

Technical Note – Boundary Wall Build Over

Job Reference: *The Old Vicarage, Milton Lilbourne, Pewsey, SN9 5LQ*
File Reference: *6849*
Designer: *Lee Bampfield*
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It is proposed to extend the existing ancillary building at the above property which includes utilising the existing retaining walls as a base to build the proposed front and gable walls.

This technical note considers the impact of building on these walls and whether it is a viable building solution for this project.

This appraisal is based on a walk over survey only. No trial holes were excavated for either inspection to determine the underlying ground conditions or the extent of any foundations.



The front wall is constructed of mass coursed stone c. 350mm wide at the top (plus brick soldier course) with a sloping face of circa 8-10 degrees as per the plan & sketch above. The retained ground is currently a domestic courtyard which can potentially be accessed by vehicles. The front wall reduces in height at the boundary, changes material to brick and continues across the front of the neighbouring property therefore the return retaining wall between the two properties only retains up to circa 1.2m.

The retaining wall profile is continuous with the base of the current ancillary building and is coursed through this transition so we would anticipate it is of similar construction.

From geological mapping, online bore hole records and experience of the area the property is located on very dense Greensand which when undisturbed in the ground is often approaching a sandstone like material. This is also supported by looking at surrounding landscaping which consists of reasonably steep embankments and more slender retaining walls than would generally be expected meaning the ground is more self-supporting and the walls are supporting less compared to a looser granular material.

The condition of the wall does need some attention. There is evidence of ivy growth which has been removed but this has both damaged the face stone in places and pulled mortar from joints. This is now allowing water to penetrate further into the wall and will only deteriorate it faster. These condition issues should be addressed immediately to maintain the walls integrity irrespective of any future works. This should include remaining areas of ivy being removed, new stones let in where blown and all repointed as required to both the main road front face and the courtyard rear face.

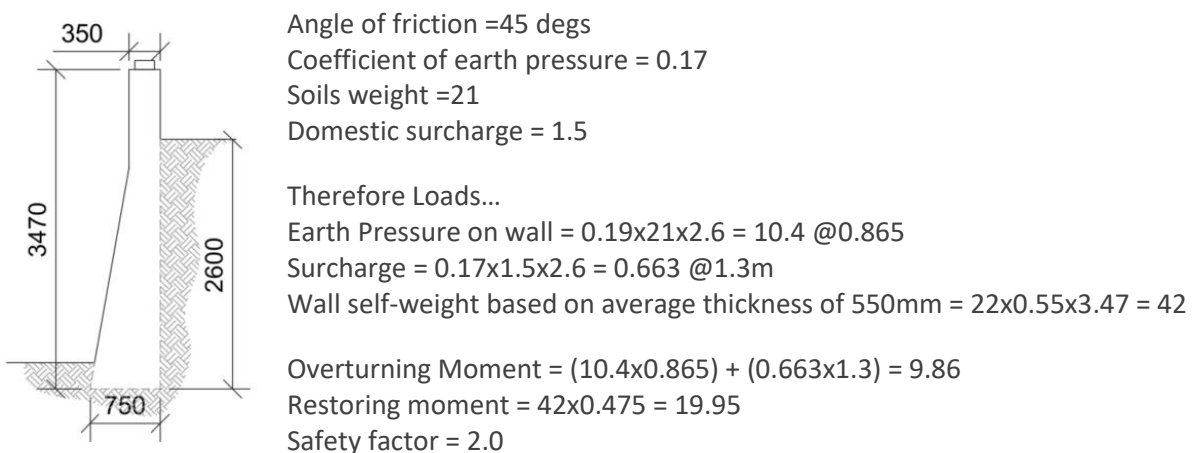
In terms of wall performance for the build over we are interested with two main structural actions. Firstly, its load bearing capacity and secondly with it acting as a retaining wall.

As a mass stone wall of at least 350 and conservatively with a weak stone we would anticipate its load bearing capacity to be well in excess of 150kN/m with the proposed applied loading (including allowance for the existing retaining wall) being Circa 75-85kN/m ULS therefore the wall strength is not of concern.

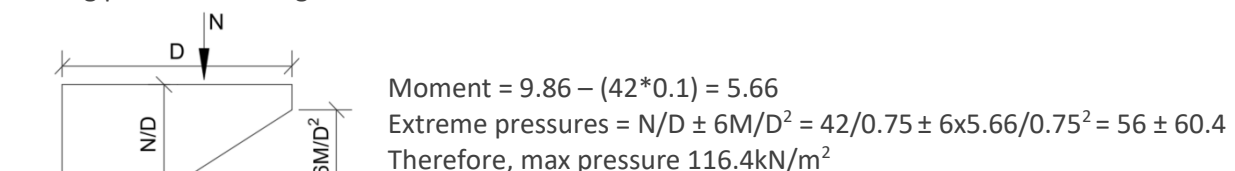
As a mass retaining wall, we are looking for sufficient mass to stop the wall from overturning which in turn generates bearing pressures at the base which should not exceed the bearing strata's capacity. The wall is visibly functioning as a retaining wall in its current state, we are not adding any additional overturning load, and we would therefore anticipate it would function adequately with the build over as this also replicates an existing arrangement. Generally, in retaining wall calculations adding weight to the top of the wall improves the walls performance as it adds restoring moments into the equation which in terms counters the overturning moments and evens out a triangular bearing stress at foundation back towards a more rectangular one.

It is not possible to do an accurate appraisal of the wall as we do not have full details of its buried geometry and ground condition parameters, but it is possible to demonstrate that based on similar parameters a load increase applied to the head of the wall improves stability and does not increase max bearing pressures.

Assuming the following theoretical model...



Bearing pressure – taking moments around centre of base...



Following the same model but replacing the parapet with the proposed construction...

Therefore Loads...

Earth Pressure on wall = $0.19 \times 21 \times 2.6 = 10.4$ @ 0.865

Surcharge = $0.17 \times 1.5 \times 2.6 = 0.663$ @ 1.3m

Wall self-weight based on average thickness of $550\text{mm} = 22 \times 0.55 \times 2.6 = 31.5$

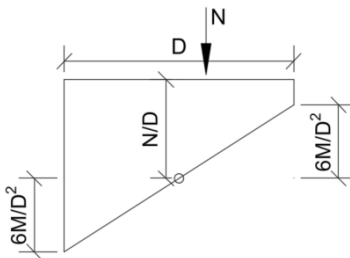
Weight of new construction = 25

Overturning Moment = $(10.4 \times 0.865) + (0.663 \times 1.3) = 9.86$

Restoring moment = $31.5 \times 0.475 + 25 \times 0.575 = 29.4$

Safety factor = 3.0

Bearing pressure – taking moments around centre of base...



Moment = $9.86 - (31.5 \times 0.1 + 25 \times 0.2) = 1.71$

Extreme pressures = $N/D \pm 6M/D^2 = 56.5/0.75 \pm 6 \times 1.71/0.75^2 = 75 \pm 18.3$

Therefore, max pressure 93.3kN/m^2

Regardless of the exact parameters of this application the structural theory above demonstrates the principle that adding vertical load to the wall is typically a betterment to the wall's performance. On the basis that the wall is currently performing with no obvious sign of structural failure and there is no intension to increase lateral loading then as shown above the addition of vertical load should improve its performance as a retaining wall whilst not increasing maximum bearing pressures. Conclusion supported by the existing ancillary building front wall built off similar construction.

As long as the condition of the wall is maintained, as highlight previously, we would not anticipate a problem with the addition of the extension load applied directly to the top of the existing retaining wall.