Dr. Lukas Gebhard
Dr. Severin Haefliger
Institute of Structural Engineering
D-BAUG, Master Civil Engineering
Autumn Semester 2023

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Advanced Structural Concrete - Colloquium 4

(101-0127-00L)

Topic: Slabs   **Skew-supported slab**

Hand out: 14. December 2023, 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. The bridge slab has a thickness of $h = 0.45$ m.

1.3   Material

For the construction of the bridge, a 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.
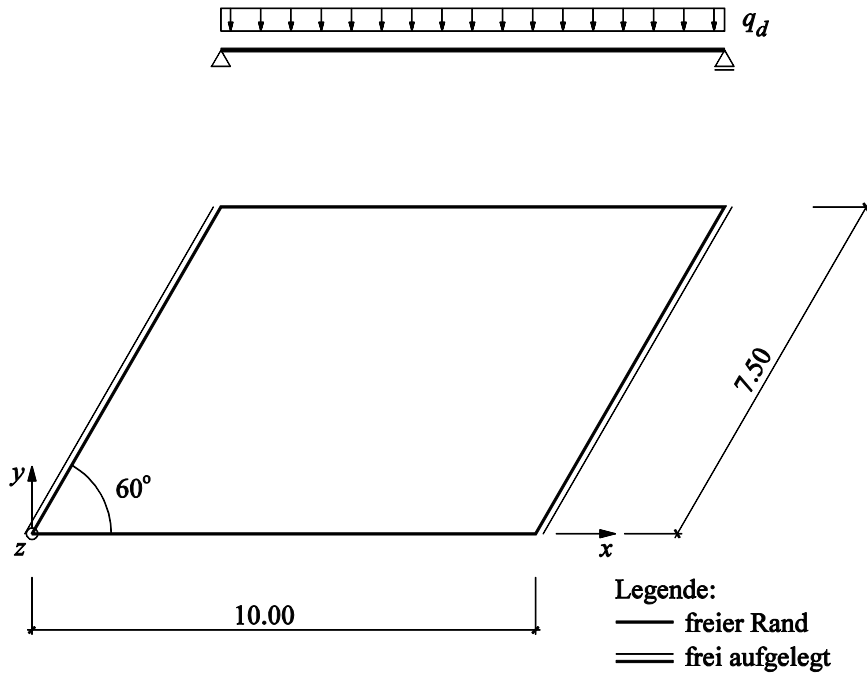
1.5   Loads

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

2   Task

Dimension the slab based on the results of an elastic FEM-calculation (Figures A2.1 to A2.7).

3   Literature

[1]   Swiss society of engineers and architects (SIA), standards: SIA 260 Basis of Structural Design, 2003

[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

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Appendix A - Figures

A1   Floor plan and side view of the skew-supported slab, dimensions in [m].

Legende:
— freier Rand
═ frei aufgelegt

## A2 Results of a FEM-Calculation for a skew-supported slab

A2.1 Structure and support of the slab. Reference load p = -100 kN/m^2 (acting on the entire surface, z-direction out of plane), dimensions in [m]
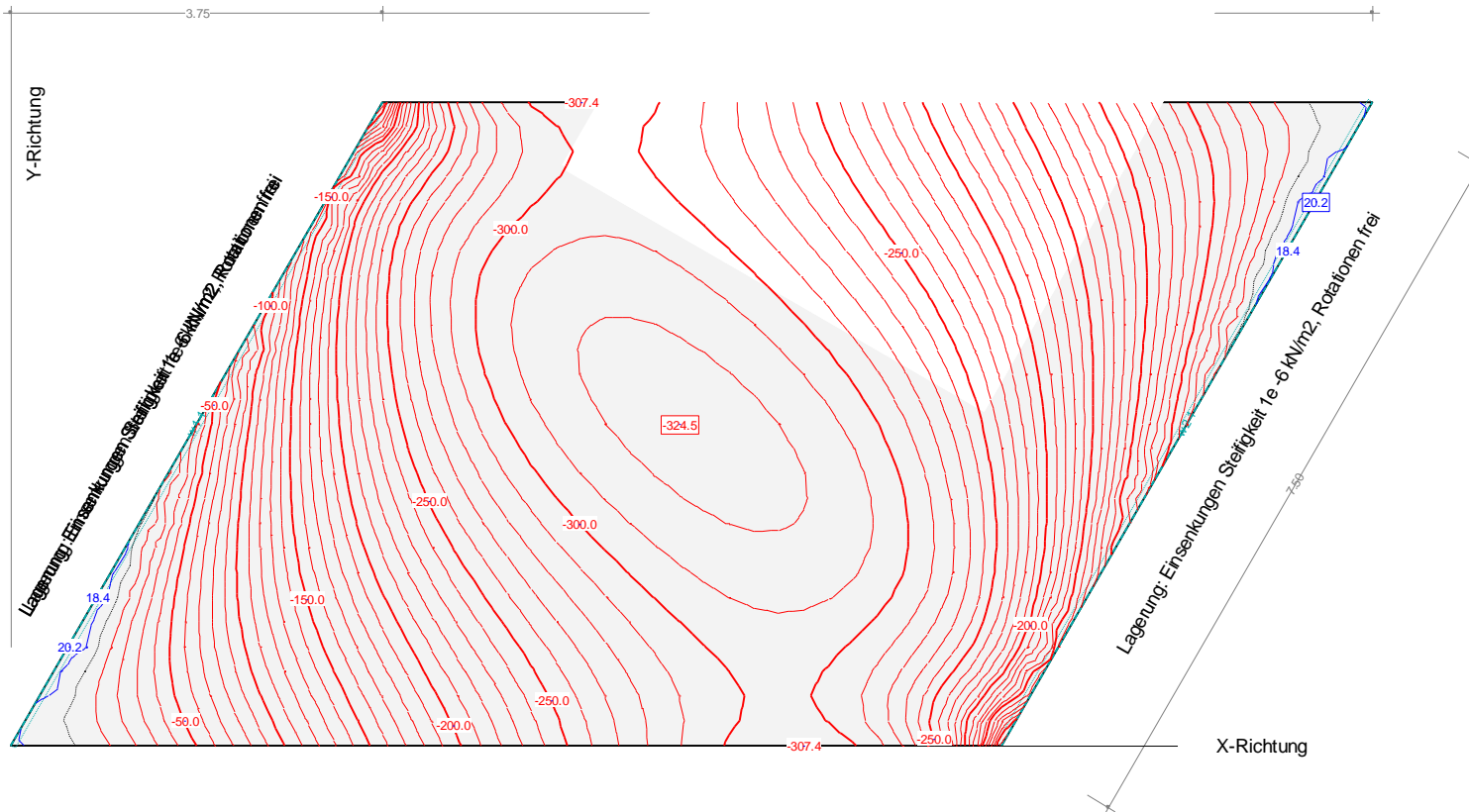
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Dr. Lukas Gebhard
Dr. Severin Haefliger
Institute of Structural Engineering
D-BAUG, Master Civil Engineering
Autumn Semester 2023

A2.2   Internal force m_x in [kNm/m] resulting from reference load $p = -100$ kN/m^2, contour lines at 50 kNm/m, dimensions in [m]
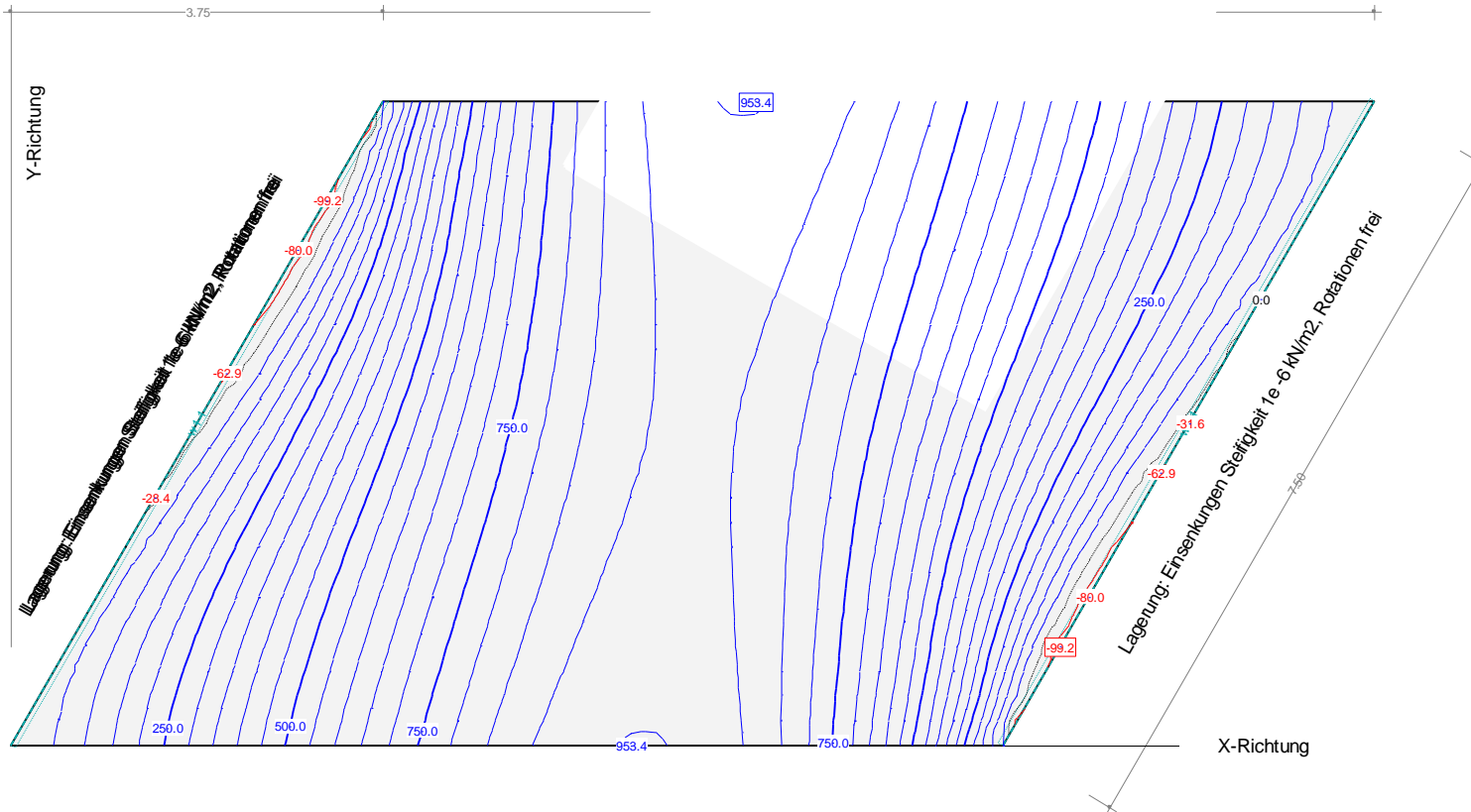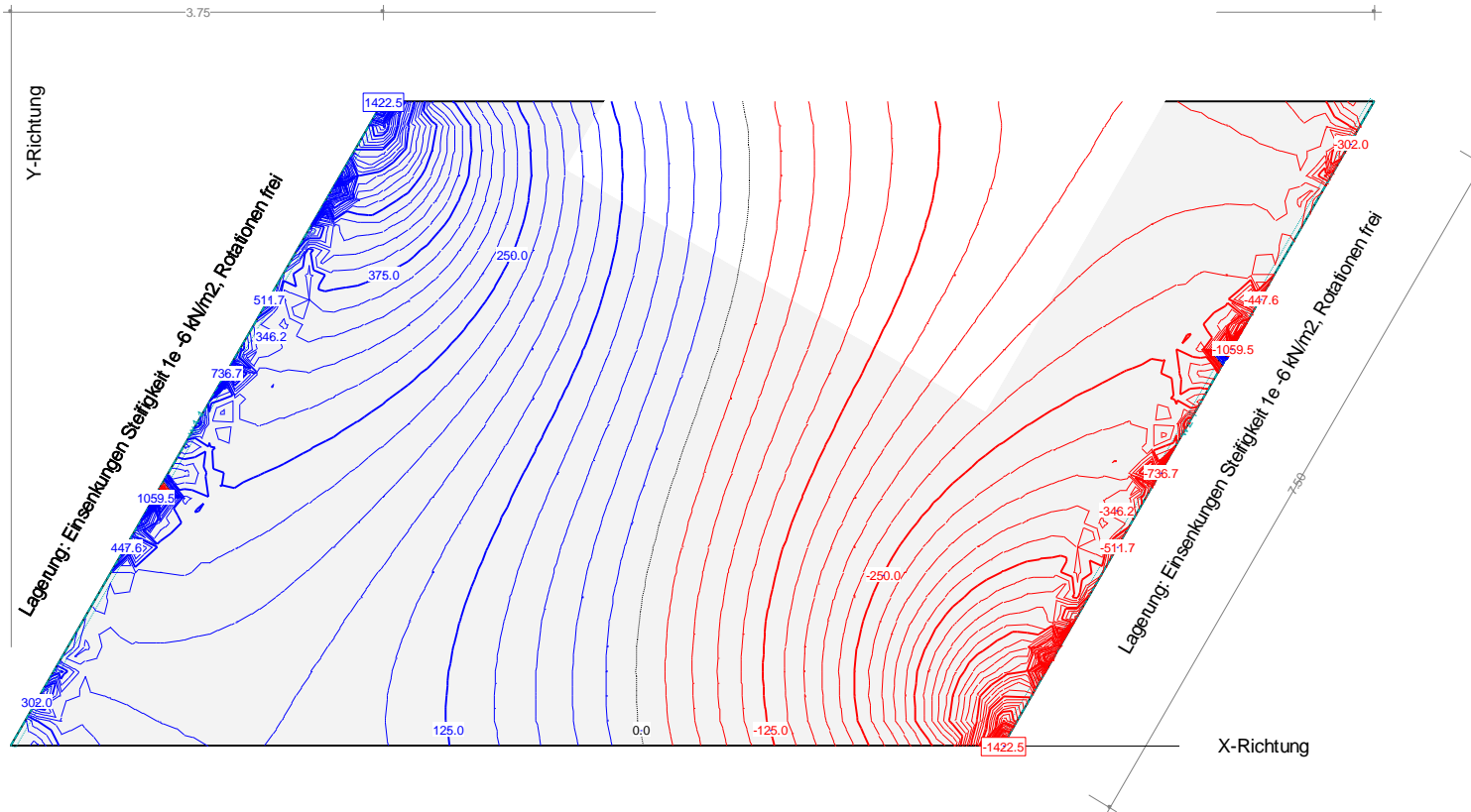
A2.3 Internal force m_y in [kNm/m] resulting from reference load p = -100 kN/m², contour lines at 20 kNm/m, dimensions in [m]
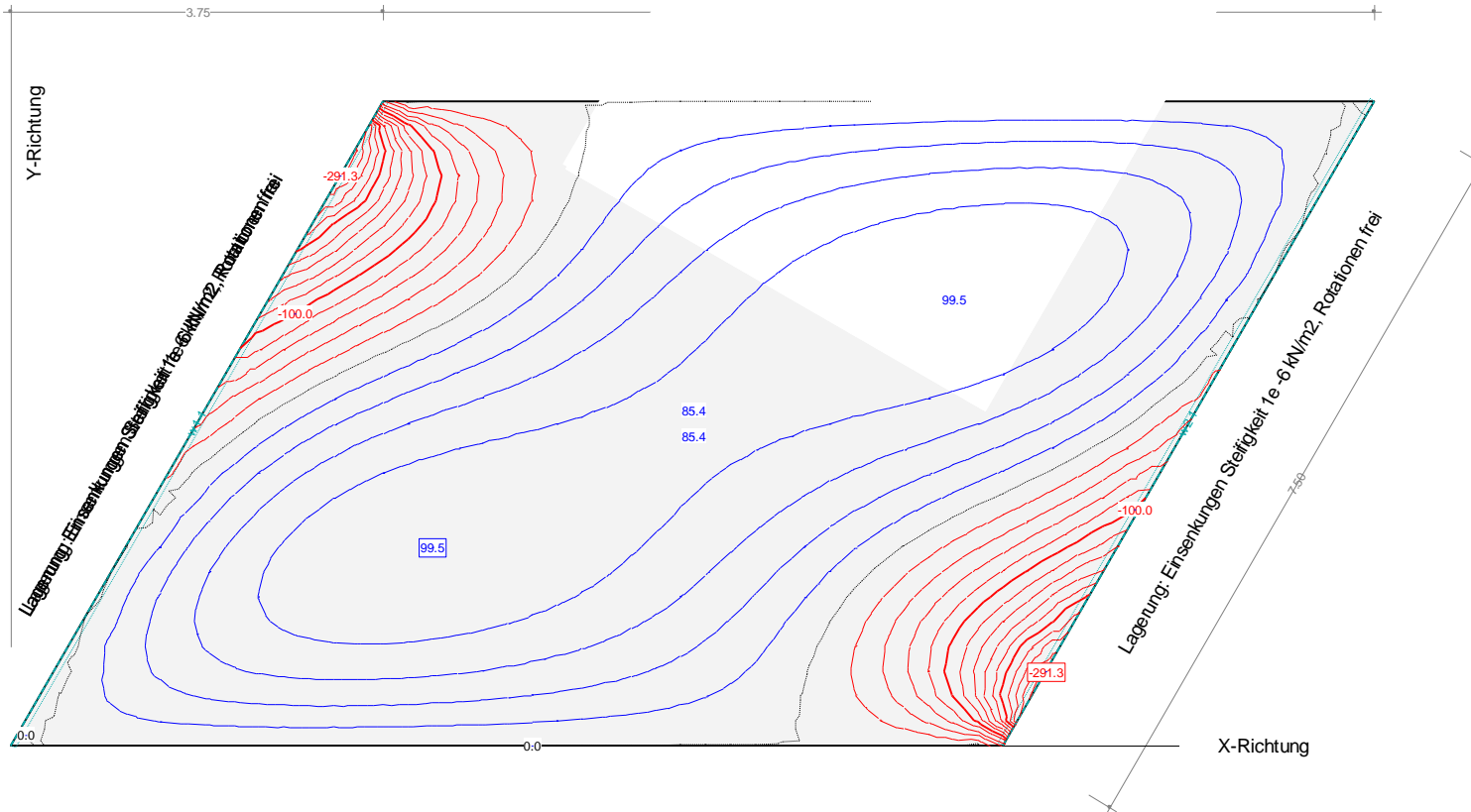
A2.4 Internal force m_{xy} in [kNm/m] resulting from reference load p = -100 kN/m², contour lines at 10 kNm/m, dimensions in [m]

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Dr. Lukas Gebhard
Dr. Severin Haefliger
Institute of Structural Engineering
D-BAUG, Master Civil Engineering
Autumn Semester 2023

A2.5 Internal force v_x in [kN/m] resulting from reference load p = -100 kN/m², contour lines at 25 kNm/m, dimensions in [m]

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Dr. Lukas Gebhard
Dr. Severin Haefliger
Institute of Structural Engineering
D-BAUG, Master Civil Engineering
Autumn Semester 2023

A2.6 Internal force v_y in [kN/m] resulting from reference load p = -100 kN/m², contour lines at 25 kNm/m, dimensions in [m]
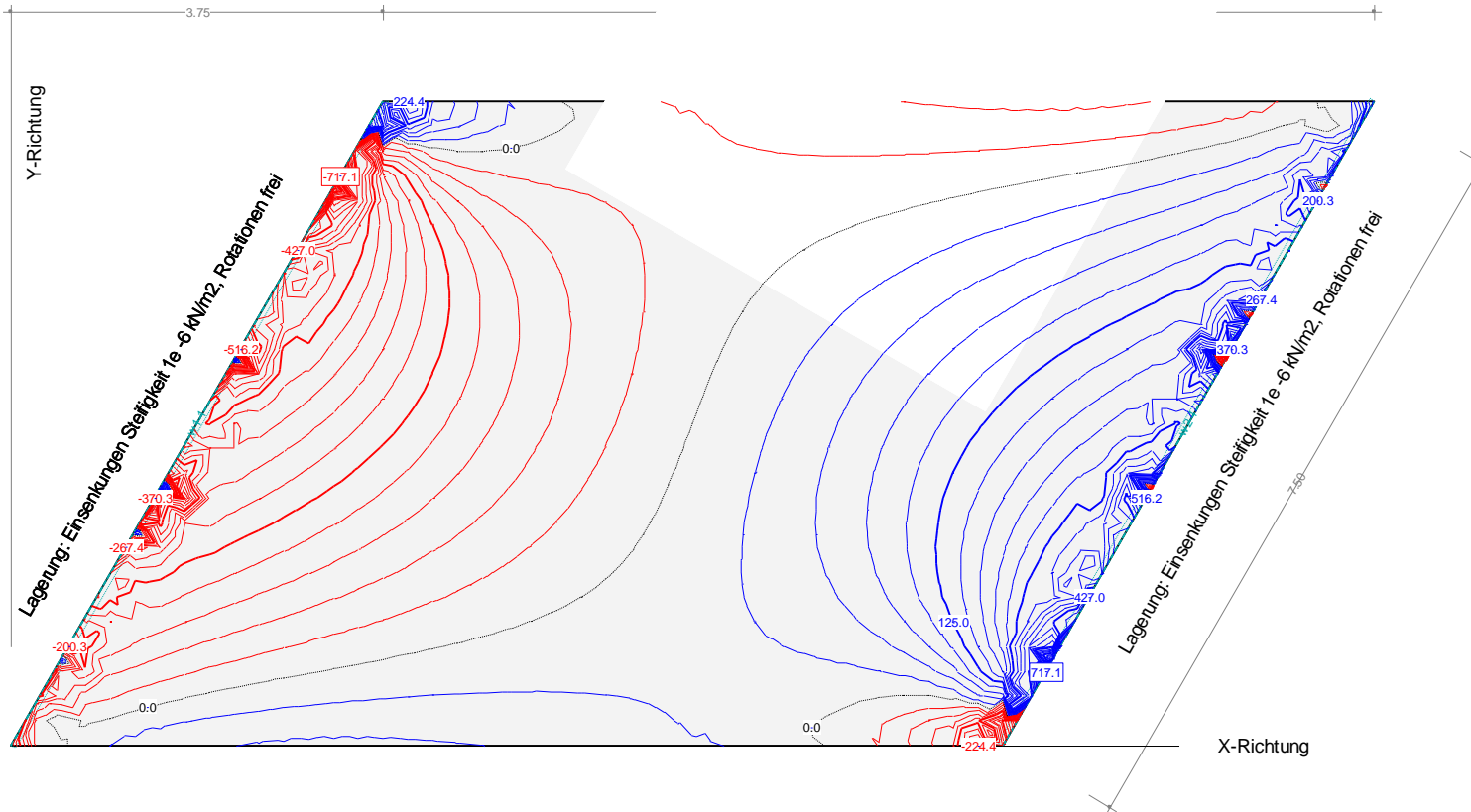
A2.7 Support reaction in [kN/m] resulting from reference load p = -100 kN/m², averaged in parts, dimensions in [m]