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# Advanced Structural Concrete – Exercise 4

(101-0127-00L)

**Topic: Slabs** Skew supported slab

Hand out: 8. December 2022, HIL E 7

## 1 Dimensioning bases of the exercise

#### 1.1 Introduction

In this exercise, a slab will be dimensioned and discussed at the ultimate limit state type 2 according to the structural design standards SIA 260 to 262 [1-3]. This exercise examines a skew-supported bridge slab.

## 1.2 Geometry

The dimensions can be taken from Figure A1.

#### 1.3 Material

For the construction of the bridge, concrete C30/37 and construction steel B500B are used.

#### 1.4 **Exposure classes**

The skew plate is exposed to weather conditions as well as de-icing salts and is situated in an environment with changing humidity. The concrete cover is  $c_{nom} = 55$  mm.

#### 1.5 Loads

The slab is subjected to its dead weight, the self-weight of non-structural elements of  $g_{1k} = 3 \text{ kN/m}^2$ , and a live load of  $q_k = 15 \text{ kN/m}^2$  (characteristic values, acting on the entire surface of the slab). The loads are to be combined according to SIA 261 [2].

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## 2 **Tasks**

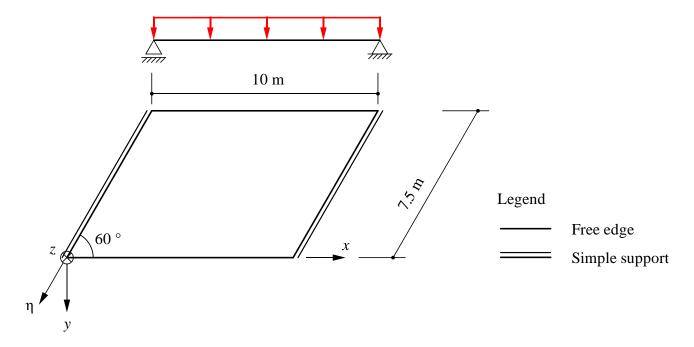
- Choose a reasonable slab thickness. a)
- Determine the minimum reinforcement of the slab and its bending and shear resistance. b)
- Dimension the slab using the strip method. c)
- Dimension the slab using an elastic FEM-calculation (e.g. with CEDRUS-7, [4]). d)
- Draw a reinforcement layout to a scale of 1:50 of the necessary bending / shear reinforcement. e)
- f) Determine an upper limit value of the ultimate load using the yield line method.
- Discuss the different methods from c), d) and f). g)

## 3 Literature

- Swiss society of engineers and architects (SIA), standards: SIA 260 Basis of Structural Design, 2003 [1]
- [2] Swiss society of engineers and architects (SIA), standards: SIA 261 Actions on Structures, 2003
- [3] Swiss society of engineers and architects (SIA), standards: SIA 262 Concrete Structures, 2003
- [4] FEM Software, CEDRUS-7, Cubus AG, Zürich

## **Appendix A - Figures**

### Α1 Floor plan and side view of the skew-supported slab, dimensions in [m].



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