PROFESSIONAL

Hailo cable shaft cover type H-CSC

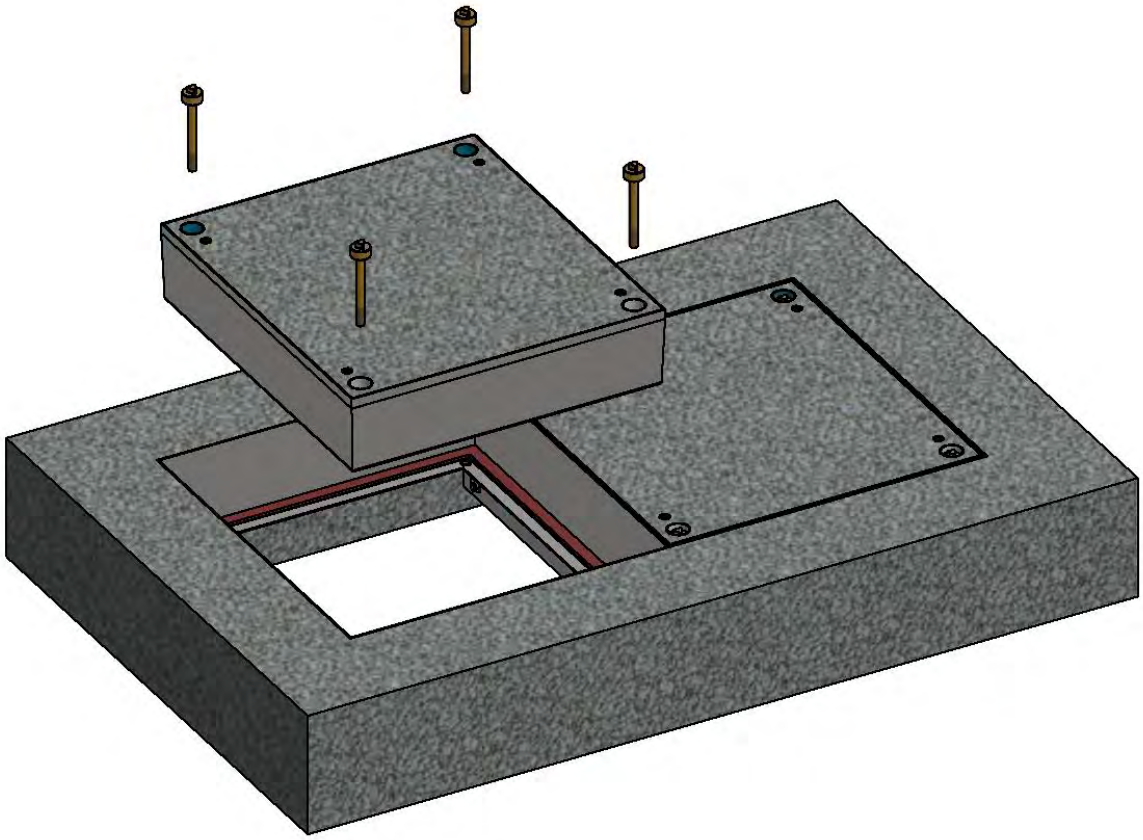
Technical documentation

Hailo

Contens:

Technical description

Hailo Cabel shaft cover Type H-CSC



Covers for cable and/or utility shafts in tunnel structures

In addition to the requirement for high load capacity, shaft covers in tunnel structures are also subject to enhanced fire safety requirements.
Over recent years tenders and specifications have increasingly demanded or specified covers that have to meet these requirements. Often F90 of DIN 4102 – Fire behaviour of building materials and elements – is mentioned in this context. This standard regulates the basis for testing the various classes of building materials and elements into which products for construction are divided. Unfortunately, there is no such class for shaft covers, and hence no test basis either, to which planners and architects can refer when determining and selecting suitable products. Even the requirements of the "Guidelines for the equipment and operation of road tunnels" (RABT) in connection with Part 5 of the "Additional technical terms of contract and guidelines for civil engineering works" (ZTV-ING) do not go specifically into the issue of shaft covers, because here too – as with DIN 4102 – the "ground-level" installation situation is not considered.

That is why the Dortmund-based test laboratory for fire safety, DMT GmbH & Co. KG, has developed a defined test basis for shaft covers on behalf of Hailo. This test basis pulls together and considers the various requirements of individual standards and regulations, providing a set of guidelines that are commensurate with the high demands on fire safety for shaft covers in tunnel structures.

A prototype Hailo cable shaft cover of type H-CSC was subjected to a fire resistance test lasting 120 minutes in accordance with these guidelines and is thus specially designed for use in tunnel structures. The cover also has the necessary type test certificates demonstrating its load capacity pursuant to EN 124 class D400kN.

The shaft cover is available in a one or multi-part version with a centre strut. The frame and lid trough are made of stainless steel V2A-1.4301 or V4A-1.4571. This protects the cover from environmental influences of a corrosive nature. In contrast to covers which have a cast iron frame and lid, the connecting or bearing surfaces cannot adhere to each other due to corrosion.
The frame can be steplessly adjusted to the surrounding ground level by adjusting screws prior to being set in concrete. The frame has masonry anchors arranged around the outside to strengthen the connection. This ensures that the frame is located securely in the surrounding concrete and is strengthened. The lid trough is intended for the insertion of a defined steel reinforcement and subsequent filling with concrete of class C50/60 for load classes B125kN – D400kN according to EN 124. To simplify installation of the lid reinforcement and establish a clean connection of the reinforcement with the lid trough, there are special support/connecting plates inside the lid trough. The lid has a slightly conical shape to prevent jamming and ensure that the lid can be easily lifted out at any time. Depending on the size, the lid is securely screwed to the frame by a number of triangular plug screws that can be unlocked using a special key (triangular spanner). To prevent seizing within the thread, a combination of stainless steel and brass is used. Each lid has M16 threaded sleeves into which the enclosed eyelets can be screwed for lifting out. To protect the threaded sleeves from dirt, they are sealed by countersunk screws when not in use. A high temperature-resistant silicone seal meets the requirements for surface water tightness and barrier integrity, e.g. smoke tightness.

MPA certificate - type test certificate pursuant to EN 124 class D400kN (before fire test)
Design height 180mm

Test certificate no. 220011164-15

Client

Hallo-Werk
Rudolf Loh GmbH & Co. KG
Daimlerstraße 2

35708 Haiger

Date of order: 11.03.2015

Specimen received: 17.03.2015

MPA NRW no.: 83/15

Order

Test of a shaft cover **"Hallo cable shaft cover type H-CSC"**, test specimen lid

Specimen type

"Hallo cable shaft cover type H-CSC"
Dimensions: 1000 mm x 600 mm x 165 mm

Number of specimens
1 unit

Description of the tests and underlying regulations

DIN EN 124 - Gully tops and manhole tops for vehicular and pedestrian areas - Part 1: Design requirements, testing, marking, quality control, August 1994 edition

This test certificate comprises 3 pages.

1 Receipt of specimen

The specimens were delivered to MPA NRW Dortmund for testing by an agent of the client on 17.03.2015.

1.1 Information of the client

Order no.: 394212
Manufacturer: Hailo-Werk Rudolf Loh GmbH & Co. KG
Dimensions: 1000 mm x 600 mm x 165 mm

2 Performance of the test

The load test and the measurement of the deflection were performed in accordance with DIN EN 124.

The test force was applied to the specimen centrally by means of a test ram having the diameter of 250 mm required under the standard.
The permanent deformations were determined after five impacts at 2/3 of the test force (F = 266.7 kN).
The specimen was then subjected to the prescribed test force F = 400 kN (class "D") for a period of 30 s.

The test setup is shown in the following illustration.

Fig.: "Hailo cable shaft cover type H-CSC", test specimen lid
Dimensions: 1000 mm x 600 mm

3 Test results

After five impacts at 2/3 of the test force, a permanent deformation of the shaft cover of 0.89 mm was determined.

4 Summary

The tested **"Hallo cable shaft cover type H-CSC"**, test specimen lid, met the requirements of DIN EN 124 with regard to load capacity. The maximum permitted deformation of 3.0 mm was not exceeded.

max. perm.: 0.3% of clearance
LW1000 (tested span) = 3mm

Dortmund, 31.03.2015
pp.

Certified translation from the German language

E. Lipinski
Administrator

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Wiesenbach, this 15.06.2023

Inge Peterschik-Heck
Sworn translator

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Englisch/Spanisch
für die Gerichte
des Landes Baden - Württemberg

DMT certificate - fire safety test
Design height 180mm

DMT fire safety test certificate
Design height 180mm

CERTIFICATE

20651649

H-CSC

Hailo-Werk Rudolf Loh GmbH & Co.KG
Daimlerstraße 2, 35708 Haiger, Germany

The product "H-CSC2" achieved the following results in conjunction with the internal DMT test instructions for shaft covers in tunnel structures (as amended on 14.10.2014):

Performance criteria according to the internal DMT test instruction for shaft covers in tunnel structures (as amended on 14.10.2014)			**Limit values**
Parameter	**Unit**	**ACTUAL value**	**NOMINAL value**
Fire containment		No flames	No flames > 10 s
Average surface temperature	[K]	94	140
Maximum surface temperature	[K]	103	180

The H-CSC two-part shaft cover in trough form thus meets the performance criteria of fire containment and insulation over a period of 120 minutes.

This certificate is only valid in conjunction with the analysis report indicated below, issued by the test laboratory for fire safety of DMT GmbH & Co.KG:

20651649-40 GS-BS-Hoi/Mö of 20.07.2015

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Wiesenbach, this 26.05.2023

Inge Peterschik-Heck
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für das Gerichtsgebiet des Landes Baden-Württemberg

MPA certificate - type test certificate pursuant to EN 124 class D400kN on one of the specimens of the DMT fire test (determination of the residual load capacity after a fire)
Design height 180mm

Test certificate no. 220011308-15

Client
Hailo-Werk
Rudolf Loh GmbH & Co. KG
Daimlerstraße 2
35708 Haiger

Date of order: 07.07.2015
Specimen received: 07.07.2015
MPA NRW no.: 171/15

Order
Test of a lid for the shaft cover **"Hailo cable shaft cover type H-CSC"**

Specimen type
Lid for the **"Hailo cable shaft cover type H-CSC"**
(The specimen comes from the DMT fire test (120 min) of 18.06.2015)

Number of specimens
1 unit

Description of the tests and underlying regulations
DIN EN 124 - Gully tops and manhole tops for vehicular and pedestrian areas - Part 1: Design requirements, testing, marking, quality control, August 1994 edition

1 Receipt of specimen

The specimens were delivered to MPA NRW Dortmund for testing by an agent of the client on 17.07.2015.

1.1 Information of the client

Manufacturer: Hailo-Werk Rudolf Loh GmbH & Co. KG

2 Performance of the test

The load test and the measurement of the deflection were performed in accordance with DIN EN 124.
The test force was applied to the specimen centrally by means of a test ram having the diameter of 250 mm required under the standard.
The permanent deformations were determined after five impacts at 2/3 of the test force (F = 266.7 kN).
The specimen was then subjected to the prescribed test force F = 400 kN (class "D") for a period of 30 s.

The test setup is shown in the following illustration.

Fig.: Lid for the **"Hailo cable shaft cover type H-CSC"**
Dimensions: 707 mm x 647 mm

3 Test results

After five impacts at 2/3 of the test force, a permanent deformation of the shaft cover of 0.96 mm was determined.

4 Summary

The tested **"Hailo cable shaft cover type H-CSC"**, test specimen lid, met the requirements of DIN EN 124 with regard to load capacity. The maximum permitted deformation of 1.8 mm was not exceeded.

Dortmund, 12.10.2020
pp.
Christian Sameit

max. perm.: 0.3% of clearance 600
(tested span) = 1.8mm

MPA certificate - type test certificate pursuant to EN 124 class D400kN
Design height 150mm

Test report no. 213000033-20

Client
Hailo-Werk
Rudolf Loh GmbH & Co. KG
Daimlerstrasse 2
35708 Haiger

Date of order: 14.03.2019
Specimen received: 21.03.2019
MPA NRW no.: 41/19

Order
Test of a lid for the shaft cover **"Hailo cable shaft cover type H-CSC H150 clearance 1000x600mm"**

Specimen type
Lid for the **"Hailo cable shaft cover type H-CSC H150 clearance 1000x600mm"**

Number of specimens
1 unit

Description of the tests and underlying regulations
DIN EN 124 - Gully tops and manhole tops for vehicular and pedestrian areas - Part 1: Design requirements, testing, marking, quality control, August 1994 edition

1 Receipt of specimen

The specimens were delivered to MPA NRW Dortmund for testing by an agent of the client on 14.03.2019.

1.1 Information of the client

Manufacturer: Hailo-Werk Rudolf Loh GmbH & Co. KG

2 Performance of the test

The load test and the measurement of the deflection were performed in accordance with DIN EN 124.
The test force was applied to the specimen centrally by means of a test ram having the diameter of 250 mm required under the standard. The span of the supports on the shorter side of the specimen was 1000 mm.
The permanent deformations were determined after five impacts at 2/3 of the test force (F = 266.7 kN).
The specimen was then subjected to the prescribed test force F = 400 kN (class "D") for a period of 30 s.

The test setup is shown in the following illustration.

Fig.: Lid for the **"Hailo cable shaft cover type H-CSC H150 clearance 1000x600mm"**
Dimensions: 1137 mm x 737 mm x 132 mm

3 Test results

After five impacts at 2/3 of the test force, a permanent deformation of the shaft cover of 0.75 mm was determined.

4 Summary

The tested **"Hailo cable shaft cover type H-CSC H150 clearance 1000x600mm"**, test specimen lid, met the requirements of DIN EN 124 with regard to load capacity. The maximum permitted deformation of 3.0 mm was not exceeded.

Dortmund, 12.10.2020
pp.
Christian Sameit

max. perm.: 0.3% of clearance 1000
(tested span) = 3mm

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Wiesenbach, this 15.06.2023

Inge Peterschik-Heck
Sworn translator

DMT fire safety expert report
Design height 150mm

Fire safety assessment

"H-CSC" shaft cover

Order number: 8116953219-10, APS4-Hoi/St

Administrator: Stefanie Steinmeier

Client: Hailo-Werk

Rudolf Loh GmbH & Co. KG

Daimlerstrasse 2

35708 Haiger

GERMANY

Content of the order: Fire safety assessment of the reduction in the tested structural height (lid height) of the "H-CSC" shaft cover from 185 mm to 150 mm and assessment of a structural modification of the frame geometry

Order date: 08.04.2019

Report date: 18.04.2019

1 Client

Hailo-Werk
Rudolf Loh GmbH & Co. KG
Daimlerstraße 2
5708 Haiger
GERMANY

2 Terms of reference

Hailo Werk Rudolf Loh GmbH & Co. KG instructed DMT GmbH & Co.KG (test laboratory for fire safety) to perform a fire safety assessment of an alternative design height of the tested "H-CSC" shaft cover for tunnel structures /1/ and an assessment of a structural modification of the frame geometry according to figure 2.

The test cover /1/ had an overall design height of 185mm. The concrete lid, which is flush with the ground when fitted, is 160mm thick. In this test the specimen was subjected to a fire safety test over a period of 120 minutes. The aim of the test was to reach fire resistances of 90 minutes when exposed to open flame from above.

In the renovation of tunnels where all covers are removed and new covers are fitted, a maximum structural height of 150mm is often a mandatory requirement.
This then gives a lid height of 130mm. The general requirement is a fire resistance of 90 minutes when exposed to open flame from above the shaft cover.

The undersigned was also asked to assess a structural modification of the frame geometry.

For the purposes of this assessment, the performance criteria of fire containment and insulation for the H-CSC variant with a lid height of 130mm and a frame reduced in height by 5mm were assessed for fire safety in respect of fire resistance of 90 minutes.

3 Underlying documents

This fire safety assessment was conducted on the basis of the documents listed below.

/1/ Report of DMT GmbH & Co. KG 20651649-40, GS-BS-Hoi/Mö on the fire safety analysis of an H-CSC two-part shaft cover for tunnel structures

/2/ Confirmation of the concrete covering from Hailo-Werk Rudolf Loh GmbH & Co. KG

/3/ Design drawing of the modified structural height

/4/ Internal DMT test instruction for shaft covers in tunnel structures (as amended on 14.10.2014)

/5/ DIN 4102-2 – Fire behaviour of building materials and building components: Definitions, requirements and tests

/6/ DIN EN 1364-2 – Fire resistance tests for non-loadbearing elements – Part 2: Ceilings

/7/ DIN EN 1363-1 – Fire resistance tests – Part 1: General requirements

4 Description of the construction to be assessed

According to the client, the construction to be assessed conforms in all details – with the exception of the difference mentioned below – to the construction tested for the purposes of the report of DMT GmbH & Co. KG 20651649-40, GS-BS-Hoi/Mö on the fire safety analysis of an H-CDC two-part shaft cover for tunnel structures.

Figure 1: Illustration of the specimen

The only difference consists in the reduction of the overall structural height from 185mm to 150mm. This is achieved structurally by a lower lid height of 130mm compared with the tested 160mm and a reduction in the height of the frame by 5mm. The frame geometry is also slightly modified (see figure 2).

Hailo cable shaft cover type H-CSC – comparison of models

Previous model
Frame stiffener

New model
Frame stiffener

Surrounding load transfer surface moved from inside to outside

Figure 2: Comparison of the two frame configurations

According to the confirmation /2/, there is no change to the concrete covering of the steel reinforcement, as the reduction is below the reinforcement.
The reduction in height results from a slight change in positioning.
These two measures then give the maximum overall structural height of 150mm.

In terms of frame geometry, the load transfer surface and sealing plane is pushed further in and the frame stiffening is modified.

5 Assessment basis

The fire safety assessment is based in particular on the analysis report /1/, the confirmation of the concrete covering /2/ and the design drawing /3/ for the modified structural height.

5.1 Test results for the construction

The aim of the fire test documented in the analysis report /1/ was to achieve a fire resistance of 90 minutes while exposed to open flame from above the shaft cover. In light of the very good results in the 90th test minute, the flame treatment was continued to the 120th test minute.

During the 120 minutes of the test no signs of flames were observed on the unexposed face. The maximum rise in the average surface temperature was 94 K (requirement: max. 140 K), and the maximum surface temperature increase was 103 K (requirement: max. 180 K).

After 90 minutes of testing the maximum surface temperature increase was 77 K (requirement: max. 180 K).

Only minimal flaking was observed on the exposed face after the fire test had ended.

6 Assessment

6.1 Fire containment

During the 120 minutes of the test no signs of flames were observed on the unexposed face. In the view of the undersigned, the reduction of 30mm in the height of the lid and the 5mm reduction in the frame height does not have a negative effect on the fire containment of the construction because the sealing plane of the overall construction and the geometries in the support area are not changed.

6.2 Insulation

After 120 minutes of testing the maximum rise in the average surface temperature was 94 K (requirement: max. 140 K), and the maximum surface temperature increase was 103 K (requirement: max. 180 K).

After 90 minutes of testing maximum temperature increases of 77 K were measured on the unexposed face.

In the view of the undersigned, the low temperature increase of maximum 77 K that was measured in the fire test mean there are no concerns about reducing the lid height by 30mm and the frame by 5mm, as the maximum permitted temperature increase of 180 K is not expected to be exceeded before the 90th test minute.

6.3 Modification of the frame geometry

As the sealing plane and contact surface of the frame structure is pushed further in, in the view of the undersigned this gives even better protection from fire, so that this modification will not have a negative effect on the expected fire resistance while exposed to fire from above.

7 Conclusion

The requirements pursuant to /4/ are also met with the 30mm reduction in the lid height and 5mm reduction in the height of the frame and a structural modification of the frame geometry according to figure 2. The H-CSC two-part shaft cover in trough form will withstand a defined fire for a period of 90 minutes. The position of the reinforcement is unchanged, as the reduction in thickness applies only below the reinforcement.

This fire safety assessment is only valid in conjunction with the report of DMT GmbH & Co.KG 20651649-40, GS-BS-Hoi/Mö on the fire safety analysis of an H-CSC two-part shaft cover for tunnel structures.

Please note that the findings contained in this fire safety assessment apply solely for the test structures illustrated in this fire safety assessment and the materials used. The findings cannot be transferred to other constructions or materials. This assessment may only be reproduced in full.

This fire safety assessment cannot be used as a basis for issuing a classification or general supervisory evidence of usability (e.g. AbP, AbZ), as there are no corresponding normative specifications.

This is to certify the correctness of the above translation from the German language. The German document was submitted to me in form of an original document/photocopy/PDF file.

Wiesenbach, this 26.05.2023

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DMT comparison expert report
Classes F90 according to DIN 41002-2 and EI90 according to EN 13501-2

Fire safety assessment
- - - - - - - - - - -
"H-CSC" shaft cover

Report number: 8119932054-10
Administrator: Bonn

Client:
Hailo-Werk
Rudolf Loh GmbH & Co. KG
Daimlerstr. 8
35708 Haiger

Content of the order:
Fire safety assessment of the results of the fire resistance test on the **"H-CSC" shaft cover** in respect of classification into classes F90 according to DIN 41002-2 and EI90 according to EN 13501-2

Order date: 17.12.2021
Report date: 28.01.2022

1 Terms of reference

Hailo Werk Rudolf Loh GmbH & Co. KG instructed DMT GmbH & Co.KG (test laboratory for fire safety) to perform a fire safety assessment of the results of the fire resistance test of the "H-CSC" shaft cover for tunnel structures (see /U1/) in respect of its equivalence to classes F90 according to DIN 4102-2 and EI90 according to EN 13501-2.
This consideration is necessary because neither the EN 1364 series of European standards nor the German DIN 4102-2 standard on fire resistance makes explicit reference to this type of component (moveable covers above cavities in road tunnels).

2 Underlying documents

This fire safety assessment was conducted on the basis of the documents listed below.

/U1/ DMT GmbH & Co. KG; report of DMT GmbH & Co.KG on the fire safety analysis of an H-CSC two-part shaft cover for tunnel structures; number 20651649-40, GS-BS-Hoi/Mö; 20.07.2015

/U2/ DMT GmbH & Co. KG; internal DMT test instruction for shaft covers in tunnel structures (as amended on 14.10.2014)

/U3/ DMT GmbH & Co. KG; fire safety assessment of the reduction in the tested structural height (lid height) of the "H-CSC" shaft cover from 185 mm to 150 mm and assessment of a structural modification of the frame geometry; 8116953219-10, APS4-Hoi/St; 18.04.2019

/R1/ DIN 4102-2 – Fire behaviour of building materials and building components: Definitions, requirements and tests; revision level 1977-09

/R2/ DIN EN 13501-2 – Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services; revision level 2010-02

/R3/ DIN EN 1364-2 – Fire resistance tests for non-loadbearing elements – Part 2: Ceilings; revision level 1999-10

/R4/ DIN EN 1363-1 – Fire resistance tests – Part 1: General requirements; revision level 2012-10

3 Description of the construction to be assessed

The construction to be assessed here corresponds to the construction described in the analysis report /U1/.
The modifications considered in the fire safety assessment /U3/ – the reduction in the lid height from 185mm to 150mm and the modified frame geometry – have also been taken into account in this assessment.

Figure 1: Illustration of the component; figure taken from /U1/

4 Assessment basis

The fire safety assessment is based in particular on the analysis report /U1/, the internal DMT test instruction /U2/, the fire safety assessment on the reduction in the lid height /U3/ and the national and European regulations governing the classification of fire resistance /R1/ and /R2/.

4.1 Comparison of the internal DMT test instruction with the test standard for comparable components

With regard to the performance and assessment of the fire resistance test, the test instruction /U2/ is based on DIN EN 1363-1 (/R4/) and DIN 4102-2 (/R1/). For the special case considered here of a heating regime applied to the specimen from above, only DIN EN 1364-2 (/R3/) mentions instructions regarding the instrumentation of the test oven, test conditions and assessment criteria, so this standard was used to specify the requirements from the above sets of regulations.

Table 1 sets out the requirements of the regulations in summary form. Where there are differences between the regulations, the chosen method applied in the fire test is noted in the last column.

Table 1: Comparison of the requirements under DIN EN 1363-1, DIN EN 1364-2 and DIN 4102-2

Requirement	DIN EN 1363-1 /R4/	DIN EN 1364-2 /R3/	DIN 4102-2 /R1/	Application in /U2/
Ambient temperature	Room temperature 10 °C to 40 °C according to DIN EN 1363-1, section 5.6		Room temperature 15 °C to 25 °C according to DIN 4102-2, section 6.2.3	Fulfilled
Load case	Heat curve and tolerances according to DIN EN 1363-1, section 5.1.1		Heat curve and tolerances according to DIN 4102-2, section 6.2.4	Chosen heat curve satisfies both requirements at room temperature
Pressure measurement	Pressure sensor heads according to DIN EN 1363-1, section 4.5.2		No specification	Pressure sensor heads according to DIN EN 1363-1, section 4.5.2
Pressure setting	Measurement 100mm below the containing component; maximum 20 Pa relative to room atmosphere	Flame treatment from above: Measurement 100mm above the ceiling; (10 ± 2) Pa relative to the cavity under the ceiling	Measurement 100mm below the exposed area; (10 ± 2) Pa relative to room atmosphere	Measurement 100mm above the specimen; (10 ± 2) Pa relative to the cavity
Measurement of the oven temperatures	Thermocouples according to DIN EN 1363-1, section 4.5.1.1, 100mm away from all parts of the specimen; 1 thermocouple per 1.5 m² of exposed area, at least 4 units		Thermocouples according to DIN-43710, 100mm away from all parts of the specimen; 1 thermocouple per 1.5 m² of exposed area, at least 4 units	6 thermocouples according to DIN 43710, 100mm away from the surface of the specimen
Measurement of the average temperatures on the side facing away from the fire	5 thermocouples in the middle of the specimen and 1 thermocouple centrally on each quarter segment (DIN EN 1363-1, sections 4.5.1.2 and 9.1.2)		5 thermocouples in the middle of the specimen and 1 thermocouple centrally on each quarter segment (DIN 4102-2, sections 6.2.8)	Fulfilled
Measurement of the average temperatures on the side facing away from the fire	2 thermocouples at each discontinuity (DIN EN 1363-1, sections 4.5.1.2 and 9.1.2)		Thermocouples at each discontinuity (DIN 4102-2, section 6.2.8)	2 thermocouples at each discontinuity
Verification of fire containment	Cotton wad test and gap gauges according to DIN EN 1363-1, section 10.4.5	Purely visual inspection according to DIN EN 1364-2, section 10.3	Cotton wad test and test for flammable gases according to DIN 4102-2, sections 6.2.6 and 6.2.7	Visual inspection

4.2 Test results for the construction

The aim of the fire test documented in the analysis report /U1/ was to achieve a fire resistance of 90 minutes while exposed to open flame from above the shaft cover. In light of the very good results in the 90th test minute, the flame treatment was continued to the 120th test minute.

During the 120 minutes of the test no signs of flames were observed on the unexposed face. The maximum rise in the average surface temperature was 94 K (requirement: max. 140 K), and the maximum surface temperature increase was 103 K (requirement: max. 180 K).

After 90 minutes of testing the maximum surface temperature increase was 77 K (requirement: max. 180 K).

Only minimal flaking was observed on the exposed face after the fire test had ended.

5 Assessment

The test instruction /U2/ and the fire resistance test performed in accordance with this document form a method that in design, parameters and the heating regime largely conforms to the relevant regulations, DIN EN 13501-2 and DIN 4102-2, and to the product-specific test standards for components with comparable applications underlying these regulations. In the event of discrepancies between the underlying test methods, the requirements of DIN EN 1364-2 – as set out in Table 1 – were chosen, as these most closely correspond to the particular application.

The results of the fire test show that the construction is a long way from failing in the "fire containment" and "insulation" criteria until 30 minutes beyond the targeted classification time of 90 minutes.

Although the construction under consideration does not explicitly fall within the scope of DIN EN 13501-2 and DIN 4102-2 or within the scope of the product-specific test standards underlying them, the specimen was exposed to comparable loads in the fire resistance test /U1/. The requirements were met.

6 Conclusion

The product

"H-CSC" shaft cover

was subjected to a fire resistance test with flame treatment from above equivalent in all relevant assessment criteria and loads to the DIN 4102-2 and DIN EN 13501-2 standards in conjunction with DIN EN 1364-2 for a period of 120 minutes. The product thus meets the requirements of the classification

EI90 according to DIN EN 13501-2
and
F90 according to DIN 4102-2.

This fire safety assessment is only valid in conjunction with the report 20651649-40, GS-BS-Hoi/Mö /U1/ on the fire safety analysis of an H-CSC two-part shaft cover for tunnel structures and the fire safety assessment 8116953219-10, APS4-Hoi/St /U3/ of the reduction in the tested structural height (lid height) of the "H-CSC" shaft cover from 185mm to 150mm and assessment of a structural modification of the frame geometry.

Remarks

Please note that the findings contained in this fire safety assessment apply solely for the test structures illustrated in this fire safety assessment and the materials used. The findings cannot be transferred to other constructions or materials. This assessment may only be reproduced in full.

Where a conformity statement has been given in this test report, the following decision rule was applied: "The measurement uncertainty is not considered in the conformity statement".

This analysis report is valid only for the items analysed and may not be transferred to other items.

This analysis report may only be disseminated in full and without modification. Excerpts and extracts require the written permission of DMT GmbH & Co. KG (fire safety test centre). In case of doubt the German version of this report prevails.

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Wiesenbach, this 26.05.2023

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Certified translation from the German language

DMT expert report - fire safety test
Design height 120mm class 125kN

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Fire safety assessment of the "H-CSC" shaft cover with a structural height of 100 mm for a 90-minute exposure to fire

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8122073388-001 GS-BS-St/Hsw
49762 Lathen, 21.11.2023

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(test centre for fire safety)

(Steinmeier) (Hauswaldt)

egolf member

Test centre pursuant to Landbauordnung NRW
Ref. number NRW49

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1 Client

Rudolf Loh GmbH & Co. KG

Sascha Rübsamen

Daimlerstraße 2

35708 Haiger

GERMANY

2 Terms of reference

Rudolf Loh GmbH & Co. KG instructed DMT GmbH & Co. KG (test laboratory for fire safety) to perform a fire safety assessment of an alternative structural height of the tested "H-CSC Kl. D400kN" shaft cover for tunnel structures /1/ for load class 125 kN.

The tested cover /1/ had an overall structural height of 185 mm. The concrete lid, which is flush with the ground when fitted, is 160 mm thick. In this test the specimen was subjected to a fire safety test over a period of 120 minutes. The aim of the test was to achieve a fire resistance duration of 90 minutes when exposed to open flame from above.

The fire safety assessment /2/ considered the reduction in the overall height from 185 mm to 150 mm and the structural modification of the frame geometry for a fire resistance duration of 90 minutes.

The aim of the fire safety assessment is to ascertain whether the "H-CSC Kl. 125kN" shaft cover also achieves a fire resistance duration of 90 minutes with the performance criteria of fire containment and isolation when exposed to open flame from below with a lid thickness of 100 mm.

3 Underlying documents

This fire safety assessment was conducted on the basis of the documents listed below.

/1/ Report of DMT GmbH & Co. KG 20651649-40, GS-BS-Hoi/Mö on the fire safety analysis of an "H-CSC" two-part shaft cover for tunnel structures

/2/ Fire safety assessment of DMT GmbH & Co. KG 8116953219-10, APS4- Hoi/St of the reduction in the tested structural height of the "H-CSC" shaft cover from 185 mm to 150 mm and assessment of a structural modification of the frame geometry

/3/ Kordina, K.; Meyer-Ottens, C., Beton Brandschutz-Handbuch, 1999, ISBN 3-7640-0380-4, Bau+Technik GmbH

/4/ DIN EN 1992-1-2: 2012-12 Eurocode 2: Design of concrete structures – Part 1-2: General rules – Structural fire design; German version EN 1992-1-2:2004 + AC:2008

/5/ DIN EN 1363-1: 2020-05 Fire resistance tests – Part 1: General requirements; German version EN 1363-1:2020

/6/ DIN 4102-2 – Fire behaviour of building materials and building components; Definitions, requirements and tests

/7/ Eurocode 4: Design of composite steel and concrete structures – Part 1-2: General rules – Structural fire design; German version EN 1994-1-2: 2005 + AC:2008

4 Description of the construction to be assessed

According to the client, the design of the construction considered in this report corresponds to the construction that was the subject of the fire safety assessment 8116953219-10 /2/. The construction to be evaluated differs in that it has a reduced lid thickness of 100 mm and is thus to be assessed for load class B125kN. There is no change to the concrete covering of the steel reinforcement, as the reduction is below the reinforcement.

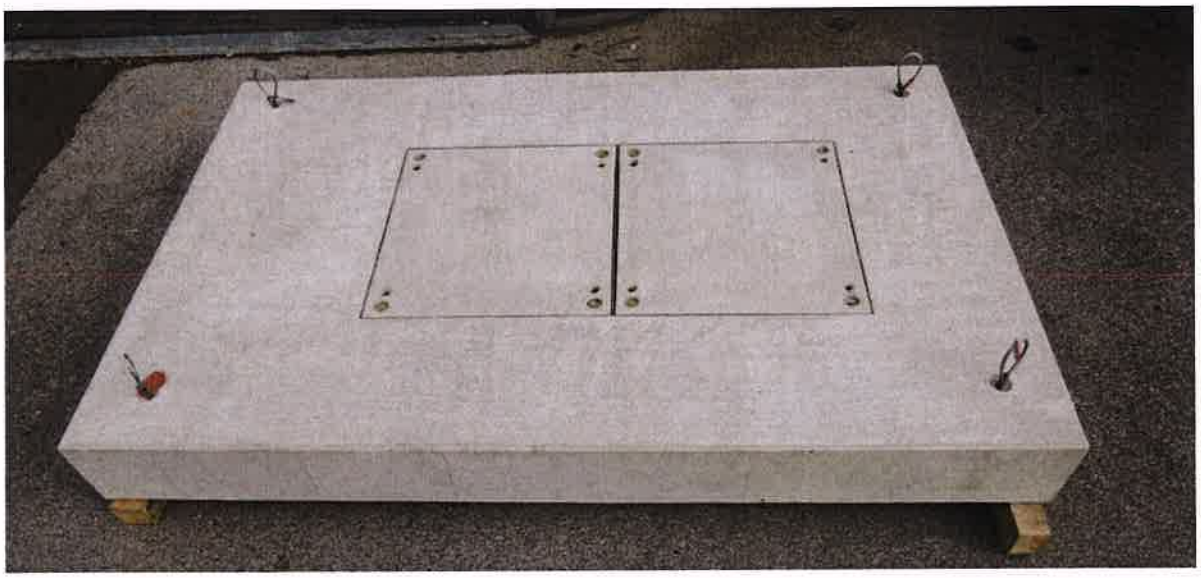

Figure 1: Illustration of the specimen

5 Assessment basis

The fire safety assessment is based in particular on the analysis report 20651649-40 /1/, the fire safety assessment 8116953219- 10 /2/, Beton Brandschutz-Handbuch Kordina /3/ and DIN EN 1992-1-2: 2012-12 /4/.

The "H-CSC Kl. D400kN" shaft cover was subjected to a fire test and the corresponding analysis report 20651649-40 /1/ was produced. The aim of the fire test was to ascertain whether the specimen with a lid thickness of 160 mm has a fire resistance duration of 90 minutes when exposed to open flame from above, but the exposure to flame was continued up to the 120th minute. During this time no signs of flames were observed on the unexposed face. It can be seen from the analysis report 20651649-40 /1/ that the surface temperature increase after a test period of 90 minutes was 77 K. A maximum surface temperature increase of 103 K was measured over the whole test period. The limit of 180 K was not exceeded at any time.

6 Assessment

The following fire safety assessment is based on an exposure to fire through the uniform temperature-time curve (UTTC) according to DIN EN 1363-1: 2020-05 /5/.

6.1 Fire containment

Table 5.8 of DIN EN 1992-1-2: 2012-12 /4/ specifies values for the minimum dimensions and axis distances for reinforced and prestressed concrete simply supported one-way and two-way solid slabs. For a fire resistance duration of 90 minutes, a slab thickness of 100 mm is required in order to meet the fire containment specification. The proposed structure meets this minimum dimension requirement.

6.2 Isolation

If the minimum specifications set out in Table 5.8 of DIN EN 1992-1-2: 2012-12 /4/ are met, isolation is ensured.

Figure 2 on temperature distribution in reinforced concrete components under UTTC exposure to fire can be taken from the Beton Brandschutz-Handbuch Kordina /3/.

For a UTTC exposure to fire of 90 minutes according to DIN 4102-2 /6/, a temperature of approx. 70 °C can be read for a plate thickness of 160 mm (see position 1). It can also be seen that temperatures of approx. 140 °C prevail in a plate with a thickness of 100 mm (see position 2).

A comparison of the specifications from Figure 2 with the temperatures measured in the fire test shows that the literature values are lower than the experimental values on the shaft cover of the same thickness. This may be attributable to joints, the frame structure, holding points and the low humidity and the associated low heat capacity of the shaft cover in comparison with an in-situ concrete slab.

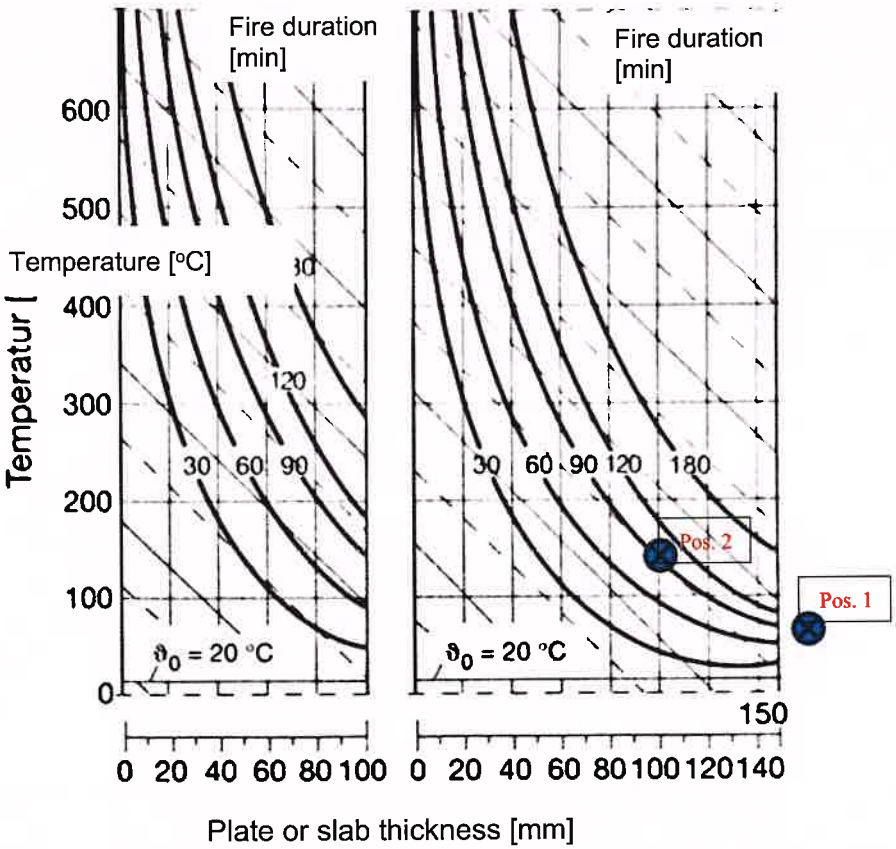

Figure 2: Temperature distribution in plates of standard concrete with quartz aggregate exposed on one side in accordance with DIN 4102-2

If, to be on the safe side, it is assumed that the temperatures occurring in the event of fire on the unexposed face of the shaft cover can be up to 30 K higher than the temperatures on slabs of the same thickness according to /3/, then the temperatures on a shaft cover 100 mm thick after 90 minutes of UTTC exposure to fire will be up to 140 °C + 30 °C = 170 °C. Thus the temperature is approx. 30 K below the isolation limit of 180 K (assuming a room temperature of 20 °C).

This statement can be confirmed by the specifications in Eurocode 4. Accordingly, the temperature on a 100 mm thick concrete surface according to /7/, see Figure 3, is 160 °C and therefore well below the specified limit value of 180 K / 200 °C.

Tabelle D.5 — Temperaturverteilung in einer massiven 100 mm dicken Decke aus ungeschütztem Normalbeton

Depth x mm	Temperature θ_c[°C] after a fire duration in min of 30'	60'	90'	120'	180'	240'
5	535	705				
10	470	642	738			
15	415	581	681	754		
20	350	525	627	697		
25	300	469	571	642	738	
30	250	421	519	591	689	740
35	210	374	473	542	635	700
40	180	327	428	493	590	670
45	160	289	387	454	549	645
50	140	250	345	415	508	550
55	125	200	294	369	469	520
60	110	175	271	342	430	495
80	80	140	220	270	330	395
100	60	100	160	210	260	305

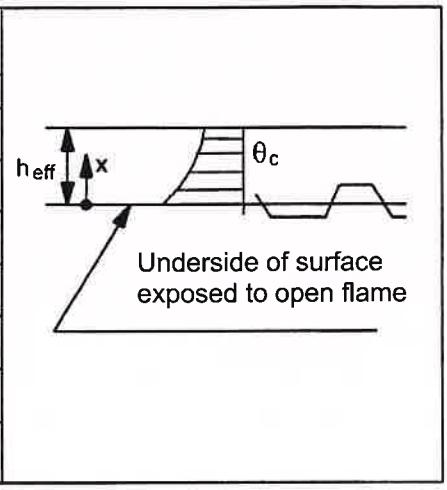

Figure 3: Temperature distribution in/on a 100 mm thick concrete surface – from /7/, page 91

7 Summary

The requirements on the "H-CSC Kl. 125kN" shaft cover for a fire resistance duration of 90 minutes under exposure to fire on one side from below through the UTTC according to DIN EN 1363-1: 2020-05 /5/ are met with a lid thickness of 100 mm.

This fire safety assessment is only valid in conjunction with the analysis report of DMT GmbH & Co. KG 20651649-40, GS-BS-Hoi/Mö on the fire safety analysis of an "H-CSC" two-part shaft cover for tunnel structures.

Dortmund, 21.11.2023

Stefanie Steinmeier 2023.11.21 15:29:43 +01'00'

(Steinmeier)

(Hauswaldt)

Please note that the findings contained in this fire safety assessment apply solely for the test structures illustrated in this fire safety assessment and the materials used. The findings cannot be transferred to other constructions or materials.

This fire safety assessment cannot be used as a basis for issuing a classification or general supervisory evidence of usability (e.g. AbP, AbZ), as there are no corresponding normative specifications.

This is to certify the correctness of the above translation from the German language. The German document was submitted in form of a photocopy/original document/pdf file.

Wiesenbach, this 06.12.2023

Inge Peterschik-Heck
Sworn translator

Öffentl. bestellte und beeidigte Urkundenübersetzerin
Inge Peterschik-Heck
staatl. gepr. Übers.
Englisch/Spanisch
für die Gerichte
des Landes Baden - Württemberg

Static calculation to EN 124 class B125kN
Design height 120mm

Statische Berechnung

Bauvorhaben: Deckelwanne Klasse B125

Bauherr: Schachtmeister Siegerländer Betonwaren GmbH & Co. KG

Hammerwerk 3

57076 Siegen

Tragwerksplaner: OTTO QUAST Fertigbau Lindenberg GmbH & Co. KG

An der Autobahn 16-30

57258 Freudenberg

Inhaltsverzeichnis

Pos. VB Allgemeine Vorbemerkungen

1.1 Entwurfsunterlagen

Der Berechnung liegen die Angaben der Fa. Heilo-Werk Rudolf Loh GmbH & Co. KG aus der E-Mail vom 07.09.2023 mit den Außenmaßen der Deckelwanne von B x L x H = 1138 x 1138 x 100mm zugrunde.

1.2 Bestimmungen und Literatur

Die Berechnungen basieren auf der Grundlage der eingeführten technischen Baubestimmungen.

1.3 Baustoffe

Beton	C 50/60
Betonstahl	BSt 500
Baustahl	S235
Schweißnähte nach DIN 18 800	a $\geq$ 4 mm
Schraubengüten	4.6, 5.6 und 10.9

Pos. H Hinweise zur Ausführung des Schachtdeckel

Die Betonkonstruktion wird in Beton der Güteklasse C 50/60 geplant.

Die in der statischen Berechnung gewählte Bewehrung gilt als Mindestbewehrung und darf nicht abgemindert werden. In der Deckelwanne befinden sich keine Öffnungen.

Betondeckung

Betondeckung bei den einzelnen Bauteilen sind entsprechend der Expositionsklassen auszuführen.

Expositionsklassen

Außenbauteile	XD3 (oben)
Innenbauteil	XC3 (unten)

Rissbreitenbeschränkung

Die Rechenwerte der Rissbreite richten sich nach den Anforderungsklassen gem. DIN-EN 124:

wk = 0,2 mm

Allgemeines

Alle nicht nachgewiesenen Bauteile sind konstruktiv nach den Regeln der Technik auszuführen bzw. den Plänen zu entnehmen.

Für die Güte der einzubauenden Materialien und die Standsicherheit der Montagezustände haften die ausführenden Unternehmer.

Alle bei der Bauausführung auffallenden Planänderungen gegenüber den Positionsplänen sind dem Aufsteller dieser statischen Berechnung umgehend mitzuteilen.

Weiterhin sind die Regelungen der DIN EN 124, DIN EN 1992-1-1, DIN EN 1992-1-1/NA und DIN EN 1992-1-2 zu beachten.

Die Prüfung der Platte hat gem. DIN EN 124 für eine Prüfkraft von 125kN für die Belastungsklasse B125 zu erfolgen.

Lastannahmen

Pos.1 Prüflast nach DIN-EN124 für Belastungsklasse B125 Einzellast mit 125kN

Pos.2 Verkehrslast von 5 kN/m²

Eigengewicht wird durch das Programm automatisch ermittelt mit 25 kN/m³

Pos. 1 Deckelwanne d=10cm Prüflast 125kN

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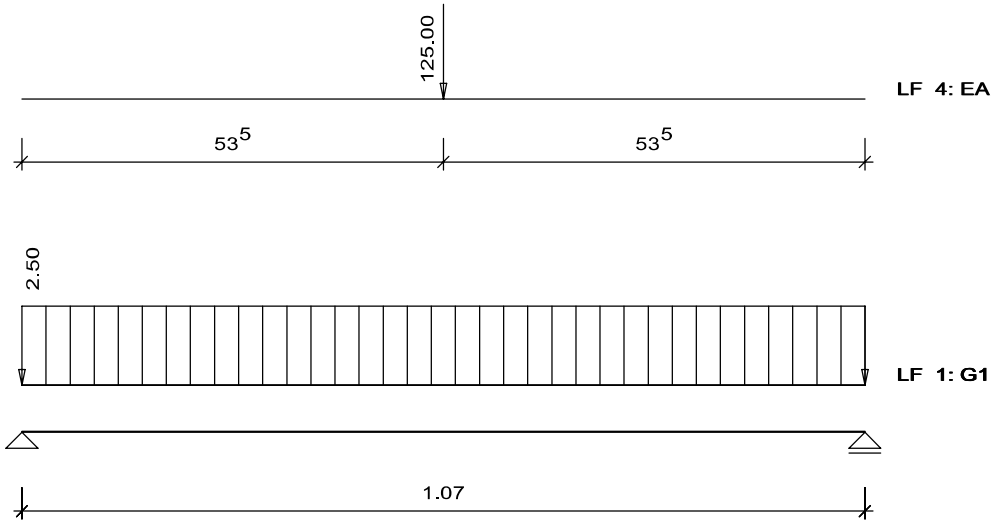
Fertigbau Lindenberg OTTO QUAST GmbH & Co. KG  57258 Freudenberg  02734/490-0

Auftrag: 239998AS              Pos.: 1        /  1                Seite

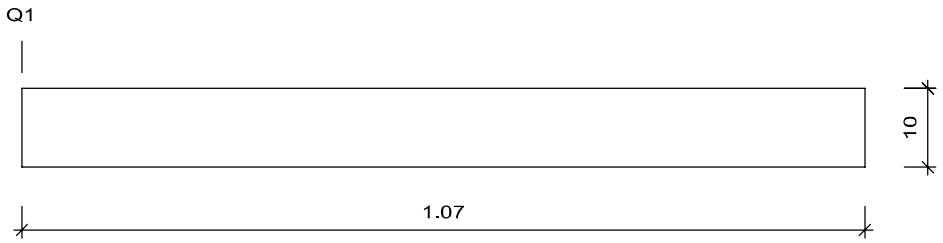
╔═══════════════════════════════════════════════════════════════════════╗
║ abacus-PROGRAMM           F E T T V19.0           ABARIB/ 8. 9.2023 ╒
║ Nachweise nach DIN/EC2   Fertigteilträger   EC2/SAU/SUP/HLK/FAT/DBS ╒
╚═══════════════════════════════════════════════════════════════════════╝

Titel: B125 Deckelwanne d=10cm ls=1,07m
Datei: ...Klasse B125\Ingenieure\Statik\abacus\Fett Prüflast mittig.dat
```

Lasten M 1 : 2

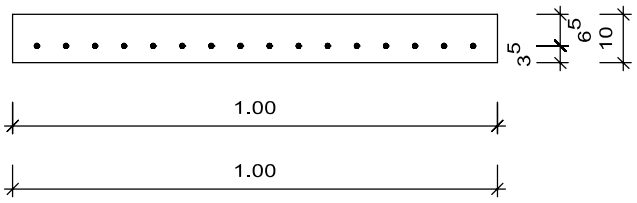


Längsschnitt M 1 : 8



Querschnitte M 1 : 13

Q1 x = 0.00




```
M A T E R I A L K E N N W E R T E :    Maßg. Norm: DIN EN 1992-1-1/N/A
* ansteigender Ast der SDL wird berücksichtigt
Bs = Bemessungssituationen

Beton Fertigteil: C50/60       Ecm     (N/mm2):   37000.0   eps.c2 :-2.00
                               Ec(To)  (N/mm2):   28600.6   eps.c2u:-3.50
Bs: Std.+vorüberg.             fcd     (N/mm2):      28.3   gamma.c: 1.50
                               fctm    (N/mm2):       4.1
                               fctk005(N/mm2):        2.9
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Auftrag: 239998AS              Pos.: 1        /  2                 Seite

Bs: Außergewöhnl.             fcd    (N/mm2):      32.7   gamma.c: 1.30
Bs: Ermüdung                  fcd    (N/mm2):      28.3   gamma.c: 1.50

Betonstahl:       S500        Es     (N/mm2):  200000.0   eps.sy : 2.17
Bs: Std.+vorüberg.            fyd*   (N/mm2):     434.8   gamma.s: 1.15
                                                          eps.su :25.00
Bs: Außergewöhnl.             fyd*   (N/mm2):     434.8   gamma.s: 1.00
Bs: Ermüdung                  fyd*   (N/mm2):     434.8   gamma.s: 1.15

Vorwerte für Kriechen und Schwinden:
Zeitpunkt          Temperatur(G)  Feuchte(%)
   bis To     1 Tage :        25
To bis T1    30 Tage :        15          80
T1 bis Too           :                    50
Beton Fertigteil :  Konsistenz S2   Zement R (s=0.20)        1 Steg(e)
Relaxationsbeiwert  Beton      :                              0.80

Maßgebende Bemessungskombinationen (Bs)      unten          oben
Expositionsklassen                            XC3            XD3
Grenzzustand der Dekompression  Bs :     quasi-ständige    häufige
Rissbreitenbegrenzung           Bs :     quasi-ständige quasi-ständige
Rissbreiten                     zul.wk(mm):  0.30           0.30
Grenzdurchmesser    Betonstahl  dg(mm)    :  10.0            8.0

S Y S T E M W E R T E :  Kragarm             Feld             Kragarm
Stützweiten       L(m):    0.00               1.07             0.00
Auflagerbreiten   B(m):             0.06               0.06

Betonstahllagen:                           (neg. Z: ab OK Fertigteil)

Lage  Anzahl  As(cm2)  Asl(cm2)    E(cm)     Z(cm)     Xa(m)     Xe(m)
 1      16       D10     12.57       6.0       3.5     0.000     1.070

Querschnittsverlauf:

Schicht  Ba(cm)    Xa(m)   Za(cm)    Be(cm)    Xe(m)   Ze(cm)
   1      100.0    0.000     10.0     100.0    1.070     10.0
   2      100.0    0.000      0.0     100.0    1.070      0.0

B E L A S T U N G:
LF  Einwirkung Alt.  LF-Bezeichnung
 1  G1               Eigenlast
 4  EA               Prüflast

STR:Streckenlast Q1,Q2(kN/m), EIN:Einzellast Q1(kN), MOM:Moment Q1(kNm)
Eigenlast G1 generiert für gamma = 25.00 kN/m3

LF  Einwirkung   Art       A(m)      Q1        B(m)      Q2      Ey(cm)
 1  G1           STR      0.000     2.500     1.070     2.500       0.0
 4  EA           EIN      0.535   125.000                           0.0

Automatische Berücksichtigung der Kombinationsbeiwerte nach DIN EN 1991
P/T: Ständige, vorüberg. Bs, A: außergew. Bs         Ls: Lagesicherheit
Einwirkung   inf.gamma(P/T).sup (A).sup  psi0  psi1  psi2  r.inf  r.sup
G1               1.00      1.35    1.00  1.00  1.00  1.00
EA               0.00      1.00    1.00  1.00  1.00  1.00

A U F L A G E R K R Ä F T E  Az, Bz + - M O M E N T E  Ta, Tb:

LF  Einwirkung          Az(kN)     Ta(kNm)      Bz(kN)     Tb(kNm)
 1  G1                   1.338       0.000       1.337       0.000
 4  EA                  62.500       0.000      62.500       0.000
-----------------------------------------------------------------
max.Ad   (P/T)           1.806       0.000       1.806       0.000
max.Ad   (A)            63.840       0.000      63.839       0.000

Nachweis des Brandschutzes:                            DIN EN 1992-1-2
-----------------------------------------------------------------------
Feuerwiderstandsklasse      ermittelt: R 90                X(m):  0.535

Mindestabmessungen                 erf.         vorh.
Platte Tabelle 5.8:
Plattendicke                hs  :  10.0 cm
Achsabstand Feldbew.        am  :   3.0 cm             Einfeldplatte
Achsabstand Feldbew.        am  :   1.5 cm             Durchlaufplatte
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Maßgebende Längsspannungen im Gebrauchszustand sig(N/mm2):

Grenzwerte Betonstahl S500
Seltene Kombination 0.80 * fyk 0.80 * 500.0 sig.s < 400.00
Grenzwerte Beton C50/60
Zeitpunkt T0 (P0+G1) 0.45 * fck(T0) 0.45 * 16.6 sig.cT0 < -7.46
Seltene Kombination 0.60 * fck 0.60 * 50.0 sig.cToo < -30.00
Quasi-ständige Kombinat. 0.45 * fck 0.45 * 50.0 sig.cToo < -22.50

		quasi-ständig			seltene Kombination		
Schnitt	X(m)	sig.co	sig.p	sig.co	sig.ao	sig.p	sig.s
		sig.cu	IAB.cToo	sig.cu	sig.au		IAB.cToo
1	0.00	0.00		0.00			0.00
		0.00	0.00	0.00			0.00
2	0.03	-0.02		-0.02			7.73
		0.02	0.00	0.02			0.00
3	0.06	-0.05		-0.05			7.77
		0.05	0.00	0.05			0.00
4	0.10	-0.07		-0.07			7.80
		0.07	0.00	0.07			0.00
5	0.21	-0.14		-0.14			7.88
		0.13	0.00	0.13			0.00
6	0.32	-0.18		-0.18			7.94
		0.18	0.00	0.18			0.00
7	0.43	-0.21		-0.21			7.97
		0.20	0.00	0.20			0.00
8	0.54	-0.22		-0.22			7.98
		0.21	0.00	0.21			0.00
9	0.54	-0.22		-0.22			7.98
		0.21	0.00	0.21			0.00
10	0.64	-0.21		-0.21			7.97
		0.20	0.00	0.20			0.00
11	0.75	-0.18		-0.18			7.93
		0.18	0.00	0.18			0.00
12	0.86	-0.14		-0.14			7.88
		0.13	0.00	0.13			0.00
13	0.96	-0.08		-0.08			7.80
		0.08	0.00	0.08			0.00
14	1.01	-0.05		-0.05			7.77
		0.05	0.00	0.05			0.00
15	1.04	-0.02		-0.02			7.73
		0.02	0.00	0.02			0.00
16	1.07	0.00		0.00			0.00
		0.00	0.00	0.00			0.00

Rissbreiten wku,wko Umweltklasse 3 quasi-std. Bs zul.wko = 0.30
Umweltklasse 2 quasi-std. Bs zul.wku = 0.30

Schnitt	X(m)	MSd(kNm)	sig.c	sig.s	Asu (cm2)	Aso	wku (mm)	wko
1	0.00	0.00	0.00	0.00	12.57		0.00	
2	0.03	0.04	0.00	9.08		0.03r		0.00
3	0.06	0.08	0.00	9.08		0.02r		0.00
4	0.10	0.12	0.00	9.08		0.01r		0.00
5	0.21	0.23	0.00	0.00	12.57		0.00	
6	0.32	0.30	0.00	0.00	12.57		0.00	
7	0.43	0.35	0.00	0.00	12.57		0.00	
8	0.54	0.36	0.00	0.00	12.57		0.00	
9	0.54	0.36	0.00	0.00	12.57		0.00	
10	0.64	0.35	0.00	0.00	12.57		0.00	
11	0.75	0.30	0.00	0.00	12.57		0.00	
12	0.86	0.23	0.00	0.00	12.57		0.00	
13	0.96	0.13	0.00	9.08		0.01r		0.00
14	1.01	0.08	0.00	9.08		0.02r		0.00
15	1.04	0.04	0.00	9.08		0.03r		0.00
16	1.07	0.00	0.00	0.00	12.57		0.00	

Fertigbau Lindenberg OTTO QUAST GmbH & Co. KG 57258 Freudenberg 02734/490-0

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Maßgebende Durchbiegungen:
k.I, k.II(1/km): Krümmungen im Zustand I und II
eff.k (1/km): effektive Krümmung für beta.1 =1.0, beta.2 =0.5

Durchbiegungen zum Zeitpunkt To unter G1 :

Schnitt	X(m)	M(kNm)	Mr(kNm)	k.I	k.II	eff.k	w(cm)
1	0.00	0.00	3.35	0.0000			0.0
2	0.03	0.04	3.35	0.0161			0.0
3	0.06	0.08	3.35	0.0338			0.0
4	0.10	0.12	3.35	0.0502			0.0
5	0.21	0.23	3.35	0.0947			0.0
6	0.32	0.30	3.35	0.1243			0.0
7	0.43	0.34	3.35	0.1421			0.0
8	0.54	0.36	3.35	0.1480			0.0
9	0.54	0.36	3.35	0.1480			0.0
10	0.64	0.34	3.35	0.1421			0.0
11	0.75	0.30	3.35	0.1243			0.0
12	0.86	0.23	3.35	0.0947			0.0
13	0.96	0.13	3.35	0.0533			0.0
14	1.01	0.08	3.35	0.0338			0.0
15	1.04	0.04	3.35	0.0161			0.0
16	1.07	0.00	3.35	0.0000			0.0

Auflagerverdrehungen alpha(arc) links: 0.00005 rechts:-0.00005

Durchbiegungen zum Zeitpunkt T11 unter G1 + (K+S).1 :

Schnitt	X(m)	M(kNm)	Mr(kNm)	k.I	k.II	eff.k	w(cm)
1	0.00	0.00	6.60	0.0000			0.0
2	0.03	0.04	6.60	0.3412			0.0
3	0.06	0.08	6.60	0.3695			0.0
4	0.10	0.12	6.60	0.3957			0.0
5	0.21	0.23	6.60	0.4672			0.0
6	0.32	0.30	6.60	0.5148			0.0
7	0.43	0.34	6.60	0.5433			0.0
8	0.54	0.36	6.60	0.5529			0.0
9	0.54	0.36	6.60	0.5529			0.0
10	0.64	0.34	6.60	0.5433			0.0
11	0.75	0.30	6.60	0.5148			0.0
12	0.86	0.23	6.60	0.4672			0.0
13	0.96	0.13	6.60	0.4008			0.0
14	1.01	0.08	6.60	0.3695			0.0
15	1.04	0.04	6.60	0.3412			0.0
16	1.07	0.00	6.60	0.0000			0.0

Auflagerverdrehungen alpha(arc) links: 0.00025 rechts:-0.00025

Durchbiegungen zum Zeitpunkt Too unter G1-3 + (K+S) + psi2*max.Q :

Schnitt	X(m)	M(kNm)	Mr(kNm)	k.I	k.II	eff.k	w(cm)
1	0.00	0.00	7.04	0.0000			0.0
2	0.03	0.04	3.38	1.1889			0.0
3	0.06	0.08	3.38	1.2340			0.0
4	0.10	0.12	3.39	1.2758			0.0
5	0.21	0.23	3.39	1.3897			0.0
6	0.32	0.30	3.40	1.4655			0.0
7	0.43	0.35	3.40	1.5110			0.0
8	0.54	0.36	3.40	1.5262			0.0
9	0.54	0.36	3.40	1.5262			0.0
10	0.64	0.35	3.40	1.5110			0.0
11	0.75	0.30	3.40	1.4655			0.0
12	0.86	0.23	3.39	1.3897			0.0
13	0.96	0.13	3.39	1.2839			0.0
14	1.01	0.08	3.38	1.2340			0.0
15	1.04	0.04	3.38	1.1889			0.0
16	1.07	0.00	7.04	0.0000			0.0

Auflagerverdrehungen alpha(arc) links: 0.00073 rechts:-0.00073

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Auftrag: 239998AS Pos.: 1 / 5 Seite

Erforderliche Längsbewehrung: (Spannstahl Ap + Betonstahl Asu, Aso)
(Außergewöhnl. Bs: MEd mit Zusatz "A")

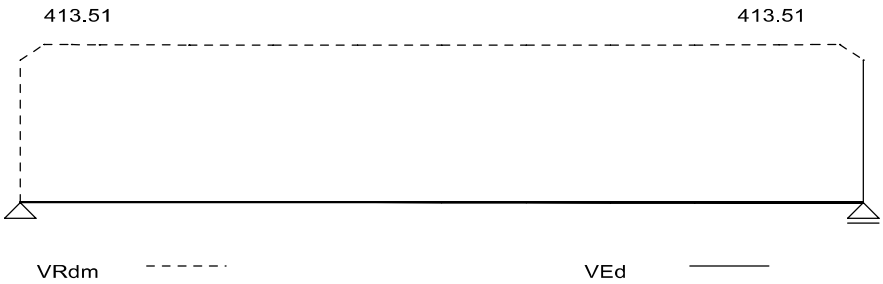
Schnitt	X(m)	MSd(kNm)	eps.c	eps.s	Z(kN)	Ap(cm2)	Asu(cm2)	Aso
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.03	1.92A	-0.93	25.00	29.85	0.00	2.19m	0.00
3	0.06	4.15A	-1.47	25.00	65.09	0.00	2.21m	0.00
4	0.10	6.37A	-1.94	25.00	100.76	0.00	2.23m	0.00
5	0.21	13.61A	-3.50	23.74	221.14	0.00	4.22	0.00
6	0.32	20.37A	-3.50	14.13	341.51	0.00	6.66	0.00
7	0.43	27.10A	-3.50	9.30	470.34	0.00	9.27	0.00
8	0.54	33.80A	-3.50	6.37	609.90	0.00	12.09	0.00
9	0.54	33.80A	-3.50	6.37	609.90	0.00	12.09	0.00
10	0.64	27.10A	-3.50	9.30	470.34	0.00	9.27	0.00
11	0.75	20.37A	-3.50	14.13	341.51	0.00	6.66	0.00
12	0.86	13.61A	-3.50	23.74	221.14	0.00	4.22	0.00
13	0.96	6.82A	-2.04	25.00	107.96	0.00	2.23m	0.00
14	1.01	4.15A	-1.47	25.00	65.09	0.00	2.21m	0.00
15	1.04	1.92A	-0.93	25.00	29.85	0.00	2.19m	0.00
16	1.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Erf. Schubbewehrung asw für Platten:
m: Mindestbewehrung
VEd*: red. Querkraft inf. auflagernaher Einzellast, z*: red. Hebelarm

Schnitt	X(m)	V0d(kN)	VEd(kN)	z(cm)	cot(V)	VRdmax	VRdc	Z.	asw
1	0.00	1.81	1.47						
2	0.03	1.70	1.47	6.5	3.00	413.51			
3	0.06	1.59	1.47	6.5	3.00	413.15	59.66	2	0.00
4	0.10	1.47	1.47	6.5	3.00	412.88	59.66	2	0.00
5	0.21	1.08	1.08	6.5	3.00	412.30	59.66	2	0.00
6	0.32	0.72	0.72	6.5	3.00	411.98	59.66	2	0.00
7	0.43	0.36	0.36	6.5	3.00	411.82	59.66	2	0.00
8	0.54	0.00	0.00						
9	0.54	0.00	0.00						
10	0.64	-0.36	-0.36	6.5	3.00	411.82	59.66	2	0.00
11	0.75	-0.72	-0.72	6.5	3.00	411.98	59.66	2	0.00
12	0.86	-1.08	-1.08	6.5	3.00	412.30	59.66	2	0.00
13	0.96	-1.44	-1.44	6.5	3.00	412.83	59.66	2	0.00
14	1.01	-1.59	-1.44	6.5	3.00	413.15	59.66	2	0.00
15	1.04	-1.70	-1.44	6.5	3.00	413.51			
16	1.07	-1.81	-1.44						

Maßg. Momente MEd (kNm) **M 1 : 14**

Maßg. Querkräfte VEd (kN) **M 1 : 165**



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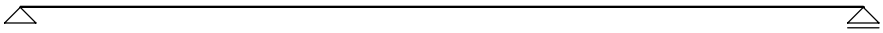
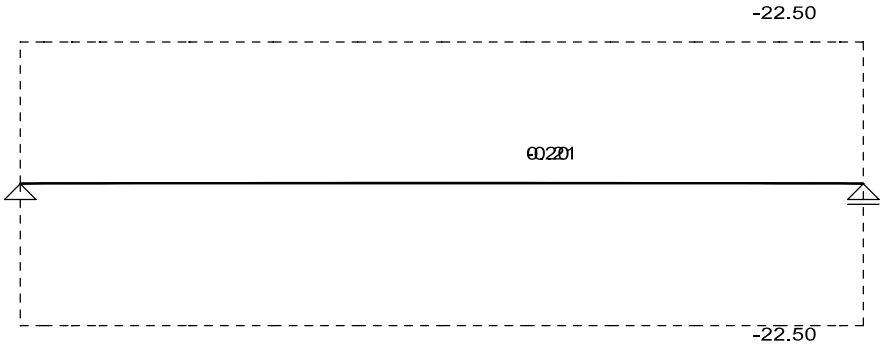
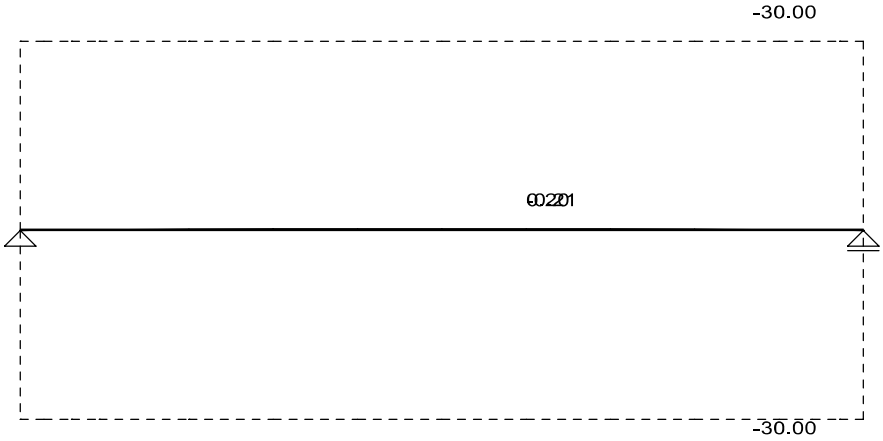
Maßg. Torsionsmomente TEd(kNm) **M 1 : 4**



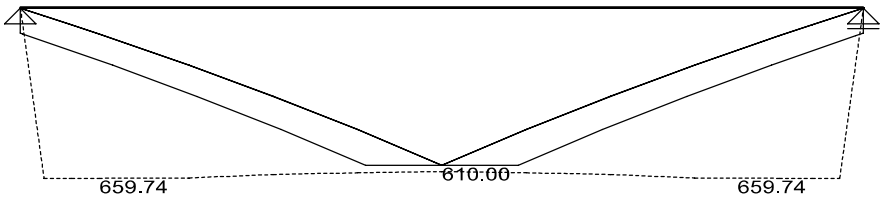
Spannungen sig.c (N/mm2) quasi-st. Kombination, T oo **M 1 : 10**



Spannungen sig.c (N/mm2) seltene Kombination, T oo **M 1 : 10**



Zugkraftdeckung Z (kN) **M 1 : 244**



erf.Z ——— vorh.Z - - - - - -

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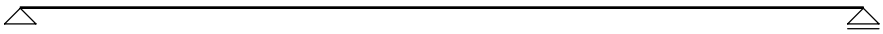
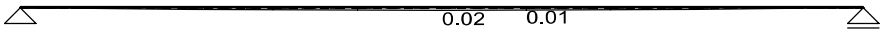
Schubbewehrung asw (cm2/m) S 500 **M 1 : 40**



Rissbreiten wk(mm) **M 1 : .30**

Durchbiegungen W (cm) **M 1 : .50**



w(To) — — —· w(T11) - - - - - · w(Too) ———

Pos. 2 Deckelwanne d=10cm Verkehrslast 5kN/m²

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Fertigbau Lindenberg OTTO QUAST GmbH & Co. KG  57258 Freudenberg  02734/490-0

Auftrag: 239998AS              Pos.: 2        /  1                Seite

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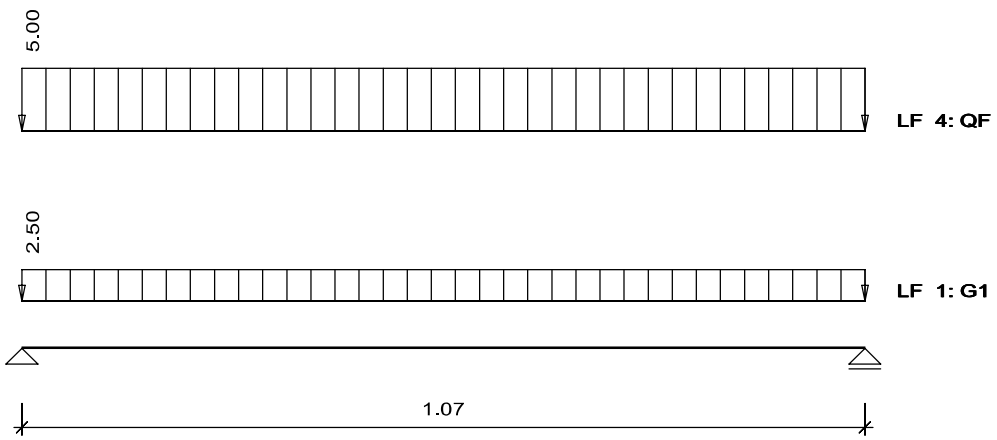
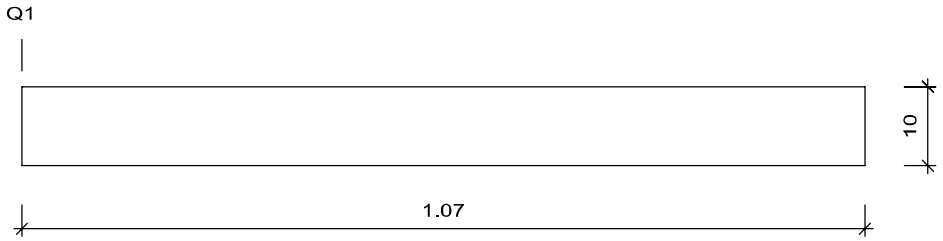
║ abacus-PROGRAMM           F E T T V19.0           ABARIB/ 8. 9.2023 ╒
║ Nachweise nach DIN/EC2   Fertigteilträger   EC2/SAU/SUP/HLK/FAT/DBS ╒
╚═══════════════════════════════════════════════════════════════════════╝

Titel: Deckelwanne d=10cm ls=1,07m LF Verkehr 5 kN/m²
Datei: ...ckung Klasse B125\Ingenieure\Statik\abacus\Fett Verkehr 5.dat
```

Lasten **M 1 : 5**

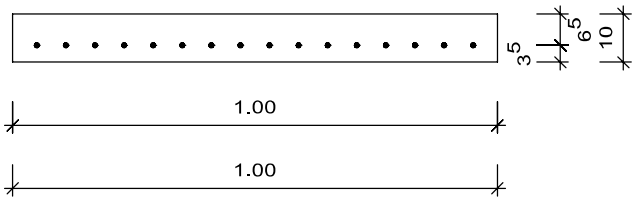


Längsschnitt **M 1 : 8**



Querschnitte **M 1 : 13**

Q1 x = 0.00




```
M A T E R I A L K E N N W E R T E :    Maßg. Norm: DIN EN 1992-1-1/N/A
* ansteigender Ast der SDL wird berücksichtigt
Bs = Bemessungssituationen

Beton Fertigteil: C50/60      Ecm     (N/mm2):   37000.0   eps.c2 :-2.00
                              Ec(To)  (N/mm2):   28600.6   eps.c2u:-3.50
Bs: Std.+vorüberg.            fcd     (N/mm2):      28.3   gamma.c: 1.50
                              fctm    (N/mm2):       4.1
                              fctk005(N/mm2):        2.9
Bs: Ermüdung                  fcd     (N/mm2):      28.3   gamma.c: 1.50

Betonstahl:       S500        Es      (N/mm2):  200000.0   eps.sy : 2.17
Bs: Std.+vorüberg.            fyd*    (N/mm2):     434.8   gamma.s: 1.15
                                                           eps.su :25.00
Bs: Ermüdung                  fyd*    (N/mm2):     434.8   gamma.s: 1.15
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Fertigbau Lindenberg OTTO QUAST GmbH & Co. KG  57258 Freudenberg  02734/490-0

Auftrag: 239998AS              Pos.: 2        /  2                 Seite


Vorwerte für Kriechen und Schwinden:
Zeitpunkt          Temperatur(G)  Feuchte(%)
   bis To     1 Tage :        25
To bis T1    30 Tage :        15          80
T1 bis Too            :                   50
Beton Fertigteil :  Konsistenz S2   Zement R (s=0.20)        1 Steg(e)
Relaxationsbeiwert  Beton      :                              0.80

Maßgebende Bemessungskombinationen (Bs)      unten          oben
Expositionsklassen                            XC3           XD3
Grenzzustand der Dekompression  Bs :     quasi-ständige    häufige
Rissbreitenbegrenzung           Bs :     quasi-ständige quasi-ständige
Rissbreiten                     zul.wk(mm):  0.30           0.30
Grenzdurchmesser    Betonstahl  dg(mm)    :  10.0            8.0

S Y S T E M W E R T E :  Kragarm             Feld             Kragarm
Stützweiten       L(m):    0.00               1.07             0.00
Auflagerbreiten   B(m):             0.06               0.06

Betonstahllagen:                            (neg. Z: ab OK Fertigteil)

Lage  Anzahl  As(cm2)  Asl(cm2)    E(cm)     Z(cm)     Xa(m)     Xe(m)
 1      16       D10     12.57       6.0       3.5     0.000     1.070

Querschnittsverlauf:

Schicht  Ba(cm)    Xa(m)   Za(cm)    Be(cm)    Xe(m)   Ze(cm)
   1      100.0    0.000     10.0     100.0    1.070     10.0
   2      100.0    0.000      0.0     100.0    1.070      0.0

B E L A S T U N G:
LF  Einwirkung Alt.  LF-Bezeichnung
 1  G1               Eigenlast
 4  QF               Verkehr

STR:Streckenlast Q1,Q2(kN/m), EIN:Einzellast Q1(kN), MOM:Moment Q1(kNm)
Eigenlast G1 generiert für gamma = 25.00 kN/m3

LF  Einwirkung   Art       A(m)      Q1        B(m)      Q2      Ey(cm)
 1  G1           STR      0.000     2.500     1.070     2.500       0.0
 4  QF           STR      0.000     5.000     1.070     5.000       0.0

Automatische Berücksichtigung der Kombinationsbeiwerte nach DIN EN 1991
P/T: Ständige, vorüberg. Bs, A: außergew. Bs         Ls: Lagesicherheit
Einwirkung   inf.gamma(P/T).sup (A).sup  psi0  psi1  psi2  r.inf  r.sup
G1               1.00      1.35    1.00  1.00  1.00  1.00
QF               0.00      1.50    1.00  0.70  0.70  0.60

A U F L A G E R K R Ä F T E  Az, Bz + - M O M E N T E  Ta, Tb:

LF  Einwirkung          Az(kN)     Ta(kNm)      Bz(kN)     Tb(kNm)
 1  G1                   1.338       0.000       1.337       0.000
 4  QF                   2.675       0.000       2.675       0.000
-----------------------------------------------------------------
max.Ad   (P/T)           5.818       0.000       5.818       0.000

Nachweis des Brandschutzes:                            DIN EN 1992-1-2
-----------------------------------------------------------------------
Feuerwiderstandsklasse      ermittelt: R 90                X(m):  0.535

Anpassung der Achsabstände a für die kritischen Temperaturen crit.T:
MEdfi=    0.86 kNm  erf.Z =   24.23 kN  crit.Ts= 700.0  del.as= -6.0 cm
MEd  =    1.56 kNm  vorh.Z=  573.68 kN

Mindestabmessungen                 erf.         vorh.
Platte Tabelle 5.8:
Plattendicke                hs  :  10.0 cm
Achsabstand Feldbew.        am  :   3.0 cm             Einfeldplatte
Achsabstand Feldbew.        am  :   1.5 cm             Durchlaufplatte
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Auftrag: 239998AS Pos.: 2 / 3 Seite

Maßgebende Längsspannungen im Gebrauchszustand sig(N/mm2):

Grenzwerte Betonstahl S500
Seltene Kombination 0.80 * fyk 0.80 * 500.0 sig.s < 400.00
Grenzwerte Beton C50/60
Zeitpunkt T0 (P0+G1) 0.45 * fck(T0) 0.45 * 16.6 sig.cT0 < -7.46
Seltene Kombination 0.60 * fck 0.60 * 50.0 sig.cToo < -30.00
Quasi-ständige Kombinat. 0.45 * fck 0.45 * 50.0 sig.cToo < -22.50

		quasi-ständig			seltene Kombination		
Schnitt	X(m)	sig.co	sig.p	sig.co	sig.ao	sig.p	sig.s
		sig.cu	IAB.cToo	sig.cu	sig.au		IAB.cToo
1	0.00	0.00		0.00			0.00
		0.00	0.00	0.00			0.00
2	0.03	-0.02		-0.02			7.81
		0.02	0.00	0.02			0.00
3	0.06	-0.05		-0.05			7.92
		0.05	0.00	0.05			0.00
4	0.10	-0.07		-0.11			8.02
		0.07	0.00	0.07			0.00
5	0.21	-0.19		-0.30			8.30
		0.13	0.01	0.13			0.01
6	0.32	-0.29		-0.43			8.48
		0.18	0.01	0.18			0.01
7	0.43	-0.34		-0.51			8.59
		0.20	0.02	0.20			0.02
8	0.54	-0.36		-0.53			8.63
		0.21	0.02	0.21			0.02
9	0.64	-0.34		-0.51			8.59
		0.20	0.02	0.20			0.02
10	0.75	-0.29		-0.43			8.48
		0.18	0.01	0.18			0.01
11	0.86	-0.19		-0.30			8.30
		0.13	0.01	0.13			0.01
12	0.96	-0.08		-0.12			8.04
		0.08	0.00	0.08			0.00
13	1.01	-0.05		-0.05			7.92
		0.05	0.00	0.05			0.00
14	1.04	-0.02		-0.02			7.81
		0.02	0.00	0.02			0.00
15	1.07	0.00		0.00			0.00
		0.00	0.00	0.00			0.00

Rissbreiten wku,wko Umweltklasse 3 quasi-std. Bs zul.wko = 0.30
Umweltklasse 2 quasi-std. Bs zul.wku = 0.30

Schnitt	X(m)	MSd(kNm)	sig.c	sig.s	Asu (cm2)	Aso	wku (mm)	wko
1	0.00	0.00	0.00	0.00	12.57		0.00	
2	0.03	0.04	0.00	9.08		0.03r		0.00
3	0.06	0.08	0.00	9.08		0.02r		0.00
4	0.10	0.12	0.00	9.08		0.01r		0.00
5	0.21	0.51	0.00	0.00	12.57		0.00	
6	0.32	0.66	0.00	0.00	12.57		0.00	
7	0.43	0.76	0.00	0.00	12.57		0.00	
8	0.54	0.79	0.00	0.00	12.57		0.00	
9	0.64	0.76	0.00	0.00	12.57		0.00	
10	0.75	0.66	0.00	0.00	12.57		0.00	
11	0.86	0.51	0.00	0.00	12.57		0.00	
12	0.96	0.13	0.00	9.08		0.01r		0.00
13	1.01	0.08	0.00	9.08		0.02r		0.00
14	1.04	0.04	0.00	9.08		0.03r		0.00
15	1.07	0.00	0.00	0.00	12.57		0.00	

Maßgebende Durchbiegungen:
k.I, k.II(1/km): Krümmungen im Zustand I und II
eff.k (1/km): effektive Krümmung für beta.1 =1.0, beta.2 =0.5

Durchbiegungen zum Zeitpunkt To unter G1 :

Schnitt	X(m)	M(kNm)	Mr(kNm)	k.I	k.II	eff.k	w(cm)
1	0.00	0.00	3.35	0.0000			0.0
2	0.03	0.04	3.35	0.0161			0.0
3	0.06	0.08	3.35	0.0338			0.0
4	0.10	0.12	3.35	0.0502			0.0
5	0.21	0.23	3.35	0.0947			0.0
6	0.32	0.30	3.35	0.1243			0.0
7	0.43	0.34	3.35	0.1421			0.0
8	0.54	0.36	3.35	0.1480			0.0
9	0.64	0.34	3.35	0.1421			0.0

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Auftrag: 239998AS Pos.: 2 / 4 Seite

Schnitt	X(m)	M(kNm)	Mr(kNm)	k.I	k.II	eff.k	w(cm)
10	0.75	0.30	3.35	0.1243			0.0
11	0.86	0.23	3.35	0.0947			0.0
12	0.96	0.13	3.35	0.0533			0.0
13	1.01	0.08	3.35	0.0338			0.0
14	1.04	0.04	3.35	0.0161			0.0
15	1.07	0.00	3.35	0.0000			0.0

Auflagerverdrehungen alpha(arc) links: 0.00005 rechts:-0.00005

Durchbiegungen zum Zeitpunkt T11 unter G1 + (K+S).1 :

Schnitt	X(m)	M(kNm)	Mr(kNm)	k.I	k.II	eff.k	w(cm)
1	0.00	0.00	6.60	0.0000			0.0
2	0.03	0.04	6.60	0.3412			0.0
3	0.06	0.08	6.60	0.3695			0.0
4	0.10	0.12	6.60	0.3957			0.0
5	0.21	0.23	6.60	0.4672			0.0
6	0.32	0.30	6.60	0.5148			0.0
7	0.43	0.34	6.60	0.5433			0.0
8	0.54	0.36	6.60	0.5529			0.0
9	0.64	0.34	6.60	0.5433			0.0
10	0.75	0.30	6.60	0.5148			0.0
11	0.86	0.23	6.60	0.4672			0.0
12	0.96	0.13	6.60	0.4008			0.0
13	1.01	0.08	6.60	0.3695			0.0
14	1.04	0.04	6.60	0.3412			0.0
15	1.07	0.00	6.60	0.0000			0.0

Auflagerverdrehungen alpha(arc) links: 0.00025 rechts:-0.00025

Durchbiegungen zum Zeitpunkt Too unter G1-3 + (K+S) + psi2*max.Q :

Schnitt	X(m)	M(kNm)	Mr(kNm)	k.I	k.II	eff.k	w(cm)
1	0.00	0.00	7.04	0.0000			0.0
2	0.03	0.09	3.38	1.2039			0.0
3	0.06	0.18	3.38	1.2654			0.0
4	0.10	0.27	3.39	1.3223			0.0
5	0.21	0.51	3.39	1.4776			0.0
6	0.32	0.66	3.40	1.5808			0.0
7	0.43	0.76	3.40	1.6428			0.0
8	0.54	0.79	3.40	1.6635			0.0
9	0.64	0.76	3.40	1.6428			0.0
10	0.75	0.66	3.40	1.5808			0.0
11	0.86	0.51	3.39	1.4776			0.0
12	0.96	0.29	3.39	1.3333			0.0
13	1.01	0.18	3.38	1.2653			0.0
14	1.04	0.09	3.38	1.2038			0.0
15	1.07	0.00	7.04	0.0000			0.0

Auflagerverdrehungen alpha(arc) links: 0.00078 rechts:-0.00078

Erforderliche Längsbewehrung: (Spannstahl Ap + Betonstahl Asu, Aso)

Schnitt	X(m)	MSd(kNm)	eps.c	eps.s	Z(kN)	Ap(cm2)	Asu(cm2)	Aso
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.03	0.17	-0.28	25.00	2.62	0.00	2.17m	0.00
3	0.06	0.36	-0.40	25.00	5.49	0.00	2.18m	0.00
4	0.10	0.53	-0.49	25.00	8.17	0.00	2.18m	0.00
5	0.21	1.00	-0.70	25.00	15.47	0.00	2.19m	0.00
6	0.32	1.31	-0.81	25.00	20.33	0.00	2.19m	0.00
7	0.43	1.49	-0.87	25.00	23.26	0.00	2.19m	0.00
8	0.54	1.56	-0.89	25.00	24.23	0.00	2.19m	0.00
9	0.64	1.49	-0.87	25.00	23.26	0.00	2.19m	0.00
10	0.75	1.31	-0.81	25.00	20.33	0.00	2.19m	0.00
11	0.86	1.00	-0.70	25.00	15.47	0.00	2.19m	0.00
12	0.96	0.56	-0.51	25.00	8.68	0.00	2.18m	0.00
13	1.01	0.36	-0.40	25.00	5.49	0.00	2.18m	0.00
14	1.04	0.17	-0.28	25.00	2.62	0.00	2.17m	0.00
15	1.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Erf. Schubbewehrung asw für Platten:
m: Mindestbewehrung
VEd*: red. Querkraft inf. auflagernaher Einzellast, z*: red. Hebelarm

Schnitt	X(m)	V0d(kN)	VEd(kN)	z(cm)	cot(V)	VRdmax	VRdc	Z.	asw
1	0.00	5.82	4.73						
2	0.03	5.49	4.73	6.5	3.00	412.85			
3	0.06	5.11	4.73	6.5	3.00	412.14	59.66	2	0.00

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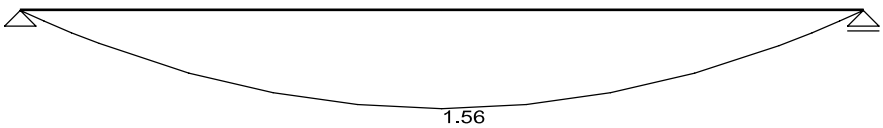
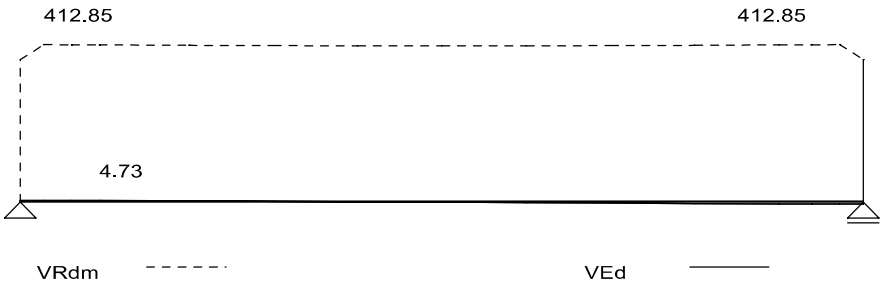
Auftrag: 239998AS Pos.: 2 / 5 Seite

Schnitt	X(m)	V0d(kN)	VEd(kN)	z(cm)	cot(V)	VRdmax	VRdc	Z.	asw
4	0.10	4.73	4.73	6.5	3.00	411.63	59.66	2	0.00
5	0.21	3.49	3.49	6.4	3.00	410.49	59.66	2	0.00
6	0.32	2.33	2.33	6.4	3.00	409.86	59.66	2	0.00
7	0.43	1.16	1.16	6.4	3.00	409.51	59.66	2	0.00
8	0.54	0.00	0.00						
9	0.64	-1.16	-1.16	6.4	3.00	409.51	59.66	2	0.00
10	0.75	-2.33	-2.33	6.4	3.00	409.86	59.66	2	0.00
11	0.86	-3.49	-3.49	6.4	3.00	410.49	59.66	2	0.00
12	0.96	-4.65	-4.65	6.5	3.00	411.54	59.66	2	0.00
13	1.01	-5.11	-4.65	6.5	3.00	412.14	59.66	2	0.00
14	1.04	-5.49	-4.65	6.5	3.00	412.85			
15	1.07	-5.82	-4.65						

Maßg. Momente MEd (kNm) **M 1 : 1**

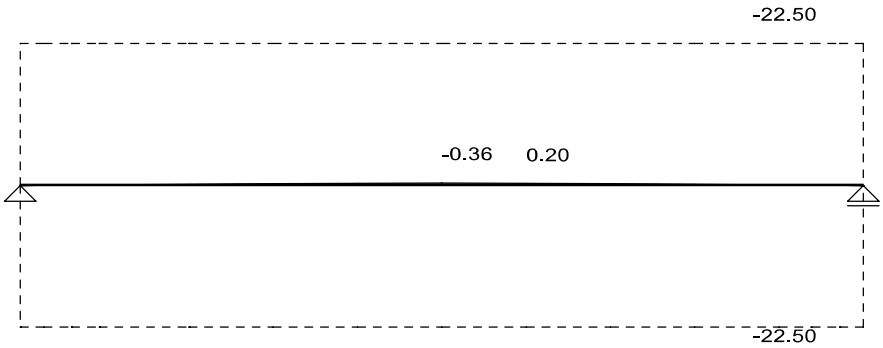


Maßg. Querkräfte VEd (kN) **M 1 : 165**



Maßg. Torsionsmomente TEd(kNm) **M 1 : 4**

Spannungen sig.c (N/mm2) quasi-st. Kombination, T oo **M 1 : 10**



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Auftrag: 239998AS Pos.: 2 / 6 Seite

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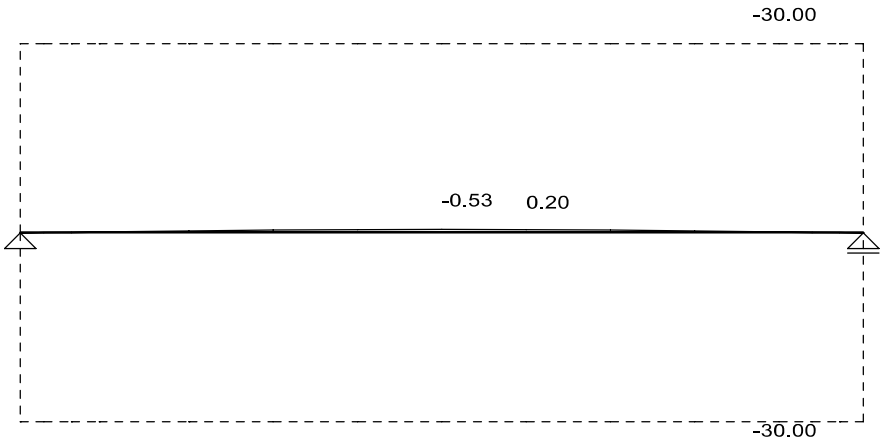
Spannungen sig.c (N/mm2) seltene Kombination, T oo **M 1 : 10**



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Auftrag: 239998AS Pos.: 2 / 7 Seite

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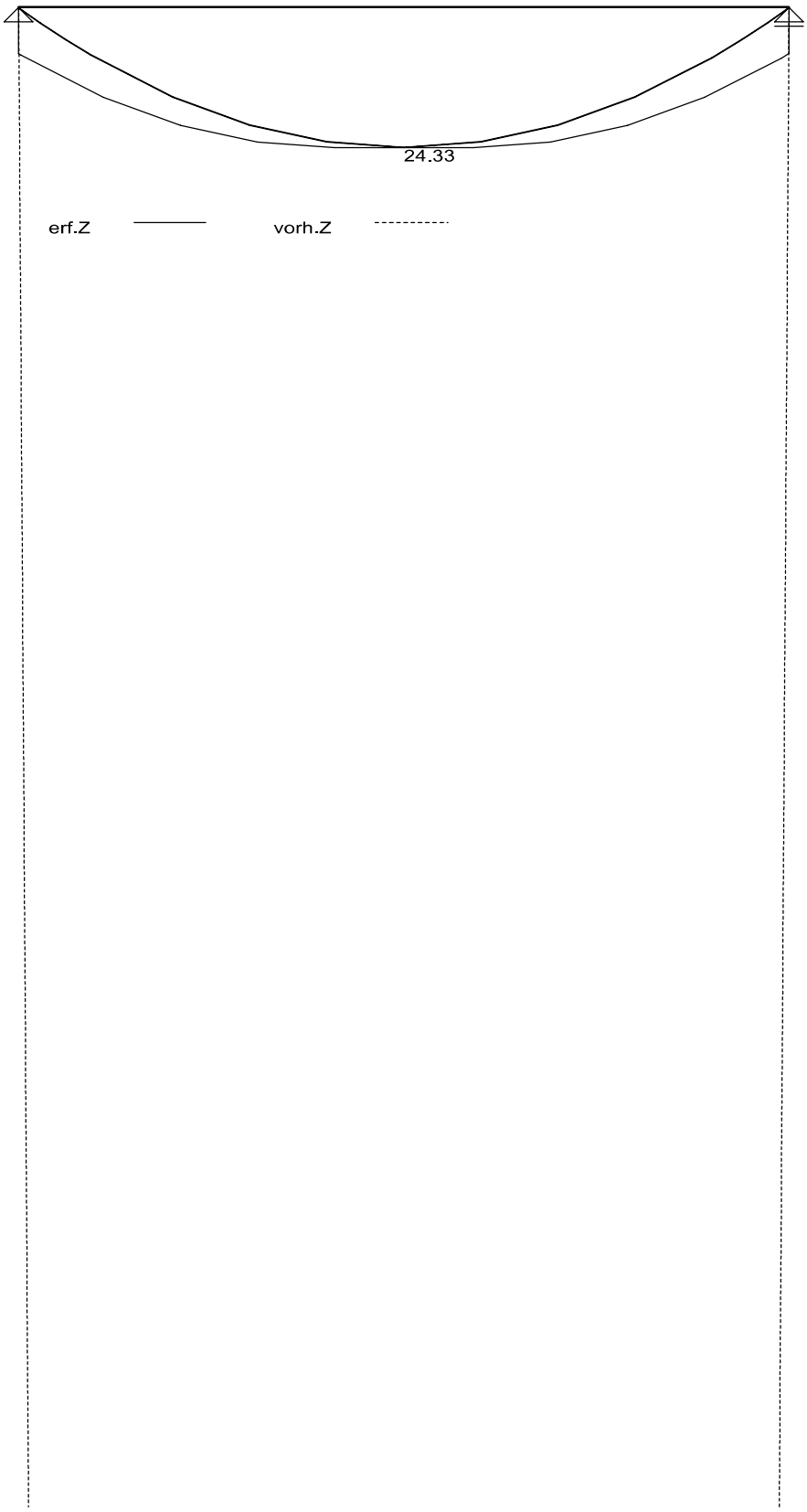
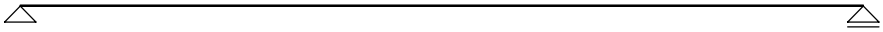
Zugkraftdeckung Z (kN) **M 1 : 10**

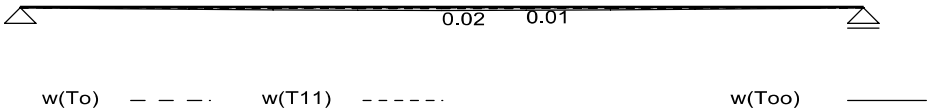


Schubbewehrung asw (cm2/m) S 500 **M 1 : 40**



Rissbreiten wk(mm) **M 1 : .30**

Durchbiegungen W (cm) **M 1 : .50**



Pos. S Schlussblatt

Zusammenfassung der Berechnung:

Die Nachweise für die Prüflast von 125kN Pos.1 als auch die Bemessung für eine Verkehrslast von 5kN/m² Pos.2 ergaben Für die Deckelwanne B x L x H = 1138x1138x100mm unter Berücksichtigung der erforderlichen Betongüte C50/60 und des ermittelten Bewehrungsgehalts eine Ausreichende Tragfähigkeit für die Nachweise nach DIN-EN 124, DIN EN 1992-1-1 und DIN EN 1992-1-1/NA.

Der Nachweis des Brandschutzes ergab für die Pos.1 und Pos.2 eine Eingruppierung des Bauteils in die Feuerwiderstandsklasse R90 nach DIN EN 1992-1-2 bei einer Höhe von 100mm.

aufgestellt:

Freudenberg, den 08.09.2023

OTTO QUAST Fertigbau Lindenberg
Telefon: +49 (0)2734 490-0

Fertigbau Lindenberg
OTTO QUAST
GmbH & Co. KG
An der Autobahn 16-30
57258 Freudenberg

Ingenieurkammer-Bau NRW
Dipl.-Ing. (FH)
John Robert Jung
qualifizierter Tragwerksplaner
Mitgliedsnummer 744519

.....
(Fa. OTTO Quast, John R. Jung)

Bei Rückfragen zur vorstehenden Berechnung wenden Sie sich bitte an unsere Mitarbeiter:
John Robert Jung (+49 (0)2734 490- 490)

Specification text: Hailo cable shaft cover type H-CSC

Trafficable flush shaft cover for setting in concrete, for enhanced fire safety requirements, tested and certified for min. 90-minute fire and smoke tightness according to DIN 4102 class F90 and EN 13501-2 class EI90 and for load class B125kN / D400kN according to EN124, frame and lid trough made of V2A - 1.4301 / V4A - 1.4571 stainless steel, frame with outer reinforcement connection and height adjustment, fire-insulated centre strut for multi-part covers, lid pre-assembled to allow insertion of a defined reinforcement and subsequent filling with concrete of class C50/60, lid with frame secured with three-square bolts, surface water tight, frost and weather-resistant and with high temperature-resistant silicone foam profile seal, version: 1-part / X-part with centre strut size: clearance ___ x ___* mm, design height: 120mm (Kl. B) oder 150 / 180mm (Kl. D)

Version Hailo type H-CSC or equivalent

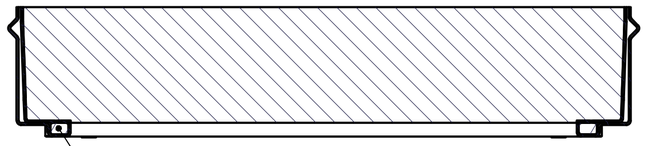
Supply recommendation:

Hailo-Werk Rudolf Loh GmbH & Co. KG
D-35708 Haiger
e-mail: info@hailo-professional.de
Tel.: 02773 / 82-0
Fax: 02773 / 82-218

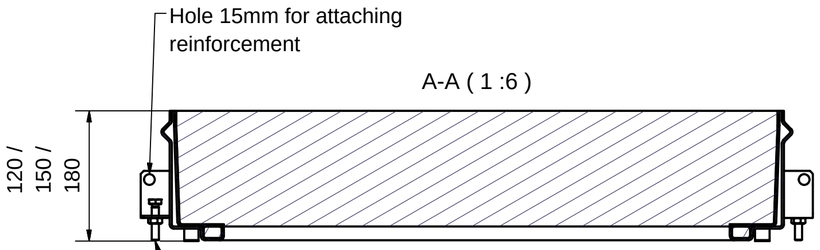
* delete as applicable / insert figures

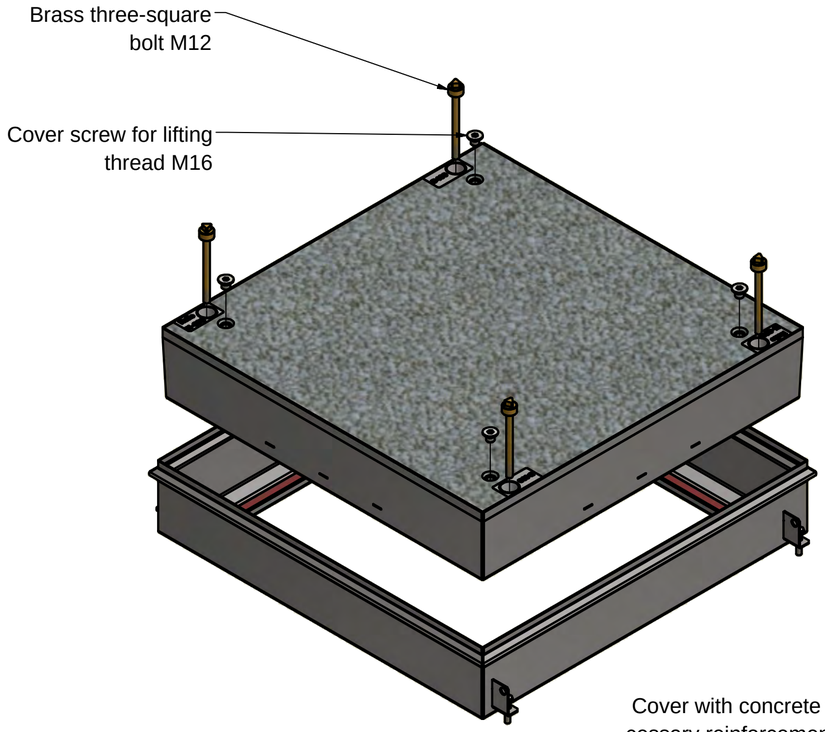
Projekt-Nr. / Project-No.

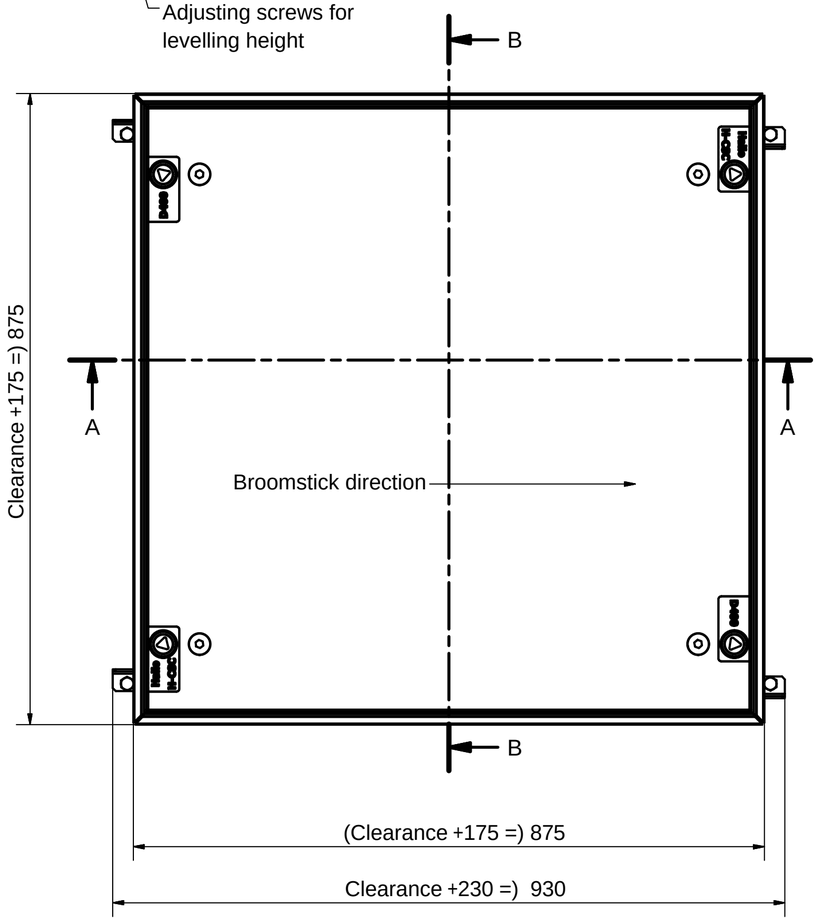
B-B (1 :6)

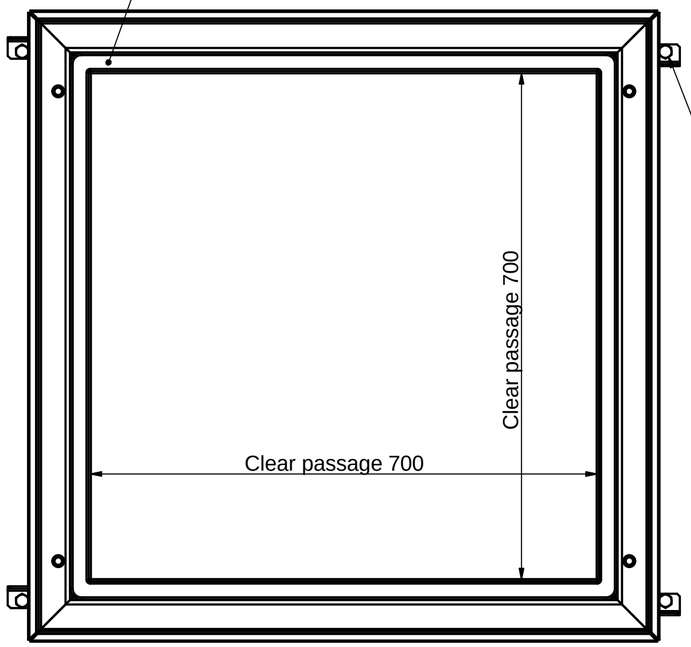


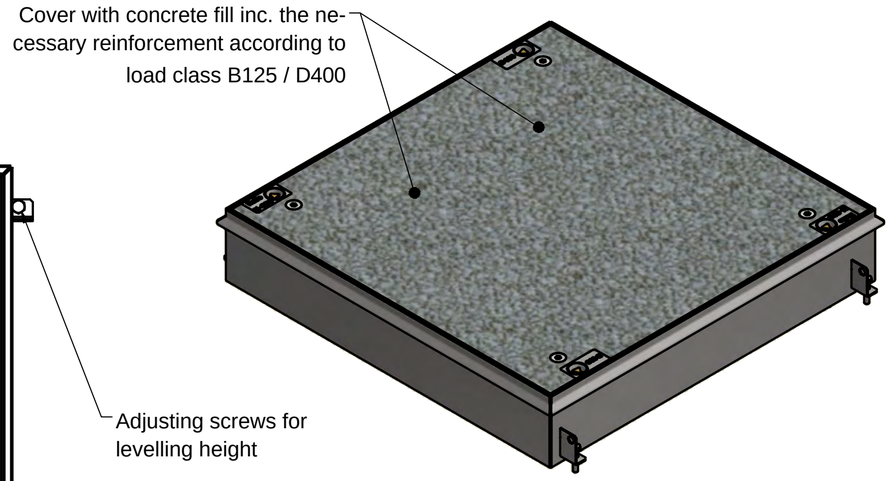
A-A (1 :6)











item	QTY	UNIT	DESCRIPTION	DWG-NUMBER	REV	ART-NO
50	4	pce	Screw DIN7991 M16x20 V4A			
40	4	pce	H-CSC H180 three-square bolt M12 L=143	6000 4091 2 09 4		
30	1	pce	H-CSC H180 cover clearance 700x700 2-tlg. kpl.	6000 5164 2 25 2		
20	1	pce	at 2,9m H-CSC silicone seal 25x20mm			
10	1	pce	H-CSC H150 frame clearance 600x1200 2-tlg.	6000 5162 1 25 2		

Verwendungsbereich/ Field of application: Professional	Zul. Abweichung/ Acc. tolerances: DIN EN ISO 13920 - A	Oberfl^{a}che/ Surface: pickled	Ma$\subset$stab / Scale: 1 :6
Artikel-Nr. / Article- No.			Gewicht / Weight: ca. 335 kg
			Werkstoff / Material: Stainless steel 1.4571 / ASTM 316 ti
	Datum / Date	Name	Benennung / Description: H-CSC H150 / H180 LW700x700 1-tlg. Cabel shaft cover - fire safety 90min
	Gezeichnet/ Created by: 23.08.2018	R¿bsamen	
	Kontrolliert/ Checked by:		
	Norm/ Standard:		

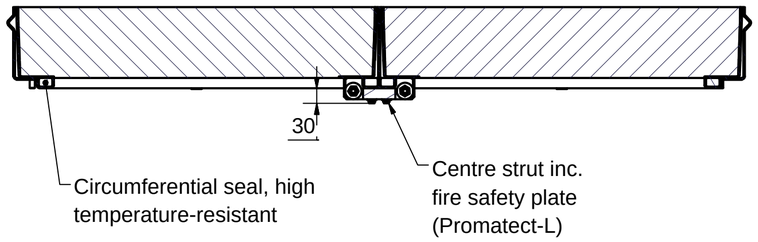
Hailo-Werk
Rudolf Loh GmbH & Co. KG

Zeichnungsnummer / Drawing number | Rev. | Blatt / Sheet 1 | A2

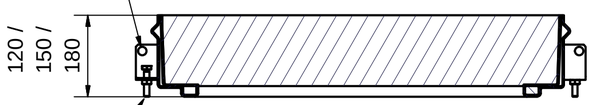
Zust / actual	nderungen / modification	Datum / Date	Name	Urspr. / Origin	Ers. f. / Issued for	Ers. d. / Issued by

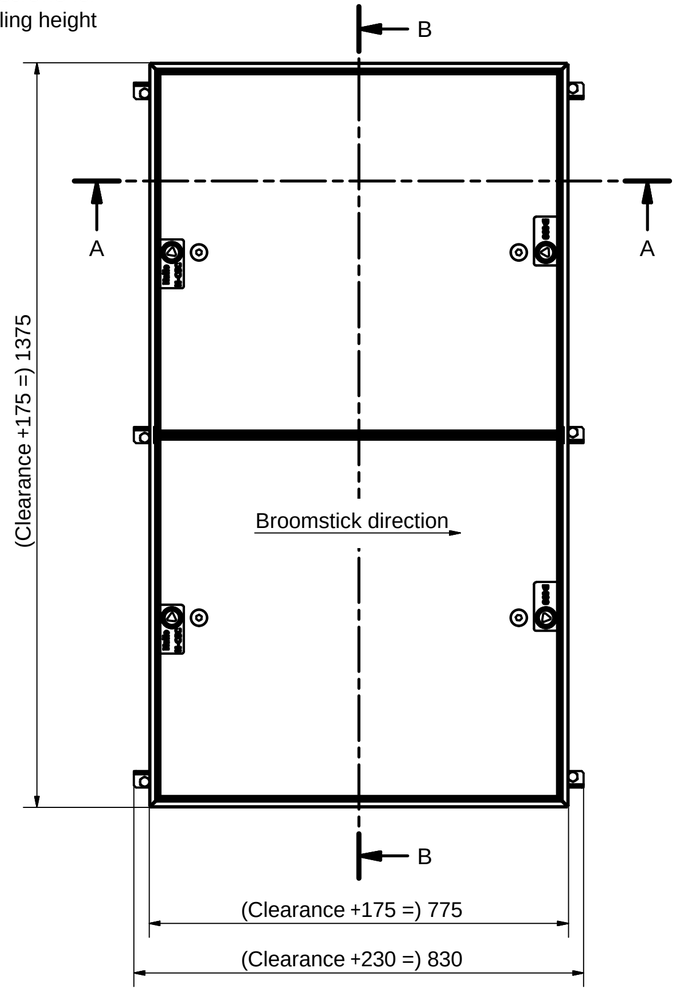
Projekt-Nr. / Project-No.

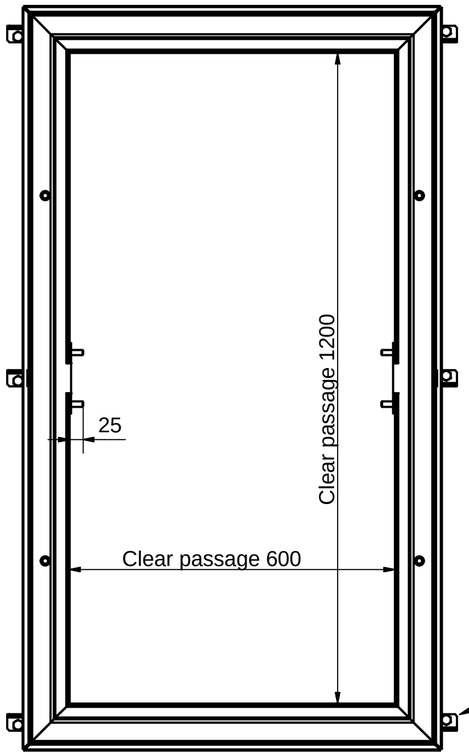
B-B (1 : 8)

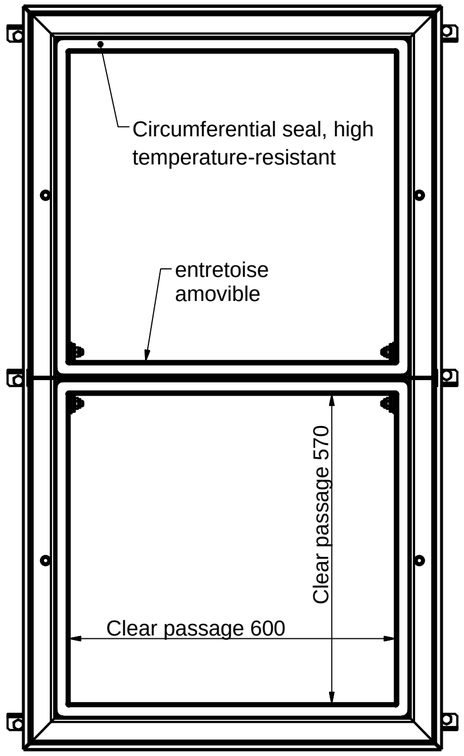


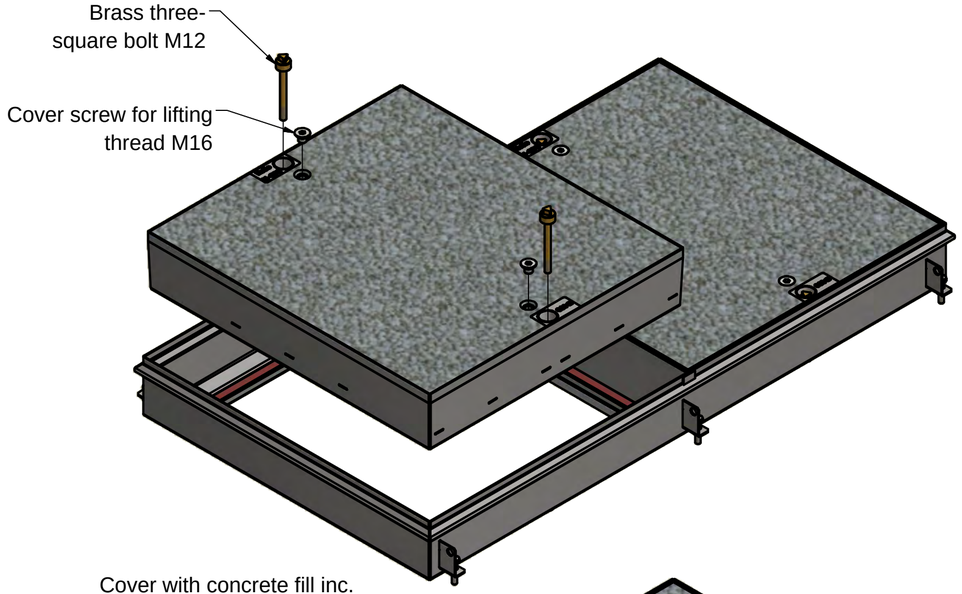
A-A (1 : 8)

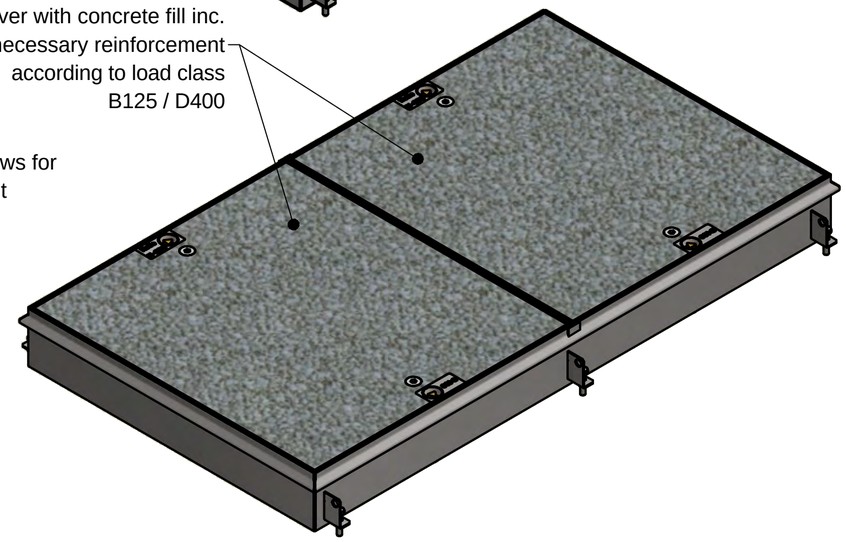












item	QTY	UNIT	DESCRIPTION	DWG-NUMBER	REV	ART-NO
120	4	pce	Nut DIN985 M10 V4A			
110	4	pce	Washer DIN9021 10,5 V4A			
100	4	pce	Nut DIN985 M6 V4A			
90	4	pce	Washer DIN9021 6,4 V4A			
80	4	pce	Screw DIN7991 M6x30 V4A			
70	4	pce	Screw DIN7991 M16x20 V4A			
60	4	pce	H-CSC H150 three-square bolt M12 L=143	6000 4091 2 09 4		
50	2	pce	H-CSC H150 cover clearance 600x1200 2-tlg. kpl.	6000 5187 1 09 3		
40	2	pce	at 2,5m H-CSC silicone seal 25x20mm			
30	1	pce	H-CSC H150 Promatect-L moulded part clearance 600	6000 4090 2 09 4		
20	1	pce	H-CSC H150 centre strut LW600	6000 5186 1 09 3		
10	1	pce	H-CSC H150 frame clearance 600x1200 2-tlg.	6000 5183 1 09 3		

Verwendungsbereich/ Field of application: Professional

Artikel-Nr. / Article- No.

Zul. Abweichung/ Acc. tolerances: DIN EN ISO 13920 - A

Oberfl^{a}che/ Surface: pickled

MaÇstab / Scale: 1 : 8

Gewicht / Weight

Werkstoff / Material: Stainless steel 1.4571 / ASTM 316 ti

	Datum / Date	Name
Gezeichnet/ Created by	26.06.2018	R¿bsamen
Kontrolliert/ Checked by		
Norm/ Standard		

Benennung / Description

H-CSC H150 / H180 LW1200x600 2-tlg.
Cabel shaft cover - fire safety 90min

Diese Zeichung darf nur am Bildschirm ge^{a}ndert werden
Alternations to be made on computer systems only

Hailo-Werk
Rudolf Loh GmbH & Co. KG

Zeichnungsnummer / Drawing number

Rev.

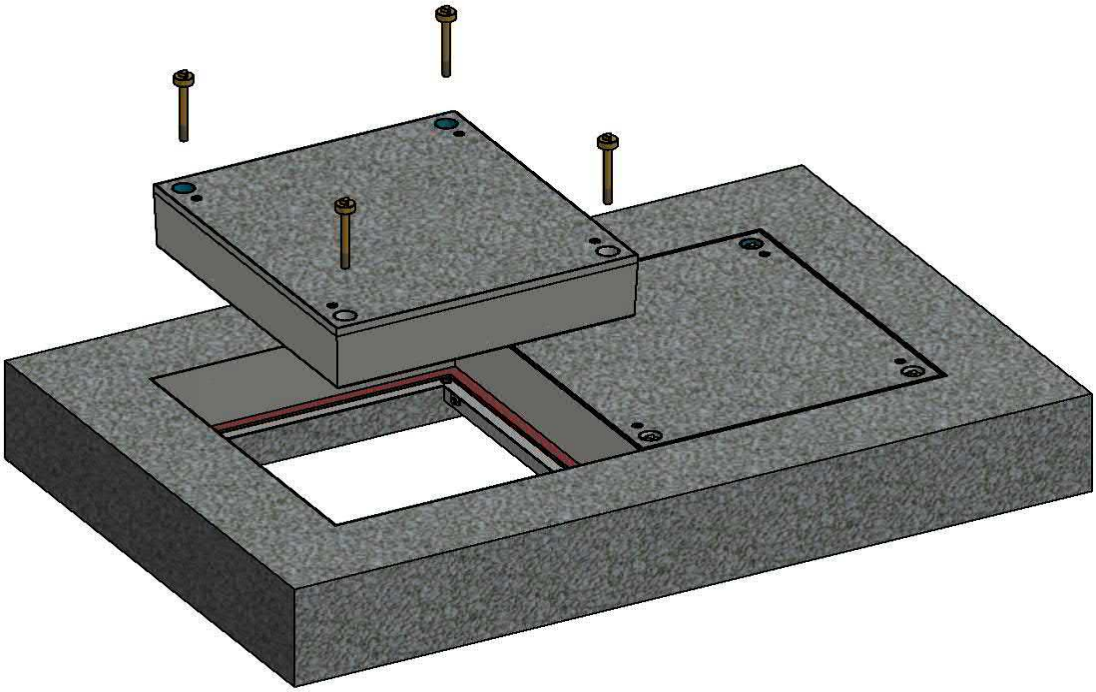
Blatt / Sheet 1

A2

Zust./ actual	nderungen / modification	Datum / Date	Name	Urspr. / Origin	Ers. f. / Issued for	Ers. d. / Issued by

Instructions for assembly and use
Hailo cable shaft cover type H-CSC

Shaft cover, flush, with lid for concrete fill, for enhanced fire safety requirements, trafficable according to EN124 load classes B125kN / D400kN
Frame and lid trough made of stainless steel, lid screwed in all round



(This view is for illustration purposes only and, depending on the equipment, is not necessarily representative of the Hailo scope of delivery).

Chapter 1: Frame - Establishing the outer concrete surround

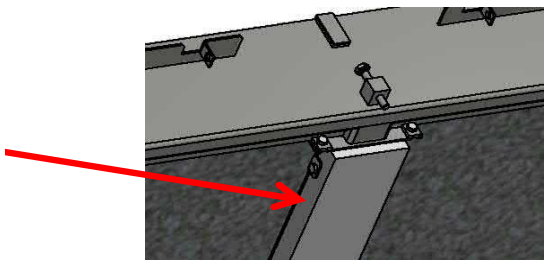
IMPORTANT!!!

To avoid damage to the cover, it is absolutely essential to comply with the following instructions.
Hailo accepts no liability or warranty for damage caused by improper handling.
The lid must sit correctly in and be firmly screwed to the frame while being sealed in the structure (e.g. emergency walkway).

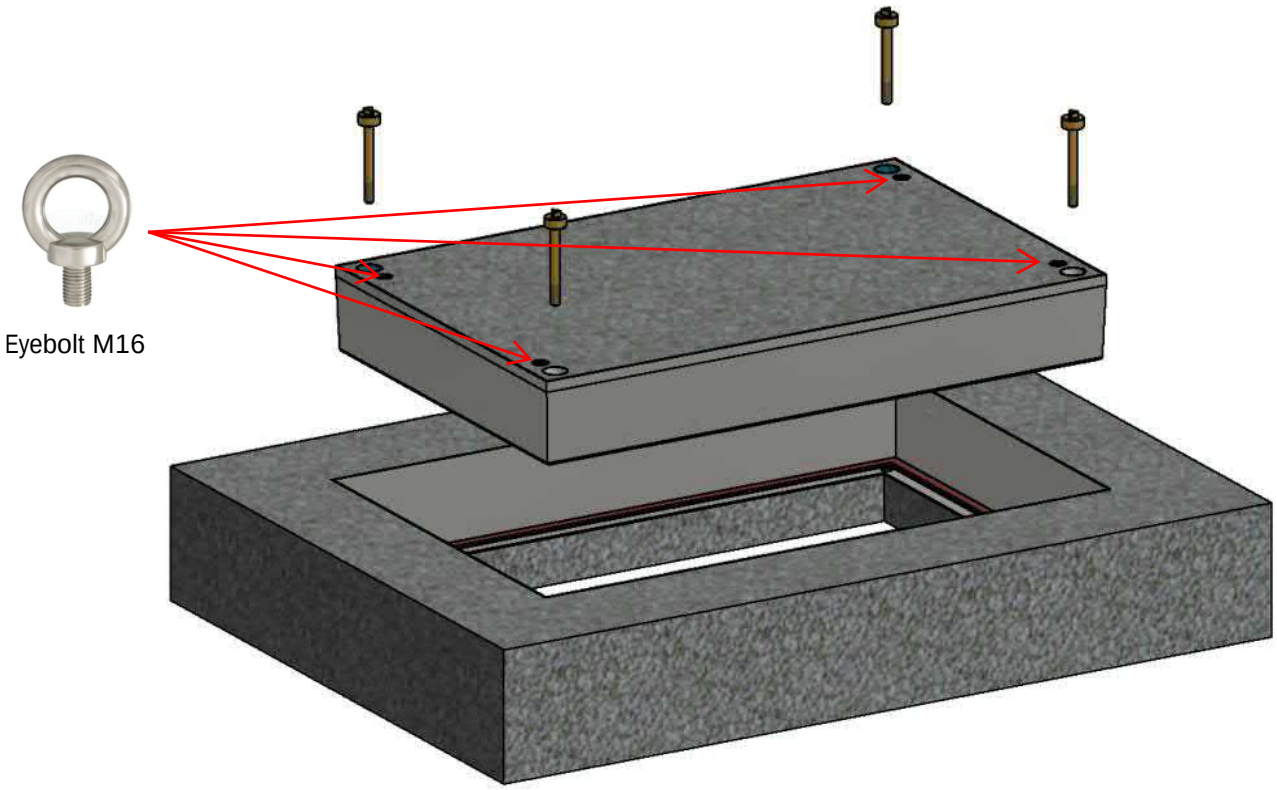
1. The installation space required corresponds to the outer dimensions of the frame + an allowance for the reinforcement and sealing compound.
2. Remove the parts supplied from the cover, e.g. the operator key.
   A level contact surface must be created for the shaft cover before the cover is placed on the structure. The depth of the contact surface, measured from ground level, depends on the design height of the cover. The contact surface can be adjusted to the slope of the ground, but this must not cause any diagonal distortion.
3. Using appropriate lifting tackle or equipment, such as a crane, forklift, digger, etc., place the shaft cover in the intended position. The cover must only be installed when closed and screwed tight (lid with frame) using the enclosed lifting eyes.

   ATTENTION: If the frame is inserted in the opening without the lid, there is a risk that the frame will go out of shape when the reinforcement is attached or the concrete is poured in. In that case it may no longer be possible to insert the lid properly and safely.
4. The frame can be adjusted precisely in height. Should this not be sufficient, suitable supports (e.g. steel plates) can be inserted underneath the adjusting screws to bring the cover to the required height.
5. Once the cover is finally fixed, seal the gap all the way round between the frame and structure (wooden framework, sealing strip, etc.).
6. Use the operator key to check whether the lid is firmly screwed to the frame with the circumferential screws. This prevents the frame from getting out of shape and ensures the lid stays in the correct position in the frame. To safeguard against lifting and movement when concreting, the cover can be secured using ballast.
7. Insert the reinforcement around the cover and establish a connection between the reinforcement and the masonry anchors of the shaft cover.
8. The cover can now be finish-poured. It is recommended that the concrete is rammed with internal vibrocompactors. Allow for the setting times specified for the concrete.
9. Once all work has been completed, it is important to remove any concrete residue and dirt from the frame and the lid. This ensures that your Hailo shaft cover will have a long and trouble-free service life.

IMPORTANT NOTICE:
In multi-part covers, the fire safety plate below the centre strut projects a little downwards out of the frame. That means the cover must not be stored on timber beams or the like.



Chapter 2: Instructions - Lifting out and inserting the lid



1. Undo the circumferential three-square bolts using the operator key.

2. There are M16 threaded sleeves in the corners of the lid. Remove the plug screws in them and screw them into the enclosed eye bolts so that the lid can be lifted.

3. You can now lift the lid out using suitable lifting tackle and hoists such as a crane or digger. To avoid damage to the stainless steel surfaces, make sure that the lid does not strike against the frame while being lifted out.

4. The clear opening of the shaft cover is now freely accessible.

5. Before fitting the lid, **clean the seal and the stainless steel contact surfaces between the lid and the frame using a hand brush or cloth**. The use of stainless steel removes the need to apply oil or grease.

6. The lid is fitted and screwed down in the reverse order of the steps described in points 1 - 3.

Chapter 3: Maintaining and caring for the shaft cover

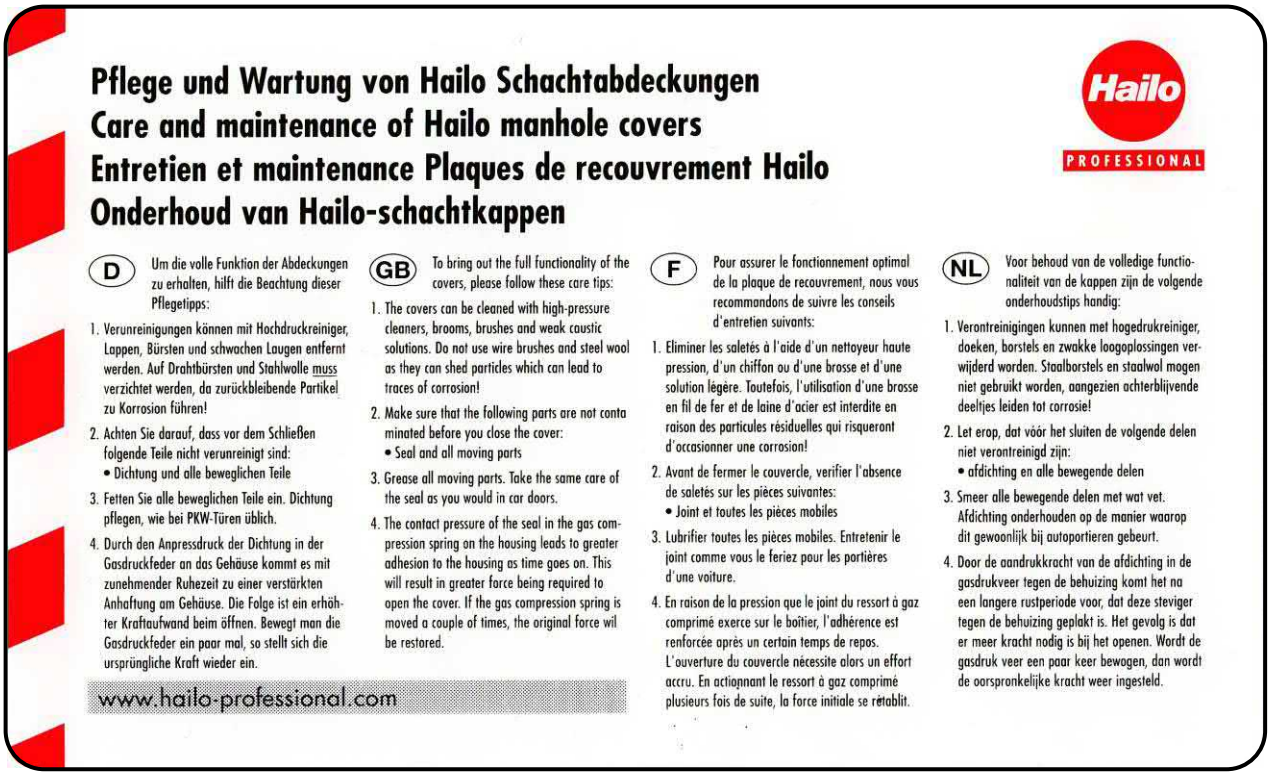
1. To prevent the screwed connection between the lid and the frame from "seizing" due to corrosion, the three-square bolts are made of brass.

2. The plug screws can be greased on the thread so that they can be freed more easily if the shaft cover has not been opened for a prolonged period.

3. The seal must always be kept clean in order to avoid damage and the resulting loss of sealing.

4. For that reason, clean the seal around the frame and the stainless steel contact surfaces between the lid and the frame with a hand brush or cloth every time before fitting the lid. The use of stainless steel removes the need to apply oil or grease.

This ensures that your Hailo shaft cover will have a long and trouble-free service life.



Pflege und Wartung von Hailo Schachtabdeckungen
Care and maintenance of Hailo manhole covers
Entretien et maintenance Plaques de recouvrement Hailo
Onderhoud van Hailo-schachtkappen

Hailo PROFESSIONAL

D Um die volle Funktion der Abdeckungen zu erhalten, hilft die Beachtung dieser Pflegetipps:

1. Verunreinigungen können mit Hochdruckreiniger, Lappen, Bürsten und schwachen Laugen entfernt werden. Auf Drahtbürsten und Stahlwolle muss verzichtet werden, da zurückbleibende Partikel zu Korrosion führen!
2. Achten Sie darauf, dass vor dem Schließen folgende Teile nicht verunreinigt sind:
   • Dichtung und alle beweglichen Teile
3. Fetten Sie alle beweglichen Teile ein. Dichtung pflegen, wie bei PKW-Türen üblich.
4. Durch den Anpressdruck der Dichtung in der Gasdruckfeder an das Gehäuse kommt es mit zunehmender Ruhezeit zu einer verstärkten Anhaftung am Gehäuse. Die Folge ist ein erhöhter Kraftaufwand beim öffnen. Bewegt man die Gasdruckfeder ein paar mal, so stellt sich die ursprüngliche Kraft wieder ein.

GB To bring out the full functionality of the covers, please follow these care tips:

1. The covers can be cleaned with high-pressure cleaners, brooms, brushes and weak caustic solutions. Do not use wire brushes and steel wool as they can shed particles which can lead to traces of corrosion!
2. Make sure that the following parts are not contaminated before you close the cover:
   • Seal and all moving parts
3. Grease all moving parts. Take the same care of the seal as you would in car doors.
4. The contact pressure of the seal in the gas compression spring on the housing leads to greater adhesion to the housing as time goes on. This will result in greater force being required to open the cover. If the gas compression spring is moved a couple of times, the original force wil be restored.

F Pour assurer le fonctionnement optimal de la plaque de recouvrement, nous vous recommandons de suivre les conseils d'entretien suivants:

1. Eliminer les saletés à l'aide d'un nettoyeur haute pression, d'un chiffon ou d'une brosse et d'une solution légère. Toutefois, l'utilisation d'une brosse en fil de fer et de laine d'acier est interdite en raison des particules résiduelles qui risqueront d'occasionner une corrosion!
2. Avant de fermer le couvercle, verifier l'absence de saletés sur les pièces suivantes:
   • Joint et toutes les pièces mobiles
3. Lubrifier toutes les pièces mobiles. Entretenir le joint comme vous le feriez pour les portières d'une voiture.
4. En raison de la pression que le joint du ressort à gaz comprimé exerce sur le boîtier, l'adhérence est renforcée après un certain temps de repos. L'ouverture du couvercle nécessite alors un effort accru. En actionnant le ressort à gaz comprimé plusieurs fois de suite, la force initiale se rétablit.

NL Voor behoud van de volledige functionaliteit van de kappen zijn de volgende onderhoudstips handig:

1. Verontreinigingen kunnen met hogedrukreiniger, doeken, borstels en zwakke loogoplossingen verwijderd worden. Staalborstels en staalwol mogen niet gebruikt worden, aangezien achterblijvende deeltjes leiden tot corrosie!
2. Let erop, dat vóór het sluiten de volgende delen niet verontreinigd zijn:
   • afdichting en alle bewegende delen
3. Smeer alle bewegende delen met wat vet. Afdichting onderhouden op de manier waarop dit gewoonlijk bij autoportieren gebeurt.
4. Door de aandrukkracht van de afdichting in de gasdrukveer tegen de behuizing komt het na een langere rustperiode voor, dat deze steviger tegen de behuizing geplakt is. Het gevolg is dat er meer kracht nodig is bij het openen. Wordt de gasdruk veer een paar keer bewogen, dan wordt de oorspronkelijke kracht weer ingesteld.

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