

# ROK HCS Slab Support Manual

Design according to Eurocodes

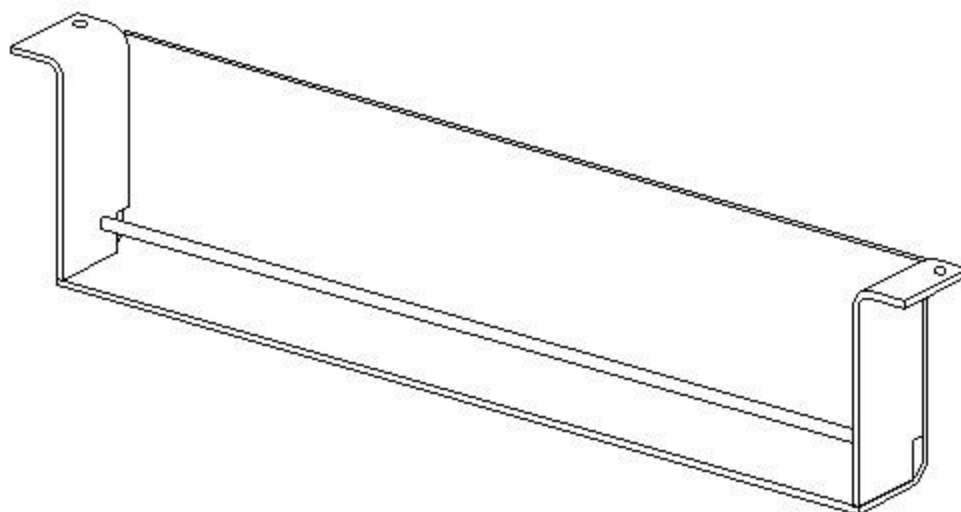
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## 1. DESCRIPTION OF THE SYSTEM

ROK hollow core slab (HCS) supports manufactured by R-Group Finland Oy are factory made steel parts designed for support of HCS slab end at holes in HCS slab structure. ROK support transfers HCS slab end support reaction to adjacent HCS slabs or walls in both installation of HCS slabs and in the final situation. ROK support (together with seam grout) acts as support structure until fire resistance class R 60 without separate fire protection for the loads given in this design instruction.



## 2. DIMENSIONS AND MATERIALS

### 2.1. Dimensions and tolerances

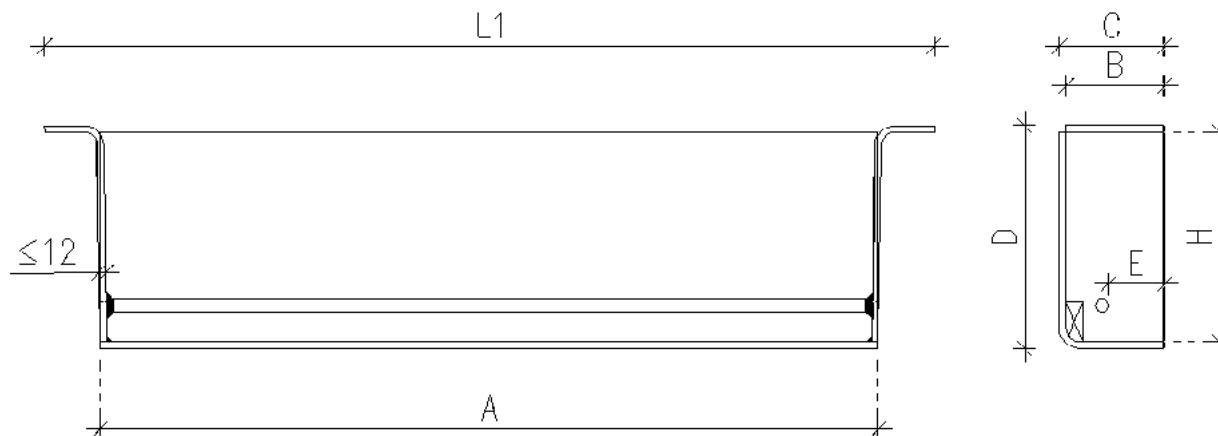


Figure 1. Dimensions of ROK support

**Table 1. Dimensions and tolerances of ROK support**

Support	L1 [mm]	H [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
ROK H-L	± 2	± 1	± 1	± 1	± 1	± 1	± 1
ROK 150-1200	1360	150	1190	150	156	162	87
ROK 175-1200	1360	175	1190	150	156	187	87
ROK 200-1200	1360	200	1190	150	156	212	87
ROK 220-1200	1360	220	1190	150	156	230	87
ROK 265-1200	1360	265	1190	150	156	275	87
ROK 300-1200	1360	300	1190	150	156	310	87
ROK 320-1200	1360	320	1190	150	156	330	87
ROK 350-1200	1360	350	1190	150	156	360	87
ROK 370-1200	1360	370	1190	150	156	380	87
ROK 400-1200	1360	400	1190	180	186	412	117
ROK 450-1200	1360	450	1190	180	186	462	117
ROK 500-1200	1360	500	1190	180	186	512	117

ROK 150-1800	1960	150	1790	150	156	162	87
ROK 175-1800	1960	175	1790	150	156	187	87
ROK 200-1800	1960	200	1790	150	158	214	87
ROK 220-1800	1960	220	1790	150	158	234	87
ROK 265-1800	1960	265	1790	150	158	279	87
ROK 300-1800	1960	300	1790	150	158	314	87
ROK 320-1800	1960	320	1790	150	158	334	87
ROK 350-1800	1960	350	1790	150	158	364	87
ROK 370-1800	1960	370	1790	150	158	384	87
ROK 400-1800	1960	400	1790	180	188	416	117
ROK 450-1800	1960	450	1790	180	188	466	117
ROK 500-1800	1960	500	1790	180	188	516	117

ROK 150-2400	2560	150	2390	150	158	164	87
ROK 175-2400	2560	175	2390	150	158	189	87
ROK 200-2400	2560	200	2390	150	158	214	87
ROK 220-2400	2560	220	2390	150	158	234	87
ROK 265-2400	2560	265	2390	150	158	279	87
ROK 300-2400	2560	300	2390	150	158	314	87
ROK 320-2400	2560	320	2390	150	158	334	87
ROK 350-2400	2560	350	2390	150	158	364	87
ROK 370-2400	2560	370	2390	150	158	384	87
ROK 400-2400	2560	400	2390	180	190	418	117
ROK 450-2400	2560	450	2390	180	190	468	117
ROK 500-2400	2560	500	2390	180	190	518	117

**Table 2. Dimensions and tolerances of ROK Solid support**

Support	L1 [mm]	H [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
ROK Solid H-L	± 2	± 1	± 1	± 1	± 1	± 1	± 1
ROK Solid 150-1200	1360	150	1190	150	158	166	87
ROK Solid 175-1200	1360	175	1190	150	158	191	87
ROK Solid 200-1200	1360	200	1190	150	158	216	87
ROK Solid 220-1200	1360	220	1190	150	158	236	87
ROK Solid 265-1200	1360	265	1190	150	158	281	87
ROK Solid 300-1200	1360	300	1190	150	158	316	87
ROK Solid 320-1200	1360	320	1190	150	158	336	87
ROK Solid 350-1200	1360	350	1190	150	160	368	87
ROK Solid 370-1200	1360	370	1190	150	160	388	87
ROK Solid 400-1200	1360	400	1190	180	188	416	117
ROK Solid 450-1200	1360	450	1190	180	188	466	117
ROK Solid 500-1200	1360	500	1190	180	188	516	117

ROK Solid 150-1800	1960	150	1790	150	160	170	87
ROK Solid 175-1800	1960	175	1790	150	160	195	87
ROK Solid 200-1800	1960	200	1790	150	160	220	87
ROK Solid 220-1800	1960	220	1790	150	160	240	87
ROK Solid 265-1800	1960	265	1790	150	160	285	87
ROK Solid 300-1800	1960	300	1790	150	160	320	87
ROK Solid 320-1800	1960	320	1790	150	160	340	87
ROK Solid 350-1800	1960	350	1790	150	160	370	87
ROK Solid 370-1800	1960	370	1790	150	160	390	87
ROK Solid 400-1800	1960	400	1790	180	190	420	117
ROK Solid 450-1800	1960	450	1790	180	190	470	117
ROK Solid 500-1800	1960	500	1790	180	190	520	117

ROK Solid 150-2400	2560	150	2390	150	160	170	87
ROK Solid 175-2400	2560	175	2390	150	160	195	87
ROK Solid 200-2400	2560	200	2390	150	160	220	87
ROK Solid 220-2400	2560	220	2390	150	160	240	87
ROK Solid 265-2400	2560	265	2390	150	160	285	87
ROK Solid 300-2400	2560	300	2390	150	160	320	87
ROK Solid 320-2400	2560	320	2390	150	160	340	87
ROK Solid 350-2400	2560	350	2390	150	160	370	87
ROK Solid 370-2400	2560	370	2390	150	160	390	87
ROK Solid 400-2400	2560	400	2390	180	190	420	117
ROK Solid 450-2400	2560	450	2390	180	190	470	117
ROK Solid 500-2400	2560	500	2390	180	190	520	117

## 2.2. Materials and standards

Part	Material	Standard
Front plate	S355J2+N	SFS-EN 10025
Side plate	S355J2+N	SFS-EN 10025
Fire steel bar	A500HW	SFS 1215
	B500B	SFS 1269

## 2.3. Ordering codes

Ordering code of ROK support is formed as follows:

ROK [height of HCS slab]- [width of opening]

ROKS [height of HCS slab]- [width of opening]

E.g., HCS height 320 mm, opening width 1200 mm.

ROK HCS slab support ordering code is ROK 320-1200.

Maximum width of opening is 2400 mm when using ROK supports.

# 3. MANUFACTURING

## 3.1. Manufacturing method

Front and side plates are cut mechanically and bent to shape. Bent side plates are welded to the front plate. Ribbed steel bar is cut mechanically and welded to the side plates.

## 3.2. Manufacturing markings

Product package is equipped with an R-Steel –sticker, which contains the following information: product type, product name, quantity, ISO9001 and ISO14001 quality and environment system, FI marking and product picture.

Products are delivered in cardboard boxes on a truck palette.

## 3.3. Quality control

Quality control of the ROK HCS slab supports is done according to the requirements of the Finnish Code of Building Regulations and the instructions according to quality and

environment system of the R-Group Baltic OÜ (EN 1090, ISO9001 and ISO14001). R-Group Baltic OÜ has a quality control contract with Inspeca Estonia OÜ.

## 4. RESISTANCES

### 4.1. Design principles

Resistances of ROK HCS slab supports are calculated for static loads according to the limit state dimensioning method. Calculations are made according to EN 1992 and EN 1993 with Finnish National Annexes.

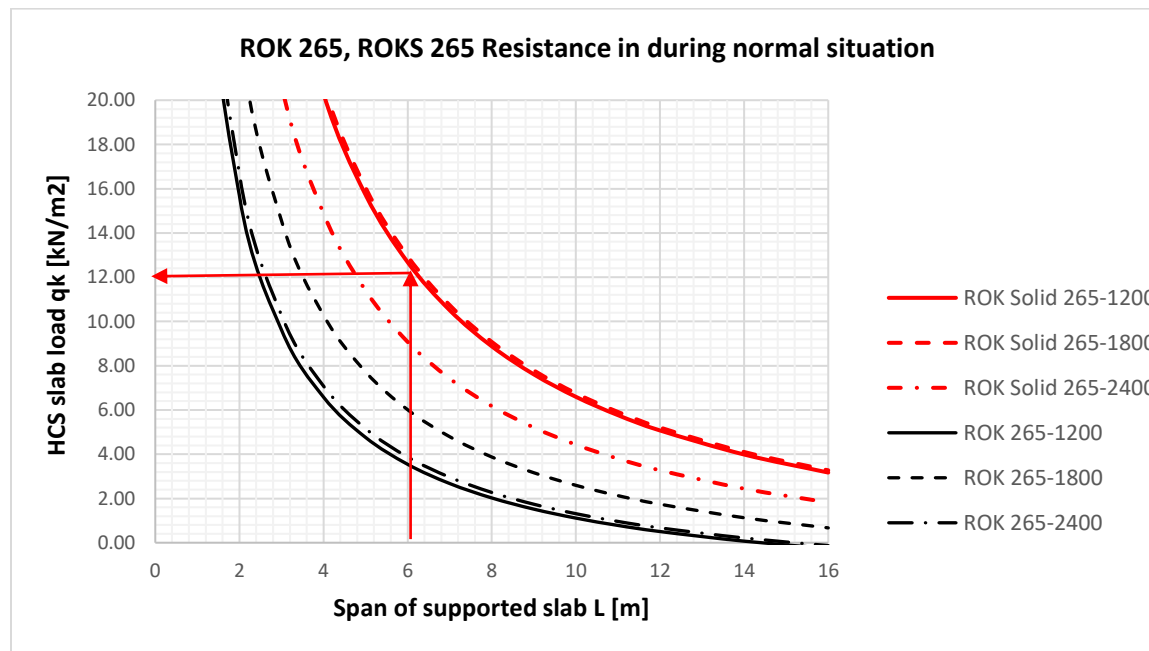
Resistances of ROK HCS slab supports are presented as resistance diagrams. Characteristic value of slab load (imposed load in addition to slab self-weight) and slab span is shown in diagrams. Self-weight of HCS slab used in calculations of diagrams is presented with the diagrams.

### 4.2. Diagram design example

Design of ROK HCS slab support in normal situation.

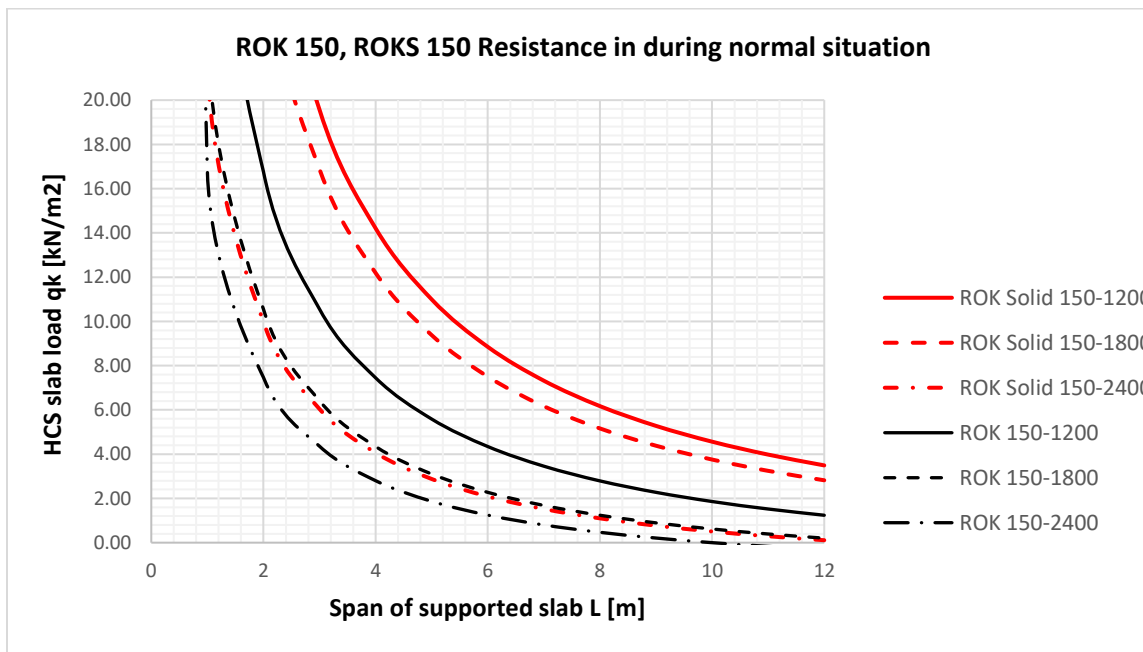
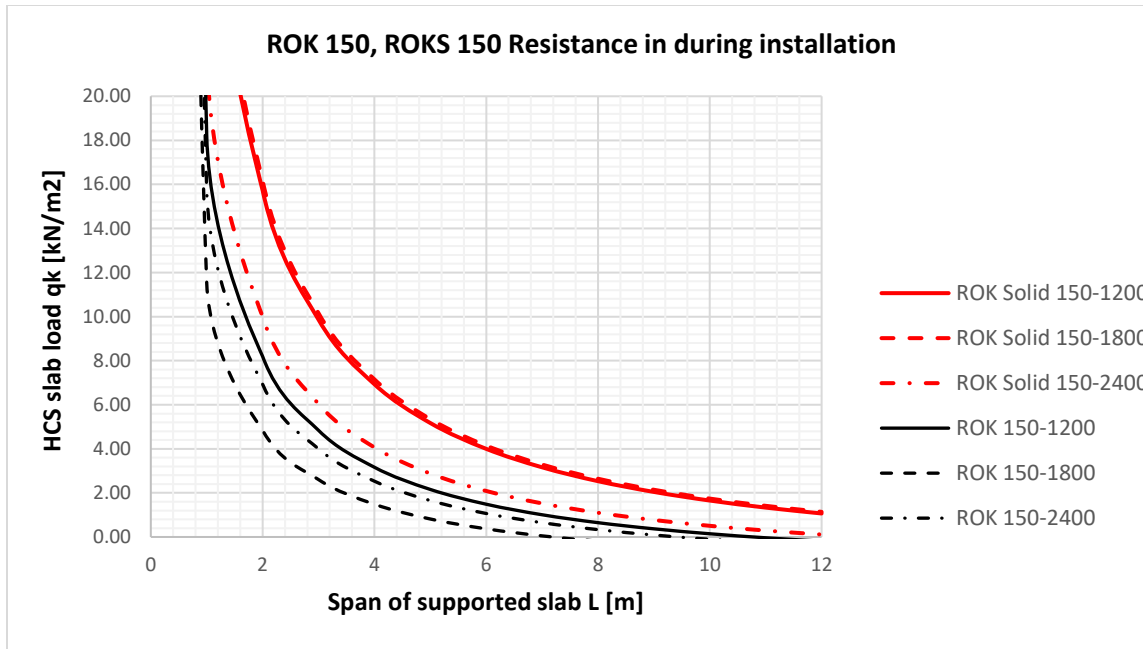
Hollow core slab height 265 mm, slab span  $L_j = 6\text{ m}$ , width of slab opening 1200 mm and characteristic load in addition to slab self-weight  $g_k = 10\text{ kN/m}^2$ .

From diagram can be seen that for ROKS 265-1200,  $L_j = 6\text{ m}$ ,  $q_{k,max} \approx 12\text{ kN/m}^2$   
→ ROK 265-1200 support is sufficient for given load.

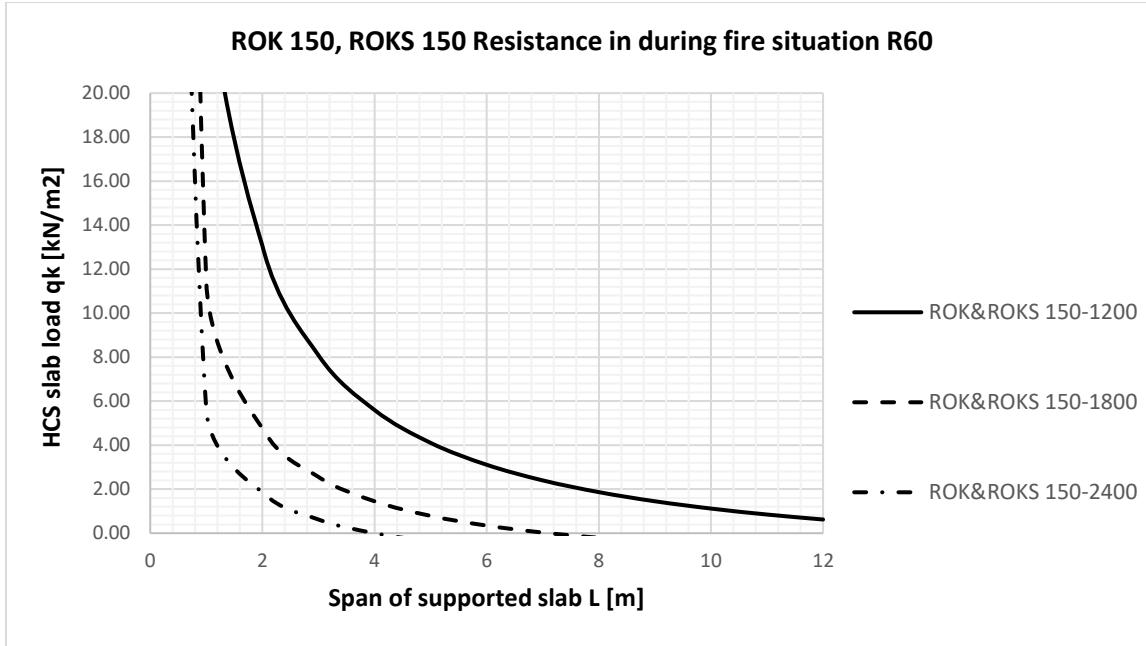


### 4.3. ROK 150, ROK Solid 150 resistance diagrams

Self-weight of the supported slab: 2,8 kN/m<sup>2</sup>

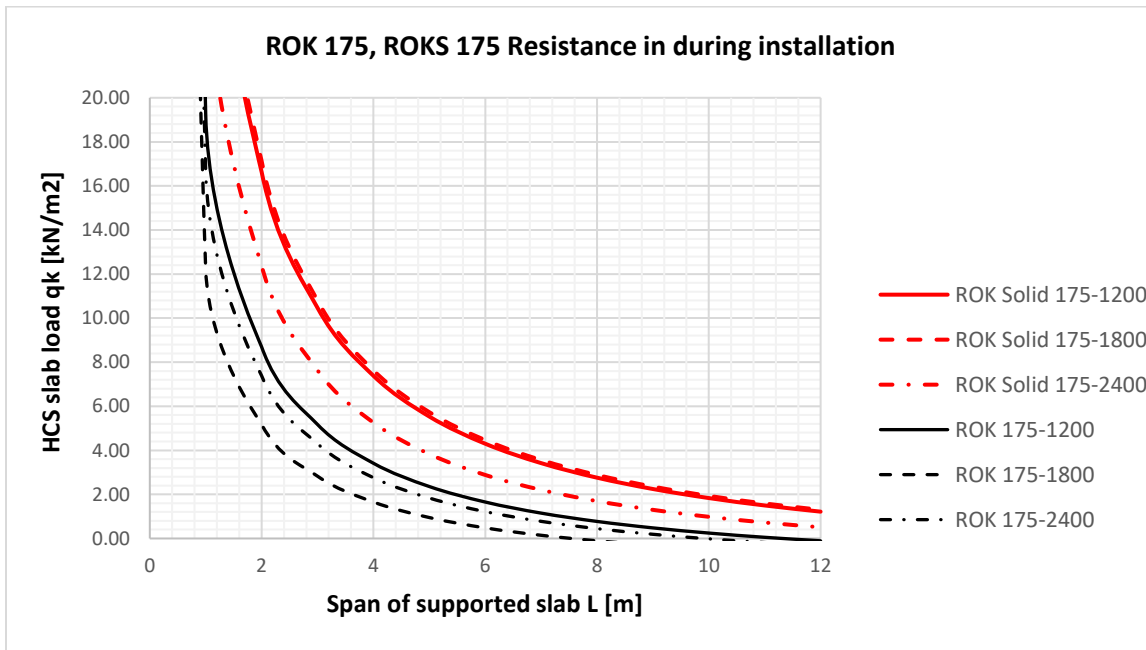


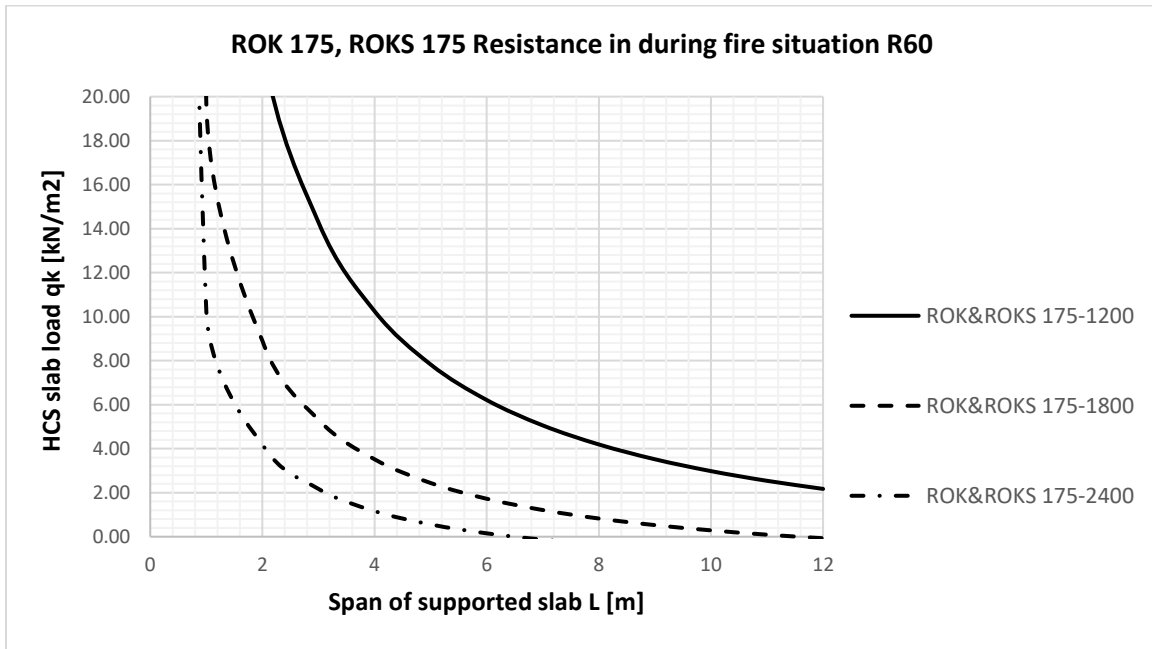
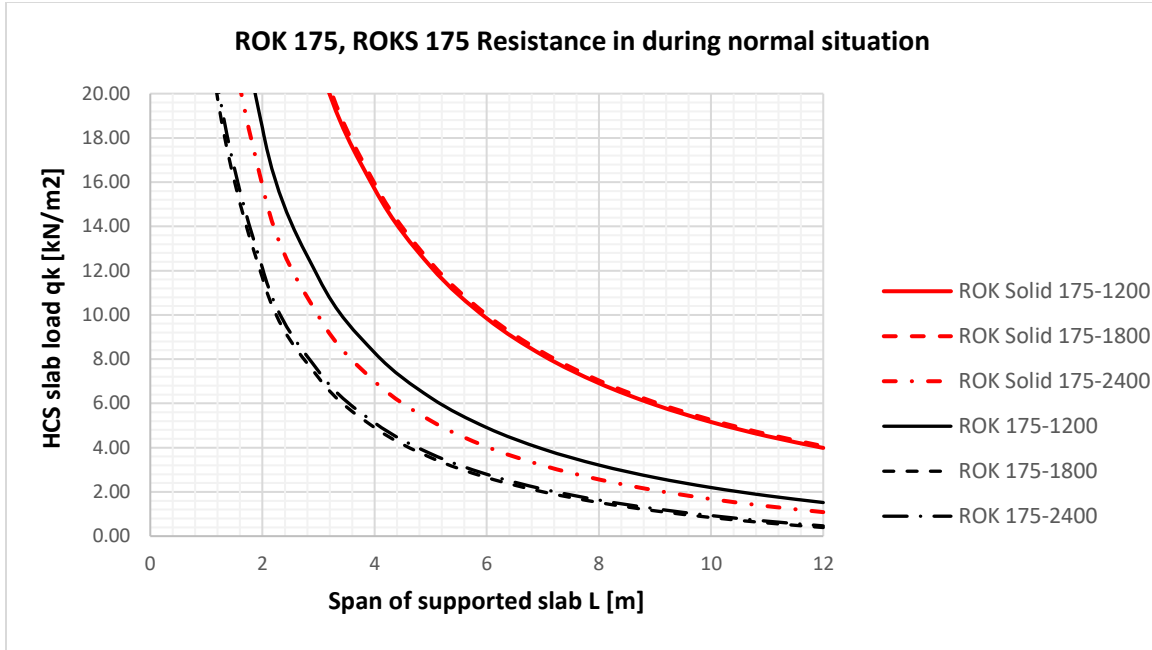




#### 4.4. ROK 175, ROK Solid 175 resistance diagrams

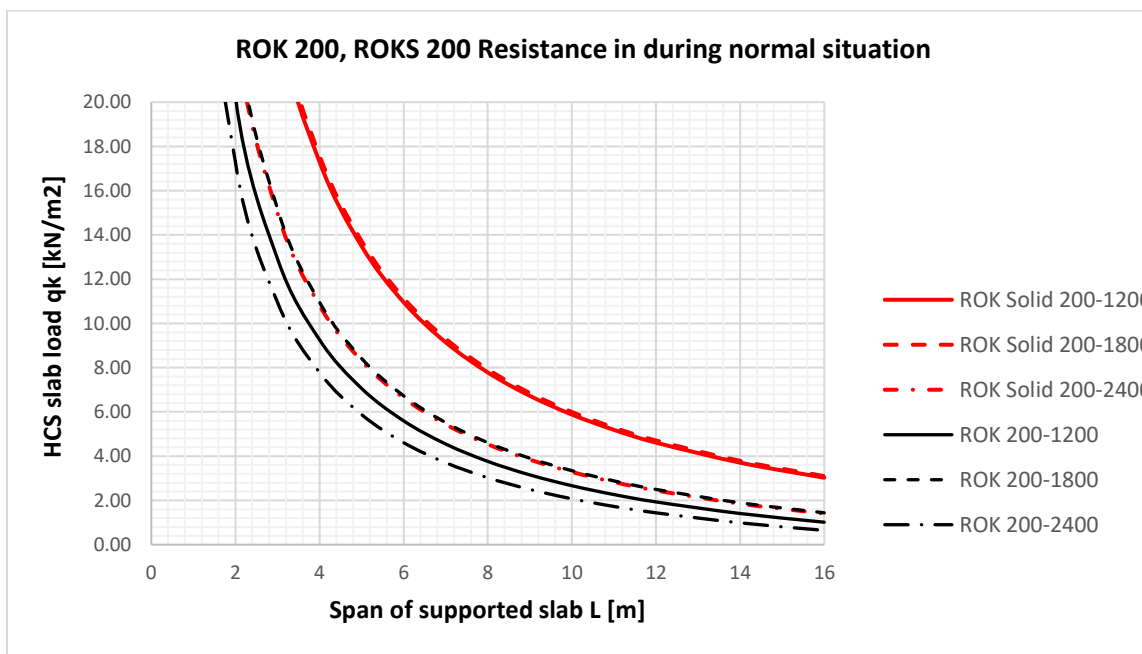
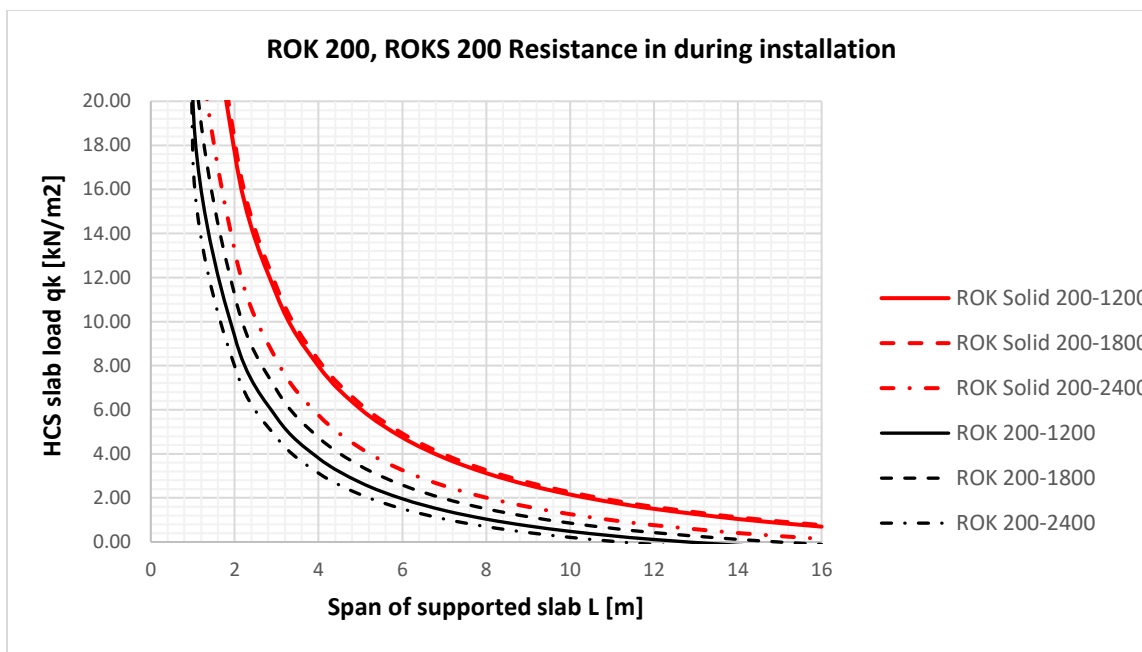
Self-weight of the supported slab: 2,8 kN/m<sup>2</sup>

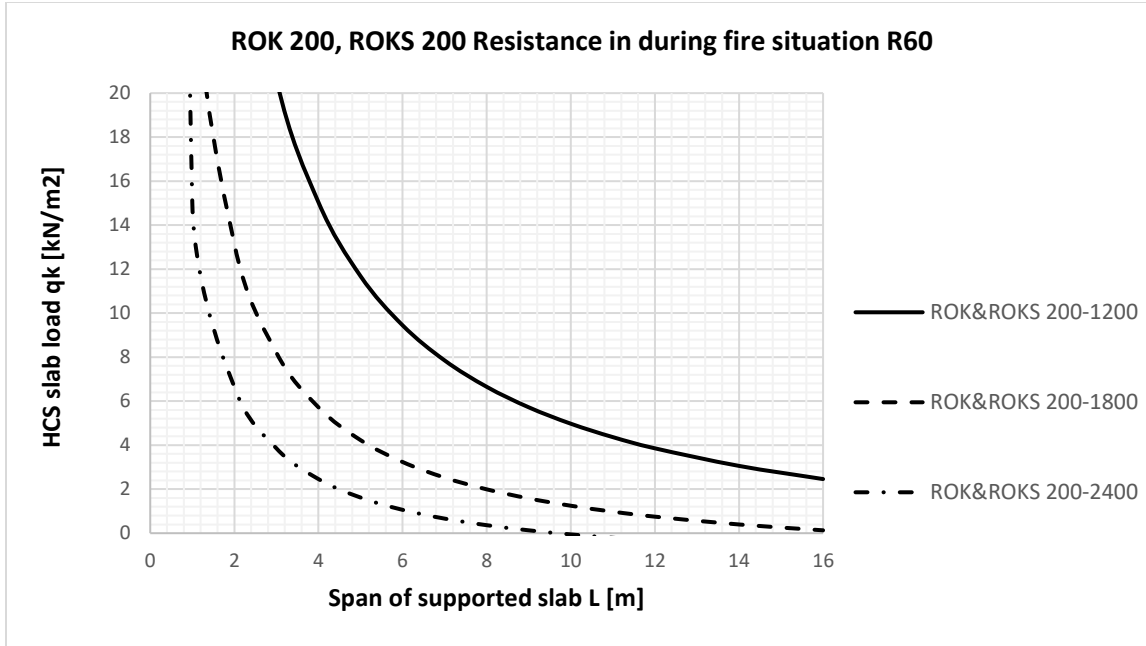




## 4.5. ROK 200, ROK Solid 200 resistance diagrams

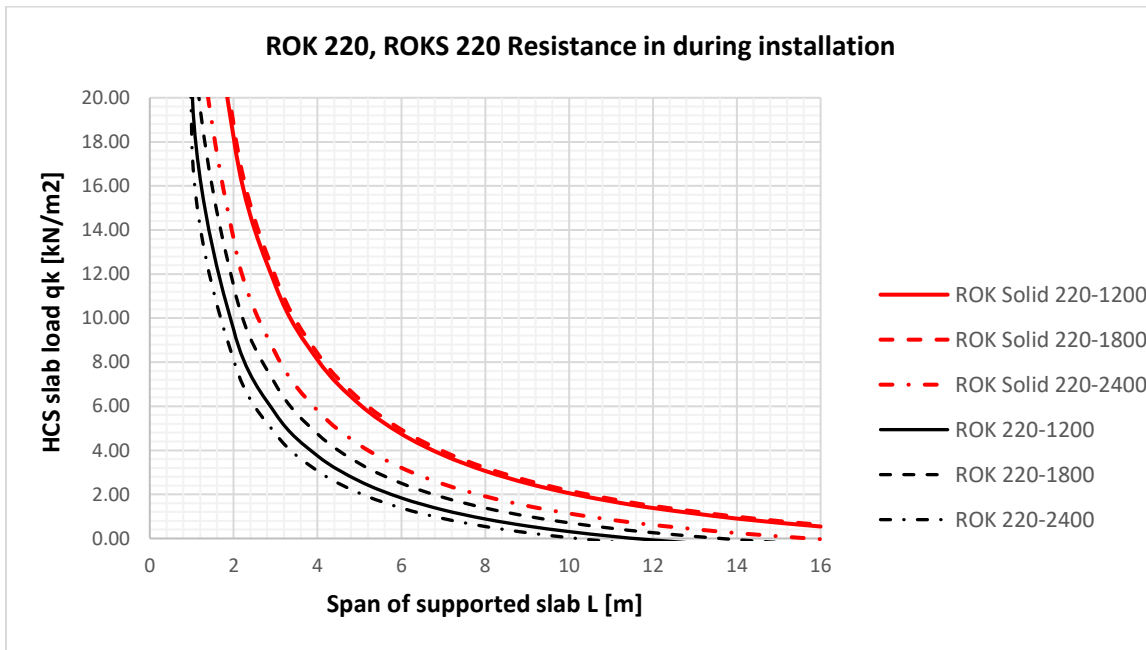
Self-weight of the supported slab: 2,6 kN/m<sup>2</sup>

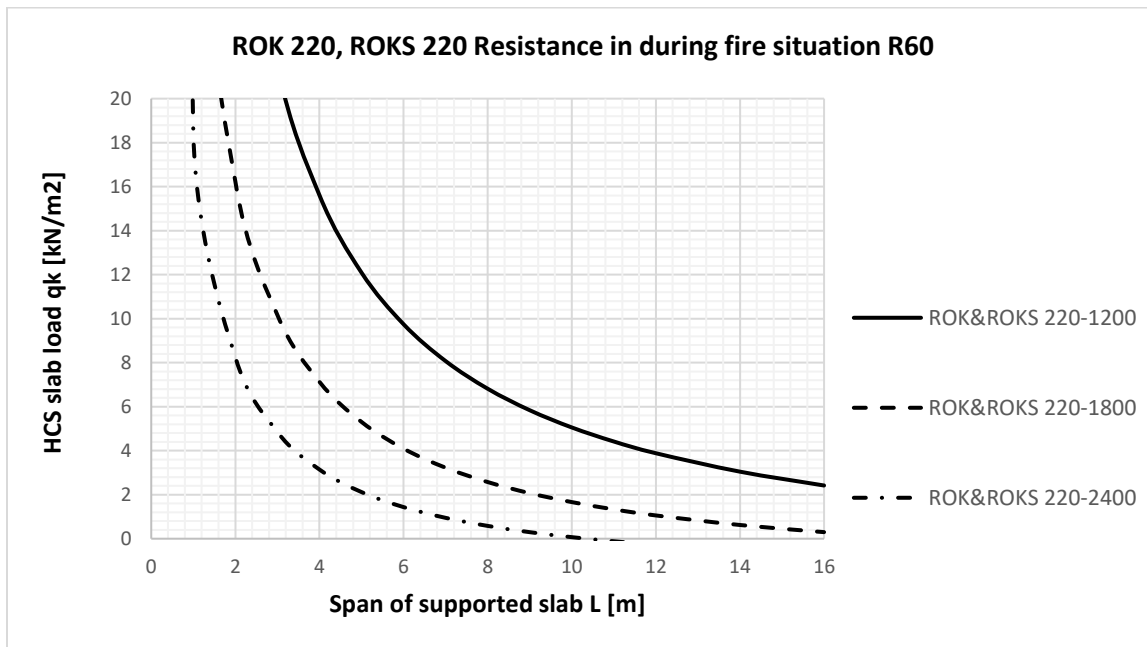
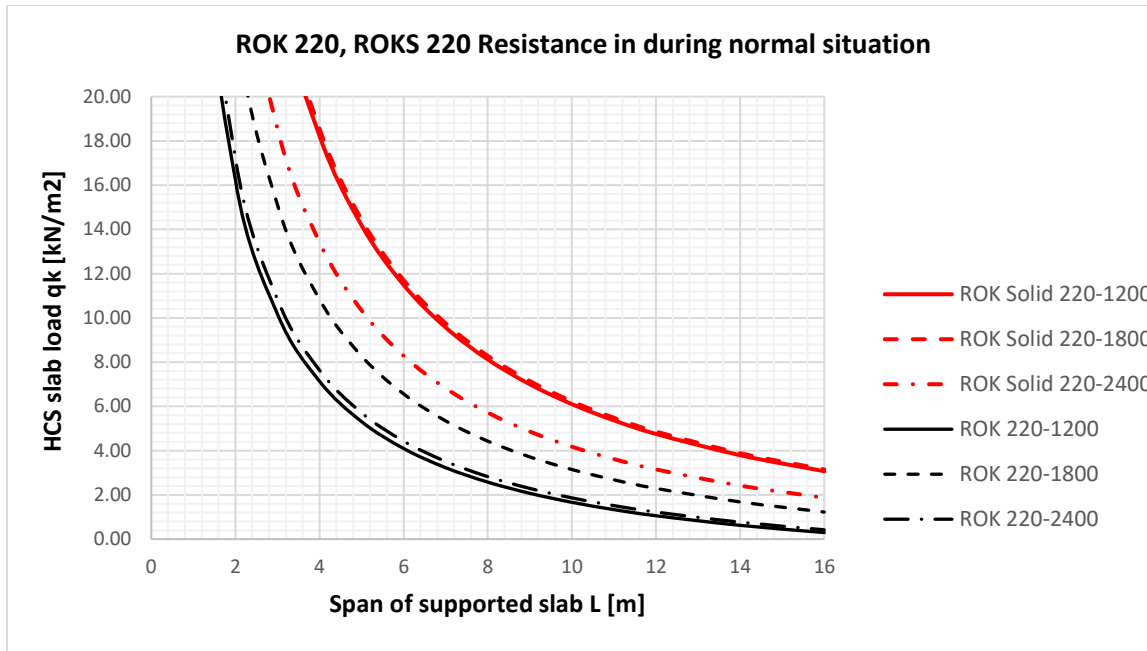




#### 4.6. ROK 220, ROK Solid 220 resistance diagrams

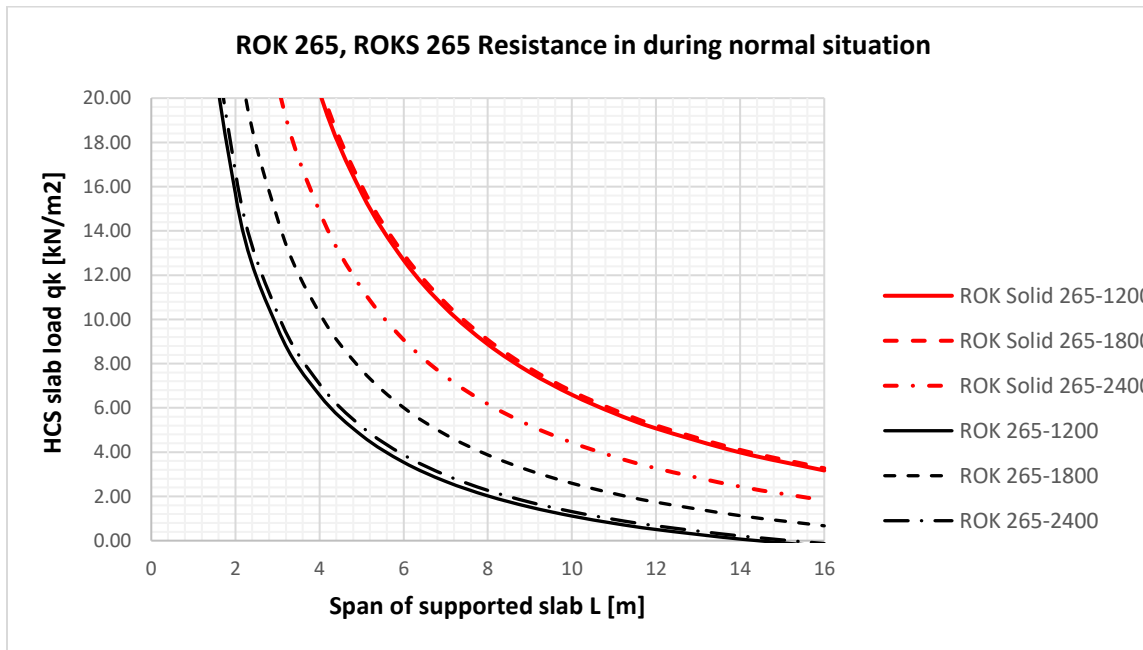
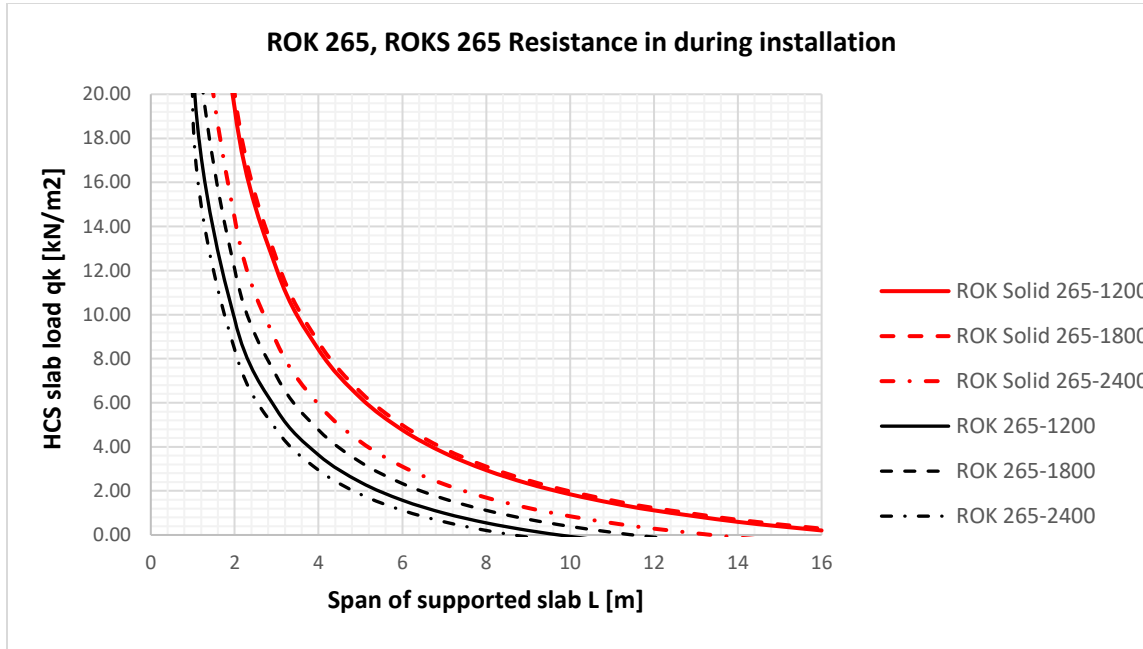
Self-weight of the supported slab: 2,97 kN/m<sup>2</sup>

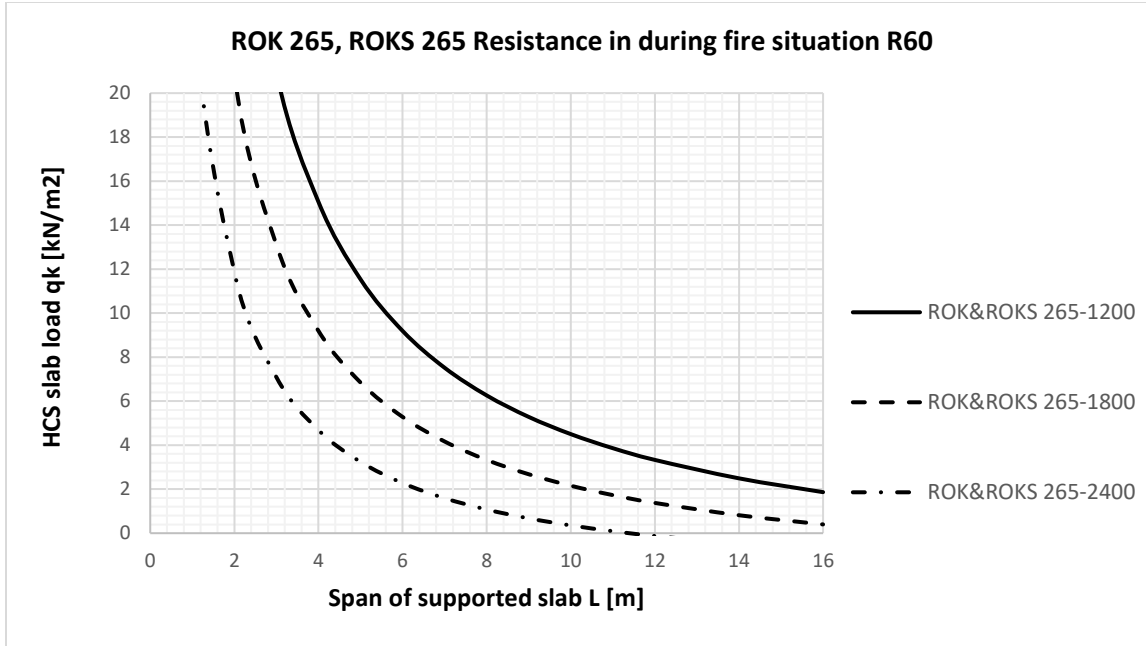




### 4.7. ROK 265, ROK Solid 265 resistance diagrams

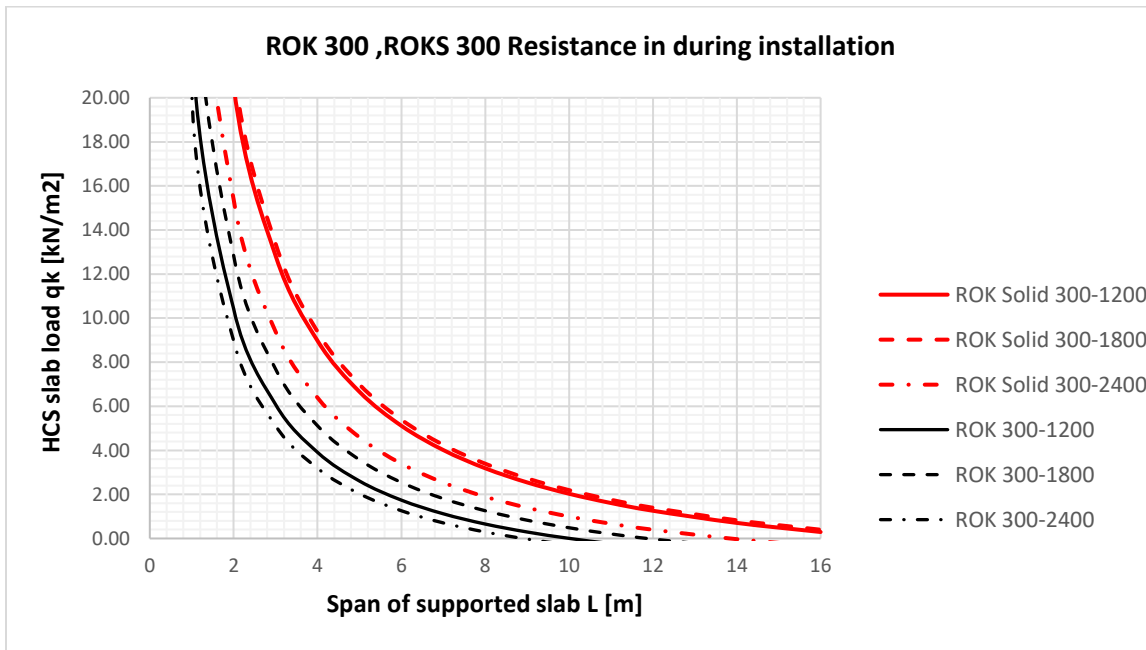
Self-weight of the supported slab: 3,8 kN/m<sup>2</sup>

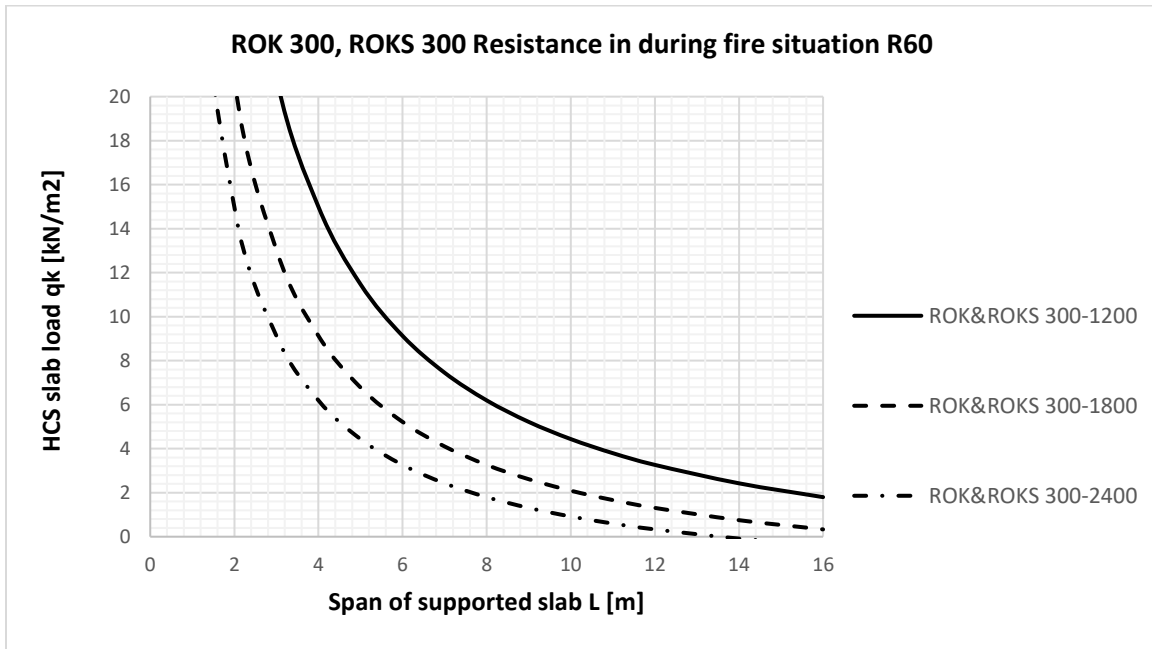
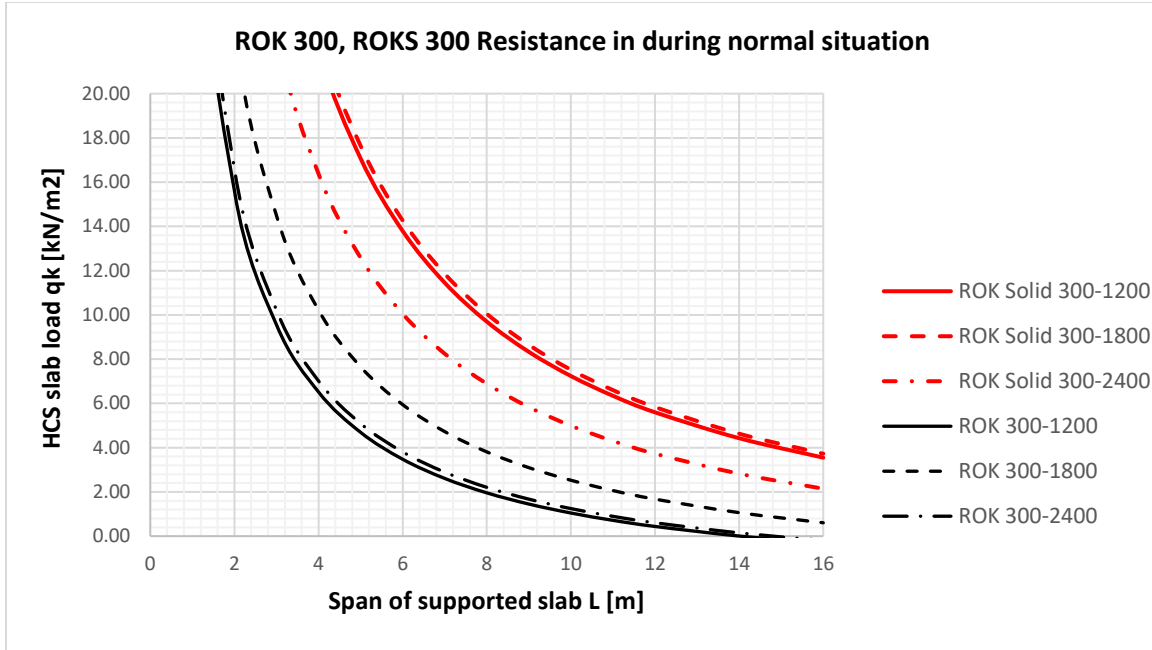




#### 4.8. ROK 300, ROK Solid 300 resistance diagrams

Self-weight of the supported slab: 3,9 kN/m<sup>2</sup>

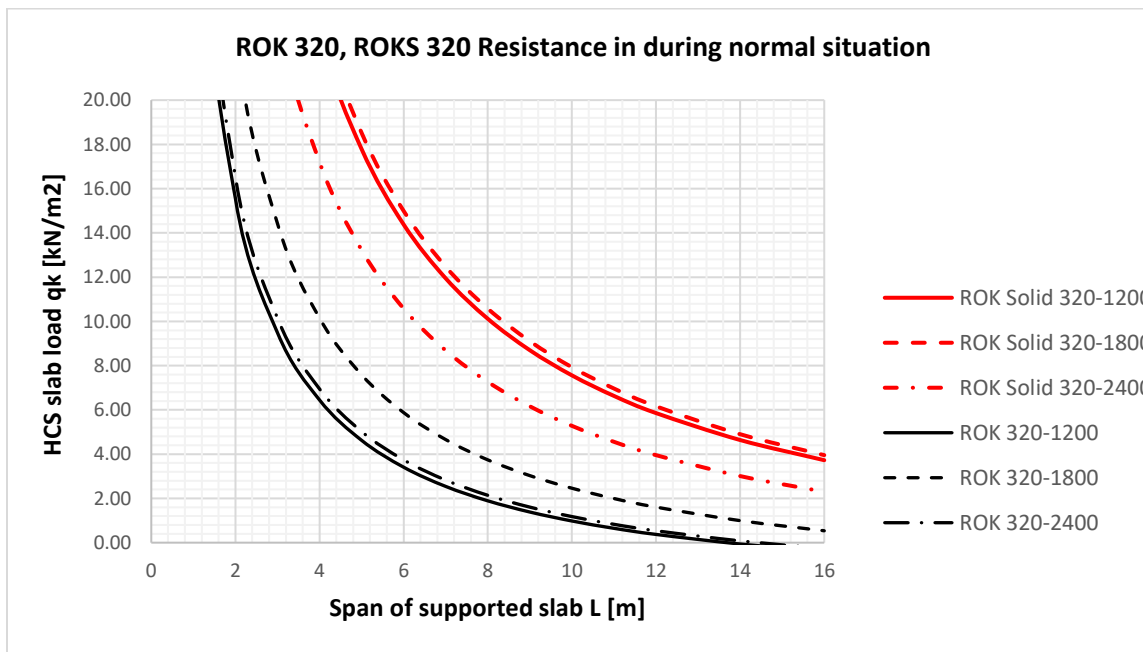
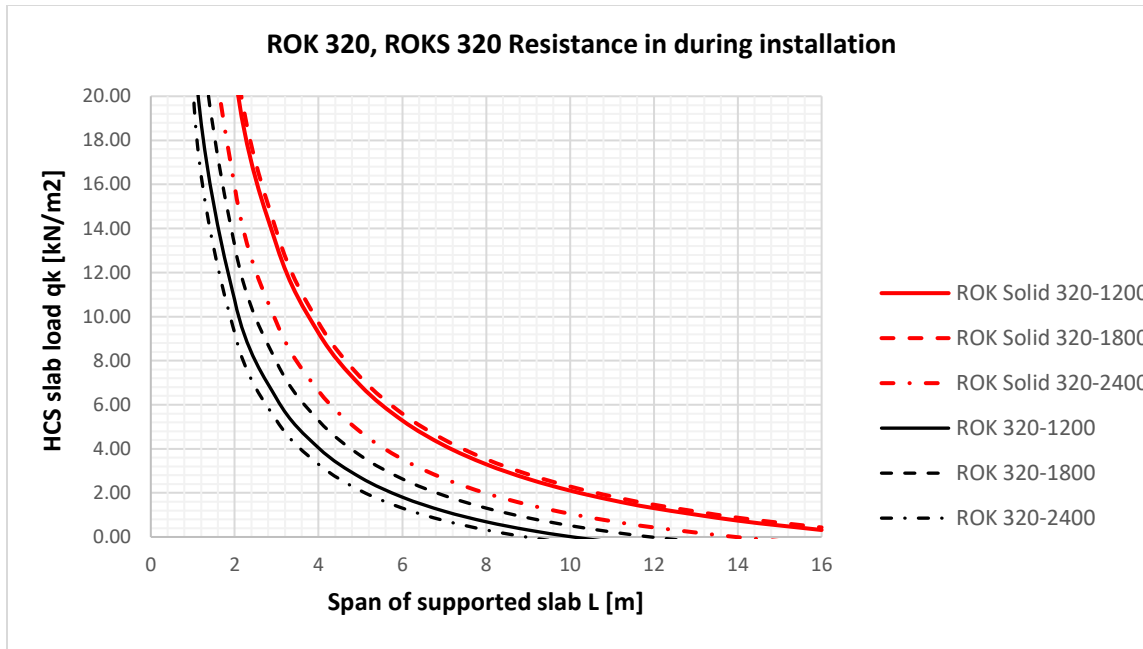


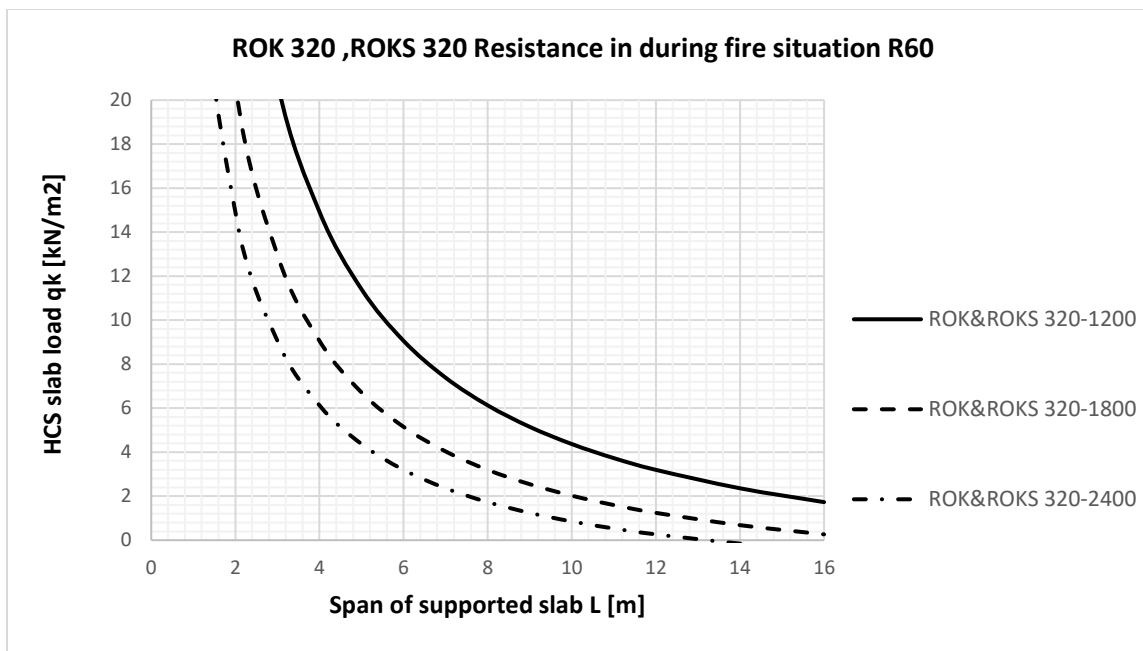




### 4.9. ROK 320, ROK Solid 320 resistance diagrams

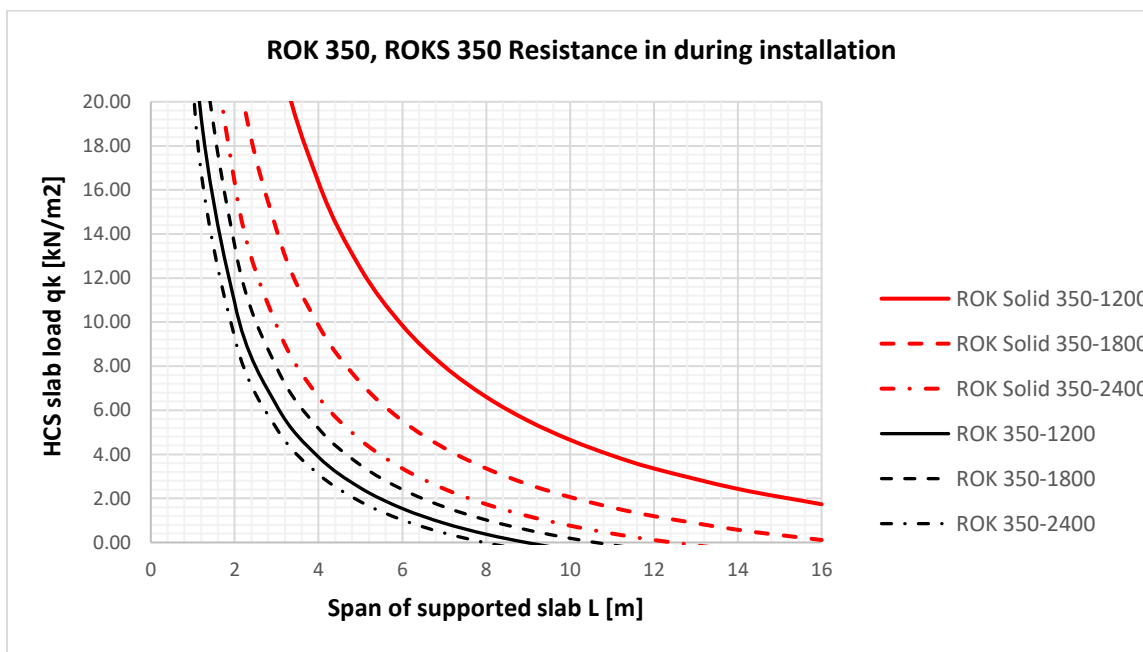
Self-weight of the supported slab: 4,0 kN/m<sup>2</sup>

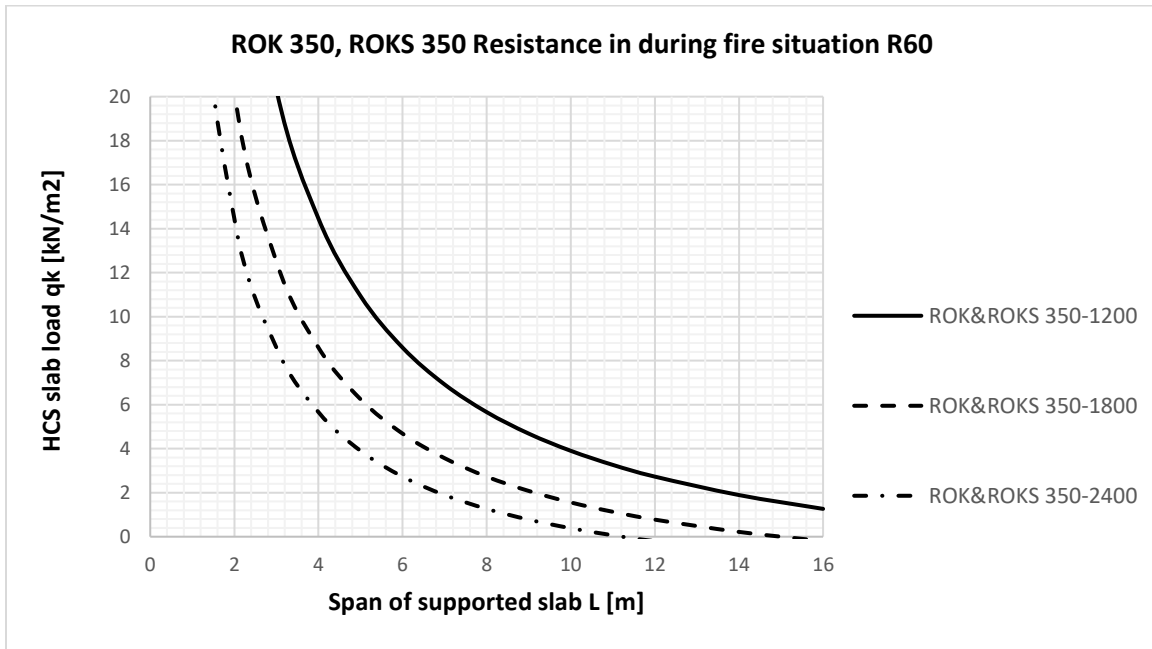
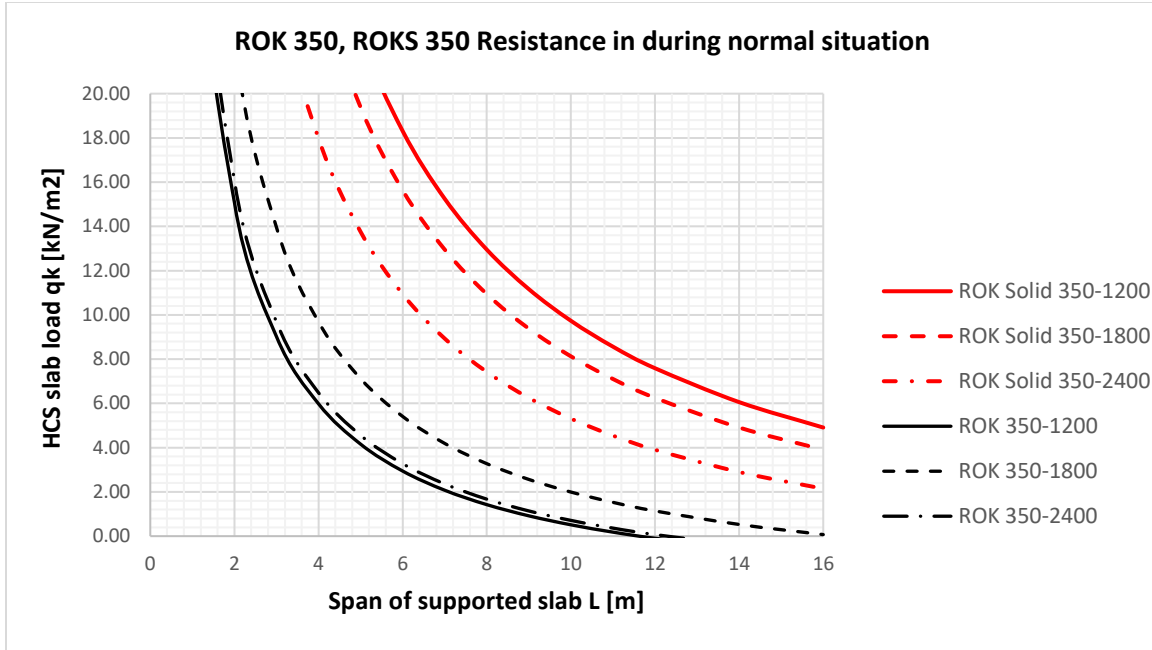




#### 4.10. ROK 350, ROK Solid 350 resistance diagrams

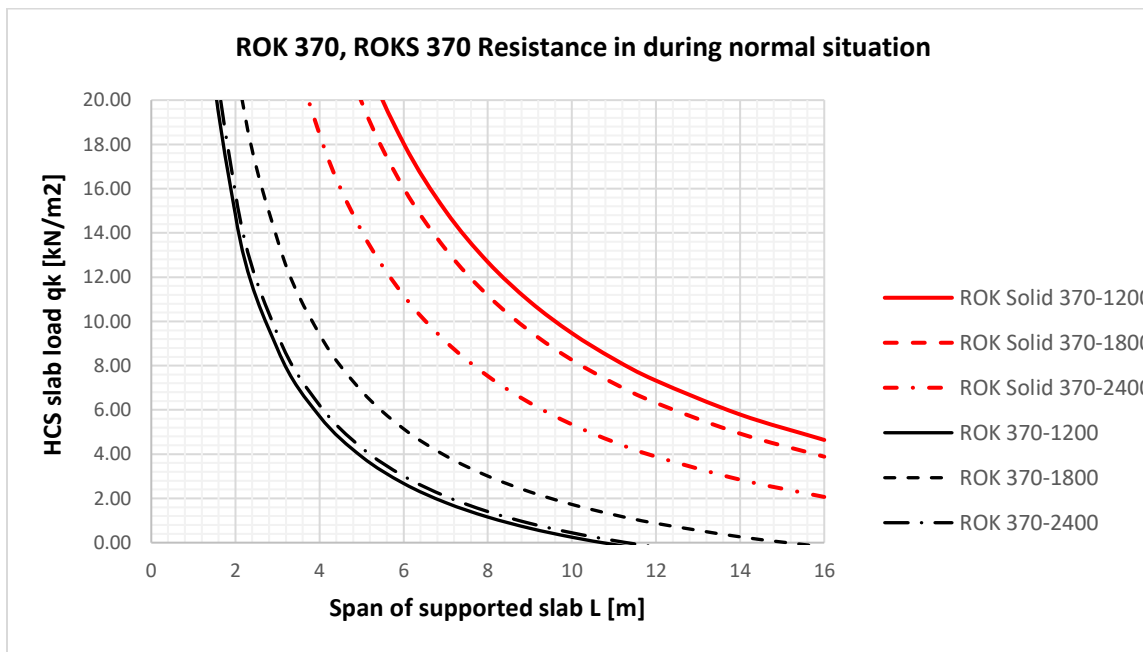
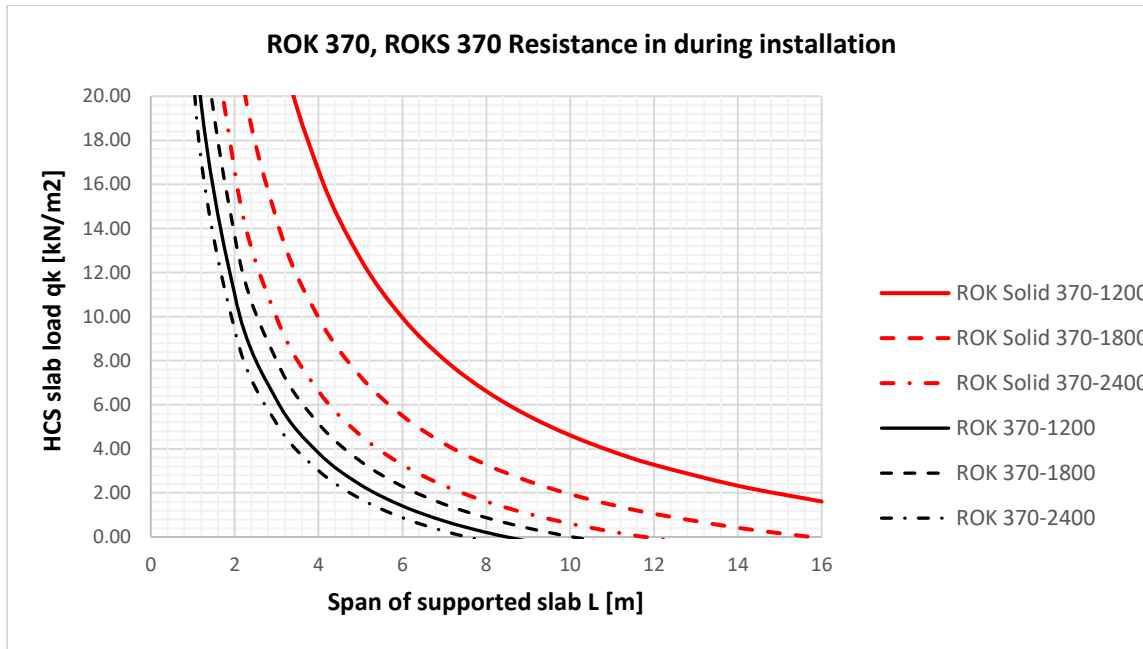
Self-weight of the supported slab: 4,7 kN/m<sup>2</sup>

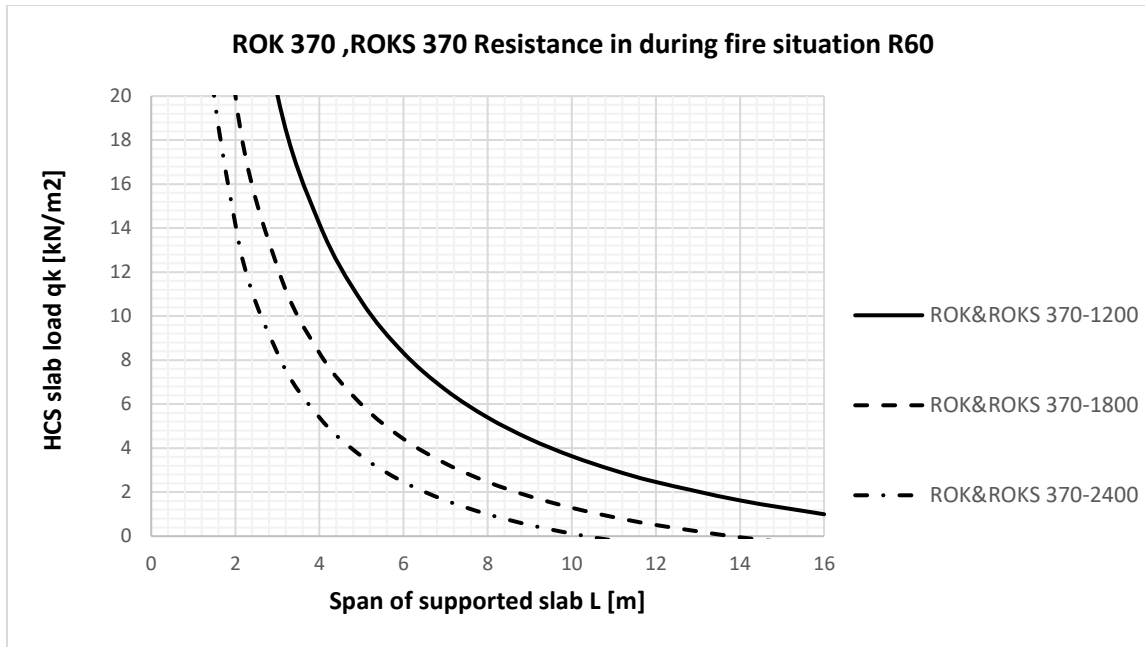




#### 4.11. ROK 370, ROK Solid 370 resistance diagrams

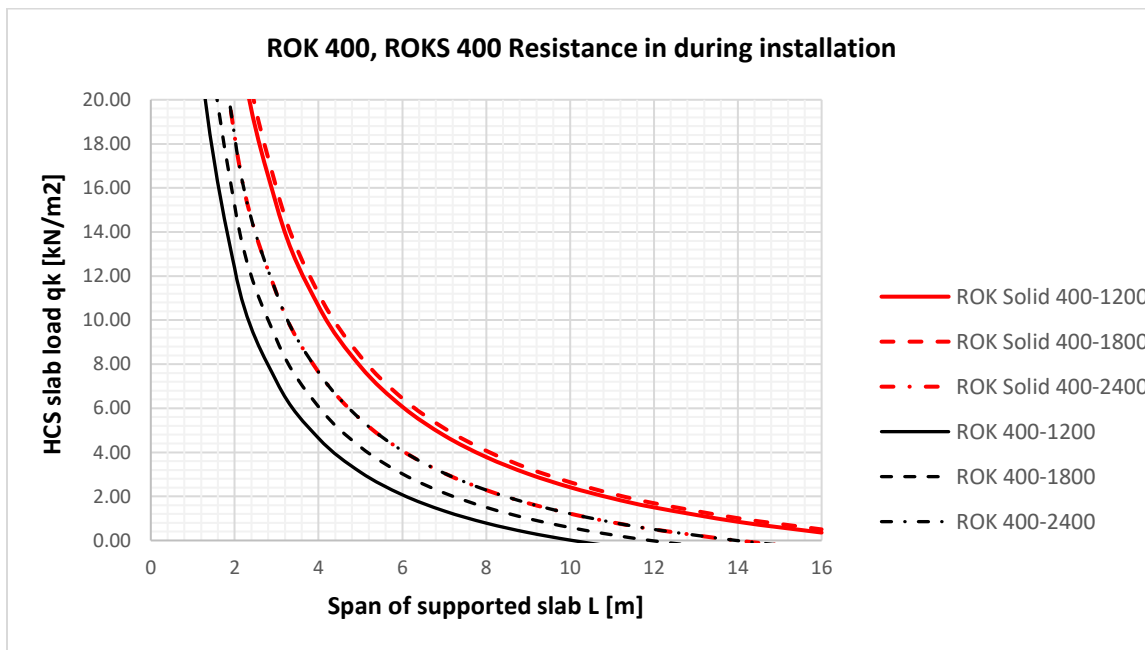
Self-weight of the supported slab: 5,1 kN/m<sup>2</sup>

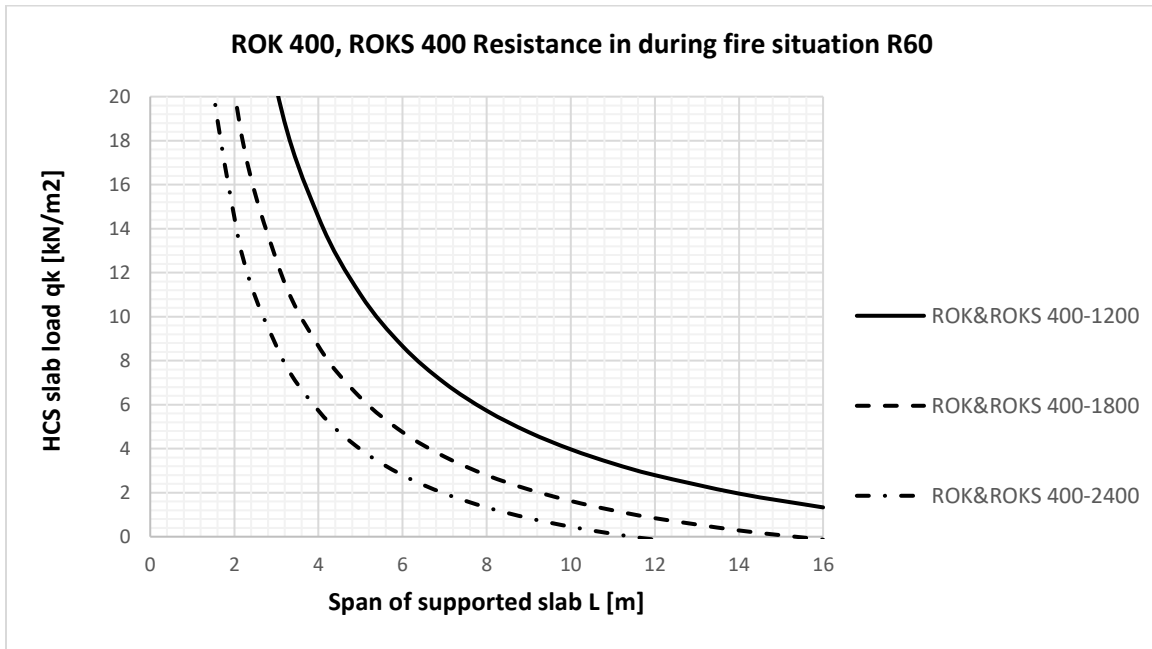
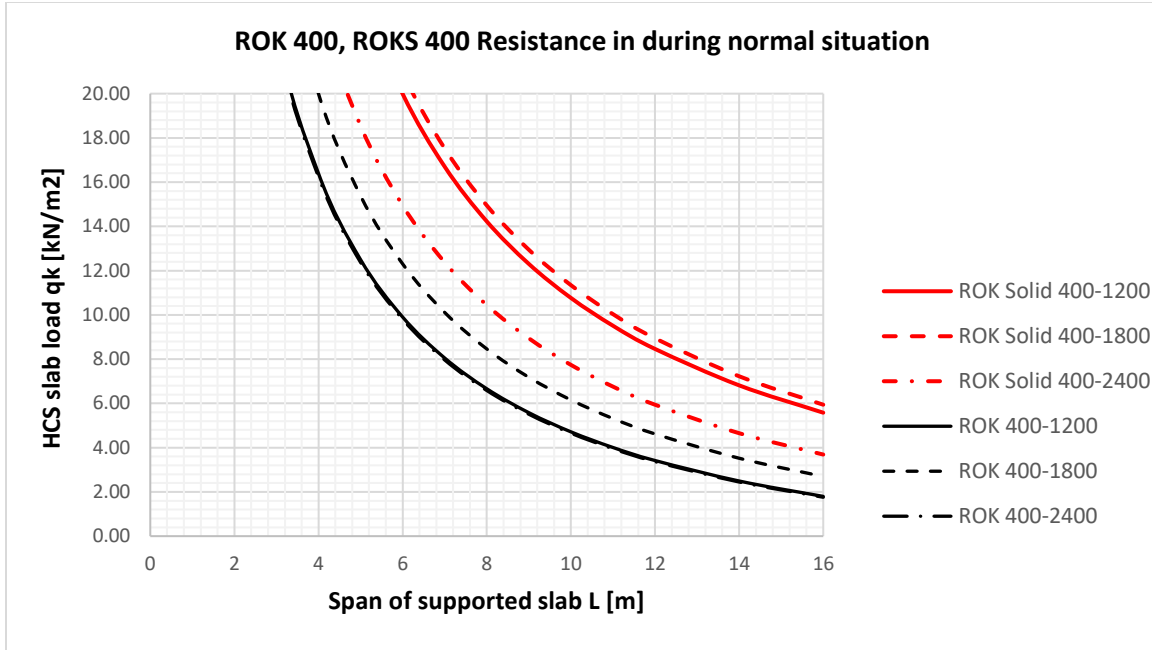




#### 4.12. ROK 400, ROK Solid 400 resistance diagrams

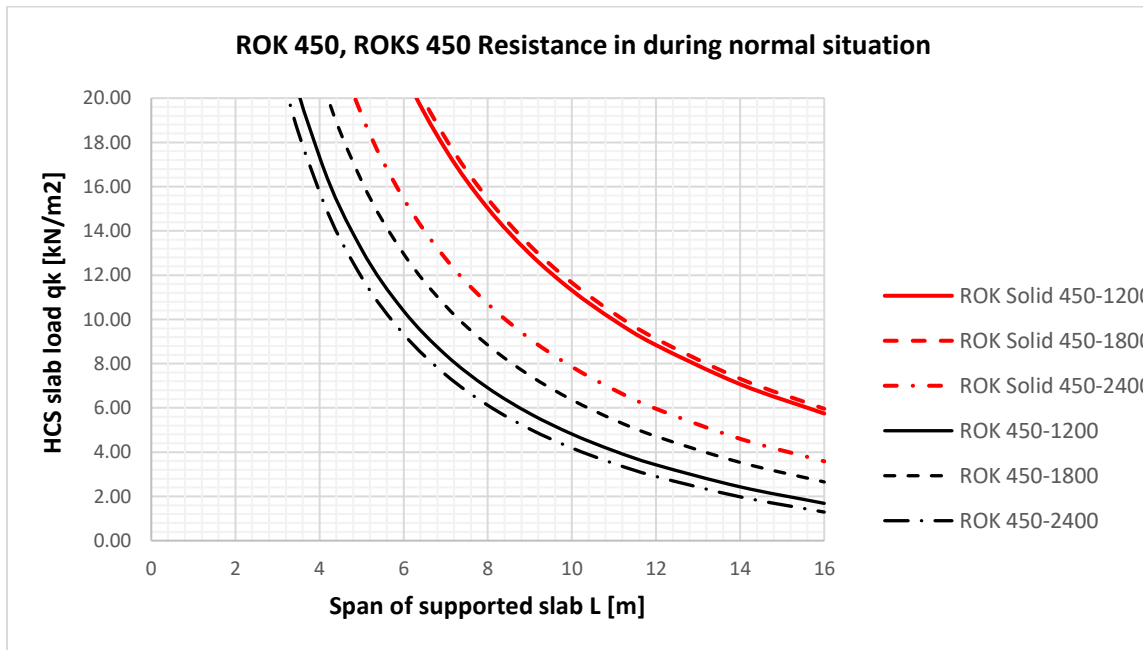
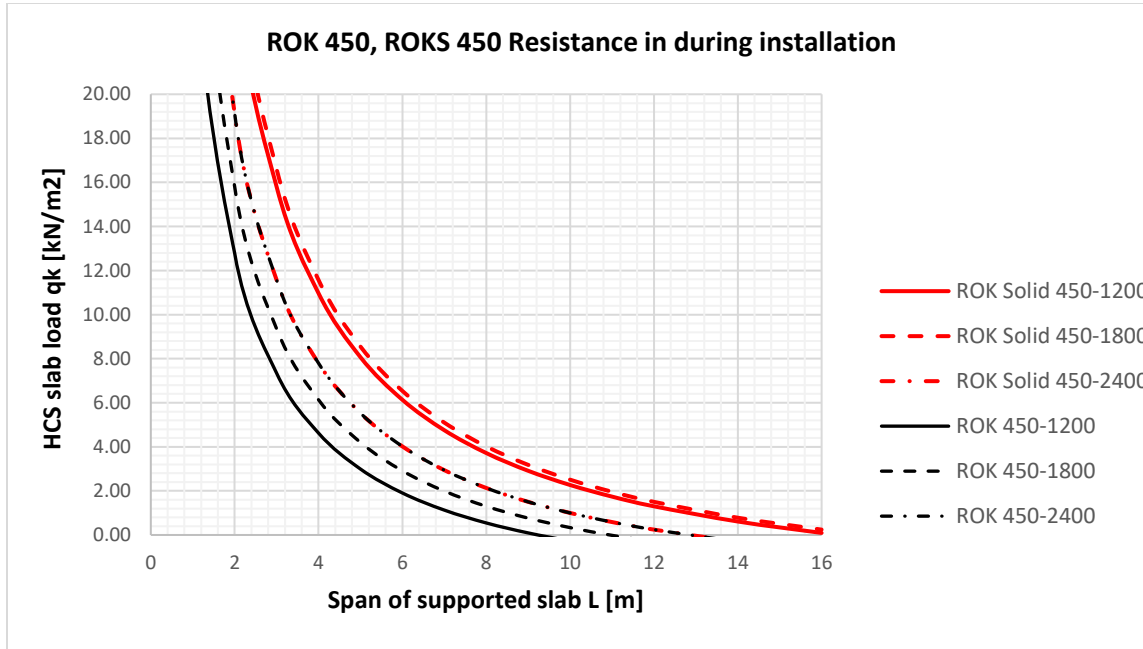
Self-weight of the supported slab: 4,60 kN/m<sup>2</sup>

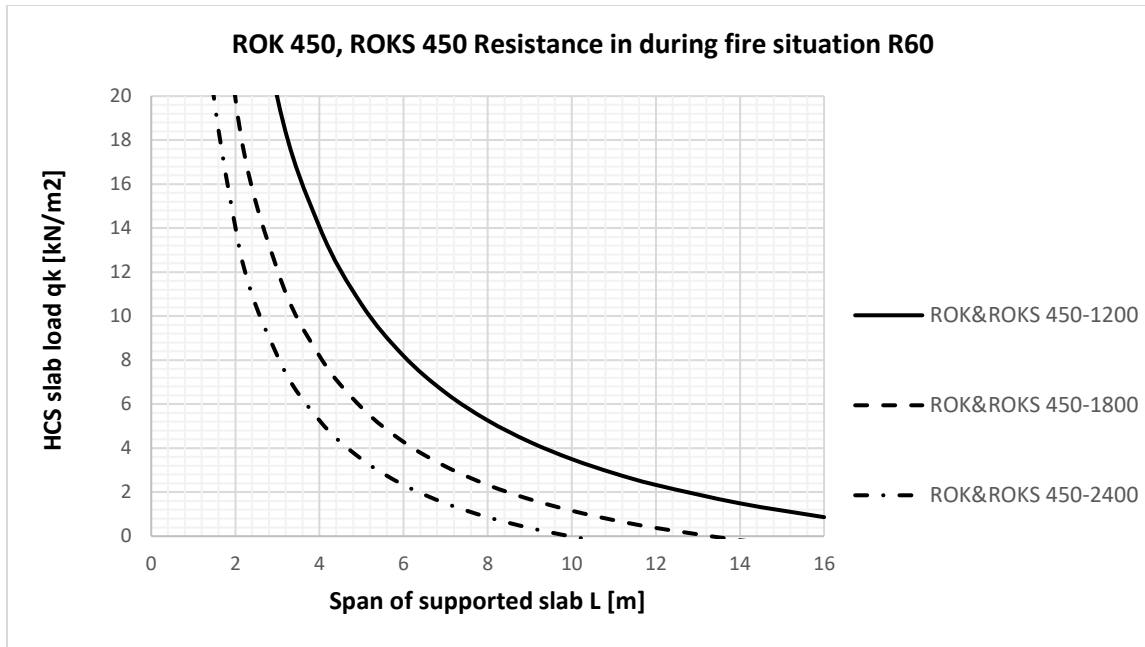




### 4.13. ROK 450, ROK Solid 450 resistance diagrams

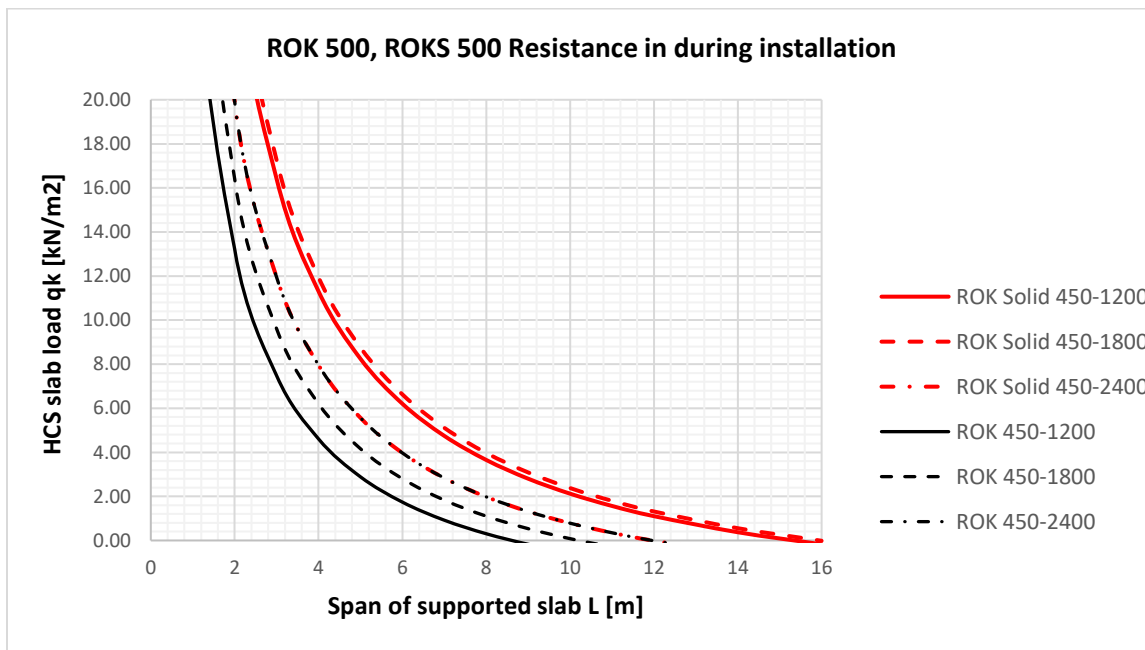
Self-weight of the supported slab: 5,3 kN/m<sup>2</sup>



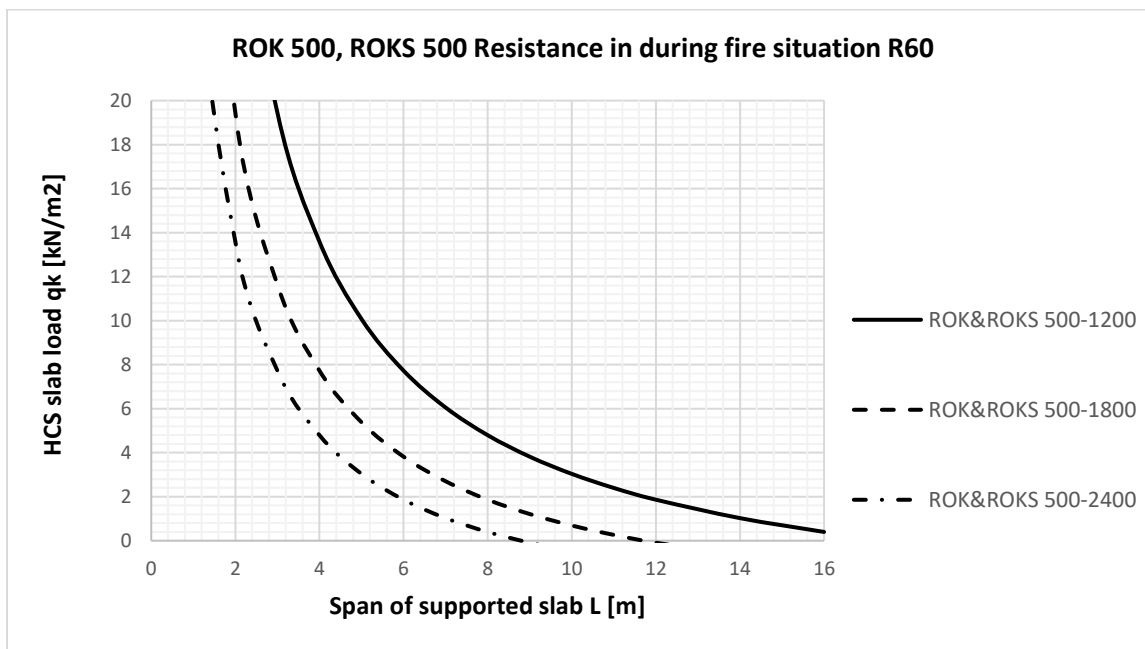
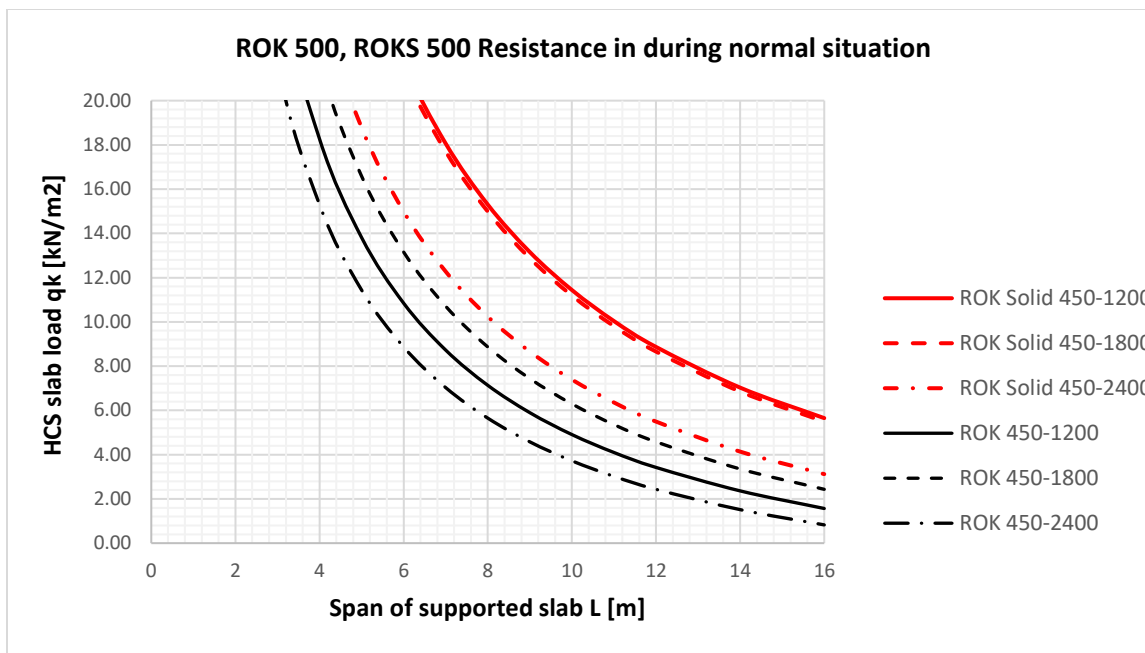


#### 4.14. ROK 500 ,ROK Solid 500 resistance diagrams

Self-weight of the supported slab: 6,0 kN/m<sup>2</sup>







## 5. ROK SUPPORTS

### 5.1. Limitations for application

Allowed characteristic value of slab load in addition to slab self-weight in diagrams 4.3–4.9 is calculated for static loads. For dynamic and fatigue loads, greater safety factors must be used and the support structure must be calculated individually for each case.

Minimum concrete class for joint grout is C25/30.

### 5.2. Loads for adjacent HCS slabs

ROK HCS slab supports transfer the loads from the supported slab to adjacent slabs or other structures (e.g. walls). Load from the ROK support to the support structure is a point load. These loads must be considered in the design of the support structures.

### 5.3. Length of slab support area

Maximum support length for HCS slab on ROK support is presented in Table 3 and Figure 2 (dimension a). Minimum support length must be designed according to HCS slab design instructions.

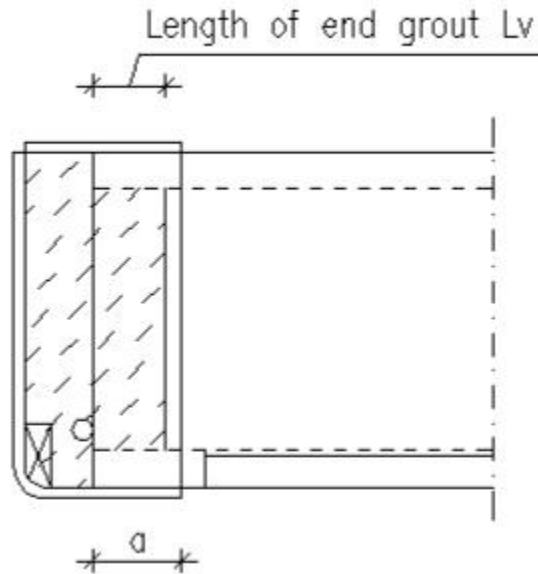
**Table 3. Maximum support length for HCS slab on ROK support**

Height of ROK support	Maximum support length (a) [mm]
175 - 370	80
400 - 500	110

### 5.4. End grout of HCS slab

HCS slab hollow core must always be grouted at the ROK support end.

Minimum length of grout is presented in Table 4 and Figure 2 (dimension  $L_v$ ).



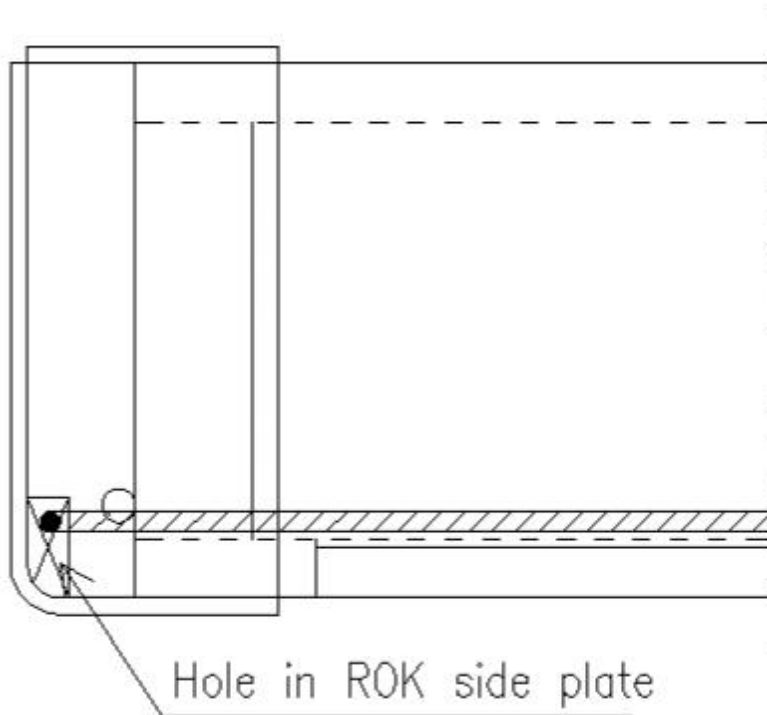
**Figure 2. Minimum length “a”**

**Table 4. Minimum length of end grout for ROK support end.**

Height of ROK support	Minimum length of end grout Lv [mm]
175 - 200	60
265 - 500	55

### 5.5. Additional reinforcement

ROK HCS slab support does not need additional reinforcement. Joint reinforcement of the HCS slabs may be anchored to the ROK end grout by bending them through holes in ROK side plates as in Figure 3.



**Figure 3. Placing the joint steel bar at ROK side plate hole**

ROK HCS slab support does not replace or act as a part of tying reinforcement of HCS floor diaphragm. Tying reinforcement must be designed separately.

## 5.6. Installation of ROK support

ROK HCS slab support is installed to the side of the hole in HCS floor. Slabs, walls or other structures which support the ROK support are installed before ROK support. Installation steps are presented in Figure 4.

1. ROK HCS slab support is installed on top of adjacent HCS slabs, to the opening between slabs.
2. HCS slab to be supported is installed on top ROK support.

Before installation of the supported HCS slab the lower corners from the supported end must be in order to make room for ROK support side plates (see Figure 4). HCS slab must be supported from the whole width by ROK support.

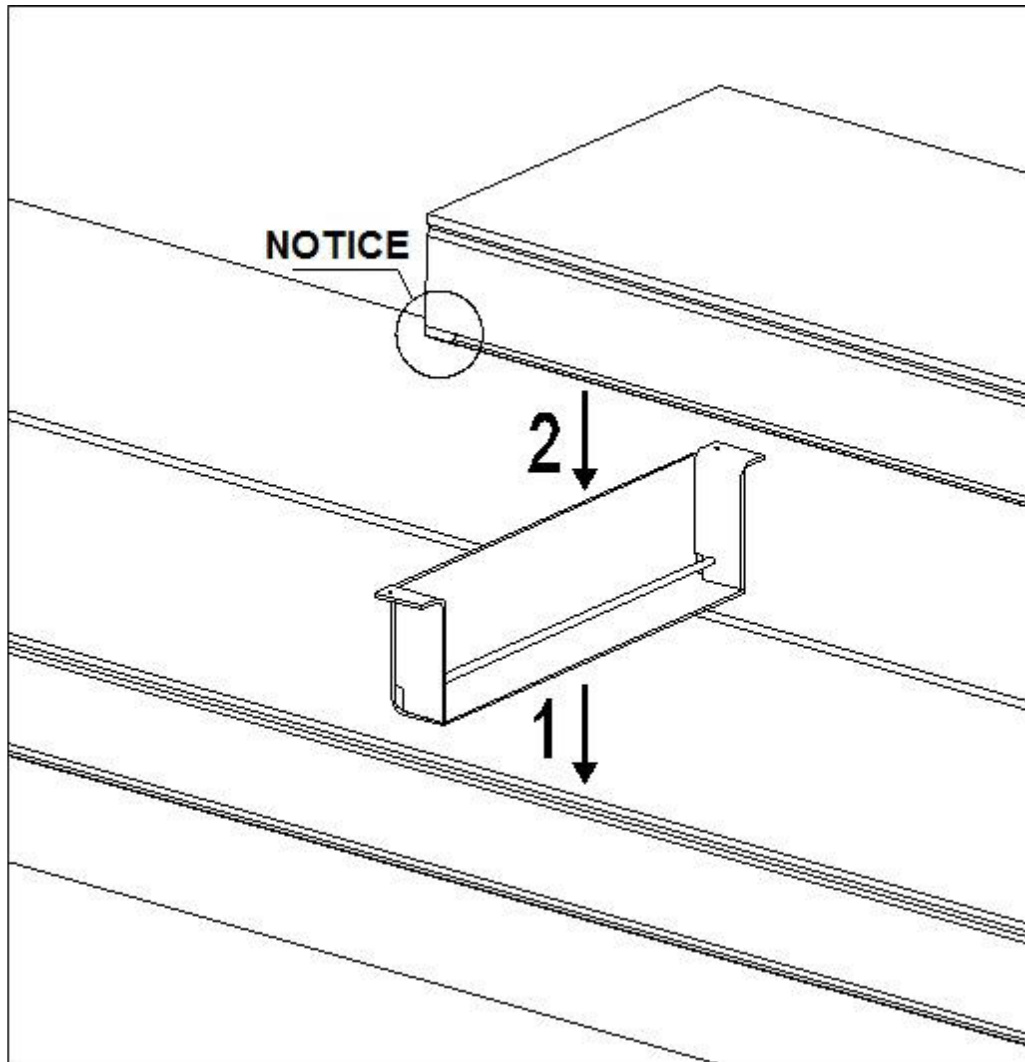


Figure 4. Installation of ROK support

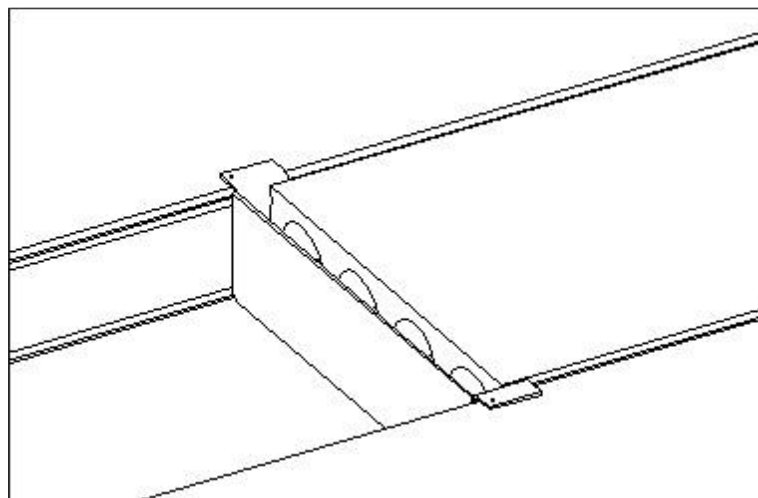


Figure 5. ROK support installed.

## 6. SUPERVISION OF INSTALLATION

### 6.1. Safety of installation work

ROK HCS slab supports and HCS slabs must be installed according to element installation plan. In all phases of installation care must be taken to ensure that ROK supports or HCS slabs cannot fall. At the top of ROK side plate's  $\phi 10$  mm holes are drilled for fixing of ROK support during installation.

ROK HCS slabs are lifted with lockable lifting devices from the ribbed steel bar in ROK support. Lifting device may be removed only after ROK support is installed at the correct position and is secured so it cannot fall.

HCS slab must be supported by its whole width at the ROK support and the support length must be according to installation design plan.