Technical Design Note

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Site-wide Landscape Items

Site-wide landscape items will inevitably require some structural input and support.

It is key to understand the sequencing of construction with regards to the landscape to ensure the correct elements are incorporated along with the adjacent structures as this may affect one another. A phasing plan is required to highlight these areas.

Site preparation is key with an understanding which area will be sculptured initially, what temporary situations are being proposed and the interaction with the adjoining areas. As phases progress areas may need re-sculpturing which could lead to cost and time implications.

As the landscape proposal is still being developed and coordinated, the structural design of these elements are seen to be undertaken in the next stages of design once the landscape layout is frozen and the ground investigation report has been finalised. There will inevitably some last-minute landscape amendments even into the construction phase so it is key for the landscape team to coordinate these with the civil and structural team to ensure efficient design and sequencing.

Nearly most of the landscape items will require some sort of structural input. Hidden requirements could be in the form of foundations for support or fixing, or soil improvement such as geotextiles and earthworks.

1. Retaining Structures

The landscape layout identifies some areas with high level changes and other areas of low-level changes. Retaining walls will therefore be required in these areas to ensure the proposed levels are maintained. It is important to ensure all ground conditions are known in detail hence a detailed ground investigation is required to begin to design the required retaining walls.

It is important to understand the concepts of the retaining wall requirements. Retaining walls can range in material and usually are constrained to level heights, ground conditions and loadings/surcharge being retained.

The sequencing of construction for retaining walls is also important as site access and site works will be crucial. Constructing retaining walls when site vehicles are still being used impose large surcharge forces which is not usually present in the permanent stage. It is important to highlight the temporary condition of the landscape levels, maximising gradual slopes during site works and finishing off the level changes post-construction.

It is key to ensure no soakaways are placed behind retaining structures as this will alter the ground conditions which the retaining walls will be initially designed for. This may lead to settlement or collapse of the retaining wall should the soil behind and underneath the retaining wall be over-saturated.

1.1 Low-level retaining walls

» **Timber retaining walls**

These consist of wooden members connected together to provide the flexural strength to withstand the soil pressures behind it. Timber retaining walls are constrained by retained soil height which are usually low, ideal for retained soil of less than 500mm in height that require more of a sustainable wooden aesthetic appeal. A specialist supplier should be consulted for this type of system. The life span of timber is dependent on how it has been treated but maintenance is required at regular intervals to ensure the wood has not rotten which can lead to failure and collapse.

Figure 1: Low height timber retaining structures

1.2 Medium-height Retaining Walls

» **Masonry retaining walls**

Masonry, in the form of brickwork or blockwork can be used as a retaining wall. These however need to specifically be for landscape only as additional surcharge can overstress the wall. They rely on their dead weight to resist the overturning moments which are limited due to the absence of tension resistance. The BRE Good Building Guide 27 gives good guidance on retained soil limitations in comparison with wall thicknesses, as shown below (for straight walls).

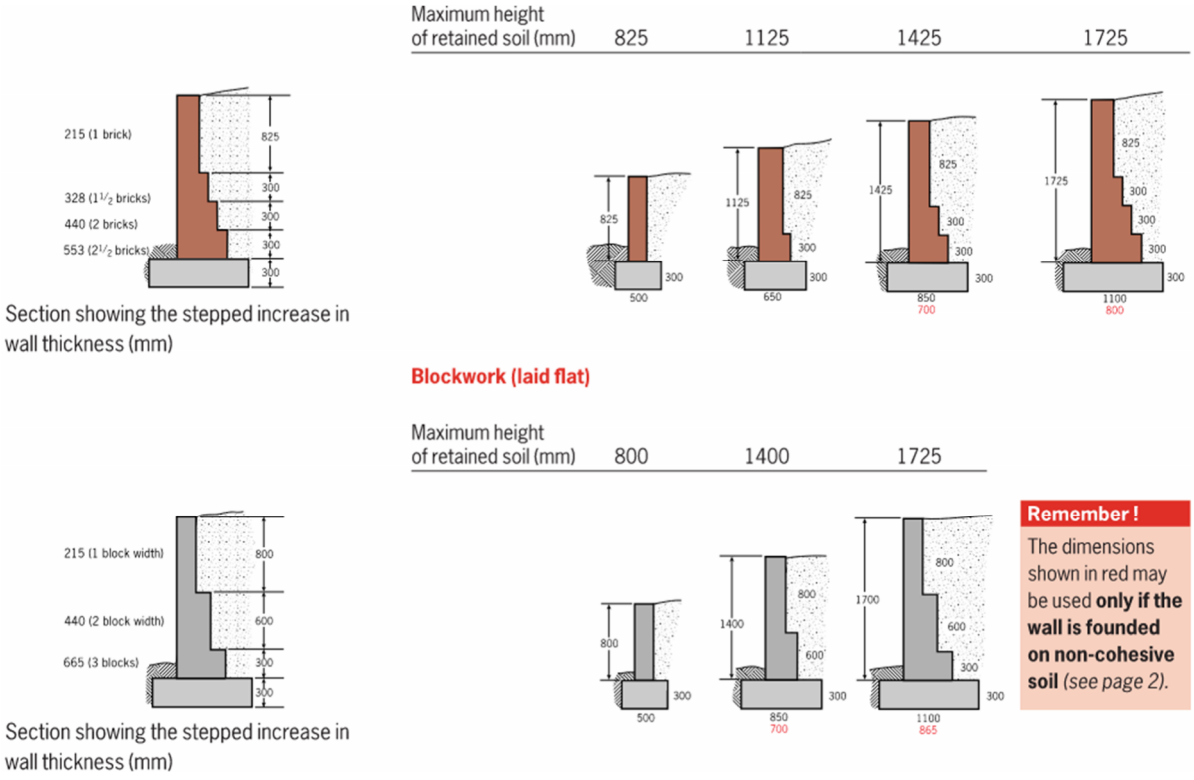

Figure 2: Guidance from BRE GBG 27

Figure 3: Picture of brick retaining wall

» **Gabion retaining walls**

Gabion retaining walls consist of wired mesh baskets usually in 1m lengths and vary between 300mm, 500mm and 1m in depth, placed side by side and on top of each other and filled with stone material of choice. They are designed utilising the self-weight of the material to withstand the soil pressures acting behind it, hence the material being used is needed to undertake the design. As the retained height increases, the base thickness would increase by adding additional baskets behind each other and building up in a pyramid-like manner. A specialist gabion supplier should be consulted to provide the design and detailing for this system.

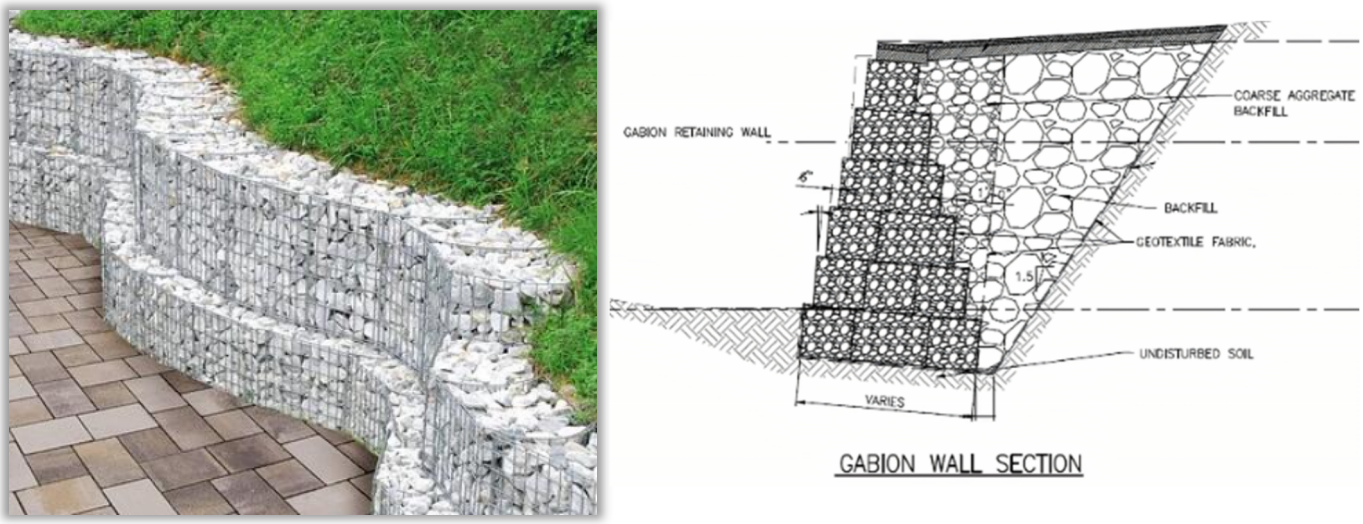

Figure 4: Gabion Walls

» **Precast concrete retaining walls**

Off the shelf precast concrete retaining walls can be used for medium to high retaining structures. Suppliers such as Bison or FPMcCann provide infrastructure systems that can be placed as a MMC option for retaining walls. These can be clad in brickwork or other finishes for a more aesthetical appeal.

Figure 5: Precast concrete retaining walls

1.3 High Retaining Walls

» **Concrete retaining walls**

Concrete retaining walls are the traditional form of structural support and can be clad with any finish the landscape architect wishes. These are designed to suit any retained height required and can be low to medium and even high retaining walls. As the retained height increases, so will the forces and hence thickness of the shaft, reinforcement within and foundation elements. This form is best used if there are any low or medium retaining walls which have excessive surcharge on the retained side, other than landscape, such as walkways or highways.

The ground will need to be battered back during its construction and only loaded once cured. If the retaining wall has been designed as propped in its permanent condition, it is required that temporary propping is maintained if the wall is to be backfilled prior to the permanent prop being cast.

Figure 6: Concrete retaining walls construction sequencing

» **King-post retaining walls**

This solution consists of steel members being piled into the ground to form the main support which panels are then spanning between. These can be in the form of precast concrete panels or timber panels. This form usually is used for temporary retaining which may be required, as the finish is not very aesthetically pleasing although it could be clad with a masonry facing wall for example.

Figure 7: King-post retaining wall

» **Piled retaining walls**

This solution consists of sheet piles being piled into the ground to support the retained ground behind. This form usually is used for temporary retaining which may be required, as the finish is not very aesthetically pleasing although it could also be clad with a masonry facing wall for example. This form saves a lot of time as the ground does not need to be readied and can support a considerable retained height. A piling specialist should be consulted to provide the design and detailing for this system.

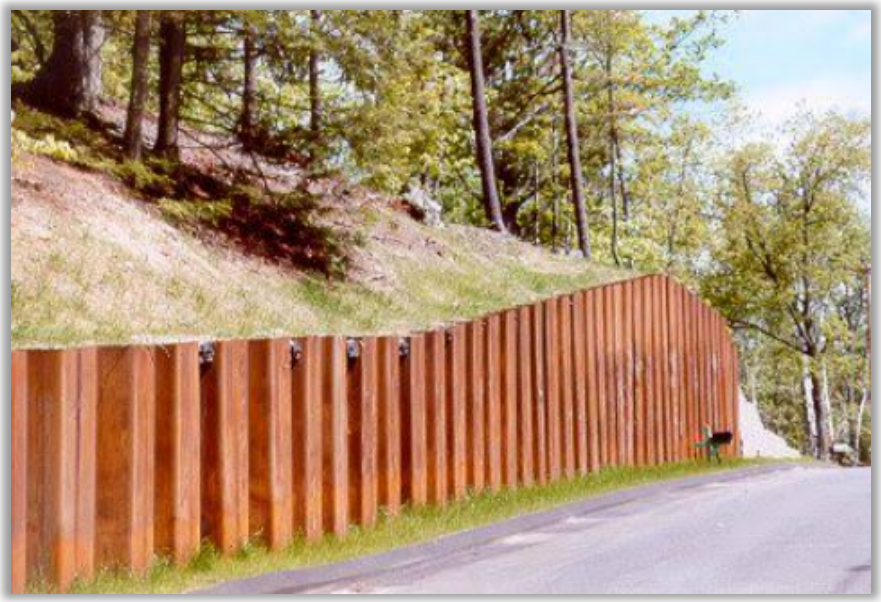

Figure 8: Sheet piling wall

» **Earth reinforced gabion retaining walls**

As the retained height increases, there comes a level where gabion baskets alone is insufficient to withstand the large forces acting on it from behind. Solution to counteract this is to provide reinforcement within the earth, in the form of geotextiles, to compositely work with the gabion walls to provide a larger volume of dead wight to withstand the loads needed to retain. This could be a cost-efficient way of providing large retaining walls with minimal material by utilising the retained soil to support itself from collapsing. A specialist gabion supplier, along with a soil specialist such as Tensar, should be consulted to provide the design and detailing for this system.

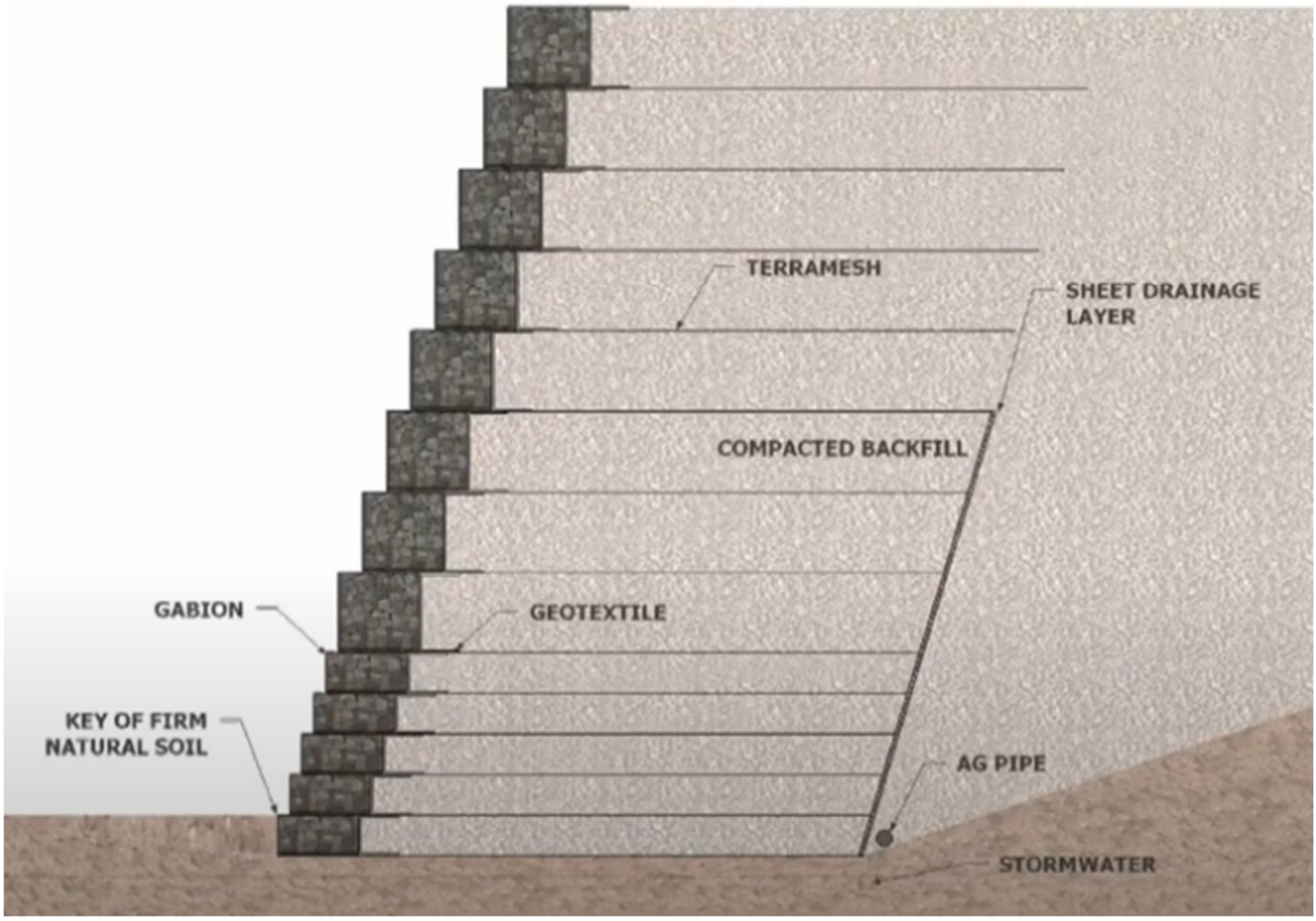

Figure 9: Sheet piling wall

2. Free-Standing Walls

Free-standing walls will be required to provide a boundary to the site or between each of the dwellings. These can consist of the following:

» **Timber fenced walls (Postcrete footings)**

These are usually found between dwellings within the rear garden to provide a boundary between them. These would form of singular posts founded in postcrete where horizontal members then are fixed between them. The design and supply of such products can be easily sourced and erected.

Figure 10: Timber fences

» **Masonry (garden) walls**

For a more robust boundary wall, brickwork garden walls may be proposed. There are various types and shapes which depend on the arrangement and forces applied to them. Other than standard 215mm thick brickwork walls, other more robust types are shown below:

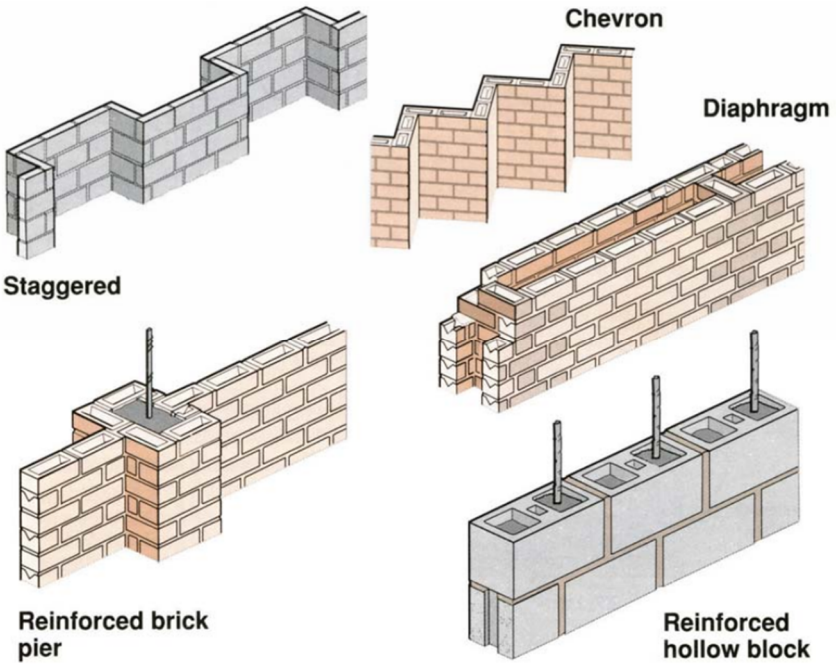

Figure 11: masonry free-standing wall types

» **Gabion walls**

Gabion baskets can also be used as free-standing walls should that be the aesthetical appeal of the landscape architect. These will consist of baskets stacked and connected on top of each other to provide a stone like boundary wall. A specialist gabion supplier should be consulted to provide the design and detailing for this system.

Figure 12: Gabion free standing wall

» **Stone walls**

Stone walls could also be used, to reinstate the existing feel of the site or joining a new section of wall with the existing stone walls. This could be the optimal solution to reuse the stone on the walls being removed. A specialist stone wall contractor should be consulted to erect these walls.

Figure 13: Stone wall located on site boundary

3. Miscellaneous Site Footings

Other substructure types will be required across the development to ensure adequate support for the infrastructure and appearance of the proposals. This includes, but is not limited to:

- Substation bases – following specialist requirements
- Fixed Bench and seating footings
- Cycle stand footings
- Signage footing
- Lamppost footings
- Bollard footings
- Cycle stand footings
- Fixed Bin footings
- Play equipment footings

These will be developed in the next stages of design following more detail proposals being put forward. An allowance should be made for a lightly reinforced with A 393 mesh concrete. These will require sub-contractor involvement to ensure adequate proposals.

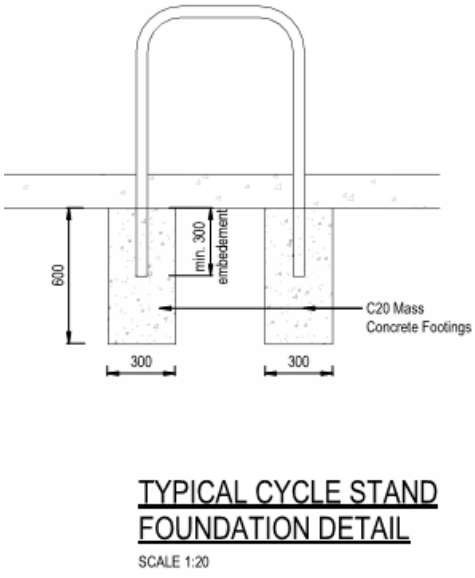

Figure 14: Typical cycle stand footing

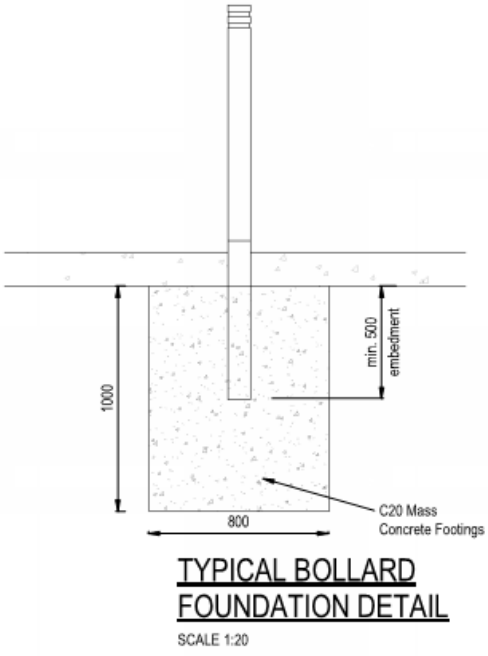

Figure 15: Typical bollard footing