Deemed-to-comply Residential Slabs

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The Residential slabs and footing standard (AS 2870) tabulates Standard Designs for various construction types and soil classifications in Section 3, and in Section 4 presents design by engineering principles including performance criteria satisfied by adopting the procedures and associated provisions.

This document aims to provide a brief understanding of designing to Section 4, and to explain how to match the deemed-to-comply slabs using the [Residential Slabs] module in Structural Toolkit.

Introduction

The proportioning of the number and dimension of slab rib beams for specific differential deflection limits shown in Table 4.1, is obtained using Clause 4.5.2 Modification procedure including the equation for the stiffness parameter.

Log[Σ(Bw*D^3/12)/W] where:

Bw = Width of web beam in millimetres
D = Depth of beam in millimetres
W = Overall slab width in the direction of beams being considered in metres

The relevant plot line is used from Figure 4.1 depending on whether there is a normal or deep-seated profile to obtain the required stiffness parameter along the bottom axis for a given ys/Δ from Table 4.1.

Once the beams are proportioned, the required reinforcement must be determined for both hogging (centre heave) and sagging (edge heave) to maintain ductility. This is done but determining the cracking moment (Mcr) of the beam; increasing this by a specified amount in accordance with the standard; then providing the reinforcement for this ultimate moment.

The sagging moment capacity is met by the bottom steel within the beam; and the hogging by the slab mesh in the effective flange in addition to additional bars (with some modifications done to consider different ductility classes of mesh and bar).

Mcr = f'ct.f*Z where

f'ct.f = characteristic flexural tensile strength = 0.6*√f'c
f'c = concrete strength in MPa
Z = elastic section modulus of the effective beam for the top in tension (centre heave), or bottom in tension (edge heave) = I/y
I = second moment of area of the beam including flange in accordance with Clause 4.4 (e)
y = distance from elastic neutral axis to edge stress being considered

Clause 4.4(i) requires this to be increased by 20% and reinforcement provided for this capacity for ductility. AS3600 Clause 8.1.6.1 states this moment as (Muo)min.

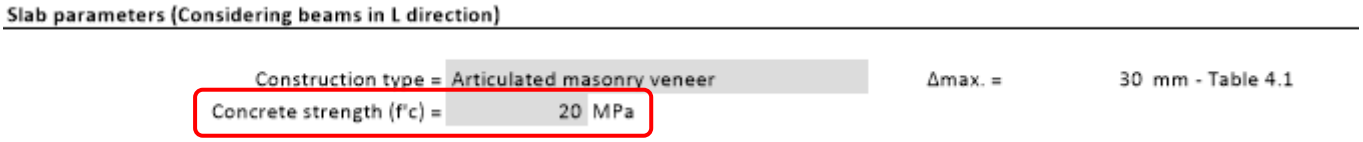
M* ≤ øMu = 1.2*Mcr

Matching the Standard Designs

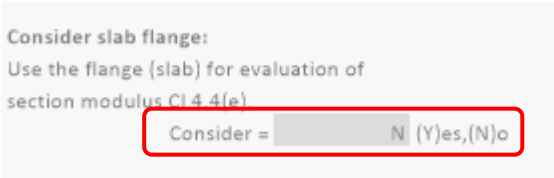
In order to arrive at the standard designs, a number of parameters require setting correctly including the concrete strength; the contributing effective flange outstand; and the formula used for the f'ct.f for hogging and sagging.

Firstly, the concrete strength must be set to 20MPa. Clause 3.1.1 of AS 2870 states that concrete strengths must be less than 32MPa. The superseded 1988 standard Cl 6.1.11 stated the strength shall not be less than 20MPa which is also the minimum

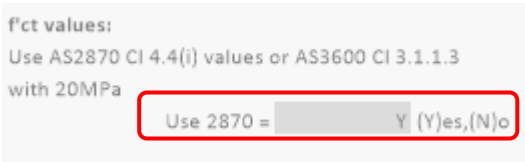
permitted by AS 3600 Clause 3.1.1.1. Using the typical concrete grade of 25MPa will result in a higher Mcr and therefore higher area of steel required.



Probably the most significant requirement is the effect of the geometric section being considered. The "Consider slab flange" option must be turned off in the grey Notes area to the right. Clause 4.4(e) explicitly states the use of the flange outstand distances in the derivation of the elastic modulus, however, this will result in a higher Mcr and therefore higher area of steel required. Including the flange can increase the Z value by as much as 2.76 times for a standard beam size.



Finally, the f'ct option to the grey Notes area right must be set to use the stress values from AS 2870 (and not AS 3600). Clause 4.4(i) requires 20MPa concrete strength also for this design. The AS 3600 equation for f'ct.f is 0.6*√f'c which for 20MPa results in 2.68MPa (2.7MPa) as stated in Clause 4.4(i) for sagging, but seems to relax this for hogging to 1.8MPa or 0.4*√f'c. Using the AS 3600 derivation will result in a higher Mcr and therefore higher area of steel required.



Using the above modifications, it should be possible to duplicate the deemed-to-comply slab reinforcements.

If adopting other than 20MPa for the concrete strength of the engineered slab solution, then the concessions to achieve the deemed-to-comply cannot be used and will result in higher steel areas.

If you have any questoins, or believe this document requires amendment, please contact our support team.