STRUCTURAL XPLORATION LAB

Parking Lysbüchel – Basel

Resource assessment of structural elements

Factsheet LYS01 – Ribbed Plate Stahlton

Version 1.2 – July 2022

Authors: Julie Devènes, Maléna Bastien-Masse, Corentin Fivet

The parking Lysbüchel is a building located at Elsässerstrasse in Basel, erected in 1970. It consists of four floors including a parking, storage spaces and mezzanines with offices. Floors 1 to 3, which are the largest area of the building, were designed as parking. Immobilien Basel-Stadt is planning its deconstruction.

The building is composed of prefabricated prestressed concrete elements. The ribbed slabs are placed on transversal beams which are supported by columns. A thickness of 8 cm of cast-in-place concrete is placed on the top surface of the prefabricated slabs, creating a continuous slab system. The slabs and transversal beams were manufactured by Stahlton AG.

Existing reports used for the elaboration of the factsheet:

A. CSD Ingernieure AG, Volta Nord - Rückbau Baufeld 4 – Konzept Kreislaufwirtschaft, Basel, 03.06.2022
B. Zweidler, Simon & Häfeli, Beat. Versuchsbericht: vorgespannte Rippenplatten – ReUse Parkhaus Lysbüchel, Basel. Fachhochschule Nordwestschweiz, Muttenz, 05.05.2022.

Factsheet list for this building:

Factsheet LYS01 – Ribbed plate Stahlton
Factsheet LYS02 – Supporting Beam Stahlton
Factsheet LYS03 – Column

Disclaimer: This document is a preliminary resource assessment and should be used as such. The results presented are based on visual inspections and on limited material testing. Material properties and detailed condition of each elements should be further assessed prior to any reuse of the elements described herein. The authors deny all liabilities with respect to the use of the information given in this document.

EPFL

EPFL ENAC IA SXL
Smart living lab - HBL
Passage du Cardinal 13b
CH – 1700 Fribourg

malena.bastien-masse@epfl.ch
corentin.fivet@epfl.ch
sxl.epfl.ch

Type LYS01

Category : Slab elements

Ribbed Plate Stahlton

Location

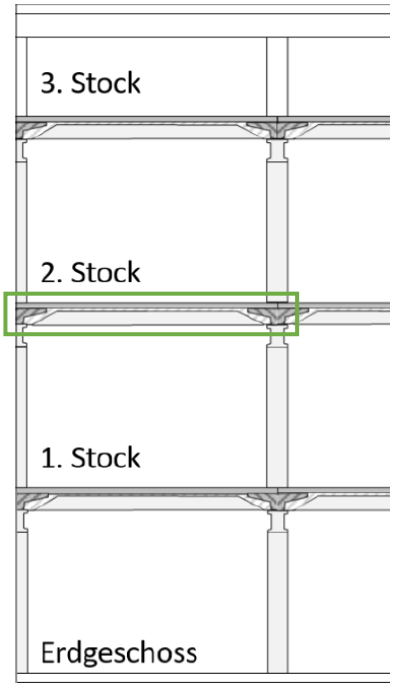

Figure from CSD Ingernieure, reference A

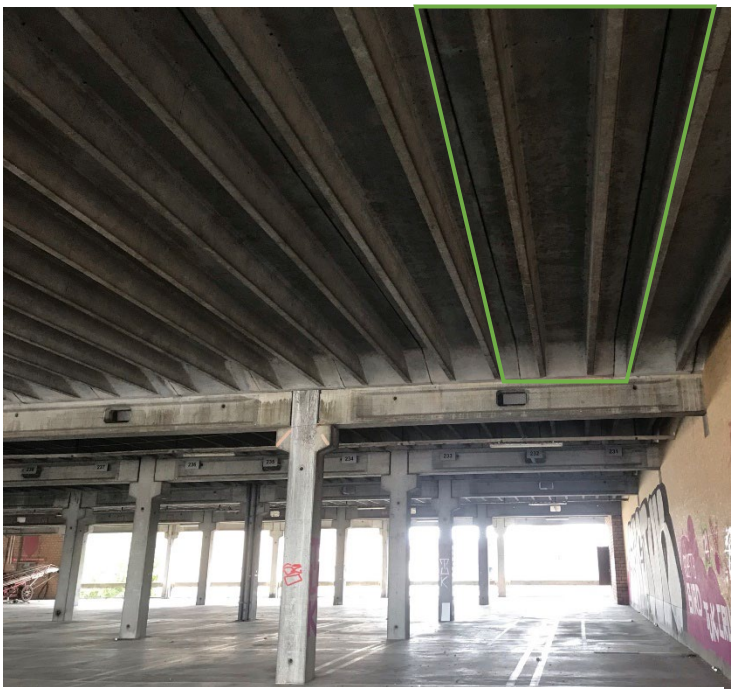

Photo from: Zirkular AG

Ribbed plate Stahlton

Photos from: Zirkular AG

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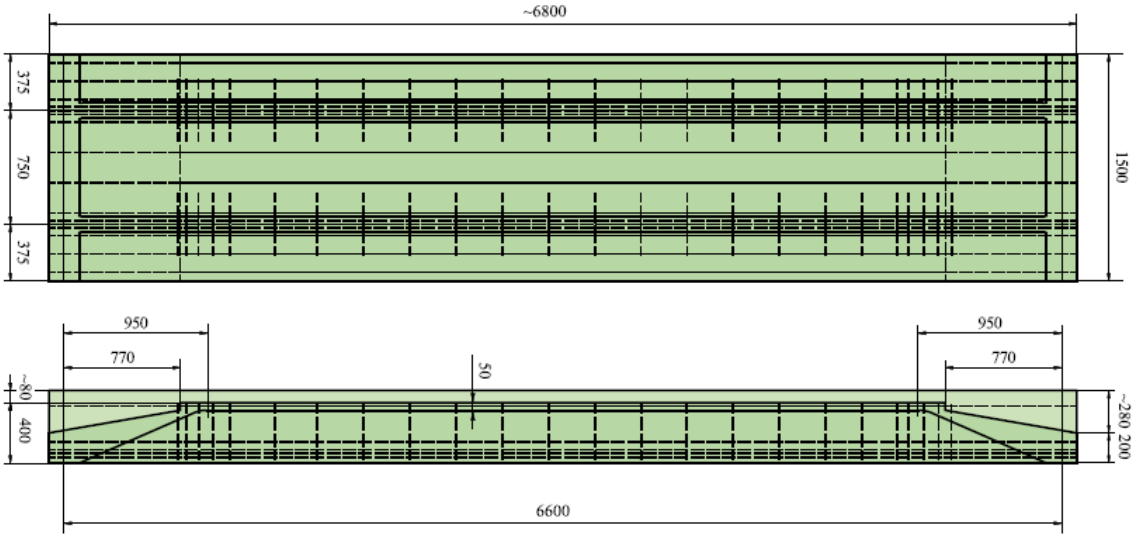
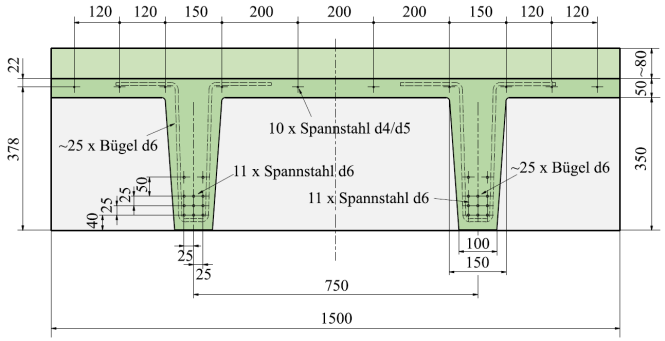
Subtype n° 4, dimensions

1:500



Subtype n°4, cross-section dimensions

1 :20



Figures from Fachhochschule Nordwestschweiz, reference B.

Type LYS01

Category : Slab elements

Ribbed Plate Stahlton

Description

Construction year	1970*		
Material	Precast reinforced concrete		
Actual location	All slabs of the parking*		
Initial function	Structural slab element*		
Accessibility	Easy – No further demolition required before*		
Anchor points	None		
Exposition	Indoor, not directly exposed to rain		
Color	Grey		
Finishing	Exposed concrete		
Overlays	Type	Fixation	Thickness
	Concrete topping*	-	8 to 11 cm*
Connexion type	Ribbed slab supported by beams. Continuous concrete layer on top of the prefabricated elements. *		
Deconstruction tool	Diamond saw*		

Condition and durability

Condition assessment	90 % reusable*
	10 % non-reusable*
Carbonatation depth	21 mm*
Toxic substance	To be investigated*

Mechanical characteristics

Concrete density (ρ_c)	n.a
Concrete compressive strength (f_{ck})	67.4 N/mm^2 *
Concrete young modulus (E_{cm})	42.1 to 50.5 kN/mm^2 *
Prestressed tensile strength (f_{pk})	1487 N/mm^2 *
Reinforcement tensile strength (f_{sk})	615 N/mm^2 *
Reinforcement young modulus (E_s)	201 kN/mm^2 *

Element	Geometry			Inventory					Environmental impacts					
Subtype	Dimensions (W x L x h) [mm]	Reinforcement [mm]	Cross-section characteristic resistance [kNm]	Quantity [u]	Weight [kg/u]	Total area [m^2]	Total volume [m^3]	Significance	Initial production [kgCO2-eq/u]	Conventional demolition [kgCO2-eq/u]	Dismantling by sawing [kgCO2-eq/u]	Initial production [kWh oil-eq/u]	Conventional demolition [kWh oil-eq/u]	Dismantling by sawing [kWh oil-eq/u]
1	1495 x 5790 x 480*	T: 11 x d=4/5* B: 2 x 11 x d=6* + Stirrups d=6 *	320**	24*	4020	210*	39	2 %*	719	50	0.28	1649	205	14.6
2	1495 x 5990 x 480*	T: 11 x d=4/5* B: 2 x 11 x d=6* + Stirrups d=6 *	320**	66*	4159	590*	111	6 %*	743	52	0.29	1706	212	15.0
3	1495 x 6540 x 480*	T: 11 x d=4/5* B: 2 x 11 x d=6* + Stirrups d=6 *	320**	80*	4540	780*	148	8 %*	812	55	0.31	1863	232	16.1
4	1495 x 6840 x 480*	T: 11 x d=4/5* B: 2 x 11 x d=6* + Stirrups d=6 *	320**	188*	4749	1920*	363	20 %*	849	59	0.32	1948	242	16.7
5	1495 x 8970 x 480*	T: 11 x d=4/5* B: 2 x 11 x d=6* + Stirrups d=6 *	320**	264*	6227	3540*	667	36 %*	1113	77	0.40	2555	318	21.0
6	1495 x 10390 x 480*	T: 11 x d=4/5* B: 2 x 11 x d=6* + Stirrups d=6 *	320**	176*	7213	2730*	517	28 %*	1289	90	0.45	2959	368	23.8

T = top; B = bottom

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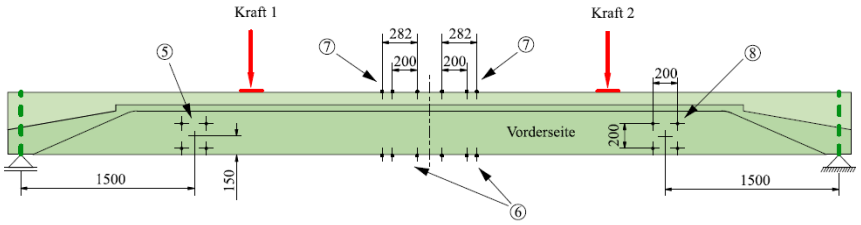
Additional information

Additional note

> * Information extracted directly from reference A by CSD Ingenieure AG and reference B by Fachhochschule Nordwestschweiz (FHNW).

> **Value calculated with the given rebars/prestress arrangement and the given material characteristic properties. The contribution of the concrete topping is considered in this calculation.

> A 4-point bending test was performed on samples extracted from the structure. A maximum load of 220 kN (22 tons) was applied before failure for the 6.84-meter-long element, including the extra concrete layer. Information is provided in reference B by FHNW.



Tests have shown that even with a load arrangement that is critical for shear resistance, bending failure always occurs first. The tests confirmed the calculation made to predict the failure load.

> The proportions of reusable or non-reusable elements are an approximation, the exact value should be evaluated during the dismantling.

> The concrete topping should be kept as it has a good adhesion with the precast concrete section and is not easily removed. The compressive strength of the concrete topping is 51.1 N/mm^2.

> Rebars are also in the concrete topping, but their precise layout is unknown

> The embodied global warming potential (in kgCO2eq) and the grey energy (in kWh oil-eq) for fabrication and demolition of the elements is calculated using their weight and the equivalent factors available in the Life Cycle Assessment KBOB database. The considered factors are the following: (1) Concrete for buildings (without reinforcement) - KBOB ID-Number 01.002 (2) Precast concrete element, normal concrete, from factory - KBOB ID-Number 01.043, (3) Reinforcement steel – KBOB ID-Number 06.003.

Attention point

> The depth of carbonation is equal to the concrete cover thickness of the stirrups. The elements should be visually inspected to check for any corrosion stains.

> Chlorides are present in the concrete topping, which could lead to corrosion of the reinforcement. The elements should be visually inspected to check for any corrosion stains. Some further measurements should also be made using ground penetrating radars to identify the zones with higher chloride contents.

> To prevent development of corrosion, the elements should be protected against water and humidity.

> Hydrocarbons were found in some parts of the building. More investigations are required to get more detailed results. No further information on others toxic substances (asbestos, PCB, etc.) are given, more investigations are required.