

MEMO 72	Date: 08.02.2021	Sign.: SSS
iC SOLUTION FOR EARTHQUAKE AND STAIRS IN BUILDINGS - ADDITIONAL REINFORCEMENT IN LANDING	Last rev.: 08.03.2021	Sign.: SSS
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ADDITIONAL REINFORCEMENT IN LANDING

When designing for seismic action, additional reinforcement around the TSS units is required to resist the horizontal forces. To ensure the stair and landing connection is working as ductile parts, the reinforcement must be designed with overstrength. In this way it can be ensured the steel unit becomes “the weakest link” and is plasticised during the earthquake.

Additional reinforcement in landing

As seen in Figure 1 in Memo 71, the transverse forces will always try to rotate the front end of the inner tube away from the edge of the landing. This is summarized in Figure 1, where also the internal reaction forces R_1 and R_2 are illustrated. In the front, the reaction force (R_1) will be transferred to the concrete inward from the edge of the landing. This may cause stress levels exceeding the concrete design stress and may cause the concrete covering the reinforcement to spall off in the area close to the unit. However, if the edge of the landing is reinforced with longitudinal bars together with vertical u-bars, this is assumed to prevent crushing inwards from the edge. Also, the special vertical anchoring reinforcement bars will to some extent be activated and prevent the concrete from breaking.

At the rear, the end of the inner tube will push towards the landing edge (R_2). Due to the short distance to the edge, it's recommended to include a u-shaped reinforcement bar at this position.

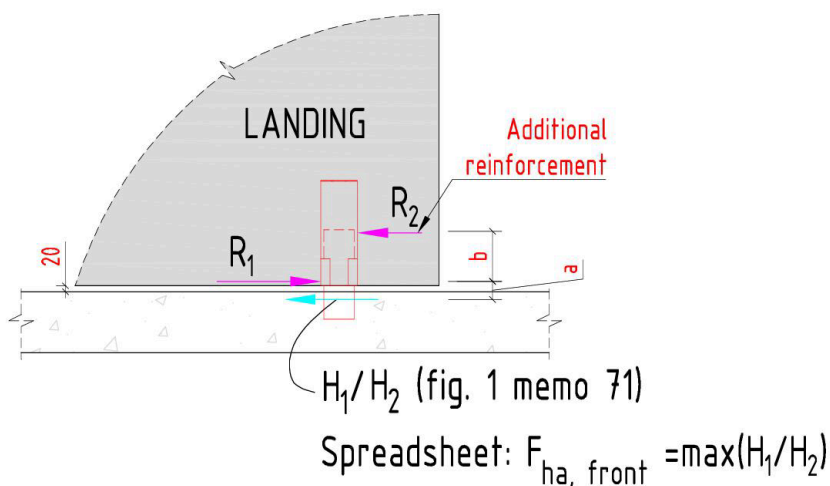
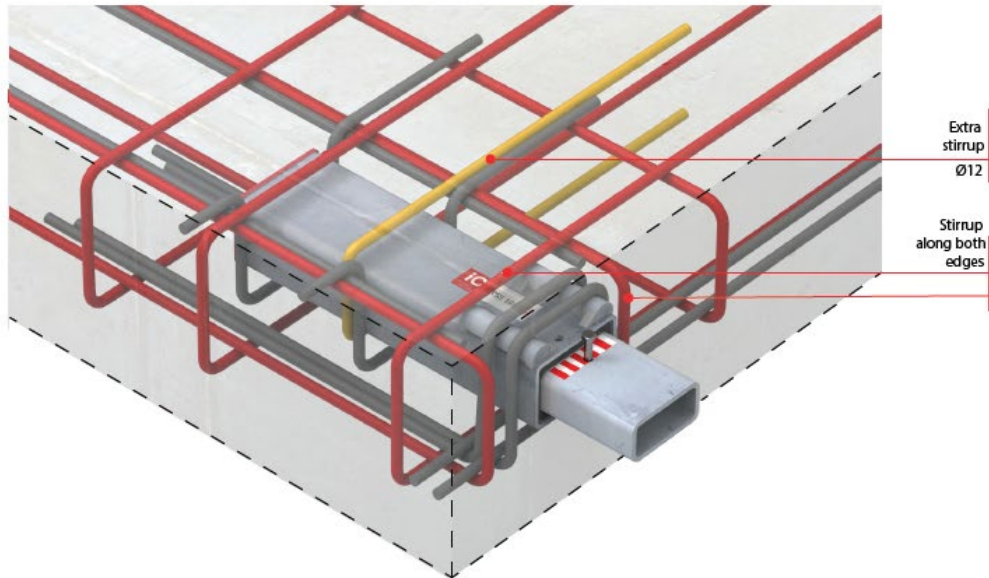
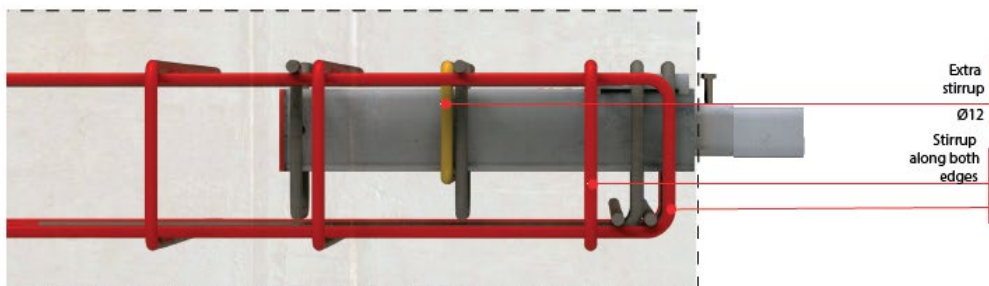


Figure 1: Forces acting on the unit.

3D ILLUSTRATION



CROSS SECTION 1-1



PLAN

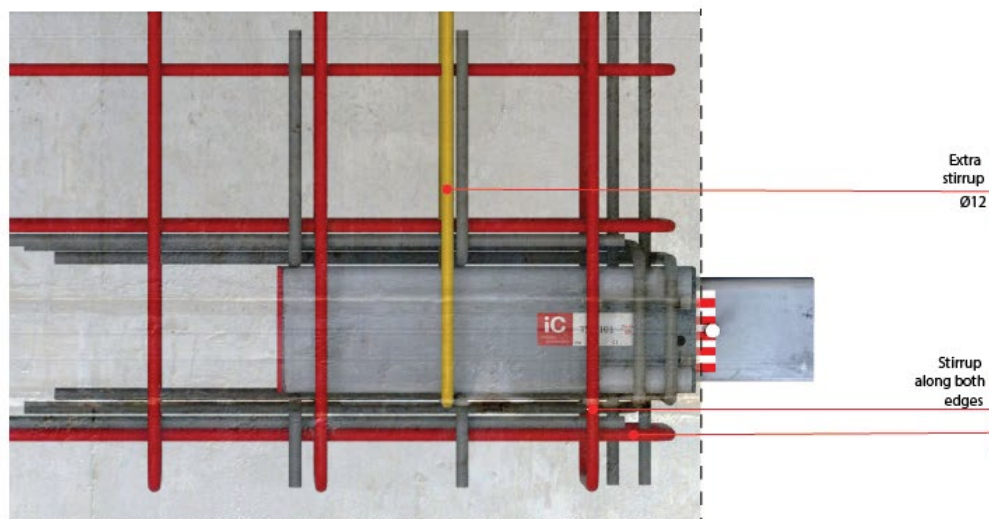


Figure 2: Extra reinforcement for horizontal earthquake forces TSS 101. Stirrups along the edges, with longitudinal bars in the bends (not illustrated), is always recommended.

REVISION HISTORY	
Date:	Description:
08.02.2021	Preliminary edition
08.03.2021	New revision