Appendix A Reinforcement quantities

This Appendix contains Tables A1, A2, A3, A4 and A5 referred to in method 2 of subsection 3.9.

The factors for converting reinforcement areas into unit weights of reinforcement assume that:

(a) the reinforcement areas are those of practical bar arrangements, e.g. standard sizes at realistic spacings in beams; an even number of bars in columns.

(b) the detailing is in accordance with reference 2.

Table A1 Solid slabs and stairs

Minimum reinforcement:

high yield bars – 0.13% of gross cross-section
mild steel bars – 0.24% of gross cross-section

Type of slab	A_{sx} required	A_{sy} required	Weight kg/m^2	Remarks
One-way spanning slabs	$\frac{M}{(0.8d)(0.87f_y)}$	Minimum steel or $0.25\,A_{sx}$	$0.0125\,A'_{sx}$*	M is the maximum bending moment per metre width anywhere in the slab.
Two-way spanning slabs with linear supports	$\frac{M_x}{(0.8d)(0.87f_y)}$	$\frac{M_y}{0.8(d-20)\,0.87f_y}$	$0.011\,(A'_{sx} + A'_{sy})$	M_x and M_y are the maximum bending moments per metre width in each direction
Flat slabs on column supports	$\frac{M_x}{(0.8d)(0.87f_y)}$	$\frac{M_y}{0.8\,(d-20)\,0.87f_y}$	$0.011\,(A'_{sx} + A'_{sy})$	M_x and M_y are the mean (of the column and middle strip) maximum bending moments per metre width in each direction

*This includes weight of distribution steel.

Notes to Table A1
1. All the bending moments are the design ultimate moments.
2. A_{sx} and A_{sy} are areas of reinforcement required in two orthogonal directions.
3. A'_{sx} and A'_{sy} are areas of reinforcement (in mm^2) selected per metre width in two orthogonal directions.
4. Consistent units must be used in the formulas for obtaining areas of reinforcement.

Table A2 Ribbed and coffered slabs

Minimum reinforcement
Ribs high yield steel – 0.25% $b_w h$
mild steel – 0.50% $b_w h$

where b_w is the average width of the ribs and h is the overall depth of the slab

Structural topping
high yield steel – 0.13% of gross cross-section of topping
mild steel – 0.24% of gross cross-section of topping

Type of slab	A_s required (in each direction for two-way and flat slabs), mm^2	Weight kg/m^2		Remarks
		Ribs	Structural topping	
One-way spanning slabs	$\frac{M}{0.87 f_y (d - 0.5 h_f)}$	$\frac{0.009 A'_s}{c}$	For fabric reinforcement: 1.25 × wt/m^2 of fabric For loose bar reinforcement: 0.009 (sum of bar areas per m width in each direction)	M is the maximum bending moment per rib anywhere in the slab
Two-way spanning slabs on linear supports	$\frac{M}{0.87 f_y (d\text{-}10\text{-}0.5 h_f)}$	$\frac{0.02 A'_s}{c}$	As for one-way spanning slabs	M is the maximum bending moment per rib in the two directions
Coffered slabs on column supports	$\frac{M_x}{0.87 f_y (d - 0.5 h_f)}$ and $\frac{M_y}{0.87 f_y (d\text{-}20\text{-}0.5 h_f)}$	$\frac{0.013 (A'_{sx} + A'_{sy})}{c}$	As for one-way spanning slabs	M_x and M_y are the mean (of the column and middle strips) maximum bending moments per rib in each direction

Notes to Table A2
1. All bending moments are the design ultimate moments.
2. c is the spacing of ribs in metres.
3. Consistent units should be used in the formulas for obtaining areas of reinforcement.
4. A'_s, A'_{sx} and A'_{sy} are the areas (in mm^2) of bars selected per rib.