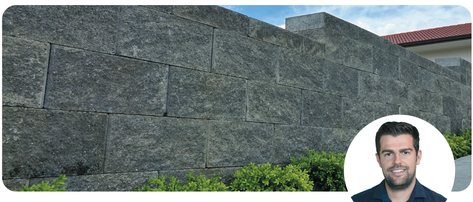

SANTI ALVAREZ
RETAINING ENGINEER

BLOG
MIND YOUR GRAVITY WALL

A Simple Gravity Wall or just a Gravity Wall is a type of retaining wall that relies purely on its own self-weight to retain the soil behind and resist external forces.

Typically made with heavy materials such as stones, poured concrete or masonry units, they can be constructed using simple or multiple depth units, and there are a multitude of systems available in the New Zealand market; small Segmental Retaining Walls (SRWs) such as Allan Block® and Rocklok®, gabion baskets, crib walls, stone walls, just to mention a few.

Figure 1: Rocklok Retaining Wall System

Among the SRWs systems, the large majority of them are low height walls used in landscaping and DIY projects for a wide variety of purposes; enhance aesthetics, create a flat level garden area, make a slope useful, reduce erosion and/or improve site drainage.

Experience tells us that most gravity walls used for landscaping do not require engineering or a statement of opinion from a competent design professional (Producer Statement), so their design, construction and Building Code compliance is typically left to the skillful and astute contractor or homeowner.

On most occasions, gravity walls are simple and straightforward, however, better to keep the following 7 things in mind when building your gravity wall.

1. HEIGHT

The maximum wall height that can be constructed using the Allan Block® or Rocklok® retaining wall systems is directly proportional to their weight, width, inter unit shear strength, and vertical batter of construction for any given soil and site geometry conditions.

Gravity walls rarely fail in sliding as the overturning calculations generally controls the maximum design height possible. Generally, most SRWs products can be comfortably built up to 900 millimetres without major complications or considerations providing that they are not excessively surcharged and that they are founded on good ground as defined by NZS 3604:2011.

If a higher wall was required, using the SRW units in conjunction with No-Fines Concrete (NFC) will help create a deeper and heavier concrete mass, augmenting the retaining wall resistance against external stability forces such as sliding and overturning.

2. WALL BATTER

The extent the wall slopes backwards into the bank is referred as setback or wall batter, and gravity wall design is very sensitive to it.

Although the client's desired aesthetics and appearance are an important factor when selecting SRW units, we need to keep in mind that battering the retaining wall enhances stability as it moves the centre of gravity back from the toe of the wall and that it also reduces the earth pressure applied to the wall from the soil it is retaining. As the setback increases so it does the maximum height the gravity wall can be built.

Typical setback angles are the 1° of Rocklok® to the 6° of the AB Classic or AB Junior units, being the AB Vertical somewhere in between as it provides a 3° angle from the vertical.

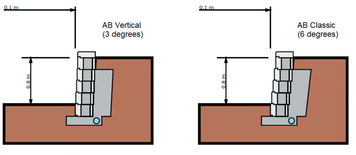

Figure 2: AB Vertical and AB Classic setbacks

3. SURCHARGES

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4. BACKSLOPES

The presence of slopes at the top of the retaining wall can substantially increase and even double the lateral earth pressures, creating instability on the retaining structure. Broken backslopes (slopes that crest and level off) will exert less pressure than steep continuous slopes, so they are less of a problem.

Generally, most Allan Block® and Rocklok® gravity walls will perform very well with batter slopes lesser than to 1V:5H (11.3 degrees). Steeper backslopes might be feasible, but they should be evaluated.

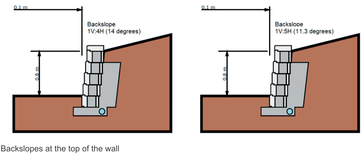

Figure 3: Backslopes at the top of the wall

5. SOIL PROPERTIES & FOUNDATION STABILITY

Soils have an enormous influence on retaining walls. Clay soils are very common in many parts of New Zealand, but they can be challenging as they retain the water that filters into it, adding weight and increasing the pressure on the gravity wall. They are also susceptible to swelling and shrinkage.

The ideal soil to be used within and behind modular concrete block units is a clean, permeable, compactible, well-graded gravel or sand, preferably a material that provides weight to the blocks and allows water to pass through, such as drainage metal.

Foundation stability is also key, so foundations soils should be adequately compacted before starting the construction of your Allan Block® and Rocklok® gravity walls, especially if the soils underneath have previously been disturbed, dug, imported, or substituted. For the levelling pad, the best options are probably an aggregate such as GAP 20 or GAP 40 as they are easy to compact and provide a high frictional and shear resistance to form a good foundation material.

6. WATER MANAGEMENT

Water is the number one enemy of any SRW, and it is the primary cause of failure. Localised sources of water must be considered when building any gravity wall, and surface water should be diverted away from the back of the wall using swales or berms.

Good drainage is essential for the longevity of the gravity wall, so all Allan Block and Rocklok® units should be filled with drainage rock. At the same time, it is convenient to place a minimum of 300 mm of the same selected material behind the SRW units to create what it is called "drainage column".

At the bottom of that drainage column a minimum Ø100 mm slotted or punched drainage pipe has to be located and vent to daylight to filtering incidental water and release hydrostatic pressure.

7. COUNCIL REQUIREMENTS

As previously stated, most gravity walls will not require engineering or a building consent as they generally retain less than 1.5 metres of ground. However, if the gravity wall height is under 1.5 metres and support any sort of surcharge or has a sloping ground above the wall a building consent might be required. Even when a building permit might not be needed, do not forget that all gravity walls must comply with the Building Code requirements.

Finally, when the gravity wall is located on a boundary most local councils would require a 5 KPa or 12 kPa boundary surcharge loading, which will definitely influence your ability to build the wall as a gravity wall and on its compliance.

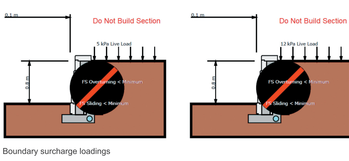

Figure 4: Boundary surcharge loadings

Bowers Brothers Concrete recommends engineering advice to be sought for walls exceeding 900 mm or positioned near a boundary.

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