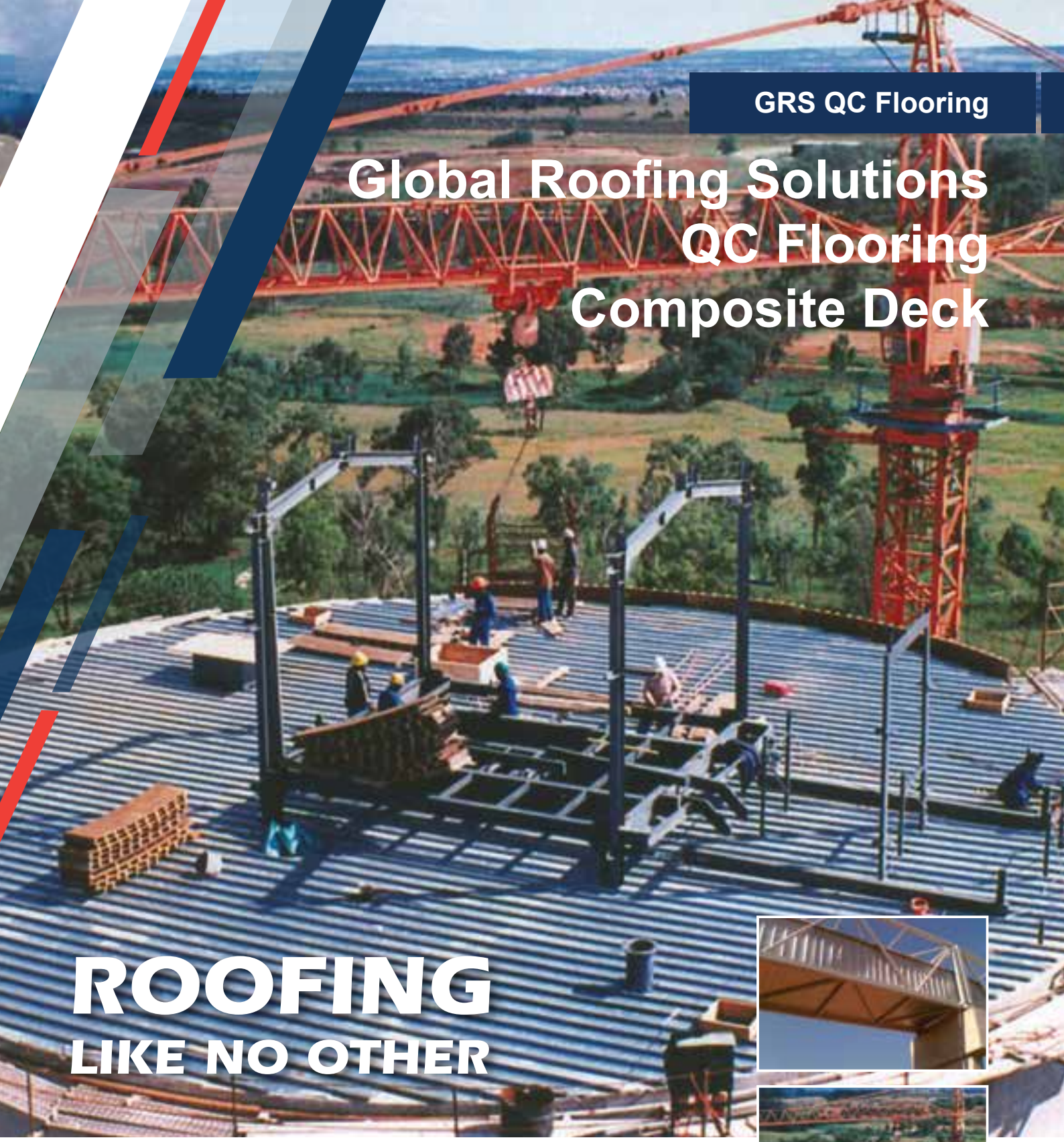
GRS QC Flooring

Global Roofing Solutions QC Flooring Composite Deck



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GRS QC Flooring

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Typical specification

Product Information

QC Flooring is a composite steel and concrete slab system for which the QC panels provide the following features:

- Shutter - supporting the mass of the wet concrete and construction loads
- Tensile reinforcement - resulting in a composite section with the concrete
- Finished ceiling - ready for painting with PVA compound

QC panels are easy to erect and the sytem is adaptable to steel, concrete and brick structures. Provision can easily be made for electrical and mechanical services.

Product Specifications

Protection, storage and hoisting of materials

- The floor units shall be protected against damage in transit to the job site.
- If site storage is necessary, steel floor units shall be stacked clear of the ground on supports at 1,5m centres and tilted slightly to help prevent the entrapment of water. The units shall be protected from the elements with a tarpaulin or equal, leaving ends open to provide air circulation. The General Contractor shall provide the storage area and protect the floor units against damage.

Preparation and concreting - for composite QC Flooring Construction

Base Preparation

Prior to concreting, the surface of the steel floor units shall be cleaned of all debris to the satisfaction of the Engineer. The units are to be free of oil before despatch from our factory.

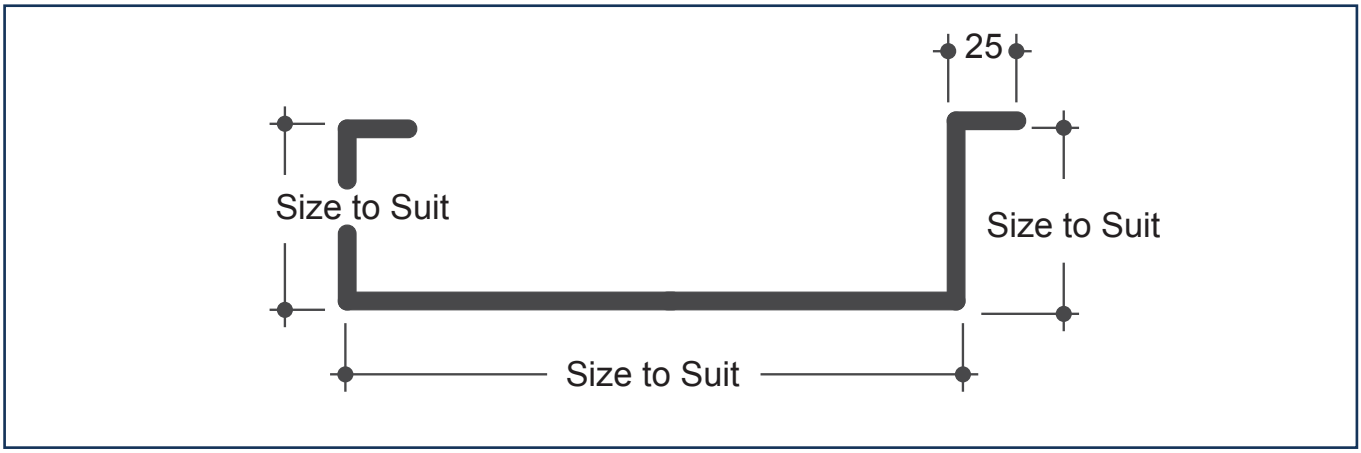
Concrete

Unless otherwise stated by the Engineer, the concrete shall have a minimum cube compressive strength of 25MPa at 28 days. Materials, mixing, placing and curing of concrete shall be in accordance with SANS 10100-2: 1992, or in accordance with the Engineer's specification. Concrete used with QC panels shall not contain chloride salts or other deleterious material. No load shall be applied until the concrete has reached its required strength.

Reinforcement

Any additional reinforcement shall be supplied by the General Contractor and placed in accordance with the Engineer's specification and layout.

QC Flooring Profile



Typical specification

Propping

When required, and in accordance with Global Roofing Solution's specifications, composite QC Flooring systems shall be propped during construction. The propping shall be in true line, braced and strutted to prevent deformation under the mass of wet concrete and construction loads. The props shall be in accordance with good building practice. Removal of the props shall be in accordance with SANS 10100-2: 1992.

Installation

When fixing to steel construction, the floor units shall be placed on the supporting framework and adjusted to final position before permanent attachment. Each unit shall be brought to proper bearing on the supporting beams. If the supporting beams are not properly aligned or sufficiently level to permit proper bearing of the floor units, the erector shall bring the matter to the attention of the General Contractor for corrective action. The floor units shall be placed in straight alignment for the entire length of run of the flutes and laid in strict accordance with the manufacturer's instructions and as shown on a layout prepared for the erector's use. Side laps shall be properly engaged.

Design Information

QC as reinforcement only

Composite QC floor slabs are designed in the same manner as conventional reinforced concrete slabs. The steel of the panels is used as the tensile reinforcement; the bond with the concrete having been verified by tests.

QC with additional reinforcement

Additional reinforcement can be used for increased moment of resistance. This reinforcement acts in conjunction with the QC panels, increasing the bending moment of the composite section.

Propping

See tables 5 to 8.

Composite Slab Design

Calculations are based on the Limit State Method (SANS 10100-1: 2000).

Fastening

Side laps

The QC panel shall be joined together by means of clips at 500mm centres.

Steelwork

QC panels shall be fastened to the supporting steelwork by means of two self-tapping screws per unit at end bearing points.

Concrete / Brickwork

The QC panels shall be connected to each other with a steel strap placed across the panels and fixed to every upstand with pop-rivets or tek screws at each bearing point. This is done to ensure lateral stability while casting the slab.

QC 54/250 tables

Table 1

QC 54/250 1.0mm composite slab without reinforcement, propped during construction

Slab Depth (mm)	Dead Load KN/m²	1.0mm Thick: Maximum uniformly distributed superimposed load (including finishes) kN/m² — Span in metres												
		2.0	2.5	3.0	3.5	4.0	4.25	4.5	4.75	5.0	5.25	5.5	5.75	6.0
100	2.48	13.1	10.1	6.6	4.4	2.9	2.2	1.6						
110	2.71	14.4	11.2	7.4	4.9	3.3	2.7	2.0						
120	2.95	15.8	12.2	8.1	5.4	3.6	3.0	2.4	1.8					
130	3.18	17.1	13.2	8.9	5.9	4.0	3.2	2.6	2.1	1.6				
140	3.42	18.4	14.2	9.7	6.4	4.3	3.5	2.9	2.3	1.8				
150	3.65	19.8	15.3	10.4	6.9	4.7	3.8	3.1	2.5	2.0	1.6			
160	3.89	21.1	16.3	11.2	7.4	5.0	4.1	3.3	2.7	2.1	1.7			
170	4.12	22.4	17.3	11.9	7.9	5.3	4.4	3.6	2.9	2.3	1.8			
180	4.36	23.7	18.3	12.7	8.4	5.7	4.7	3.8	3.1	2.5	1.9			
190	4.59	25.1	19.4	13.4	8.9	6.0	5.0	4.0	3.3	2.6	2.1	1.6		
200	4.83	26.4	20.4	14.2	9.4	6.4	5.2	4.3	3.5	2.8	2.2	1.7		

Propping Distance 1,50 m

1,35 m

Transverse bowing likely to be exceeded

Loads in blue determined by bond.
Loads in yellow determined by moment of resistance.
Loads in green determined by deflection under total load (Span/250), or deflection under live load (Span/350) but ≤ 20mm.
Loads determined by bond or resistance can be increased by including reinforcement. An anti-crack fabric reinforcement is recommended in all cases (Ref 193).
Bold black line indicated maximum Span/Depth ratio at 30.

Table 2

QC 54/250 1.2mm composite slab without reinforcement, propped during construction

Slab Depth (mm)	Dead Load KN/m²	1.2mm Thick: Maximum uniformly distributed superimposed load (including finishes) kN/m² — Span in metres															
		2.0	2.5	3.0	3.5	4.0	4.25	4.5	4.75	5.0	5.25	5.5	5.75	6.0	6.25	6.5	6.75
100	2.5	13.1	10.1	8.1	5.5	3.5	2.5	1.8									
110	2.74	14.4	11.1	8.9	6.2	4.2	3.1	2.2	1.5								
120	2.97	15.8	12.2	9.8	6.8	4.7	3.8	2.8	2.0								
130	3.21	17.1	13.2	10.6	7.5	5.2	4.3	3.5	2.6	1.8							
140	3.44	18.4	14.2	11.4	8.1	5.6	4.7	3.9	3.2	2.4	1.7						
150	3.68	19.7	15.2	12.2	8.8	6.1	5.1	4.2	3.5	2.9	2.2	1.5					
160	3.91	21.1	16.3	13.1	9.4	6.5	5.4	4.5	3.8	3.1	2.6	2.1					
170	4.15	22.4	17.3	13.9	10.1	7.0	5.8	4.9	4.0	3.3	2.7	2.2	1.8				
180	4.38	23.7	18.3	14.7	10.7	7.4	6.2	5.2	4.3	3.6	2.9	2.4	1.9				
190	4.62	25.0	19.3	15.5	11.4	7.9	6.6	5.5	4.6	3.8	3.1	2.5	2.0	1.6			
200	4.85	26.4	20.4	16.4	12.0	8.3	7.0	5.8	4.9	4.0	3.3	2.7	2.2	1.7			
210	5.09	27.7	21.4	17.2	12.7	8.8	7.4	6.1	5.1	4.3	3.5	2.9	2.3	1.8			
220	5.33	29.0	22.4	18.0	13.3	9.2	7.7	6.5	5.4	4.5	3.7	3.0	2.4	1.9			
230	5.56	30.3	23.4	18.8	13.9	9.7	8.1	6.8	5.7	4.7	3.9	3.2	2.5	2.0	1.5		
240	5.8	31.7	24.5	19.7	14.6	10.2	8.5	7.1	5.9	4.9	4.1	3.3	2.7	2.1	1.6		

Propping Distance 1,50 m

Transverse bowing likely to be exceeded

Loads in blue determined by bond.
Loads in yellow determined by moment of resistance.
Loads in green determined by deflection under total load (Span/250), or deflection under live load (Span/350) but ≤ 20mm.
Loads determined by bond or resistance can be increased by including reinforcement. An anti-crack fabric reinforcement is recommended in all cases (Ref 193).
Bold black line indicated maximum Span/Depth ratio at 30.

QC 54/250 tables

Table 3

QC 54/250 1.6mm composite slab without reinforcement, propped during construction

Slab Depth (mm)	Dead Load KN/m²		1.6mm Thick: Maximum uniformly distributed superimposed load (including finishes) kN/m² — Span in metres										
			3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
160	3.96		13.0	10.7	9.0	6.8	5.0	3.6	2.2					
170	4.2		13.9	11.4	9.6	7.3	5.3	3.9	2.6					
180	4.43		14.7	12.1	10.2	7.8	5.7	4.1	3.0	1.7				
190	4.67		15.5	12.8	10.7	8.3	6.1	4.4	3.1	2.1				
200	4.9		16.3	13.5	11.3	8.8	6.4	4.7	3.4	2.3				
210	5.14		17.1	14.1	11.9	9.3	6.8	5.0	3.6	2.5	1.6			
220	5.38		18.0	14.8	12.5	9.8	7.2	5.2	3.7	2.6	1.7			
230	5.61		18.8	15.5	13.0	10.3	7.5	5.5	4.0	2.7	1.8			
240	5.85		19.6	16.2	13.6	10.8	7.9	5.8	4.1	2.9	1.9			
260	6.32		21.3	17.5	14.8	11.8	8.6	6.3	4.6	3.2	2.1			
280	6.79		22.9	18.9	15.9	12.8	9.4	6.9	5.0	3.5	2.3			
300	7.26		24.6	20.3	17.1	13.8	10.1	7.4	5.4	3.8	2.5			
320	7.73		26.2	21.6	18.2	14.7	10.8	8.0	5.8	4.0	2.7	1.6		

Propping Distance 1,60 m

Loads in blue determined by bond.
Loads in yellow determined by moment of resistance.
Loads in green determined by deflection under total load (Span/250), or deflection under live load (Span/350) but ≤ 20mm.
Loads determined by bond or resistance can be increased by including reinforcement. An anti-crack fabric reinforcement is recommended in all cases (Ref 193).
Bold black line indicated maximum Span/Depth ratio at 30.

Table 4

QC 54/250 2.0mm composite slab without reinforcement, propped during construction

Slab Depth (mm)	Dead Load KN/m²		2.0mm Thick: Maximum uniformly distributed superimposed load (including finishes) kN/m² — Span in metres										
			4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
200	4.95		11.3	9.6	8.3	6.6	5.0	3.7	2.7	1.8			
220	5.42		12.4	10.6	9.1	7.4	5.5	4.1	3.0	2.1			
240	5.9		13.6	11.6	10.0	8.1	6.1	4.6	3.3	2.3	1.5		
260	6.37		14.7	12.6	10.8	8.9	6.7	5.0	3.7	2.6	1.7		
280	6.84		15.9	13.5	11.7	9.7	7.3	5.5	4.0	2.8	1.9		
300	7.31		17.0	14.5	12.5	10.5	7.9	5.9	4.4	3.1	2.1		
320	7.78		18.2	15.5	13.4	11.2	8.5	6.4	4.7	3.3	2.2		
340	8.25		19.3	16.5	14.2	12.0	9.1	6.8	5.1	3.6	2.4		
360	8.72		20.5	17.5	15.1	12.8	9.7	7.3	5.4	3.9	2.6	1.6	
380	9.19		21.6	18.4	15.9	13.6	10.3	7.8	5.7	4.1	2.8	1.7	
400	9.66		22.8	19.4	16.8	14.3	10.9	8.2	6.1	4.4	3.0	1.8	

Propping Distance 1,60 m

Loads in blue determined by bond.
Loads in yellow determined by moment of resistance.
Loads in green determined by deflection under total load (Span/250), or deflection under live load (Span/350) but ≤ 20mm.
Loads determined by bond or resistance can be increased by including reinforcement. An anti-crack fabric reinforcement is recommended in all cases (Ref 193).
Bold black line indicated maximum Span/Depth ratio at 30.

QC unpropped tables

Table 5

QC UNPROPPED: 1.0mm composite slab unpropped during concreting

QC Panel dimension DEPTH / WIDTH

Slab Depth (mm)	Dead Load KN/m²		Span in metres				
			1.5	2.0	2.5	3.0	3.5
100	2.4		54/250	60/235	75/205	No	No
110	2.64					90/175	
120	2.88			65/225	80/195		105/145
130	3.12					95/165	
140	3.36				85/185		No
150	3.6			70/215		100/155	
160	3.84				90/175		
170	4.08			75/205		105/145	
180	4.32						
190	4.56						
200	4.8		60/235				

Tables allow for construction loads according to S.A. Steel Construction handbook.

The load carried by the composite section is similar to that of a 54 / 250 section of the same thickness.

Table 6

QC UNPROPPED: 1.2mm composite slab unpropped during concreting

QC Panel dimension DEPTH / WIDTH

Slab Depth (mm)	Dead Load KN/m²		Span in metres					
			1.5	2.0	2.5	3.0	3.5	4.0
100	2.4		54/250	54/250	60/235	75/205	No	No
110	2.64				65/225		85/185	
120	2.88					80/195	90/175	
130	3.12			60/235				100/155
140	3.36				70/215			105/145
150	3.6					85/185	95/165	No
160	3.84							
170	4.08						100/155	
180	4.32				75/205			
190	4.56					90/175		
200	4.8						105/145	
210	5.04			65/225	80/195			
220	5.28					No	No	
230	5.52							
240	5.76				85/185			
250	6			70/215				

Table 7

QC UNPROPPED: 1.6mm composite slab unpropped during concreting

QC Panel dimension DEPTH / WIDTH

Slab Depth (mm)	Dead Load KN/m²		Span in metres								
			1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
150	3.6		54/250	54/250	60/235	65/225	80/195	90/175	95/165	105/145	No	No
160	3.84					70/215			100/155			
170	4.08						85/185					
180	4.32					75/205		95/165	105/145			
190	4.56				65/225		90/175	100/155	No			
200	4.8					80/195						
210	5.04							105/145				
220	5.28											
230	5.52											
240	5.76											
250	6											
260	6.24				70/215							
270	6.48			60/235		85/185	95/165					
280	6.72											
290	6.96											
300	7.2											
310	7.44				75/205		No	No				
320	7.68					90/175						

QC unpropped tables

Table 8

QC UNPROPPED: 2.0mm composite slab unpropped during concreting
QC Panel dimension DEPTH / WIDTH

Slab Depth (mm)	Dead Load KN/m²		Span in metres									
			2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5
200	4.8		54/250	54/250	65/225	75/205	85/185	95/165	No	No	No	No
220	5.28											
240	5.76			60/235	70/215	80/195	90/175	100/155				
260	6.24							105/145				
280	6.72					85/185		No				
300	7.2				75/205		95/165					
320	7.68			65/225			100/155					
340	8.16					90/175	105/145					
360	8.64				80/195							
380	9.12			70/215								
400	9.6		60/235			95/165						

Composite slab design criteria

Calculations are based on the Limit State Method (SANS 10100-1: 2000)
- Cube strength of concrete at 28 days = 25 MPa
- Modulus of Elasticity of steel = 200 GPa
- Modular ratio for deflection calculations = $\frac{Es}{Ec} = 10$

Commerical Quality Steel: Assumed Yield strength = 200 MPa
- Partial safety factors for strength (bond, shear, bending)

steel $\gamma m = 1,15$
concrete $\gamma m = 1,5$
dead load $\gamma f = 1,2$
imposed load $\gamma f = 1,6$

For serviceability, all factors equal one:
- Ultimate shear stress: see tables 5 and 14 of SABS 0100 of 1980.
- Ultimate bond stress: ratio between shear and lever arm = 0,41 kN/m per mm width based on SABS tests
- Minimum recommended slab depth (in mm) = t x 100, where it is the unit thickness in mm
- Resistance factor for bending and shear Ø = 0,90

Construction loads
A construction load of 1,5kN/m² or line load of 2kN/m, 300mm in width transverse to deck is added to the dead load of the wet concrete and unit, when determining the section modulus of the unit.

End bearing requirements
Minimum end bearing on to brick walls = 75mm
Minimum end bearing on to reinforced concrete beams and structural steel beams = 50mm

Fire rating
QC panels in 1,0mm and 1,2mm have an SABS certified 2 hour fire rating for framed structures

Deflection limits
- Maximum deflection of the composite slab under total load: $\Delta \leq \frac{span}{250}$

  The limit does not take into account the initial deflection under wet concrete of propless units.

- Maximum deflection of the composite slab due to imposed load alone:

  $\Delta \leq \frac{span}{350}$ or 20mm, whichever is smaller

- Maximum deflection of propless units under wet concrete: $\Delta \leq \frac{span}{180}$

- Transverse bowing (across unit width):

  $\Delta \leq \frac{base\ width}{75}$

  (unless otherwise specified in tables)

Sectional Properties
The design and evaluation of sectional properties of QC units is in accordance with BS 5950: Part 4. Code of practice for design of floors with profiled steel sheeting.

Mass Of QC panels	
Thickness (mm)	Mass (kg/m)
1.0	3.27
1.2	3.96
1.6	5.32
2.0	6.68

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