

MEMO 64
ANCHORING REINFORCEMENT
TSS AND RVK
–TWO UNITS IN PAIR C-C 250mm
DESIGN

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ANCHORING REINFORCEMENT TSS AND RVK TWO UNITS IN PAIR C-C 250mm

The general, and local reinforcement of the slab in the vicinity of the unit, must be designed by the responsible engineer in order to ensure integrity of the slab itself. The assumed equilibrium situation for each of the units, and the corresponding reaction forces from one unit into the slab is found in Memo 54.

The recommended installation procedure is to prop the landing, pull out the inner tubes, and then fill the recesses with a concrete-based mortar. An installation movie can be found under the “iC Academy/Movies” tab, at iC’s homepage.

LAYOUT OF ANCHORING REINFORCEMENT

3D ILLUSTRATION

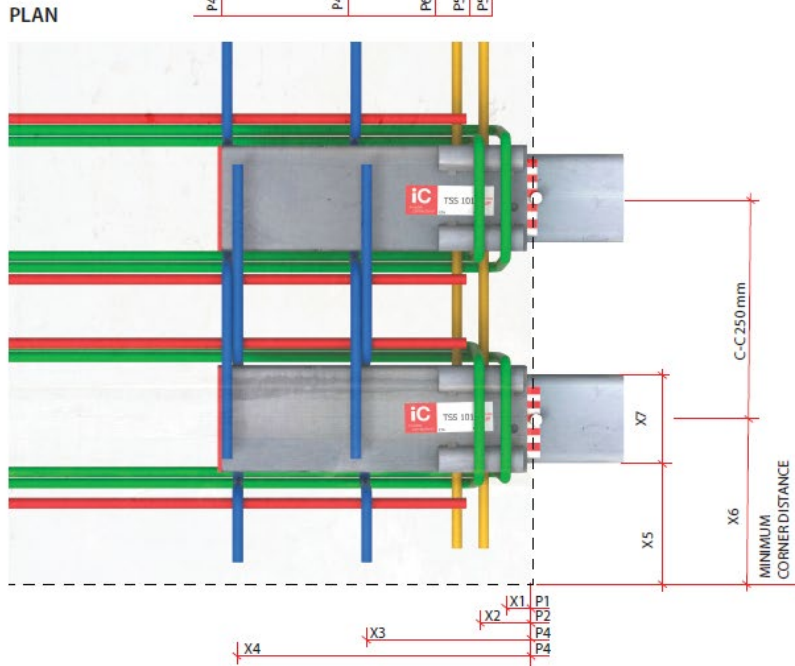
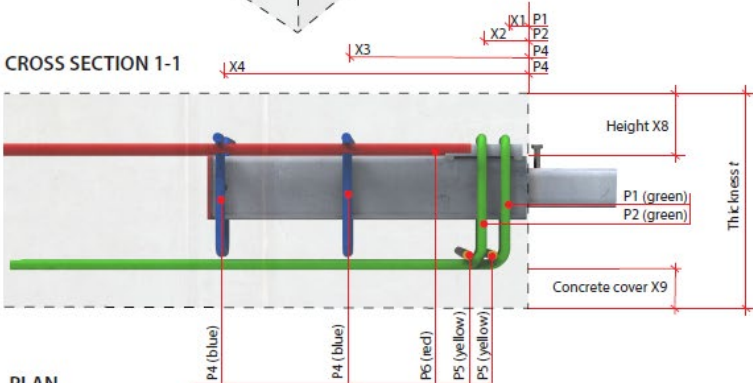
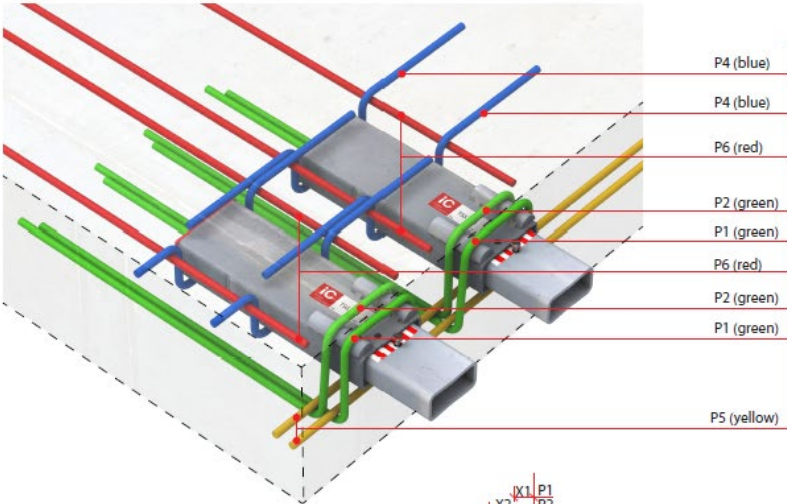
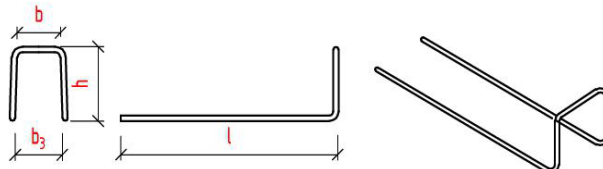
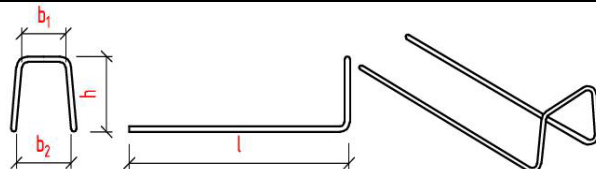
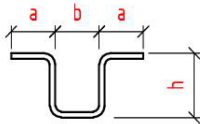



Figure 1: Layout of anchoring reinforcement.

ANCHORING REINFORCEMENT (LISTED FOR ONE UNIT)

All anchoring reinforcement: Steel grade 500C. Reinforcement steel of different ductility grade may be chosen provided that the bendability is sufficient for fitting the vertical suspension reinforcement to the half round steels in front of the unit. See also Memo 54.

PRODUCT SERIES	TSS 41 TSS 41 G	RVK 60 P ¹⁾	TSS 60 P ¹⁾	TSS 101 TSS 101 G	RVK 101 RVK 101 G	TSS 102 TSS 102 G
Reinforcement P1:						
No. x diameter:	1 x Ø8	1 x Ø8	1 x Ø8	1 x Ø12	1 x Ø12	1 x Ø12
x ₁ [mm]:	25 ± 5	25	25	25 ± 5	25 ± 5	25 ± 5
b [mm]: Internal width	82	96		122		
b ₃ [mm]: Internal width	b ₃ = b = 82		112	b ₃ = b = 122		
h [mm]: See Fig. 1, section 1-1.	Depending on slab thickness. The maximum concrete cover x ₉ shall not be exceeded.					
l [mm]:	600					
Mandrel diameter [mm]:	20	20		32		
Reinforcement P2:						
No. x diameter:	1 x Ø8	1 x Ø8	1 x Ø8	1 x Ø12	1 x Ø12	1 x Ø12
x ₂ [mm]:	45 ± 5	45	45	55 ± 5	55 ± 5	55 ± 5
b ₁ [mm]: Internal width	82	96		122		
b ₂ [mm]: Internal width	105	135		155		
h [mm]: See Fig. 1, section 1-1.	Depending on slab thickness. The maximum concrete cover x ₉ shall not be exceeded.					
l [mm]:	600					
Mandrel diameter [mm]:	20	20		32		
Reinforcement P4:						
No. x diameter:	1+1 x Ø8	1+1 x Ø8	1+1 x Ø8	1+1 x Ø12	1+1 x Ø12	1+1 x Ø12
x ₃ [mm]:	155 ± 5	192	192	175 ± 5	175 ± 5	225 ± 5
x ₄ [mm]:	310 ± 5	301	301	335 ± 5	335 ± 5	385 ± 5
a [mm]:	80	80		120		
b [mm]: Internal width	82	94		122		
h [mm]: See Fig. 1, section 1-1.	Decided locally.					
Mandrel diameter [mm]:	20	20		32		
Reinforcement P5:						
Reinforcement P6:	One transverse bar with the same diameter as the anchorage bar to be placed in the bend of every anchorage bar.					
No. x diameter:	One transverse bar with the same diameter as the anchorage bar to be placed in the bend of every anchorage bar.					
Minimum edge distance:						
x ₅ [mm]:	125	120	120	130	130	130
x ₆ [mm]:	160	160	160	180	180	180
x ₇ [mm]:	70	80	80	100	100	100
Minimum concrete cover (top flange of the outer tube)						
x ₈ [mm]:	50	38	38	70	70	70
Maximum concrete cover P1/P2 at bottom of slab						
x ₉ [mm]:	35	35	35	35	35	35

¹⁾ The plastic outer tube is made with snap-on slots to ensure correct positioning of the reinforcement. Thus, no tolerances are given.

Table 1: Anchoring reinforcement

**RECOMMENDED MAX. ULS LOAD ($F_{V,Ed}$) - TWO UNITS IN PAIR C-C
250mm**

RECOMMENDED MAXIMUM ULS LOAD $F_{V,Ed}$ IN LOAD CATEGORY a) AND b) UNDER THE FOLLOWING ASSUMPTIONS:

- No skew load. I.e. 50% of the load is carried by each of the units.
- Anchoring reinforcement according to Figure 1 and Table 1.
- Minimum edge distance according to Figure 1 and Table 1.
- The specified maximum concrete cover (x_s) of anchoring bars P1 and P2 according to Figure 1, is not exceeded. With a larger concrete cover on these bars, the capacity is reduced. The reduced capacity will correspond to the capacity of a thinner slab correlating with the change in concrete cover.
- Concrete grade: Minimum C35/45.
- The general reinforcement in the slab is sufficient to carry the load.

The recommended maximum ULS load $F_{V,Ed}$ is based on multiple FEM analyses. The FEM analysis are carried out assuming load category a), with cast-in RVK/TSS 101 units in slabs with 200mm and 265mm thicknesses. The value for $t=170$ mm is a derived from the results. For load category b), the ULS Load is found by requiring the force $R_{1,2}$ to be equal to, or less, than the calculated reaction force $R_{1,1}$, $R_{1,1}$ and $R_{1,2}$ are the front reaction forces in the slab for load category a) and b) respectively, calculated according to the formulas outlined in Memo 54.

PRODUCT SERIES	TSS 41 TSS 41 G	RVK 60 P	TSS 60 P	TSS 101 TSS 101 G	RVK 101 RVK 101 G	TSS 102 TSS 102 G
<i>Load category a) - without simultaneously acting horizontal design support reaction. H_{Ed}</i>						
Slab thickness [mm]	Recommended maximum ULS load $F_{V,Ed}$ on two units in pair c-c 250mm [kN]					
170	-	-	-	135	135	-
200	-	-	-	150	150	144 ¹⁾
265	-	-	-	200	200	200
<i>Load category b) - with simultaneously acting horizontal design support reaction. $H_{Ed}=0,2F_{V,Ed}$</i>						
Slab thickness [mm]	Recommended maximum ULS load $F_{V,Ed}$ on two units in pair, c-c 250mm [kN]					
170	-	-	-	129	129	-
200	-	-	-	140	140	135 ¹⁾
265	-	-	-	188	188	180

¹⁾ The TSS102 may in special cases fit into slabs with $t=200$ mm if reduced concrete cover is acceptable. The unit should be placed centric in the slab, which will slightly reduce the height x_s below the minimum value stated in Table 1.

Table 2: Recommended max. ULS load $F_{V,Ed}$ in load category a) and b) - two units in pair c-c 250mm.

REVISION HISTORY	
Date:	Description:
26.10.2020	First edition
03.11.2020	Clarified the assumption of 50% of the load on each unit. Reference to installation movie at "IC Academy".
05.11.2020	Adjusted internal width of P1, P2 and P4.
12.11.2020	Included parameter x_9 , concrete cover