Stepoc calculation example

Walls subject to bending and shear

Stepoc Reinforced Block, Anderton Concrete

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1 Introduction

This document provides an example calculation for a retaining wall stem in Stepoc. Derivation of the design charts is presented in Structensor report 6057-R01 and a procedure for structural calculations in 6057-R01. A structural designer should satisfy themselves that they are in agreement with these documents. If a designer has any queries please contact Anderton Concrete technical team. This design example should be read in conjunction with these documents. The design is a theoretical example only and purley intended to show how the Stepoc design charts fit into the process of structural design. This report is not intended to fix the geotechnical design process. It further does not consider the global stability of the structure. It makes no assertion that the chosen conditions are relevant to a particular structural condition.

2 Design condition assumed

A Retaining wall 2.5m tall from the top of the supporting foundation. The design soil properties are assumed to be:

- Surcharge applied uniformly to the surface = $5kPa$
- The bulk design unit weight of soil = $19kN/m^2$
- The soil pressure are from the active condition with a coefficient of active earth pressure = 0.30 (friction assumed on the back of the wall). This is assumed to be the component of active pressure normal to the rear face of the wall.
- No hydraulic pressure is applied. It is assumed that sufficient drainage provision is provided to the rear of the wall.

3 Calculate the design force actions

Adopt $\gamma_f = 1.50$ for surcharge and $\gamma_f = 1.35$ for the bulk unit weight of the soil. Taking γ_s to be the weight of the soil, z the height of the wall and q the surcharge (with K_a as the coefficient of active earth pressure), the ultimate limit state force effects are:

$$V = \int_0^z K_a(q\gamma_{f,q} + \gamma_s\gamma_{fs}z)dz = K_a(qz\gamma_{f,q} + \gamma_s\gamma_{f,s}z^2/2) \tag{1}$$

$$M = \int_0^z Vdz = K_a(qz^2/2\gamma_{f,q} + \gamma_s\gamma_{f,s}z^3/6) \tag{2}$$

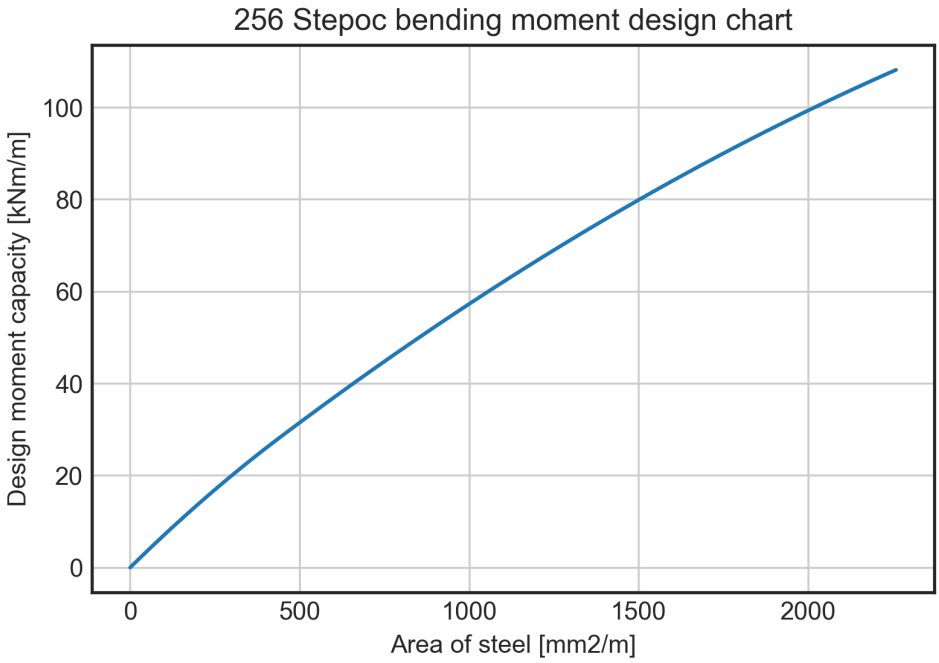
Placing the assumed parameters in the above equations gives the following design force effects:

- M = 29.67 kNm
- V = 27.07 kN

4 Bending Reinforcement

The height of the wall is 2500 mm. Therefore, adopt 256 mm Stepoc which has a serviceability limit of 3000 mm.

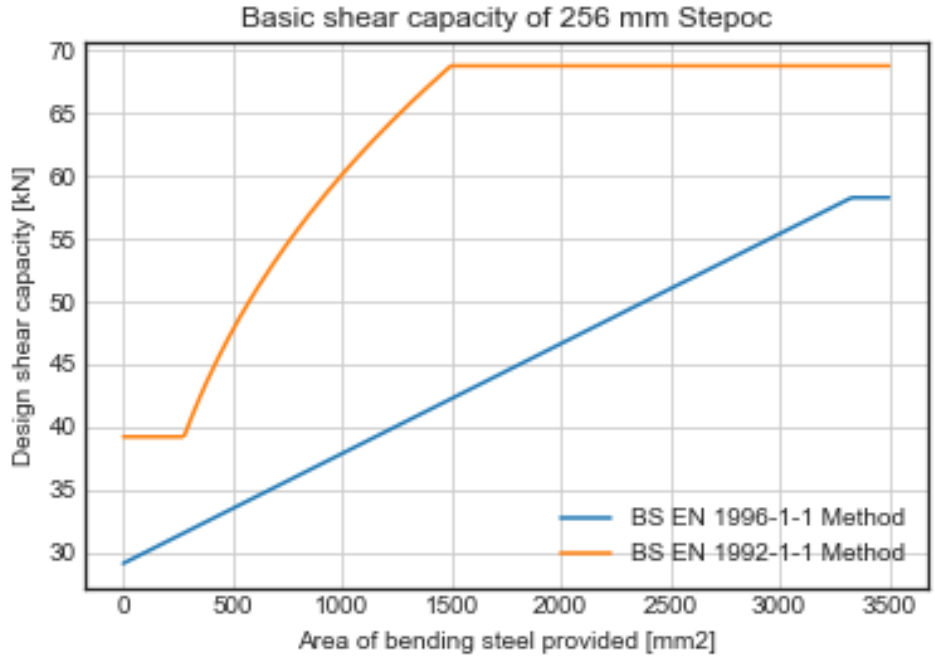
From the 256 mm bending moment design chart:



Provide 500 sq.mm of bending reinforcement. Try H12 at 133 mm center which provides 850 sq.mm.

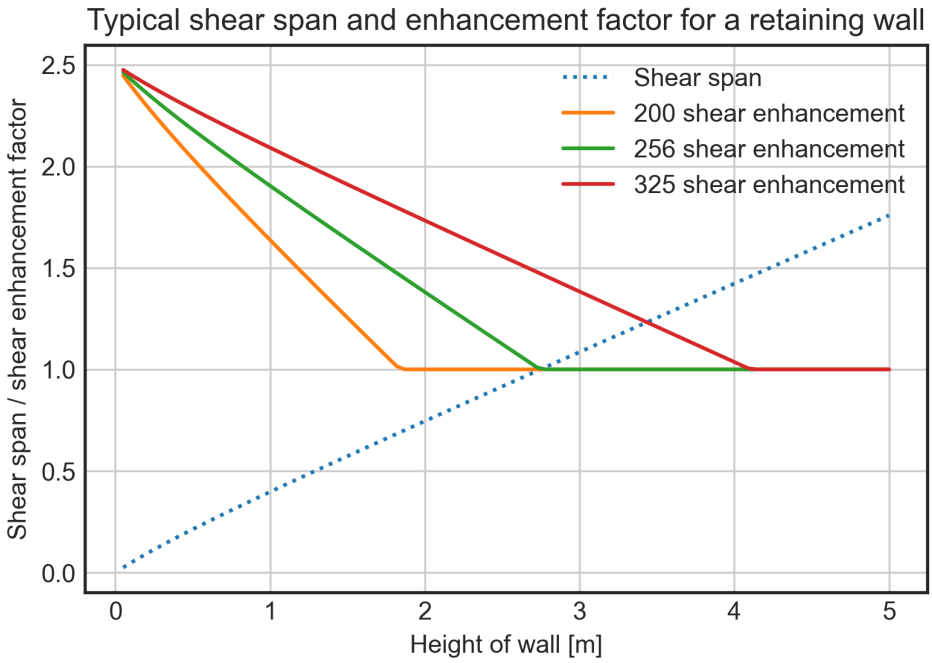
5 Check the shear capacity of the section

Refer to the 256 mmm Stepoc shear capacity curve:



Treating as a reinforced masonry section 850 mm sq.mm provides a basic shear capacity of circa

37 kN. This is a cantilivered retainined wall. The shear enhancement factor is taken from the below chart:



This is circa 1.1.

The final design shear strength = 37 x 1.1 = 40.70 kN.

Since 40.7 kN is greater than the design shear forcce of 27.07 kN the stem to the wall is adequate.