

MEMO 45  
FIRE PROTECTION

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Sign.: sss  
Sign.: sb  
Contr.: sb

## FIRE PROTECTION - TSS/RVK CONNECTIONS

### General information

Stairs are used both as a daily communication route and as a fire escape route. Legislation, design and performance prevent stairs from being exposed to fire and high temperatures. Building regulations and standards have been developed to protect life and health, material values and the safety for firefighting. In Norway and several countries, minimum fire resistance is required for stairs.

The minimum fire resistance is determined by the fire class of the building, which is affected by the building activity and the amount of floors. The requirements of minimum fire resistance came as a matter retaining the stair's function, in case of fire. Their main function is to be operative during an evacuation and that the fire department can execute fire fighting even when the building is burning. The Building Construction Engineer (RIB) is responsible for designing the load bearing system of the building. The table below shows Norwegian fire requirements for stairs in some selected typical buildings that are designed according to prescriptive solutions:

Building	Floors			
	1	2	3 and 4	5 or more
Office	-	-	R 30 [B 30]	R 30 A2-s1,d0 [A 30]
Storage	-	-	R 30 [B 30]	R 30 A2-s1,d0 [A 30]
School	-	-	R 30 [B 30]	R 30 A2-s1,d0 [A 30]
Residential	-	-	R 30 [B 30]	R 30 A2-s1,d0 [A 30]
Sports centre	-	R 30 [B 30]	R 30 A2-s1,d0 [A 30]	R 30 A2-s1,d0 [A 30]

Shopping mall	-	R 30 [B 30]	R 30 A2-s1,d0 [A 30]	R 30 A2-s1,d0 [A 30]
Hospital	-	R 30 [B 30]	R 30 [B 30]	R 30 A2-s1,d0 [A 30]

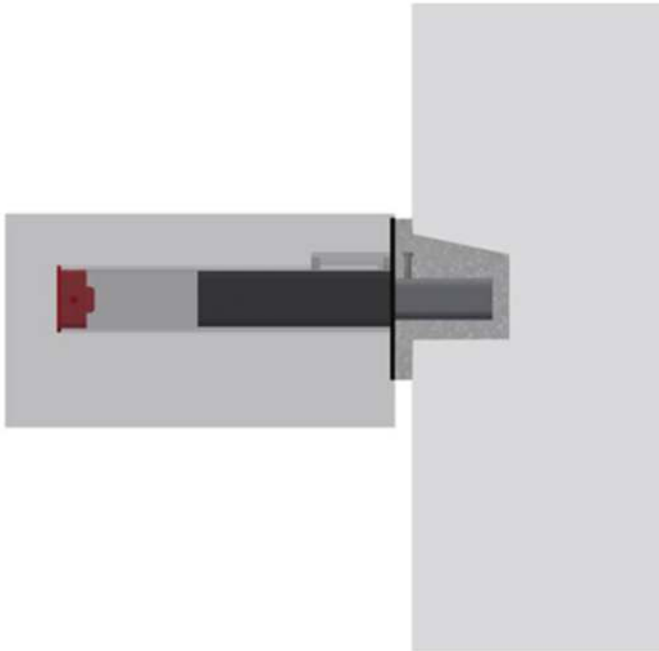
## Fire resistance and recommendations for TSS/RVK

TSS and RVK act as load bearing connections between repos and stairwells. When the connections are installed, normally a 20-30mm air gap appears. To properly protect the inner tube in the air gap and the cavity, in terms of fire, please see the figure below.

According to BS EN 1992-1-2:2004, Clause 4.6; joint components of structural steel shall be designed for fire resistance in accordance with BS EN 1993-1-2.

IC has performed simplified calculations, using the reduction factor  $\eta_{fi} = 0,7$  for the design load level for the fire situation vs. the ultimate limit state load. These calculations indicated nearly the same critical temperature for the anchoring reinforcement, as for the steel unit itself (assuming anchoring reinforcement in accordance with Memo 55). Thus, normally, the TSS/RVK units and the anchoring reinforcement will have the same need for fire protection.

Invisible Connections recommends filling the air gap with floating concrete, see instruction movie : Trapp, Installasjon. <https://www.invisibleconnections.no/category/ic-akademiet/>



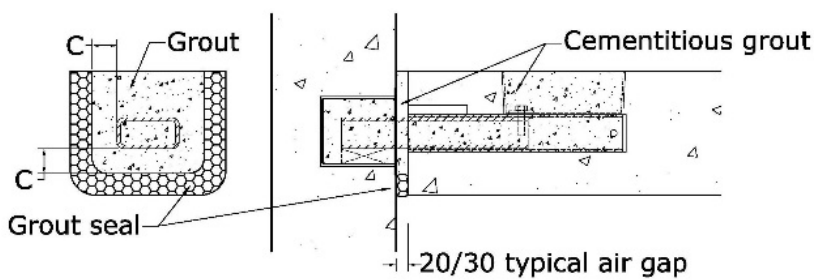
BS EN 1992-1-2:2004 provides standardized solutions on fire protection of steel beams protected with concrete. The figure and table below shows table 5.5 from the standard.

**Table 5.5: Minimum dimensions and axis distances for simply supported beams made with reinforced and prestressed concrete**

Standard fire resistance	Minimum dimensions (mm)						
	Possible combinations of $a$ and $b_{min}$ where $a$ is the average axis distance and $b_{min}$ is the width of beam				Web thickness $b_w$		
					Class WA	Class WB	Class WC
1	2	3	4	5	6	7	8
R 30	$b_{min}= 80$ $a = 25$	120 20	160 15*	200 15*	80	80	80
R 60	$b_{min}= 120$ $a = 40$	160 35	200 30	300 25	100	80	100

In order to achieve the required fire resistance, it is important to fulfill the minimum cover 'a', see table above. The cover is poured around the steel part and fill the air gap. A minimum of 25mm concrete cover is always recommended.

Invisible Connections AS does not specify any manufacturer for the floating concrete, but it must be of good quality and be able to fill and cover the entire air gap, wall cavity and mounting. The concrete must also be capable to fulfill the imposed loads. The manufacturer can confirm the fire rating of their products. If in doubt, contact the manufacturer to confirm the fire rating of the chosen product.



**Typical section**

Sometimes the connection is exposed due to design and architectural reasons. In such cases, alternative measures must be taken to achieve the required fire safety. The most common solution is to choose a durable coating that is applied to the inner tube. Guidance should be sought from manufacturers of such coatings to select a suitable solution.

<b>REVISION HISTORY</b>	
<b>Date:</b>	<b>Description:</b>
26.10.2006	Preliminary
12.05.2020	New template
22.01.2021	Included reference to BS EN 1992-1-2: 2004 Clause 4.6. Included reference to simplified calculations of critical temperature. Included recommended minimum concrete cover. (25mm)