

The Formwork Experts.

Tie rod system 20.0 – Fibre concrete tube 27mm

Art. n° 581472000

Test Report

smoke control

321030304-1





TEST REPORT

Report n°: 321030304-1

Report date: 27/08/2021

Technician: Ralf ANDEXLINGER / LehT

Ext: 868

CLIENT: Doka GmbH
Josef Umdasch Platz 1
A-3300 Amstetten,
Austria

OBJECT OF TESTING: Test of fire resistance and smoke control
"Rectangular concrete block with various Doka-
system tie points"

BASIS FOR TESTING: EN 1363, Part 1 by analogy
EN 1634, Part 3 by analogy

TEST DATE: 22/06/2021

**TEST-SPECIMEN SIZE
(DGL)** 1000 x 1250 mm (WxH)

TEST SIDE: Tested from both sides

**SUPPORTING
CONSTRUCTION:** Rectangular concrete block in gypsum plasterboard wall
structure

**PERSON CONDUCTING
TEST:** Ralf ANDEXLINGER

This test report contains 30 text pages and 6 annexes

A: Description 6 pages

The results set out in the test report relate only to the object tested as received.

Only the German-language version of this document is valid.

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Institut für Brandschutztechnik
und Sicherheitsforschung

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1. **Basis for testing**

EN 1363 Part 1:

“Fire resistance tests – Part 1: General requirements”

edition: 01/09/2012

EN 1634 Part 3:

“Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 3: Smoke control test for door and shutter assemblies”

edition: 01/02/2007

2. **Purpose of test / test program**

To ascertain the smoke control ability of “various **Doka-system tie points**” through a rectangular concrete block set in a standard wall construction consisting of metal profile uprights sheeted with gypsum plasterboard; the tests of smoke control were conducted on 22 June 2021 in the test laboratory of IBS Linz, Austria.

2 test specimens were set up for the tests. The purpose of the tests was to ascertain the leakage rates of warm smoke (200 °C) at various pressure differences from one side of a shutter to the other side and vice versa.

Test specimen 1 – side 1 tested

“Rectangular concrete block with various Doka-system tie points”, 1000 x 1250 mm (W x H)

Test specimen 2 – side 2 tested

“Rectangular concrete block with various Doka-system tie points”, 1000 x 1250 mm (W x H)

The test is part of a test series. The choice of test specimen, supporting structure and load side derives from the context of the test series.

3. **Manufacturer of the construction / compiler of the plan**

Overall construction

Manufacturer: Doka GmbH
Josef Umdasch Platz 1
A-3300 Amstetten,
Austria

Compiler of the plan: Helga Hülmbauer



4. Materials used

See Section 6

5. Test-specimen preparation

The test specimens were supplied by the client.

No additional test specimens were requested by the testing instance for test-specimen examination (verification of the materials used and dimensions) because since in-test destruction was not anticipated post-test examination was possible.

Post-test examination of the test specimens revealed no deviations from the information and technical drawings provided by the client. Consequently, these drawings were attested by the testing instance and are enclosed as copies in Annex B of the test report.

6. Description of the specimens

6.1. Dimensions

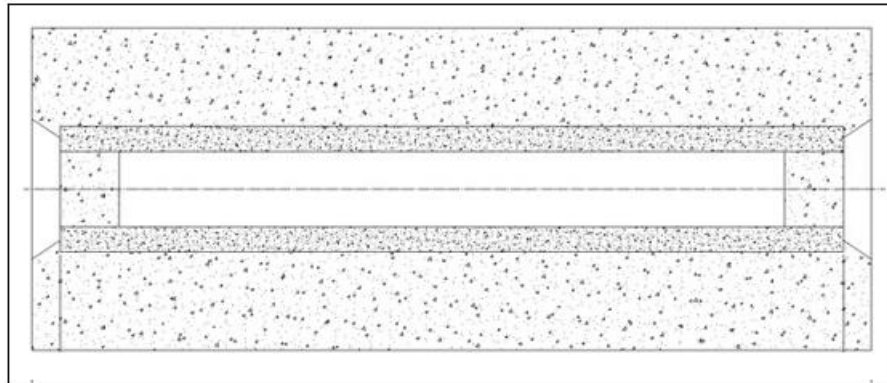
Rectangular 1000 x 1250 mm (W x H)
concrete block

6.2. General description of the test specimens

Test specimens 1 and 2: "Rectangular concrete block with various Doka-system tie points"

Form-tie point 16:

Tie rod system 20.0 – Fibre concrete tube 27mm (wall thickness 15 cm)



Material used:

Article name	Article number
Fibre concrete tube 27mm 1.25m (cut-to-length)	58 1472 000
Universal cone 26mm (removed after pouring)	58 1464 000
Fibre concrete plug 27mm	58 1473 000
REPOXAL two-component adhesive	58 1993 000

7. Test-specimen conditioning

The test specimens were delivered on 08 June 2021, installed in the supporting construction (see Section 8.) and stored upright in the test laboratory. The ambient conditions at this time were in the vicinity of approximately 20 °C and 45 % relative humidity.

8. Supporting construction

The supporting construction used was a standard supporting construction consisting of 50 mm metal profile uprights, sheeted on both sides with 2 x 12.5 mm gypsum plasterboard.

9. Test-specimen installation in supporting construction

Installation was performed by client's personnel prior to testing.

10. Measurements prior to testing, examination and preparation

10.1. Measurement of gaps

The rectangular concrete block featured form-tie points, so there were no gaps.

10.2. Opening and closing forces

No openable components are installed.

10.3. Final adjustment

The Doka company's form-tie points were again rechecked by the sponsor to ensure correct installation and the sponsor cleared them for testing.

11. Smoke control test of specimen 1

Test date: 22/06/2021

11.1. Position of side where pressure applied

The specimen was tested from side 1.

11.2. Test of smoke control at ambient temperature

The leakage rate through the test specimen was measured at pressure differences of 10 Pa, 25 Pa and 50 Pa.

On account of the 20 installed parts, it was not possible to ascertain the peripheral leakage rate.

Side to which pressure was applied	Temperature	Leakage rate $Q_{\text{spec}}(20)$ [m ³ /h]			Peripheral leakage rate Q_l [m ³ /h/m]	
		10 Pa	25 Pa	50 Pa	10 Pa	25 Pa
Side 1	Amb. pressure	0.1	0.8	2.4	x	x
Side 1	Amb. suction	0.1	1.6	2.8	x	x

11.3. Test of smoke control at elevated temperature

The leakage rate through the test specimen was measured at pressure differences of 10 Pa, 25 Pa and 50 Pa. Leakage rates at the individual pressure stages were measured between test minutes 25 and 31.

Side to which pressure was applied	Temperature	Leakage rate $Q_{\text{spec}}(200)$ [m ³ /h]		
		10 Pa	25 Pa	50 Pa
Side 1	200 °C	0.1	0.2	0.4

11.4. Observations during and after the test

On account of the virtually complete leak-tightness of the form-tie points during the test, no anomalies were observed. After the test, all form-tie points were still fully operational.

12. Smoke control test of specimen 2

Test date: 22/06/2021

12.1. Position of side where pressure applied

The specimen was tested from side 2.

12.2. Test of smoke control at ambient temperature

The leakage rate through the test specimen was measured at pressure differences of 10 Pa, 25 Pa and 50 Pa.

Side to which pressure was applied	Temperature	Leakage rate $Q_{\text{spec}}(20)$ [m³/h]			Peripheral leakage rate Q_l [m³/h/m]	
		10 Pa	25 Pa	50 Pa	10 Pa	25 Pa
Side 2	Amb. pressure	0.1	0.6	2.2	x	x
Side 2	Amb. suction	0.2	1.7	2.5	x	x

12.3. Test of smoke control at elevated temperature

The leakage rate through the test specimen was measured at pressure differences of 10 Pa, 25 Pa and 50 Pa. Leakage rates at the individual pressure stages were measured between test minutes 25 and 31.

Side to which pressure was applied	Temperature	Leakage rate $Q_{\text{spec}}(200)$ [m³/h]		
		10 Pa	25 Pa	50 Pa
Hinge side	200 °C	0.1	0.3	0.8

12.4. Observations during and after the test

On account of the virtually complete leak-tightness of the form-tie points during the test, no anomalies were observed. After the test, all form-tie points were still fully operational.

13. Field of direct application

Reference to standard 1634-3, section:	Permissible change with regard to the tested construction, with evaluations and additions as per test results
13.1	General
13.1.	The results of the leakage test continue to apply to assemblies of a different construction subject to the following: a) The assembly is of a similar generic construction, e.g. a solid timber leaf in a timber frame or a folded sheet metal leaf in a steel frame. b) The mode of operation is identical, e.g. single swing, double swing, roller shutter or folding leaf. c) In the case of assemblies that only require a restriction in the leakage rate from one direction only then the direction does not vary from that tested. d) The stiffness of the supporting construction and the method of fixing and sealing the frame to the supporting or associated construction shall not be less than that of the tested construction (this may be the specimen frame in some furnaces). Doors tested in a flexible construction may be installed into rigid constructions but not vice-versa. Doors tested in a flexible construction to achieve ambient temperature classification S_a may be installed in alternative flexible constructions. The use of alternative flexible constructions for doors with S_m classification will be the subject of extended application considerations.
13.2.	Construction of assembly
13.2.1	General
13.2.1.	a) Decorative finishes such as paints may be varied. b) The clearance gaps between components may be varied but shall not be greater than those in the tested assembly and where gaps are smaller they shall not impair the ability of the leaf/ leaves/curtain to close, especially in cases where both leaves of hinged or pivoted door assemblies are opened or closed simultaneously. c) Threshold gaps protected by active drop seals may be varied within the movement range specified by the seal manufacturer.

Test standard 1634-3 regulates the smoke-control testing of door and shutter assemblies, normally doors and windows, so although it is required to be stated in the test report, the field of direct application does not apply to the through-hole closures of the DOKA GmbH company and is therefore not applicable.

13.2.2.	Hinged or pivoted leaf assemblies
13.2.2.1.	Timber leaves
13.2.2.1.	a) The door leaf shall be constructed from similar materials (e.g. flaxboard, softwood) and stiffness equal or greater than that tested. Equal or increased stiffness may be assumed for ambient temperature use if; 1) the leaf is thicker than that tested; 2) the facings to the leaf are thicker than those tested; 3) the size and density of any framing member enclosing the leaf core is not reduced; 4) the glues and jointing procedures are not changed; 5) for ambient temperature only, openings for glazing are not greater in dimensions or aspect ratio than any incorporated in the construction tested.
	b) Variations for medium temperature uses are the subject of extended application considerations.
13.3	Size and aspect ratio
13.3.1	Hinged and pivoted leaf assemblies
13.3.1.1	The leaf size shall not be increased but may be reduced providing that the number of any movement restrictors such as locks, latches and hinges is not decreased (but may be increased).
13.5	Hardware and fittings
	Elements of hardware or ironmongery and/or their fixing technique may not be changed without extended application evaluation.
	The positioning of elements of hardware or ironmongery may be modified for ambient temperature smoke application but shall not be changed for medium temperature applications.
13.6.	Seals
	As the sealing system is a critical part of the test, no modification may be made to the system tested.



14. Summary / result

This test report describes in detail the process of manufacture and installation, the test conditions and the results obtained with the components described here, on their being tested by this procedure pursuant to EN 1363, Part 1 and EN 1634, Part 3.

Any major deviation with regard to size, design details, except the deviations permissible in the applicable test procedure for the field of direct application, is not covered by this test report.

The present test report shall be used only in non-abbreviated form and together with the stated, validated enclosures.

**IBS - INSTITUT FÜR BRANDSCHUTZTECHNIK UND
SICHERHEITSFORSCHUNG GESELLSCHAFT M.B.H
(INSTITUTE OF FIRE PROTECTION ENGINEERING
AND SAFETY RESEARCH).**

Accredited testing, inspection and certification agency

	Unterzeichner	Ralf Andexlinger
	Datum/Zeit-UTC	2021-10-28T08:40:43+02:00
	Prüfinformation	Informationen zur Prüfung der elektronischen Signatur finden Sie unter: https://www.signaturpruefung.gv.at

Ralf ANDEXLINGER
Technician

	Unterzeichner	Ing. Josef Stockinger
	Datum/Zeit-UTC	2021-10-28T13:05:05+02:00
	Prüfinformation	Informationen zur Prüfung der elektronischen Signatur finden Sie unter: https://www.signaturpruefung.gv.at

Ing. Josef STOCKINGER,
engineer and authorised signatory

Information about multi-signature, electronically signed documents is posted [here](#).
Information about the decision rule is posted [here](#).

Casting of the concrete test specimen

The test specimen for the smoke control test was cast on 10 May 2021 at approx. 07:00 hours in the concrete laboratory.

The form ties of the test specimen were removed from the test specimen on 12 May 2021. Until 01 June 2021 the test specimen remained under covers in the concrete laboratory to prevent cracking.



Fig. 4: Temperature measurement



Fig. 5: Finished test specimen

The fresh-concrete temperature on pouring was 22.6 °C.
Slump a = 45 cm, b = 46 cm => total 45.5 cm.
The concrete therefore corresponds to consistency F45.



Lieferschein
nach Ö-Norm B 4710-1

LEHNER
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Rechnungsempfänger: **Doka GmbH**
Kunden-Nr.: **4071**
Baustelle: **Josef-Lindtner-Platz 1**
Baust-Nr.: **3300, -Häuser**

Werk: **1**
Datum: **18.05.2021**
Lieferschein-Nr.: **608234**

Beim nach: ☐ Eigenschaften
☐ Zusammensetzung
☐ Standardbeton

Artikel-Nummer	Menge (m³)	Expositions-klassen(n)	Festigkeits-klasse	Konsistenz-klasse	Größtkorn	Festigkeitsentwicklung Nachbehandlung nach Ö-Norm B 4710-1	Rohdichte-kategorie	Stand der Lieferung (m³)	
20024562	1,30	R-ALC2	C15/20	745	SK16	1- 0, 21- 0, 22- 0, 23- 0, 24- 0, 25- 0, 26- 0, 27- 0, 28- 0, 29- 0, 30- 0, 31- 0, 32- 0, 33- 0, 34- 0, 35- 0, 36- 0, 37- 0, 38- 0, 39- 0, 40- 0, 41- 0, 42- 0, 43- 0, 44- 0, 45- 0, 46- 0, 47- 0, 48- 0, 49- 0, 50- 0, 51- 0, 52- 0, 53- 0, 54- 0, 55- 0, 56- 0, 57- 0, 58- 0, 59- 0, 60- 0, 61- 0, 62- 0, 63- 0, 64- 0, 65- 0, 66- 0, 67- 0, 68- 0, 69- 0, 70- 0, 71- 0, 72- 0, 73- 0, 74- 0, 75- 0, 76- 0, 77- 0, 78- 0, 79- 0, 80- 0, 81- 0, 82- 0, 83- 0, 84- 0, 85- 0, 86- 0, 87- 0, 88- 0, 89- 0, 90- 0, 91- 0, 92- 0, 93- 0, 94- 0, 95- 0, 96- 0, 97- 0, 98- 0, 99- 0, 100- 0	Soil: 1,30 Ist: 1,30 Rest: 0,00		
Zement/Zusatzstoff		kg/m³		Zusatzmittel		Verwendung/Eigenschaften Klasse des Chloridgehaltes		Fahrzeug	Liefer- Zone
CEM II/A-M 10-11 42,5N CEM II/B-M 10-11 42,5N		Kirchdorfer		VISCOCRETE 025M S10A		C15/20 XC2		4	1
Zustellung									

Wir danken für Ihren Auftrag!

Nachträgliche VZ-Zugabe:
Zugabeart: Bezeichnung:
Zugegebene Menge: Uhrzeit:
Verzögerungszeit: Std

Name des überwachenden Fachmannes:
Nachträgliche FM-Zugabe oder Nachdosierung von FM:
Betonrestmenge vor FM-Zugabe:
Zugegebene Menge: Uhrzeit:
Konsistenz vor/nach FM-Zugabe:
Planmäßige nachträgliche Wasserzugabe:
Nach zugebbare Wassermenge:

Sonderleistungen	Uhrzeit Beladung	Uhrzeit Ankunft Baustelle	Uhrzeit Beginn Entladung	Uhrzeit Ende Entladung	Wartezeit auf Baustelle	Uhrzeit Ankunft Werk
Der Fahrer ist grundsätzlich nicht berechtigt, zusätzliches Wasser dem Beton zuzugeben, es sei denn, dies ist planmäßig vorgesehen. Alle nachträglichen Betondeckungen entstehen uns von der Gewährleistung. Der Fernüberwacher ist befugt, die Baustelle zu betreten und dort Proben zu entnehmen. Der Beton ist überwacht nach Ö-Norm B 4710-1.		11:20				

Unterschrift des Beauftragten des Herstellers: *[Signature]*
Unterschrift des Fahrers: *[Signature]*
Unterschrift des Beauftragten des Abnehmers: *[Signature]*

Hinweis: Frischbeton ist alkalisch, deshalb Haut und Augen schützen. Bei Berührung grundsätzlich mit Wasser spülen. Bei Augenkontakt sofort gründlich spülen und unverzüglich einen Arzt aufsuchen. Geeignete Schutzausrüstung tragen.

Die Erfüllung des Auftrages erfolgt ausschließlich auf Grund unserer Allgemeinen Geschäftsbedingungen. Der beschriebene Beton wurde ordnungsgemäß geliefert. Ankunfts- und Abfahrtszeiten sind richtig eingetragen und können für die Wartezeit-ermittlung verwendet werden.

Fig. 6: Concrete delivery docket



Chargenprotokolle
vom 10.05.2021

Firma Josef Lehner GmbH Seite: 1
Werk Lehner Amstetten gedruckt am: 11.05.2021 um 07:04:42

Lieferschein Nr: 608234 Chargenprotokoll Nr: 293317

Datum: 10.05.2021 Zeit: 10:56

Mischer: 1 Auslaß: 1 Menge: 1.30 Rückm: 0.00 Mltz Soll/Ist: 15.0/ 97.0
Betonart: 2530XC2 Fahrz-Nr / Kz: 4 /AM524HX
Kunde: 4071 Doka GmbH Konsistenz: A-409
Baust.: 0 Wasserkorr: 0.0 l
Betontemp(C): 21.8 Lufttemp(C): 10.0 Spülw: 0.5 MiWas: 0.0
Brauchwasser: 401 Rohdichte: 0.000
Wassergehalt ermittelt von Ludwig: 0.00

Mat-Nr	Bezeichnung	Wg	Silo	Rez.Sollw	Sollwert	Istwert	Abweich	Eh	Feu%	Kenn
201	42,5N	2	1	351.00	351.00	346.78	-4.22	kg		
204	SC80	2	4	45.50	45.50	44.94	-0.56	kg		
301	FW	3	1	113.75	41.44	19.00	-22.44	kg		E
401	BW	4	1	113.75	118.30	118.91	0.61	kg		
506	4025H	5	4	1.78	1.78	1.77	-0.01	kg		
103	8/16	1	3	903.30	915.04	915.56	0.52	kg	1.3	
102	4/8	1	2	512.48	519.66	521.24	1.58	kg	1.4	
101	0/4	1	1	1157.23	1210.13	1209.51	-0.62	kg	4.6	

W/Z: 0.52 W/Z max: 0.65 Gesamtsoll: 3203.35kg Gesamtist: 3178.21kg
Mischerleistung vor Entleerung (%): 42.566 Gesamtwasser: 206kg

Fig. 7: Batch log

Delivery of test specimens and closure of the form-tie points



Fig. 8: Installation of the concrete block (side 1)
in supporting construction

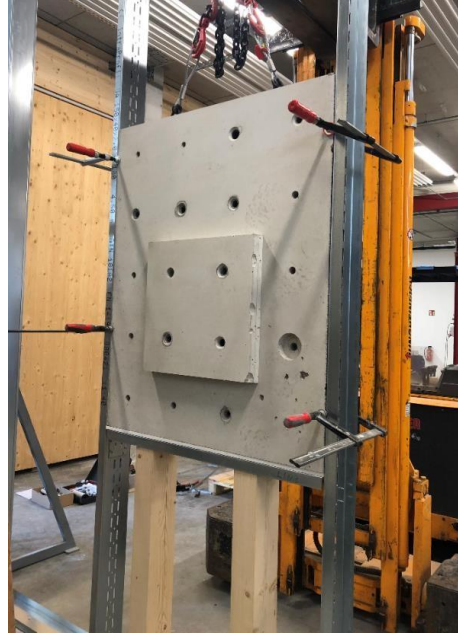


Fig. 9: Rear of the concrete block (side 2)

The concrete block was delivered to the IBS testing facility in Hof near Salzburg, Austria, on 09 June 2021 and the form-tie points were sealed by Mr Geiger and Ms Hülmbauer.



Fig. 10: Detail of form-tie points 1 to 8 of side 1

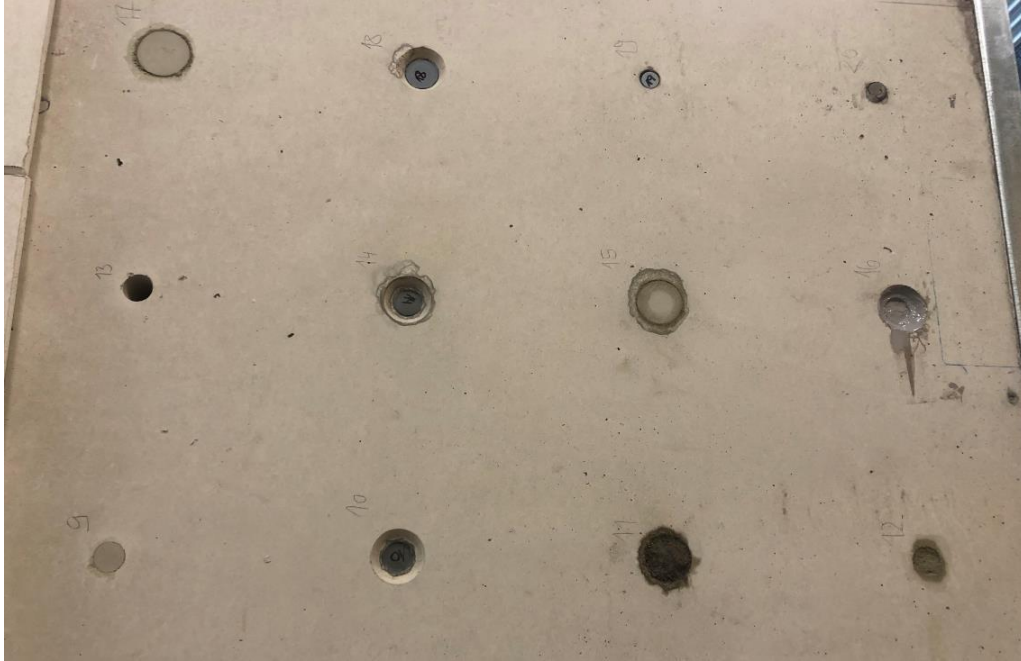


Fig. 11: Detail of form-tie points 9 to 20 of side 1



Fig. 12: Detail of form-tie points 1 to 8 of side 2

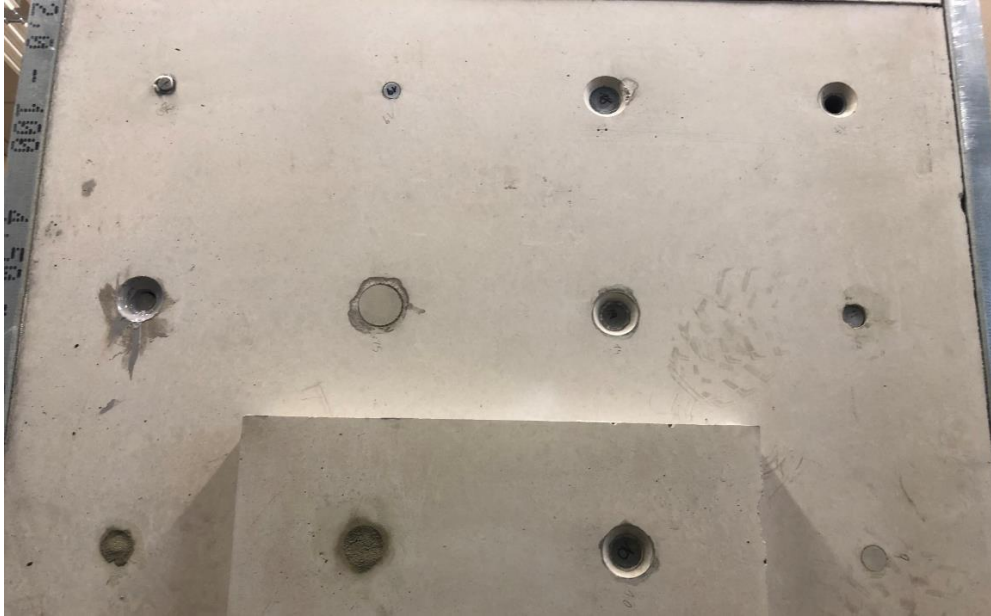


Fig. 13: Detail of form-tie points 9 to 20 of side 2

Smoke control test conducted at IBS-Hof near Salzburg, Austria, on 22 June 2021

The test was conducted on 22 June 2021 by Mr Andexlinger and was performed on the basis of Austrian standard **ÖNORM EN 1634-3**, because there is no test standard for form-tie points.

The test was carried out twice per side.

Once at room temperature and once with a temperature of 200 °C.

The heat-up period was 30 minutes.

The leakage rate of the test specimen was then measured at pressures of 10 Pa, 25 Pa and 50 Pa.

Each pressure level was maintained for 2 minutes and pressure was then increased to the next level.

More detailed description of the test => see test report or classification



Fig. 14: Readings at pressure of 6 pascals => 0 pressure loss = no air leakage at the form-tie points