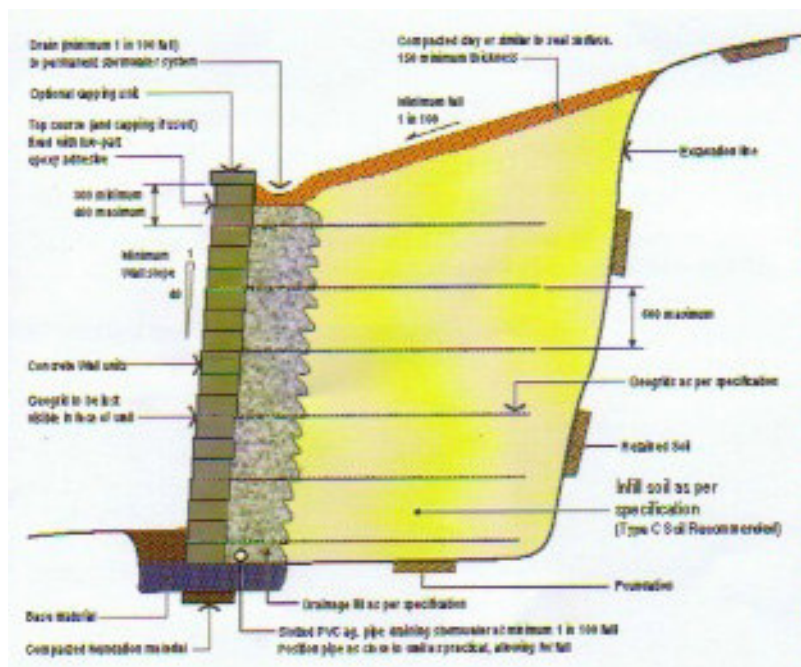


Figure 2

R E T A I N I N G W A L L

GEOGRIDS

Geogrid Spacing:

- Bottom Layer - Top of 1st course (200mm from base)
- Intermediate Layers - 400-600mm max.
- Top Layer - 400mm from top course
- Geogrid lengths from design tables above are measured from the back of the wall.

DRAINAGE SYSTEM

The drainage system consists of:

- A permeable drainage layer at least 300mm wide adjacent to the stem of the wall;
- A slotted PVC agricultural pipe, with geofabric sock if appropriate, or equivalent system, draining to the storm water system;
- A catch drain capable of removing surface water from the top of the embankment;
- A surface-sealing layer that prevents the ingress of surface water into the fill behind the wall.

Drainage fill material should be:

- A single-sized gravel or crushed rock in the range of 10 to 20mm, designated GP, or a well-graded gravel, designated GW, with a minimum particle size at least 5mm.
- Must be free draining, particularly in the lower parts of the wall.
- It should be positioned so that it delivers water at the level of the drainage pipe, which must slope along the length of the wall.
- To minimise the effect of clogging, position the drainage pipe in the drainage fill at a minimum uniform grade of 1 in 100.
- Connect the agricultural pipe with a PVC stormwater pipe and brought through the front face of the wall at intervals not exceeding 30m. Where practical, it should be connected to the storm-water system at the lower end of each run, and must drain positively away from the base of the retaining wall.
- The whole of the disturbed fill surface should be sealed by at least 150mm of compacted clay and properly drained.

Reinforced Infill Soil

- This material should not contain large or sharp material that will damage the geogrids.
- It must be fully compacted to form a solid mass reinforced by the geogrids.
- Well graded gravel (GW) is recommended (Type C soils per reinforced design table above).

RETAINING WALL

CONSTRUCTION NOTES

ENGINEERING – To comply with most council requirements, please seek specific engineering advice for walls over 1 metre high or for low walls carrying car traffic, etc.

1. The following assumptions have been made regarding soil properties:
 - a. Infill Soil Types – As above: Internal Friction Angle $\geq 20 - 30^\circ$
 - b. Bearing Pad – Compacted density angle: at least 18.6kg/m^3
 - Effective internal friction angle: at least 37°
 - Effective Cohesion: at least 5kPa
2. Caution is required when using heavy or dry clays as retained soil or backfill.
3. Subcharge loads as follows:

Domestic Vehicles	- 500kg/m^2
Heavy Vehicles	- To be separately assessed
4. The wall footing shall consist of a compacted, well-graded gravel footing 600mm wide x 150mm deep for walls up to 1 metre high, with the first course at least 100mm below finished ground level. For walls over 1 metre high, an engineer will consider extra depth in the gravel footing along with a minimum 200mm embedment of the first course, subject to soil conditions.
5. Drainage shall be supplied in the form of a slotted P.V.C ag-pipe with geotextile sock drain (as shown in figure 2, fall at 1:100min. to S/W disposal system) or with deep holes. A 300mm drainage layer of uniformity graded gravel shall be provided behind the wall.
6. Geogrid soil reinforcement shall be "Fortrac®" installed in accordance with the manufacturer's recommendation. "Fortrac®" geogrid is to be unrolled perpendicular to the wall.
7. The geogrid reinforcing should be butt joined, or aligned vertically. Where overlapping can occur (e.g. curved walls) the geogrid must be separated with a minimum of 100mm of backfill material.
8. The unreinforced soil design table complies with AS 4678 and is based on Tasman blocks 390mm L x 245mm W x 200mm H.
9. For backslope conditions greater than 1 in 4, seek specific engineering advice.
10. Vehicle traffic should not be allowed closer than 1 metre behind the wall.

Engineering by: Dale P Luck & Associates Consulting Engineers and Quasar Management Services Pty Ltd