Appendix C: Robustness requirements for Class 2 buildings

This topic is discussed at greater length in SCI Report RT1215 which can be accessed via www.corusconstruction.com

Class 2A buildings

No special robustness rules or considerations are required for Class 2A buildings with Slimdek floors. The general rules for Class 2A buildings from BS 5950–1 should be followed. All beams and ties and their end connections should have a minimum tying capacity of 75 kN which can be achieved by adopting conventional connection details such as those illustrated in the Connection Design section of this manual. The floor bearing requirement is satisfied using the standard Slimdek construction details. The floor slab is not required to be anchored to its supports apart from satisfying the bearing conditions.

Class 2B buildings

Three approaches exist to demonstrate compliance with the requirements of Clause 2.4.5.3 of BS 5950–1 for Class 2B structures namely the tying route, the notional element removal method and key element design. As the tying route is the most commonly used, because it is normally the easiest one to adopt for design and construction, the other methods are not taken further in this manual.

Tie requirements

1. Members supporting floor loads

ASBs and RHSFBs

These members and their end connections should have a tie capacity at least equal to the beam end reactions under factored loading multiplied by n (a factor dependent upon the number of storeys).

2. Members not supporting floor loads

General requirement

Tie members and their end connections should have a tie capacity at least equal to 75 kN.

Tying of edge columns.

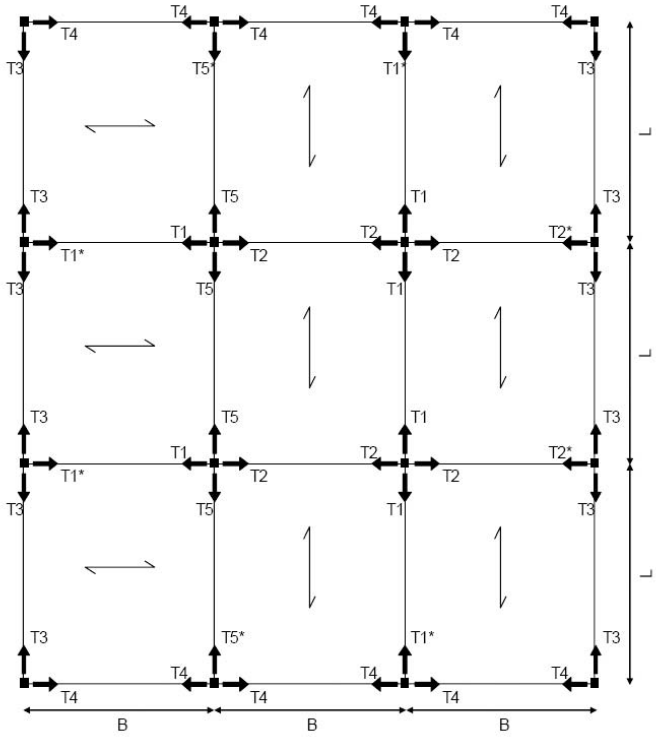
Sub-clause 2.4.5.3 b) of BS 5950–1 requires that horizontal ties anchoring edge columns should be capable of resisting a factored tensile load (acting perpendicular to the edge) at least equal to 1% of the maximum factored vertical dead and imposed load in the column at that level. Therefore, for this to exceed the general requirement, the axial load in the column must exceed 7500 kN – which is unlikely unless there are at least 10 storeys.

Edge ties

Edge ties and their end connections should be designed for a tie capacity equal to their end shear reactions (multiplied by n) but not less than the general requirement of 75kN – which will normally govern.

However, a tie force of 75 kN will not be capable of forming a catenary if, for example, a central edge column was to be damaged. It is therefore recommended that edge tie members (and their end connections) should be designed for a minimum tie force equal to 25% of the factored dead and imposed floor load (multiplied by n) of the slab plus any load contribution from the cladding that is supported by the edge member. Edge tie members are usually a structural section because stiffness, bending capacity and tying capacity is required. These are all substantial members and are capable of having end connections with the necessary tying capacities.

The various tie requirements are summarised in the diagram below:



T1 = 75kN
T2 = (wLB/2).n but > 75kN
T3 = (wLB/4 + cL/2).n but > 75kN
T4 = (wLB/4 + cB/2).n but > 75kN
T5 = (wLB/4).n but > 75kN

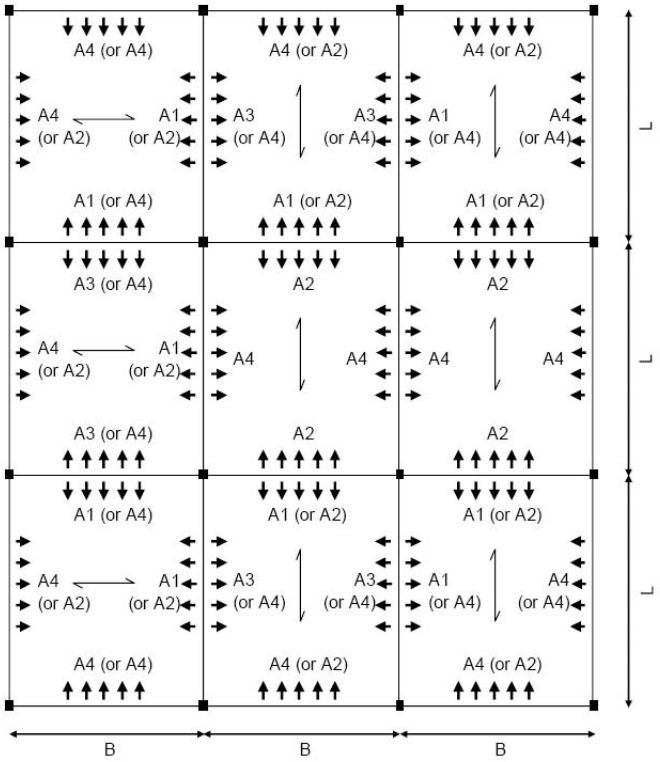
where:
w = factored floor load per m²
c = factored cladding load per m
n = reduction factor from BS 5950–1
* tie force > 1% of axial load in column

Standard connection details for main and edge members are given in Section 4 of this manual. Good practice requires that a minimum of four bolts (20mm dia. Grade 8.8) are used to make structural connections for Slimdek components and this arrangement will provide sufficient tie capacity for most situations.

Anchorage requirements

Sub-clause 2.4.5.3 e) of BS 5950–1 requires that floor slabs are anchored in the direction of their span either to an adjacent slab or to a support to prevent disproportionate collapse in the event that columns or beams are damaged. Where the slab spans on to an edge tie or occurs at a corner, the anchorage requirements vary. The reinforcement provided must be capable of supporting the weight of the slab in the event of a collapse but it can be the same reinforcement as that used to prevent cracking in the slabs, provided the reinforcement is continuous over the beam or tie member. A142 mesh is usually provided in Slimdek slabs as a minimum which is adequate for the majority of situations.

Anchorage requirements are summarised in the diagram below:



A1 = dLB
A2 = dLB/2
A3 = dLB/3
A4 = No anchorage

where:
d = weight of floor slab per m^2

Notes:
Where there are two alternative anchorage values presented, the selection must be consistent within each slab (i.e., if the first option is selected for one side of the slab the first option must be selected for all other sides of the slab).
Where the slab anchorage requirements are different on either side of the interface between two slabs, the anchorage provided across the interface must be capable of resisting the larger of the two anchorage forces.