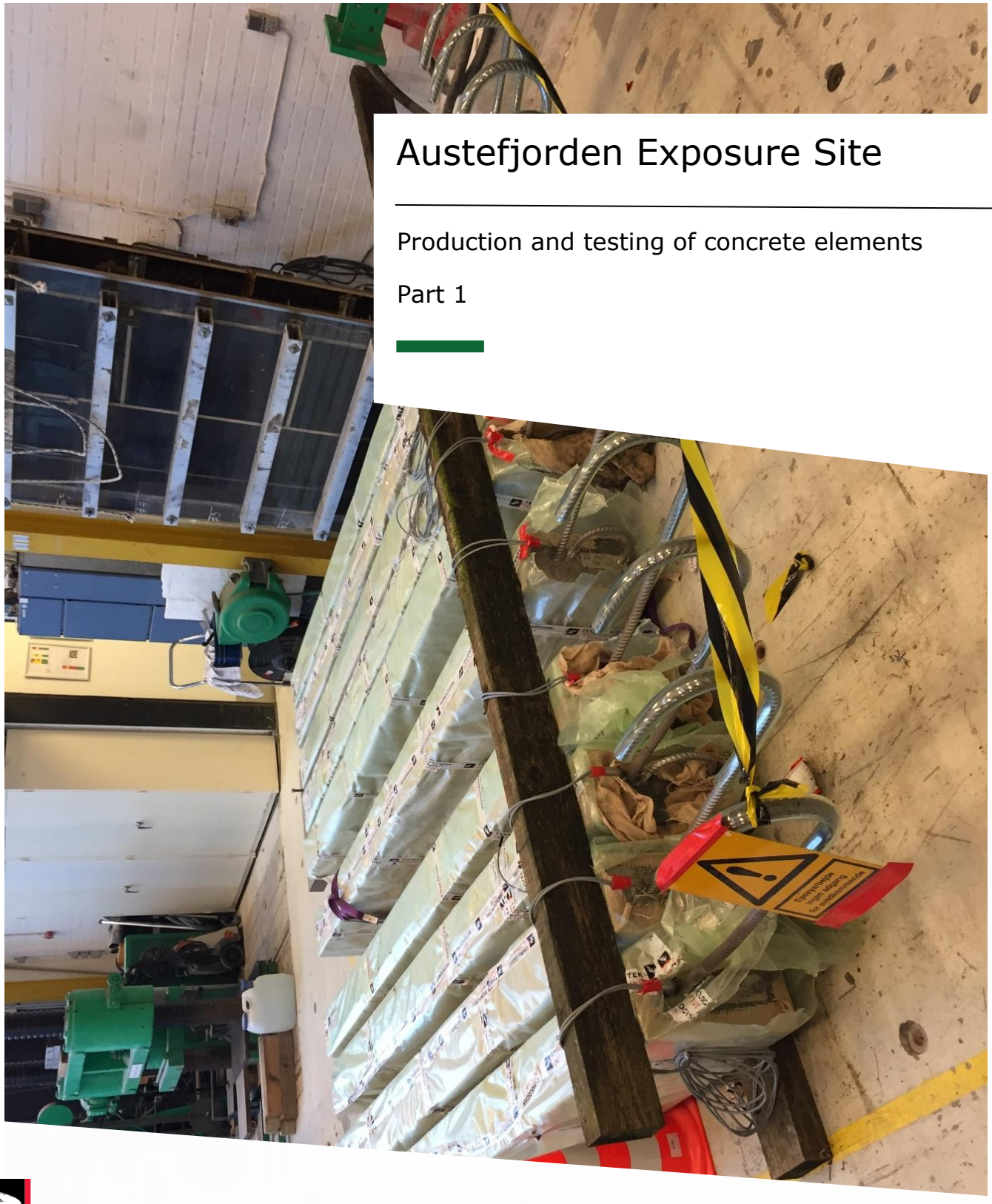
Vedlegg A

Austefjorden Exposure Site

Production and testing of concrete elements

Part 1



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24 March 2018

DANISH TECHNOLOGICAL INSTITUTE

Title:
Austefjorden Exposure Site
Production and testing of concrete elements
Part 1

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1. Introduction

Statens vegvesen retained based on an open tender process the Danish Technological Institute, Building and Construction to produce and deliver concrete elements for their field station in Austefjord near the city of Bergen. This report contains information about the ten first concrete elements that where produced in November 2017 and delivered at the field station on January 31st, 2018.

2. Materials and methods

2.1. Constituent materials

Statens vegvesen supplied all the materials for the concrete as given in Table 2.1. The density and absorption of the aggregate were determined by DTI for use in mix designs.

2.2. Mix designs

Statens vegvesen provided the mix designs for the concrete. The amounts of superplasticizing and air entraining admixture had to be fine-tuned by trial mixing to achieve the required consistence (slump = 190 ± 30mm) and air content (4.5 ± 1%) of the concrete.

The nominal mix designs of the five concretes are shown in Table 2.1.

Table 2.1. Nominal mix designs of the five concrete types.

Constituent	Mix ID									
	STD 0		STD 18		STD 40		ANL 16		CEMEX 46	
	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2
Norcem STD	427,2	427,2								
Norcem STD FA			419,0	419,0	281,6	281,6				
Norcem Anlegg FA							420,0	420,0		
Cemex CEM III/A									420,8	420,8
Silica fume, Elkem densified	18,0	18,0	17,6	17,6	16,6	16,6	17,6	17,6	17,7	17,7
Fly ash, Emineral B4					114,3	114,3				
Free water	180,6	180,6	177,2	177,3	173,7	173,7	177,5	177,5	177,9	177,9
Årdal sand 0/8	887,8	887,8	887,8	887,8	887,8	887,8	888,1	888,1	887,8	887,8
Årdal stein 8/16	793,4	793,4	793,4	793,4	793,4	793,4	793,7	793,7	793,4	793,4
Mapei Dynamon SX-23	3,10	3,10	2,60	2,70	1,90	1,90	2,50	2,50	2,40	2,50
Mapeair 25 (1:9)	1,60	1,60	2,90	2,80	5,60	5,20	4,00	4,00	1,40	1,40
Density	2308	2308	2296	2296	2268	2268	2298	2298	2298	2298
Air content	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%
w/c ratio	0,390	0,390	0,390	0,390	0,440	0,440	0,390	0,390	0,390	0,390
Casting date	031117	031117	101117	071117	211117	211117	131117	131117	171117	171117

2.3. Formwork, reinforcement, inserts and labelling

2.3.1. Formwork

The formwork was made from water resistant plywood.

2.3.2. Reinforcement and insert

The main reinforcement consisting of 12mm ribbed bars and the stirrups consisting of 8mm ribbed bar was purchased from Celsa Armeringsstål AS, Mo in Rana, Norway in steel grade B500NC according to NS 3576-3. Tying thread of Ø1.00mm annealed stainless steel quality 1.4301 from Arminox in Denmark was used to fixate the main bars to the stirrups. The lifting and mounting brackets were supplied by Arminox in stainless steel grade 1.4362 with a PRE-value of 26 and compliance with B500NCR. The cable pipe was stainless steel grade 1.4404.

The layout of the reinforcement and inserts are shown in 3D in Figure 2.1.

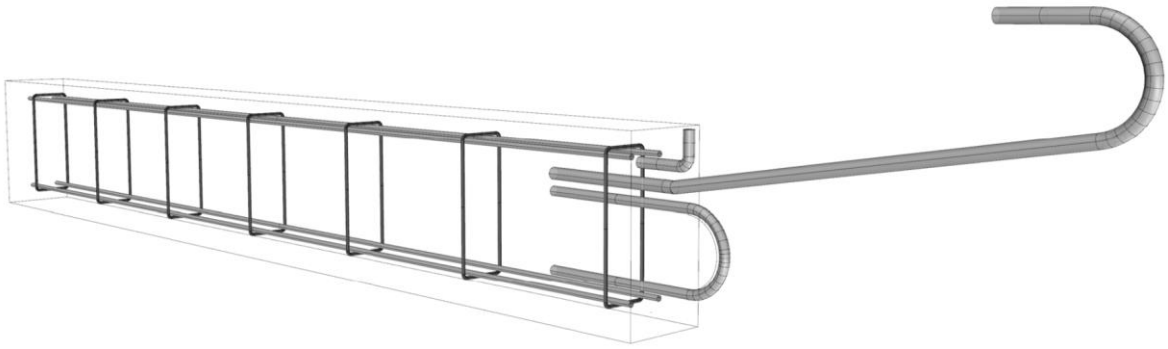


Figure 2.1. 3D drawing of the concrete element including reinforcement and inserts.

2.3.3. Spacer

Concrete spacers of the type "Round" (quality STQ3) from Haucon A/S was used.

2.3.4. Labelling

Labelling of the individual concrete element consisted of an imprint into the top surface of the concrete and of a 5mm stainless steel plate attached to the lifting bracket and cast into the top surface. The labelling used is shown in Table 2.2.

Table 2.2. Labelling of concrete types/elements.

Concrete type	**A**		**B**		**C**		**D**		**E**	
Imprint	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	E-1	E-2
Steel plate	STD 0		STD 18		STD 40		ANL 15		Cemex 45	
	03.11.2017		07.11.2017	10.11.2017	21.11.2017		13.11.2017		17.11.2017	

2.4. Batching

For the production of concrete elements and test specimens batches of 260 litres were produced using the following batching procedure:

1. Initial estimation of moisture in aggregate based on moisture determination of one sample of each aggregate taken from silo (needs to be fairly accurate, i.e. within 1% of the actual content).
2. Calculation of amounts of constituent materials to be mixed.
3. Weighing of aggregate materials. The exact amount is ensured by adding or removing material from the conveyor belt. In the process of dosing aggregate, three samples of 1 kg are taken of each aggregate and the moisture content determined in microwave ovens. A battery of 12 ovens are available for this task, see Figure 2.3. The moisture determination takes approximately 20 minutes.
4. The aggregate is transferred to the mixer (closed space where no evaporation takes place).
5. Weighing of cement, silica fume and fly ash into buckets by hand.
6. Weighing of admixtures into beakers by hand.
7. Calculation of water to be added based on the microwave oven moisture content measurements.
8. Weighing of water into pre-tank.
9. Recalculation of amounts of constituent materials to be mixed. Verification that the amounts already weighed fulfil requirements to dosing accuracy:
    a. If yes – the mixing procedure is started and the concrete subsequently tested.
    b. If no – the mixing procedure is started and the concrete is subsequently discarded.

Figure 2.3. Microwave ovens used to determine the moisture content of aggregate fractions.

2.5. Mixing and fresh concrete

For the production of concrete blocks and test specimens batches of 260 litres were produced in Danish Technological Institute's 375/250 litre Haarup countercurrent mixer (Figure 2.4) using the following mixing procedure:

1. The aggregate already in the mixer was mixed for 30 seconds.
2. Powder was added and mixing continues for 30 seconds.
3. Water was added over a period of 20-30 seconds while mixing.
4. Air entraining agent and superplasticizer was added.
5. Mixing was continued for 60 seconds after addition of superplasticizer.
6. The concrete was discharged to a 500 litre crane bucket.
7. The consistence was determined according to EN 12350-2.
8. The density and air content was determined according to EN 12350-6 and –7.
9. The temperature of the concrete was measured.

Figure 2.4. To the left a view into the Haarup 375/250 litre concrete mixer. To the right the vibration during casting of a concrete element is seen.

2.6. Casting

The concrete elements were cast in two layers of approximately equal height. Each layer was compacted using a 40mm electrical poker inserted for every 30cm. The vibration time at each insertion point was 6 seconds (Figure 2.4). At the end of the concrete element where the chords leave the concrete through a stainless steel pipe vibration was performed using a 25mm electrical poker. The top surface of the concrete was finished by hand trowelling.

For each batch of concrete 10 nos. of 100mm cubes were cast, and for each concrete type a total of 5 nos. Ø100x200mm cylinder and one 150mm cube were cast. The casting of test specimens was performed according to EN 12350-1.

2.7. Curing

The finished top surface was immediately covered with plastic sheeting. The concrete was left to harden for 48-72 hours. Subsequently, the formwork was stripped and the concrete element checked for correct dimensions, cover to reinforcement and surface appearance. If the concrete element was approved it was wrapped in wet burlap and plastic sheeting and left to cure inside in the DTI concrete laboratory where the temperature was between 15.5°C and 21°C (Figure 2.5).

The 100mm cubes and Ø100 cylinders were demoulded after 48-72 hours and stored immersed in water at 20°C. The 150mm cubes were demoulded after 48-72 hours wrapped in wet burlap, covered with plastic sheeting, and stored next to the concrete elements.

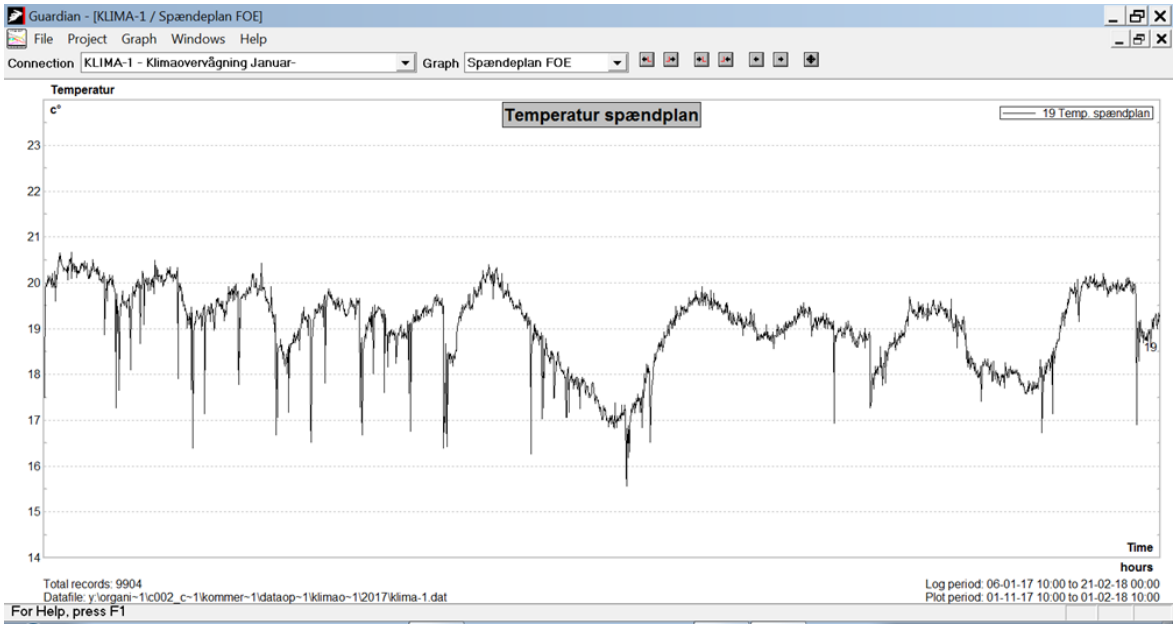


Figure 2.5. Temperature in the room were the concrete elements were stored until transport to the Austefjord field station.

2.8. Hardened concrete

The compressive strength of the concrete from each batch was determined according to EN 12390-3 on three 100mm cubes at ages of 28 and 91 days.

The resistivity of the concrete from each batch was determined according to "Statens vegvesen R210 Laboratorieundersøkelser, 443 Spesifikk elektrisk motstand" on four 100mm cubes at ages of 28 and 91 days.

3. Results

The results of the measurements performed to document the formwork, fresh and hardened concrete and concrete element are presented in this chapter.

3.1. Formwork

The dimensions of the formwork, the cover to reinforcement and the electrical contact between the different reinforcement were documented prior to the casting of each concrete element. Calibrated equipment was used for the documentation. Photographic documentation of the formwork is found in Annex 1.

3.1.1. Dimensions

Using a calibrated measuring tape (QA) the dimensions of the formwork was documented. The target dimensions and tolerances set are shown in Table 3.1. The measurements on the formwork used for the ten concrete elements all fell within the tolerances.

In addition, the position of lifting bracket was checked, i.e. distance from top surface to top of the bracket and the offset of top point of the bracket "hook" to the "back side of the concrete element, to make sure that the concrete element would fit into the slots at the Austefjord field station.

The laboratory sheets with the documentation of each individual concrete element is found in Annex 2.

Table 3.1. Tolerances on dimensions of formwork.

Property	Dimension (mm)	Tolerance (mm)
Length	2700	±3
Height	390	±3
Width	190	±3

3.1.2. Reinforcement location

The location of the reinforcement inside the formwork was documented based on the drawing shown in Figure 3.1. The nominal cover was 40±5mm and 50±5mm for the stirrups and longitudinal reinforcement, respectively. The results for the individual formwork can be found in Annex 2.

A summary of the results is found in Table 3.2. As can be seen six concrete elements (A1, A2, C2, D1, E1 and E2) had reinforcement location within tolerances. Four concrete elements (B1, B2, C1 and D2) had reinforcement location outside tolerances. However, all nonconforming measurements showed slightly larger cover than required, except for B1 where the distance between two main rebar ends and the bottom end of the formwork were 40 and 38mm, respectively. These two rebar ends were treated with epoxy on the outer 20+mm to increase the effective cover to at least 55mm (Figure 3.2). The few recordings of larger cover than nominal cover plus tolerance for elements B2 and in particular B1 were accepted. Subsequently, the reinforcement cage assembly was

improved and for the later elements (C, D and E) only three measurements at 1mm above the maximum 55mm were recorded.

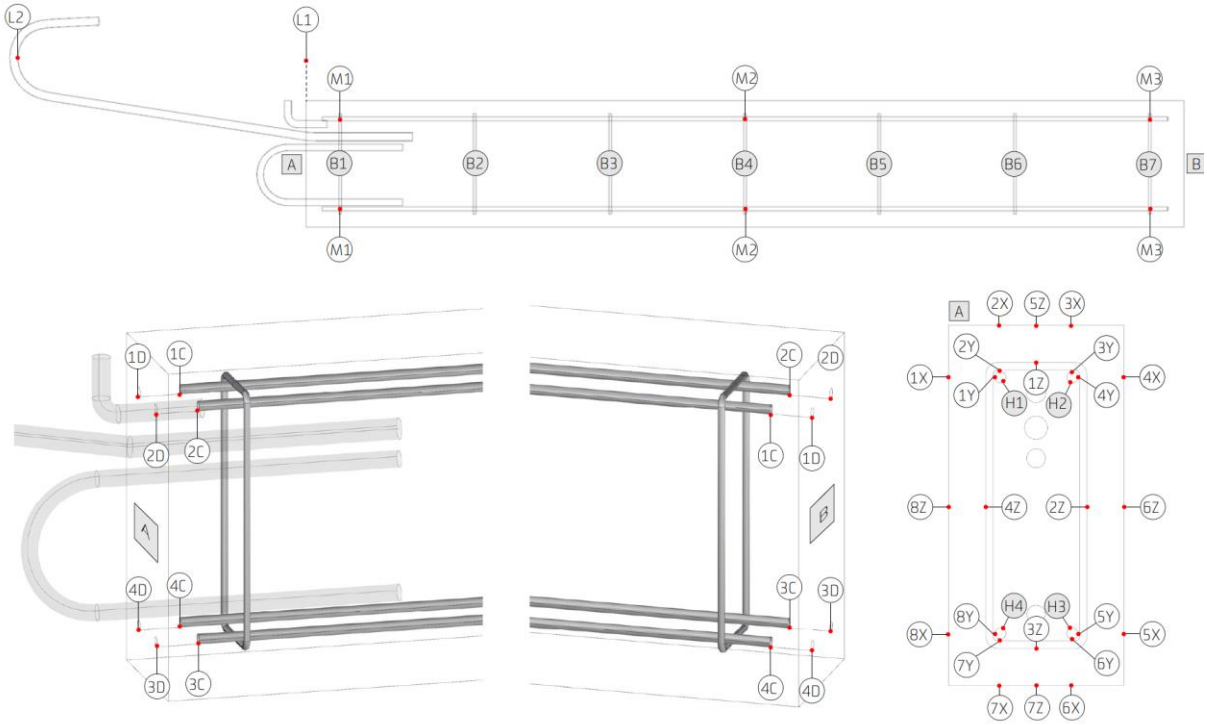


Figure 3.1. Drawing defining points on the inside of the formwork and on the outside of the reinforcement used to document the cover to reinforcement prior to casting of the concrete elements.

*Table 3.2. Summary of the documentation of reinforcement location.*The outer +20mm of the rebar ends were treated with epoxy.*

Concrete element	Cover to stirrup	Cover to main rebars, large faces	Cover to main rebars, short faces
A1	OK	OK	
A2	OK	OK	
B1	OK	58	56,65,65,40*,38*
B2	OK	56	58,56,58
C1	OK	56	56
C2	OK	OK	
D1	OK	OK	
D2	OK	OK	56
E1	OK	OK	
E2	OK	OK	

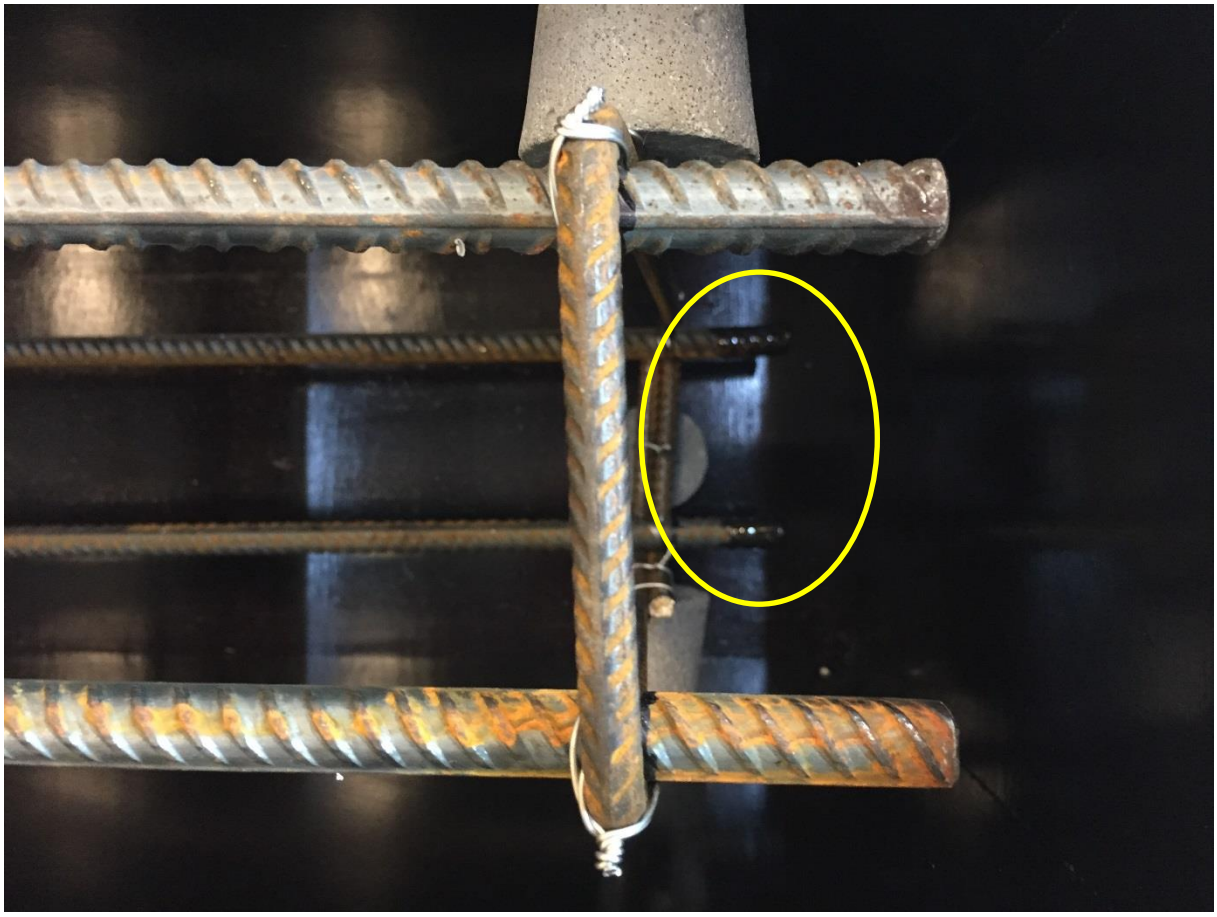


Figure 3.2. Epoxy treatment of the (lower) main rebar ends of element B1 (inside yellow marking).

3.1.3. Rebar contact

The electrical continuity within the reinforcement cage and between the cage and the two attached cables was determined by measuring the electrical resistance between rebars and between cables and rebars. For all ten formworks, the resistance was recorded to be 0.2Ω, i.e. below the required maximum of 0.5Ω. Recorded resistances are shown in more detail in Annex 2.

The fixation points between reinforcement cage and cables were sealed with epoxy. Photographic documentation is found in Figure 3.3.

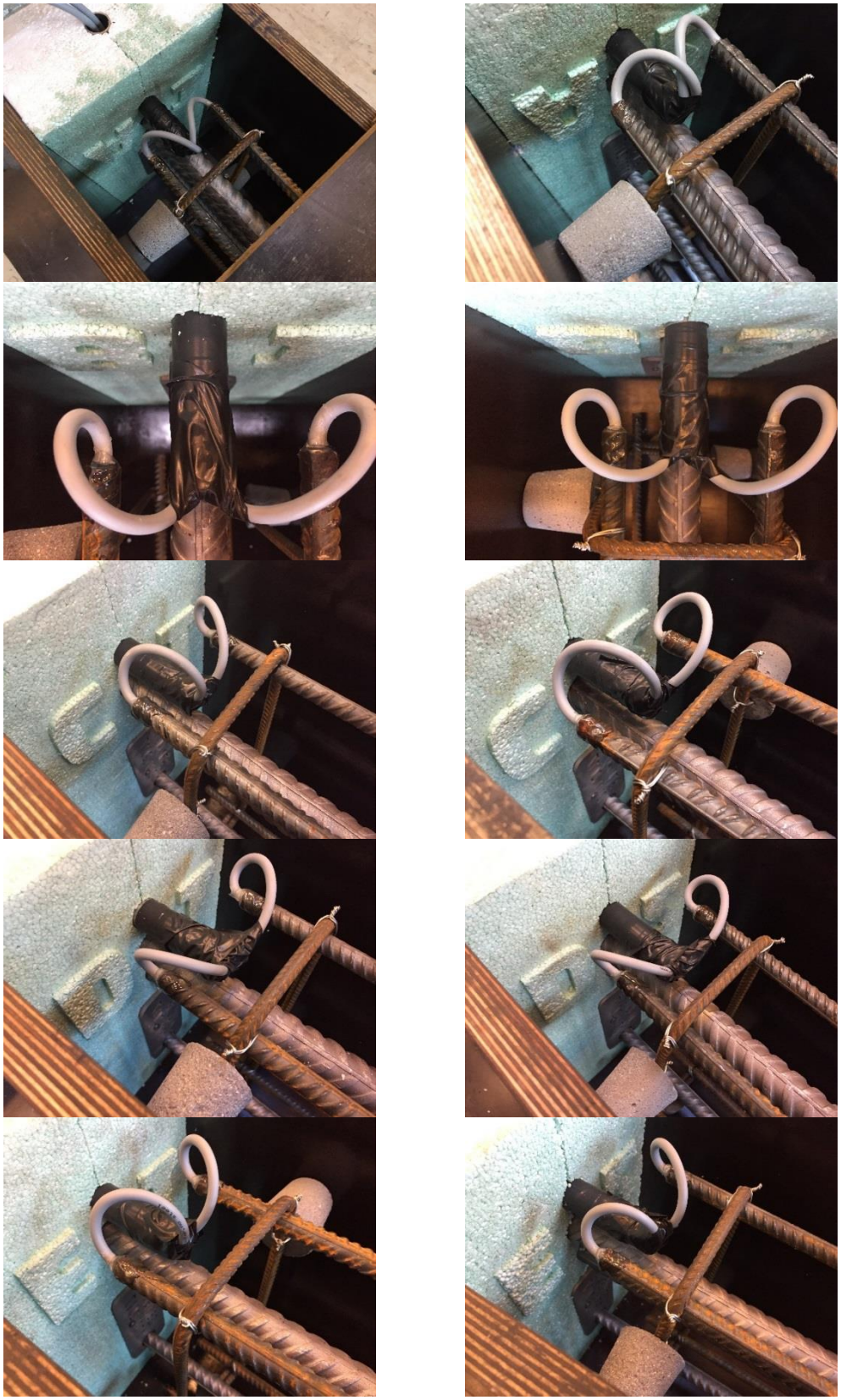


Figure 3.3. Photographic documentation of epoxy treatment of electrical contact between rebar cage and cables.

3.2. Constituent materials

DTI determined the density and absorption of the Årdal aggregate batches supplied for the project. The test reports are found in Annex 3.

3.3. Mix design

Batch reports are found in Annex 4. All constituent materials were batched with a recorded mass within 0.5% of the target amount. The average deviation was 0,08% of target amount. The obtained w/c ratios deviates by no more than 0.001 from the target value (Table 3.3).

3.4. Fresh concrete properties

The obtained fresh concrete properties are shown in Table 3.3. As can been seen from the table the measured consistence is within the target range of 190±30mm and likewise the air content is within the target range of 4.5±1%. Test reports are found in Annex 5.

Table 3.3. Fresh concrete properties of the ten concrete batches produced.

Mix ID	Date	w/c-ratio	Slump (mm)	Air Content (%)	Density (kg/m3)	Temperature (°C)
A1	03-11-2017	0,390	200	4,2	2330	20,5
A2	03-11-2017	0,389	200	4,1	2340	20,7
B2	07-11-2017	0,389	220	3,8	2330	20,0
B1	10-11-2017	0,390	220	5,1	2300	20,0
D1	13-11-2017	0,391	220	4,5	2320	20,3
D2	13-11-2017	0,389	210	4,3	2320	19,7
E1	17-11-2017	0,389	190	4,2	2330	21,0
E2	17-11-2017	0,390	200	4,1	2330	19,8
C1	21-11-2017	0,439	220	5,5	2260	19,1
C2	21-11-2017	0,440	210	5,0	2270	18,4

3.5. Hardened concrete properties

3.5.1. Concrete element dimensions

Laboratory sheets with the recorded dimensions and straightness of the concrete elements are found in Annex 6 and summarized in Table 3.4. All concrete elements were well within dimensional tolerances of ±5mm.

3.5.2. Concrete element surface appearance

The size of bug holes on the formed faces of the concrete elements were recorded. The results are found in Annex 7 and summarized in Table 3.5. The largest hole recorded was 175mm^2 and found in element A2.

Table 3.4. Concrete elements' dimensions and straightness. Tolerance ±5mm.

Concrete element	Length (mm)	Width (mm)	Height (mm)	Straightness (mm)
A1	2700	190-192	391-392	-0,1-1,4
A2	2696-2701	190-191	391-393	-0,6-1,8
B1	2701	190-192	389-390	-0,8-1,8
B2	2700-2701	190-192	389-391	0,1-2,0
C1	2699-2702	190-191	390-392	-1,6-1,3
C2	2700-2702	190-191	391-392	-0,7-1,6
D1	2699-2701	190-192	390-392	-0,7-1,8
D2	2700-2703	190-192	391-393	-0,1-1,4
E1	2701-2702	190-192	390-391	-0,3-2,2
E2	2700-2702	190-191	390-391	-1,3-3,2

3.5.3. Concrete element cover to reinforcement

The cover to reinforcement of the concrete elements was determined using a covermeter. The results of the measurements are found in detail in Annex 8 and summarized in Table 3.6. The cover is found to be larger than the minimum cover of 35mm to stirrups and 45mm to main reinforcement. However, a few recordings show slightly (1mm) larger than "maximum" cover (45 and 55mm respectively).

Table 3.5. Bug holes in the formed faces of the concrete elements. ">10mm" refers to holes with largest dimensions x perpendicular dimension larger than 100mm^2. "5-10mm" refers to holes with largest dimension x perpendicular dimension between 25 and 100mm^2.

Beam ID	Bug holes (nos.)					
	Face A		Face B		Bottom face	
	>10mm	5-10mm	>10mm	5-10mm	>10mm	5-10mm
A1	0	5	0	10	0	2
A2	1	4	0	4	1	0
B1	0	2	1	6	0	0
B2	0	1	0	3	0	1
C1	0	1	0	4	3	1
C2	0	5	0	4	1	0
D1	0	0	0	4	0	0
D2	0	4	0	4	0	1
E1	0	3	1	5	0	1
E2	0	7	0	2	0	2

Table 3.6. Cover to reinforcement recorded for the ten concrete elements.

Beam ID	Cover to reinforcement (mm)			
	Stirrup min	Stirrup max	Longitudinal min	Longitudital max
A1	39	43	46	55
A2	39	43	46	56
B1	36	41	45	50
B2	38	43	49	55
C1	38	42	46	52
C2	39	43	49	54
D1	36	39	46	52
D2	36	41	48	55
E1	39	42	52	56
E2	39	43	48	56

3.5.4. Compressive strength

The compressive strength of the ten concrete batches was determined after 28 and 91 days. Test reports are found in Annex 9. The average strength of three test specimens (100mm cubes) are presented graphically in Figure 3.4.

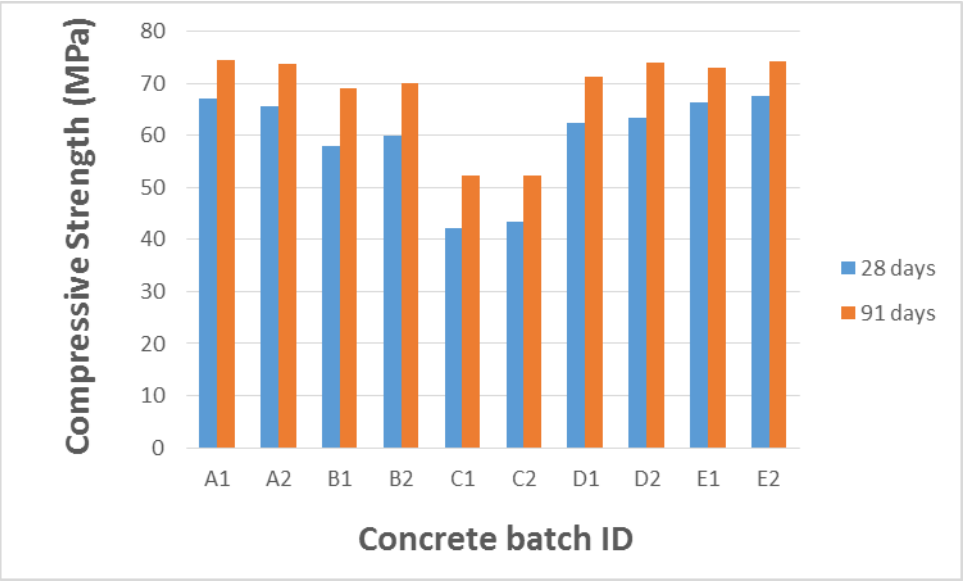


Figure 3.4. Compressive strength of the ten concrete batches used for the elements as determined according to EN 12390-3. Each column represent the average of 3 nos. of 100mm cubes.

3.5.5. Resistivity

The resistivity of the ten concrete batches was determined after 28 and 91 days. Test reports are found in Annex 10. The average resistivity of four test specimens (100mm cubes) are presented graphically in Figure 3.5.

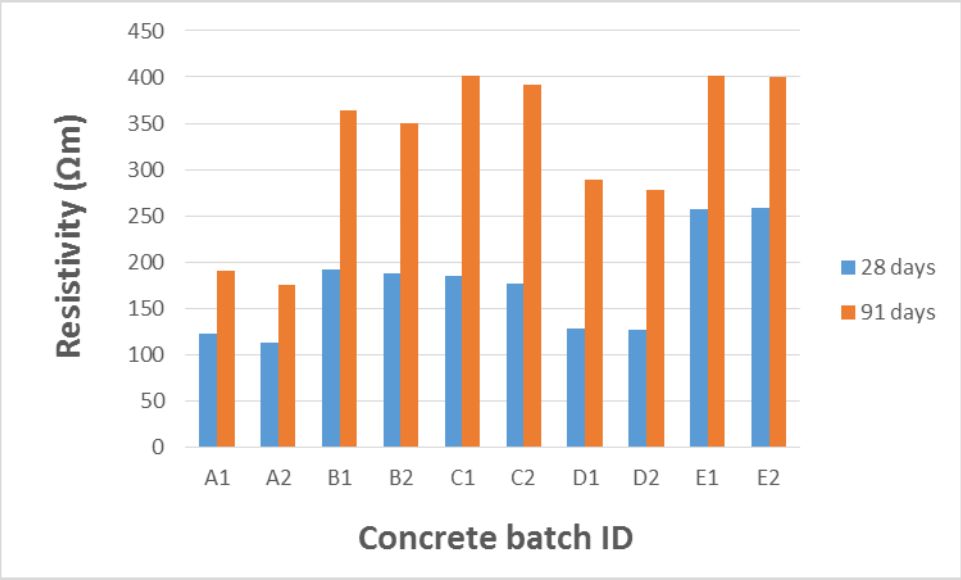


Figure 3.5. Resistivity of concrete types as determined according to SV R210 443 "spesifikk elektrisk motstand" on 100mm cubes.

4. Annexes

Annex 1 – Formwork photographic documentation

A1

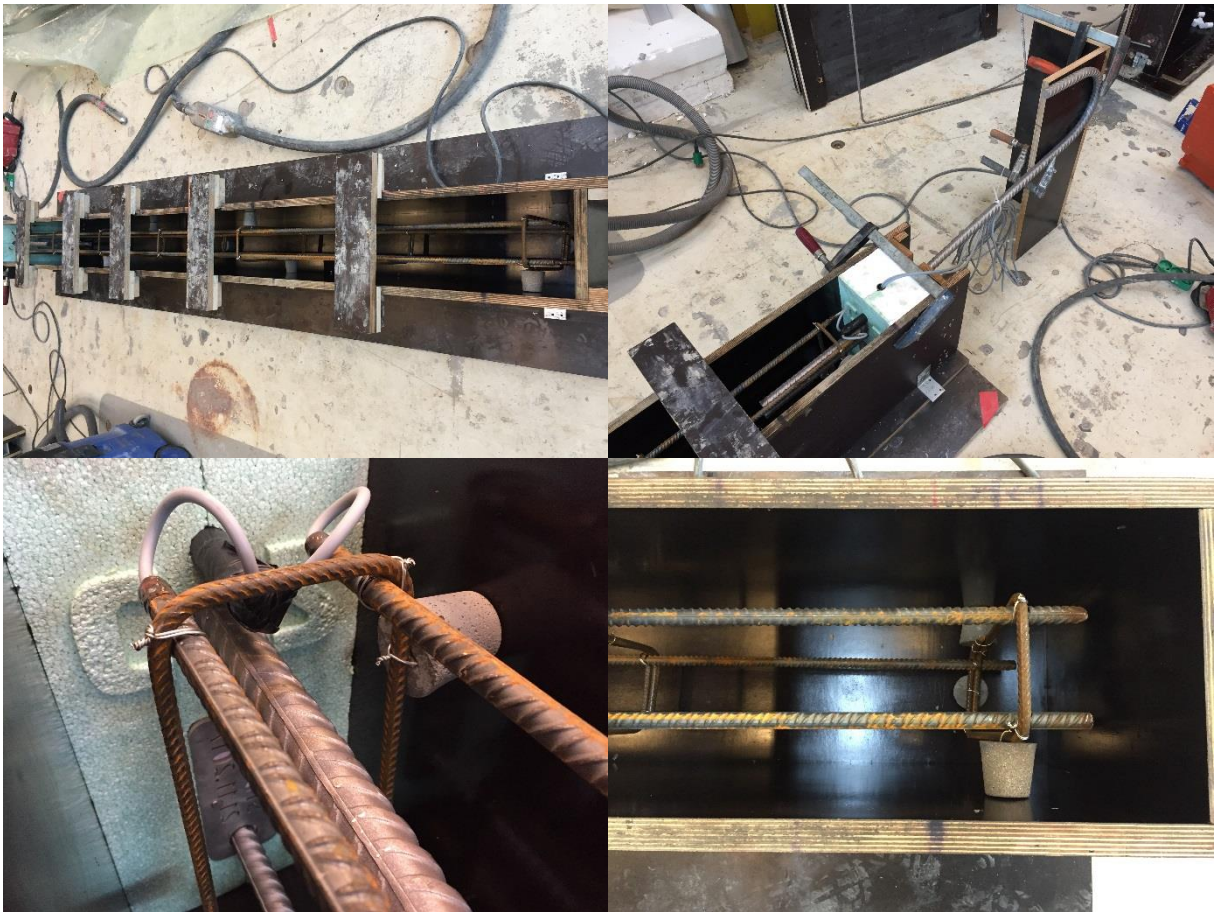
A2

B1

B2

C1

C2



D1

D2

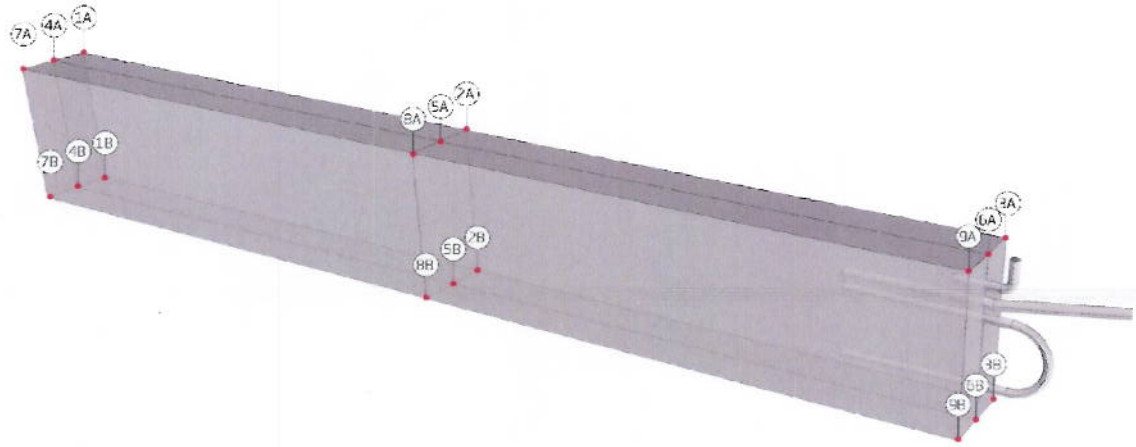
E1

E2

Annex 2 – Formwork, reinforcement and inserts

Formwork dimensions verification

Beam ID: A7



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2698

1B - 3B	7B- 9B
2699	2699

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	390

7A -7B	8A - 8B	9A - 9B
391	390	390

Equipment used: ~~QA 139869~~ QA 139869

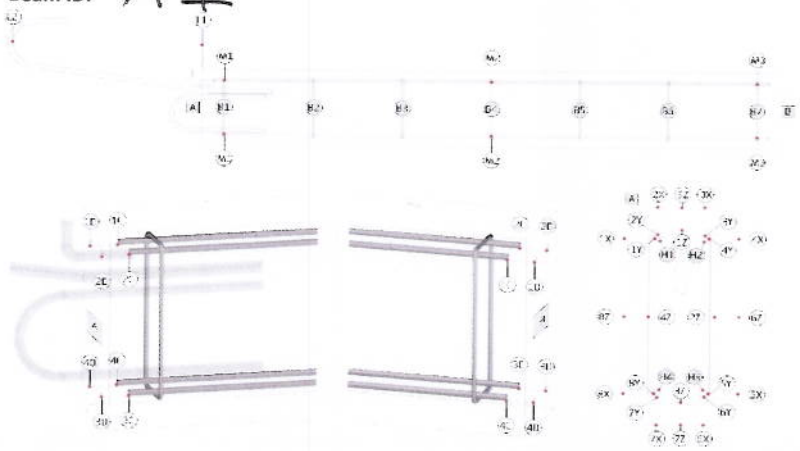
Photo documentation taken: OK

Date: 2017-11-03

Measurement performed by:

Cover verification (form)

Beam ID: A7



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	47
	2X-2Y	53
H2	3X-3Y	51
	4X-4Y	54
H3	5X-5Y	51
	6X-6Y	54
H4	7X-7Y	53
	8X-8Y	51

M2		
H1	1X-1Y	50
	2X-2Y	50
H2	3X-3Y	50
	4X-4Y	54
H3	5X-5Y	48
	6X-6Y	54
H4	7X-7Y	53
	8X-8Y	53

M3		
H1	1X-1Y	52
	2X-2Y	52
H2	3X-3Y	50
	4X-4Y	49
H3	5X-5Y	52
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	50

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	43
4Z-8Z	40

M2	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	43
4Z-8Z	39

M3	
1Z-5Z	39
2Z-6Z	42
3Z-7Z	39
4Z-8Z	40

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
416	417	417	417	412	413

Distance between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
106	113	105	103

Distance from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	50
2D-2C	52
3D-3C	54
4D-4C	55

B	
1D-1C	55
2D-2C	53
3D-3C	51
4D-4C	50

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	881

Equipment used: QA 139869, QA 89413

Date: 2017-11-03

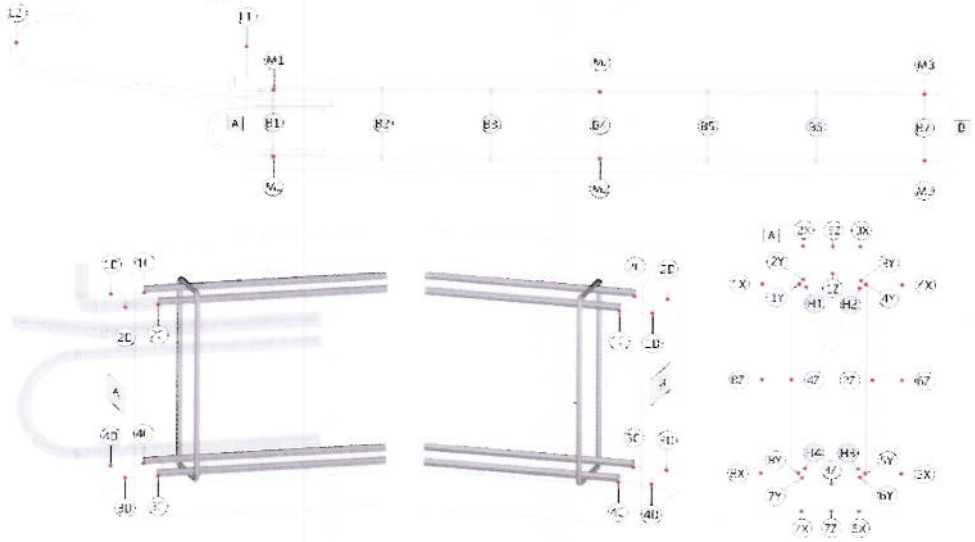
Measurement performed by:

Photo documentation taken:

OK

Reinforcement contact verification

Beam ID: A1



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

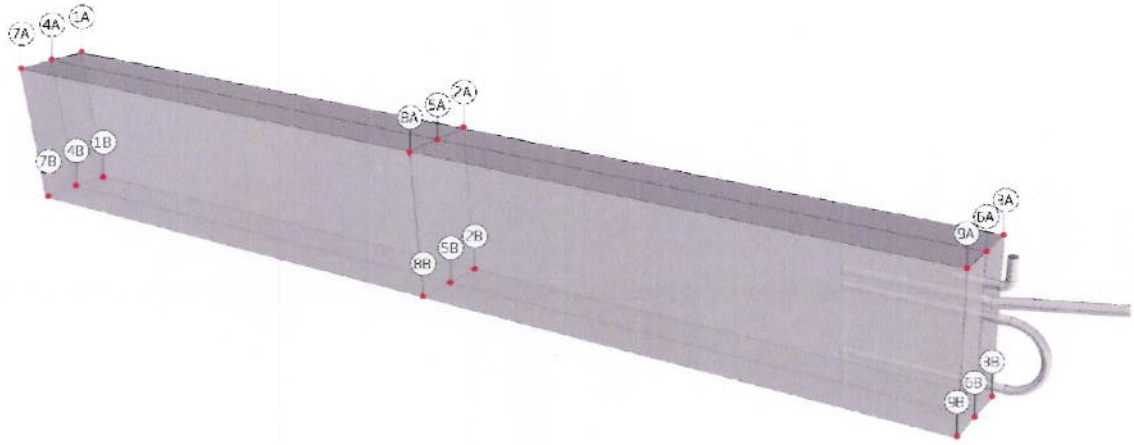
Equipment used: QA 77717

Date: 2017-11-03

Measurement performed by:

Formwork dimensions verification

Beam ID: A 2



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2698	2697

1B - 3B	7B- 9B
2698	2699

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
191	190	190

1B - 7B	2B - 8B	3B - 9B
191	191	191

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
391	390	391

7A -7B	8A - 8B	9A - 9B
390	390	391

Equipment used: QA 139869

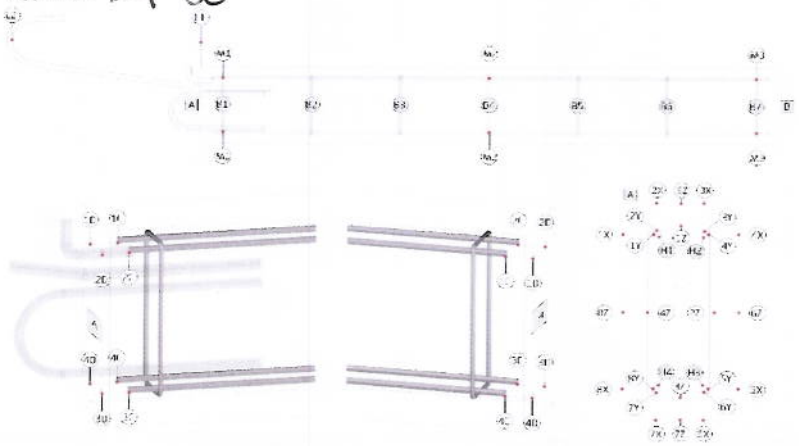
Photo documentation taken: OK

Date: 2017-11-03

Measurement performed by:

Cover verification (form)

Beam ID: A 2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	48
	2X-2Y	52
H2	3X-3Y	49
	4X-4Y	54
H3	5X-5Y	52
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	52

M2		
H1	1X-1Y	48
	2X-2Y	54
H2	3X-3Y	50
	4X-4Y	53
H3	5X-5Y	50
	6X-6Y	52
H4	7X-7Y	52
	8X-8Y	53

M3		
H1	1X-1Y	50
	2X-2Y	53
H2	3X-3Y	50
	4X-4Y	50
H3	5X-5Y	51
	6X-6Y	54
H4	7X-7Y	53
	8X-8Y	50

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	43
4Z-8Z	40

M2	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	41
4Z-8Z	40

M3	
1Z-5Z	40
2Z-6Z	39
3Z-7Z	41
4Z-8Z	39

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
417	413	415	412	416	416

Distance between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
102	100	105	102

Distance from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	49
2D-2C	52
3D-3C	49
4D-4C	50

B	
1D-1C	51
2D-2C	50
3D-3C	54
4D-4C	53

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

Equipment used: QA 139869
QA 89413

Date: 2017-11-03

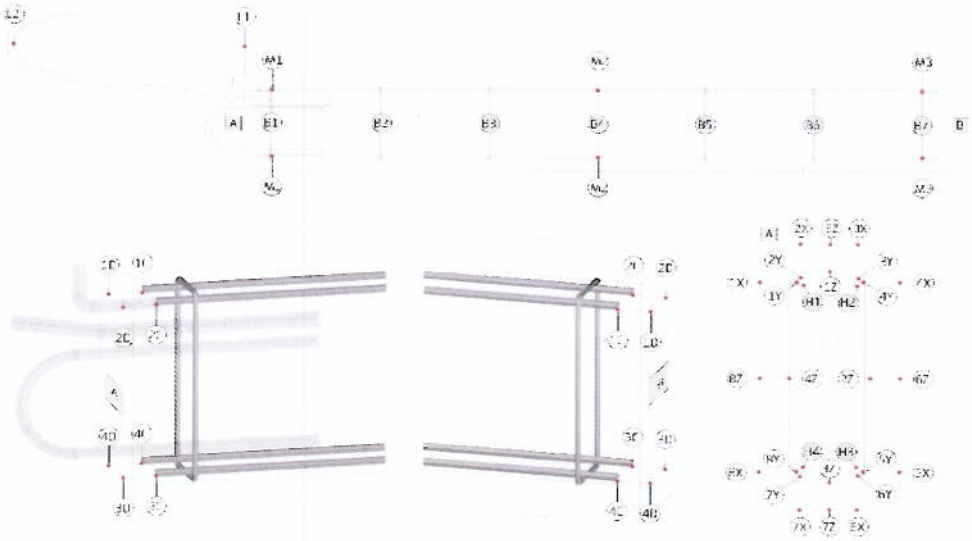
Measurement performed by:

Photo documentation taken:

OK

Reinforcement contact verification

Beam ID: A 2



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

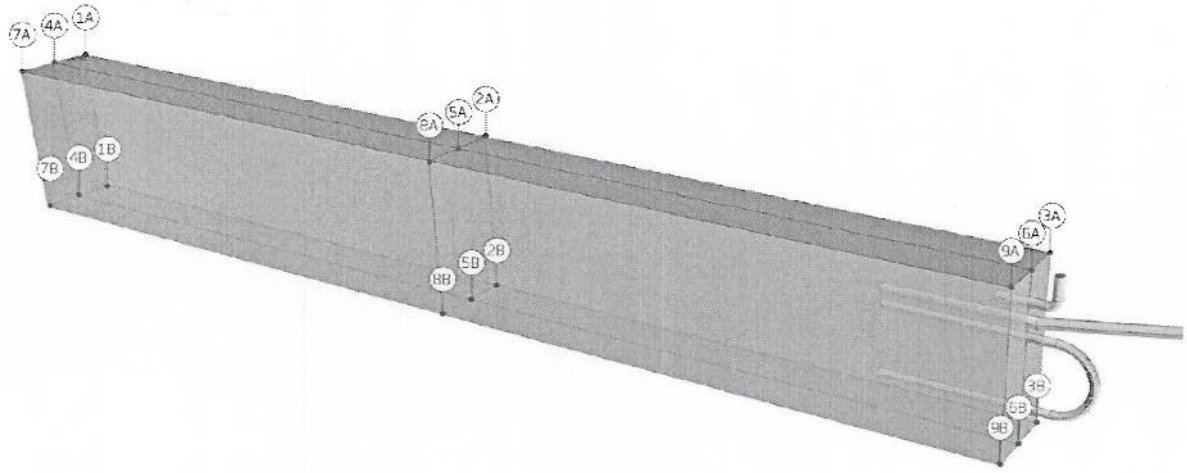
Equipment used: QA 77717

Date: 2017-11-03

Measurement performed by:

Formwork dimensions verification

Beam ID: B7



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	389	390

7A -7B	8A - 8B	9A - 9B
390	390	390

Equipment used: QA 139869

Photo documentation taken: ✓ CPA

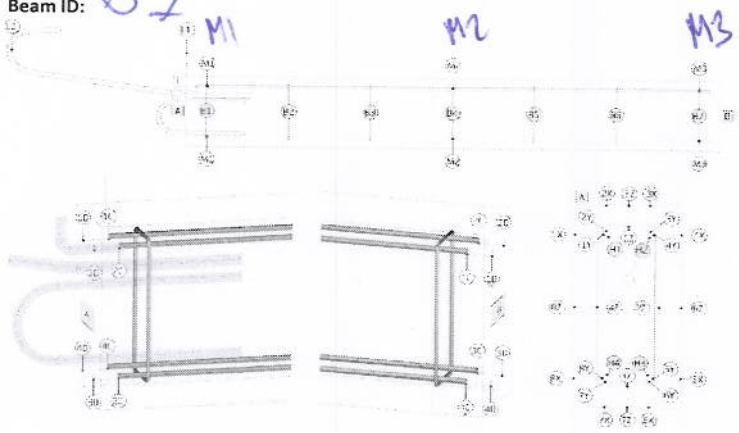
Date: 10/11-2017

Measurement performed by:

CPA

Cover verification (form)

Beam ID: B7



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	45
	2X-2Y	50
H2	3X-3Y	48
	4X-4Y	54
H3	5X-5Y	49
	6X-6Y	55
H4	7X-7Y	53
	8X-8Y	52

M2		
H1	1X-1Y	50
	2X-2Y	51
H2	3X-3Y	50
	4X-4Y	50
H3	5X-5Y	51
	6X-6Y	53
H4	7X-7Y	55
	8X-8Y	49

M3		
H1	1X-1Y	53
	2X-2Y	49
H2	3X-3Y	50
	4X-4Y	47
H3	5X-5Y	54
	6X-6Y	54
H4	7X-7Y	58
	8X-8Y	47

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	38
2Z-6Z	38
3Z-7Z	43
4Z-8Z	39

M2	
1Z-5Z	38
2Z-6Z	39
3Z-7Z	42
4Z-8Z	40

M3	
1Z-5Z	38
2Z-6Z	39
3Z-7Z	42
4Z-8Z	39

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
414	413	418	416	418	414

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
105	~~117~~ 117	100	92

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	51
2D-2C	56
3D-3C	65
4D-4C	65

B	
1D-1C	50
2D-2C	49
3D-3C	40
4D-4C	38

> Epoxy applied

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

Equipment used: 139869, ~~QA 77716~~, QA 89413

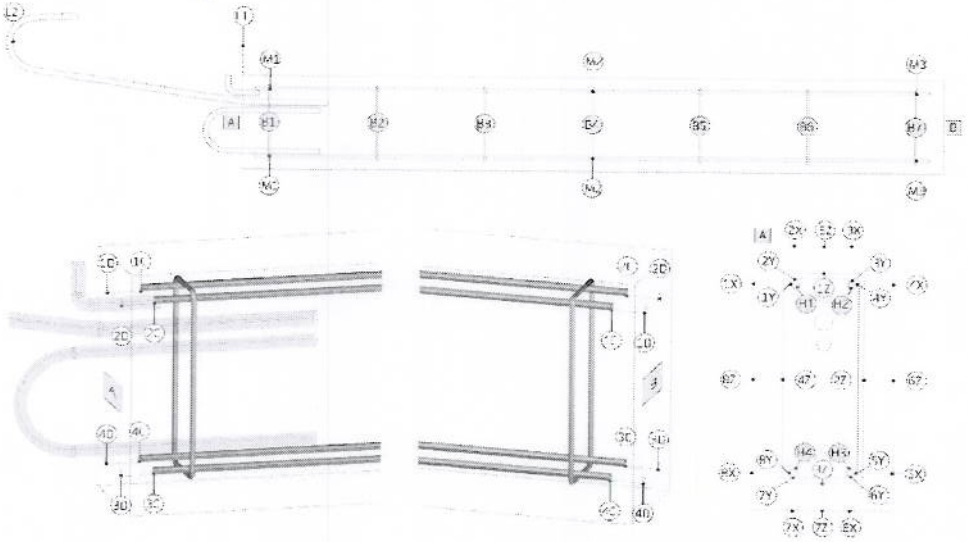
Date: 10/11-2017

Measurement performed by: CPA

Photo documentation taken: ✓ CPA

Reinforcement contact verification

Beam ID: B7



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0.2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0.2	0.2	0.2	0.2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0.2	0.2	0.2	0.2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0.2	0.2	0.2

Equipment used: QA 77717

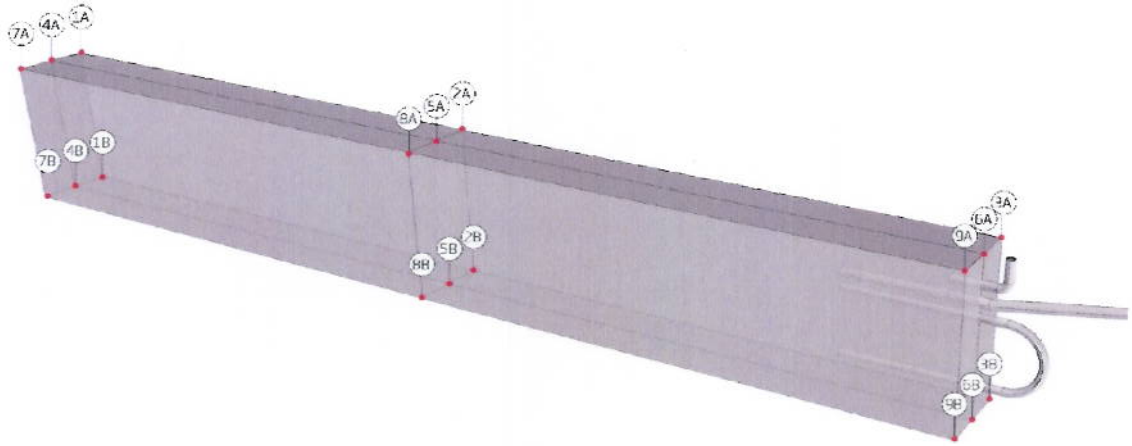
Date: 10/11 - 2017

Measurement performed by: Claus

QA

Formwork dimensions verification

Beam ID: B2



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	390

7A -7B	8A - 8B	9A - 9B
390	390	390

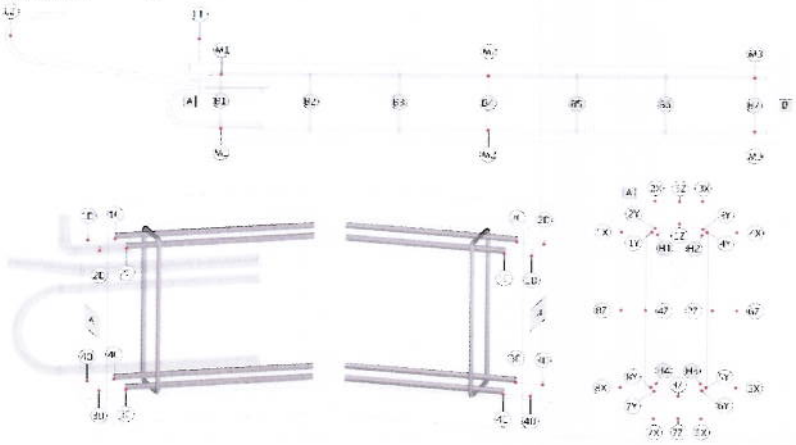
Equipment used: QA 139869 **Photo documentation taken:** CPA

Date: 2017-11-07

Measurement performed by:

Cover verification (form)

Beam ID: B2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	48
	2X-2Y	51
H2	3X-3Y	50
	4X-4Y	51
H3	5X-5Y	49
	6X-6Y	53
H4	7X-7Y	56
	8X-8Y	51

M2		
H1	1X-1Y	52
	2X-2Y	50
H2	3X-3Y	51
	4X-4Y	47
H3	5X-5Y	54
	6X-6Y	52
H4	7X-7Y	53
	8X-8Y	49

M3		
H1	1X-1Y	53
	2X-2Y	51
H2	3X-3Y	53
	4X-4Y	48
H3	5X-5Y	51
	6X-6Y	55
H4	7X-7Y	55
	8X-8Y	48

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	38
2Z-6Z	38
3Z-7Z	43
4Z-8Z	40

M2	
1Z-5Z	38
2Z-6Z	39
3Z-7Z	42
4Z-8Z	39

M3	
1Z-5Z	39
2Z-6Z	41
3Z-7Z	43
4Z-8Z	38

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
406	419	420	410	423	410

Distance between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
107	106	103	106

Distance from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	52
2D-2C	53
3D-3C	53
4D-4C	51

B	
1D-1C	58
2D-2C	55
3D-3C	56
4D-4C	58

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

Equipment used: QA 139869, QA 89413

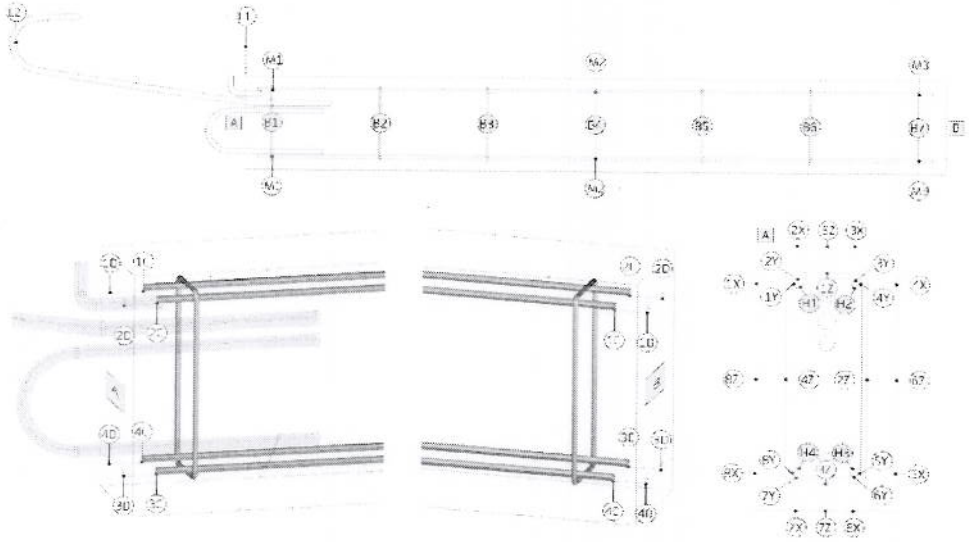
Date: 2017-11-07

Measurement performed by:

Photo documentation taken: QA

Reinforcement contact verification

Beam ID: B2



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

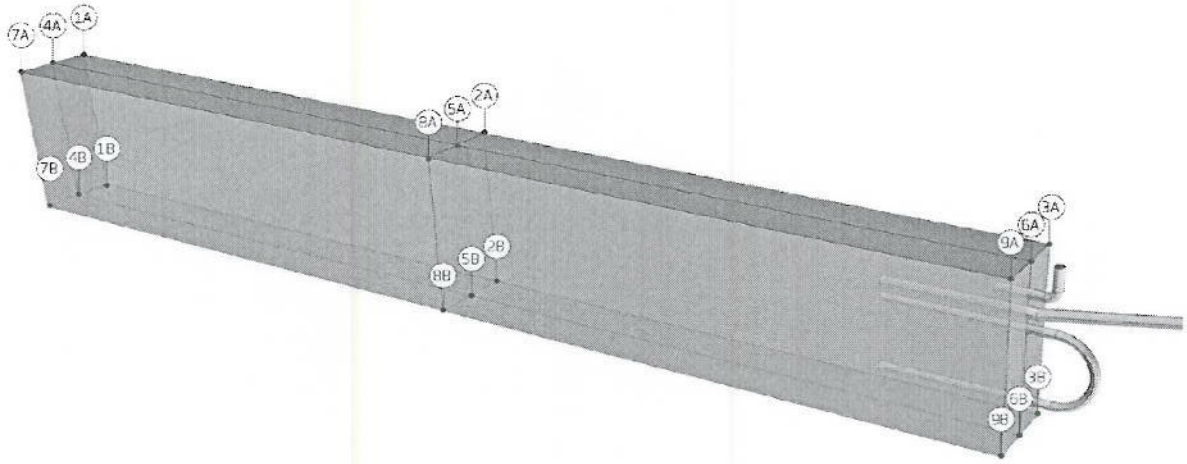
Equipment used: QA 77717

Date: 2017-11-07

Measurement performed by:

Formwork dimensions verification

Beam ID: C1



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	191

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	391	391

7A -7B	8A - 8B	9A - 9B
390	391	391

Equipment used: QA 139869

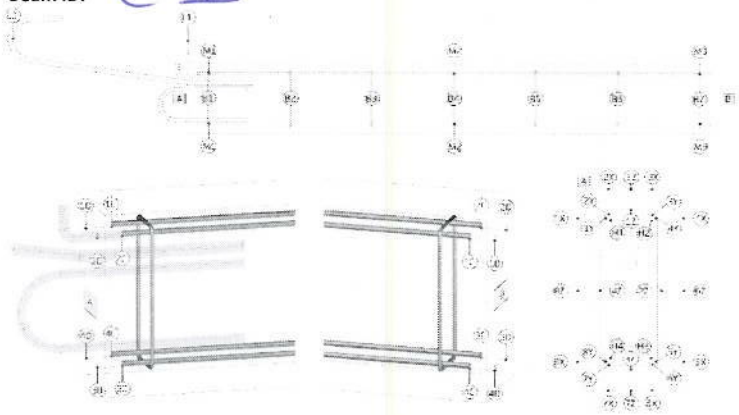
Photo documentation taken: OK

Date: 2017-11-20

Measurement performed by:

Cover verification (form)

Beam ID: C 1



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	46
	2X-2Y	54
H2	3X-3Y	49
	4X-4Y	53
H3	5X-5Y	51
	6X-6Y	54
H4	7X-7Y	53
	8X-8Y	50

M2		
H1	1X-1Y	50
	2X-2Y	49
H2	3X-3Y	49
	4X-4Y	51
H3	5X-5Y	51
	6X-6Y	52
H4	7X-7Y	52
	8X-8Y	52

M3		
H1	1X-1Y	52
	2X-2Y	47
H2	3X-3Y	52
	4X-4Y	47
H3	5X-5Y	52
	6X-6Y	53
H4	7X-7Y	53
	8X-8Y	56

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	38
4Z-8Z	42

M2	
1Z-5Z	38
2Z-6Z	39
3Z-7Z	39
4Z-8Z	41

M3	
1Z-5Z	39
2Z-6Z	39
3Z-7Z	39
4Z-8Z	42

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
418	419	413	420	412	417

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
101	104	100	100

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	51
2D-2C	53
3D-3C	52
4D-4C	56

B	
1D-1C	52
2D-2C	50
3D-3C	51
4D-4C	49

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

Equipment used: QA 139869 QA 89413

Date: 2017-11-20

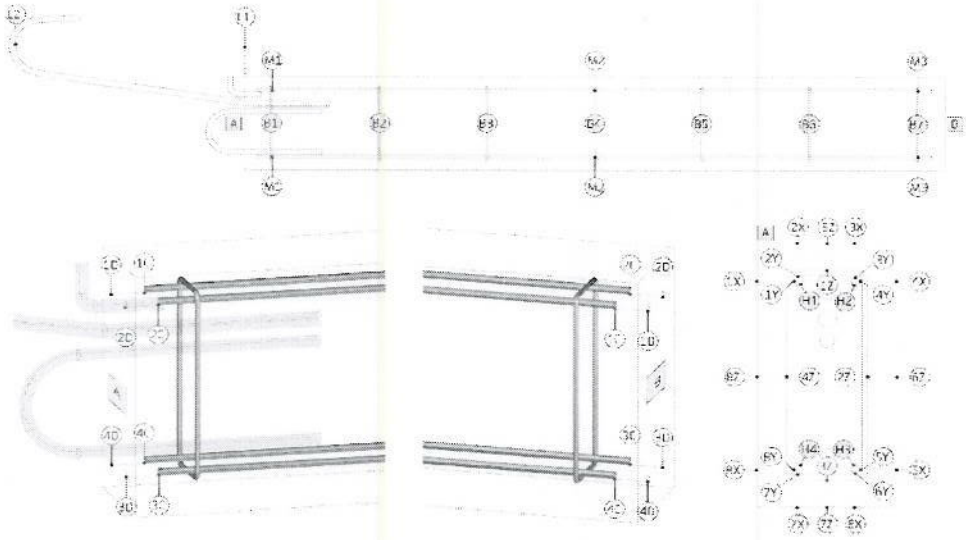
Measurement performed by:

Photo documentation taken:

OK

Reinforcement contact verification

Beam ID: C1



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

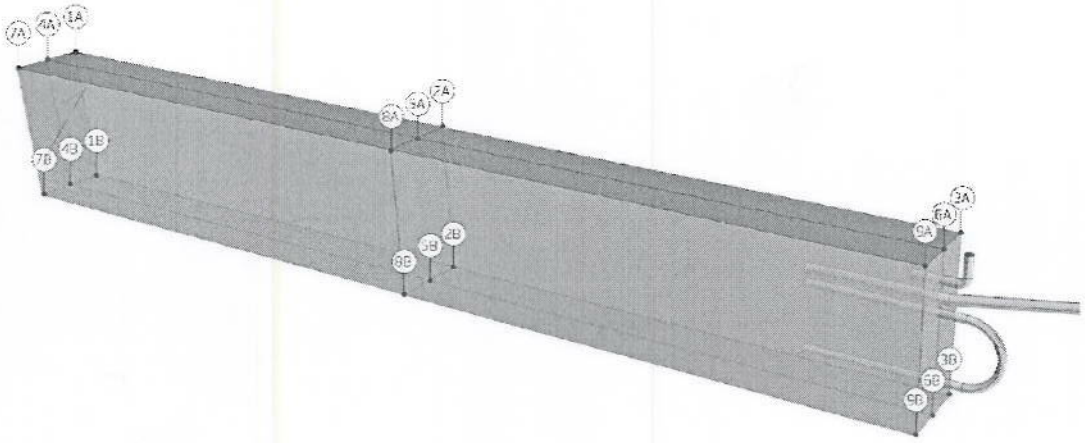
Equipment used: QA 77717

Date: 2017-11-20

Measurement performed by:

Concrete beam dimensions verification

Beam ID: C1



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2699	2700

1B - 3B	7B- 9B
2701	2702

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
192	191	190

1B - 7B	2B - 8B	3B - 9B
191	191	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	391

7A -7B	8A - 8B	9A - 9B
390	391	392

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,4	1,0	1,3	1,2	1,2	1,3	1,3	1,3	0,5	0,4

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,3	~~0,4~~ -0,3	-0,4	-0,9	-1,6	1,0	1,1	1,3	1,2	0,6

Equipment used: QA 139869

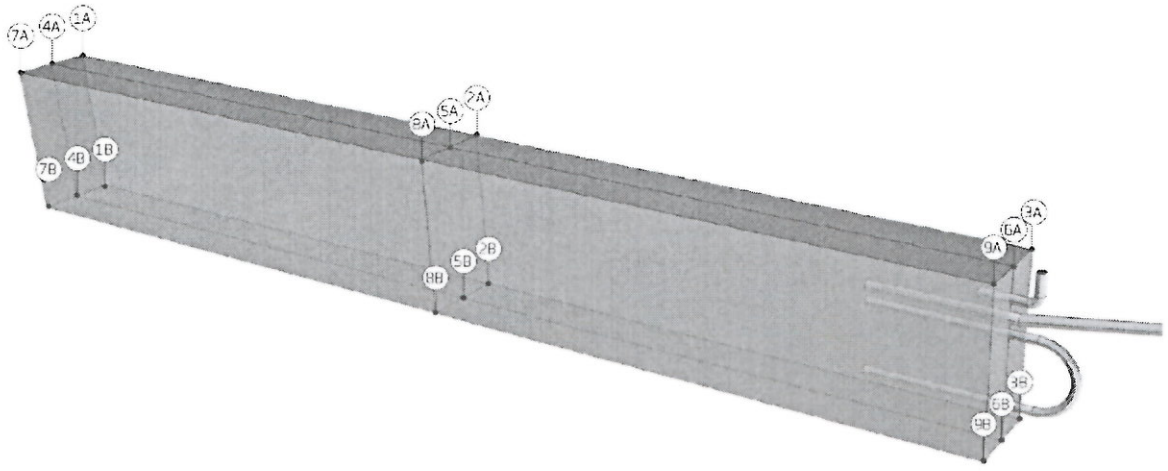
Photo documentation taken: OK

Date: 2017-11-24

Measurement performed by:

Formwork dimensions verification

Beam ID: C 2



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2699

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
191	190	190

1B - 7B	2B - 8B	3B - 9B
191	190	191

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
391	391	391

7A -7B	8A - 8B	9A - 9B
389	391	391

Equipment used: QA 139869

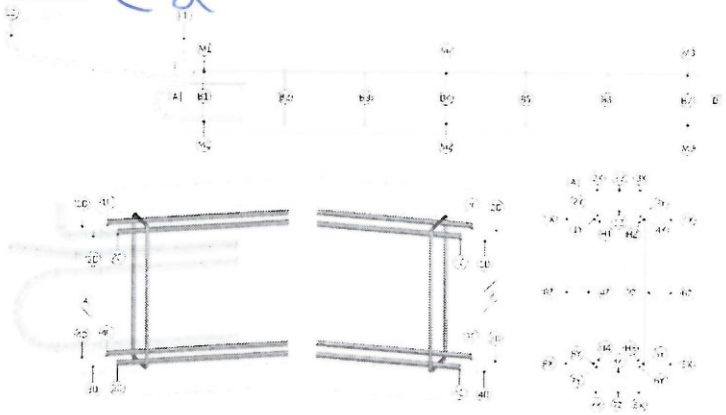
Photo documentation taken: OK

Date: 2017-11-20

Measurement performed by:

Cover verification (form)

Beam ID: C2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	51
	2X-2Y	51
H2	3X-3Y	54
	4X-4Y	47
H3	5X-5Y	53
	6X-6Y	54
H4	7X-7Y	53
	8X-8Y	50

M2		
H1	1X-1Y	50
	2X-2Y	50
H2	3X-3Y	49
	4X-4Y	51
H3	5X-5Y	52
	6X-6Y	52
H4	7X-7Y	52
	8X-8Y	52

M3		
H1	1X-1Y	48
	2X-2Y	50
H2	3X-3Y	50
	4X-4Y	48
H3	5X-5Y	54
	6X-6Y	52
H4	7X-7Y	52
	8X-8Y	54

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	39
4Z-8Z	42

M2	
1Z-5Z	39
2Z-6Z	39
3Z-7Z	42
4Z-8Z	40

M3	
1Z-5Z	40
2Z-6Z	39
3Z-7Z	42
4Z-8Z	42

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
417	415	416	416	419	415

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
102	104	100	104

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	50
2D-2C	54
3D-3C	54
4D-4C	53

B	
1D-1C	52
2D-2C	50
3D-3C	53
4D-4C	52

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

Equipment used: QA 139869, QA 89413

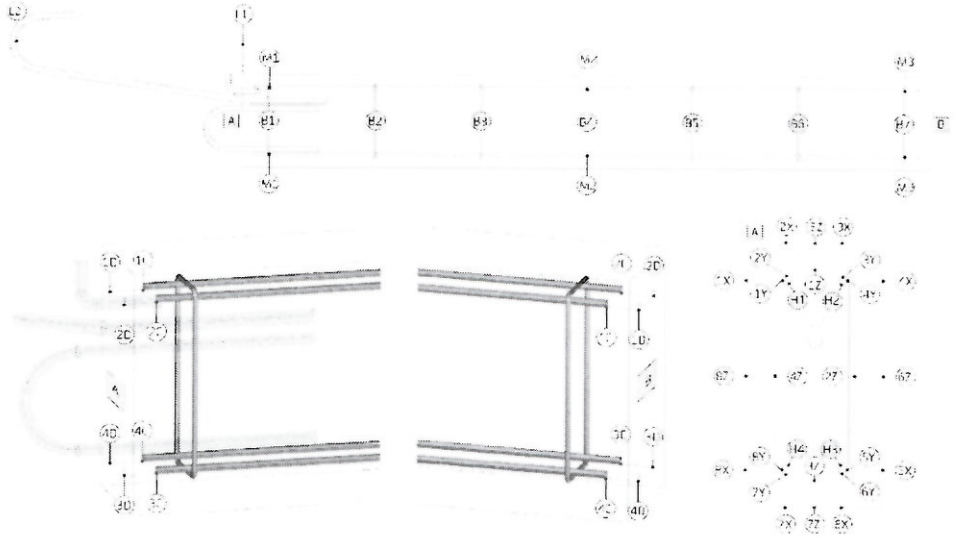
Date: 2017-11-20

Measurement performed by:

Photo documentation taken: OK

Reinforcement contact verification

Beam ID: C 2



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

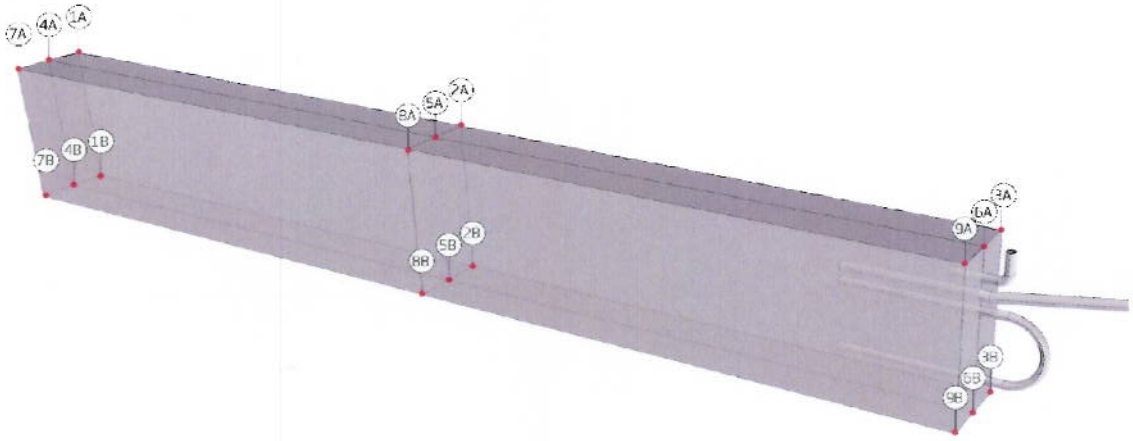
Equipment used: QA 77717

Date: 2017-11-20

Measurement performed by:

Formwork dimensions verification

Beam ID: D1



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2699	2699

1B - 3B	7B- 9B
2699	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
391	391	391

7A -7B	8A - 8B	9A - 9B
390	391	391

Equipment used: QA 139869

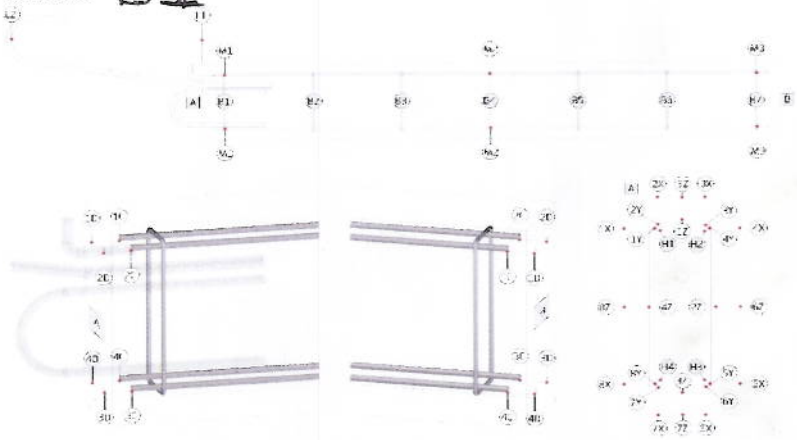
Photo documentation taken: OK

Date: 2017-11-09

Measurement performed by:

Cover verification (form)

Beam ID: D7



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	49
	2X-2Y	50
H2	3X-3Y	52
	4X-4Y	50
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	53
	8X-8Y	50

M2		
H1	1X-1Y	51
	2X-2Y	52
H2	3X-3Y	53
	4X-4Y	49
H3	5X-5Y	53
	6X-6Y	52
H4	7X-7Y	55
	8X-8Y	49

M3		
H1	1X-1Y	51
	2X-2Y	51
H2	3X-3Y	53
	4X-4Y	53
H3	5X-5Y	53
	6X-6Y	52
H4	7X-7Y	55
	8X-8Y	49

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	40
2Z-6Z	39
3Z-7Z	42
4Z-8Z	40

M2	
1Z-5Z	39
2Z-6Z	38
3Z-7Z	43
4Z-8Z	39

M3	
1Z-5Z	40
2Z-6Z	39
3Z-7Z	43
4Z-8Z	38

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
414	415	412	415	420	416

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
108	102	101	105

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	51
2D-2C	50
3D-3C	50
4D-4C	49

B	
1D-1C	50
2D-2C	52
3D-3C	55
4D-4C	52

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

Equipment used: QA 139869 QA 894113

Date: 2017-11-09

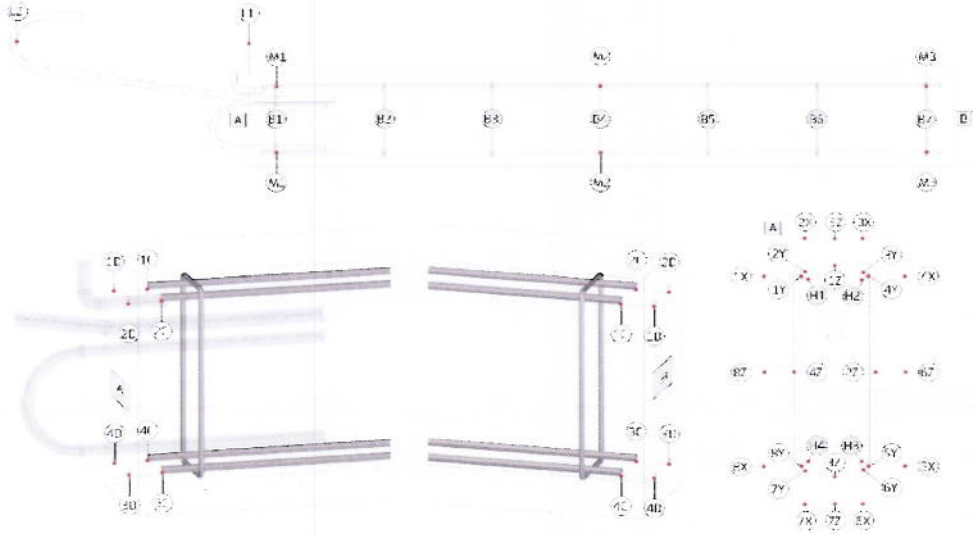
Measurement performed by:

Photo documentation taken:

OK

Reinforcement contact verification

Beam ID: D1



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

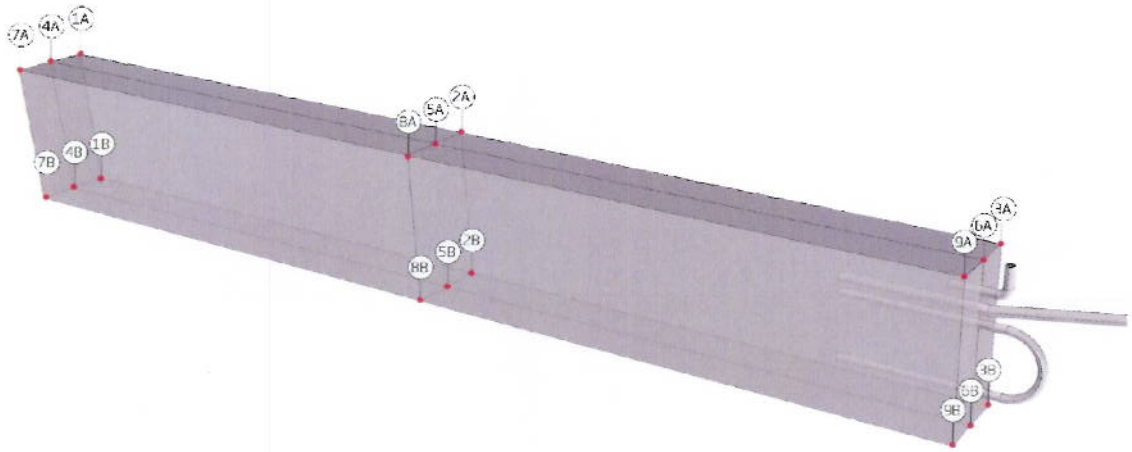
Equipment used: QA 77717

Date: 2017-11-08

Measurement performed by:

Formwork dimensions verification

Beam ID: D2



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2701	2702

1B - 3B	7B- 9B
2699	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	191	190

1B - 7B	2B - 8B	3B - 9B
190	191	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	391	391

7A -7B	8A - 8B	9A - 9B
390	390	392

Equipment used: QA 139869

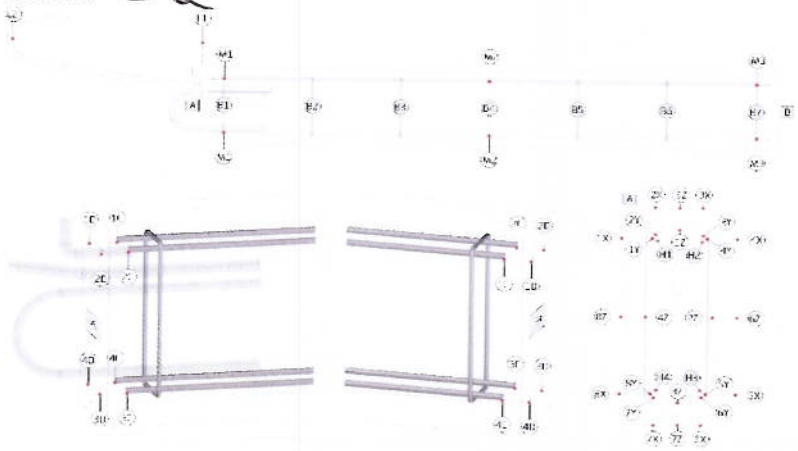
Photo documentation taken: OK

Date: 2017-11-09

Measurement performed by:

Cover verification (form)

Beam ID: D2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	46
	2X-2Y	55
H2	3X-3Y	53
	4X-4Y	51
H3	5X-5Y	48
	6X-6Y	54
H4	7X-7Y	55
	8X-8Y	49

M2		
H1	1X-1Y	52
	2X-2Y	49
H2	3X-3Y	51
	4X-4Y	48
H3	5X-5Y	53
	6X-6Y	53
H4	7X-7Y	55
	8X-8Y	48

M3		
H1	1X-1Y	52
	2X-2Y	53
H2	3X-3Y	51
	4X-4Y	48
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	47

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	42
2Z-6Z	39
3Z-7Z	42
4Z-8Z	41

M2	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	44
4Z-8Z	40

M3	
1Z-5Z	40
2Z-6Z	41
3Z-7Z	42
4Z-8Z	39

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
413	414	415	422	416	417

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
100	100	107	109

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	50
2D-2C	54
3D-3C	50
4D-4C	55

B	
1D-1C	56
2D-2C	51
3D-3C	53
4D-4C	48

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

Equipment used: QA 139869, QA 89413

Date: 2017-11-09

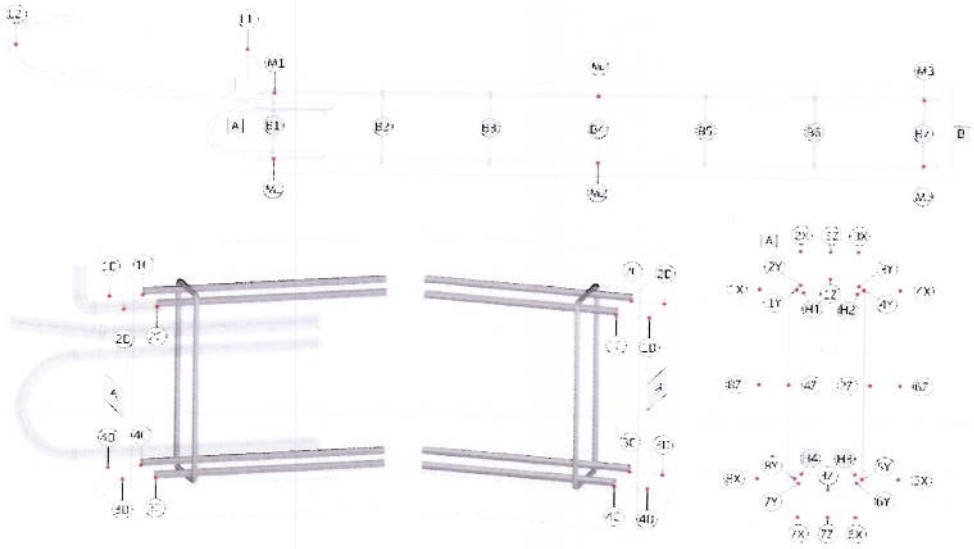
Measurement performed by:

Photo documentation taken:

OK

Reinforcement contact verification

Beam ID: D2



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

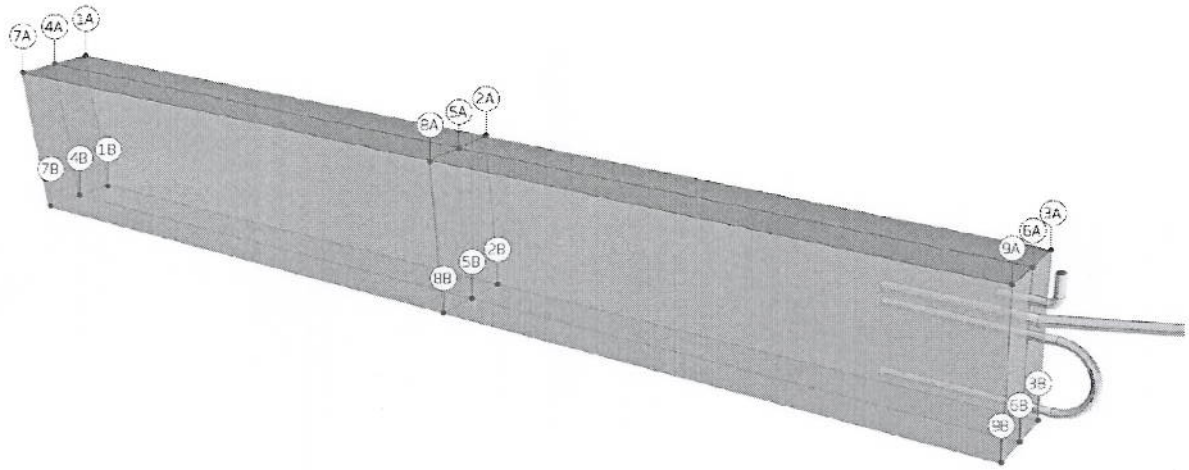
Equipment used: QA 77717

Date: 2017-11-08

Measurement performed by:

Formwork dimensions verification

Beam ID: E 1



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2700	2699

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
389	390	391

7A -7B	8A - 8B	9A - 9B
390	390	390

Equipment used: QA 139869

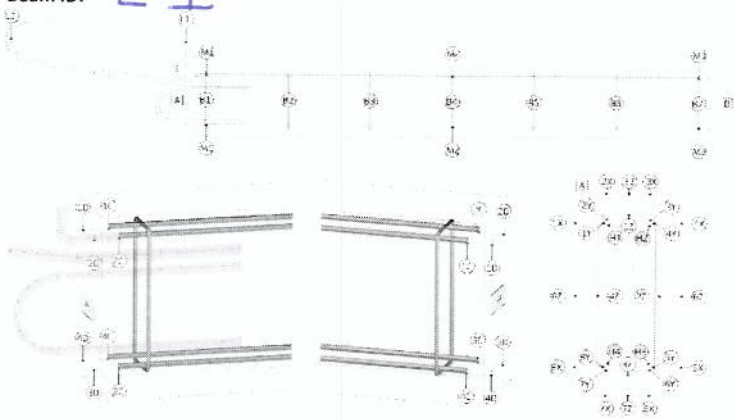
Photo documentation taken: OK

Date: 2017-11-15

Measurement performed by:

Cover verification (form)

Beam ID: E1



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	51
	2X-2Y	49
H2	3X-3Y	50
	4X-4Y	48
H3	5X-5Y	53
	6X-6Y	54
H4	7X-7Y	53
	8X-8Y	50

M2		
H1	1X-1Y	50
	2X-2Y	50
H2	3X-3Y	50
	4X-4Y	50
H3	5X-5Y	49
	6X-6Y	52
H4	7X-7Y	53
	8X-8Y	52

M3		
H1	1X-1Y	49
	2X-2Y	49
H2	3X-3Y	48
	4X-4Y	54
H3	5X-5Y	50
	6X-6Y	52
H4	7X-7Y	51
	8X-8Y	54

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	38
2Z-6Z	40
3Z-7Z	41
4Z-8Z	38

M2	
1Z-5Z	39
2Z-6Z	38
3Z-7Z	43
4Z-8Z	39

M3	
1Z-5Z	38
2Z-6Z	38
3Z-7Z	42
4Z-8Z	39

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
414	417	416	414	415	412

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
106	102	104	100

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	54
2D-2C	54
3D-3C	53
4D-4C	52

B	
1D-1C	51
2D-2C	51
3D-3C	53
4D-4C	51

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

Equipment used: QA 139869, QA 89413

Date: 2017-11-15

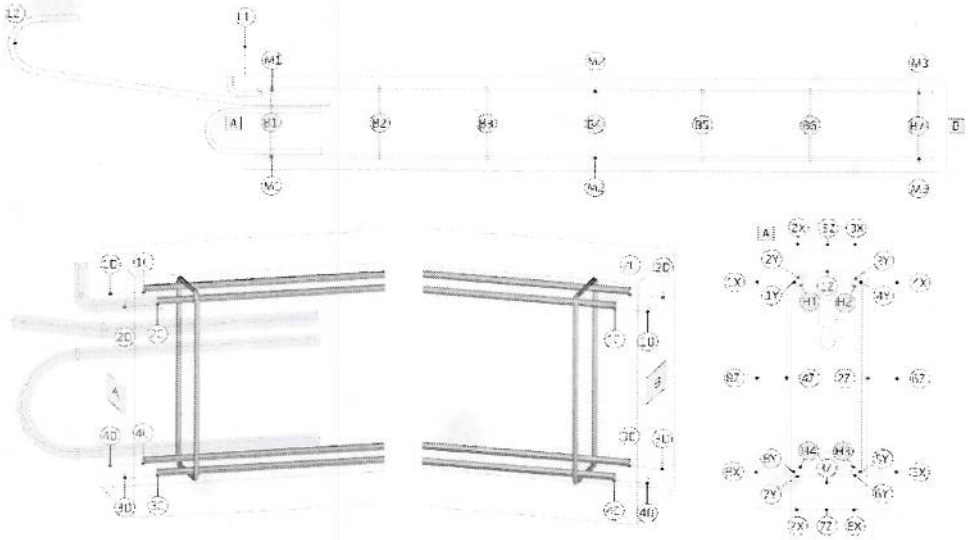
Measurement performed by:

Photo documentation taken:

OK

Reinforcement contact verification

Beam ID: E1



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

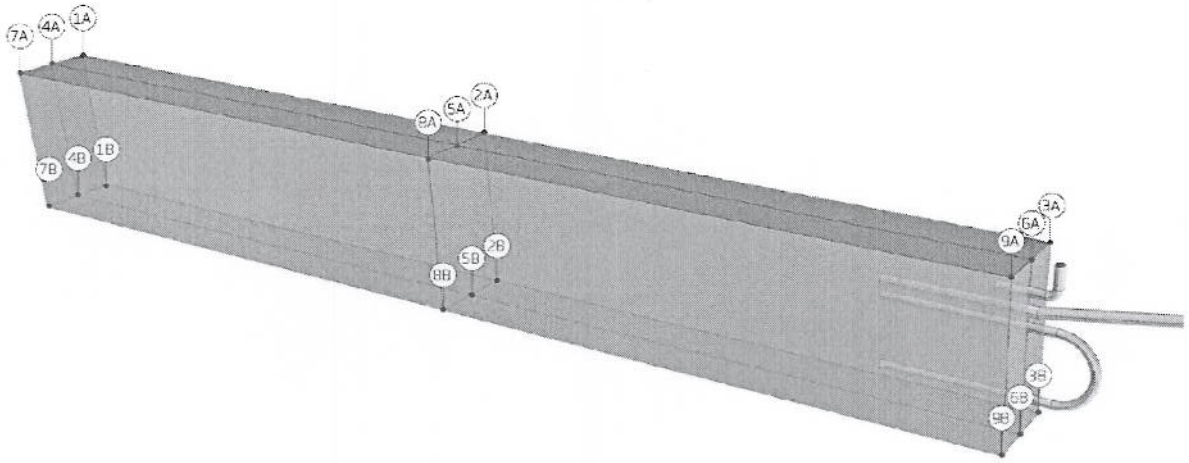
Equipment used: QA 77717

Date: 2017-11-16

Measurement performed by:

Formwork dimensions verification

Beam ID: E 2



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2701	2701

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	390

7A -7B	8A - 8B	9A - 9B
390	390	390

Equipment used: QA 139869

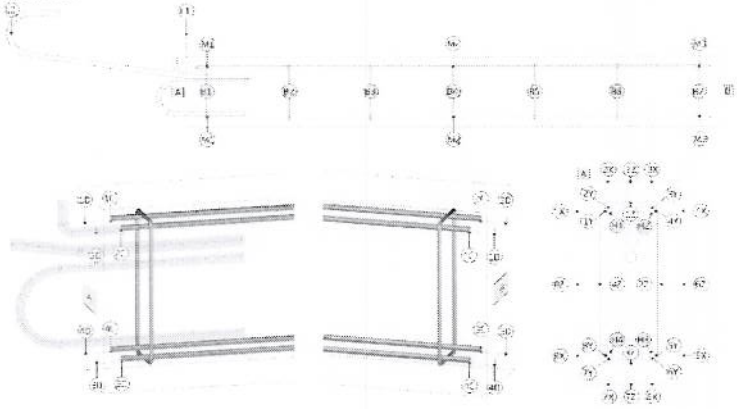
Photo documentation taken: OK

Date: 2017-11-15

Measurement performed by:

Cover verification (form)

Beam ID: E2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	46
	2X-2Y	51
H2	3X-3Y	51
	4X-4Y	50
H3	5X-5Y	49
	6X-6Y	51
H4	7X-7Y	54
	8X-8Y	50

M2		
H1	1X-1Y	49
	2X-2Y	50
H2	3X-3Y	53
	4X-4Y	48
H3	5X-5Y	50
	6X-6Y	52
H4	7X-7Y	54
	8X-8Y	51

M3		
H1	1X-1Y	51
	2X-2Y	49
H2	3X-3Y	51
	4X-4Y	50
H3	5X-5Y	50
	6X-6Y	53
H4	7X-7Y	55
	8X-8Y	49

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	38
2Z-6Z	39
3Z-7Z	41
4Z-8Z	39

M2	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	42
4Z-8Z	39

M3	
1Z-5Z	36
2Z-6Z	40
3Z-7Z	42
4Z-8Z	39

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
415	418	413	417	417	415

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
102	105	102	100

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	50
2D-2C	51
3D-3C	54
4D-4C	55

B	
1D-1C	53
2D-2C	51
3D-3C	52
4D-4C	50

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

Equipment used: QA 139869, QA 89413

Date: 2017-11-15

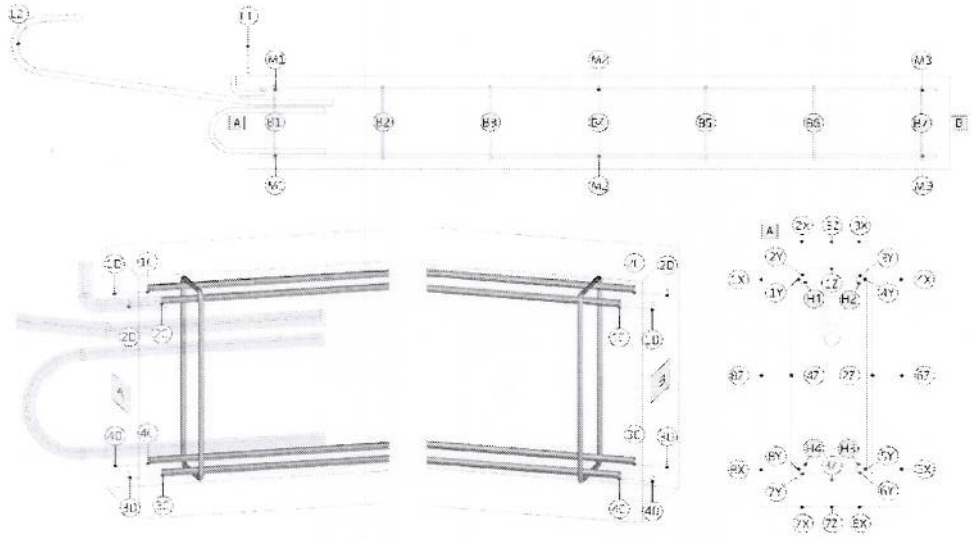
Measurement performed by:

Photo documentation taken:

OK

Reinforcement contact verification

Beam ID: E 2



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

Equipment used: QA 77717

Date: 2017-11-16

Measurement performed by:

Annex 3 – Aggregate properties

Test report

REPORT NO.:
804573-1

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej 4
City: DK-2630 Taastrup

Material: Årdal sand 0-8$_{mm}$. The material for testing was submitted by Statens Vegvesen and received on Danish Technological Institute in september of 2017.

Sampling: The test portion was sampled by DTI/PEMD 2017-10-02. The test portion was split in two fractions using a 4$_{mm}$ sieve. The 0-4$_{mm}$ fraction make up 79.8% and the 4-8$_{mm}$ fraction make up 20.2% of the total test portion.

Period: The test was completed 2017-10-06.

Test method: DS/EN 1097-6:2013 Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption.

Method used: Sections 8 and 9

Results: Result of the test is given on page 2 of this report.

Terms: The test has been performed according to the conditions laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

Place: Date 2018-03-15, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Peter Mathias Dissing
Digitally signed by Peter Mathias Dissing
Date: 2018.03.16 15:09:06 +01'00'

Peter Dissing
Laboratory Technician

Digitalt signeret af Thomas Lennart Svensson
Dato: 2018.03.16 15:01:09 +01'00'

Thomas Svensson
Team Manager

ilac-MRA

DANAK
Test Reg. no. 2

Results

Sample ID	Apparent density (kg/m^3)	Density, S.S.D. (kg/m^3)	Density, oven dry (kg/m^3)	Absorption (%)
Årdal 0-4 mm.	2679	2662	2652	0,38

Sample ID	Apparent density (kg/m^3)	Density, S.S.D. (kg/m^3)	Density, oven dry (kg/m^3)	Absorption (%)
Årdal 4-8 mm.	2693	2658	2637	0,79

Test report

REPORT NO.:
804573-3

DANISH
TECHNOLOGICAL
INSTITUTE

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DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Init: PEMD/THSV
Order no.: 804573-3
Appendix: 0

Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej 4
City: DK-2630 Taastrup

Material: Årdal sand 0-8$_{mm}$. The material for testing was submitted by Statens Vegvesen and received on Danish Technological Institute in september of 2017.

Sampling: The test portion was sampled by DTI/PEMD 2017-10-09. The test portion was split in two fractions using a 4$_{mm}$ sieve. The 0-4$_{mm}$ fraction make up 79.8% and the 4-8$_{mm}$ fraction make up 20.2% of the total test portion.

Period: The test was completed 2017-10-11.

Test method: DS/EN 1097-6:2013 Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption.

Method used: Sections 8 and 9

Results: Result of the test is given on page 2 of this report.

Terms: The test has been performed according to the conditions laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

Place: Date 2018-03-16, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Peter Mathias Dissing
Digitally signed by Peter Mathias Dissing
Date: 2018.03.16 15:10:01 +01'00'

Peter Dissing
Laboratory Technician

Digitalt signeret af Thomas Lennart Svensson
Dato: 2018.03.16 15:03:04 +01'00'

Thomas Svensson
Team Manager

ilac-MRA

DANAK
Test Reg. no. 2

Results

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
A1 Årdal 0-4 mm	2675	2658	2648	0,38

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
A2 Årdal 4-8 mm	2693	2657	2635	0,81

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
B1 Årdal 0-4 mm	2678	2662	2653	0,35

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
B2 Årdal 4-8 mm	2705	2668	2647	0,80

Test report

REPORT NO.:
804573-2

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
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Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej 4
City: DK-2630 Taastrup

Material: Årdal sten 8-16$_{mm}$. The material for testing was submitted by Statens Vegvesen and received on Danish Technological Institute in september of 2017.

Sampling: The test portion was sampled by DTI/PEMD 2017-10-02.

Period: The test was completed 2017-10-06.

Test method: DS/EN 1097-6:2013 Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption.

Method used: Section 8.

Results: Result of the test is given on page 2 of this report.

Terms: The test has been performed according to the conditions laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

Place: Date 2018-03-16, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Peter Mathias Dissing
Digitally signed by Peter Mathias Dissing
Date: 2018.03.16 15:09:33 +01'00'

Peter Dissing
Laboratory Technician

Digitalt signeret af Thomas Lennart Svensson
Dato: 2018.03.16 15:02:12 +01'00'

Thomas Svensson
Team Manager

ilac-MRA DANAK
Test Reg. no. 2

Results

Sample ID	Apparent density (kg/m^3)	Density, S.S.D. (kg/m^3)	Density, oven dry (kg/m^3)	Absorption (%)
Årdal 8-16 mm.	2703	2678	2664	0,54

Test report

REPORT NO.:
804573-4

DANISH
TECHNOLOGICAL
INSTITUTE

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www.teknologisk.dk

Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej 4
City: DK-2630 Taastrup

Material: Årdal sten 8-16$_{mm}$. The material for testing was submitted by Statens Vegvesen and received on Danish Technological Institute in september of 2017.

Sampling: The test portion was sampled by DTI/PEMD 2017-10-09.

Period: The test was completed 2017-10-11.

Test method: DS/EN 1097-6:2013 Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption.

Method used: Section 8.

Results: Result of the test is given on page 2 of this report.

Terms: The test has been performed according to the conditions laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

Place: Date 2018-03-16, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Peter Mathias Dissing
Digitally signed by Peter Mathias Dissing
Date: 2018.03.16 15:10:28 +01'00'

Peter Dissing
Laboratory Technician

Digitalt signeret af Thomas Lennart Svensson
Dato: 2018.03.16 15:03:51 +01'00'

Thomas Svensson
Team Manager

ilac-MRA DANAK
Test Reg. no. 2

Results

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
A1 Årdal 8-16 mm	2704	2676	2660	0,60

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
A2 Årdal 8-16 mm	2713	2686	2671	0,57

Annex 4 – Batch reports

Teknologisk Institut

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Standard	427,2	3150		0,1356	427,2	**111,0720**	111,0700	0,0	0,0	111,0700	0,0353	429,2	0,1362
Microsilica	18,0	2200		0,0082	18,0	**4,6800**	4,6800	0,0	0,0	4,6800	0,0021	18,1	0,0082
Årdal sand 0/8	887,8	2660	0,46	0,3338	922,7	**239,8897**	238,9000	-1,0	-0,4	229,8757	0,0864	888,2	0,3339
Årdal stein 8/16	793,4	2680	0,57	0,2960	793,0	**206,1894**	206,3000	0,1	0,1	206,3947	0,0770	797,5	0,2976
Mapei Dynamon	3,10	1050	77	0,0030	3,1	**0,8060**	0,8060	0,0	0,0	0,8060	0,0008	3,1	0,0030
Mapeair	1,60	1000	99,6	0,0016	1,6	**0,4160**	0,4160	0,0	0,0	0,4160	0,0004	1,6	0,0016
Water	176,7	1000		0,1767	142,2	**36,9665**	37,0000	0,0	0,1	45,9296	0,0459	177,5	0,1775
Air				0,0450							0,0109		0,0420
Total	2307,8			0,9998	2307,8	600,0195	599,1720			599,1720	0,2588	2315,2	1,0000

w/c	0,39
Water free	180,6
Batch size	0,260
Date	03-11-2017
Time	11:51
ID	A1

w/c actual	0,390

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	445,6	1024,5	997,2	4,95
	2	454,2	1174,2	1144,3	4,33
	3	484,4	1157,2	1132,1	3,88
	Average				4,39
Årdal stein 8/16	1	475,6	1156,1	1153,0	0,46
	2	591,3	1326,4	1322,4	0,55
	3	428,2	1260,9	1256,2	0,57
	Average				0,52

Slump	Air	Weight	Density	Temperature	Watt
200	4,2	22,61	2333,8	20,5	69

Teknologisk Institut

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Standard	427,2	3150		0,1356	427,2	**111,0720**	111,0700	0,0	0,0	111,0700	0,0353	428,9	0,1362
Microsilica	18,0	2200		0,0082	18,0	**4,6800**	4,6800	0,0	0,0	4,6800	0,0021	18,1	0,0082
Årdal sand 0/8	887,8	2660	0,46	0,3338	917,1	**238,4440**	238,8000	0,4	0,1	231,1726	0,0869	892,6	0,3356
Årdal stein 8/16	793,4	2680	0,57	0,2960	793,4	**206,2830**	206,5000	0,2	0,1	206,5010	0,0771	797,4	0,2975
Mapei Dynamon	3,10	1050	77	0,0030	3,1	**0,8060**	0,8060	0,0	0,0	0,8060	0,0008	3,1	0,0030
Mapeair	1,60	1000	99,6	0,0016	1,6	**0,4160**	0,4160	0,0	0,0	0,4160	0,0004	1,6	0,0016
Water	176,7	1000		0,1767	147,4	**38,3185**	38,2000	-0,1	-0,3	45,8264	0,0458	177,0	0,1770
Air				0,0450							0,0106		0,0410
Total	2307,8			0,9998	2307,8	600,0195	600,4720			600,4720	0,2590	2318,6	1,0000

w/c	0,39
Water free	180,6
Batch size	0,260
Date	03-11-2017
Time	13:23
ID	A2

w/c actual	0,389

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	445,6	1140,8	1114,5	3,93
	2	484,4	1248,4	1221,0	3,72
	3	591,3	1348,5	1322,0	3,63
	Average				3,76
Årdal stein 8/16	1	454,2	1236,3	1232,0	0,55
	2	475,6	1399,6	1393,6	0,65
	3	428,2	1168,7	1165,0	0,50
	Average				0,57

Slump	Air	Weight	Density	Temperature	Watt
200	4,1	22,65	2338,8	20,7	66

Teknologisk Institut

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Standard FA	419,0	3000		0,1397	419,0	**108,9400**	108,9400	0,0	0,0	108,9400	0,0363	415,7	0,1386
Microsilica	17,6	2200		0,0080	17,6	**4,5760**	4,5800	0,0	0,1	4,5800	0,0021	17,5	0,0079
Årdal sand 0/8	887,8	2660	0,46	0,3338	917,1	**238,4547**	238,9000	0,4	0,2	231,2591	0,0869	882,5	0,3318
Årdal stein 8/16	793,4	2680	0,57	0,2960	793,2	**206,2445**	206,7000	0,5	0,2	206,7396	0,0771	789,0	0,2944
Mapei Dynamon	2,60	1050	77	0,0025	2,6	**0,6760**	0,6760	0,0	0,0	0,6760	0,0006	2,6	0,0025
Mapeair	2,90	1000	99,6	0,0029	2,9	**0,7540**	0,7540	0,0	0,0	0,7540	0,0008	2,9	0,0029
Water	172,2	1000		0,1722	143,1	**37,1972**	37,2000	0,0	0,0	44,8014	0,0448	171,0	0,1710
Air				0,0450							0,0134		0,0510
Total	2295,5			1,0001	2295,5	596,8424	597,7500			597,7500	0,2620	2281,1	1,0000

w/c	0,39
Water free	177,1
Batch size	0,260
Date	10-11-2017
Time	14:10
ID	B1

w/c actual	0,390

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	428,2	1117,9	1092,0	3,90
	2	454,2	1169,4	1145,5	3,46
	3	484,4	1311,5	1280,2	3,93
	Average				3,76
Årdal stein 8/16	1	591,3	1331,9	1328,5	0,46
	2	445,6	1333,8	1328,6	0,59
	3	475,6	1310,5	1305,5	0,60
	Average				0,55

Slump	Air	Weight	Density	Temperature	Watt
220	5,1	22,31	2296,3	20	60

Teknologisk Institut

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Standard FA	419,0	3000		0,1397	419,0	**108,9400**	108,9400	0,0	0,0	108,9400	0,0363	421,6	0,1405
Microsilica	17,6	2200		0,0080	17,6	**4,5760**	4,5760	0,0	0,0	4,5760	0,0021	17,7	0,0080
Årdal sand 0/8	887,8	2660	0,46	0,3338	916,4	**238,2726**	238,8000	0,5	0,2	231,3389	0,0870	895,3	0,3366
Årdal stein 8/16	793,4	2680	0,57	0,2960	793,6	**206,3385**	206,7000	0,4	0,2	206,6454	0,0771	799,7	0,2984
Mapei Dynamon	2,70	1050	77	0,0026	2,7	**0,7020**	0,7020	0,0	0,0	0,7020	0,0007	2,7	0,0026
Mapeair	2,80	1000	99,6	0,0028	2,8	**0,7280**	0,7280	0,0	0,0	0,7280	0,0007	2,8	0,0028
Water	172,3	1000		0,1723	143,4	**37,2912**	37,2000	-0,1	-0,2	44,7157	0,0447	173,0	0,1730
Air				0,0450							0,0098		0,0380
Total	2295,6			1,0001	2295,6	596,8483	597,6460			597,6460	0,2584	2312,9	1,0000

w/c	0,39
Water free	177,1
Batch size	0,260
Date	07-11-2017
Time	
ID	B2

w/c actual	0,389

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	445,6	1100,7	1077,6	3,66
	2	591,3	1214,7	1192,6	3,68
	3	475,6	1248,2	1220,5	3,72
	Average	1512,5	3563,6	3490,7	3,69
Årdal stein 8/16	1	484,4	1293,9	1289,2	0,58
	2	454,2	1358,1	1352,5	0,62
	3	428,2	1312,3	1307,2	0,58
	Average	1366,8	3964,3	3948,9	0,60

Slump	Air	Weight	Density	Temperature	Watt
220	3,8	22,592	2331,5	20	N/A

Teknologisk Institut

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Standard FA	281,6	3000		0,0939	281,6	**73,2160**	73,2200	0,0	0,0	73,2200	0,0244	278,9	0,0930
Microsilica	16,6	2200		0,0075	16,6	**4,3160**	4,3200	0,0	0,1	4,3200	0,0020	16,5	0,0075
Fly ash	114,3	2300		0,0497	114,3	**29,7180**	29,7200	0,0	0,0	29,7200	0,0129	113,2	0,0492
Årdal sand 0/8	887,8	2660	0,46	0,3338	921,6	**239,6032**	238,8000	-0,8	-0,3	230,0542	0,0865	876,2	0,3294
Årdal stein 8/16	793,4	2680	0,57	0,2960	791,5	**205,8009**	206,3000	0,5	0,2	206,7842	0,0772	787,6	0,2939
Mapei Dynamon	1,90	1050	77	0,0018	1,9	**0,4940**	0,4940	0,0	0,0	0,4940	0,0005	1,9	0,0018
Mapeair	5,60	1000	99,6	0,0056	5,6	**1,4560**	1,4560	0,0	0,0	1,4560	0,0015	5,5	0,0055
Water	166,7	1000		0,1667	134,8	**35,0436**	35,0000	0,0	-0,1	43,2616	0,0433	164,8	0,1648
Air				0,0450							0,0144		0,0550
Total	2267,9			1,0000	2267,9	589,6477	589,3100			589,3100	0,2626	2244,4	1,0000

w/c	0,44
Water free	173,7
Batch size	0,260
Date	21-11-2017
Time	09:57
ID	C1

w/c actual	0,439

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	475,6	1069,3	1044,5	4,36
	2	611,7	1170,2	1146,0	4,53
	3	591,3	1324,6	1297,1	3,90
	Average				4,26
Årdal stein 8/16	1	454,2	1333,6	1331,5	0,24
	2	428,2	1254,8	1251,5	0,40
	3	484,4	1276,9	1274,0	0,37
	Average				0,34

Slump	Air	Weight	Density	Temperature	Watt
220	5,5	22,02	2260,0	19,1	60

Teknologisk Institut

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Standard FA	281,6	3000		0,0939	281,6	**73,2160**	73,2200	0,0	0,0	73,2200	0,0244	280,3	0,0934
Microsilica	16,6	2200		0,0075	16,6	**4,3160**	4,3200	0,0	0,1	4,3200	0,0020	16,5	0,0075
Fly ash	114,3	2300		0,0497	114,3	**29,7180**	29,7200	0,0	0,0	29,7200	0,0129	113,8	0,0495
Årdal sand 0/8	887,8	2660	0,46	0,3338	920,1	**239,2324**	238,7000	-0,5	-0,2	230,3143	0,0866	881,5	0,3314
Årdal stein 8/16	793,4	2680	0,57	0,2960	792,0	**205,9254**	206,2000	0,3	0,1	206,5590	0,0771	790,6	0,2950
Mapei Dynamon	1,90	1050	77	0,0018	1,9	**0,4940**	0,4940	0,0	0,0	0,4940	0,0005	1,9	0,0018
Mapeair	5,20	1000	99,6	0,0052	5,2	**1,3520**	1,3520	0,0	0,0	1,3520	0,0014	5,2	0,0052
Water	167,1	1000		0,1671	136,1	**35,3935**	35,4000	0,0	0,0	43,4267	0,0434	166,2	0,1662
Air				0,0450							0,0131		0,0500
Total	2267,9			1,0000	2267,9	589,6473	589,4060			589,4060	0,2613	2256,0	1,0000

w/c	0,44
Water free	173,7
Batch size	0,260
Date	21-11-2017
Time	12:54
ID	C2

w/c actual	0,440

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	454,2	1220,5	1190,5	4,07
	2	484,4	1095,6	1070,8	4,23
	3	428,2	1028,9	1005,8	4,00
	Average				4,10
Årdal stein 8/16	1	611,7	1584,1	1580,3	0,39
	2	475,6	1253,8	1250,5	0,43
	3	591,3	1350,1	1347,3	0,37
	Average				0,40

Slump	Air	Weight	Density	Temperature	Watt
210	5,0	22,11	2271,3	18,4	63

Teknologisk Institut

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Anlegg FA	420,0	3020		0,1391	420,0	**109,2000**	109,2000	0,0	0,0	109,2000	0,0362	419,8	0,1390
Microsilica	17,6	2200		0,0080	17,6	**4,5760**	4,5800	0,0	0,1	4,5800	0,0021	17,6	0,0080
Årdal sand 0/8	888,1	2660	0,46	0,3339	919,7	**239,1148**	238,9000	-0,2	-0,1	230,6986	0,0867	886,8	0,3334
Årdal stein 8/16	793,7	2680	0,57	0,2962	792,6	**206,0766**	206,3000	0,2	0,1	206,5857	0,0771	794,1	0,2963
Mapei Dynamon	2,50	1050	77	0,0024	2,5	**0,6500**	0,6500	0,0	0,0	0,6500	0,0006	2,5	0,0024
Mapeair	4,00	1000	99,6	0,0040	4,0	**1,0400**	1,0400	0,0	0,0	1,0400	0,0010	4,0	0,0040
Water	171,6	1000		0,1716	141,1	**36,6976**	36,8000	0,1	0,3	44,7157	0,0447	171,9	0,1719
Air				0,0450							0,0117		0,0450
Total	2297,5			1,0001	2297,5	597,3549	597,4700			597,4700	0,2601	2296,8	1,0000

w/c	0,39
Water free	177,5
Batch size	0,260
Date	13-11-2017
Time	10:40
ID	D1

w/c actual	0,391

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	428,2	1120,7	1093,2	4,14
	2	591,3	1265,9	1238,8	4,19
	3	475,6	1144,0	1120,0	3,72
	Average				4,02
Årdal stein 8/16	1	454,2	1138,0	1136,0	0,29
	2	445,6	1346,7	1342,7	0,45
	3	484,4	1280,3	1275,9	0,56
	Average				0,43

Slump	Air	Weight	Density	Temperature	Watt
220	4,5	22,48	2317,5	20,3	63

Teknologisk Institut

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Anlegg FA	420,0	3020		0,1391	420,0	**109,2000**	109,2000	0,0	0,0	109,2000	0,0362	421,0	0,1394
Microsilica	17,6	2200		0,0080	17,6	**4,5760**	4,5800	0,0	0,1	4,5800	0,0021	17,7	0,0080
Årdal sand 0/8	888,1	2660	0,46	0,3339	917,5	**238,5443**	238,8000	0,3	0,1	231,1535	0,0869	891,2	0,3350
Årdal stein 8/16	793,7	2680	0,57	0,2962	793,8	**206,3755**	206,3000	-0,1	0,0	206,2865	0,0770	795,3	0,2967
Mapei Dynamon	2,50	1050	77	0,0024	2,5	**0,6500**	0,6500	0,0	0,0	0,6500	0,0006	2,5	0,0024
Mapeair	4,00	1000	99,6	0,0040	4,0	**1,0400**	1,0400	0,0	0,0	1,0400	0,0010	4,0	0,0040
Water	171,6	1000		0,1716	142,2	**36,9691**	36,8000	-0,2	-0,5	44,4600	0,0445	171,4	0,1714
Air				0,0450							0,0112		0,0430
Total	2297,5			1,0001	2297,5	597,3549	597,3700			597,3700	0,2594	2303,0	1,0000

w/c	0,39
Water free	177,5
Batch size	0,260
Date	13-11-2017
Time	13:03
ID	D2

w/c actual	0,389

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	428,2	1095,5	1071,5	3,73
	2	591,3	1291,5	1266,3	3,73
	3	454,2	1149,2	1123,5	3,84
	Average				3,77
Årdal stein 8/16	1	475,6	1226,6	1222,7	0,52
	2	445,6	1174,2	1169,5	0,65
	3	484,4	1132,8	1129,2	0,56
	Average				0,58

Slump	Air	Weight	Density	Temperature	Watt
210	4,3	22,53	2323,8	19,7	64

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Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Cemex CEM III/A	420,8	3030		0,1389	420,8	**109,4080**	109,4100	0,0	0,0	109,4100	0,0361	421,8	0,1392
Microsilica	17,7	2200		0,0080	17,7	**4,6020**	4,6000	0,0	0,0	4,6000	0,0021	17,7	0,0081
Årdal sand 0/8	887,8	2660	0,46	0,3338	917,4	**238,5279**	238,9000	0,4	0,2	231,1881	0,0869	891,2	0,3350
Årdal stein 8/16	793,4	2680	0,57	0,2960	792,7	**206,0967**	206,5000	0,4	0,2	206,6877	0,0771	796,8	0,2973
Mapei Dynamon	2,40	1050	77	0,0023	2,4	**0,6240**	0,6240	0,0	0,0	0,6240	0,0006	2,4	0,0023
Mapeair	1,40	1000	99,6	0,0014	1,4	**0,3640**	0,3640	0,0	0,0	0,3640	0,0004	1,4	0,0014
Water	174,7	1000		0,1747	145,8	**37,9030**	37,8000	-0,1	-0,3	45,3243	0,0453	174,7	0,1747
Air				0,0450							0,0109		0,0420
Total	2298,2			1,0001	2298,2	597,5257	598,1980			598,1980	0,2594	2306,0	1,0000

w/c	0,39
Water free	177,9
Batch size	0,260
Date	17-11-2017
Time	10:20
ID	E1

w/c actual	0,389

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	591,3	1247,8	1223,5	3,84
	2	611,7	1214,4	1192,0	3,86
	3	428,2	1095,3	1071,6	3,68
	Average				3,80
Årdal stein 8/16	1	475,6	1143,9	1142,0	0,29
	2	454,2	1253,1	1248,2	0,62
	3	484,4	1179,2	1175,5	0,54
	Average				0,48

Slump	Air	Weight	Density	Temperature	Watt
190	4,2	22,56	2327,5	21	66

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Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Cemex CEM III/A	420,8	3030		0,1389	420,8	**109,4080**	109,4100	0,0	0,0	109,4100	0,0361	422,5	0,1394
Microsilica	17,7	2200		0,0080	17,7	**4,6020**	4,6000	0,0	0,0	4,6000	0,0021	17,8	0,0081
Årdal sand 0/8	887,8	2660	0,46	0,3338	917,3	**238,5088**	238,3000	-0,2	-0,1	230,6259	0,0867	890,6	0,3348
Årdal stein 8/16	793,4	2680	0,57	0,2960	792,3	**205,9898**	206,3000	0,3	0,2	206,5947	0,0771	797,8	0,2977
Mapei Dynamon	2,50	1050	77	0,0024	2,5	**0,6500**	0,6500	0,0	0,0	0,6500	0,0006	2,5	0,0024
Mapeair	1,40	1000	99,6	0,0014	1,4	**0,3640**	0,3640	0,0	0,0	0,3640	0,0004	1,4	0,0014
Water	174,6	1000		0,1746	146,2	**38,0090**	38,0000	0,0	0,0	45,3795	0,0454	175,2	0,1752
Air				0,0450							0,0106		0,0410
Total	2298,2			1,0001	2298,2	597,5316	597,6240			597,6240	0,2590	2307,7	1,0000

w/c	0,39
Water free	177,9
Batch size	0,260
Date	17-11-2017
Time	12:15
ID	E2

w/c actual	0,390

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	484,4	1143,5	1119,2	3,83
	2	454,2	1142,2	1117,0	3,80
	3	428,2	1281,4	1250,7	3,73
	Average				3,79
Årdal stein 8/16	1	475,6	1234,5	1230,2	0,57
	2	591,3	1381,5	1377,8	0,47
	3	611,7	1523,6	1521,4	0,24
	Average				0,43

Slump	Air	Weight	Density	Temperature	Watt
200	4,1	22,56	2327,5	19,8	64

Annex 5 – Fresh concrete properties

Test report

REPORT NO.:
797832

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej
City: DK-2630 Taastrup

Material:
10 batches of fresh concrete.
Date and time of testing and Batch ID appears from the following pages

Sampling:
The concrete batches were mixed and sampled at the Concrete Laboratory of the Danish Technological Institute.

Period:
The testing was completed between 03-11-2017 and 21-11-2017

Test method:

DS/EN 12350-2:2009	Testing fresh concrete - Part 2: Slump-test
DS/EN 12350-6:2012	Testing fresh concrete - Part 6: Density
DS/EN 12350-7:2012	Testing fresh concrete - Part 7: Air content - Pressure methods

Results:
Result of the test is given on page 2 of this report.

Storage:
The tested material will be discarded after testing unless something else is pre-agreed in writing.

Remarks:

Terms:
The test has been performed according to the conditions laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

Place:
Date 07.02.2018, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Thomas Lennart Svensson
Digitalt signeret af Thomas Lennart Svensson
Dato: 2018.03.12 14:53:54 +01'00'
Thomas Svensson
Team Manager

Jan Hansen
Digitally signed by Jan Hansen
Date: 2018.02.12 12:19:15 +01'00'
Jan Hansen
Laboratory Technician

ilac-MRA
DANAK
Test Reg. no. 2

Remarks to the test results:

Slump: All reported slump measurements are "true slump".

Air Content and Density: Method of compaction: Compaction with vibrating table

Air content: The air contents are measured using the pressure gauge method

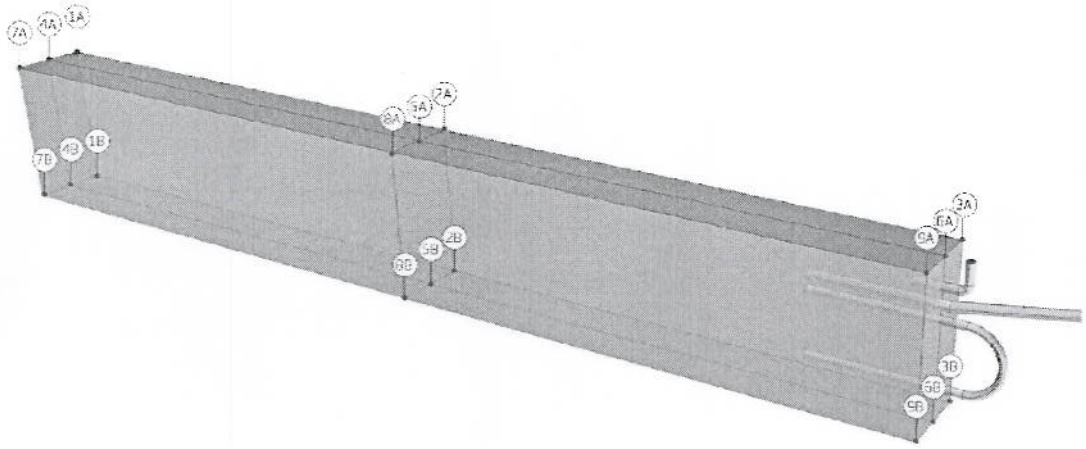
Results:

Mix ID	Date	Slump (mm)	Air Content (%)	Density (kg/m³)	Temperature (°C)
A1	03-11-2017	200	4,2	2330	20,5
A2	03-11-2017	200	4,1	2340	20,7
B2	07-11-2017	220	3,8	2330	20,0
B1	10-11-2017	220	5,1	2300	20,0
D1	13-11-2017	220	4,5	2320	20,3
D2	13-11-2017	210	4,3	2320	19,7
E1	17-11-2017	190	4,2	2330	21,0
E2	17-11-2017	200	4,1	2330	19,8
C1	21-11-2017	220	5,5	2260	19,1
C2	21-11-2017	210	5,0	2270	18,4

Annex 6 – Concrete element dimensions

Concrete beam dimensions verification

Beam ID: A 1



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
191	192	190

1B - 7B	2B - 8B	3B - 9B
190	190	191

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
391	392	392

7A -7B	8A - 8B	9A - 9B
392	391	392

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,0	0,7	0,0	-0,1	+0,1	0,5	0,8	1,1	1,4	1,3

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,0	1,3	1,3	1,1	0,1	0,1	0,1	0,1	0,1	0,5

Equipment used: QA 77716, QA 151267 QA 139869

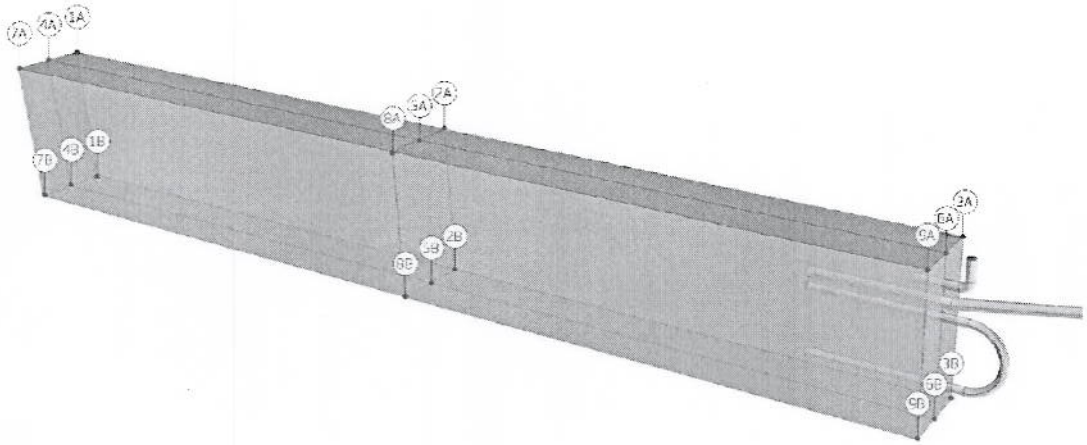
Photo documentation taken: OK

Date: 2017-11-06

Measurement performed by:

Concrete beam dimensions verification

Beam ID: A2



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2698	2696

1B - 3B	7B- 9B
2700	2701

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
191	191	190

1B - 7B	2B - 8B	3B - 9B
191	191	191

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
393	391	391

7A -7B	8A - 8B	9A - 9B
391	391	392

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,2	1,0	1,3	1,4	1,4	1,0	1,4	1,6	1,6	1,8

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,1	0,8	0,5	0,0	-0,6	0,6	0,8	1,0	1,1	1,1

Equipment used: QA 77716, QA 151267 QA 139869

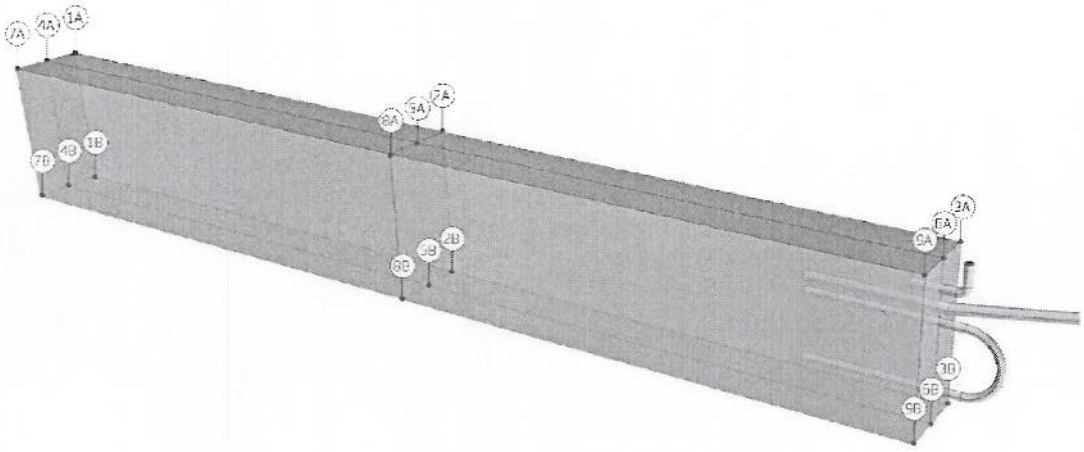
Photo documentation taken: OK

Date: 2017-11-06

Measurement performed by:

Concrete beam dimensions verification

Beam ID: B 1



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2701	2701

1B - 3B	7B- 9B
2701	2701

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
190	192	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
390	389	390

7A -7B	8A - 8B	9A - 9B
389	390	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,20	0,20	-0,8	-0,8	-0,4	0,4	0,4	0,2	0,4	0,7

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,9	1,4	1,5	0,9	0,5	1,5	1,8	1,6	1,0	0,6

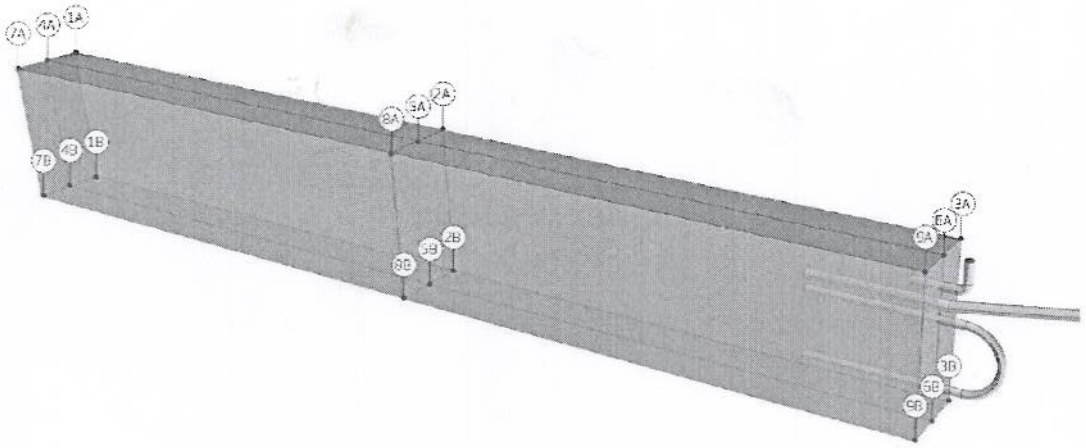
Equipment used: QA 151267, QA 139869 QA 77716 **Photo documentation taken:** OK

Date: 2017-11-13

Measurement performed by:

Concrete beam dimensions verification

Beam ID: B2



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2701	2700

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
190	192	190

1B - 7B	2B - 8B	3B - 9B
191	190	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
390	391	390

7A -7B	8A - 8B	9A - 9B
391	390	389

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,7	0,4	0,9	0,7	0,8	1,3	~~1,5~~ 1,5	~~2,0~~ 2,0	1,5	1,8

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,9	1,7	1,0	0,2	0,7	0,6	0,3	0,3	0,8	0,1

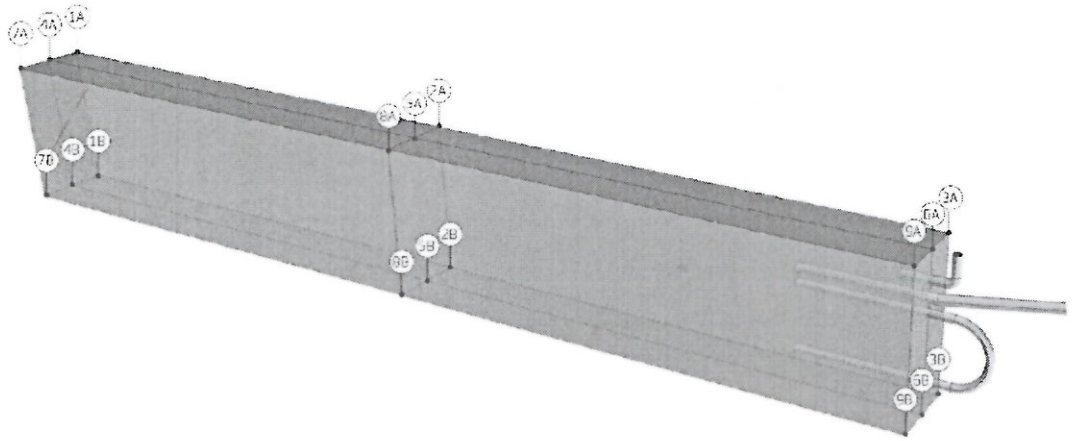
Equipment used: QA139869, QA151267 QA77716 **Photo documentation taken:** OK

Date: 2017-11-09

Measurement performed by:

Concrete beam dimensions verification

Beam ID: C1



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2699	2700

1B - 3B	7B- 9B
2701	2702

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
192	191	190

1B - 7B	2B - 8B	3B - 9B
191	191	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	391

7A -7B	8A - 8B	9A - 9B
390	391	392

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,4	1,0	1,3	1,2	1,2	1,3	1,3	1,3	0,5	0,4

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,3	~~-0,4~~ -0,3	-0,4	-0,9	-1,6	1,0	1,1	1,3	1,2	0,6

Equipment used: QA 139869

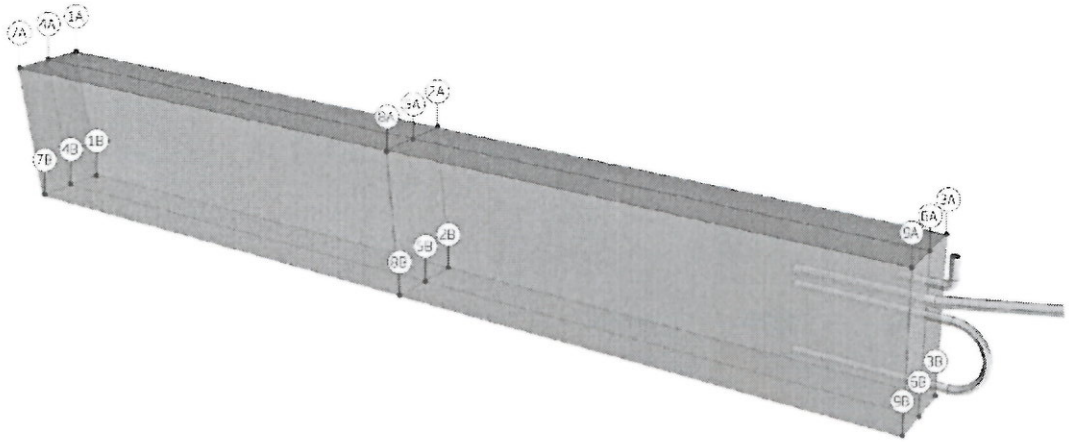
Photo documentation taken: OK

Date: 2017-11-24

Measurement performed by:

Concrete beam dimensions verification

Beam ID: C2



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2701	2700

1B - 3B	7B- 9B
2702	2700

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
191	191	190

1B - 7B	2B - 8B	3B - 9B
191	191	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
391	391	391

7A -7B	8A - 8B	9A - 9B
391	391	392

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,2	-0,6	-0,7	-0,3	-0,1	0,1	0,1	0,3	0,6	0,8

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,1	1,4	0,4	-0,2	-0,6	0,9	1,6	1,2	0,3	-0,2

Equipment used: QA 139869

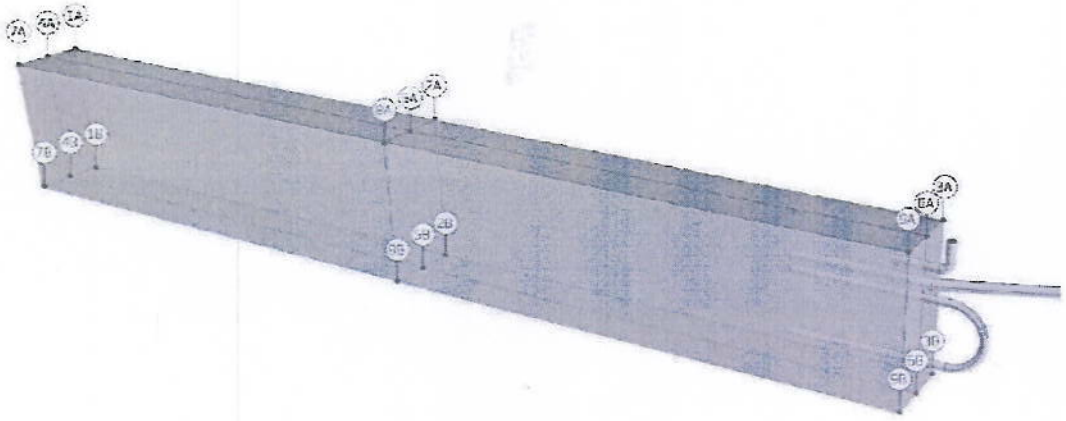
Photo documentation taken: OK

Date: 2017-11-24

Measurement performed by:

Concrete beam dimensions verification

Beam ID: D 1



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2699	2701

1B - 3B	7B- 9B
2700	2701

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
192	192	192

1B - 7B	2B - 8B	3B - 9B
191	191	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
391	392	392

7A -7B	8A - 8B	9A - 9B
392	391	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,5	0,8	1,5	1,8	1,0	0,0	0,0	0,6	0,9	0,6

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,4	-0,3	-0,5	-0,7	-0,4	1,3	1,0	0,9	0,6	0,2

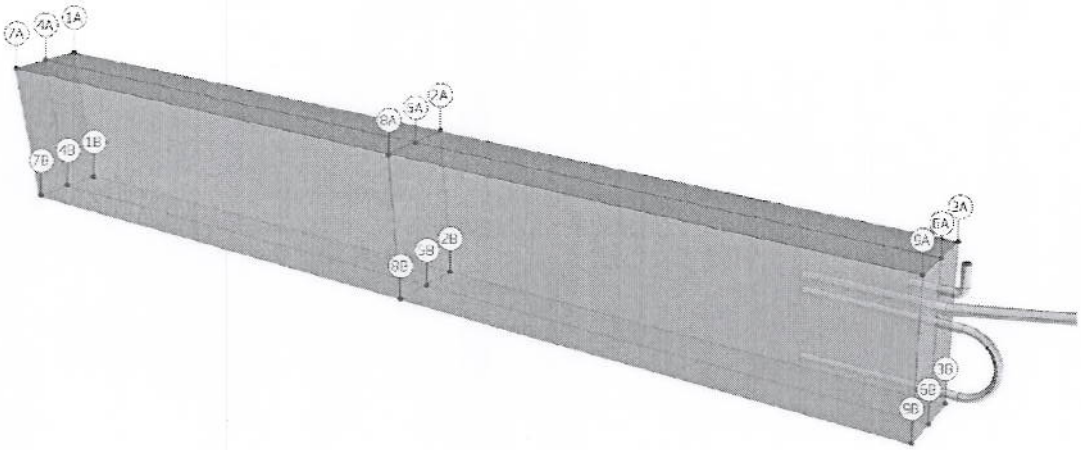
Equipment used: QA 151267, QA 139869 QA 77716 **Photo documentation taken:** OK

Date: 2017-11-16

Measurement performed by:

Concrete beam dimensions verification

Beam ID: D 2



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2702

1B - 3B	7B- 9B
2702	2703

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
191	192	190

1B - 7B	2B - 8B	3B - 9B
190	191	191

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
392	392	392

7A -7B	8A - 8B	9A - 9B
391	391	393

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,7	0,7	0,8	1,1	1,2	1,3	1,1	0,8	0,7	0,4

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,1	1,4	0,9	0,1	-0,1	0,4	0,7	0,7	1,1	0,6

Equipment used: QA151267, 139869
QA 77716

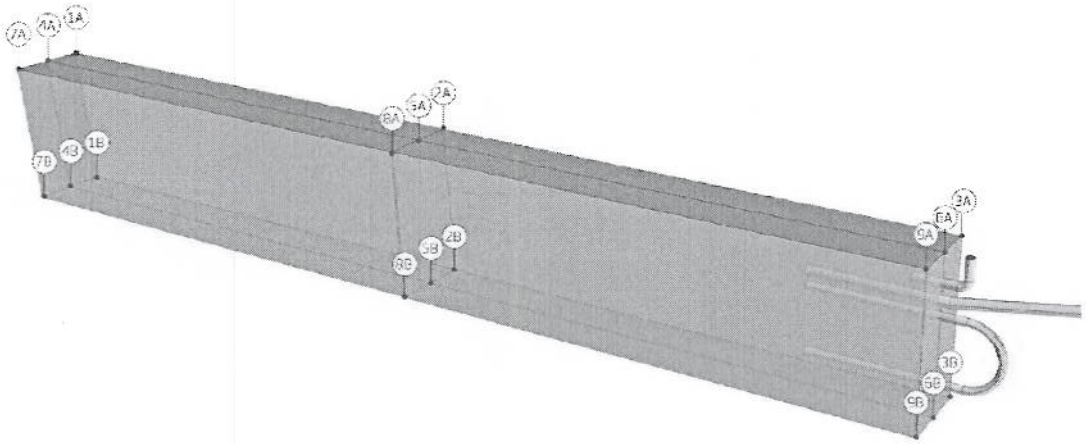
Photo documentation taken: OK

Date: 2017-11-16

Measurement performed by:

Concrete beam dimensions verification

Beam ID: E1



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2702	2701

1B - 3B	7B- 9B
2701	2701

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
190	192	190

1B - 7B	2B - 8B	3B - 9B
191	190	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
390	391	391

7A -7B	8A - 8B	9A - 9B
390	391	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,1	1,3	1,7	1,7	1,3	0,8	1,2	1,2	1,1	0,9

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,5	0,9	0,5	0,5	-0,3	2,1	2,1	2,2	1,7	1,7

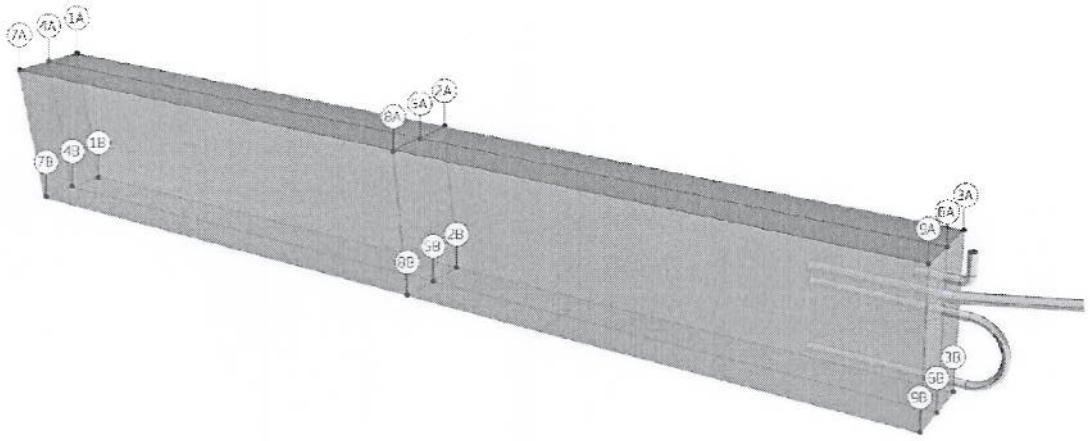
Equipment used: QA 139869, QA 151267 QA 7716 **Photo documentation taken:** OK

Date: 2017-11-20

Measurement performed by:

Concrete beam dimensions verification

Beam ID: E 2



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2701

1B - 3B	7B- 9B
2702	2702

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
190	191	190

1B - 7B	2B - 8B	3B - 9B
191	191	191

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	391

7A -7B	8A - 8B	9A - 9B
391	391	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
1,1	0,8	0,8	0,3	0,4	2,2	2,8	3,2	2,1	2,6

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,3	0,2	0,5	0,2	0,0	0,0	~~0,0~~ -1,1	~~-1,3~~ -1,3	-1,3	-1,3

Equipment used: QA 139869, QA151267 QA 77716

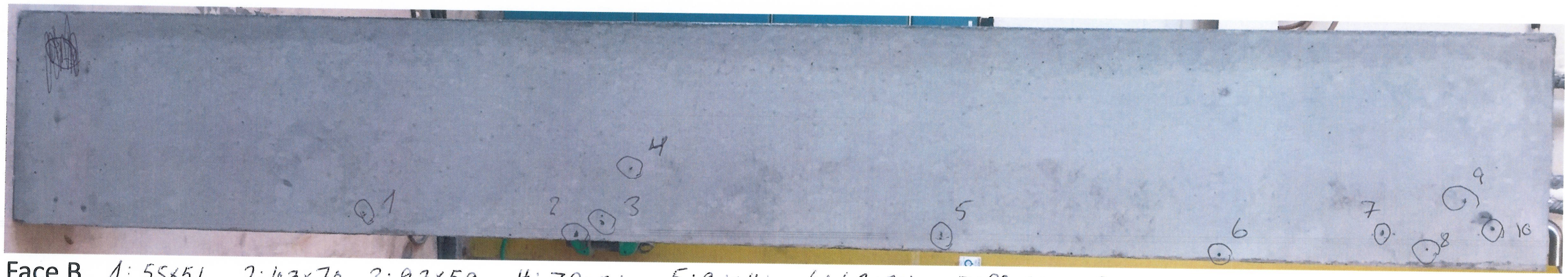
Photo documentation taken: OK

Date: 2017-11-20

Measurement performed by:

Annex 7 – Concrete element surface appearance

BEAM ID: A-1



Face B 1: 5.5×5.1 2: 10.7×7.0 3: 9.7×5.9 4: 7.9×5.1 5: 9.1×4.1 6: 6.3×5.4 7: 9.9×5.8 8: 7.2×4.0 9: 6.9×6.1 10: 11.1×8.0

Bottom 1: 6.7×5.9 2: 5.8×5.8

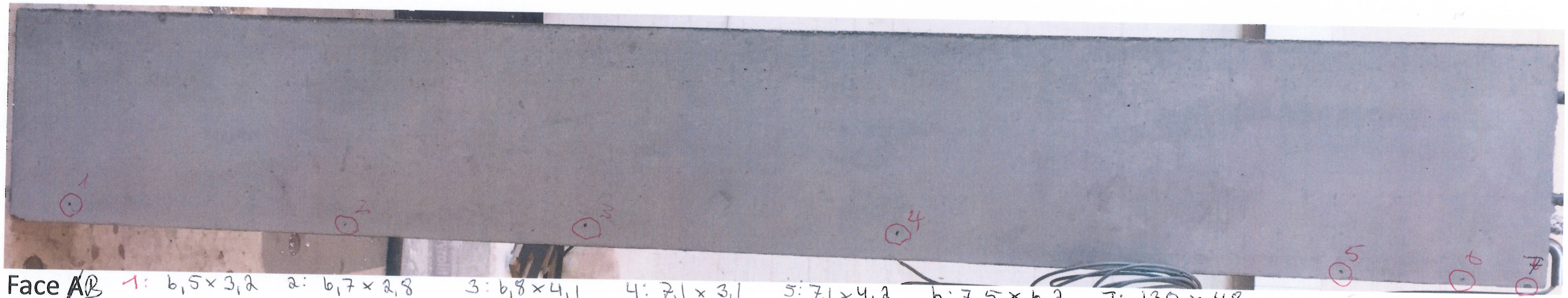
Face A

1: 12.6×6.8 2: 5.3×3.9 3: 7.9×5.4 4: 3.7×4.0 5: 9.2×6.4 6: 5.7×5.1

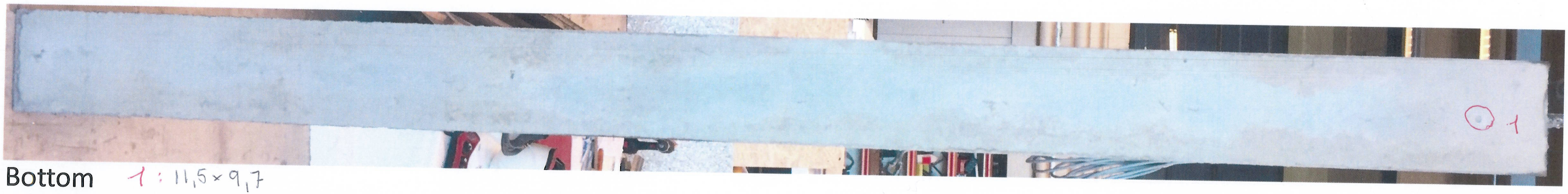
7: 5.2×4.7 8: 8.8×4.5

2017-11-06

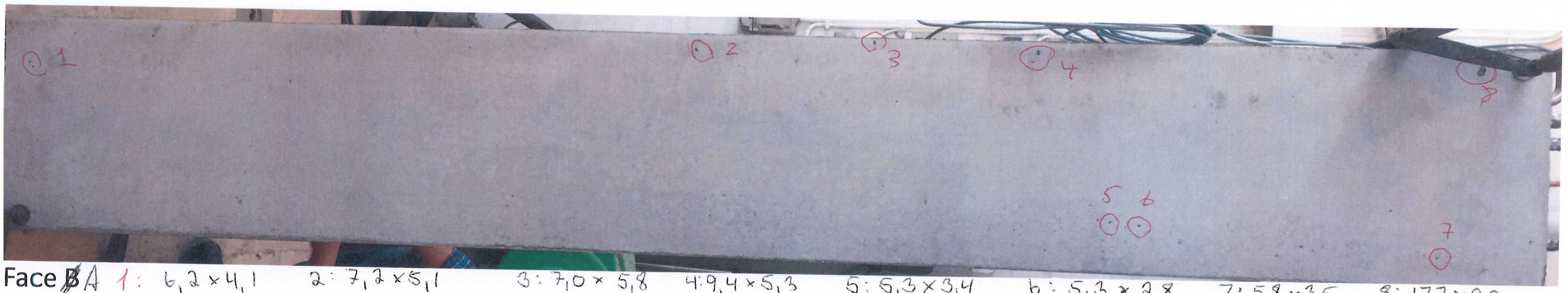
BEAM ID: A-2



Face ~~A~~B 1: 6,5×3,2 2: 6,7×2,8 3: 6,8×4,1 4: 7,1×3,1 5: 7,1×4,2 6: 7,5×6,2 7: 13,0×4,8



Bottom 1: 11,5×9,7



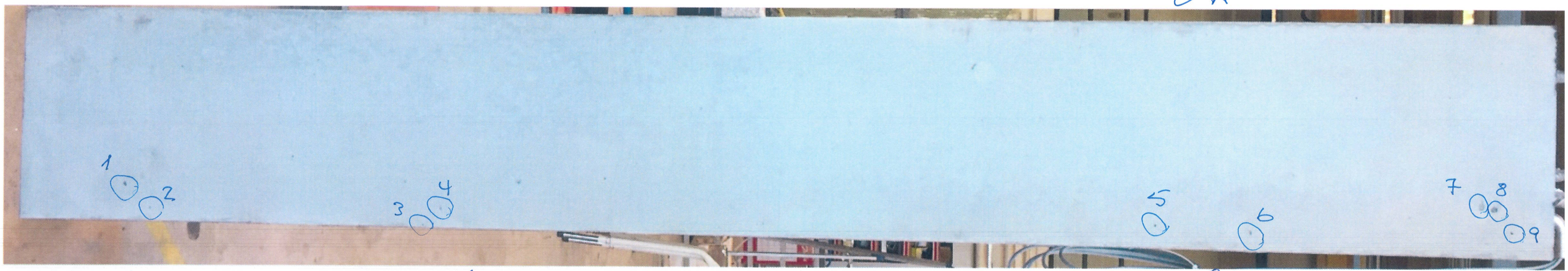
Face ~~B~~A 1: 6,2×4,1 2: 7,2×5,1 3: 7,0×5,8 4: 9,4×5,3 5: 5,3×3,4 6: 5,3×2,8 7: 5,8×3,5 8: 17,7×9,9

2017-11-06

BEAM ID : B-XY

13/11 - 2017

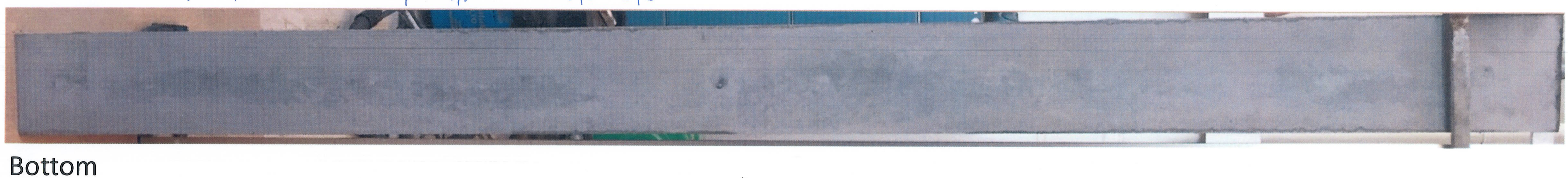
CRA



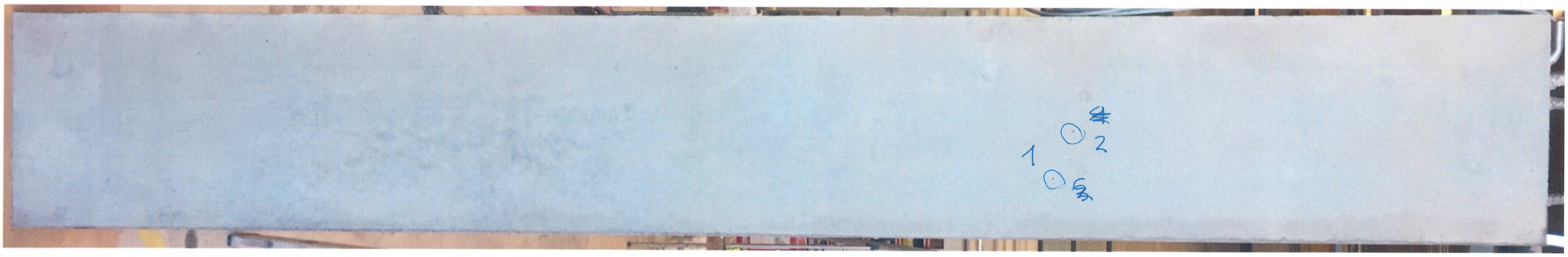
Face B

1 : 8,5 × 6,6 2 : 6,0 × 4,8 3 : 6,6 × 4,6 4 : 5,4 × 3,8 5 : 5,0 × 3,1 6 : 8,2 × 3,3

7 : 18,3 × 8,7 8 : 10,5 × 8,8 9 : 6,0 × 5,5



Bottom

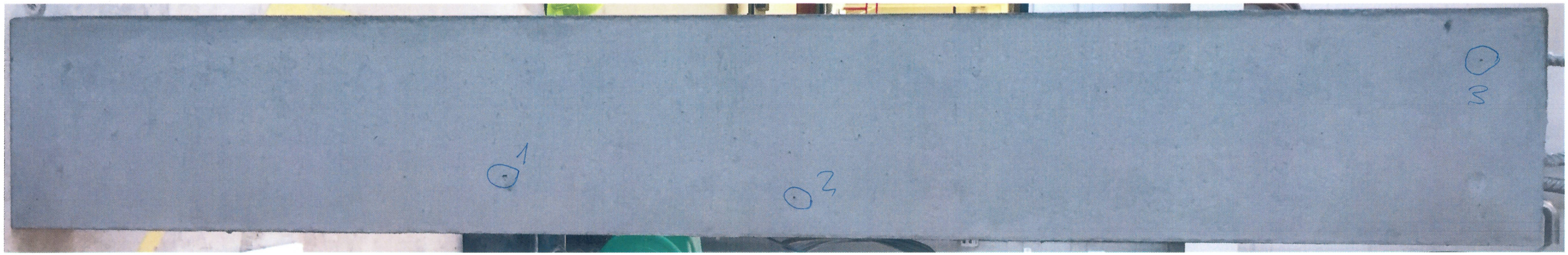


Face A

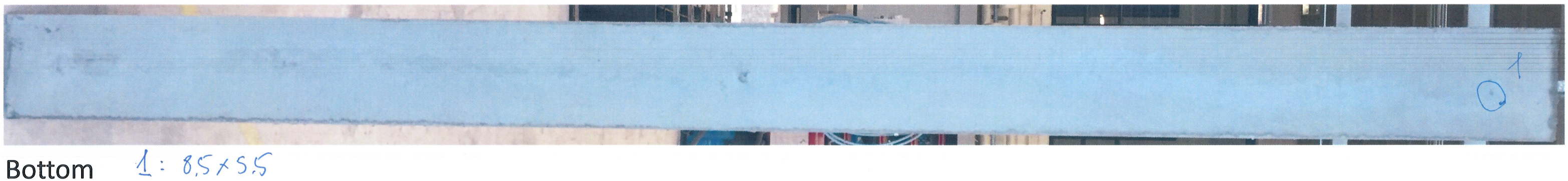
1 : 6,4 × 4,1

2 : 7,8 × 4,3

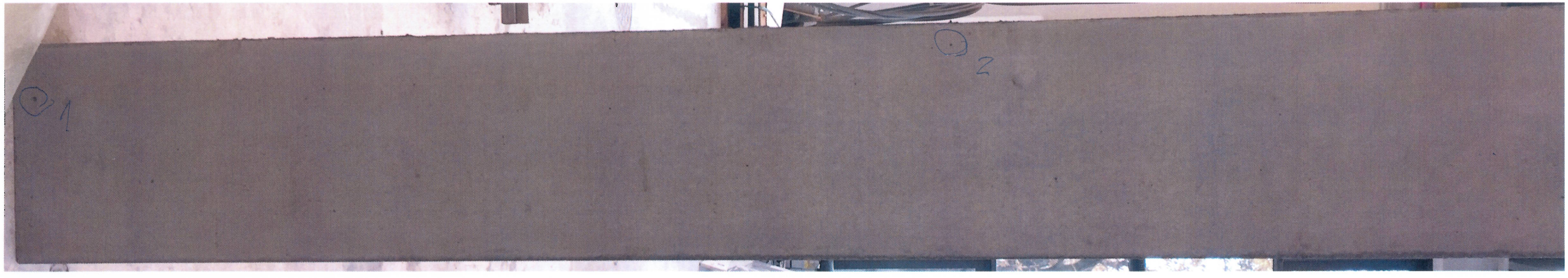
BEAM ID : B-2 2017-11-09 CPA



Face B 1: 8.9 x 5.1 2: 6.5 x 4.4 3: 5.6 x 4.7



Bottom 1: 8.5 x 5.5



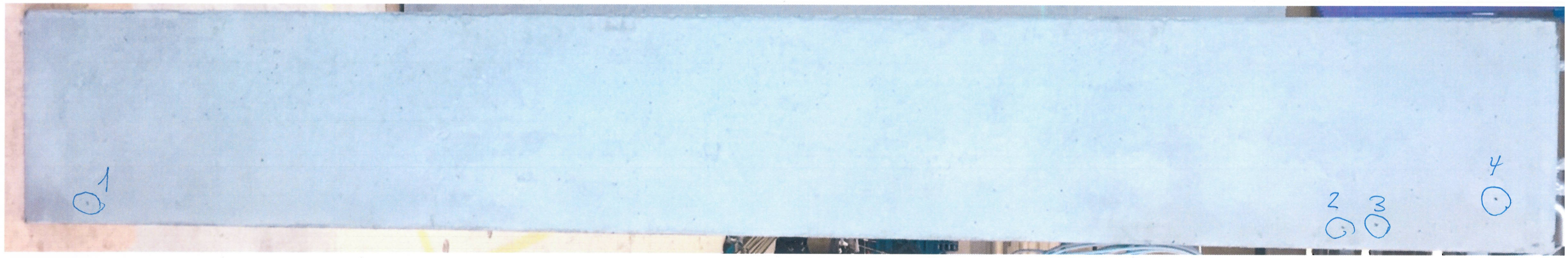
Face A

1: 7.4 x 8.6

2: 7.4 x ~~9~~ 8.3

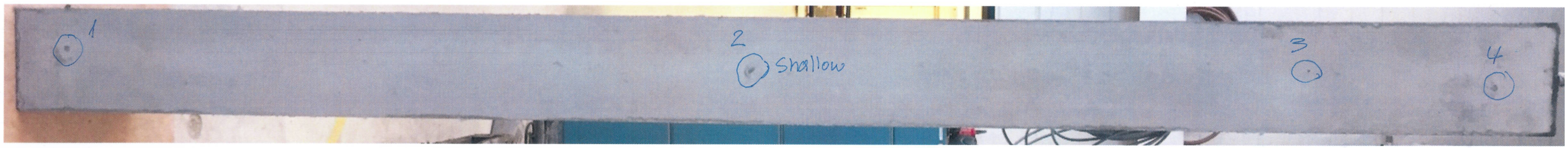
BEAM ID: C1

24/11-2017
CPK



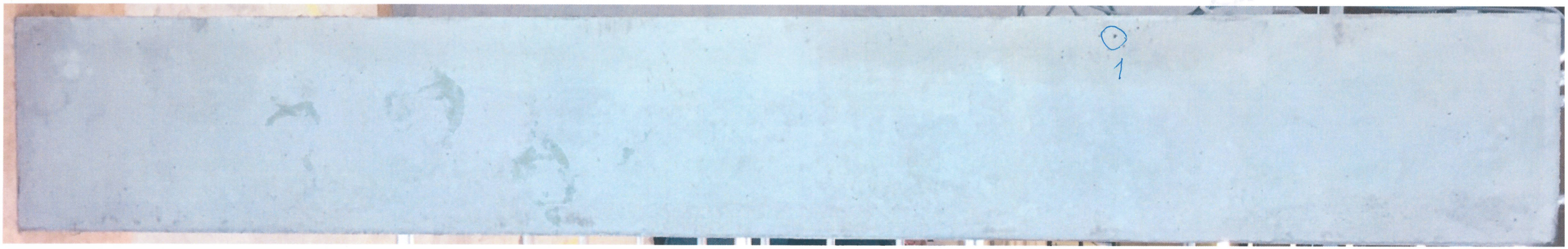
Face B

1: 6,4 x 4,6 2: 5,7 x 5,8 3: 7,0 x 4,3 4: 8,3 x 4,4



Bottom

1: 12,4 x 11,3 2: 16,3 x 6,9 3: 5,6 x 3,4 4: 10,3 x 10,7



Face A

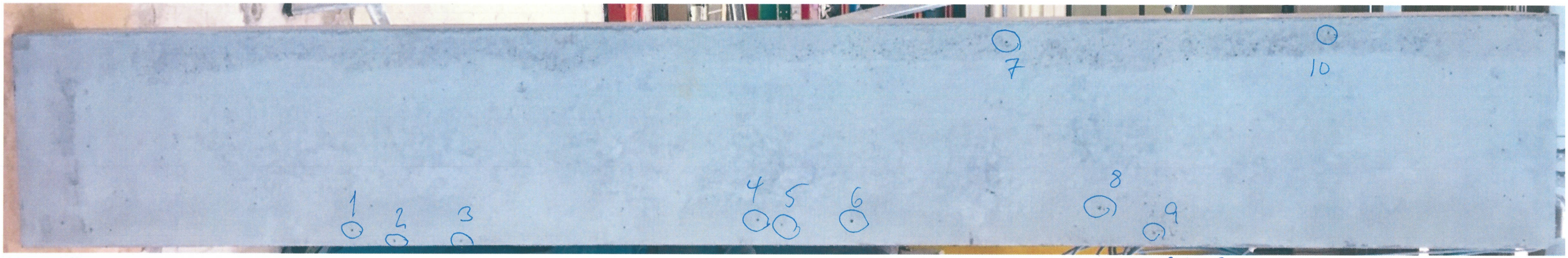
1: 10,3 x 5,1

QA 89413

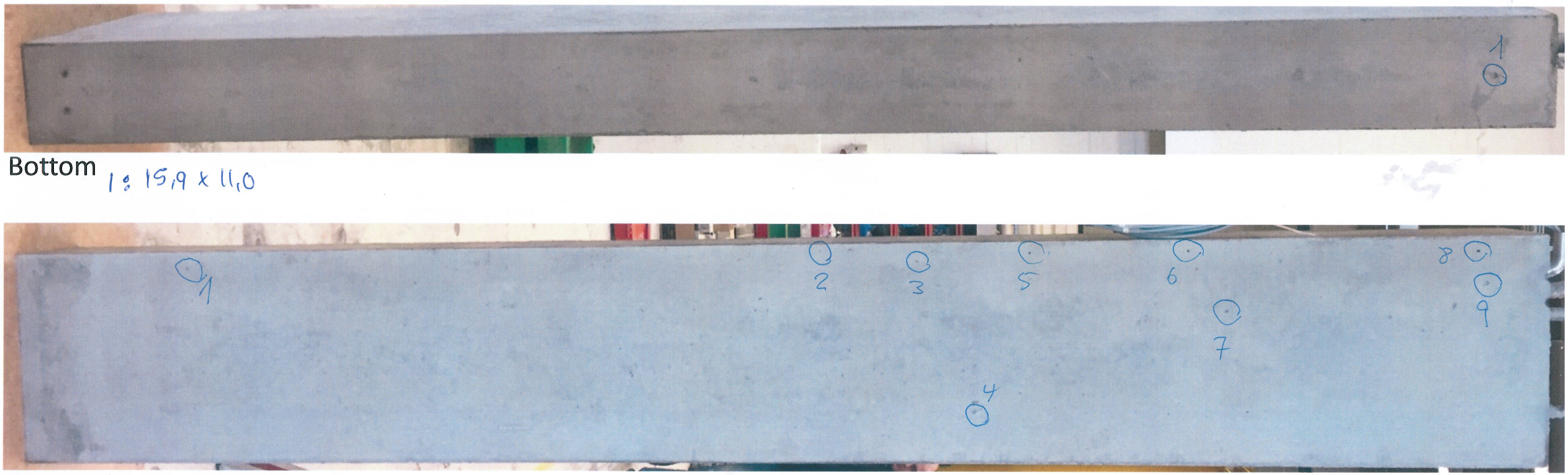
BEAM ID: C2

24/11-2017

CRK



Face B 1: 5,0x3,7 2: 5,6x3,5 3: 5,7x3,3 4: 4,1 x5,6 5: 4,0x3,4 6: 5,7x 5,2 7: 4,0 x 6,1 8: 5,8x 3,6 9: 5,6x4,5 10: 6,0x3,9



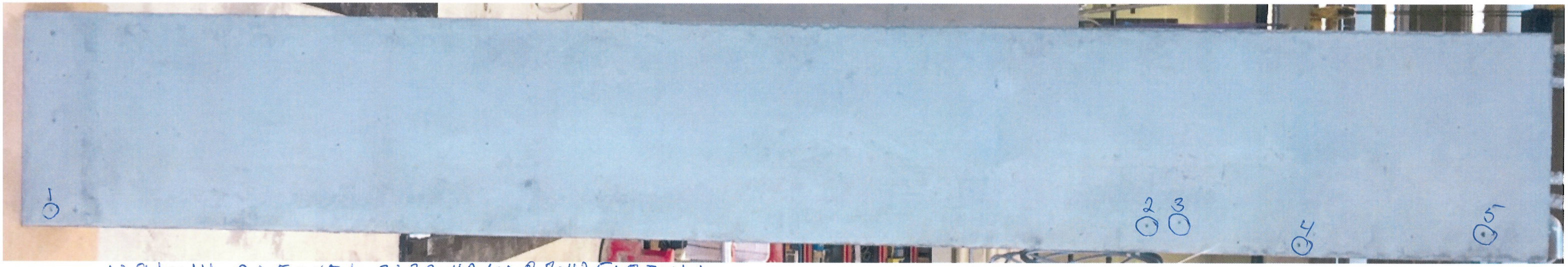
Bottom 1: 15,9 x 11,0

Face A 1: 6,4 x 3,5 2: 5,6x 4,3 3: 5,3x 3,8 4: 7,5x 6,8 5: 4,1 x 4,1 6: 8,2 x 5,8 7: 8,0x 4,5 8: 8,5x6,0 9: 6,0x9,0

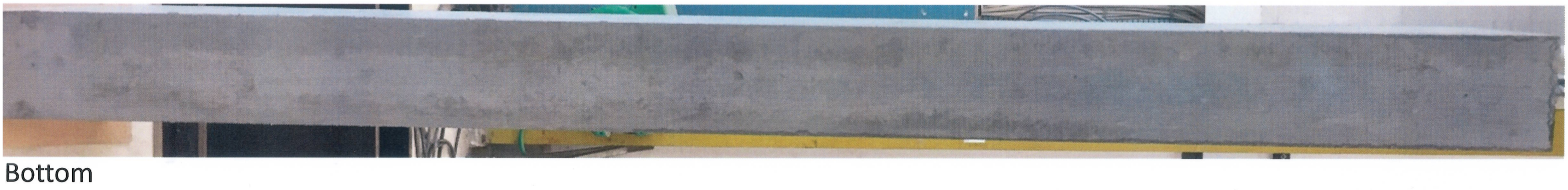
QA 89413

D1.

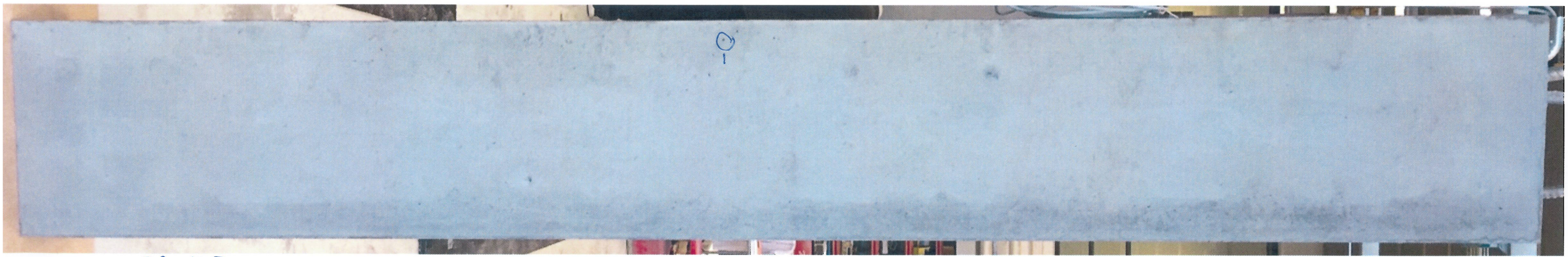
2017-11-16.



Face B 1: 9,6×46 2: 5,0×5,1 3: 3,2×4,24: 8,8×4,25: 8,7×6,6



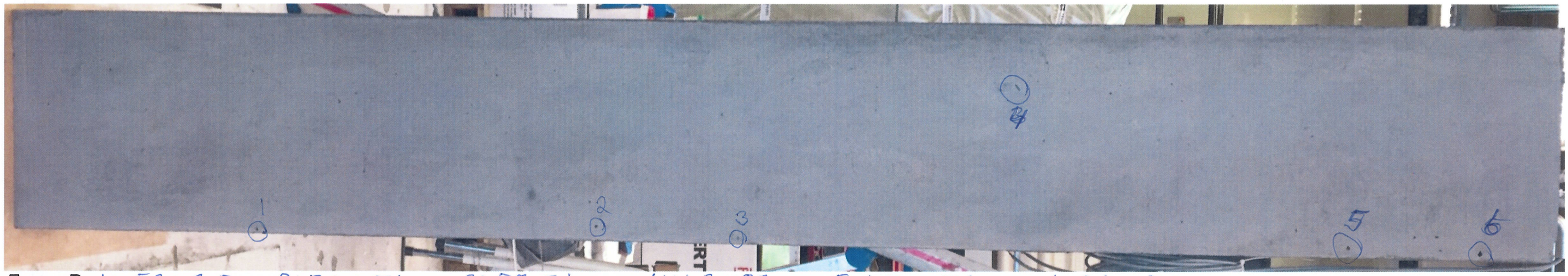
Bottom



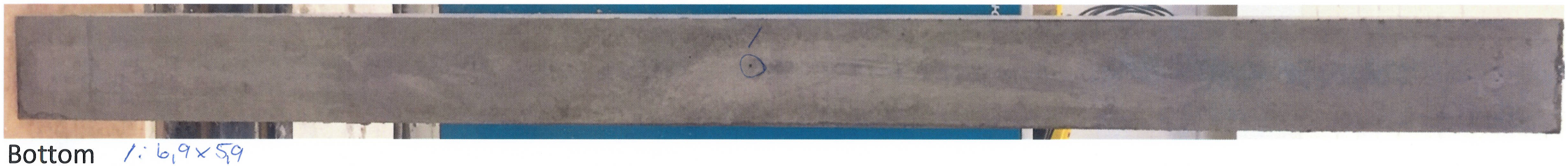
Face A 1: 5,2×4,5

2017-11-16

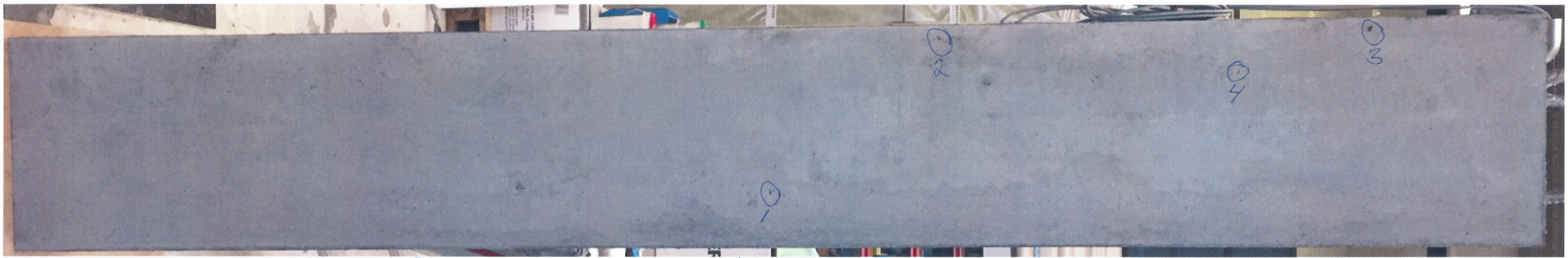
D 2.



Face B 1: 5,3×3,5 2: 7,2×5,6 3: 5,8×3,6 4: 6,3×9,8 5: 6,5×5,2 6: 9,6×7,2



Bottom 1: 6,9×5,9

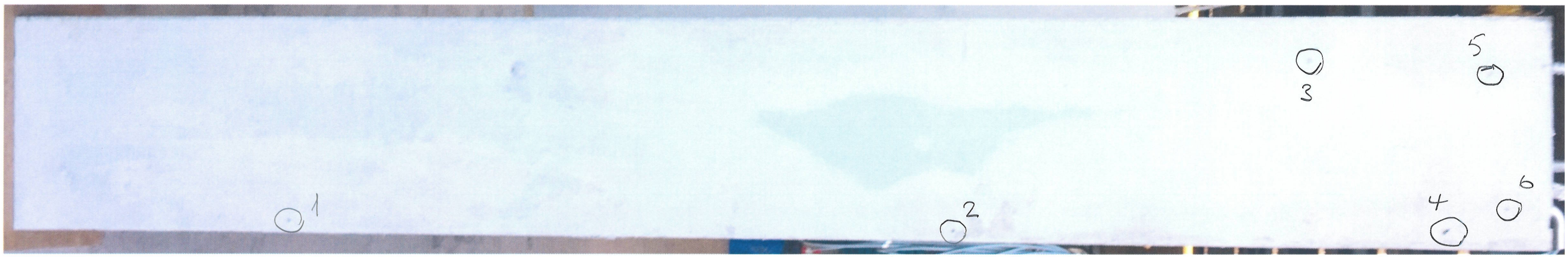


Face A 1: 7,2 ×3,7 2: 6,5×5,0 3: 9,3×6,3 4: 6,9×3,0

BEAM ID : E1

2017-11-20

CPR



Face B 1: 7,0 × 6,1 2: 11,5 × 6,9 3: 10,0 × 6,2 4: 15,4 × 11,4 5: 6,1 × 4,5 6: 7,9 × 6,2

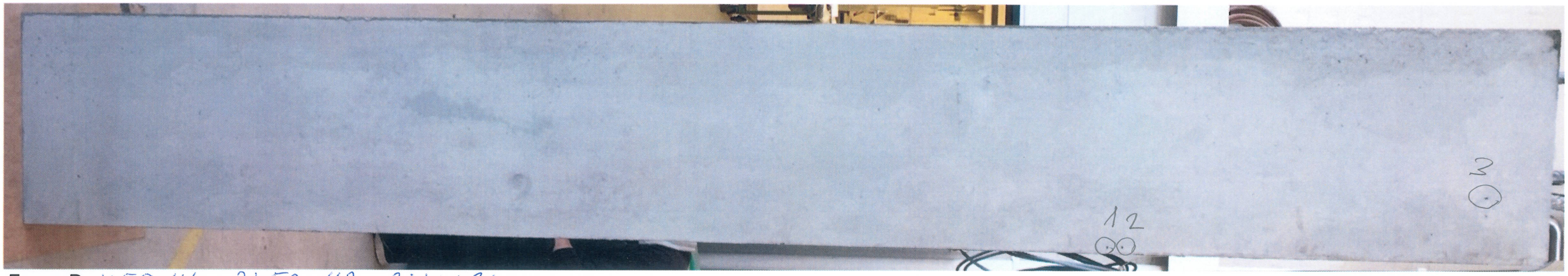
Bottom 1: 5,7 × 4,9

Face A 1: 9,4 × 5,0 2: 6,1 × 5,6 3: 7,2 × 4,0

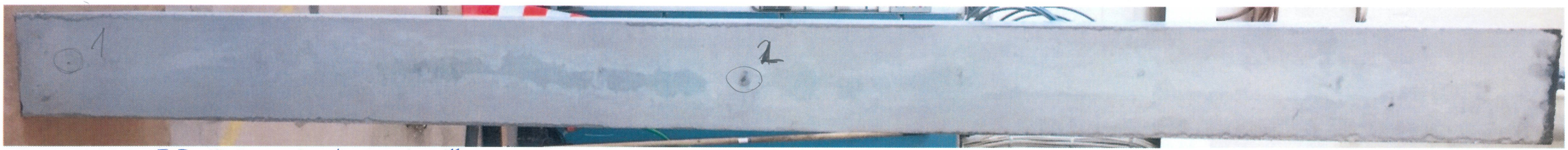
BEAM ID: E2

2017-11-20

CBA



Face B 1: 5,5 × 4,6 2: 5,9 × 4,2 3: 6,5 × 3,1



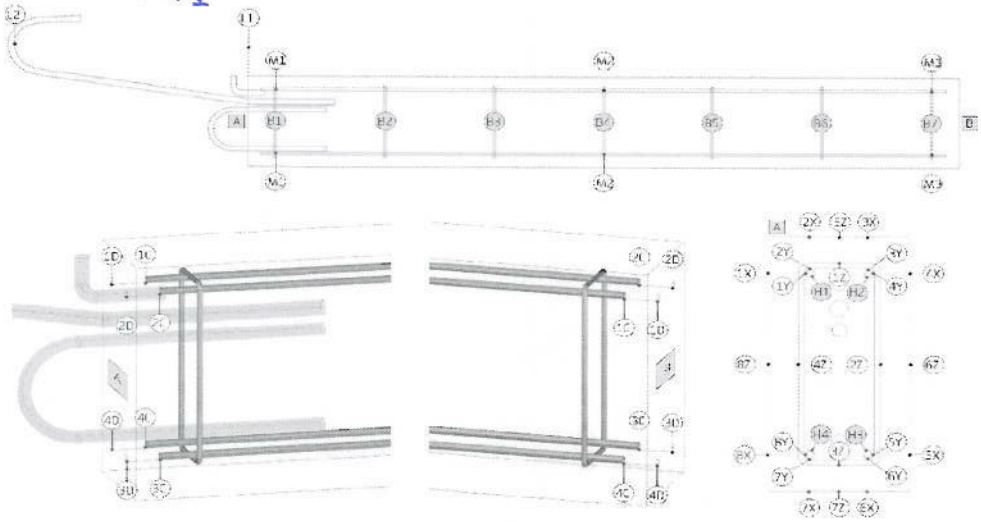
Bottom 1: 5,5 × 5,5 2: 10,5 × 6,4

Face A 1: 7,7 × 5,2 2: 8,9 × 5,3 3: 7,6 × 4,4 4: 7,2 × 4,1 5: 5,1 × 5,0 6: 7,5 × 4,9 7: 7,0 × 6,5

Annex 8 – Concrete element cover to reinforcement

Cover verification (beam)

Beam ID: A1



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	51
	2X-2Y	52
H2	3X-3Y	52
	4X-4Y	47
H3	5X-5Y	52
	6X-6Y	53
H4	7X-7Y	52
	8X-8Y	50

M2-M3		
H1	1X-1Y	50
	2X-2Y	53
H2	3X-3Y	50
	4X-4Y	55
H3	5X-5Y	46
	6X-6Y	52
H4	7X-7Y	53
	8X-8Y	53

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	40
2Z-6Z	42
3Z-7Z	39
4Z-8Z	39

B4	
1Z-5Z	39
2Z-6Z	41
3Z-7Z	40
4Z-8Z	41

B7	
1Z-5Z	40
2Z-6Z	42
3Z-7Z	40
4Z-8Z	43

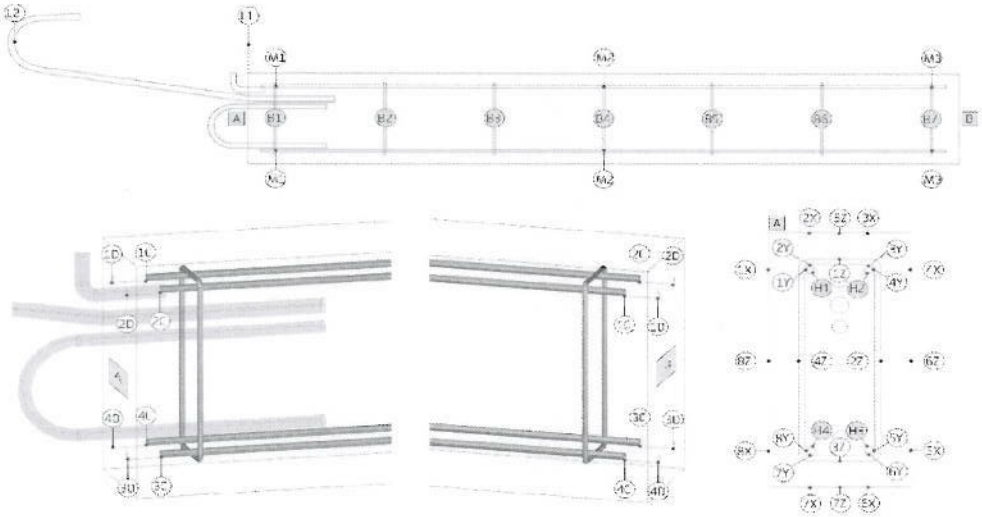
Equipment used: Profometer 5

Date: 6/11-17

Measurement performed by: MJT

Cover verification (beam)

Beam ID: A2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	53
	2X-2Y	52
H2	3X-3Y	53
	4X-4Y	56
H3	5X-5Y	54
	6X-6Y	56
H4	7X-7Y	53
	8X-8Y	56

M2-M3		
H1	1X-1Y	49
	2X-2Y	54
H2	3X-3Y	49
	4X-4Y	55
H3	5X-5Y	46
	6X-6Y	55
H4	7X-7Y	55
	8X-8Y	56

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	39
2Z-6Z	41
3Z-7Z	39
4Z-8Z	40

B4	
1Z-5Z	40
2Z-6Z	42
3Z-7Z	39
4Z-8Z	42

B7	
1Z-5Z	41
2Z-6Z	43
3Z-7Z	40
4Z-8Z	39

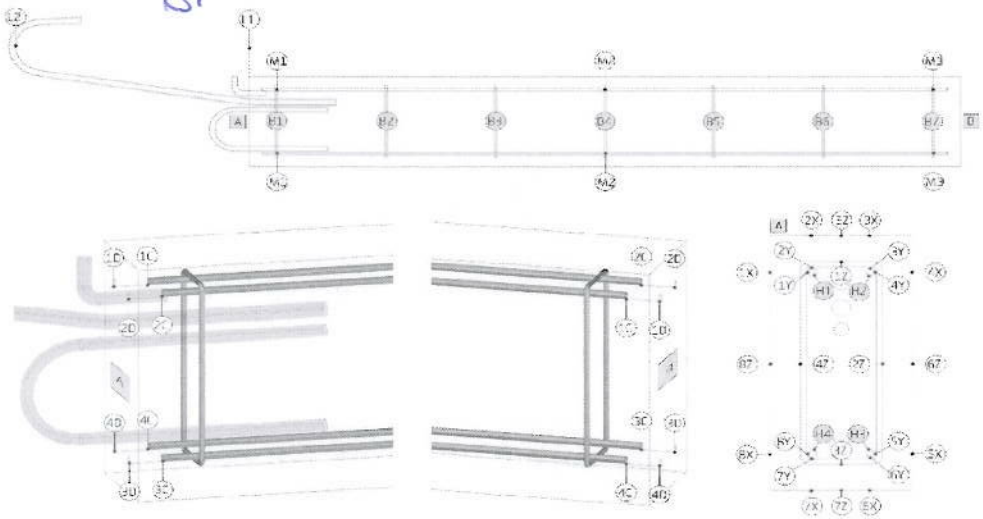
Equipment used: profometer 5

Date: 6/11-17

Measurement performed by: Mot

Cover verification (beam)

Beam ID: B1



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	47
	2X-2Y	47
H2	3X-3Y	47
	4X-4Y	46
H3	5X-5Y	48
	6X-6Y	47
H4	7X-7Y	46
	8X-8Y	45

M2-M3		
H1	1X-1Y	46
	2X-2Y	45
H2	3X-3Y	46
	4X-4Y	48
H3	5X-5Y	46
	6X-6Y	49
H4	7X-7Y	50
	8X-8Y	46

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	38
2Z-6Z	39
3Z-7Z	36
4Z-8Z	39

B4	
1Z-5Z	37
2Z-6Z	40
3Z-7Z	36
4Z-8Z	41

B7	
1Z-5Z	37
2Z-6Z	39
3Z-7Z	38
4Z-8Z	41

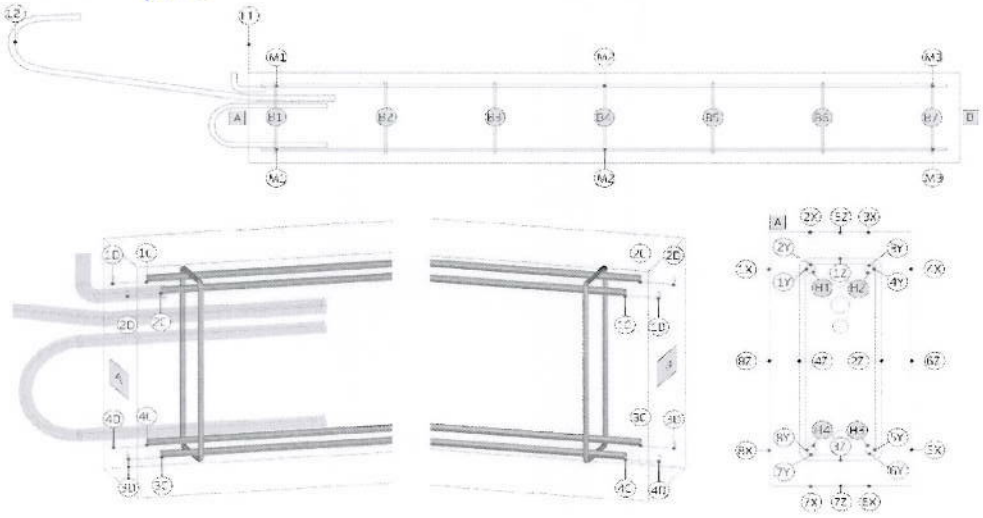
Equipment used: Proceq profoscope

Date: 13/11-17

Measurement performed by: CBJN

Cover verification (beam)

Beam ID: B2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	51
	2X-2Y	51
H2	3X-3Y	52
	4X-4Y	49
H3	5X-5Y	54
	6X-6Y	52
H4	7X-7Y	55
	8X-8Y	50

M2-M3		
H1	1X-1Y	50
	2X-2Y	55
H2	3X-3Y	55
	4X-4Y	53
H3	5X-5Y	52
	6X-6Y	53
H4	7X-7Y	53
	8X-8Y	51

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	38
2Z-6Z	40
3Z-7Z	41
4Z-8Z	43

B4	
1Z-5Z	40
2Z-6Z	41
3Z-7Z	40
4Z-8Z	41

B7	
1Z-5Z	41
2Z-6Z	42
3Z-7Z	41
4Z-8Z	40

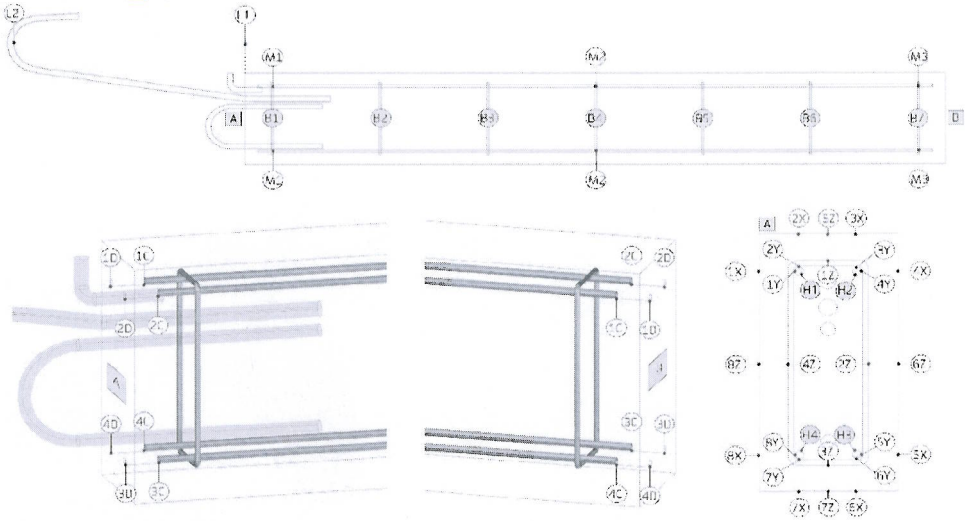
Equipment used: Profometer 5

Date: 9/11-17

Measurement performed by: MOT

Cover verification (beam)

Beam ID: C1



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	50
	2X-2Y	49
H2	3X-3Y	48
	4X-4Y	49
H3	5X-5Y	52
	6X-6Y	50
H4	7X-7Y	51
	8X-8Y	50

M2-M3		
H1	1X-1Y	50
	2X-2Y	46
H2	3X-3Y	52
	4X-4Y	52
H3	5X-5Y	51
	6X-6Y	46
H4	7X-7Y	46
	8X-8Y	51

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	41
2Z-6Z	42
3Z-7Z	38
4Z-8Z	41

B4	
1Z-5Z	40
2Z-6Z	40
3Z-7Z	39
4Z-8Z	42

B7	
1Z-5Z	40
2Z-6Z	42
3Z-7Z	40
4Z-8Z	4

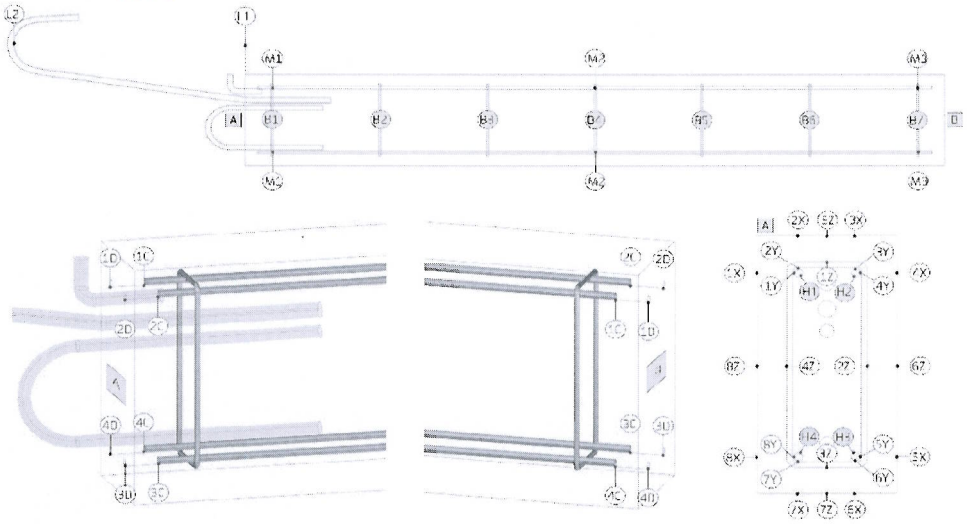
Equipment used: Profometer 5

Date: 24/11-2017

Measurement performed by: MOT / CBJN

Cover verification (beam)

Beam ID: C2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	50
	2X-2Y	49
H2	3X-3Y	49
	4X-4Y	51
H3	5X-5Y	51
	6X-6Y	54
H4	7X-7Y	52
	8X-8Y	53

M2-M3		
H1	1X-1Y	54
	2X-2Y	52
H2	3X-3Y	51
	4X-4Y	52
H3	5X-5Y	53
	6X-6Y	52
H4	7X-7Y	52
	8X-8Y	50

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	40
2Z-6Z	42
3Z-7Z	39
4Z-8Z	40

B4	
1Z-5Z	39
2Z-6Z	43
3Z-7Z	40
4Z-8Z	42

B7	
1Z-5Z	40
2Z-6Z	41
3Z-7Z	42
4Z-8Z	41

Equipment used: Profometer 5

Date: 24/11-2017

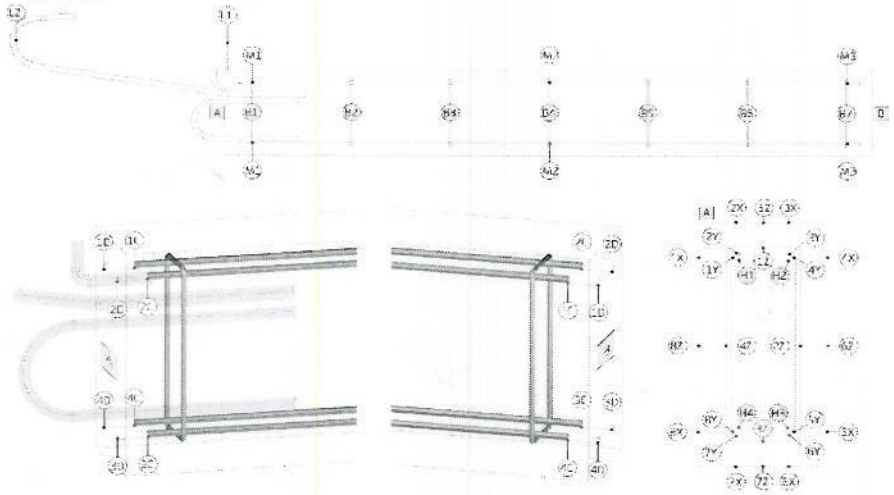
Measurement performed by: MOT/CBJN

D1

44 36 44

Cover verification (beam)

Beam ID:



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	49
	2X-2Y	51
H2	3X-3Y	49
	4X-4Y	49
H3	5X-5Y	46
	6X-6Y	50
H4	7X-7Y	46
	8X-8Y	49

M2-M3		
H1	1X-1Y	48
	2X-2Y	51
H2	3X-3Y	52
	4X-4Y	49
H3	5X-5Y	47
	6X-6Y	49
H4	7X-7Y	51
	8X-8Y	52

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	39
2Z-6Z	39
3Z-7Z	36
4Z-8Z	40

B4	
1Z-5Z	41
2Z-6Z	41
3Z-7Z	36
4Z-8Z	40

B7	
1Z-5Z	40
2Z-6Z	41
3Z-7Z	37
4Z-8Z	40

Equipment used: PROCEQ, PROFOSCOPE

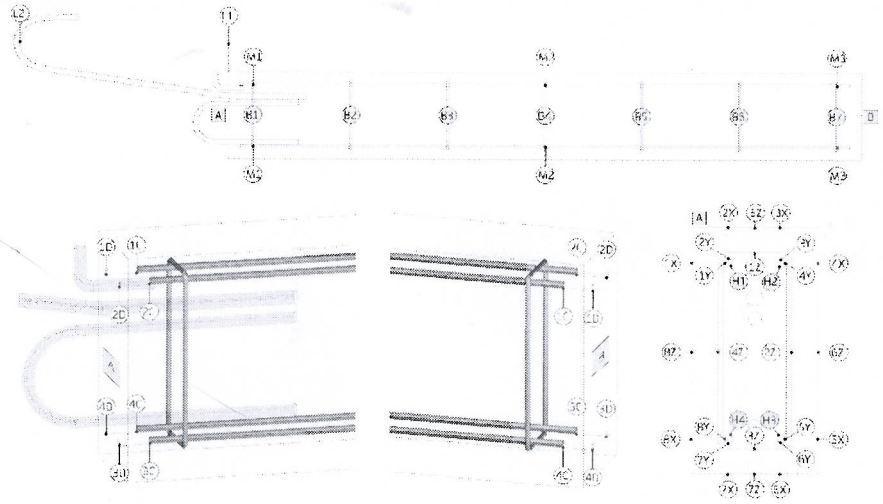
Date: 16/10 - 2017

Measurement performed by: (MIIOP)

D2

Cover verification (beam)

Beam ID:



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	49
	2X-2Y	54
H2	3X-3Y	55
	4X-4Y	48
H3	5X-5Y	51
	6X-6Y	51
H4	7X-7Y	50
	8X-8Y	49

M2-M3		
H1	1X-1Y	50
	2X-2Y	53
H2	3X-3Y	50
	4X-4Y	51
H3	5X-5Y	51
	6X-6Y	52
H4	7X-7Y	52
	8X-8Y	52

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	41
2Z-6Z	41
3Z-7Z	36
4Z-8Z	40

B4	
1Z-5Z	40
2Z-6Z	40
3Z-7Z	36
4Z-8Z	37

B7	
1Z-5Z	40
2Z-6Z	39
3Z-7Z	36
4Z-8Z	40

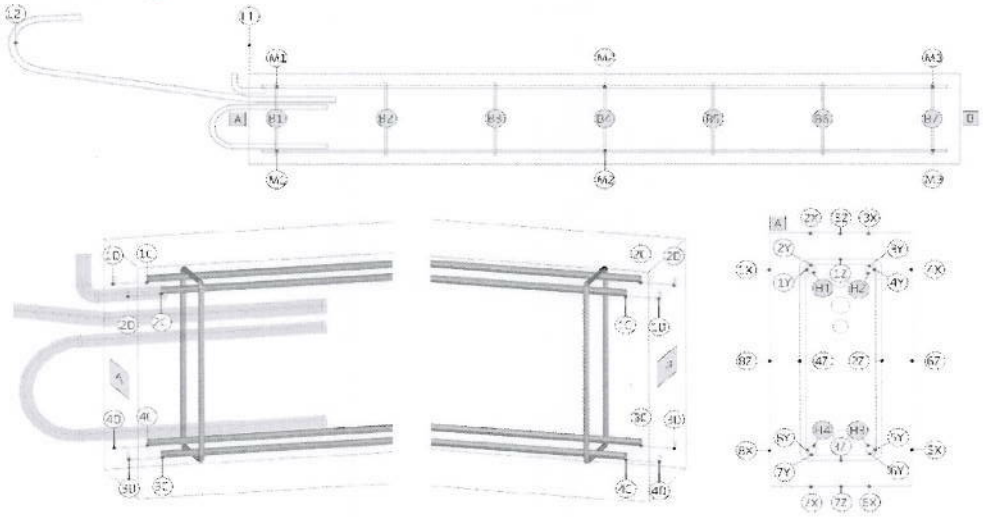
Equipment used: PROCEQ, PROFOSCOPE

Date: 16/10-2017

Measurement performed by: [signature] (MHOP)

Cover verification (beam)

Beam ID: F1



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	52
	2X-2Y	55
H2	3X-3Y	55
	4X-4Y	56
H3	5X-5Y	52
	6X-6Y	53
H4	7X-7Y	52
	8X-8Y	55

M2-M3		
H1	1X-1Y	56
	2X-2Y	53
H2	3X-3Y	52
	4X-4Y	52
H3	5X-5Y	54
	6X-6Y	53
H4	7X-7Y	52
	8X-8Y	53

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	40
2Z-6Z	42
3Z-7Z	39
4Z-8Z	40

B4	
1Z-5Z	41
2Z-6Z	42
3Z-7Z	39
4Z-8Z	42

B7	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	39
4Z-8Z	42

Equipment used:

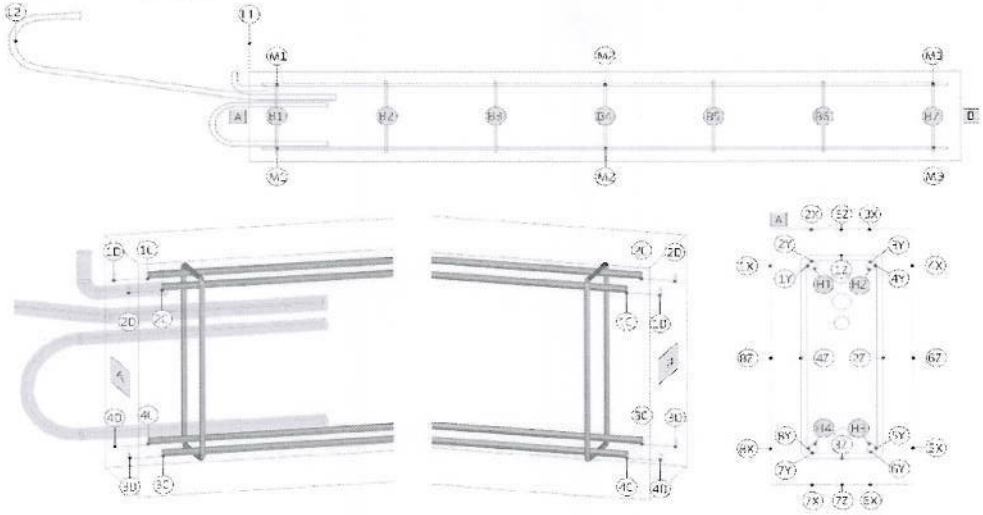
Profometer 5

Date: 20/11-2017

Measurement performed by: MOT

Cover verification (beam)

Beam ID: E2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	55
	2X-2Y	54
H2	3X-3Y	56
	4X-4Y	48
H3	5X-5Y	56
	6X-6Y	52
H4	7X-7Y	55
	8X-8Y	51

M2-M3		
H1	1X-1Y	50
	2X-2Y	52
H2	3X-3Y	53
	4X-4Y	54
H3	5X-5Y	53
	6X-6Y	51
H4	7X-7Y	55
	8X-8Y	50

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	40
2Z-6Z	41
3Z-7Z	39
4Z-8Z	41

B4	
1Z-5Z	39
2Z-6Z	42
3Z-7Z	40
4Z-8Z	42

B7	
1Z-5Z	39
2Z-6Z	41
3Z-7Z	40
4Z-8Z	43

Equipment used: Profometer 5

Date: 20/11-2017

Measurement performed by: MOT

Annex 9 – Compressive strength

Test report

REPORT NO.:
778300-4

DANISH TECHNOLOGICAL INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Assigner:

Contact person:	Claus Pade
Company:	Teknologisk Institut
Address:	Gregersensvej
City:	2630 Taastrup

Material: 30 casted concrete cubes 100 x 100 x 100 mm.
Project: Austefjorden Exposure Site.

Sampling: The material for testing was casted at the Danish Technological Institute and marked: (3 cubes for each mix)

Mix A1 + A2 (STD 0). Date of casting 2017-11-03.
Mix B1 + B2 (STD 18). Date of casting 2017-11-10 and 2017-11-07.
Mix C1 + C2 (STD 40). Date of casting 2017-11-21.
Mix D1 + D2 (ANL 15). Date of casting 2017-11-13.
Mix E1 + E2 (CEMEX 45). Date of casting 2017-11-17.

Period: The testing was completed 28 days after the date of casting. (see results table).

Test method: DS/EN 12390-3 + AC :2012 Testing hardened concrete - Part 3: Compressive strength of test specimens.
DS/EN 12390-7:2012 Testing hardened concrete - Part 7: Density of hardened concrete.
Condition of specimen at time of test; Water saturated.
Method of determination of volume; Measured size.

Results: Result of the test is given on page 2- 4 of this report.

Storage: The tested material will be destroyed after testing unless something else is pre-agreed in writing.

Terms: The test has been performed according to the rear side conditions, which are according to the guidelines laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and according to Danish Technological Institute's general terms and conditions at the time of order confirmation. The testing is only valid for the tested specimen. The test report may only be extracted, if the laboratory has approved the extract.

Place: Date 2018-02-06, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Digitally signed by: Mette Gressmann
Date: 2018.02.08 09:00:37 +01'00'

Mette Gressmann
Laboratory Technician

Henrik Bertelsen
Date: 2018.02.08 07:42:19 +01'00'

Henrik Berthelsen
Laboratory Technician

ilac-MRA DANAK
Test Reg. no. 2

Testing in accordance with DS/EN 12390-3:2012 Compressive strength and DS/EN 12390-7:2012 Density.

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
A1 - 1	100	100	100,0	660,0	2350	66,0
A1 - 2	100	100	100,1	692,0	2370	69,1
A1 - 3	100	100	100,2	660,0	2350	65,9
Mean						67,0
Standard deviation						1,8
Casting date:	2017-11-03					
Testing date:	2017-12-01					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
A2 - 1	100	100	100,1	656,0	2350	65,5
A2 - 2	100	100	100,2	667,0	2360	66,6
A2 - 3	100	100	100,1	651,0	2370	65,0
Mean						65,7
Standard deviation						0,8
Casting date:	2017-11-03					
Testing date:	2017-12-01					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
B1(2) - 1	100	100	100,3	610,0	2300	60,8
B1(2) - 2	100	100	100,1	572,0	2290	57,1
B1(2) - 3	100	100	100,2	560,0	2290	55,9
Mean						57,9
Standard deviation						2,6
Casting date:	2017-11-10					
Testing date:	2017-12-08					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
B2 - 1	100	100	100,2	610,0	2300	60,9
B2 - 2	100	100	100,1	594,0	2290	59,3
B2 - 3	100	100	100,2	597,0	2290	59,6
Mean						59,9
Standard deviation						0,8
Casting date:	2017-11-07					
Testing date:	2017-12-05					

Testing in accordance with DS/EN 12390-3:2012 Compressive strength and DS/EN 12390-7:2012 Density.

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
C1 - 1	100	100	100,1	420,0	2270	42,0
C1 - 2	100	100	100,2	430,0	2250	42,9
C1 - 3	100	100	100,2	421,0	2260	42,0
Mean						42,3
Standard deviation						0,5
Casting date:	2017-11-21					
Testing date:	2017-12-19					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
C2 - 1	100	100	100,4	442,0	2270	44,0
C2 - 2	100	100	100,3	447,0	2280	44,6
C2 - 3	100	100	100,5	421,0	2260	41,9
Mean						43,5
Standard deviation						1,4
Casting date:	2017-11-21					
Testing date:	2017-12-19					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
D1 - 1	100	100	100,2	620,0	2310	61,9
D1 - 2	100	100	100,7	622,0	2320	61,8
D1 - 3	100	100	100,4	636,0	2320	63,3
Mean						62,3
Standard deviation						0,9
Casting date:	2017-11-13					
Testing date:	2017-12-11					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
D2 - 1	100	100	100,7	624,0	2350	62,0
D2 - 2	100	100	100,5	647,0	2340	64,4
D2 - 3	100	100	100,3	640,0	2340	63,8
Mean						63,4
Standard deviation						1,3
Casting date:	2017-11-13					
Testing date:	2017-12-11					

Testing in accordance with DS/EN 12390-3:2012 Compressive strength and DS/EN 12390-7:2012 Density.

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
E1 - 1	100	100	100,4	670,0	2330	66,7
E1 - 2	100	100	100,1	662,0	2310	66,1
E1 - 3	100	100	100,0	662,0	2300	66,2
Mean						66,4
Standard deviation						0,3
Casting date: 2017-11-17						
Testing date: 2017-12-15						

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
E2 - 1	100	100	100,0	672,0	2330	67,2
E2 - 2	100	100	100,2	691,0	2340	69,0
E2 - 3	100	100	100,5	667,0	2320	66,4
Mean						67,5
Standard deviation						1,3
Casting date: 2017-11-17						
Testing date: 2017-12-15						

The general conditions pertaining to assignments accepted by Danish Technological Institute shall apply in full to the technical testing or calibration at Danish Technological Institute and to the completion of test reports or calibration certificates within the relevant field.

Danish Accreditation (DANAK):
DANAK is the national accreditation body in Denmark in compliance with EU regulation No. 765/2008.

DANAK participates in the multilateral agreements for testing and calibration under European co-operation for Accreditation (EA) and under International Laboratory Accreditation Cooperation (ILAC) based on peer evaluation. Accredited test reports and calibration certificates issued by laboratories accredited by DANAK are recognized cross border by members of EA and ILAC equal to test reports and calibration certificates issued by these members' accredited laboratories.

The use of the accreditation mark on test reports and calibration certificates or reference to accreditation, documents that the service is provided as an accredited service under the company's DANAK accreditation according to EN ISO IEC 17025.

Construction Product Regulation:
The Danish Technological Institute guarantees that employees carrying out tests to be used together with harmonized standards under notification no. 1235 according to EU regulation 305/2011, article 43, satisfy all the requirements made for capability, integrity and impartiality. You find the CPR here:

http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/construction-products/index_en.htm

September 2015

Test report

REPORT NO.:
778300-5

DANISH TECHNOLOGICAL INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Init: Mtg/Hbn
Order no.: 778300-5
Appendix: 0

Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej
City: 2630 Taastrup

Material:
30 casted concrete cubes 100 x 100 x 100 mm.
Project: Austefjorden Exposure Site.

Sampling:
The material for testing was casted at the Danish Technological Institute and marked: (3 cubes for each mix)

Mix A1 + A2 (STD 0).	Date of casting 2017-11-03.
Mix B1 + B2 (STD 18).	Date of casting 2017-11-10 and 2017-11-07.
Mix C1 + C2 (STD 40).	Date of casting 2017-11-21.
Mix D1 + D2 (ANL 15).	Date of casting 2017-11-13.
Mix E1 + E2 (CEMEX 45).	Date of casting 2017-11-17.

Period:
The testing was completed 91 days after the date of casting. (see results table).

Test method:
DS/EN 12390-3 + AC :2012 Testing hardened concrete - Part 3: Compressive strength of test specimens.
DS/EN 12390-7:2012 Testing hardened concrete - Part 7: Density of hardened concrete.
Condition of specimen at time of test; Water saturated.
Method of determination of volume; Measured size.

Results:
Result of the test is given on page 2- 4 of this report.

Storage:
The tested material will be destroyed after testing unless something else is pre-agreed in writing.

Terms:
The test has been performed according to the rear side conditions, which are according to the guidelines laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and according to Danish Technological Institute's general terms and conditions at the time of order confirmation. The testing is only valid for the tested specimen. The test report may only be extracted, if the laboratory has approved the extract.

Place:
Date 2018-02-20, Danish Technological Institute, Taastrup, Concrete Centre

Signature:
Digitally signed by: Mette Gressmann
Date: 2018.03.05 13:26:27 +01'00'

Mette Gressmann
Laboratory Technician

Henrik Bertelsen
Date: 2018.02.22 14:15:49 +01'00'

Henrik Berthelsen
Laboratory Technician

ilac-MRA DANAK
Test Reg. no. 2

Testing in accordance with DS/EN 12390-3:2012 Compressive strength and DS/EN 12390-7:2012 Density.

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
A1 - 1	100	100	100	740,0	2350	74,0
A1 - 2	100	100	100	737,0	2350	73,7
A1 - 3	100	100	100	757,0	2360	75,7
Mean						74,5
Standard deviation						1,1
Casting date:	2017-11-03					
Testing date:	2018-02-02					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
A2 - 1	100	100	100	746,0	2380	74,6
A2 - 2	100	100	100	735,0	2360	73,5
A2 - 3	100	100	100	731,0	2350	73,1
Mean						73,7
Standard deviation						0,8
Casting date:	2017-11-03					
Testing date:	2018-02-02					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
B1(2) - 1	100	100	100	675,0	2310	67,5
B1(2) - 2	100	100	100	704,0	2300	70,4
B1(2) - 3	100	100	100	696,0	2300	69,6
Mean						69,2
Standard deviation						1,5
Casting date:	2017-11-10					
Testing date:	2018-02-09					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
B2 - 1	100	100	100	693,0	2320	69,3
B2 - 2	100	100	100	694,0	2340	69,4
B2 - 3	100	100	100	712,0	2320	71,2
Mean						70,0
Standard deviation						1,1
Casting date:	2017-11-07					
Testing date:	2018-02-06					

Testing in accordance with DS/EN 12390-3:2012 Compressive strength and DS/EN 12390-7:2012 Density.

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
C1 - 1	100	100	100	524,0	2280	52,4
C1 - 2	100	100	100	525,0	2270	52,5
C1 - 3	100	100	100	522,0	2280	52,2
Mean						52,4
Standard deviation						0,2
Casting date:	2017-11-21					
Testing date:	2018-02-20					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
C2 - 1	100	100	100	524,0	2280	52,4
C2 - 2	100	100	100	520,0	2270	52,0
C2 - 3	100	100	100	524,0	2280	52,4
Mean						52,3
Standard deviation						0,2
Casting date:	2017-11-21					
Testing date:	2018-02-20					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
D1 - 1	100	100	100	720,0	2340	72,0
D1 - 2	100	100	100	713,0	2340	71,3
D1 - 3	100	100	100	707,0	2380	70,7
Mean						71,3
Standard deviation						0,7
Casting date:	2017-11-13					
Testing date:	2018-02-12					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
D2 - 1	100	100	100	756,0	2350	75,6
D2 - 2	100	100	100	732,0	2370	73,2
D2 - 3	100	100	100	730,0	2350	73,0
Mean						73,9
Standard deviation						1,4
Casting date:	2017-11-13					
Testing date:	2018-02-12					

Testing in accordance with DS/EN 12390-3:2012 Compressive strength and DS/EN 12390-7:2012 Density.

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
E1 - 1	100	100	100	731,0	2320	73,1
E1 - 2	100	100	100	737,0	2350	73,7
E1 - 3	100	100	100	719,0	2330	71,9
Mean						72,9
Standard deviation						0,9
Casting date:	2017-11-17					
Testing date:	2018-02-16					

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Load [kN]	Density [Kg/m³]	Compressive strength Cube [MPa]
E2 - 1	100	100	100	751,0	2360	75,1
E2 - 2	100	100	100	744,0	2350	74,4
E2 - 3	100	100	100	730,0	2340	73,0
Mean						74,2
Standard deviation						1,1
Casting date:	2017-11-17					
Testing date:	2018-02-16					

The general conditions pertaining to assignments accepted by Danish Technological Institute shall apply in full to the technical testing or calibration at Danish Technological Institute and to the completion of test reports or calibration certificates within the relevant field.

Danish Accreditation (DANAK):
DANAK is the national accreditation body in Denmark in compliance with EU regulation No. 765/2008.

DANAK participates in the multilateral agreements for testing and calibration under European co-operation for Accreditation (EA) and under International Laboratory Accreditation Cooperation (ILAC) based on peer evaluation. Accredited test reports and calibration certificates issued by laboratories accredited by DANAK are recognized cross border by members of EA and ILAC equal to test reports and calibration certificates issued by these members' accredited laboratories.

The use of the accreditation mark on test reports and calibration certificates or reference to accreditation, documents that the service is provided as an accredited service under the company's DANAK accreditation according to EN ISO IEC 17025.

Construction Product Regulation:
The Danish Technological Institute guarantees that employees carrying out tests to be used together with harmonized standards under notification no. 1235 according to EU regulation 305/2011, article 43, satisfy all the requirements made for capability, integrity and impartiality. You find the CPR here:

http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/construction-products/index_en.htm

September 2015

Annex 10 - Resistivity

Test report

REPORT NO.:
778300-6

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
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Init: FOE/THSV
Order no.: 778300-6
Appendix: 0

Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej 1
City: DK-2630 Taastrup

Material:
5 x 8 cast concrete cubes 100 x 100 x 100 mm.
Project: Austefjorden Exposure Site.

Sampling:
The material for testing was cast by the Danish Technological Institute and marked:
Mix A1 + A2 (STD 0). Date of casting 2017-11-03.
Mix B1 + B2 (STD 18). Date of casting 2017-11-10 and 2017-11-07.
Mix C1 + C2 (STD 40). Date of casting 2017-11-21.
Mix D1 + D2 (ANL 15). Date of casting 2017-11-13.
Mix E1 + E2 (CEMEX 45). Date of casting 2017-11-17.

Period:
The testing was completed 2017-12-01 to 2018-02-20.

Test method:
Statens vegvesen, R210 Laboratorieundersøkelser.
443 Spesifikk elektrisk motstand (resistivitet).

Results:
Results of the test is given on page 2 to 6.

Storage:
The tested material will be destroyed after testing unless something else is pre-agreed in writing.

Remarks:
Exposure temperature: Water bath 20°C ±1 °C.
Testing temperature: Climate chamber 20°C ±1 °C.
Resistance in the electronics circuit: <10 Ω.

Terms:
The test has been performed according to the rear side conditions. The testing is only valid for the tested specimen. The test report may only be extracted, if the laboratory has approved the extract.

Place:
Date 2018-03-12, Danish Technological Institute, Taastrup, Concrete Centre.

Signature:

Digitally signed by: Finn Lykke Østergård
Date: 2018.03.12 13:57:35 + 01'00'
Finn Østergård
Laboratory Technician

Digitalt signeret af Thomas Lennart Svensson
Dato: 2018.03.12 15:25:52 +01'00'
Thomas Lennart Svensson
Teamleader

443 Spesifikk elektrisk motstand (resistivitet)

Testing Date:
28 days: 2017-12-01
91 days: 2018-02-02

ID: Mix A1 (STD 0)

Dimension	1	2	3	4
Length m	0,1001	0,1001	0,1001	0,1001
Width m	0,1001	0,1002	0,1004	0,1001
Height m	0,1000	0,1001	0,1001	0,1001
Cross-sectional area m^2	0,0100	0,0100	0,0101	0,0100

Resistance Ω	1	2	3	4
28 days	1274	1209	1229	1206
91 days	1972	1859	1899	1884

Resistivitet Ωm	1	2	3	4	Mean
28 days	127,7	121,1	123,4	120,7	**123,2**
91 days	197,6	186,3	190,7	188,6	**190,8**

ID: Mix A2 (STD 0)

Dimension	1	2	3	4
Length m	0,1001	0,1001	0,1001	0,1001
Width m	0,1001	0,1001	0,1003	0,1000
Height m	0,1001	0,1002	0,1001	0,1001
Cross-sectional area m^2	0,0100	0,0100	0,0100	0,0100

Resistance Ω	1	2	3	4
28 days	1085	1114	1171	1122
91 days	1683	1746	1818	1755

Resistivitet Ωm	1	2	3	4	Mean
28 days	108,6	111,4	117,5	112,2	**112,4**
91 days	168,5	174,6	182,3	175,5	**175,2**

443 Spesifikk elektrisk motstand (resistivitet)

Testing Date:
28 days: 2017-12-08
91 days: 2018-02-09

ID: Mix B1 (STD 18)

Dimension	1	2	3	4
Length m	0,1001	0,1000	0,1001	0,1001
Width m	0,1000	0,1002	0,1001	0,1001
Height m	0,1001	0,1002	0,1001	0,1001
Cross-sectional area m^2	0,0100	0,0100	0,0100	0,0100

Resistance Ω	1	2	3	4
28 days	1914	1887	1928	1921
91 days	3644	3565	3687	3661

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	191,4	188,7	193,0	192,3	**191,3**
91 days	364,4	356,5	369,1	366,5	**364,1**

Testing Date:
28 days: 2017-12-05
91 days: 2018-02-06

ID: Mix B2 (STD 18)

Dimension	1	2	3	4
Length m	0,1001	0,1001	0,1001	0,1000
Width m	0,1000	0,1002	0,1003	0,1003
Height m	0,1000	0,1000	0,1001	0,1001
Cross-sectional area m^2	0,0100	0,0100	0,0100	0,0100

Resistance Ω	1	2	3	4
28 days	1881	1891	1845	1852
91 days	3544	3537	3417	3463

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	188,3	189,7	185,1	185,6	**187,1**
91 days	354,8	354,8	342,7	347,0	**349,8**

443 Spesifikk elektrisk motstand (resistivitet)

Testing Date:
28 days: 2017-12-19
91 days: 2018-02-20

ID: Mix C1 (STD 40)

Dimension	1	2	3	4
Length m	0,1000	0,1001	0,1000	0,1001
Width m	0,1000	0,1000	0,1000	0,0997
Height m	0,1000	0,1000	0,1001	0,1000
Cross-sectional area m^2	0,0100	0,0100	0,0100	0,0100

Resistance Ω	1	2	3	4
28 days	1895	1839	1863	1814
91 days	4052	4001	4013	3995

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	189,5	184,1	186,1	181,0	**185,2**
91 days	405,2	400,5	400,9	398,7	**401,3**

ID: Mix C2 (STD 40)

Dimension	1	2	3	4
Length m	0,1000	0,1000	0,1000	0,1001
Width m	0,1000	0,1003	0,1001	0,1004
Height m	0,1001	0,1001	0,1000	0,1001
Cross-sectional area m^2	0,0100	0,0100	0,0100	0,0101

Resistance Ω	1	2	3	4
28 days	1773	1731	1739	1808
91 days	3830	3910	3858	4020

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	177,1	173,4	174,1	181,5	**176,5**
91 days	382,6	391,8	386,2	403,6	**391,0**

443 Spesifikk elektrisk motstand (resistivitet)

Testing Date:
28 days: 2017-12-11
91 days: 2018-02-12

ID: Mix D1 (ANL 15)

Dimension	1	2	3	4
Length m	0,1001	0,1000	0,1000	0,1001
Width m	0,1002	0,1002	0,1001	0,1007
Height m	0,1001	0,1001	0,1000	0,1000
Cross-sectional area m^2	0,0100	0,0100	0,0100	0,0101

Resistance Ω	1	2	3	4
28 days	1324	1269	1282	1259
91 days	2929	2853	2857	2899

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	132,7	127,0	128,3	126,9	**128,7**
91 days	293,5	285,6	286,0	292,2	**289,3**

ID: Mix D2 (ANL 15)

Dimension	1	2	3	4
Length m	0,1001	0,1000	0,1001	0,1001
Width m	0,1005	0,1003	0,1004	0,1005
Height m	0,1000	0,1001	0,1002	0,1002
Cross-sectional area m^2	0,0101	0,0100	0,0101	0,0101

Resistance Ω	1	2	3	4
28 days	1262	1286	1302	1182
91 days	2752	2833	2877	2636

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	127,0	128,9	130,6	118,7	**126,3**
91 days	276,9	283,9	288,6	264,7	**278,5**

443 Spesifikk elektrisk motstand (resistivitet)

Testing Date:
28 days: 2017-12-15
91 days: 2018-02-16

ID: Mix E1 (CEMEX 45)

Dimension	1	2	3	4
Length m	0,1001	0,1000	0,1000	0,1001
Width m	0,1003	0,1002	0,1000	0,0999
Height m	0,1002	0,1001	0,1001	0,1000
Cross-sectional area m^2	0,0100	0,0100	0,0100	0,0100

Resistance Ω	1	2	3	4
28 days	2520	2547	2582	2637
91 days	3906	3860	3999	4266

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	252,5	255,0	257,9	263,7	**257,3**
91 days	391,4	386,4	399,5	426,6	**401,0**

ID: Mix E2 (CEMEX 45)

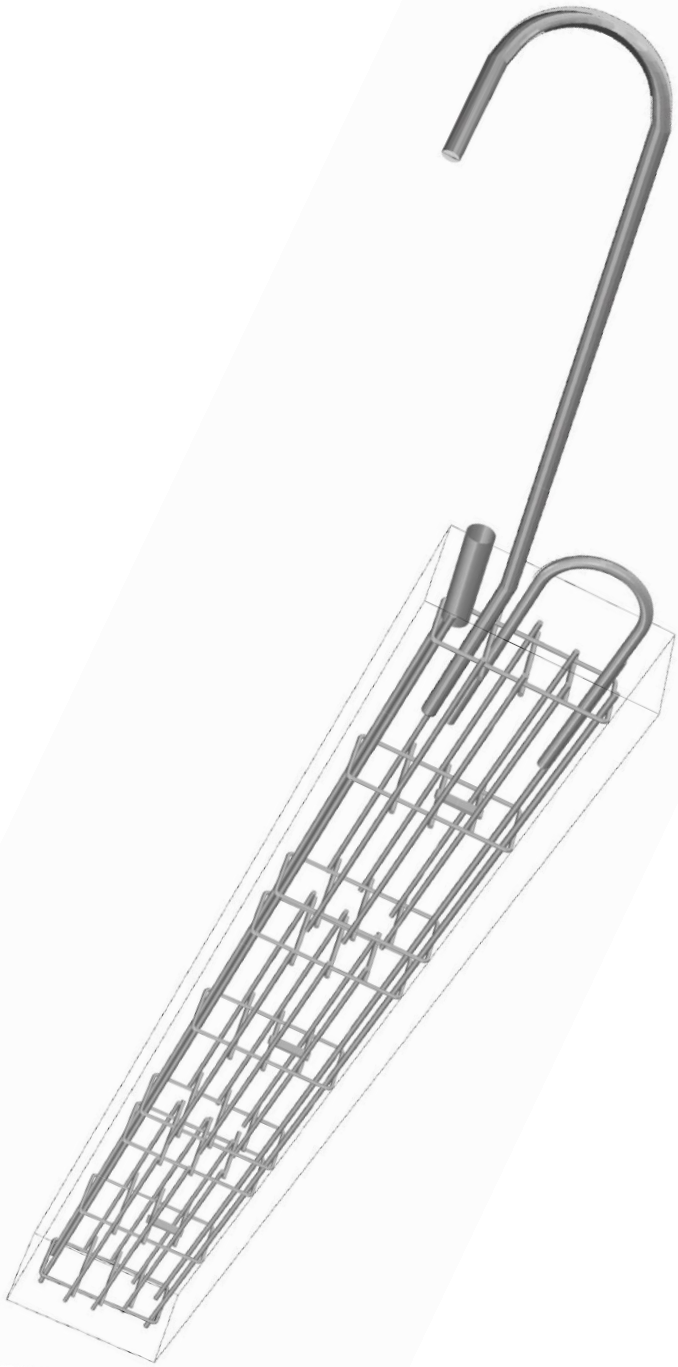
Dimension	1	2	3	4
Length m	0,1000	0,1000	0,1000	0,1001
Width m	0,1000	0,1003	0,1003	0,1001
Height m	0,1000	0,1001	0,1000	0,1000
Cross-sectional area m^2	0,0100	0,0100	0,0100	0,0100

Resistance Ω	1	2	3	4
28 days	2533	2621	2548	2593
91 days	3937	4045	3936	4055

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	253,3	262,6	255,6	259,8	**257,8**
91 days	393,7	405,3	394,8	406,3	**400,0**

The general conditions pertaining to assignments accepted by Danish Technological Institute shall apply in full to the technical testing and calibration at Danish Technological Institute and to the completion of test reports and calibration certificates within the relevant field.

Vedlegg B



Austefjorden Exposure Site

Production and testing of concrete elements
Part 2

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Austefjorden Exposure Site

Production and testing of concrete elements
Part 2

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Version No.: 1, 16 July 2019

1. Contents

2. Introduction

Statens vegvesen retained based on an open tender process the Danish Technological Institute, Building and Construction to produce and deliver concrete elements for their field station in Austefjord near the city of Bergen. This report contains information about the nine concrete elements in Part 2 of the assignment that where produced in December 2018 and delivered at the field station on March 6th, 2019.

3. Materials and methods

3.1. Constituent materials

Statens vegvesen supplied all the materials for the concrete as given in Table 2.1. The density and absorption of the aggregate were determined by DTI in Part 1of the assignment for use in final mix designs.

3.2. Mix designs

Statens vegvesen provided the original mix designs for the concrete. The amounts of superplasticizing and air entraining admixture had to be fine-tuned by trial mixing to achieve the required consistence (slump = 190 ± 30mm) and air content (4.5 ± 1%) of the concrete.

The nominal mix designs of the three concretes are shown in Table 2.1.

Table 2.1. Nominal mix designs of the three concrete types. Units are given in kg/m^3, except for air content in vol% and w/c ratio in kg/kg

Constituent	Mix ID								
	ANL 40			MILJØ			AALB 20		
	F1	F2	F3	G1	G2	G3	H1	H2	H3
Norcem Anlegg FA	272.3	272.3	272.3						
Cemex Miljøcement				422.3	422.3	422.3			
Aalborg Rapid							338.7	338.7	338.7
Silica fume, Elkem densified	16.7	16.7	16.7	17.7	17.7	17.7	18.0	18.0	18.0
Fly ash, Emineral B4	124.4	124.4	124.4				89.2	89.2	89.2
Free water	172.8	172.8	172.8	178.5	178.5	178.5	170.5	170.5	170.5
Årdal sand 0/8	888.4	888.4	888.4	888.4	888.4	888.4	888.4	888.4	888.4
Årdal stein 8/16	793,2	793,2	793,2	793.2	793.2	793.2	793.2	793.2	793.2
Mapei Dynamon SX-23	1.70	1.70	1.70	1.90	2.00	2.00	2.20	2.20	2.20
Mapeair 25 (1:9)	6,50	6,00	6,00	1.90	1.80	1.90	2.90	3.10	3.00
Density	2268	2268	2268	2301	2301	2301	2299	2299	2299
Air content	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%
w/c ratio	0.44	0.44	0.44	0.39	0.39	0.39	0.39	0.39	0.39
Casting date	041218	041218	041218	071218	071218	071218	111218	111218	111218

3.3. Formwork, reinforcement, inserts, sensors and labelling

3.3.1. Formwork

The formwork was made from water resistant plywood. All concrete elements were cast in new formwork, except for concrete elements H1 and H2 which were cast in formwork reused from casting of concrete elements F1 and F2, respectively.

3.3.2. Reinforcement and inserts

The main reinforcement consisting of 12mm ribbed bars and the stirrups consisting of 8mm ribbed bar was purchased from Celsa Armeringsstål AS, Mo in Rana, Norway in steel grade B500NC according to NS 3576-3. Tying thread of Ø1.00mm annealed stainless steel quality 1.4301 from Arminox in Denmark was used to fixate the main bars to the stirrups. The lifting and mounting brackets were supplied

by Arminox in stainless steel grade 1.4362 with a PRE-value of 26 and compliance with B500NCR. The cable pipe was stainless steel grade 1.4404.

The layout of the reinforcement and inserts for concrete elements without instrumentation are shown in 3D perspective view in Figure 2.1.

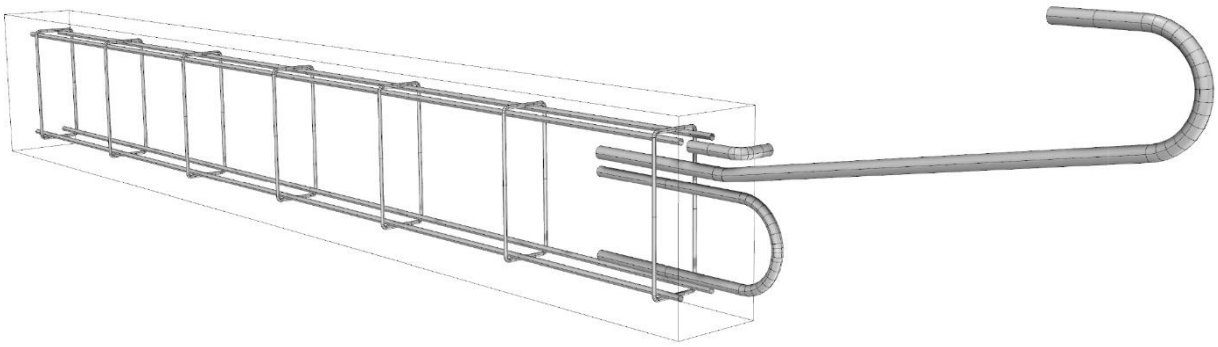


Figure 2.1. 3D drawing of the non-instrumented concrete element including reinforcement and inserts.

The layout of the reinforcement and inserts in the concrete elements with instrumentation was altered somewhat to facilitate easy mounting of working electrodes and to protect all sensor cables by one large cable pipe. Both stirrup No. 3 and stirrup No. 5 was changed to a set of two stirrups with an individual distance of 135mm. The cable pipe was changed to a straight pipe with an inside M40 thread in one end.

The layout of the reinforcement and inserts for concrete elements with instrumentation are shown in 3D perspective view in Figure 2.2.

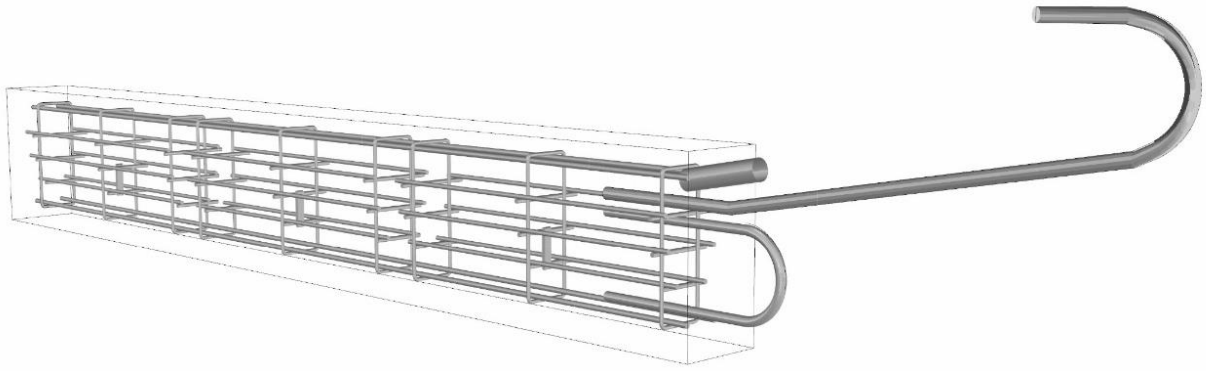


Figure 2.2. 3D drawing of the instrumented concrete element including reinforcement, inserts and sensors.

3.3.3. Sensors

The sensors for the three concrete elements with instrumentation are:

Reference electrode
The reference electrodes delivered by Statens vegvesen are ERE-20 Reference Electrodes from FORCE Technology. The ERE-20 potentials vs. SCE as specified by FORCE Technology was checked by laboratory measurements – see Annex 12.

Temperature sensor
The temperature sensors delivered by Statens vegvesen are Type T Thermocouples.

Working electrode
The working electrodes are made from 800mm long ø10mm ribbed bars delivered by Celsa Armeringsstål AS, Mo in Rana, Norway in steel grade B500NC according to NS 3576-3. They have been mounted with cable by DTI according to the procedure given in Annex 11. As agreed with Statens vegvesen the length of the working electrodes is reduced to 800mm to give room for the cables and the required cover depth. Both ends are coated with Renderoc ST 05 from Fosroc (substituting SBR Febond as agreed with Statens vegvesen) and sealed by a heat shrinking plastic tube – see Figure 2.3. The exposed length between the coated end are between 670mm and 690mm.

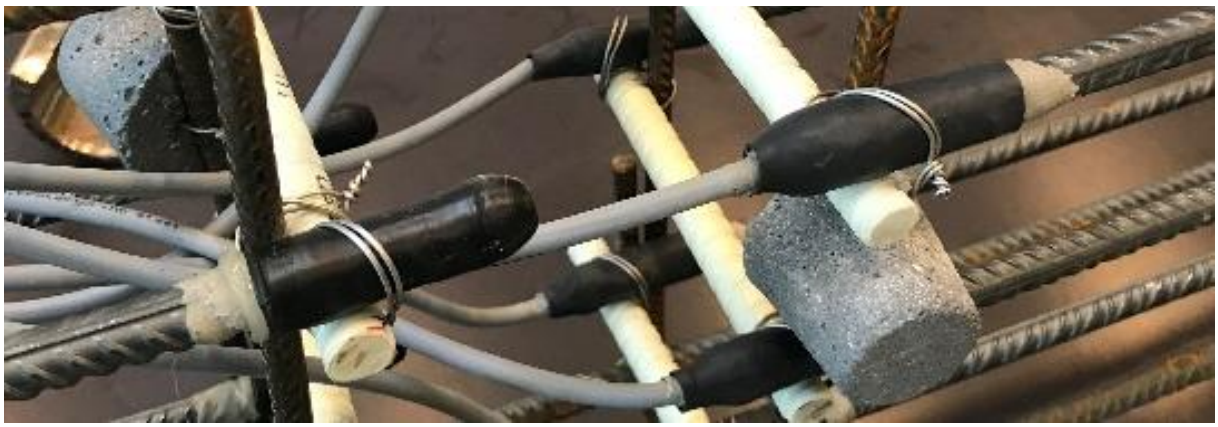


Figure 2-3. Photo of coated ends on working electrodes.

Mounting of sensors
In order to fulfill the requirements regarding position and insulation of the sensors they were mounted on a skeleton of ø12mm glass fibre reinforcement rods from Schöck Bauteile GmbH – see Figure 2-4. The sensors were mounted with the nominal positions shown in Figure 2-5.

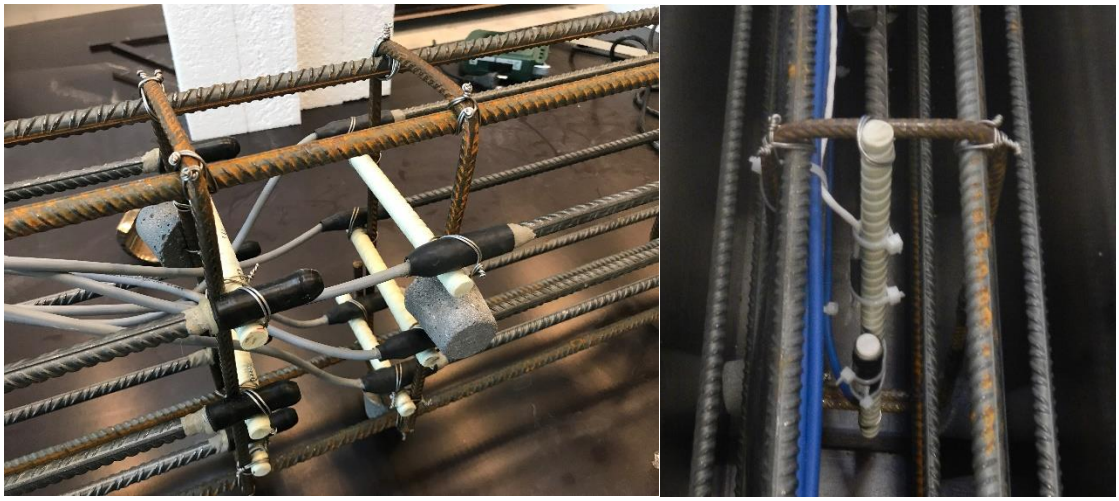


Figure 2-4. Photo of sensors mounted on glass fibre reinforcement attached to the stirrups. Left: Working electrodes. Right: Reference electrode and temperature sensor.

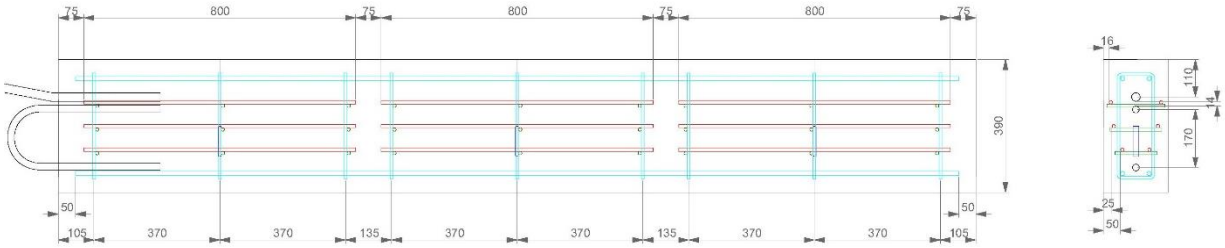


Figure 2-5. Drawing showing sensor positions in the instrumented concrete elements.

3.3.4. Spacers

Concrete spacers of the type "Round" (quality STQ3) from Haucon A/S was used.

3.3.5. Labelling

Labelling of the individual concrete element consisted of an imprint into the top surface of the concrete and of a 5mm stainless steel plate attached to the lifting bracket and cast into the top surface. The labelling used is shown in Table 2.2.

Table 2.2. Labelling of concrete types/elements.

Concrete type	**F**			**G**			**H**		
Imprint	F1	F2	F3	G1	G2	G3	H1	H2	H3
Steel plate	ANL 40			MILJØ			AALB 20		
	04.12.2018			07.12.2018			11.12.2018		

3.4. Batching

For the production of concrete elements and test specimens batches of 260 litres were produced using the following batching procedure:

1. Initial estimation of moisture in aggregate based on moisture determination of one sample of each aggregate taken from silo (needs to be fairly accurate, i.e. within 1% of the actual content).
2. Calculation of amounts of constituent materials to be mixed.
3. Weighing of aggregate materials. The exact amount is ensured by adding or removing material from the conveyor belt. In the process of dosing aggregate, three samples of 1 kg are taken of each aggregate and the moisture content determined in microwave ovens. A battery of 12 ovens are available for this task, see Figure 2.3. The moisture determination takes approximately 20 minutes.
4. The aggregate is transferred to the mixer (closed space where no evaporation takes place).
5. Weighing of cement, silica fume and fly ash into buckets by hand.
6. Weighing of admixtures into beakers by hand.
7. Calculation of water to be added based on the microwave oven moisture content measurements.
8. Weighing of water into pre-tank.
9. Recalculation of amounts of constituent materials to be mixed. Verification that the amounts already weighed fulfil requirements to dosing accuracy:
    a. If yes – the mixing procedure is started and the concrete subsequently tested.
    b. If no – the mixing procedure is started and the concrete is subsequently discarded.

Figure 2.6. Microwave ovens used to determine the moisture content of aggregate fractions.

3.5. Mixing and testing of fresh concrete

For the production of concrete blocks and test specimens batches of 260 litres were produced in Danish Technological Institute's 375/250 litre Haarup countercurrent mixer (Figure 2.7) using the following mixing procedure:

1. The aggregate already in the mixer was mixed for 30 seconds.
2. Powder was added and mixing continues for 30 seconds.
3. Water was added over a period of 20-30 seconds while mixing.
4. Air entraining agent and superplasticizer was added.
5. Mixing was continued for 60 seconds after addition of superplasticizer.
6. The concrete was discharged to a 500 litre crane bucket.
7. The consistence was determined according to EN 12350-2.
8. The density and air content was determined according to EN 12350-6 and –7.
9. The temperature of the concrete was measured.

Figure 2.7. Left: A view into the Haarup 375/250 litre concrete mixer. Right: The vibration during casting of a concrete element is shown.

3.6. Casting

The concrete elements were cast in two layers of approximately equal height. Each layer was compacted using a 40mm electrical poker inserted for every 30cm. The vibration time at each insertion point was 6 seconds (Figure 2.7). At the end of the concrete element where the cables leave the concrete through a stainless steel pipe vibration was performed using a 25mm electrical poker for the non-instrumented concrete elements and for the instrumented concrete elements compaction had to be carefully performed with a steel rod to avoid damage on the large amount of cables. The top surface of the concrete was finished by hand trowelling.

For each batch of concrete 10 nos. of 100mm cubes were cast, and for each concrete type a total of 6 nos. ø100x200mm cylinders and one 150mm cube were cast from the batch used for the instrumented concrete element. The casting of test specimens was performed according to EN 12350-1.

3.7. Curing

The finished top surface was immediately covered with plastic sheeting. The concrete was left to harden for 48-72 hours. Subsequently, the formwork was stripped and the concrete element checked for correct dimensions, cover to reinforcement and surface appearance. If the concrete element was approved it was wrapped in wet burlap and plastic sheeting and left to cure inside in the DTI concrete laboratory where the temperature was between 16.4°C and 21.2°C with an average of 19.6°C (Figure 2.8).

The 100mm cubes and ø100mm cylinders were demoulded after 48-72 hours and stored immersed in water at 20°C. The 150mm cubes were demoulded after 48-72 hours wrapped in wet burlap, covered with plastic sheeting, and stored next to the concrete elements.

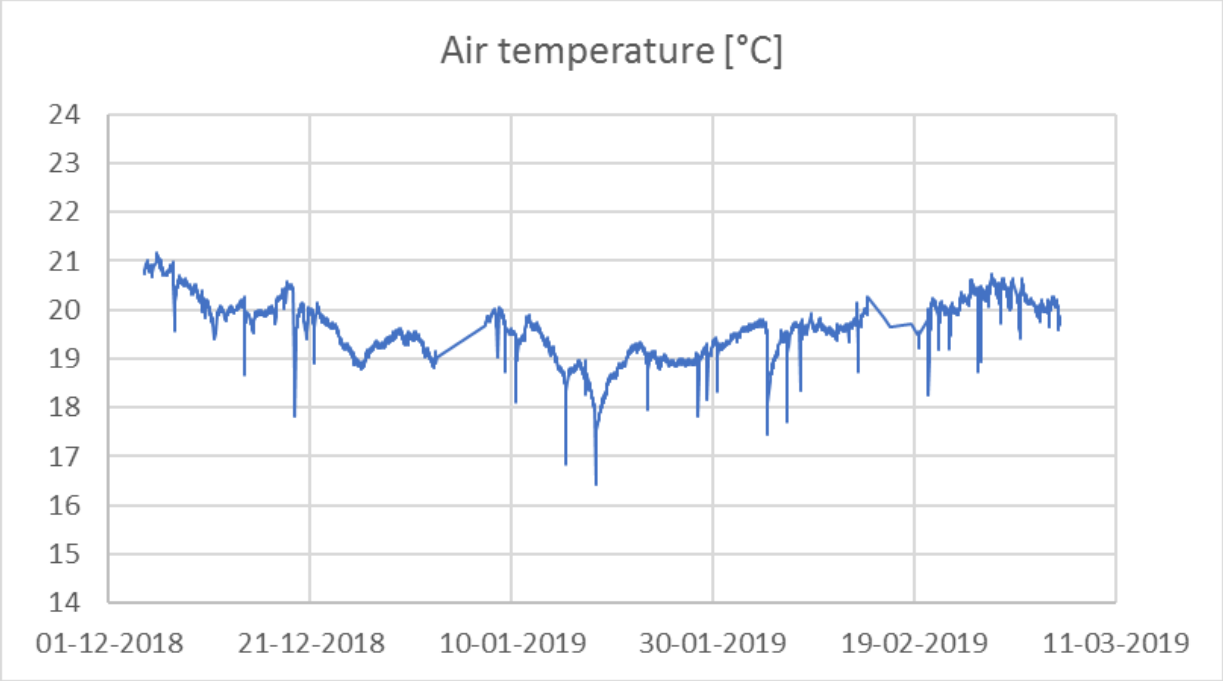


Figure 2.8. Temperature in the room were the concrete elements were stored until transport to the Austefjord field station.

3.8. Hardened concrete

The compressive strength of the concrete from each batch was determined according to EN 12390-3 on three 100mm cubes at ages of 28 and 91 days.

The resistivity of the concrete from each batch was determined according to "Statens vegvesen R210 Laboratorieundersøkelser, 443 Spesifikk elektrisk motstand" on four 100mm cubes at ages of 28 and 91 days.

3.9. Protection of cables in instrumented elements

The external cables from the sensors in the instrumented elements are protected by a watertight and UV resistant Ø40mm hose from HellermannTyton. The hose is a PVC covered spiral corrugated stainless steel hose. The protective hose is mounted to the inside M40 thread on the stainless steel cable pipe by the HellermannTyton fitting shown in Figure 2.9. A similar fitting is used to connect the other end of the hose to the cupboard with connectors to the data logging system.

Figure 2.8. Fitting for protective hose.
Left end: Connection to protective hose. Right end: Connection to cable pipe.

4. Results

The results of the measurements performed to document the formwork, fresh and hardened concrete and concrete element are presented in this chapter.

4.1. Formwork

The dimensions of the formwork, the cover to reinforcement and the electrical contact between the different reinforcement were documented prior to the casting of each concrete element. Calibrated equipment was used for the documentation. Photographic documentation of the formwork is found in Annex 1.

4.1.1. Dimensions

Using a calibrated measuring tape (QA) the dimensions of the formwork was documented. The target dimensions and tolerances set are shown in Table 3.1. The measurements on the formwork used for the nine concrete elements all fell within the tolerances.

In addition, the position of lifting bracket was checked, i.e. distance from top surface to top of the bracket and the offset of top point of the bracket "hook" to the "back side of the concrete element, to make sure that the concrete element would fit into the slots at the Austefjord field station.

The laboratory sheets with the documentation of each individual concrete element is found in Annex 2.

Table 3.1. Tolerances on dimensions of formwork.

Property	Dimension (mm)	Tolerance (mm)
Length	2700	±5
Height	390	±5
Width	190	±5

4.1.2. Reinforcement and working electrode location

The location of the reinforcement inside the formwork was documented based on the drawing shown in Figure 3.1. The nominal cover was 40±5mm and 50±5mm for the stirrups and longitudinal reinforcement, respectively. The results for the individual formwork can be found in Annex 2. A summary of the results is found in Table 3.2. As can be seen one concrete element (H1) had reinforcement location outside tolerances. However, the nonconforming measurement showed slightly larger cover than required. This single recording of larger cover than nominal cover plus tolerance for element H1 was accepted.

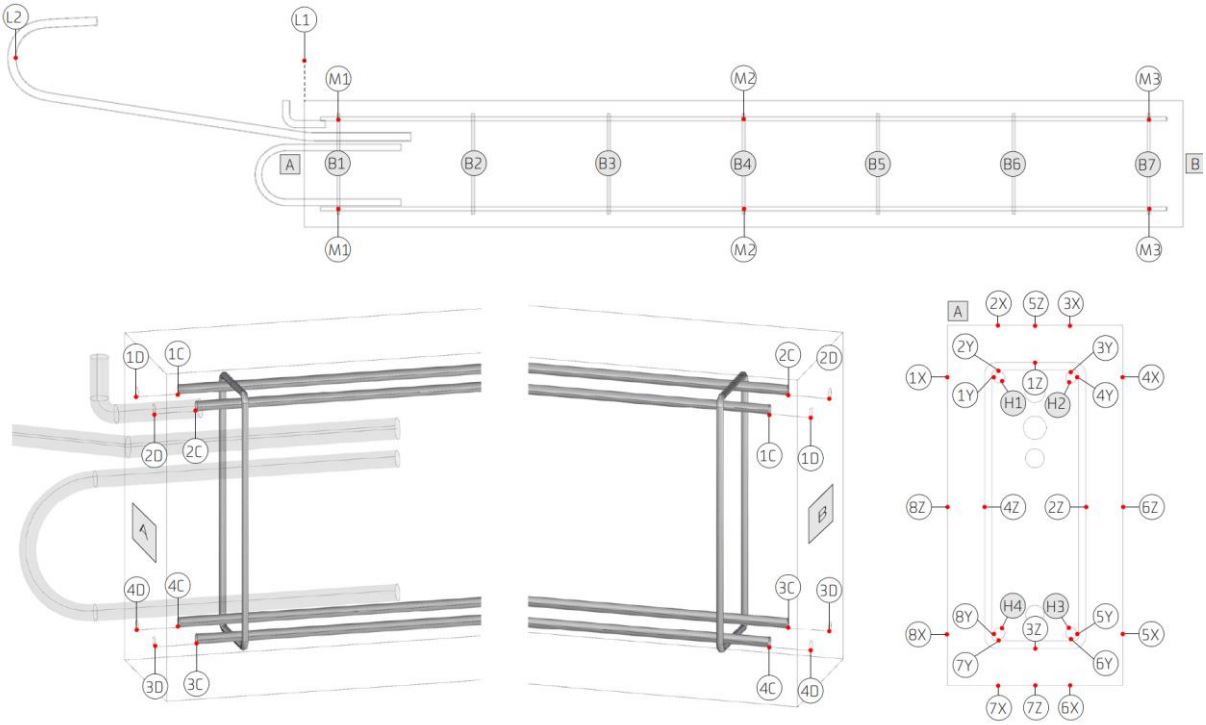


Figure 3.1. Drawing defining points on the inside of the formwork and on the outside of the reinforcement used to document the cover to reinforcement prior to casting of the concrete elements. Two extra stirrups are added to the instrumented concrete elements as shown in Figure 2.5. Therefore, the stirrups in the instrumented elements are numbered B1 to B9 shown from left to right in Figure 2.5.

Table 3.2. Summary of the documentation of reinforcement location.

Concrete element	Cover to stirrups	Cover to main rebars, large faces	Cover to main rebars, short faces
F1	OK	OK	OK
F2	OK	OK	OK
F3	OK	OK	OK
G1	OK	OK	OK
G2	OK	OK	OK
G3	OK	OK	OK
H1	OK	OK	58
H2	OK	OK	OK

H3	OK	OK	OK

The location of the working electrodes inside the formwork for the instrumented concrete elements was documented based on the drawing shown in Figure 2.5. The nominal cover is 16±2mm, 25±2mm and 50±2mm for the three different cover levels, respectively. The achieved cover of the working electrodes with nominal cover 50±2mm is often 52mm due to interference from the stirrups. The results for the individual formwork can be found in Annex 2. A summary of the results is found in Table 3.3. As can be seen all instrumented concrete elements have working electrode locations within the tolerances.

Table 3.3. Summary of the documentation of working electrode location in the instrumented concrete elements.

Concrete element	Cover to working electrodes (mm)			
	Face A min	Face A max	Face B min	Face B max
F3 - 16mm	OK	OK	OK	OK
F3 - 25mm	OK	OK	OK	OK
F3 - 50mm	OK	OK	OK	OK
G3 - 16mm	OK	OK	OK	OK
G3 - 25mm	OK	OK	OK	OK
G3 - 50mm	OK	OK	OK	OK
H3 - 16mm	OK	OK	OK	OK
H3 - 25mm	OK	OK	OK	OK
H3 - 50mm	OK	OK	OK	OK

4.1.3. Rebar contact

The electrical continuity within the reinforcement cage and between the cage and the two attached cables was determined by measuring the electrical resistance between rebars and between cables and rebars. For all nine formworks, the resistance was recorded to be max. 0.3Ω, i.e. below the required maximum of 0.5Ω. Recorded resistances are shown in more detail in Annex 2.

The fixation points between reinforcement cage and cables were sealed with epoxy. An example is shown on the photo in Figure 3.2.

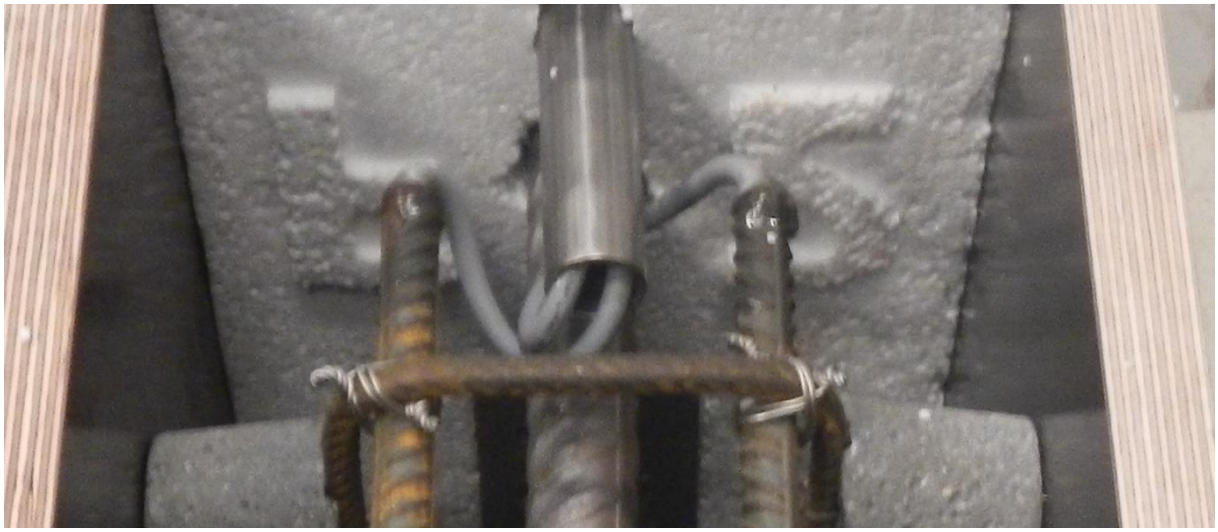


Figure 3.2. Fixation points between reinforcement cage and cables were sealed with epoxy.

4.2. Constituent materials

DTI determined the density and absorption of the Årdal aggregate batches supplied for the project in Part 1 of the assigment. The test reports are found in Annex 3.

4.3. Mix design

Batch reports are found in Annex 4. All constituent materials were batched with a recorded mass within 0.8% of the target amount. The obtained w/c ratios deviate by no more than 0.001 from the target value (Table 3.4).

4.4. Fresh concrete properties

The obtained fresh concrete properties are shown in Table 3.4. As can been seen from the table the measured consistence is within the target range of 190±30mm and likewise the air content is within the target range of 4.5±1%. Test reports are found in Annex 5.

Table 3.4. Fresh concrete properties of the ten concrete batches produced.

Mix ID	Date	w/c-ratio	Slump (mm)	Air Content (%)	Density (kg/m^3)	Temperature (°C)
F1	04-12-2018	0.441	210	5.3	2270	-
F2	04-12-2018	0.441	210	4.9	2270	20.7
F3	04-12-2018	0.440	200	4.8	2280	20.1
G1	07-12-2018	0.389	200	5.0	2320	20.7
G2	07-12-2018	0.389	210	4.4	2330	21.4
G3	07-12-2018	0.390	210	4.7	2320	21.9
H1	11-12-2018	0.391	220	4.3	2330	20.9
H2	11-12-2018	0.389	220	4.8	2320	21.2
H3	11-12-2018	0.390	210	4.5	2330	21.1

4.5. Hardened concrete properties

3.5.1. Concrete element dimensions

Laboratory sheets with the recorded dimensions and straightness of the concrete elements are found in Annex 6 and summarized in Table 3.5. All concrete elements were within dimensional tolerances of ±5mm.

Table 3.5. Concrete elements' dimensions and straightness. Tolerance ±5mm.

Concrete element	Length (mm)	Width (mm)	Height (mm)	Straightness (mm)
F1	2699-2701	190-192	391-392	-2.8-0.9
F2	2700-2701	190-191	390-391	-2.4-0.6
F3	2699-2702	189-190	390-393	-3.5-2.8
G1	2698-2700	189-191	391-392	-2.1-1.0
G2	2698-2701	189-191	390-394	-1.7-0.9
G3	2699-2700	189-190	389-391	-2.3-0.5
H1	2700-2704	189-191	390-392	-2.7-1.0
H2	2700-2705	189-192	388-390	-2.2-1.6
H3	2698-2701	190-191	390-391	-2.5-0.5

3.5.2. Concrete element surface appearance

The size of bug holes on the formed faces of the concrete elements were recorded. The results are found in Annex 7 and summarized in Table 3.6. Eight bug holes were larger than 10mm in both directions (Three in G1, two in G2, two in H2, and one in H3). The largest bug hole recorded was 330mm^2 and found in element H2.

Table 3.6. Bug holes in the formed faces of the concrete elements. ">10mm" refers to holes with smallest dimension larger than 10mm. "5-10mm" refers to holes with smallest dimension between 5-10mm.

Beam ID	Bug holes (nos.)					
	Face A		Face B		Bottom face	
	>10mm	5-10mm	>10mm	5-10mm	>10mm	5-10mm
F1	0	3	0	3	0	0
F2	0	2	0	1	0	0
F3	0	5	0	5	0	0
G1	3	13	0	8	0	1
G2	2	5	0	6	0	0
G3	0	1	0	6	0	1
H1	0	5	0	2	0	1
H2	1	9	1	15	0	0
H3	0	21	1	13	0	0

The minor bug holes in the instrumented elements F3 and G3 are judged to be without any significant influence on chloride penetration and subsequent corrosion initiation on the working electrodes. The more pronounced bug holes in the instrumented element H3 might influence corrosion initiation on the outmost working electrodes. To avoid this all bug holes with depth larger than 2mm and distance within 20mm from the centreline projection on the concrete surface of the outmost working electrode was sealed with epoxy. The sealing was performed with a two-component epoxy mixed 1:1.65 (w/w) of Conpox EH1021 (hardener) and Conpox EB1010 (resin) from Condor Kemi A/S. The identification of bug holes to be sealed in element H3 is presented in Annex 7.

3.5.3. Concrete cover to reinforcement and working electrodes

The cover to reinforcement of the concrete elements was determined using a covermeter. The results of the measurements are found in detail in Annex 8 and summarized in Table 3.7. The cover is found to be larger than the minimum cover of 35mm to stirrups and 45mm to main reinforcement. However, two recordings show slightly (1mm) larger values than "maximum" cover (45 and 55mm respectively).

Table 3.7. Cover to reinforcement recorded for the concrete elements.

Concrete element	Cover to reinforcement (mm)			
	Stirrup min	Stirrup max	Longitudinal min	Longitudinal max
F1	38	43	48	55
F2	36	42	49	53
F3	35	41	48	53
G1	37	43	49	55
G2	39	45	50	55
G3	36	40	46	54
H1	39	44	49	56
H2	37	43	48	56
H3	36	41	47	54

The cover to working electrodes of the instrumented concrete elements was determined using a cover-meter. The results of the measurements are found in detail in Annex 8 and summarized in Table 3.8. Three recordings show slightly deviating values (1mm) from the designed minimum and maximum cover. However, this small deviation is within the accuracy of the covermeter measurements.

Table 3.8. Cover to working electrodes recorded for the instrumented concrete elements.

Concrete element	Cover to working electrodes (mm)			
	Face A min	Face A max	Face B min	Face B max
F3 - 16mm	17	18	17	19
F3 - 25mm	24	26	25	26
F3 - 50mm	49	51	49	50
G3 - 16mm	17	18	17	18
G3 - 25mm	24	27	23	26
G3 - 50mm	49	51	49	52
H3 - 16mm	15	16	15	16
H3 - 25mm	25	26	24	26
H3 - 50mm	52	53	52	53

3.5.4. Compressive strength

The compressive strength of the nine concrete batches was determined after 28 and 91 days. Test reports are found in Annex 9. The average strength of three test specimens (100mm cubes) are presented graphically in Figure 3.3.

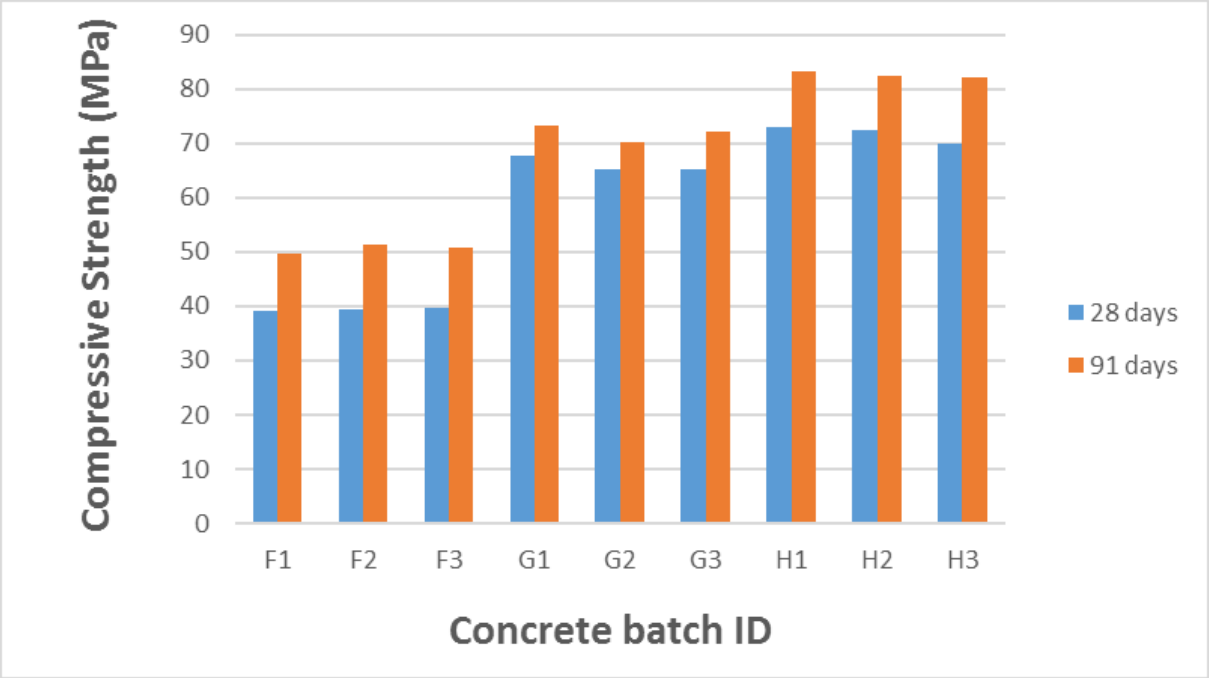


Figure 3.3. Compressive strength of the nine concrete batches used for the concrete elements as determined according to EN 12390-3. Each column represents the average of 3 nos. of 100mm cubes.

3.5.5. Resistivity

The resistivity of the nine concrete batches was determined after 28 and 91 days. Test reports are found in Annex 10. The average resistivity of four test specimens (100mm cubes) are presented graphically in Figure 3.4.

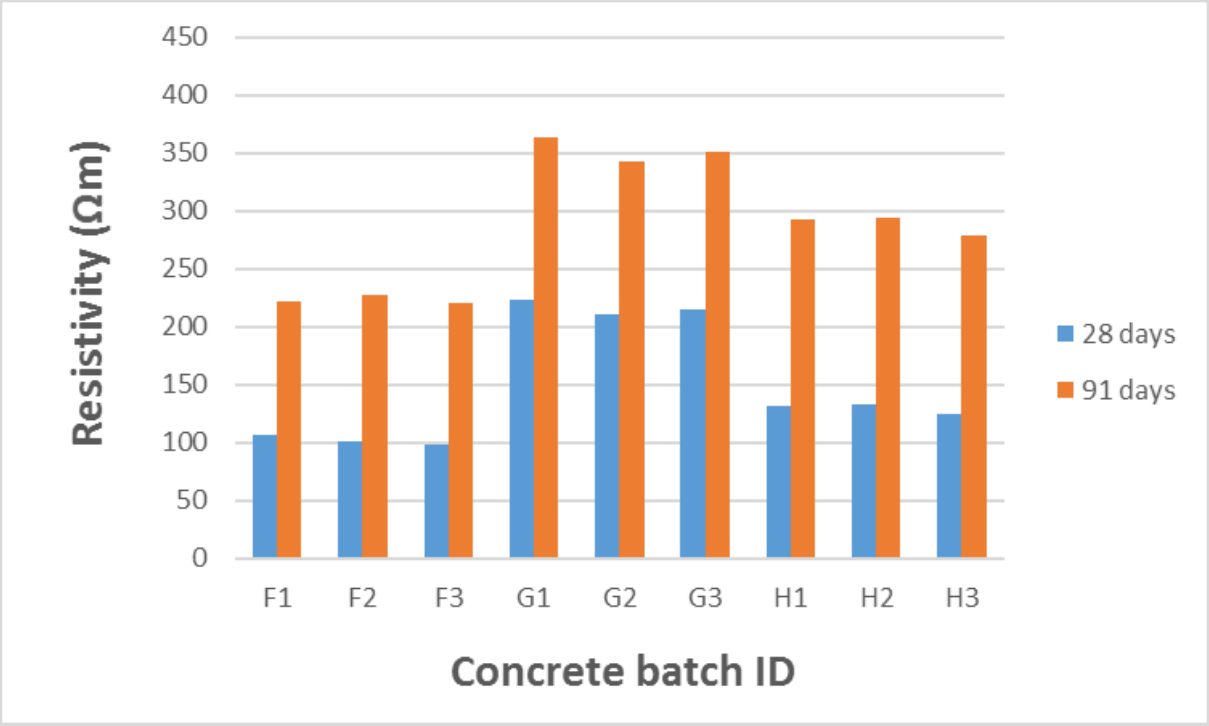


Figure 3.4. Resistivity of concrete types as determined according to SV R210 443 "spesifikk elektrisk motstand" on 100mm cubes.

4.6. Sensor details of the instrumented concrete elements

A summary of information about the sensors in the instrumented concrete elements is presented in Tables 3.9, 3.10, and 3.11. The tables present information about labelling, exposure zone, position, cover, reference electrode calibration from FORCE Technology (Annex 12), and exposed lengths of working electrodes.

Table 3.9. Details for instrumented concrete element F3

Instrumented element F3						
Item	ID	Zone	Distance to top [mm]	Distance to side [mm]	Cover [mm]	Remarks
WE No. 1 - face A	F_16_L_A	ATM	475±400	120±5	16	Exposed length: 680
WE No. 2 - face A	F_16_T_A	SPL	1350±400	120±5	15	Exposed length: 690
WE No. 3 - face A	F_16_N_A	SUB	2225±400	120±5	15	Exposed length: 680
WE No. 4 - face A	F_25_L_A	ATM	475±400	200±5	25	Exposed length: 670
WE No. 5 - face A	F_25_T_A	SPL	1350±400	200±5	25	Exposed length: 680
WE No. 6 - face A	F_25_N_A	SUB	2225±400	200±5	25	Exposed length: 680
WE No. 7 - face A	F_50_L_A	ATM	475±400	280±5	52	Exposed length: 680
WE No. 8 - face A	F_50_T_A	SPL	1350±400	280±5	52	Exposed length: 680
WE No. 9 - face A	F_50_N_A	SUB	2225±400	280±5	52	Exposed length: 680
WE No. 10 - face B	F_16_L_B	ATM	475±400	120±5	16	Exposed length: 680
WE No. 11 - face B	F_16_T_B	SPL	1350±400	120±5	16	Exposed length: 680
WE No. 12 - face B	F_16_N_B	SUB	2225±400	120±5	15	Exposed length: 680
WE No. 13 - face B	F_25_L_B	ATM	475±400	200±5	25	Exposed length: 670
WE No. 14 - face B	F_25_T_B	SPL	1350±400	200±5	26	Exposed length: 670
WE No. 15 - face B	F_25_N_B	SUB	2225±400	200±5	25	Exposed length: 680
WE No. 16 - face B	F_50_L_B	ATM	475±400	280±5	52	Exposed length: 680
WE No. 17 - face B	F_50_T_B	SPL	1350±400	280±5	51	Exposed length: 690
WE No. 18 - face B	F_50_N_B	SUB	2225±400	280±5	51	Exposed length: 680
Rebar contact - face A	F_MIN_A	-	75	335	55	
Rebar contact - face B	F_MIN_B	-	75	335	55	
ERE 20 - R39656	F_RE_L	ATM	460	195	95	195 mV vs. SCE
ERE 20 - R39654	F_RE_T	SPL	1335	195	95	191 mV vs. SCE
ERE 20 - R39655	F_RE_N	SUB	2210	195	95	195 mV vs. SCE
Temp. sensor No. 1	F_T_L	ATM	475	195	95	
Temp. sensor No. 2	F_T_T	SPL	1350	195	95	
Temp. sensor No. 3	F_T_N	SUB	2225	195	95	

Table 3.10. Details for instrumented concrete element G3

Instrumented element G3						
Item	ID	Zone	Distance to top [mm]	Distance to side [mm]	Cover [mm]	Remarks
WE No. 1 - face A	G_16_L_A	ATM	475±400	120±5	15	Exposed length: 680
WE No. 2 - face A	G_16_T_A	SPL	1350±400	120±5	16	Exposed length: 680
WE No. 3 - face A	G_16_N_A	SUB	2225±400	120±5	15	Exposed length: 670
WE No. 4 - face A	G_25_L_A	ATM	475±400	200±5	25	Exposed length: 680
WE No. 5 - face A	G_25_T_A	SPL	1350±400	200±5	25	Exposed length: 680
WE No. 6 - face A	G_25_N_A	SUB	2225±400	200±5	25	Exposed length: 670
WE No. 7 - face A	G_50_L_A	ATM	475±400	280±5	52	Exposed length: 680
WE No. 8 - face A	G_50_T_A	SPL	1350±400	280±5	52	Exposed length: 670
WE No. 9 - face A	G_50_N_A	SUB	2225±400	280±5	51	Exposed length: 680
WE No. 10 - face B	G_16_L_B	ATM	475±400	120±5	16	Exposed length: 690
WE No. 11 - face B	G_16_T_B	SPL	1350±400	120±5	15	Exposed length: 680
WE No. 12 - face B	G_16_N_B	SUB	2225±400	120±5	15	Exposed length: 680
WE No. 13 - face B	G_25_L_B	ATM	475±400	200±5	25	Exposed length: 670
WE No. 14 - face B	G_25_T_B	SPL	1350±400	200±5	25	Exposed length: 680
WE No. 15 - face B	G_25_N_B	SUB	2225±400	200±5	25	Exposed length: 670
WE No. 16 - face B	G_50_L_B	ATM	475±400	280±5	50	Exposed length: 680
WE No. 17 - face B	G_50_T_B	SPL	1350±400	280±5	52	Exposed length: 670
WE No. 18 - face B	G_50_N_B	SUB	2225±400	280±5	51	Exposed length: 680
Rebar contact - face A	G_MIN_A	-	75	335	55	
Rebar contact - face B	G_MIN_B	-	75	335	55	
ERE 20 - R39650	G_RE_L	ATM	460	195	95	187 mV vs. SCE
ERE 20 - R39648	G_RE_T	SPL	1335	195	95	194 mV vs. SCE
ERE 20 - R39652	G_RE_N	SUB	2210	195	95	187 mV vs. SCE
Temp. sensor No. 1	G_T_L	ATM	475	195	95	
Temp. sensor No. 2	G_T_T	SPL	1350	195	95	
Temp. sensor No. 3	G_T_N	SUB	2225	195	95	

Table 3.11. Details for instrumented concrete element H3

Instrumented element H3						
Item	ID	Zone	Distance to top [mm]	Distance to side [mm]	Cover [mm]	Remarks
WE No. 1 - face A	H_16_L_A	ATM	475±400	120±5	16	Exposed length: 680
WE No. 2 - face A	H_16_T_A	SPL	1350±400	120±5	16	Exposed length: 670
WE No. 3 - face A	H_16_N_A	SUB	2225±400	120±5	15	Exposed length: 680
WE No. 4 - face A	H_25_L_A	ATM	475±400	200±5	25	Exposed length: 670
WE No. 5 - face A	H_25_T_A	SPL	1350±400	200±5	25	Exposed length: 670
WE No. 6 - face A	H_25_N_A	SUB	2225±400	200±5	25	Exposed length: 680
WE No. 7 - face A	H_50_L_A	ATM	475±400	280±5	52	Exposed length: 690
WE No. 8 - face A	H_50_T_A	SPL	1350±400	280±5	52	Exposed length: 670
WE No. 9 - face A	H_50_N_A	SUB	2225±400	280±5	52	Exposed length: 680
WE No. 10 - face B	H_16_L_B	ATM	475±400	120±5	16	Exposed length: 670
WE No. 11 - face B	H_16_T_B	SPL	1350±400	120±5	15	Exposed length: 680
WE No. 12 - face B	H_16_N_B	SUB	2225±400	120±5	16	Exposed length: 670
WE No. 13 - face B	H_25_L_B	ATM	475±400	200±5	26	Exposed length: 670
WE No. 14 - face B	H_25_T_B	SPL	1350±400	200±5	26	Exposed length: 690
WE No. 15 - face B	H_25_N_B	SUB	2225±400	200±5	24	Exposed length: 680
WE No. 16 - face B	H_50_L_B	ATM	475±400	280±5	52	Exposed length: 670
WE No. 17 - face B	H_50_T_B	SPL	1350±400	280±5	52	Exposed length: 680
WE No. 18 - face B	H_50_N_B	SUB	2225±400	280±5	52	Exposed length: 670
Rebar contact - face A	H_MIN_A	-	75	335	55	
Rebar contact - face B	H_MIN_B	-	75	335	55	
ERE 20 - R39642	H_RE_L	ATM	460	195	95	194 mV vs. SCE
ERE 20 - R39647	H_RE_T	SPL	1335	195	95	187 mV vs. SCE
ERE 20 - R39651	H_RE_N	SUB	2210	195	95	197 mV vs. SCE
Temp. sensor No. 1	H_T_L	ATM	475	195	95	
Temp. sensor No. 2	H_T_T	SPL	1350	195	95	
Temp. sensor No. 3	H_T_N	SUB	2225	195	95	

5. Annexes

5.1. Annex 1
Formwork photographic documentation

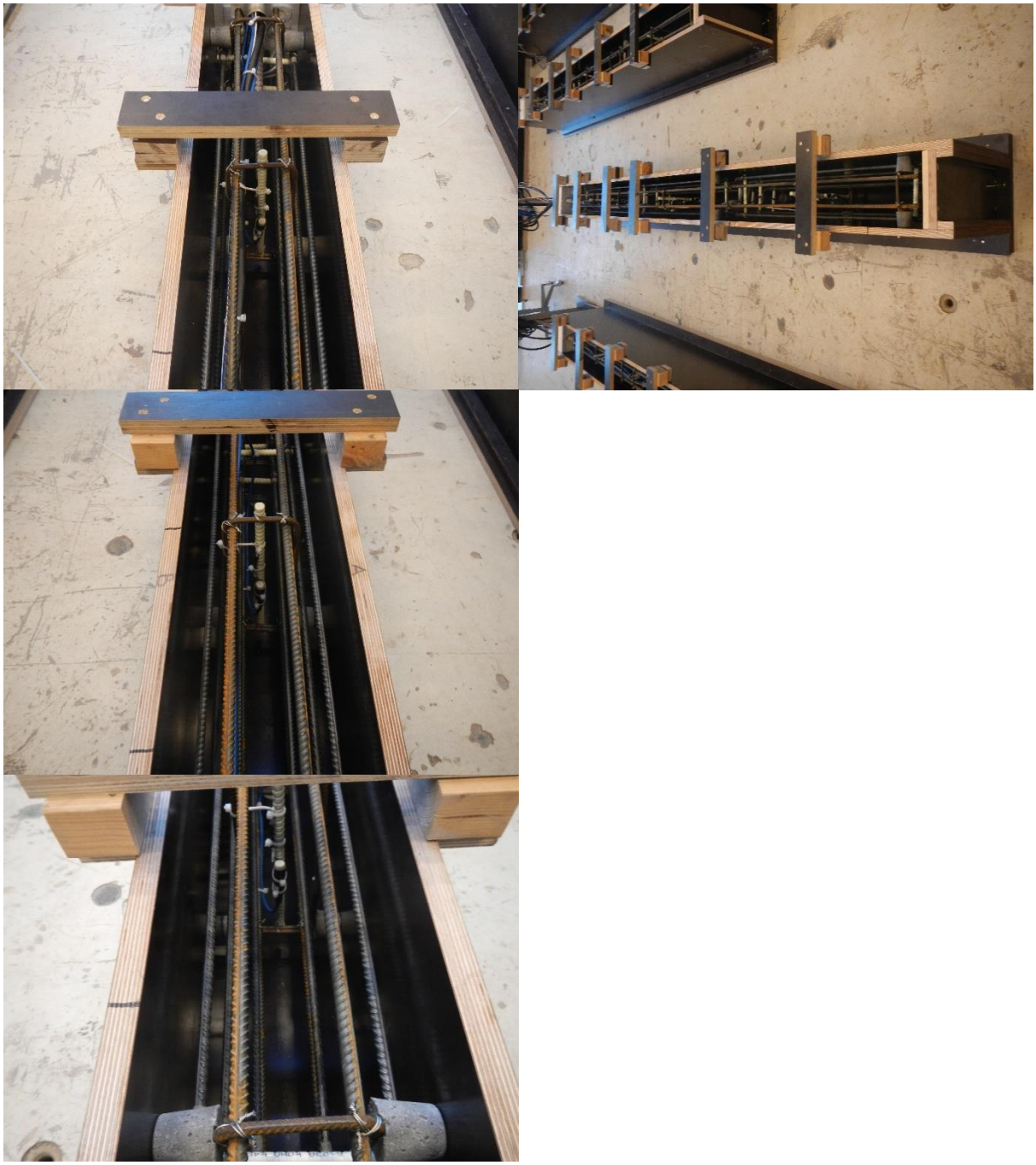
Concrete element F1

Concrete element F2

Concrete element F3

Concrete element F3 - continued

Concrete element F3 – just before casting

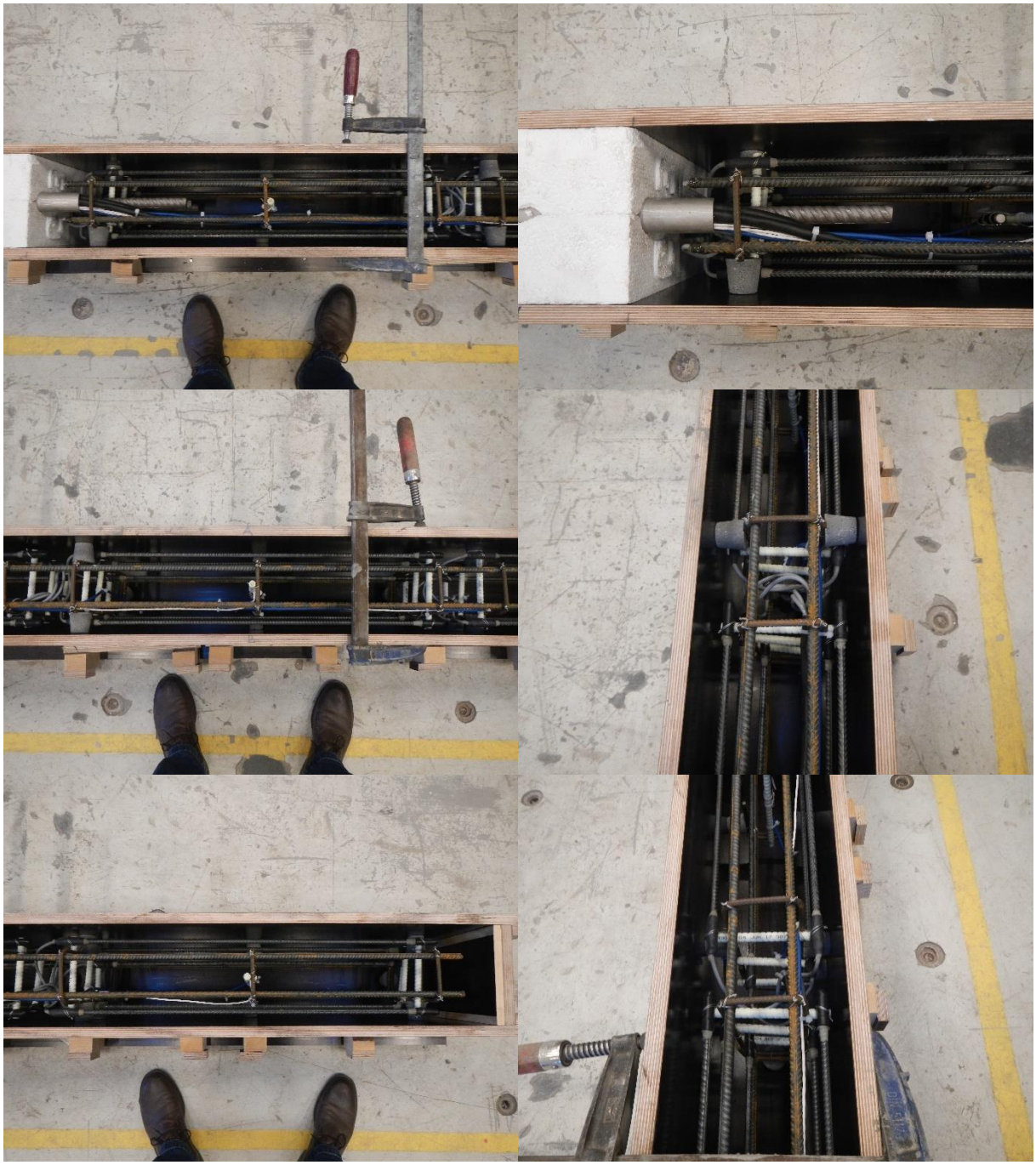


Concrete element G1

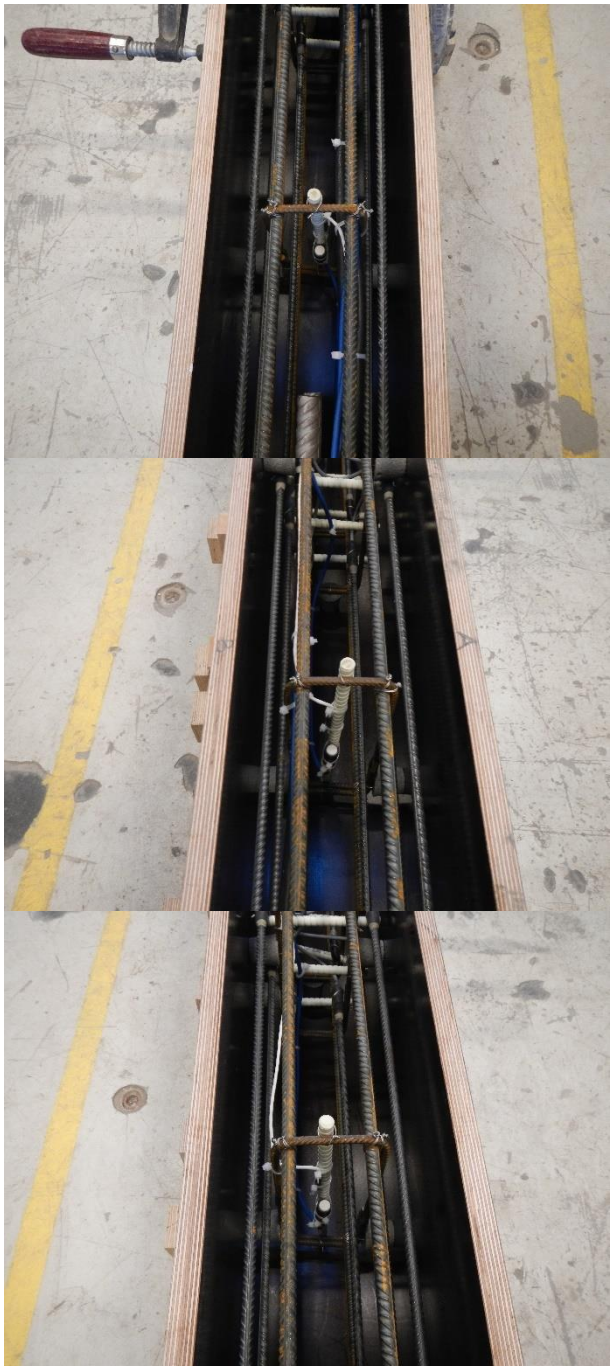
Concrete element G2

Concrete element G3

Concrete element G3 - continued



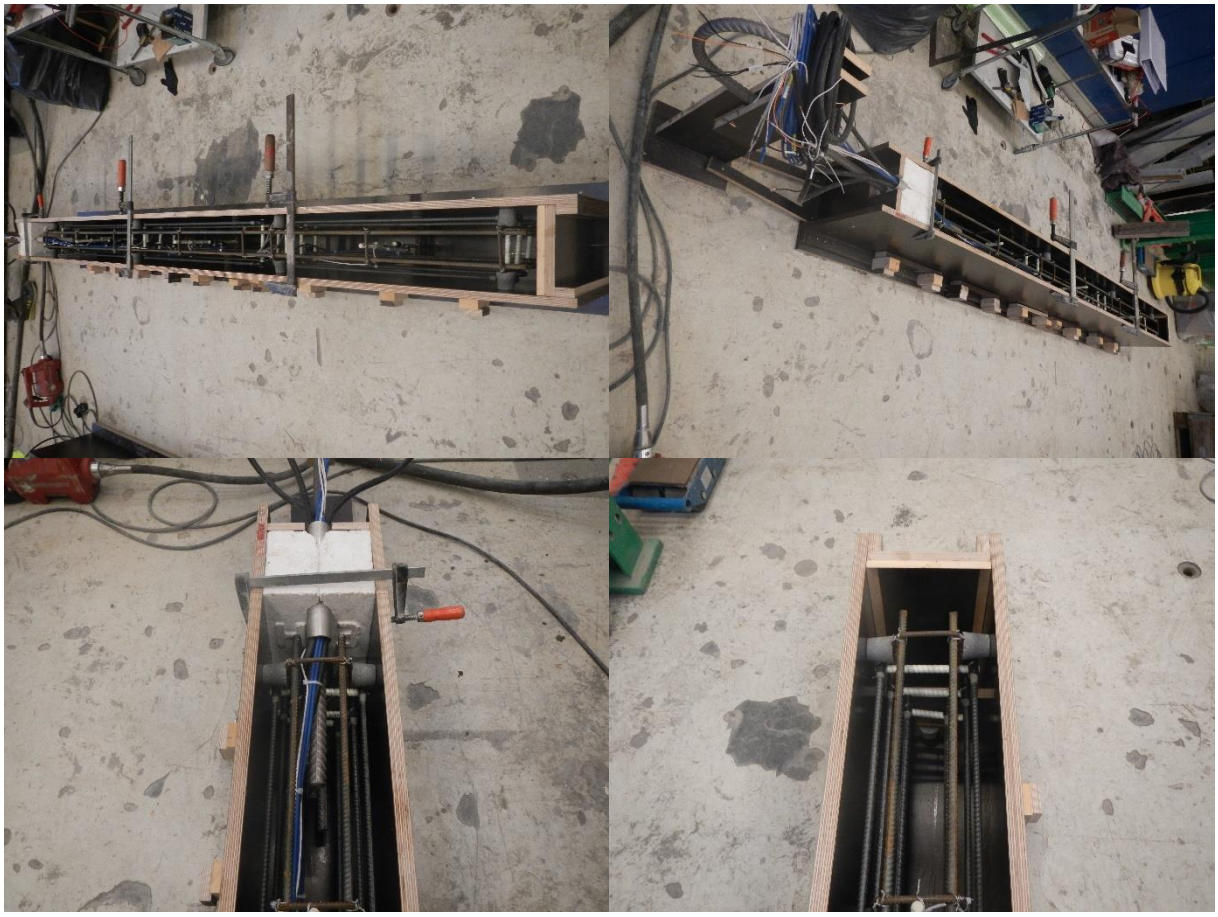
Concrete element G3 - just before casting



Concrete element H1

Concrete element H2

Concrete element H3



Concrete element H3 - continued

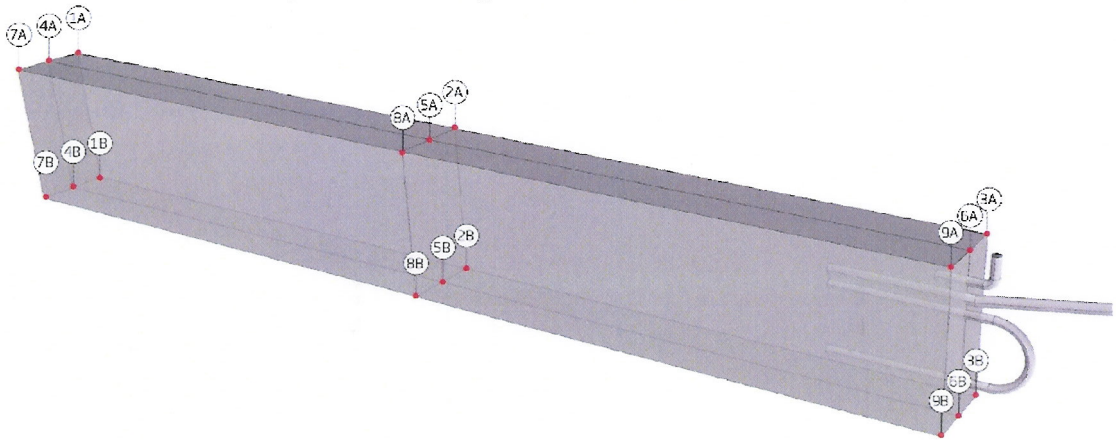
Concrete element H3 - just before casting

5.2. Annex 2
Formwork, reinforcement, inserts and working electrodes

Laboratory sheets with measurements of dimensions of formwork, electrical continuity of reinforcement, and positions of reinforcement, inserts and working electrodes are presented on the following 33 pages.

Formwork dimensions verification

Beam ID: F-1 ANL 40



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
269.9	269.9

1B - 3B	7B- 9B
269.9	269.9

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190 ✓

1B - 7B	2B - 8B	3B - 9B
190	190	190 ✓

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
391	391 ✓	391

7A -7B	8A - 8B	9A - 9B
391	391 ✓	391

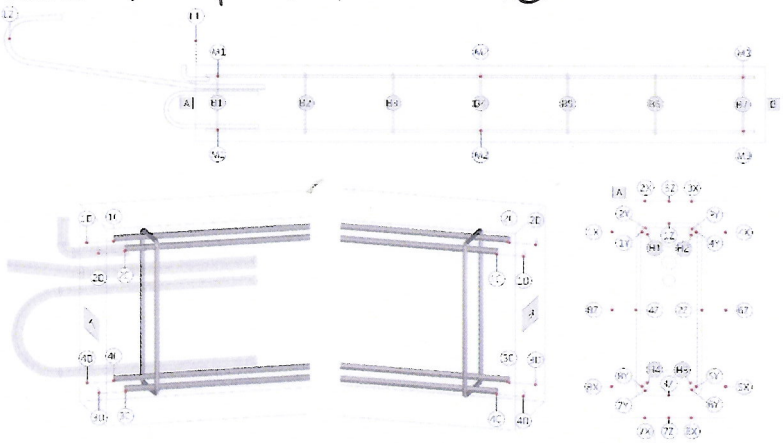
Equipment used: Q9 139869 **Photo documentation taken:**

Date: 3/12-18

Measurement performed by: Modan Thanna.

Cover verification (form)

Beam ID: F-1 ANL 40



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	51
	2X-2Y	51
H2	3X-3Y	51
	4X-4Y	52
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	51

M2		
H1	1X-1Y	51
	2X-2Y	50
H2	3X-3Y	50
	4X-4Y	52
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	52

M3		
H1	1X-1Y	48
	2X-2Y	49
H2	3X-3Y	50
	4X-4Y	52
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	52

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	40
2Z-6Z	40
3Z-7Z	42
4Z-8Z	41

M2	
1Z-5Z	40
2Z-6Z	40
3Z-7Z	43
4Z-8Z	41

M3	
1Z-5Z	40
2Z-6Z	40
3Z-7Z	44
4Z-8Z	40

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
417	415	415	416	418	416

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
102	100	104	103

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	54
2D-2C	52
3D-3C	49
4D-4C	50

B	
1D-1C	49
2D-2C	50
3D-3C	50
4D-4C	52

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880	triple	534

Equipment used: QA 139869 , QA 77716 , QA 157819

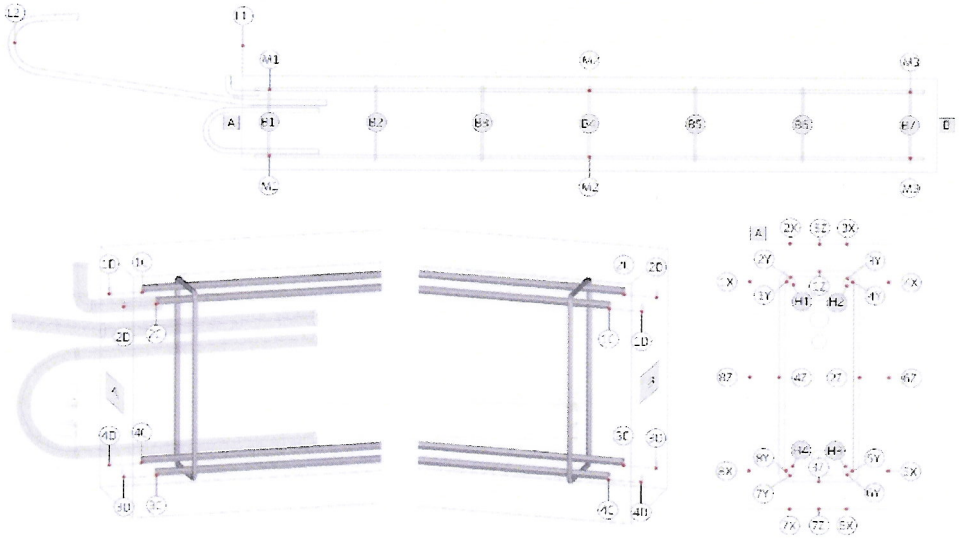
Date: 3/12-15

Measurement performed by:

Photo documentation taken:

Reinforcement contact verification

Beam ID: F-1 ANL40



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

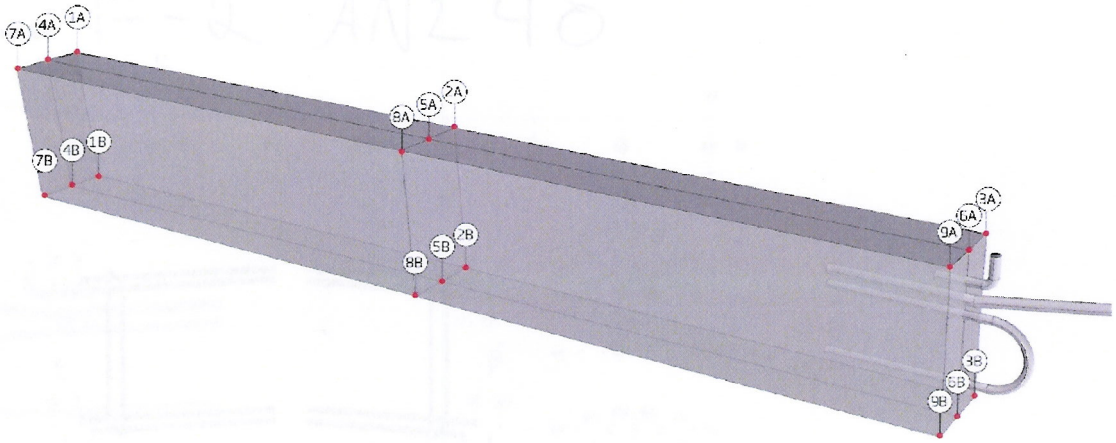
Equipment used: QA 77717

Date: 2018-11-30

Measurement performed by:

Formwork dimensions verification

Beam ID: F-2 ANL40



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2699

1B - 3B	7B- 9B
2700	2699

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190 ✓	190

1B - 7B	2B - 8B	3B - 9B
190	190 ✓	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	391 ✓

7A -7B	8A - 8B	9A - 9B
390	390	390 ✓

Equipment used: QA 139869

Photo documentation taken: QA 139869

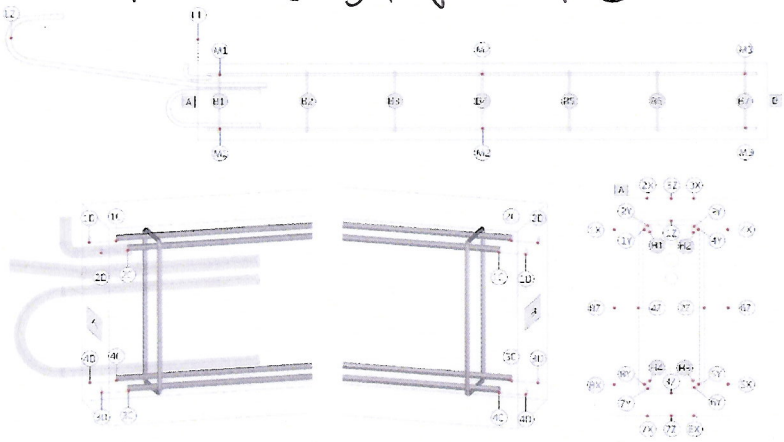
Date: 3/12-18

Measurement performed by:

Mohr Brun

Cover verification (form)

Beam ID: F-2 AN240



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	52
	2X-2Y	46
H2	3X-3Y	48
	4X-4Y	51
H3	5X-5Y	51
	6X-6Y	53
H4	7X-7Y	52
	8X-8Y	50

M2		
H1	1X-1Y	50
	2X-2Y	50
H2	3X-3Y	51
	4X-4Y	51
H3	5X-5Y	50
	6X-6Y	53
H4	7X-7Y	52
	8X-8Y	51

M3		
H1	1X-1Y	50
	2X-2Y	50
H2	3X-3Y	50
	4X-4Y	50
H3	5X-5Y	50
	6X-6Y	53
H4	7X-7Y	53
	8X-8Y	53

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	37
2Z-6Z	41
3Z-7Z	42
4Z-8Z	39

M2	
1Z-5Z	37
2Z-6Z	40
3Z-7Z	39
4Z-8Z	40

M3	
1Z-5Z	36
2Z-6Z	40
3Z-7Z	41
4Z-8Z	39

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
415	415	415	411	414	415

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
101	103	101	101

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	48
2D-2C	50
3D-3C	50
4D-4C	52

B	
1D-1C	49
2D-2C	48
3D-3C	48
4D-4C	46

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880 ✓ 53,4 ✓

Equipment used: QA157819, QA139869

Date: 3/12-18

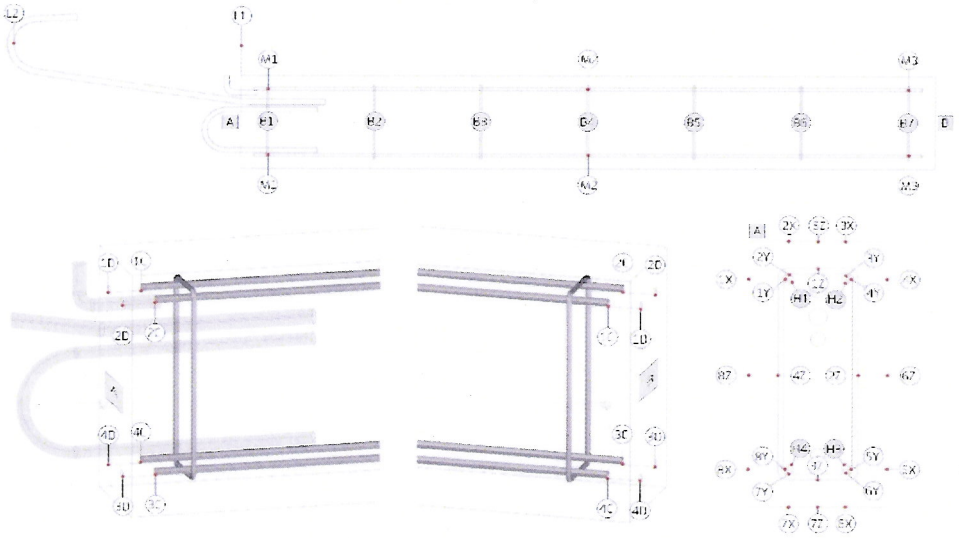
Measurement performed by:

Mirka Tomm.

Photo documentation taken:

Reinforcement contact verification

Beam ID: F-2 ANL 40



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,1	0,1	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,1	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

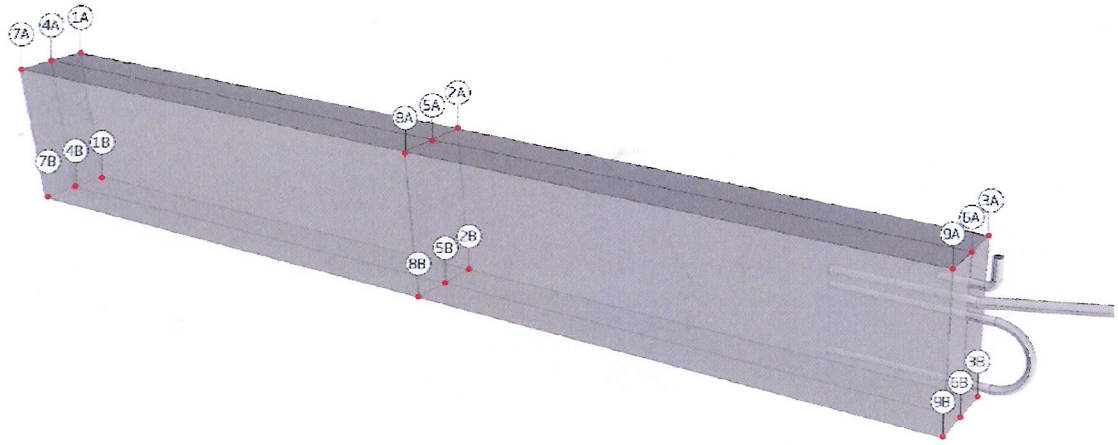
Equipment used: QA 77717

Date: 2018-11-30

Measurement performed by:

Formwork dimensions verification

Beam ID: F-3 ANL 40



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	390

7A -7B	8A - 8B	9A - 9B
390	390	390

Equipment used: QA 139869

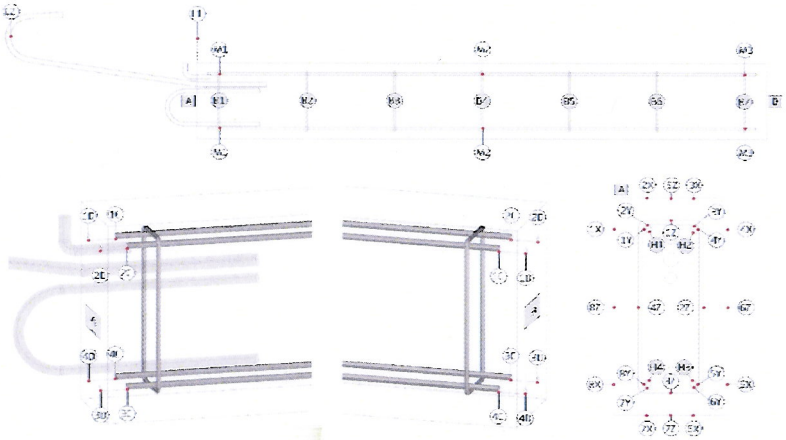
Photo documentation taken:

Date: 2018-11-28

Measurement performed by:

Cover verification (form)

Beam ID: F-3 ANL 40



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	50
	2X-2Y	49
H2	3X-3Y	51
	4X-4Y	50
H3	5X-5Y	49
	6X-6Y	53
H4	7X-7Y	53
	8X-8Y	51

M2		
H1	1X-1Y	55
	2X-2Y	47
H2	3X-3Y	50
	4X-4Y	49
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	51

M3		
H1	1X-1Y	52
	2X-2Y	50
H2	3X-3Y	50
	4X-4Y	50
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	52

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	42
4Z-8Z	39

M2	
1Z-5Z	38
2Z-6Z	40
3Z-7Z	44
4Z-8Z	41

M3	
1Z-5Z	38
2Z-6Z	40
3Z-7Z	44
4Z-8Z	40

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
370	368	132	370	370	130

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
103	105	103	110

B7-B8	B8-B9
371	367

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	49
2D-2C	49
3D-3C	45
4D-4C	48

B	
1D-1C	51
2D-2C	51
3D-3C	55
4D-4C	52

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

L2-7Z 534

Equipment used: QA 139869, QA 77716

Date: 2018-11-28

Measurement performed by:

Photo documentation taken:

Cover verification (form)

Beam ID: F-3 ANL 40

Cover to working electrodes

Cover to Working Electrodes in face A:

M1 (Atmospheric)		
16_L_A	1A-1T	16
16±2 mm	2A-2T	16
25_L_A	1B-1T	25
25±2 mm	2B-2T	26
50_L_A	1C-1T	52
50±2 mm	2C-2T	52

52

M2 (Splash)		
16_T_A	3A-3T	16
16±2 mm	4A-4T	15
25_T_A	3B-3T	26
25±2 mm	4B-4T	25
50_T_A	3C-3T	52
50±2 mm	4C-4T	52

M3 (Immersed)		
16_N_A	5A-5T	16
16±2 mm	6A-6T	15
25_N_A	5B-5T	25
25±2 mm	6B-6T	25
50_N_A	5C-5T	52
50±2 mm	6C-6T	52

Cover to Working Electrodes in face B:

M1 (Atmospheric)		
16_L_B	1X-1S	17
16±2 mm	2X-2S	16
25_L_B	1Y-1S	25
25±2 mm	2Y-2S	25
50_L_B	1Z-1S	52
50±2 mm	2Z-2S	52

M2 (Splash)		
16_T_B	3X-3S	16
16±2 mm	4X-4S	17
25_T_B	3Y-3S	26
25±2 mm	4Y-4S	26
50_T_B	3Z-3S	51
50±2 mm	4Z-4S	53

M3 (Immersed)		
16_N_B	5X-5S	16
16±2 mm	6X-6S	15
25_N_B	5Y-5S	26
25±2 mm	6Y-6S	25
50_N_B	5Z-5S	51
50±2 mm	6Z-6S	51

Position of working electrodes

Distance from formwork in face A

M1 (Atmospheric)		
16_L_A	1K-1U	272
271 mm	2K-2U	274
25_L_A	1L-1U	197
195 mm	2L-2U	197
50_L_A	1M-1U	121
119 mm	2M-2U	121

M2 (Splash)		
16_T_A	3K-3U	278
271 mm	4K-4U	279
25_T_A	3L-3U	202
195 mm	4L-4U	202
50_T_A	3M-3U	123
119 mm	4M-4U	124

M3 (Immersed)		
16_N_A	5K-5U	274
271 mm	6K-6U	272
25_N_A	5L-5U	200
195 mm	6L-6U	203
50_N_A	5M-5U	122
119 mm	6M-6U	123

Distance from formwork in face B

M1 (Atmospheric)		
16_L_B	1K-1U	279
271 mm	2K-2U	275
25_L_B	1L-1U	199
195 mm	2L-2U	195
50_L_B	1M-1U	123
119 mm	2M-2U	117

M2 (Splash)		
16_T_B	3K-3U	278
271 mm	4K-4U	273
25_T_B	3L-3U	200
195 mm	4L-4U	198
50_T_B	3M-3U	124
119 mm	4M-4U	125

M3 (Immersed)		
16_N_B	5K-5U	278
271 mm	6K-6U	282
25_N_B	5L-5U	199
195 mm	6L-6U	203
50_N_B	5M-5U	122
119 mm	6M-6U	126

Equipment used: QA 139869, QA 157819, QA 157815

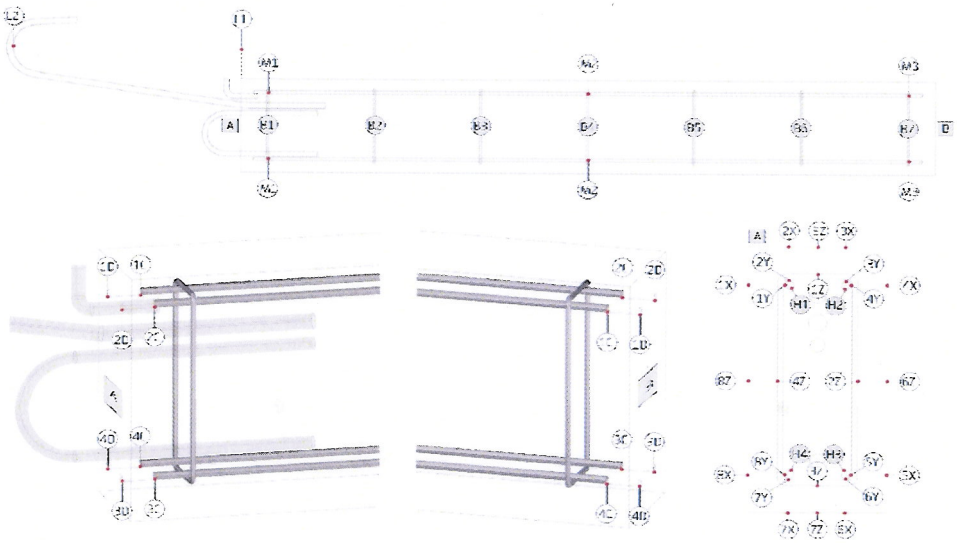
Date: 2018-11-28

Measurement performed by:

Photo documentation taken:

Reinforcement contact verification

Beam ID: F-3 ANL 40



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2 V

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2 V	0,1 V	0,0	0,0

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,0 (0,2)V	0,0	0,0	0,0

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B	8B	9B
0,0	0,0	0,0	0,0 (0,2)V	0,0

Equipment used: QA 77717

Date: 2018-11-28

Measurement performed by:

Working electrodes contact verification

Beam ID: F-3 ANL40

Cable to WE: (<0,5 Ohm)

MULTICABLE

W/B	Working electrodes	Cover [mm]	Exposure zone	Face A	White	Face B	Black	EXP. LENGTH (CM) A	EXP. LENGTH (CM) B
1		16	Atmospheric	x_16_L_A	0,3	x_16_L_B	0,2	68	68
2			Splash	x_16_T_A	0,2	x_16_T_B	0,2	69	68
3			Submerged	x_16_N_A	0,2	x_16_N_B	0,2	68	68
1		25	Atmospheric	x_25_L_A	0,3	x_25_L_B	0,1	67	67
2			Splash	x_25_T_A	0,1	x_25_T_B	0,1	68	67
3			Submerged	x_25_N_A	0,3	x_25_N_B	0,2	68	68
1		50	Atmospheric	x_50_L_A	0,2	x_50_L_B	0,2	68	68
2			Splash	x_50_T_A	0,2	x_50_T_B	0,1	68	69
3			Submerged	x_50_N_A	0,2	x_50_N_B	0,2	68	68

x = F (mix F), G (mix G) or H (mix H)

Reference electrode ID:

Reference electrode	Atmospheric	x_RE_L	R39656 V	M1
	Splash	x_RE_T	R39654 V	M2
	Submerged	x_RE_N	R39655 V	M3

x = F (mix F), G (mix G) or H (mix H)

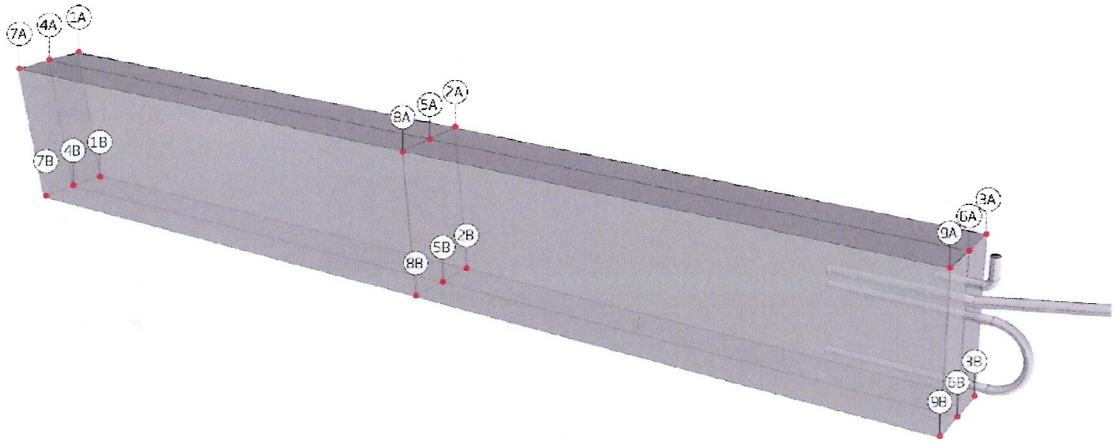
Equipment used: QA 77717

Date: 2018-11-28

Measurement performed by:

Formwork dimensions verification

Beam ID: G1 - M1L30



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2699	2699

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	191

1B - 7B	2B - 8B	3B - 9B
190	191	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
392	392	391

7A -7B	8A - 8B	9A - 9B
391	391	391

Equipment used: QA 139869

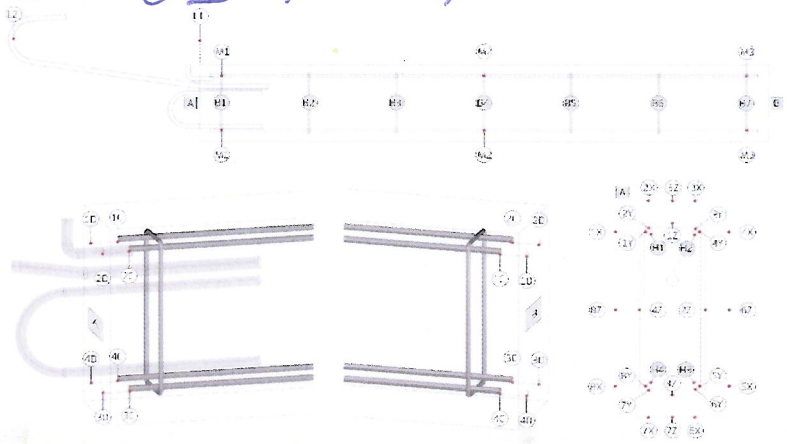
Photo documentation taken: QA 1571

Date: 2018-12-05

Measurement performed by:

Cover verification (form)

Beam ID: G1-M1L30



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	51
	2X-2Y	53
H2	3X-3Y	53
	4X-4Y	51
H3	5X-5Y	50
	6X-6Y	53
H4	7X-7Y	53
	8X-8Y	51

M2		
H1	1X-1Y	50
	2X-2Y	54
H2	3X-3Y	52
	4X-4Y	53
H3	5X-5Y	53
	6X-6Y	51
H4	7X-7Y	51
	8X-8Y	50

M3		
H1	1X-1Y	49
	2X-2Y	50
H2	3X-3Y	52
	4X-4Y	52
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	50

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	40
2Z-6Z	40
3Z-7Z	37
4Z-8Z	40

V

M2	
1Z-5Z	40
2Z-6Z	41
3Z-7Z	37
4Z-8Z	40

V

M3	
1Z-5Z	38
2Z-6Z	40
3Z-7Z	38
4Z-8Z	40

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
412	412	419	410	415	415

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
102	103	100	103

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	48
2D-2C	48
3D-3C	~~46~~ 48
4D-4C	50

B	
1D-1C	52
2D-2C	49
3D-3C	46
4D-4C	49

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	879

534

Equipment used: QA 139869 QA 77716 QA 1261

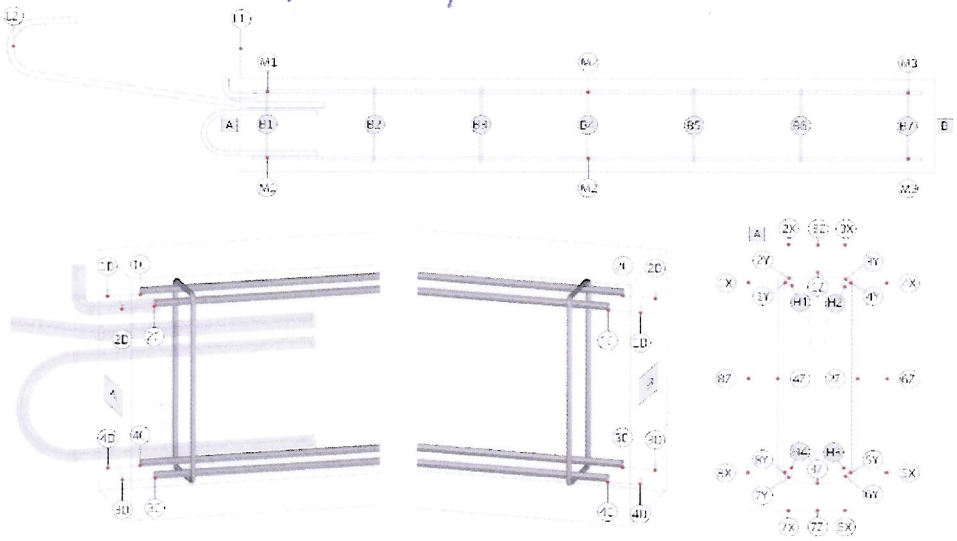
Date: 2018-12-05

Measurement performed by:

Photo documentation taken:

Reinforcement contact verification

Beam ID: G1-MIL30



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,2	0,1	0,1

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,2	0,2

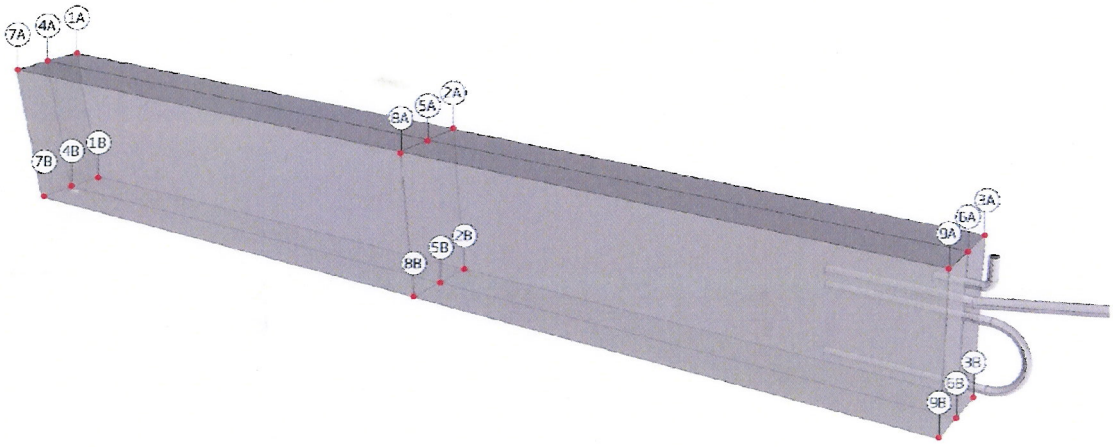
Equipment used: QA 77717

Date: 2018-12-05

Measurement performed by:

Formwork dimensions verification

Beam ID: G2 - MiL30



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
191	191	191

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
392	391	390

7A -7B	8A - 8B	9A - 9B
390	392	392

Equipment used: Q1 139869

Photo documentation taken:

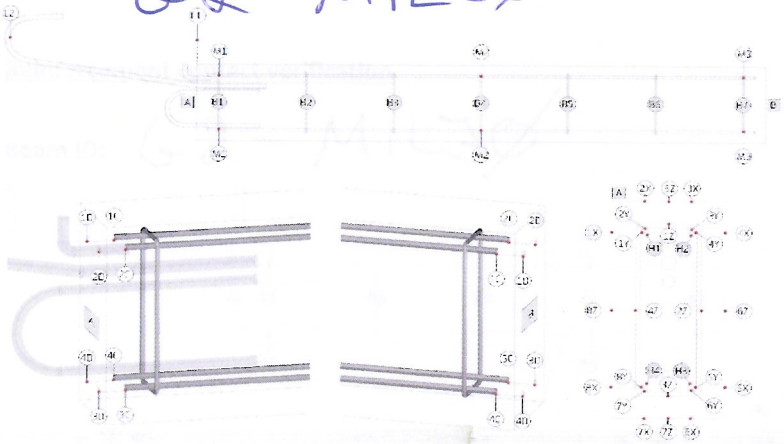
Date: 2018-12-05

Measurement performed by:

Jan Ågård

Cover verification (form)

Beam ID: G2 - MiL30



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	50
	2X-2Y	54
H2	3X-3Y	54
	4X-4Y	48
H3	5X-5Y	51
	6X-6Y	52
H4	7X-7Y	52
	8X-8Y	51

M2		
H1	1X-1Y	51
	2X-2Y	49
H2	3X-3Y	51
	4X-4Y	51
H3	5X-5Y	51
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	50

M3		
H1	1X-1Y	51
	2X-2Y	47
H2	3X-3Y	49
	4X-4Y	51
H3	5X-5Y	51
	6X-6Y	55
H4	7X-7Y	55
	8X-8Y	48

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	38
2Z-6Z	39
3Z-7Z	41
4Z-8Z	40

M2	
1Z-5Z	38
2Z-6Z	41
3Z-7Z	43
4Z-8Z	41

M3	
1Z-5Z	38
2Z-6Z	40
3Z-7Z	42
4Z-8Z	39

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
405	421	407	415	420	415

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
103	103	101	100

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	52
2D-2C	52
3D-3C	55
4D-4C	55

B	
1D-1C	53
2D-2C	54
3D-3C	52
4D-4C	52

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	882

533

Equipment used: QA 139869, QA 77716

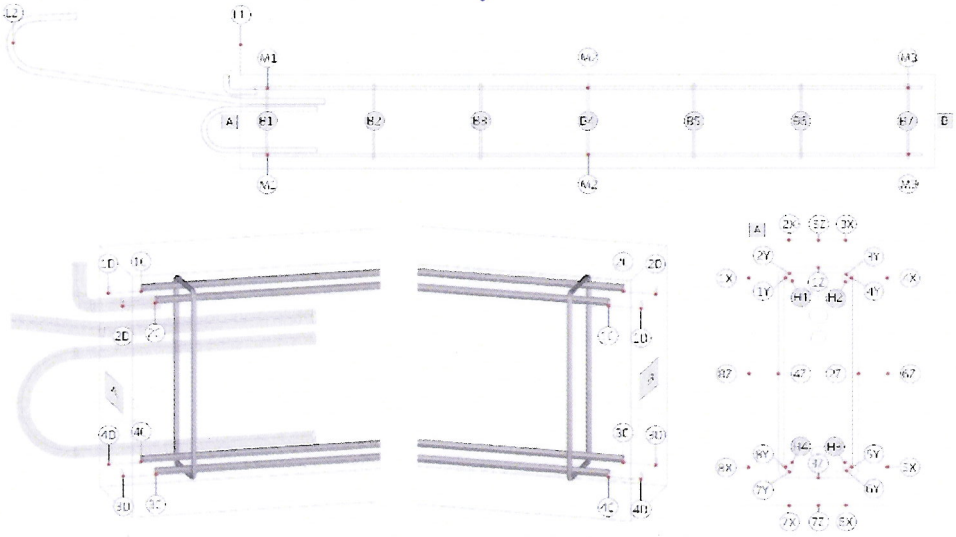
Date: 2018-12-05

Measurement performed by:

Photo documentation taken:

Reinforcement contact verification

Beam ID: G2 - MiLJØ



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2 V

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,1 V	0,2 V	0,2 V	0,2 V

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2 V	0,1	0,1	0,2 V

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,1	0,1

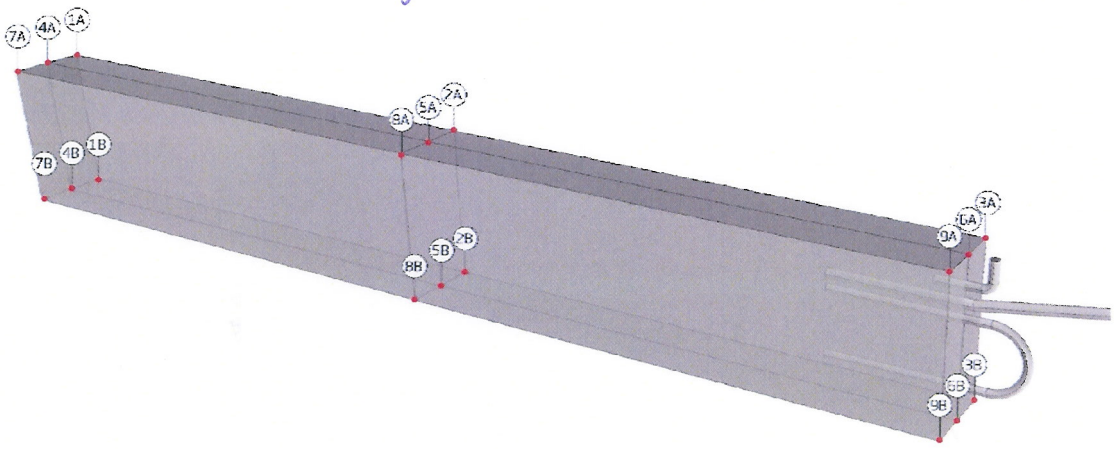
Equipment used: QA 77717

Date: 2018-12-05

Measurement performed by:

Formwork dimensions verification

Beam ID: G-3 MILJØ



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2699

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	191	190

1B - 7B	2B - 8B	3B - 9B
190	191	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	391

7A -7B	8A - 8B	9A - 9B
390	390	392

Equipment used: QA 139869

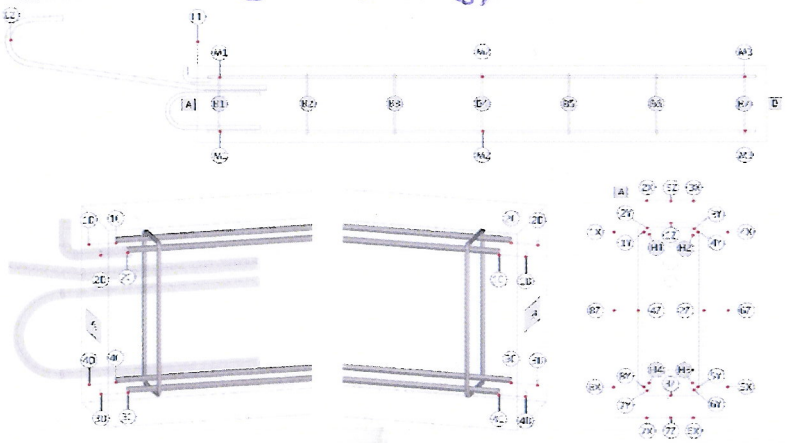
Photo documentation taken:

Date: 2018-12-05

Measurement performed by:

Cover verification (form)

Beam ID: G-3 MILJØ



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	50
	2X-2Y	50
H2	3X-3Y	50
	4X-4Y	50
H3	5X-5Y	50
	6X-6Y	~~48~~ 52
H4	7X-7Y	~~54~~ 51
	8X-8Y	51

M2		
H1	1X-1Y	51
	2X-2Y	49
H2	3X-3Y	46
	4X-4Y	51
H3	5X-5Y	50
	6X-6Y	~~54~~ 50
H4	7X-7Y	~~54~~ 50
	8X-8Y	52

M3		
H1	1X-1Y	49
	2X-2Y	49
H2	3X-3Y	48
	4X-4Y	52
H3	5X-5Y	50
	6X-6Y	~~54~~ 50
H4	7X-7Y	~~54~~ 50
	8X-8Y	~~50~~ 50

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	37
2Z-6Z	40
3Z-7Z	43
4Z-8Z	40

M2	
1Z-5Z	36
2Z-6Z	41
3Z-7Z	42
4Z-8Z	39

M3	
1Z-5Z	37
2Z-6Z	39
3Z-7Z	41
4Z-8Z	40

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
370	368	136	370	372	135

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
103	104	101	102

B-7-B8	B8-B9
370	370

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	48
2D-2C	51
3D-3C	48
4D-4C	51

B	
1D-1C	50
2D-2C	52
3D-3C	47
4D-4C	48

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880 535

Equipment used: QA 139869, QA 77716

Date: 2018-12-05

Measurement performed by:

Photo documentation taken:

Cover verification (form)

Beam ID: G-3 MIL30

Cover to working electrodes

Cover to Working Electrodes in face A:

M1 (Atmospheric)		
16_L_A	1A-1T	17
16±2 mm	2A-2T	15
25_L_A	1B-1T	25
25±2 mm	2B-2T	25
50_L_A	1C-1T	53
50±2 mm	2C-2T	52

52

M2 (Splash)		
16_T_A	3A-3T	16
16±2 mm	4A-4T	16
25_T_A	3B-3T	26
25±2 mm	4B-4T	25
50_T_A	3C-3T	52
50±2 mm	4C-4T	52

M3 (Immersed)		
16_N_A	5A-5T	15
16±2 mm	6A-6T	16
25_N_A	5B-5T	25
25±2 mm	6B-6T	25
50_N_A	5C-5T	51
50±2 mm	6C-6T	53

Cover to Working Electrodes in face B:

M1 (Atmospheric)		
16_L_B	1X-1S	16
16±2 mm	2X-2S	16
25_L_B	1Y-1S	26
25±2 mm	2Y-2S	25
50_L_B	1Z-1S	50
50±2 mm	2Z-2S	51

M2 (Splash)		
16_T_B	3X-3S	16
16±2 mm	4X-4S	15
25_T_B	3Y-3S	25
25±2 mm	4Y-4S	25
50_T_B	3Z-3S	53
50±2 mm	4Z-4S	52

M3 (Immersed)		
16_N_B	5X-5S	16
16±2 mm	6X-6S	15
25_N_B	5Y-5S	25
25±2 mm	6Y-6S	26
50_N_B	5Z-5S	52
50±2 mm	6Z-6S	51

Position of working electrodes

Distance from formwork in face A

M1 (Atmospheric)		
16_L_A	1K-1U	276
271 mm	2K-2U	276
25_L_A	1L-1U	197
195 mm	2L-2U	193
50_L_A	1M-1U	121
119 mm	2M-2U	117

M2 (Splash)		
16_T_A	3K-3U	272
271 mm	4K-4U	277
25_T_A	3L-3U	199
195 mm	4L-4U	196
50_T_A	3M-3U	120
119 mm	4M-4U	118

M3 (Immersed)		
16_N_A	5K-5U	283
271 mm	6K-6U	281
25_N_A	5L-5U	195
195 mm	6L-6U	186
50_N_A	5M-5U	121
119 mm	6M-6U	119

Distance from formwork in face B

M1 (Atmospheric)		
16_L_B	1K-1U	276
271 mm	2K-2U	284
25_L_B	1L-1U	195
195 mm	2L-2U	195
50_L_B	1M-1U	119
119 mm	2M-2U	118

M2 (Splash)		
16_T_B	3K-3U	281
271 mm	4K-4U	279
25_T_B	3L-3U	201
195 mm	4L-4U	199
50_T_B	3M-3U	122
119 mm	4M-4U	115

M3 (Immersed)		
16_N_B	5K-5U	282
271 mm	6K-6U	280
25_N_B	5L-5U	195
195 mm	6L-6U	196
50_N_B	5M-5U	119
119 mm	6M-6U	120

Equipment used: QA 157819 QA 157815

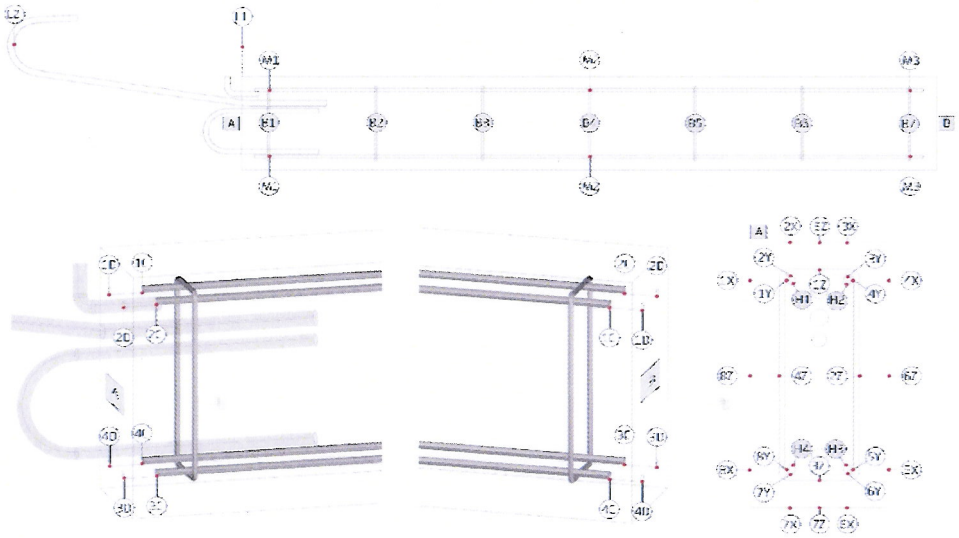
Date: 2018-12-05

Measurement performed by:

Photo documentation taken:

Reinforcement contact verification

Beam ID: G-3 MiL30



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,3 ✓

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2 ✓	0,2 ✓	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,3	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B	1 - 8B	1 - 9B
0,2	0,2	0,2	0,2	0,2

Equipment used: QA 77717

Date: 2018-12-30

Measurement performed by:

Working electrodes contact verification

Beam ID: G-3 MIL30

Cable to WE: (<0,5 Ohm)

MULTI CABLE

W/B	Working electrodes	Cover [mm]	Exposure zone	Face A		Face B		White (EXP. LENGTH (CM)) A	Black (EXP. LENGTH (CM)) B
1		16	Atmospheric	x_16_L_A	0,2	x_16_L_B	0,2	68	69
2			Splash	x_16_T_A	0,2	x_16_T_B	0,2 ✓	68	68
3			Submerged	x_16_N_A	0,2	x_16_N_B	0,2	~~6~~67	68
1		25	Atmospheric	x_25_L_A	0,2	x_25_L_B	0,2	~~6~~68	67
2			Splash	x_25_T_A	0,2	x_25_T_B	0,2 ✓	68	68
3			Submerged	x_25_N_A	0,2	x_25_N_B	0,2	67	67
1		50	Atmospheric	x_50_L_A	0,2	x_50_L_B	0,2	68	68
2			Splash	x_50_T_A	0,2	x_50_T_B	0,2	~~6~~67	67
3			Submerged	x_50_N_A	0,2	x_50_N_B	0,2	68	68

x = F (mix F), G (mix G) or H (mix H)

Reference electrode ID:

Reference electrode	Atmospheric	x_RE_L	R39650	M1
	Splash	x_RE_T	R39648	M2
	Submerged	x_RE_N	R39652	M3

x = F (mix F), G (mix G) or H (mix H)

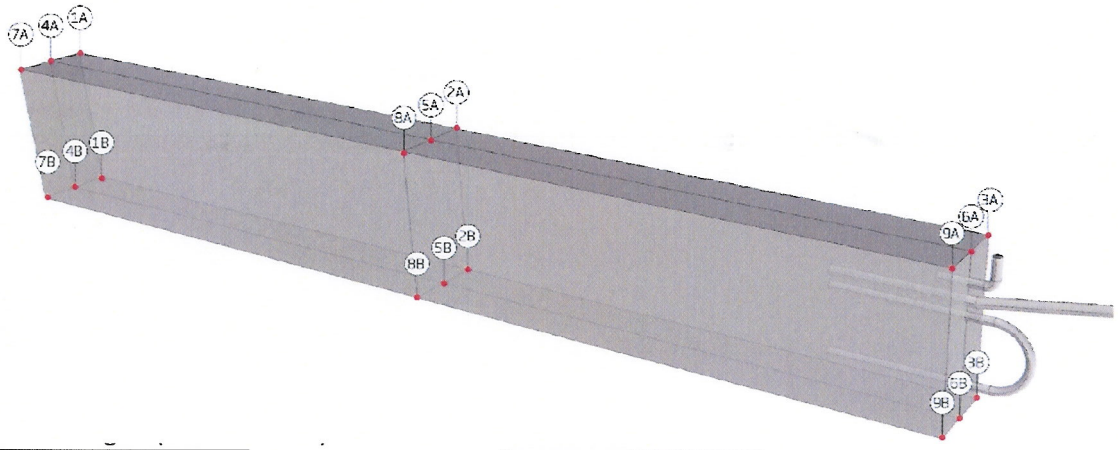
Equipment used: QA77717

Date: 2018-~~11~~12-30

Measurement performed by:

Formwork dimensions verification

Beam ID: H1.



1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
392	391	392

7A -7B	8A - 8B	9A - 9B
390	391	390

Equipment used: QA 139869

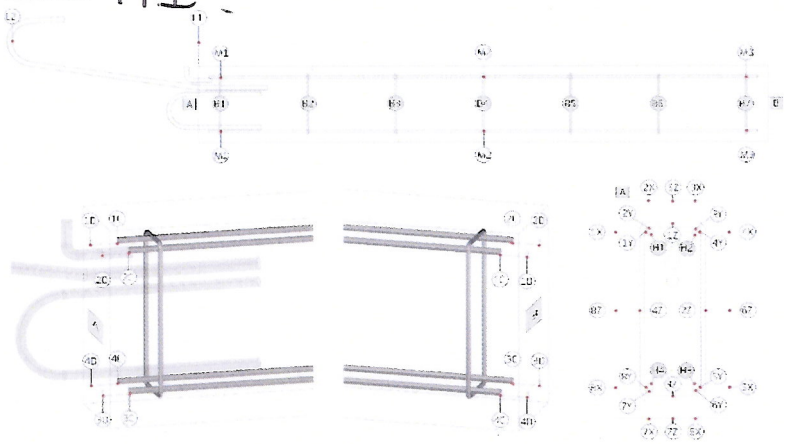
Photo documentation taken:

Date: 2018-12-10

Measurement performed by:

Cover verification (form)

Beam ID: H1



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	49
	2X-2Y	52
H2	3X-3Y	50
	4X-4Y	53
H3	5X-5Y	54
	6X-6Y	53
H4	7X-7Y	53
	8X-8Y	52

M2		
H1	1X-1Y	51
	2X-2Y	52
H2	3X-3Y	51
	4X-4Y	52
H3	5X-5Y	50
	6X-6Y	52
H4	7X-7Y	52
	8X-8Y	53

M3		
H1	1X-1Y	50
	2X-2Y	51
H2	3X-3Y	49
	4X-4Y	53
H3	5X-5Y	49
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	53

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	40
2Z-6Z	43
3Z-7Z	43
4Z-8Z	40

M2	
1Z-5Z	40
2Z-6Z	41
3Z-7Z	41
4Z-8Z	42

M3	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	41
4Z-8Z	41

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
417	418	413	413	418	412

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
100	100	100	101

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	55
2D-2C	55
3D-3C	50
4D-4C	55

B	
1D-1C	49
2D-2C	50
3D-3C	58
4D-4C	52

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880 535

Equipment used: QA 139869, QA 77716

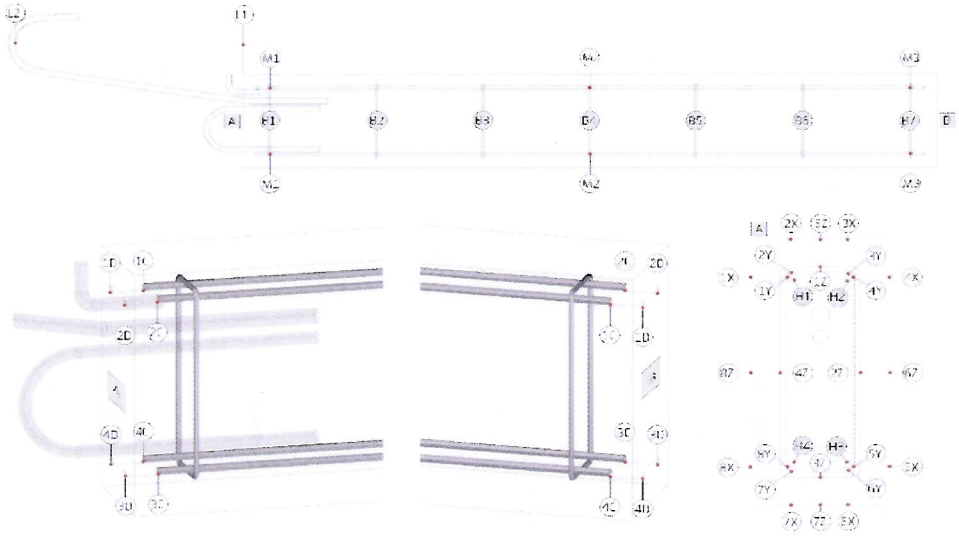
Date: 2018-12-10

Measurement performed by:

Photo documentation taken:

Reinforcement contact verification

Beam ID: H1



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,1	0,2	0,1	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,1	0,1	0,1	0,1

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,2	0,1	0,2

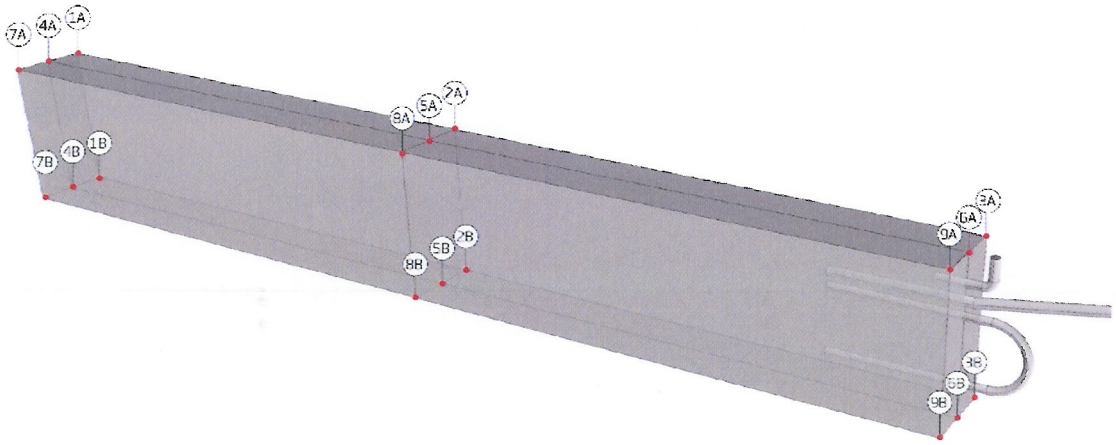
Equipment used: QA 77717

Date: 2018-12-10

Measurement performed by:

Formwork dimensions verification

Beam ID: H2



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
191	191	191

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
389	389	390

7A -7B	8A - 8B	9A - 9B
390	390	390

Equipment used: GA 139869

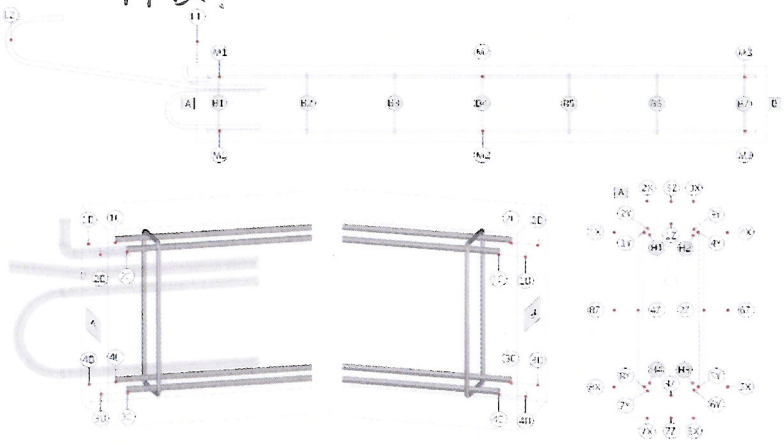
Photo documentation taken:

Date: 2018-12-10

Measurement performed by:

Cover verification (form)

Beam ID: H2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	52
	2X-2Y	48
H2	3X-3Y	49
	4X-4Y	51
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	50

M2		
H1	1X-1Y	51
	2X-2Y	51
H2	3X-3Y	48
	4X-4Y	53
H3	5X-5Y	49
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	52

M3		
H1	1X-1Y	51
	2X-2Y	48
H2	3X-3Y	48
	4X-4Y	50
H3	5X-5Y	51
	6X-6Y	55
H4	7X-7Y	55
	8X-8Y	49

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	36
2Z-6Z	40
3Z-7Z	38
4Z-8Z	40

M2	
1Z-5Z	38
2Z-6Z	41
3Z-7Z	38
4Z-8Z	40

M3	
1Z-5Z	36
2Z-6Z	39
3Z-7Z	40
4Z-8Z	40

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
415	417	415	415	415	419

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
100	105	100	105

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	49
2D-2C	50
3D-3C	49
4D-4C	53

B	
1D-1C	52
2D-2C	51
3D-3C	55
4D-4C	50

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	882

535

Equipment used: QA 77716, QA 139869

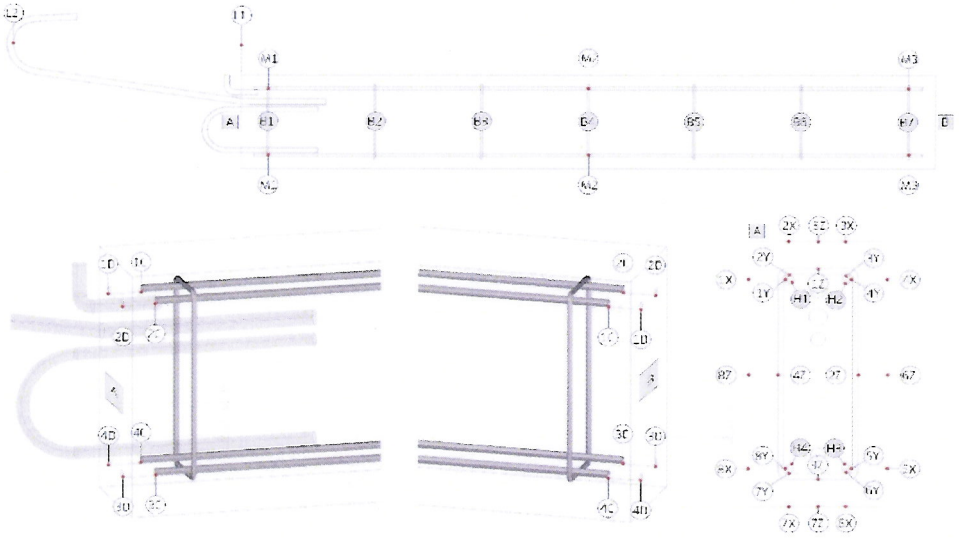
Date: 2018-12-10

Measurement performed by:

Photo documentation taken:

Reinforcement contact verification

Beam ID: H2



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,1	0,2	0,1

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,2	0,2	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B
0,1	0,2	0,1

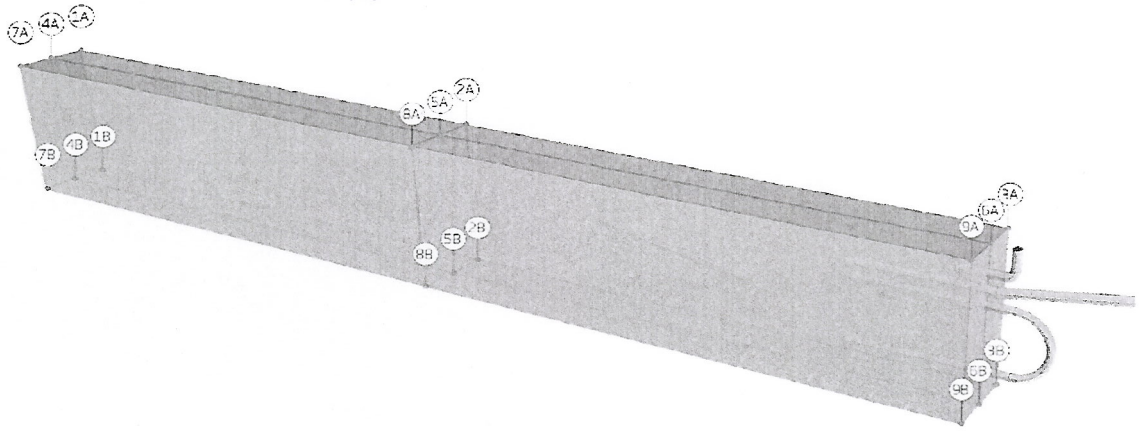
Equipment used: QA 77717

Date: 2018-12-10

Measurement performed by:

Formwork dimensions verification

Beam ID: H3-AALB 20



Dimensions, cross section:

Beam length: (2700 ± 3 mm.)

1A - 3A	7A - 9A
2700	2701

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 3 mm.)

1A - 7A	2A - 8A	3A - 9A
191	189	191

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 3 mm.)

1A -1B	2A - 2B	3A - 3B
390	390	391

7A -7B	8A - 8B	9A - 9B
391	390	390

Equipment used: QA 1398

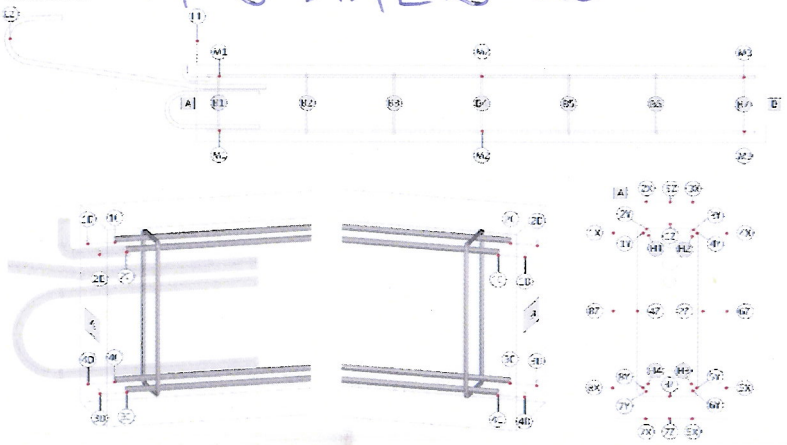
Photo documentation taken:

Date: 2018-12-03

Measurement performed by:

Cover verification (form)

Beam ID: M-3 AALB 20



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1		
H1	1X-1Y	51
	2X-2Y	50
H2	3X-3Y	51
	4X-4Y	49
H3	5X-5Y	52
	6X-6Y	55
H4	7X-7Y	55
	8X-8Y	51

M2		
H1	1X-1Y	50
	2X-2Y	50
H2	3X-3Y	50
	4X-4Y	52
H3	5X-5Y	52
	6X-6Y	55
H4	7X-7Y	55
	8X-8Y	50

M3		
H1	1X-1Y	50
	2X-2Y	50
H2	3X-3Y	52
	4X-4Y	51
H3	5X-5Y	51
	6X-6Y	55
H4	7X-7Y	55
	8X-8Y	50

Cover to stirrups: (40 ± 5 mm.)

M1	
1Z-5Z	37
2Z-6Z	41
3Z-7Z	43
4Z-8Z	39

M2	
1Z-5Z	38
2Z-6Z	41
3Z-7Z	44
4Z-8Z	39

M3	
1Z-5Z	38
2Z-6Z	39
3Z-7Z	45
4Z-8Z	40

Distance between stirrups: (415 mm.)

B1-B2	B2-B3	B3-B4	B4-B5	B5-B6	B6-B7
371	370	132	370	370	137

Cover between stirrup and formwork: (105 mm)

B1	B1	B7	B7
A - 1Z	A -3Z	B -1Z	B-3Z
106	105	100	102

B7-B8	B8-B9
370	370

Cover from longitudinal reinforcement to formwork: (50 ± 5 mm.)

A	
1D-1C	48
2D-2C	46
3D-3C	46
4D-4C	45

B	
1D-1C	51
2D-2C	50
3D-3C	50
4D-4C	47

Distance from formwork to mounting bracket : 880 mm.)

L1-L2	880

53,5

Equipment used: QA 157819, QA 139869

Date: 2018-12-03

Measurement performed by:

Photo documentation taken:

Cover verification (form)

Beam ID: H-3 AALB 20

Cover to working electrodes

Cover to Working Electrodes in face A:

M1 (Atmospheric)		
16_L_A	1A-1T	16
16±2 mm	2A-2T	16
25_L_A	1B-1T	26
25±2 mm	2B-2T	25
~~50~~_L_A	1C-1T	52
50±2 mm	2C-2T	52

M2 (Splash)		
16_T_A	3A-3T	16
16±2 mm	4A-4T	16
25_T_A	3B-3T	25
25±2 mm	4B-4T	26
~~50~~_T_A	3C-3T	53
50±2 mm	4C-4T	52

M3 (Immersed)		
16_N_A	5A-5T	15
16±2 mm	6A-6T	16
25_N_A	5B-5T	25
25±2 mm	6B-6T	25
~~50~~_N_A	5C-5T	52
50±2 mm	6C-6T	52

52

Cover to Working Electrodes in face B:

M1 (Atmospheric)		
16_L_B	1X-1S	16
16±2 mm	2X-2S	16
25_L_B	1Y-1S	26
25±2 mm	2Y-2S	26
~~50~~_L_B	1Z-1S	52
50±2 mm	2Z-2S	52

M2 (Splash)		
16_T_B	3X-3S	15
16±2 mm	4X-4S	16
25_T_B	3Y-3S	26
25±2 mm	4Y-4S	26
~~50~~_T_B	3Z-3S	52
50±2 mm	4Z-4S	53

M3 (Immersed)		
16_N_B	5X-5S	16
16±2 mm	6X-6S	16
25_N_B	5Y-5S	26
25±2 mm	6Y-6S	24
~~50~~_N_B	5Z-5S	52
50±2 mm	6Z-6S	53

Position of working electrodes

Distance from formwork in face A

M1 (Atmospheric)		
16_L_A	1K-1U	278
271 mm	2K-2U	278
25_L_A	1L-1U	200
195 mm	2L-2U	200
50_L_A	1M-1U	125
119 mm	2M-2U	122

M2 (Splash)		
16_T_A	3K-3U	280
271 mm	4K-4U	276
25_T_A	3L-3U	196
195 mm	4L-4U	195
50_T_A	3M-3U	124
119 mm	4M-4U	121

M3 (Immersed)		
16_N_A	5K-5U	274
271 mm	6K-6U	277
25_N_A	5L-5U	298
195 mm	6L-6U	200
50_N_A	5M-5U	120
119 mm	6M-6U	120

Distance from formwork in face B

M1 (Atmospheric)		
16_L_B	1K-1U	279
271 mm	2K-2U	279
25_L_B	1L-1U	202
195 mm	2L-2U	200
50_L_B	1M-1U	125
119 mm	2M-2U	123

M2 (Splash)		
16_T_B	3K-3U	278
271 mm	4K-4U	277
25_T_B	3L-3U	201
195 mm	4L-4U	197
50_T_B	3M-3U	121
119 mm	4M-4U	120

M3 (Immersed)		
16_N_B	5K-5U	275
271 mm	6K-6U	281
25_N_B	5L-5U	198
195 mm	6L-6U	205
50_N_B	5M-5U	121
119 mm	6M-6U	121

Equipment used: QA 139869, QA157815

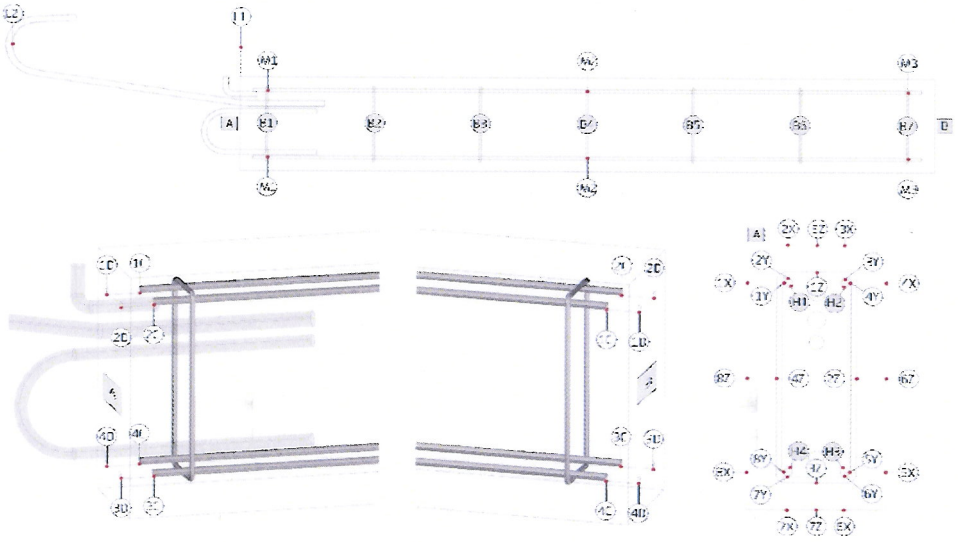
Date: 2018-12-03

Measurement performed by:

Photo documentation taken:

Reinforcement contact verification

Beam ID: H-3 AALB 20



Cable to cable: (<0,5 Ohm)

Cable 1 - Cable 2:
0,2

Cable to longitudinal reinforcement: (<0,5 Ohm)

Cable 1 - 1C	Cable 1 - 2C	Cable 1 - 3C	Cable 1 - 4C
0,2	0,3	0,2	0,2

Cable to stirrup: (<0,5 Ohm)

Cable 1 - 1B	Cable 1 - 2B	Cable 1 - 3B	Cable 1 - 4B
0,3	0,3	0,2	0,2

Cable 1 - 5B	Cable 1 - 6B	Cable 1 - 7B	1 - 8B	1 - 9B
0,3	0,3	0,3	0,3	0,3

Equipment used: QA 77717

Date: 2018-11-29

Measurement performed by:

Working electrodes contact verification

Beam ID: H-3 AA2B 20

Cable to WE: (<0,5 Ohm)

	Cover [mm]	Exposure zone	Face A		Face B		EXP. LENGTH (CM) A	B
Working electrodes	16	Atmospheric	x_16_L_A	0,2	x_16_L_B	0,2	68	67
		Splash	x_16_T_A	0,2	x_16_T_B	0,2	67	68
		Submerged	x_16_N_A	0,2	x_16_N_B	0,2	68	67
	25	Atmospheric	x_25_L_A	0,2	x_25_L_B	0,2	67	67
		Splash	x_25_T_A	0,2	x_25_T_B	0,2	67	69
		Submerged	x_25_N_A	0,2	x_25_N_B	0,2	~~68~~ 68	68
	50	Atmospheric	x_50_L_A	0,2	x_50_L_B	0,2	69	67
		Splash	x_50_T_A	0,2	x_50_T_B	0,2	67	68
		Submerged	x_50_N_A	0,2	x_50_N_B	0,2	68	67

x = F (mix F), G (mix G) or H (mix H)

Reference electrode ID:

Reference electrode	Atmospheric	x_RE_L	R39642 ?	M1
	Splash	x_RE_T	R39647	M2
	Submerged	x_RE_N	R39651	M3

x = F (mix F), G (mix G) or H (mix H)

Equipment used: QA 77717

Date: 2018-11-29

Measurement performed by:

Tris Hedgill

5.3. Annex 3
Aggregate properties

Reports from testing of aggregate properties are presented on the following 8 pages.

Test report

REPORT NO.:
804573-1

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej 4
City: DK-2630 Taastrup

Material: Årdal sand 0-8$_{mm}$. The material for testing was submitted by Statens Vegvesen and received on Danish Technological Institute in september of 2017.

Sampling: The test portion was sampled by DTI/PEMD 2017-10-02. The test portion was split in two fractions using a 4$_{mm}$ sieve. The 0-4$_{mm}$ fraction make up 79.8% and the 4-8$_{mm}$ fraction make up 20.2% of the total test portion.

Period: The test was completed 2017-10-06.

Test method: DS/EN 1097-6:2013 Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption.

Method used: Sections 8 and 9

Results: Result of the test is given on page 2 of this report.

Terms: The test has been performed according to the conditions laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

Place: Date 2018-03-15, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Peter Mathias Dissing
Digitally signed by Peter Mathias Dissing
Date: 2018.03.16 15:09:06 +01'00'

Peter Dissing
Laboratory Technician

Digitalt signeret af Thomas Lennart Svensson
Dato: 2018.03.16 15:01:09 +01'00'

Thomas Svensson
Team Manager

ilac-MRA

DANAK
Test Reg. no. 2

Results

Sample ID	Apparent density (kg/m^3)	Density, S.S.D. (kg/m^3)	Density, oven dry (kg/m^3)	Absorption (%)
Årdal 0-4 mm.	2679	2662	2652	0,38

Sample ID	Apparent density (kg/m^3)	Density, S.S.D. (kg/m^3)	Density, oven dry (kg/m^3)	Absorption (%)
Årdal 4-8 mm.	2693	2658	2637	0,79

Test report

REPORT NO.:
804573-3

DANISH
TECHNOLOGICAL
INSTITUTE

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DK-2630 Taastrup
+45 72 20 20 00
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www.teknologisk.dk

Init: PEMD/THSV
Order no.: 804573-3
Appendix: 0

Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej 4
City: DK-2630 Taastrup

Material: Årdal sand 0-8$_{mm}$. The material for testing was submitted by Statens Vegvesen and received on Danish Technological Institute in september of 2017.

Sampling: The test portion was sampled by DTI/PEMD 2017-10-09. The test portion was split in two fractions using a 4$_{mm}$ sieve. The 0-4$_{mm}$ fraction make up 79.8% and the 4-8$_{mm}$ fraction make up 20.2% of the total test portion.

Period: The test was completed 2017-10-11.

Test method: DS/EN 1097-6:2013 Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption.

Method used: Sections 8 and 9

Results: Result of the test is given on page 2 of this report.

Terms: The test has been performed according to the conditions laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

Place: Date 2018-03-16, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Peter Mathias Dissing
Digitally signed by Peter Mathias Dissing
Date: 2018.03.16 15:10:01 +01'00'

Peter Dissing
Laboratory Technician

Digitalt signeret af Thomas Lennart Svensson
Dato: 2018.03.16 15:03:04 +01'00'

Thomas Svensson
Team Manager

ilac-MRA

DANAK
Test Reg. no. 2

Results

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
A1 Årdal 0-4 mm	2675	2658	2648	0,38

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
A2 Årdal 4-8 mm	2693	2657	2635	0,81

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
B1 Årdal 0-4 mm	2678	2662	2653	0,35

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
B2 Årdal 4-8 mm	2705	2668	2647	0,80

Test report

REPORT NO.:
804573-2

DANISH
TECHNOLOGICAL
INSTITUTE

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DK-2630 Taastrup
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www.teknologisk.dk

Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej 4
City: DK-2630 Taastrup

Material: Årdal sten 8-16$_{mm}$. The material for testing was submitted by Statens Vegvesen and received on Danish Technological Institute in september of 2017.

Sampling: The test portion was sampled by DTI/PEMD 2017-10-02.

Period: The test was completed 2017-10-06.

Test method: DS/EN 1097-6:2013 Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption.

Method used: Section 8.

Results: Result of the test is given on page 2 of this report.

Terms: The test has been performed according to the conditions laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

Place: Date 2018-03-16, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

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Date: 2018.03.16 15:09:33 +01'00'

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Digitalt signeret af Thomas Lennart Svensson
Dato: 2018.03.16 15:02:12 +01'00'

Thomas Svensson
Team Manager

ilac-MRA DANAK
Test Reg. no. 2

Results

Sample ID	Apparent density (kg/m^3)	Density, S.S.D. (kg/m^3)	Density, oven dry (kg/m^3)	Absorption (%)
Årdal 8-16 mm.	2703	2678	2664	0,54

Test report

REPORT NO.:
804573-4

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
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Assigner:
Contact person: Claus Pade
Company: Teknologisk Institut
Address: Gregersensvej 4
City: DK-2630 Taastrup

Material: Årdal sten 8-16$_{mm}$. The material for testing was submitted by Statens Vegvesen and received on Danish Technological Institute in september of 2017.

Sampling: The test portion was sampled by DTI/PEMD 2017-10-09.

Period: The test was completed 2017-10-11.

Test method: DS/EN 1097-6:2013 Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption.

Method used: Section 8.

Results: Result of the test is given on page 2 of this report.

Terms: The test has been performed according to the conditions laid down by DANAK (The Danish Accreditation), cf. www.danak.dk, and the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

Place: Date 2018-03-16, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

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Date: 2018.03.16 15:10:28 +01'00'

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Dato: 2018.03.16 15:03:51 +01'00'

Thomas Svensson
Team Manager

ilac-MRA DANAK
Test Reg. no. 2

Results

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
A1 Årdal 8-16 mm	2704	2676	2660	0,60

Prøve ID	Tilsyneladende densitet (kg/m^3)	Densitet, v.o.t. (kg/m^3)	Densitet, tør (kg/m^3)	Absorption (%)
A2 Årdal 8-16 mm	2713	2686	2671	0,57

5.4. Annex 4
Batch reports

Batch reports are presented on the following 9 pages.

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Anlegg FA	272.3	3020		0.0902	272.3	**68.0750**	68.0750	0.0	0.0	68.0750	0.0225	269.6	0.0893
Microsilica Densified	16.7	2200		0.0076	16.7	**4.1750**	4.1750	0.0	0.0	4.1750	0.0019	16.5	0.0075
Fly ash	124.4	2300		0.0541	124.4	**31.1000**	31.1000	0.0	0.0	31.1000	0.0135	123.2	0.0535
Årdal sand 0/8	888.4	2660	0.46	0.3340	916.9	**229.2150**	230.0000	0.8	0.3	222.8606	0.0838	882.5	0.3318
Årdal stein 8/16	793.2	2680	0.57	0.2960	790.4	**197.6010**	197.7000	0.1	0.1	198.3994	0.0740	785.7	0.2932
Mapei Dynamon SX-23	1.70	1050	77	0.0016	1.7	**0.4250**	0.4250	0.0	0.0	0.4250	0.0004	1.7	0.0016
Mapeair 25 (1:9)	6.50	1000	99.6	0.0065	6.5	**1.6250**	1.6250	0.0	0.0	1.6250	0.0016	6.4	0.0064
Water	165.0	1000		0.1650	139.4	**34.8440**	34.9000	0.1	0.2	41.3400	0.0413	163.7	0.1637
Air				0.0450							0.0134		0.0530
Total	2268.2			1.0000	2268.2	567.0601	568.0000			568.0000	0.2525	2249.3	1.0000

w/c	0.44	w/c actual	0.441
Water free	172.8		
Batch size	0.250		
Date	04-12-2018		
Time	09:15		
ID	**F1**		

		Container	Initial	After drying	Moisture	Slump	Air	Weight	Density	Temperature	Watt
Årdal sand 0/8	1	405.6	1159.2	1134.7	3.36	210	5.3	22.08	2265.0		58
	2	460.6	1159.5	1133.4	3.88						
	3	435.5	1232.1	1203.3	3.75						
	Average				3.66						
Årdal stein 8/16	1	390.5	1234.8	1233.6	0.14						
	2	466.3	1392.4	1391.1	0.14						
	3	392.5	1370.2	1366.6	0.37						
	Average				0.22						

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Anlegg FA	272.3	3020		0.0902	272.3	**68.0750**	68.0750	0.0	0.0	68.0750	0.0225	271.3	0.0898
Microsilica Densified	16.7	2200		0.0076	16.7	**4.1750**	4.1750	0.0	0.0	4.1750	0.0019	16.6	0.0076
Fly ash	124.4	2300		0.0541	124.4	**31.1000**	31.1000	0.0	0.0	31.1000	0.0135	124.0	0.0539
Årdal sand 0/8	888.4	2660	0.46	0.3340	919.3	**229.8274**	229.8000	0.0	0.0	222.0735	0.0835	885.1	0.3328
Årdal stein 8/16	793.2	2680	0.57	0.2960	792.5	**198.1208**	197.6000	-0.5	-0.3	197.7787	0.0738	788.3	0.2941
Mapei Dynamon SX-23	1.70	1050	77	0.0016	1.7	**0.4250**	0.4250	0.0	0.0	0.4250	0.0004	1.7	0.0016
Mapeair 25 (1:9)	6.00	1000	99.6	0.0060	6.0	**1.5000**	1.5000	0.0	0.0	1.5000	0.0015	6.0	0.0060
Water	165.5	1000		0.1655	135.3	**33.8363**	33.9000	0.1	0.2	41.4478	0.0414	165.2	0.1652
Air				0.0450							0.0123		0.0490
Total	2268.2			1.0000	2268.2	567.0596	566.5750			566.5750	0.2509	2258.2	1.0000

w/c	0.44										w/c actual	0.441	
Water free	172.8												
Batch size	0.250												
Date	04-12-2018												
Time	10:20												
ID	**F2**												

		Container	Initial	After drying	Moisture		Slump	Air	Weight	Density	Temperature	Watt	
Årdal sand 0/8	1	390.5	1075.8	1050.6	3.82		210	4.9	22.13	2271.3	20.7	58	
	2	466.3	1220.0	1189.8	4.17								
	3	392.5	1144.2	1116.5	3.83								
	Average				3.94								
Årdal stein 8/16	1	405.6	1225.2	1221.6	0.44								
	2	460.6	1338.3	1333.8	0.52								
	3	435.5	1352.0	1347.6	0.48								
	Average				0.48								

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Norcem Anlegg FA	272.3	3020		0.0902	272.3	**68.0750**	68.0750	0.0	0.0	68.0750	0.0225	270.8	0.0897
Microsilica Densified	16.7	2200		0.0076	16.7	**4.1750**	4.1750	0.0	0.0	4.1750	0.0019	16.6	0.0076
Fly ash	124.4	2300		0.0541	124.4	**31.1000**	31.1000	0.0	0.0	31.1000	0.0135	123.7	0.0538
Årdal sand 0/8	888.4	2660	0.46	0.3340	913.9	**228.4760**	229.7000	1.2	0.5	223.2899	0.0839	888.4	0.3340
Årdal stein 8/16	793.2	2680	0.57	0.2960	791.9	**197.9844**	198.2000	0.2	0.1	198.5159	0.0741	789.8	0.2947
Mapei Dynamon SX-23	1.70	1050	77	0.0016	1.7	**0.4250**	0.4250	0.0	0.0	0.4250	0.0004	1.7	0.0016
Mapeair 25 (1:9)	6.00	1000	99.6	0.0060	6.0	**1.5000**	1.5000	0.0	0.0	1.5000	0.0015	6.0	0.0060
Water	165.5	1000		0.1655	141.3	**35.3242**	35.3000	0.0	-0.1	41.3942	0.0414	164.7	0.1647
Air				0.0450							0.0121		0.0480
Total	2268.2			1.0000	2268.2	567.0596	568.4750			568.4750	0.2513	2261.8	1.0000

w/c	0.44	w/c actual	0.440
Water free	172.8		
Batch size	0.250		
Date	04-12-2018		
Time	12:45		
ID	**F3**		

		Container	Initial	After drying	Moisture	Slump	Air	Weight	Density	Temperature	Watt
Årdal sand 0/8	1	466.3	1117.8	1097.0	3.30	200	4.8	22.16	2275.0	20.1	60
	2	435.5	1143.4	1121.0	3.27						
	3	405.6	1166.2	1141.0	3.43						
	Average				3.33						
Årdal stein 8/16	1	390.5	1247.8	1244.1	0.43						
	2	460.6	1340.5	1337.3	0.37						
	3	392.5	1341.1	1337.0	0.43						
	Average				0.41						

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Cemex Miljøsement	422.3	3060		0.1380	422.3	**105.5750**	105.5750	0.0	0.0	105.5750	0.0345	421.6	0.1378
Microsilica Densified	17.7	2200		0.0080	17.7	**4.4250**	4.4250	0.0	0.0	4.4250	0.0020	17.7	0.0080
Årdal sand 0/8	888.4	2660	0.46	0.3340	922.5	**230.6254**	228.7000	-1.9	-0.8	220.2458	0.0828	879.5	0.3306
Årdal stein 8/16	793.2	2680	0.57	0.2960	791.1	**197.7745**	197.6000	-0.2	-0.1	198.1250	0.0739	791.2	0.2952
Mapei Dynamon SX-23	1.90	1050	77	0.0018	1.9	**0.4750**	0.4750	0.0	0.0	0.4750	0.0005	1.9	0.0018
Mapeair 25 (1:9)	1.90	1000	99.6	0.0019	1.9	**0.4750**	0.4750	0.0	0.0	0.4750	0.0005	1.9	0.0019
Water	175.1	1000		0.1751	143.1	**35.7870**	35.8000	0.0	0.0	43.7292	0.0437	174.6	0.1746
Air				0.0450							0.0125		0.0500
Total	2300.5			0.9999	2300.5	575.1369	573.0500			573.0500	0.2504	2288.4	1.0000

w/c	0.39
Water free	178.5
Batch size	0.250
Date	07-12-2018
Time	08:50
ID	**G1**

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	405.6	1189.5	1156.0	4.46
	2	466.3	1184.7	1153.4	4.56
	3	392.5	1089.3	1063.3	3.88
	Average				4.30
Årdal stein 8/16	1	435.5	1183.6	1181.0	0.35
	2	591.3	1420.7	1419.0	0.21
	3	390.5	1280.5	1277.3	0.36
	Average				0.30

w/c actual	0.389

Slump	Air	Weight	Density	Temperature	Watt
200	5.0	22.5	2317.5	20.7	66

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Cemex Miljøsement	422.3	3060		0.1380	422.3	**105.5750**	105.5750	0.0	0.0	105.5750	0.0345	421.6	0.1378
Microsilica Densified	17.7	2200		0.0080	17.7	**4.4250**	4.4250	0.0	0.0	4.4250	0.0020	17.7	0.0080
Årdal sand 0/8	888.4	2660	0.46	0.3340	912.3	**228.0641**	230.0000	1.9	0.8	223.9853	0.0842	894.5	0.3363
Årdal stein 8/16	793.2	2680	0.57	0.2960	791.4	**197.8555**	197.8000	-0.1	0.0	198.2443	0.0740	791.7	0.2954
Mapei Dynamon SX-23	2.00	1050	77	0.0019	2.0	**0.5000**	0.5000	0.0	0.0	0.5000	0.0005	2.0	0.0019
Mapeair 25 (1:9)	1.80	1000	99.6	0.0018	1.8	**0.4500**	0.4500	0.0	0.0	0.4500	0.0005	1.8	0.0018
Water	175.2	1000		0.1752	153.1	**38.2729**	38.2000	-0.1	-0.2	43.7704	0.0438	174.8	0.1748
Air				0.0450							0.0110		0.0440
Total	2300.6			0.9999	2300.6	575.1426	576.9500			576.9500	0.2504	2304.1	1.0000

w/c	0.39
Water free	178.5
Batch size	0.250
Date	07-12-2018
Time	09:40
ID	**G2**

w/c actual	0.390

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	435.5	1040.0	1021.8	3.10
	2	390.5	1138.8	1116.6	3.06
	3	392.5	1133.7	1110.2	3.27
	Average				3.15
Årdal stein 8/16	1	405.6	1091.1	1089.0	0.31
	2	466.3	1253.3	1250.6	0.34
	3	591.3	1423.4	1420.2	0.39
	Average				0.35

Slump	Air	Weight	Density	Temperature	Watt
210	4.4	22.63	2333.8	21.4	63

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Cemex Miljøsement	422.3	3060		0.1380	422.3	**105.5750**	105.5750	0.0	0.0	105.5750	0.0345	422.0	0.1379
Microsilica Densified	17.7	2200		0.0080	17.7	**4.4250**	4.4250	0.0	0.0	4.4250	0.0020	17.7	0.0080
Årdal sand 0/8	888.4	2660	0.46	0.3340	917.3	**229.3224**	228.5000	-0.8	-0.4	221.3035	0.0832	884.6	0.3326
Årdal stein 8/16	793.2	2680	0.57	0.2960	791.3	**197.8272**	197.9000	0.1	0.0	198.3730	0.0740	793.0	0.2959
Mapei Dynamon SX-23	2.00	1050	77	0.0019	2.0	**0.5000**	0.5000	0.0	0.0	0.5000	0.0005	2.0	0.0019
Mapeair 25 (1:9)	1.90	1000	99.6	0.0019	1.9	**0.4750**	0.4750	0.0	0.0	0.4750	0.0005	1.9	0.0019
Water	175.1	1000		0.1751	148.1	**37.0181**	37.0000	0.0	0.0	43.7235	0.0437	174.8	0.1748
Air				0.0450							0.0118		0.0470
Total	2300.6			0.9999	2300.6	575.1427	574.3750			574.3750	0.2502	2296.0	1.0000

w/c	0.39
Water free	178.5
Batch size	0.250
Date	07-12-2018
Time	10:40
ID	**G3**

w/c actual	0.390

		Container	Initial	After drying	Moisture
Årdal sand 0/8	1	405.6	1136.6	1109.0	3.92
	2	591.3	1284.2	1260.3	3.57
	3	390.5	1017.0	995.0	3.64
	Average				3.71
Årdal stein 8/16	1	466.3	1281.9	1279.0	0.36
	2	435.5	1320.9	1317.7	0.36
	3	392.5	1230.9	1228.6	0.28
	Average				0.33

Slump	Air	Weight	Density	Temperature	Watt
210	4.7	22.5	2317.5	21.9	63

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Aalborg Rapid	338.7	3160		0.1072	338.7	**84.6750**	84.6750	0.0	0.0	84.6750	0.0268	339.7	0.1075
Microsilica Densified	18.0	2200		0.0082	18.0	**4.5000**	4.5000	0.0	0.0	4.5000	0.0020	18.1	0.0082
Fly ash	89.2	2300		0.0388	89.2	**22.3000**	22.3000	0.0	0.0	22.3000	0.0097	89.5	0.0389
Årdal sand 0/8	888.4	2660	0.46	0.3340	919.4	**229.8532**	229.2000	-0.7	-0.3	221.4689	0.0833	888.5	0.3340
Årdal stein 8/16	793.2	2680	0.57	0.2960	792.4	**198.1087**	198.0000	-0.1	-0.1	198.1912	0.0740	795.1	0.2967
Mapei Dynamon SX-23	2.20	1050	77	0.0021	2.2	**0.5500**	0.5500	0.0	0.0	0.5500	0.0005	2.2	0.0021
Mapeair 25 (1:9)	2.90	1000	99.6	0.0029	2.9	**0.7250**	0.7250	0.0	0.0	0.7250	0.0007	2.9	0.0029
Water	165.9	1000		0.1659	135.7	**33.9137**	34.0000	0.1	0.3	41.5400	0.0415	166.7	0.1667
Air				0.0450							0.0107		0.0430
Total	2298.5			1.0000	2298.5	574.6256	573.9500			573.9500	0.2493	2302.7	1.0000

w/c	0.39	w/c actual	0.391
Water free	170.5		
Batch size	0.250		
Date	11-12-2018		
Time	08:50		
ID	**H1**		

		Container	Initial	After drying	Moisture	Slump	Air	Weight	Density	Temperature	Watt
Årdal sand 0/8	1	405.6	1031.3	1005.8	4.25	215	4.3	22.62	2332.5	20.9	71
	2	390.5	1046.0	1020.2	4.10						
	3	466.3	1095.0	1073.7	3.51						
	Average				3.95						
Årdal stein 8/16	1	460.6	1213.7	1210.3	0.45						
	2	392.5	1184.5	1180.7	0.48						
	3	435.5	1222.8	1219.0	0.49						
	Average				0.47						

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Aalborg Rapid	338.7	3160		0.1072	338.7	**84.6750**	84.6750	0.0	0.0	84.6750	0.0268	337.6	0.1068
Microsilica Densified	18.0	2200		0.0082	18.0	**4.5000**	4.5000	0.0	0.0	4.5000	0.0020	17.9	0.0082
Fly ash	89.2	2300		0.0388	89.2	**22.3000**	22.3000	0.0	0.0	22.3000	0.0097	88.9	0.0387
Årdal sand 0/8	888.4	2660	0.46	0.3340	915.8	**228.9524**	229.5000	0.5	0.2	222.6312	0.0837	887.5	0.3336
Årdal stein 8/16	793.2	2680	0.57	0.2960	792.9	**198.2266**	198.2000	0.0	0.0	198.2734	0.0740	790.4	0.2949
Mapei Dynamon SX-23	2.20	1050	77	0.0021	2.2	**0.5500**	0.5500	0.0	0.0	0.5500	0.0005	2.2	0.0021
Mapeair 25 (1:9)	3.10	1000	99.6	0.0031	3.1	**0.7750**	0.7750	0.0	0.0	0.7750	0.0008	3.1	0.0031
Water	165.7	1000		0.1657	138.6	**34.6467**	34.5000	-0.1	-0.4	41.2954	0.0413	164.6	0.1646
Air				0.0450							0.0120		0.0480
Total	2298.5			1.0000	2298.5	574.6258	575.0000			575.0000	0.2509	2292.2	1.0000

w/c	0.39	w/c actual	0.389
Water free	170.5		
Batch size	0.250		
Date	11-12-2018		
Time	09:45		
ID	**H2**		

		Container	Initial	After drying	Moisture	Slump	Air	Weight	Density	Temperature	Watt
Årdal sand 0/8	1	392.5	995.4	975.0	3.50	215	4.8	22.52	2320.0	21.2	69
	2	405.6	1000.7	980.1	3.59						
	3	466.3	1082.1	1061.0	3.55						
	Average				3.55						
Årdal stein 8/16	1	435.5	1188.6	1185.0	0.48						
	2	390.5	1225.8	1220.6	0.63						
	3	460.6	1175.2	1171.7	0.49						
	Average				0.53						

Constituent	Nominal SSD (kg/m^3)	Density (kg/m^3)	Absorption or water content (%)	Nominal SSD (m^3/m^3)	Target (kg/m^3)	Target (kg)	Actual (kg)	Deviation (kg)	Deviation (%)	Actual SSD (kg)	Actual SSD (m^3)	Actual SSD (kg/m^3)	Actual SSD (m^3/m^3)
Aalborg Rapid	338.7	3160		0.1072	338.7	**84.6750**	84.6750	0.0	0.0	84.6750	0.0268	338.8	0.1072
Microsilica Densified	18.0	2200		0.0082	18.0	**4.5000**	4.5000	0.0	0.0	4.5000	0.0020	18.0	0.0082
Fly ash	89.2	2300		0.0388	89.2	**22.3000**	22.3000	0.0	0.0	22.3000	0.0097	89.2	0.0388
Årdal sand 0/8	888.4	2660	0.46	0.3340	918.7	**229.6735**	229.2000	-0.5	-0.2	221.6421	0.0833	886.8	0.3334
Årdal stein 8/16	793.2	2680	0.57	0.2960	792.6	**198.1420**	198.3000	0.2	0.1	198.4581	0.0741	794.0	0.2963
Mapei Dynamon SX-23	2.20	1050	77	0.0021	2.2	**0.5500**	0.5500	0.0	0.0	0.5500	0.0005	2.2	0.0021
Mapeair 25 (1:9)	3.00	1000	99.6	0.0030	3.0	**0.7500**	0.7500	0.0	0.0	0.7500	0.0008	3.0	0.0030
Water	165.8	1000		0.1658	136.1	**34.0351**	34.1000	0.1	0.2	41.4998	0.0415	166.0	0.1660
Air				0.0450							0.0112		0.0450
Total	2298.5			1.0000	2298.5	574.6257	574.3750			574.3750	0.2499	2298.1	1.0000

w/c	0.39	w/c actual	0.390
Water free	170.5		
Batch size	0.250		
Date	11-12-2018		
Time	11:25		
ID	**H3**		

		Container	Initial	After drying	Moisture	Slump	Air	Weight	Density	Temperature	Watt
Årdal sand 0/8	1	390.5	1040.3	1017.3	3.67	210	4.5	22.58	2327.5	21.1	67
	2	392.5	1148.0	1119.2	3.96						
	3	466.3	1200.9	1172.8	3.98						
	Average				3.87						
Årdal stein 8/16	1	460.6	1188.0	1184.5	0.48						
	2	405.6	1190.4	1186.5	0.50						
	3	435.5	1217.8	1214.0	0.49						
	Average				0.49						

5.5. Annex 5
Fresh concrete properties

Report from testing of fresh concrete properties are presented on the following 2 pages.

Test report

REPORT NO.:
866865-2

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Init: Mkaa/Thsv
Order no.: 866865
Appendix: 0

Assigner: Company: Teknologisk Institut
Address: Gregersensvej 1
City: DK-2630 Taastrup

Material: 9 batches of fresh concrete

Sampling: The material for testing was mixed at the Danish Technological Institute and marked:
Mix F1, F2, F3. Date of mixing 2018-12-04.
Mix G1, G2, G3. Date of mixing 2018-12-07
Mix H1, H2, H3. Date of mixing 2018-12-11.

Period: The testing was completed 2018-12-04 – 2018-12-11.

Test method:

DS/EN 12350-2:2012	Testing fresh concrete - Part 2: Slump-test
DS/EN 12350-6:2012	Testing fresh concrete - Part 6: Density
DS/EN 12350-7:2012	Testing fresh concrete - Part 7: Air content - Pressure methods

Results: Result of the test is given on page 2 of this report.

Storage: The tested material will be destroyed after testing unless something else is pre-agreed in writing.

Terms: Accredited testing was carried out in compliance with international requirements (EN/ISO/IEC 17025:2005) and in compliance with Danish Technological Institute's General Terms and Conditions regarding Commissioned Work accepted by Danish Technological Institute. The test results apply to the tested products only. This report may be quoted in extract only if the laboratory has granted its written consent.

Place: Date 2019-04-05, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Martin Kaasgaard

Martin Kaasgaard
Product Manager

Thomas Svensson
Team Manager

ilac-MRA DANAK
Test Reg. no. 2

Remarks to the test results:

Slump test: All perfomed tests were true slump

Air Content and Density: Method of compaction: Vibrating table

Air content: The air contents are measured using the pressure gauge method

Results:

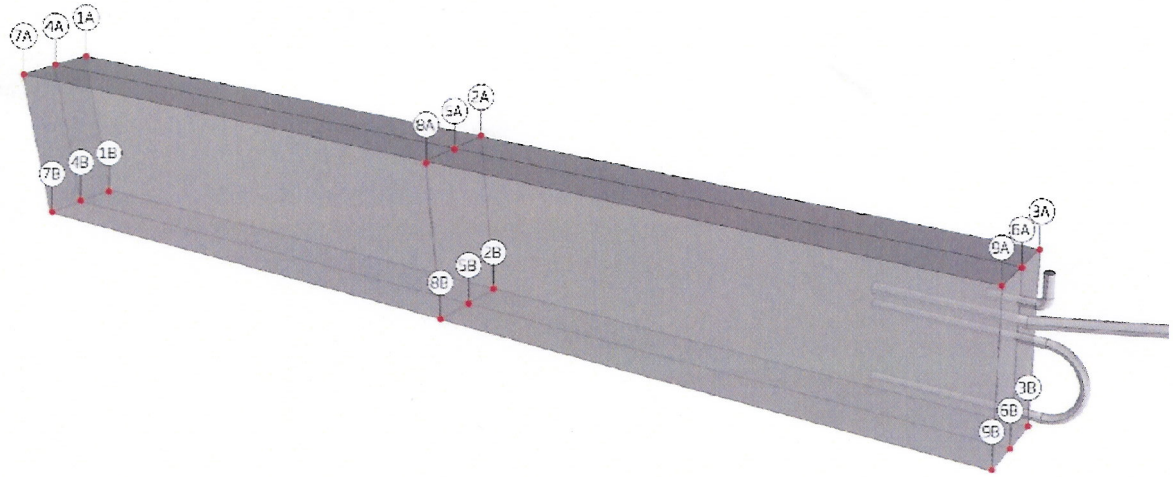
Mix ID	Slump (mm)	Air Content (%)	Density (kg/m^3)
F1	210	5,3	2270
F2	210	4,9	2270
F3	200	4,8	2280
G1	200	5	2320
G2	210	4,4	2330
G3	210	4,7	2320
H1	220	4,3	2330
H2	220	4,8	2320
H3	210	4,5	2330

5.6. Annex 6
Concrete element dimensions

Laboratory sheets with measurements of dimensions of the concrete elements are presented on the following 9 pages.

Concrete beam dimensions verification

Beam ID: F1



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2699

1B - 3B	7B- 9B
2700	2701

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
190	192	190

1B - 7B	2B - 8B	3B - 9B
196	190	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
391	391	392

7A -7B	8A - 8B	9A - 9B
392	391	392

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,2	-0,3	0,0	0,9	0,9	-0,6	-1,5	-1,8	-0,8	-0,8

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,1	-1,2	-0,4	-0,7	-0,8	-1,1	-2,1	-2,8	-2,2	-1,1

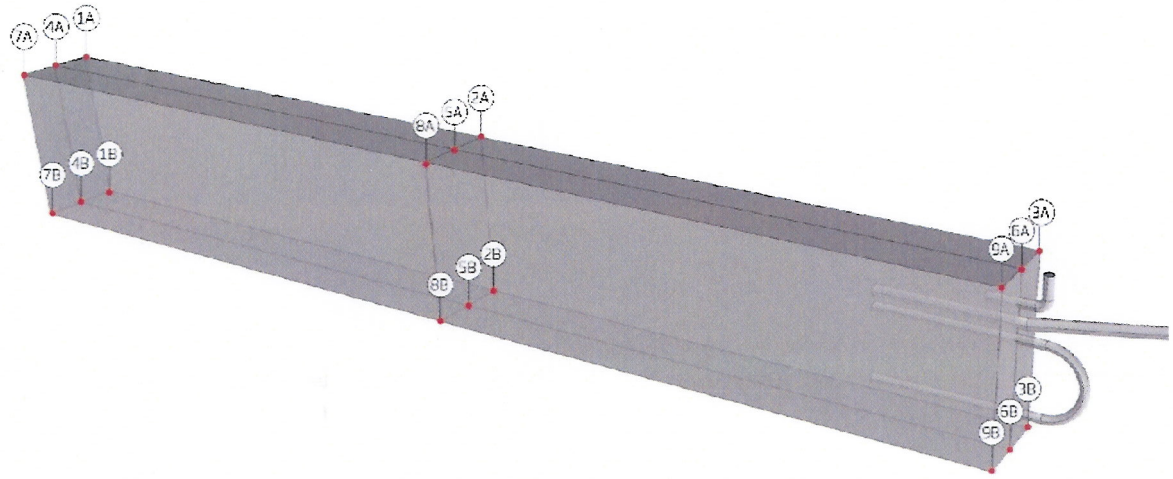
Equipment used: QA 139869, QA 157819, QA 151267 **Photo documentation taken:**

Date: 2018-12-06

Measurement performed by:

Concrete beam dimensions verification

Beam ID: F2



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2701

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	191

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
390	391	391

7A -7B	8A - 8B	9A - 9B
390	391	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,4	0,2	0,4	0,6	0,3	-0,3	-0,1	-0,4	-0,1	-0,5

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-1,0	-1,3	-1,4	-2,0	-2,3	-0,2	-0,8	-1,6	-2,4	-2,2

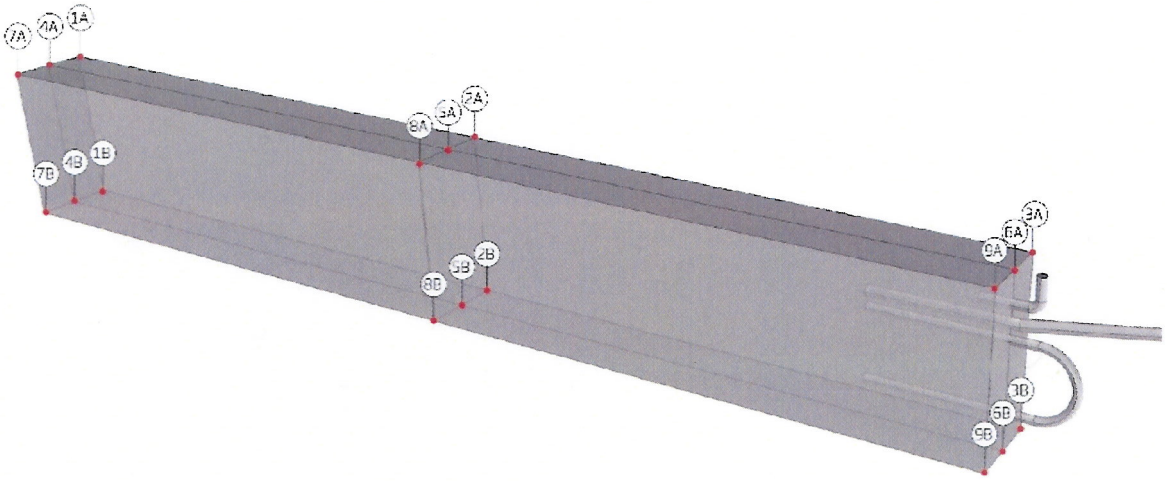
Equipment used: QA 157816 QA 139869, QA 151267 **Photo documentation taken:**

Date: 2018-12-06

Measurement performed by:

Concrete beam dimensions verification

Beam ID: F3.



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2702

1B - 3B	7B- 9B
2699	2699

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	189

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
392	391	393

7A -7B	8A - 8B	9A - 9B
390	390	393

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
-2,0	-3,2	-3,5	-3,1	-2,2	-1,5	-1,6	-1,4	-1,1	-0,8

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,2	0,2	-0,1	-0,7	-0,6	1,8	2,6	2,8	1,8	0,5

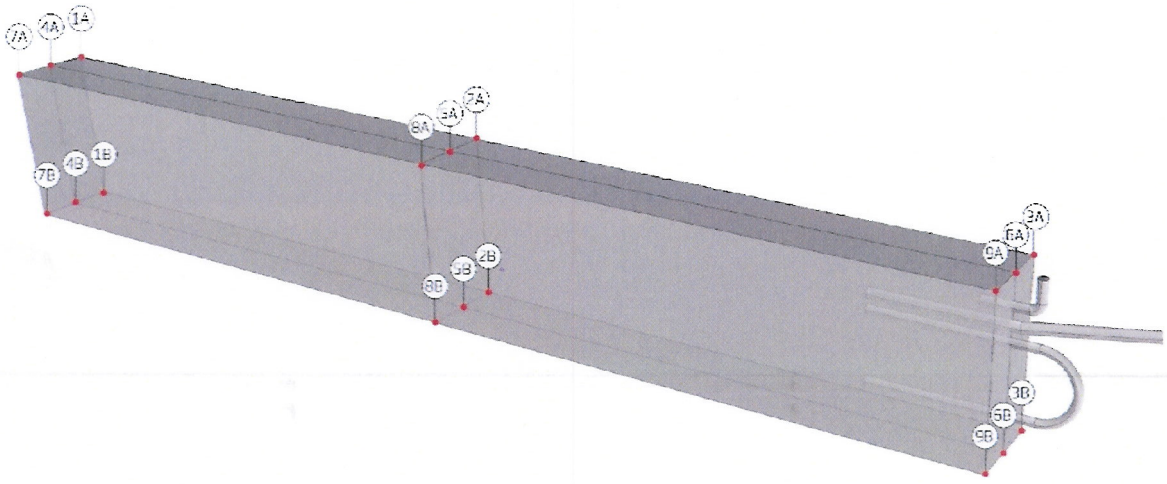
Equipment used: QA 139869, QA51267 QA 157819 **Photo documentation taken:**

Date: 06/12-18

Measurement performed by: Mats Thomsen

Concrete beam dimensions verification

Beam ID: G1



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2698	2698

1B - 3B	7B- 9B
2700	2689

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
191	~~192~~ 191	191

1B - 7B	2B - 8B	3B - 9B
190	~~192~~ 189	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
391	392	392

7A -7B	8A - 8B	9A - 9B
391	392	391

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,1	-1,1	-1,2	-1,8	-2,1	-0,5	-1,0	+1,0	0,5	0,3

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-1,1	-1,1	-0,1	-0,4	-0,4	-1,2	-1,8	-1,8	-1,8	-1,1

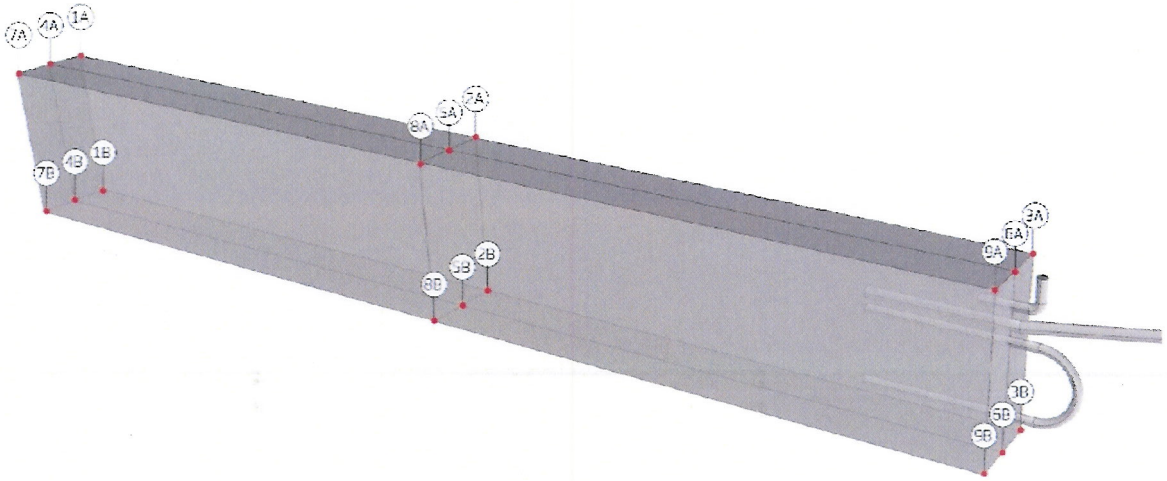
Equipment used: QA 139869, QA 151267, QA 157819 **Photo documentation taken:**

Date: 2018-12-10

Measurement performed by:

Concrete beam dimensions verification

Beam ID: G2



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2698	2698

1B - 3B	7B- 9B
2701	2700

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
190	190	189

1B - 7B	2B - 8B	3B - 9B
190	191	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
392	393	391

7A -7B	8A - 8B	9A - 9B
392	394	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,5	-0,6	-0,8	-1,6	-1,6	-0,9	-1,2	-1,3	-1,7	-1,5

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,7	-0,6	0,1	-0,6	-0,6	0,9	0,3	0,5	-0,6	-0,8

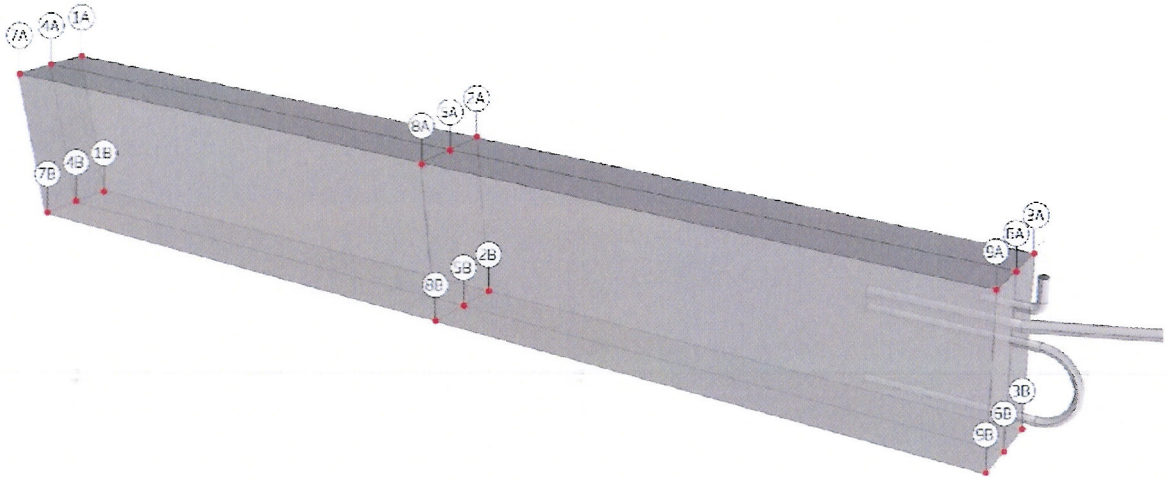
Equipment used: QA139869, QA157819 **Photo documentation taken:** QA159267

Date: 2018-12-10

Measurement performed by:

Concrete beam dimensions verification

Beam ID: G3.



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2699

1B - 3B	7B- 9B
2700	2700

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
189	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
391	390	390

7A -7B	8A - 8B	9A - 9B
389	389	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,8	-1,4	-1,1	-2,2	-1,3	-0,7	-1,2	-1,2	-2,3	-2,2

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,6	-1,0	-1,0	-0,4	-0,3	0,5	-0,2	-0,3	0,0	-0,2

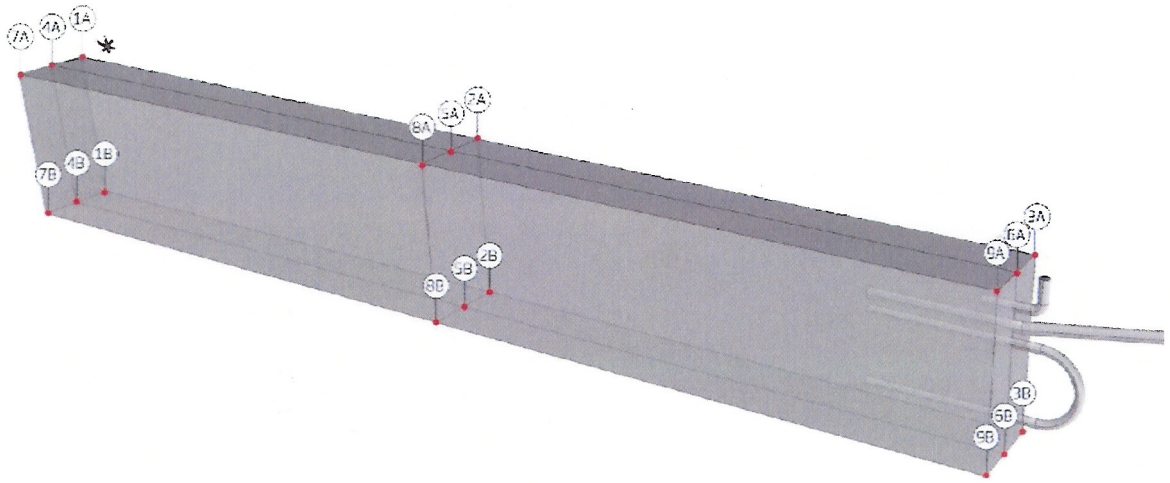
Equipment used: QA 139869, QA 157819 **Photo documentation taken:** QA 151267

Date: 2018-12-10

Measurement performed by:

Concrete beam dimensions verification

Beam ID: H1.



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2700

1B - 3B	7B- 9B
2704	2704

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
190	191	190

1B - 7B	2B - 8B	3B - 9B
190	191	189

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
391	390	390

7A -7B	8A - 8B	9A - 9B
392	392	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,6	0,4	0,4	1,0	0,3	0,1	-0,3	-0,3	-0,3	-0,5

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,8	-1,6	-2,7	-2,3	-1,8	-1,1	-1,4	-2,2	-1,4	-1,5

Equipment used: QA 139869 QA 157819 QA 151267

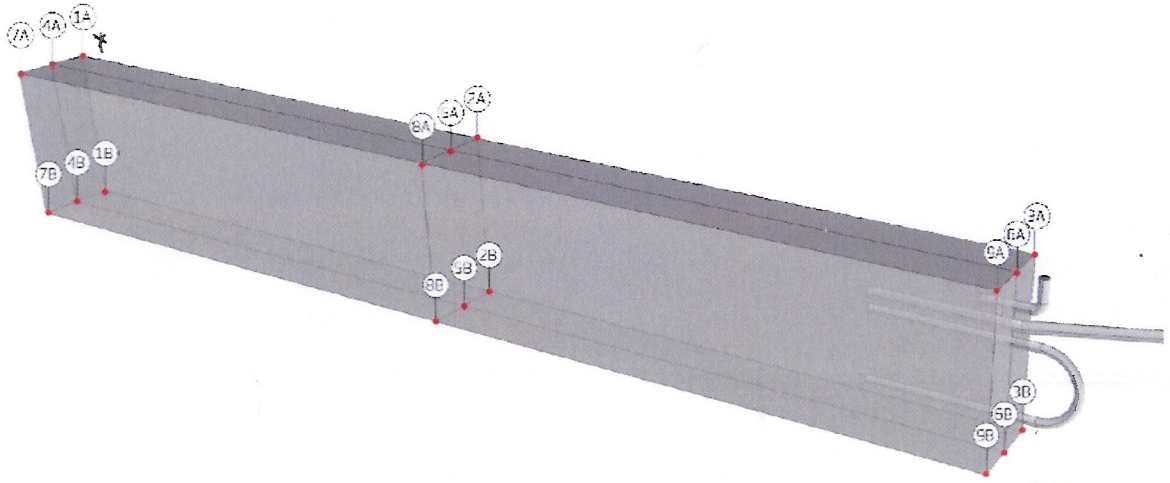
Photo documentation taken:

Date: 2018-12-13

Measurement performed by:

Concrete beam dimensions verification

Beam ID: H2



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2700	2706

1B - 3B	7B- 9B
2704	2705

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
189	190	190

1B - 7B	2B - 8B	3B - 9B
190	192	191

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
390	389	390

7A -7B	8A - 8B	9A - 9B
388	388	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,2	-0,3	-0,6	-1,6	-1,8	1,1	1,6	0,3	-0,8	-1,3

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
0,1	0,7	-0,2	0,3	-0,3	-1,8	-1,5	-2,2	-1,5	-1,3

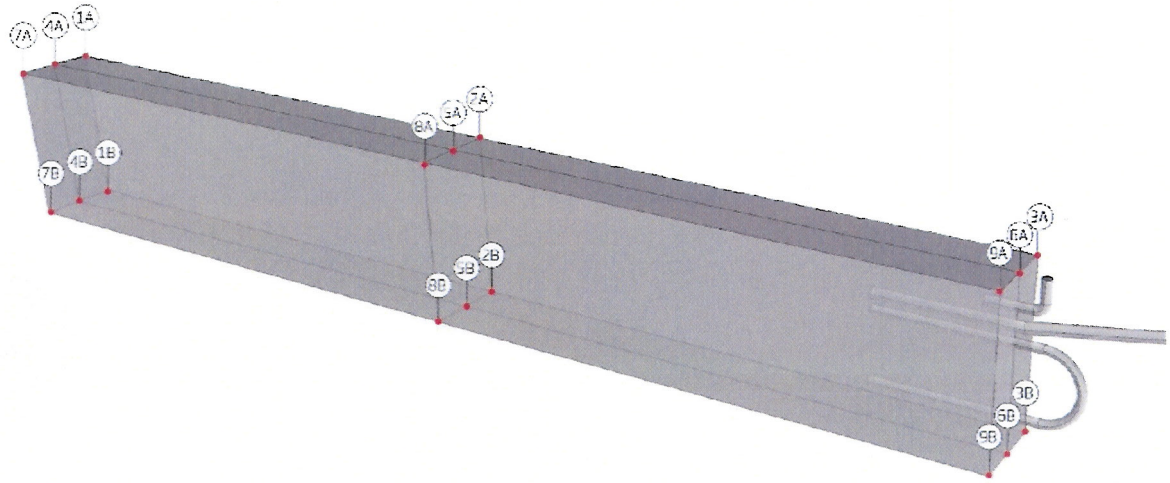
Equipment used: QA 157819, QA 151267, QA 139869 **Photo documentation taken:**

Date: 2018-12-13

Measurement performed by:

Concrete beam dimensions verification

Beam ID: H3



Dimensionns, cross section:

Beam length: (2700 ± 5 mm.)

1A - 3A	7A - 9A
2698	2700

1B - 3B	7B- 9B
2701	2700

Beam width: (190 ± 5 mm.)

1A - 7A	2A - 8A	3A - 9A
191	190	190

1B - 7B	2B - 8B	3B - 9B
190	190	190

Beam hight: (390 ± 5 mm.)

1A -1B	2A - 2B	3A - 3B
391	390	390

7A -7B	8A - 8B	9A - 9B
392	390	390

Verticality: (Total ± 5 mm.) Concave +

1A - 3B, Diff.					1B - 3A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,7	-0,2	0,4	0,3	-0,6	-0,1	0,4	0,5	0,4	-0,3

7A - 9B, Diff.					7B - 9A, Diff.				
1	2	3	4	5	1	2	3	4	5
-0,4	-1,3	-2,2	-2,2	-1,1	-1,4	-1,8	-2,5	-2,0	-1,1

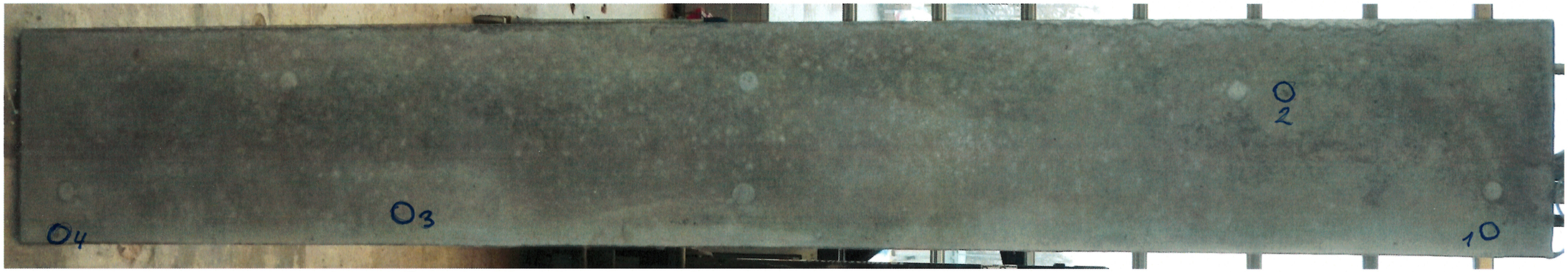
Equipment used: QA 157819, QA 139869, QA 151267 **Photo documentation taken:**

Date: 2018-12-13

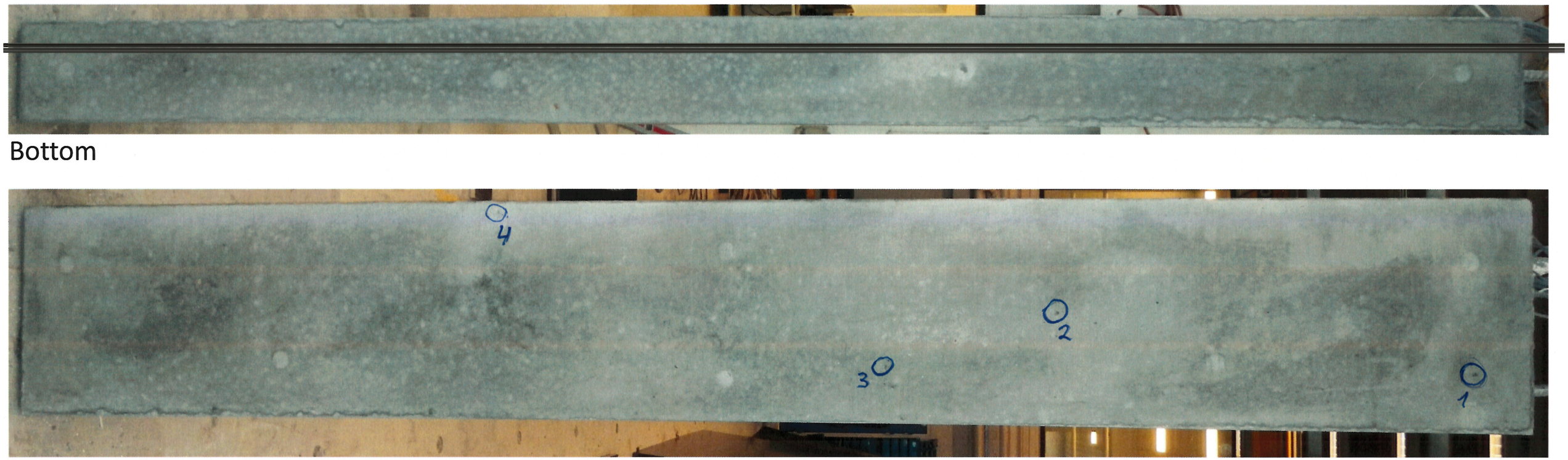
Measurement performed by:

5.7. Annex 7
Concrete element surface appearance

Photographic documentation with measurements of bug hole sizes are presented at the following 18 pages.



Face B 1: 6,4×6,0 2: 12,6×4,5 3: 6,7×5,5 4: 15,1×9,5



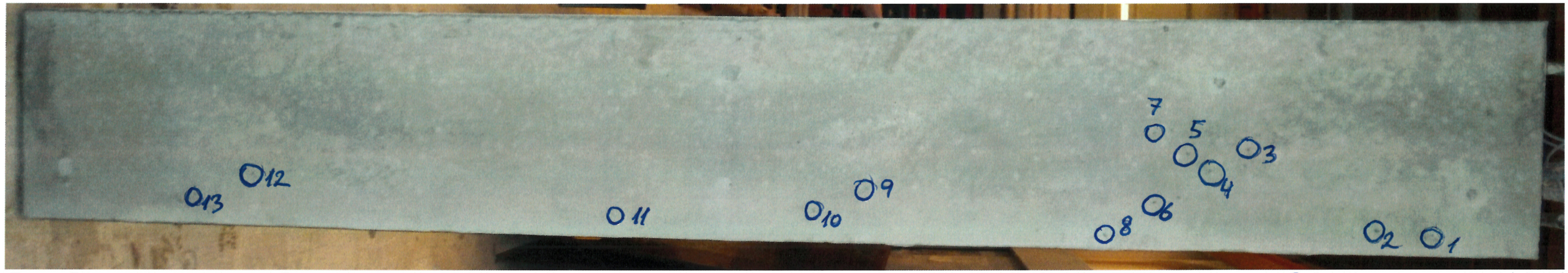
Bottom

Face A 1: 7,0×5,3 2: 9,1×5,2 3: 6,9×3,8
4: 8,5×5,1

Element F-1

2018-12-06

FOE/HKS

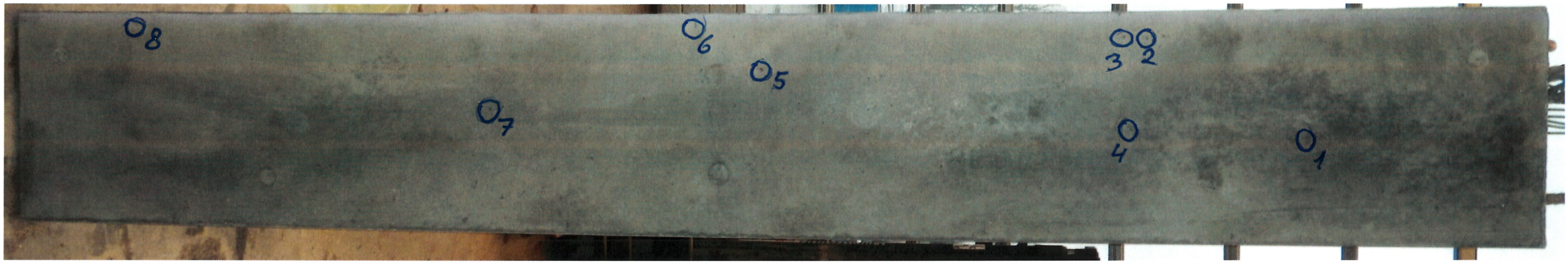


Face B

1: 8,7 × 7,0 | 2: 7,0 × 4,7 | 3: 6,6 × 4,5 | 4: 5,7 × 4,2 | 5: 5,5 × 4,8 | 6: 5,2 × 3,8 | 7: 6,6 × 3,7 | 8: 9,4 × 4,2 | 9: 7,2 × 2,8 | 10: 8,0 × 4,3

11: 9,4 × 3,9 | 12: 5,7 × 3,5 | 13: 5,6 × 4,6

Bottom



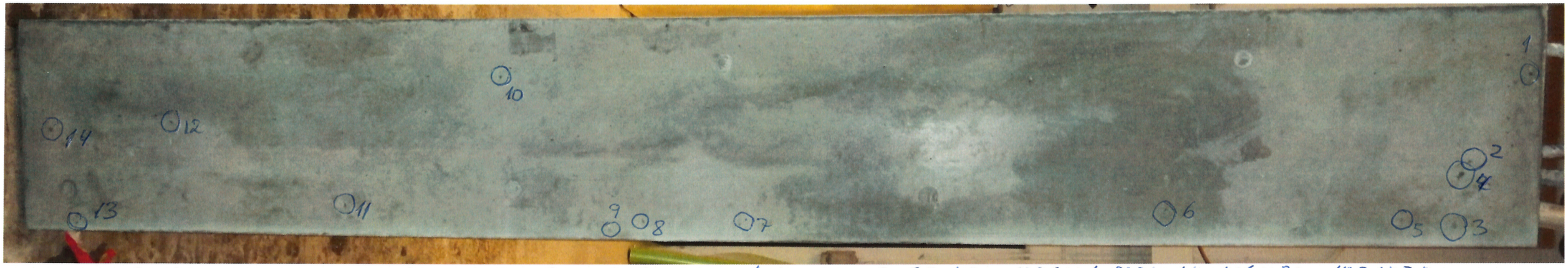
Face A

1: 6,3 × 3,5 | 2: 5,7 × 4,6 | 3: 6,2 × 4,4 | 4: 6,3 × 3,7 | 5: 7,1 × 5,3 | 6: 8,2 × 4,2 | 7: 6,0 × 5,1 | 8: 6,5 × 2,0

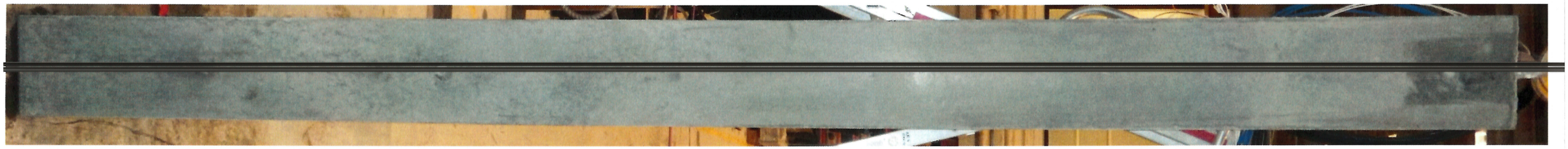
Element F-2

2018-12-06

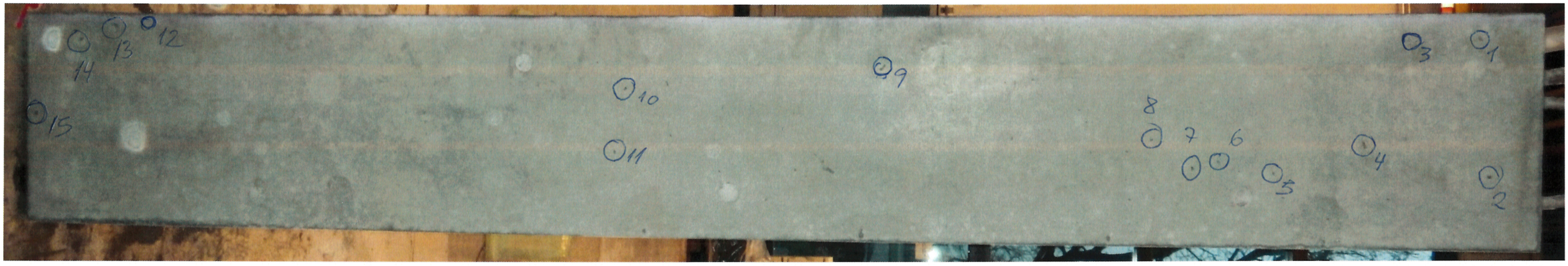
MOT / HKS



Face B 1: 5,8 × 3,9 2: 6,8 × 4,0 3: 9,8 × 7,4 4: 17,1 × 7,2 5: 5,3 × 3,9 6: 11,1 × 3,4 7: 5,5 × 4,9 8: 8,5 × 4,1 9: 8,4 × 6,4 10: 6,0 × 3,7 11: 8,1 × 3,8
12: 6,9 × 4,5 13: 8,9 × 6,0 14: 8,9 × 5,5



Bottom



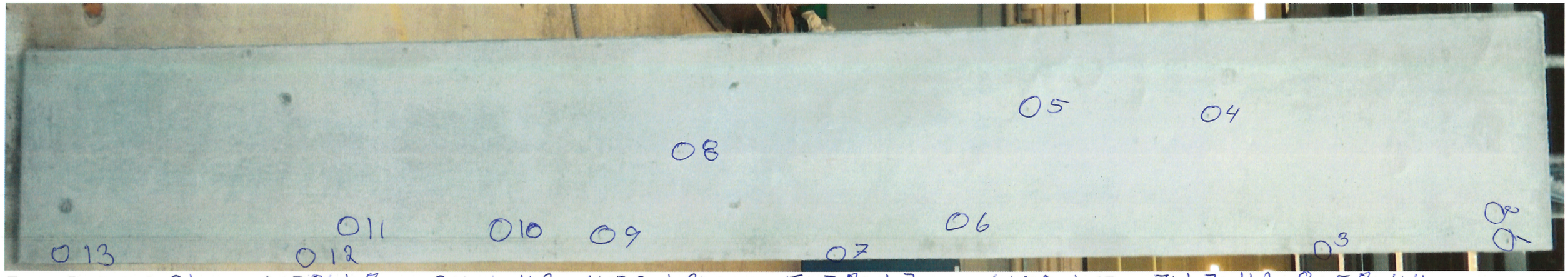
Face A 1: 8,7 × 5,1 2: 6,7 × 5,8 3: 7,8 × 2,7 4: 12,2 × 3,6
9: 13,1 × 4,4 10: 8,0 × 3,8 11: 6,9 × 4,1 12: 5,9 × 5,4

Element F-3

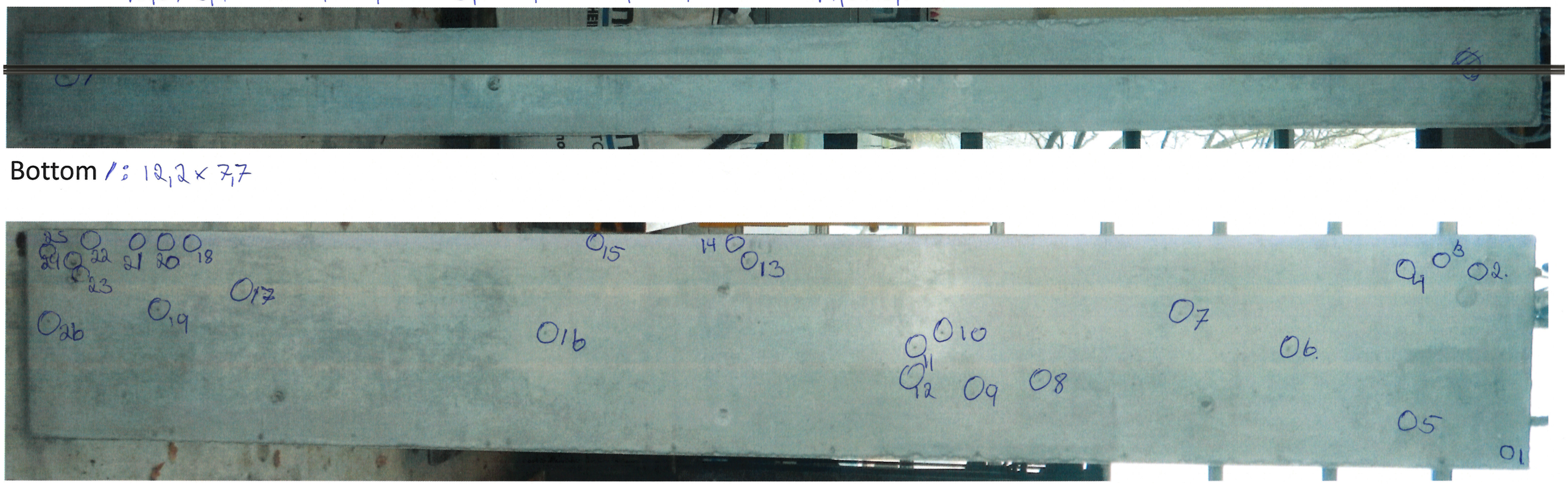
5: 7,2 × 3,7 6: 7,2 × 2,3 7: 7,1 × 3,3 8: 5,5 × 4,3
13: 20,3 × 8,7 14: 14,5 × 6,6 15: 10,1 × 4,8

2018-12-06 MOT / MKS

2018-12-10 FOE/HKS



Face B 1: 11,3×5,6 2: 7,8×6,8 3: 10,1×4,3 4: 7,2×6,3 5: 7,8×6,7 6: 5,9×6,5 7: 6,7×4,2 8: 5,8×4,4
9: 10,5×3,9 10: 10,1×6,1 11: 5,8×5,0 12: 11,4×4,0 13: 14,0×6,6

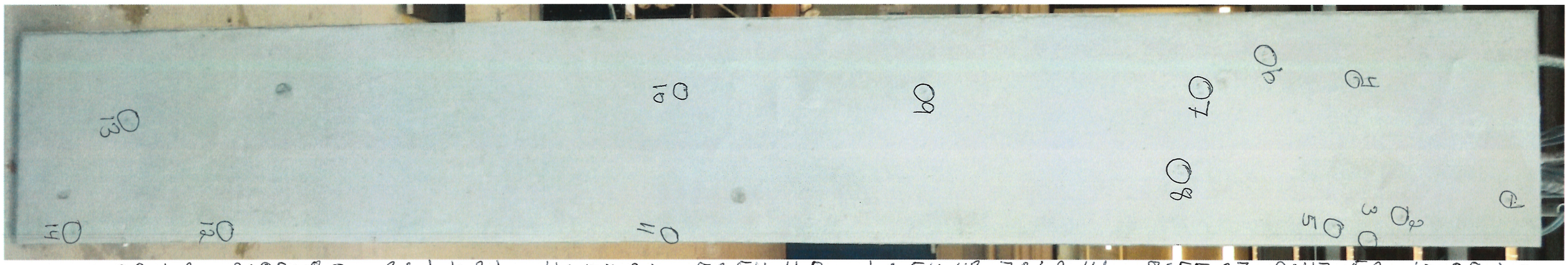


Face A

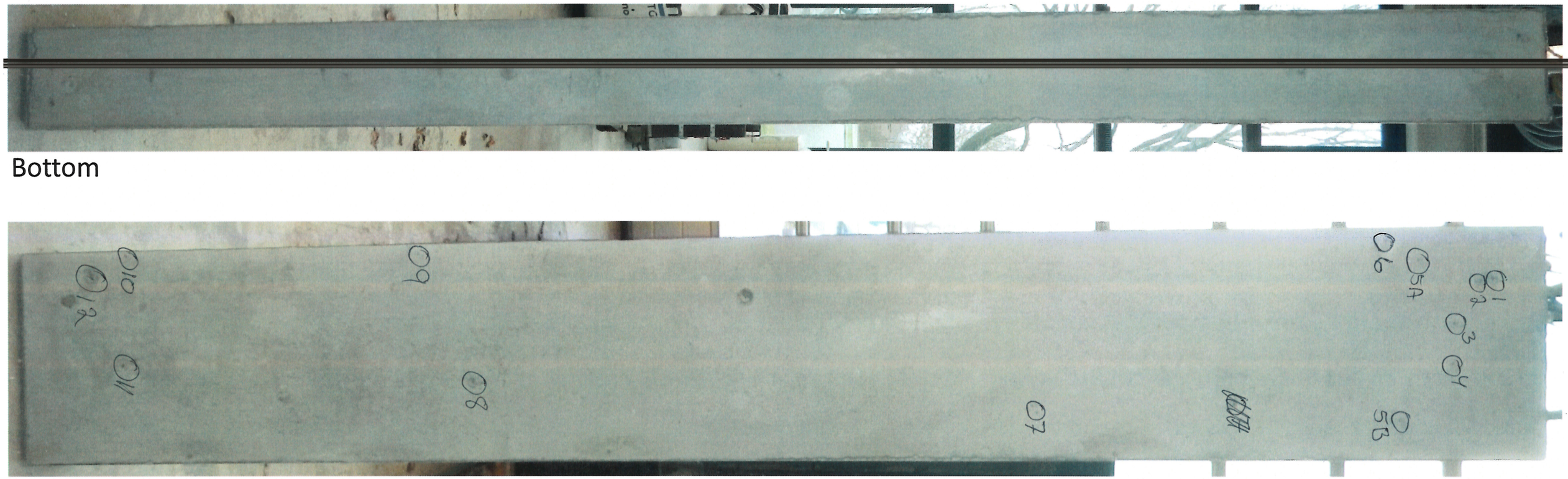
Element G-1

1: 5,3×4,5 2: 18,6×8,6 3: 14,1×10,9 4: 6,1×4,6 5: 6,5×5,4 6: 9,4×5,5 7: 6,7×5,3 8: 5,4×4,7 9: 8,2×4,8
10: 8,3×6,0 11: 5,7×3,9 12: 7,1×4,8 13: 12,6×8,5 14: 8,3×5,9 15: 10,7×6,5 16: 7,2×4,3 17: 6,9×4,9 18: 7,8×5,9
19: 5,5×5,3 20: 6,3×6,1 24: 9,8×8,0 22: 10,8×7,7 23: 13,4×13,9 24: 12,0×12,8 25: 5,4×4,4 26: 6,4×3,1

2018 -12-10 FOE / HKS



Face B 1: 9,8×6,3 2: 8,8×8,0 3: 6,1×3,6 4: 5,8×2,6 5: 5,4×4,8 6: 5,4×4,3 7: 6,2×4,6 8: 5,5×3,7 9: 4,7×5,2 10: 9,9×6,0
11: 9,9×4,2 12: 9,6×7,6 13: 8,2×7,4 14: 10,5×6,9

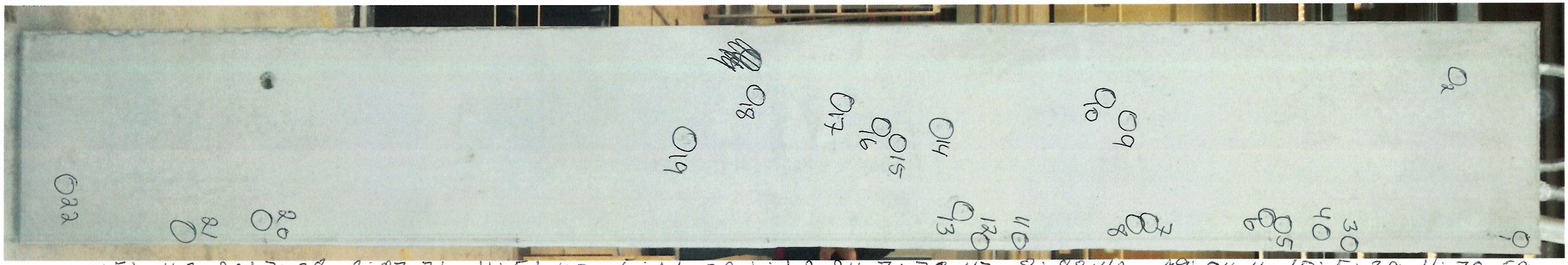


Bottom

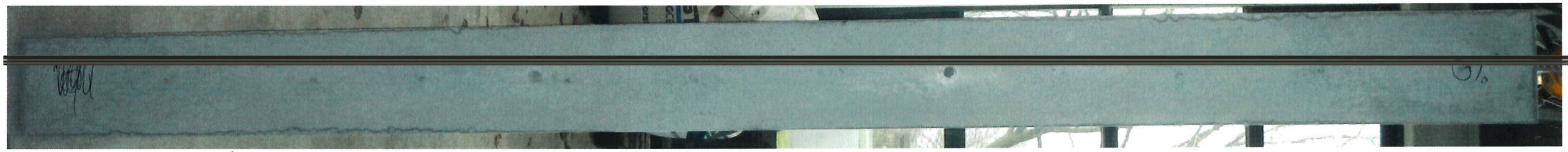
Face A 1: 8,8×4,9 2: 11,1×10,6 3: 5,8×5,5 4: 6,9×4,1
10: 7,7×7,6 11: 6,3×7,4 12: 19,9×13,5

Element G-2
5A: 6,8×3,7 6: 6,9×5,0 7: 6,2×4,1 8: 8,4×5,2 9: 7,0×2,9
5B: 5,6×4,8

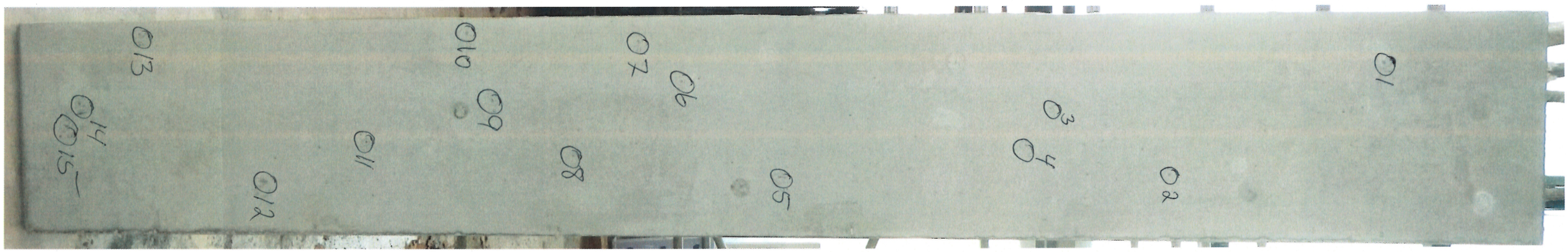
2018-12-10 FOE / HKS



Face B 1: 5,6×4,3 2: 6,7×3,8 3: 8,7×7,6 4: 5,1×4,0 5: 6,6×3,9 6: 6,2×2,4 7: 7,8×4,7 8: 8,8×4,2 9: 9,4×4,0 10: 5,1×3,9 11: 7,9×5,9
12: 6,9×4,8 13: 9,5×4,4 14: 7,0×5,2 15: 7,7×3,9 16. 4,8×4,6 17: 11,5×4,6 18: 6,6×4,6 19: 6,6×6,2 20: 14,7×6,0 21: 5,6×5,0 22: 5,2×4,7



Bottom 1: 9,5×5,4



Face A

1: 8,3×4,0 2: 5,3×4,0 3: 5,5×3,1 4: 6,4×3,7 5: 5,1×3,4

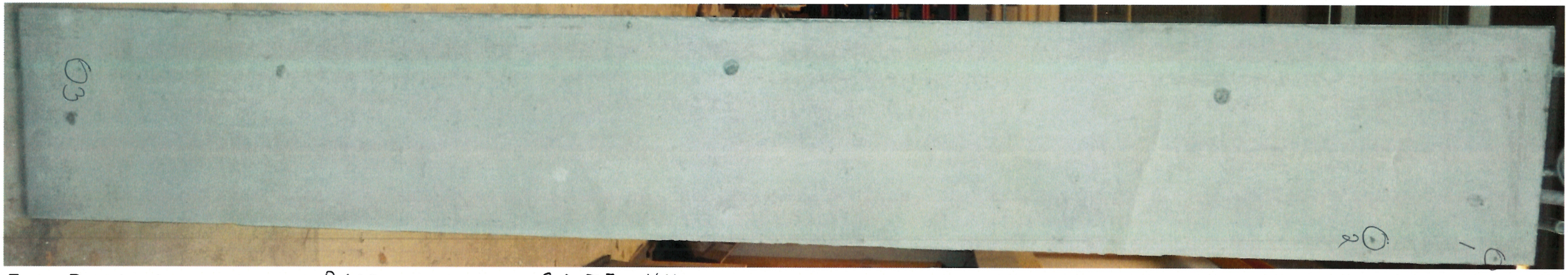
11: 4,9×4,8 12: 6,1×3,3 / 3: 4,7×4,6 / 4: 4,9×4,6

Element G-3

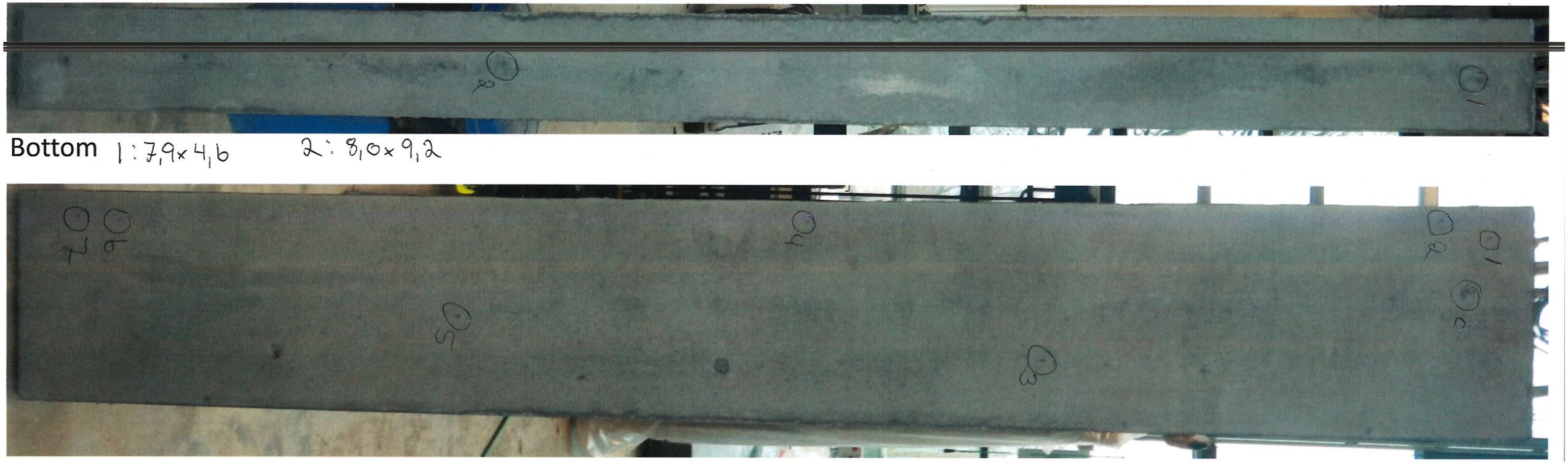
6: 5,0×4,3 7: 4,3×4,5 8: 4,5×3,8 9: 7,6×4,7 10: 9,3×5,6

15: 8,2×4,3

2018 - 12 - 13 FOE / HKS



Face B 1: 8,1 × 6,2 2: 13,4 × 7,8 3: 5,7 × 4,4



Bottom 1: 7,9 × 4,6 2: 8,0 × 9,2

Face A

1: 6,6 × 5,0 2: 10,2 × 7,6 3: 6,1 × 4,9 4: 8,1 × 3,8

0: 8,9 × 6,0

Element H-1

5: 7,2 × 5,6 6: 5,7 × 3,6 7: 7,6 × 5,5

2018 - 12 - 13 FOE / HKS

Face B

1: 19,1 × 17,3 (8,9)
2: 15,2 × 9,3 (6,4)
3: 8,2 × 6,9
4: 7,5 × 5,7
5: 8,4 × 5,7
6: 10,4 × 5,9 (3,0)
7: 7,4 × 6,1
8: 10,4 × 6,4
9: 14,8 × 6 (2,4)
10: 17,7 × 7,0 (3,2)
11: 7,2 × 6,0
12: 15,8 × 6,7 (4,8)
13: 7,9 × 5,5
14: 6,6 × 5,8
15: 6,2 × 5,0
16: 8,2 × 6,8

Bottom

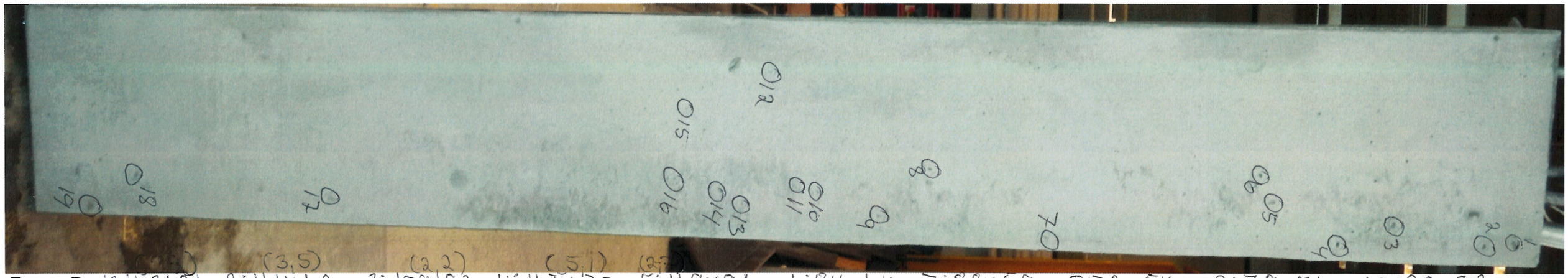
Face A

1: 15,1 × 10,3 (2,5)
2: 11,0 × 7,1 (3,2)
3: 9,9 × 7,2
4: 8,9 × 5,6
5: 10,8 × 5,8 (3,9)

Element H-2

6: 8,0 × 5,3
7: 9,5 × 5,2
8: 9,7 × 5,5
9: 8,3 × 6,5
10: 11,2 × 8,0 (1,6)

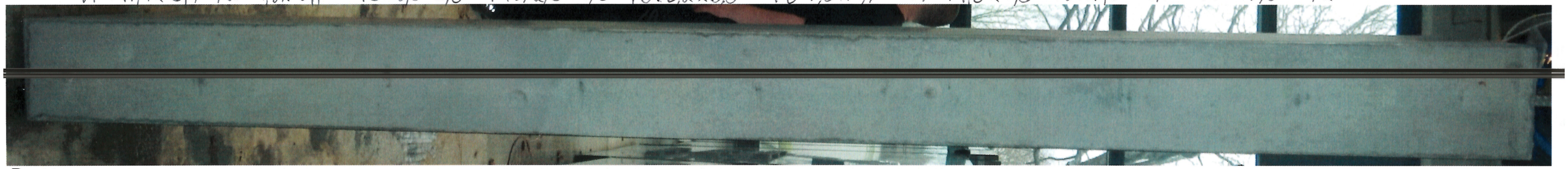
2018-12-13 FOE/HKS



Face B

1: 16,3×9,6 (1,3) 2: 11,1×6,2 (3,5) 3: 10,9×9,2 (2,2) 4: 16,5×7,0 (5,1) 5: 11,9×9,1 (2,7) 6: 8,4×6,4 7: 8,8×5,9 8: 7,2×5,4 9: 7,9×5,1 10: 9,9×3,2

11: 11,4×5,9 12: 4,8×6,1 13: 8,3×5,6 (2,6) 14: 12,3×4,0 15: 6,2×3,5 16: 7,5×4,4 (3,2) 17: 14,6×7,5 (1,8) 18: 10,0×8,1 (4,9) 19: 17,5×11,2



Bottom

Face A

Element H-3

1: 8,8×4,7 2: 9,9×7,8 3: 9,1×5,9 4: 7,5×8,0 5: 9,8×5,5 6: 7,4×7,4 (3,8) 7: 12,2×6,8 8: 7,7×9,9 9: 7,8×5,9 10: 8,2×8,2

(4,5) 11: 12,5×6,0 12: 6,3×5,0 (2,7) 13: 11,4×6,9 14: 7,5×5,0 15: 7,4×4,3 16: 9,7×6,7 17: 6,5×4,0 (5,8) 18: 15,5×5,2 (3,8) 19: 6,8×4,4 20: 7,0×5,2

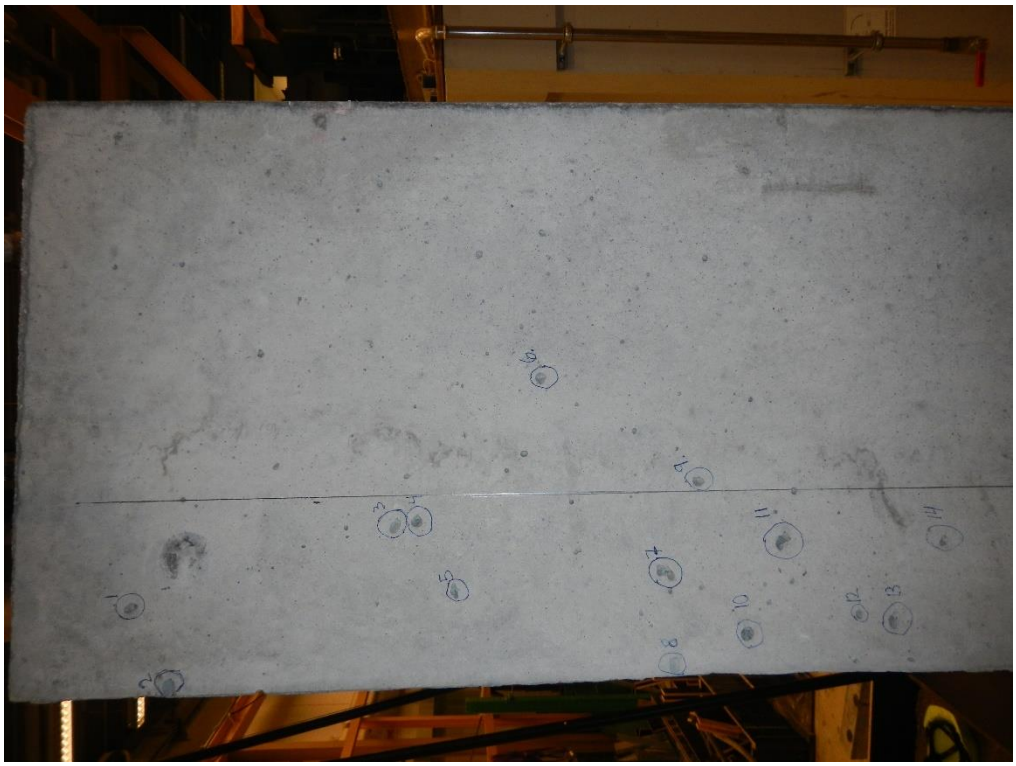
21: 7,2×4,2 22: 11,5×5,0 23: 7,6×4,6 24: 7,7×3,9 25: 8,6×4,3 26: 6,8×5,0 27: 9,1×7,0 28: 14,8×5,3 29: 9,7×6,8

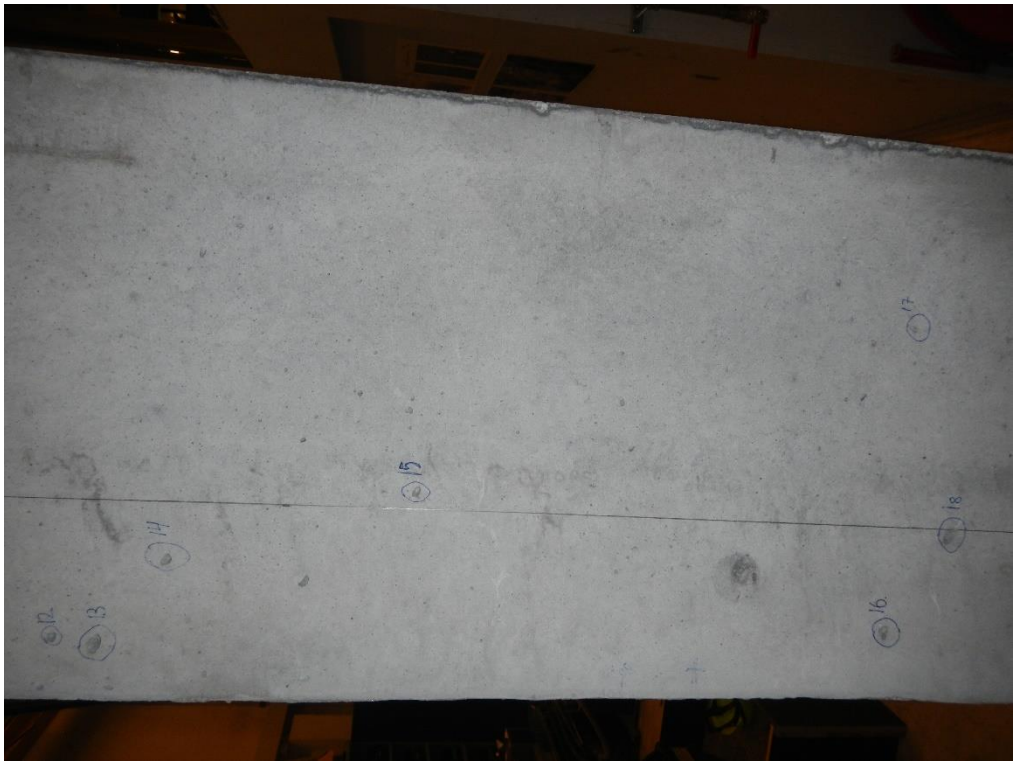
Element H3 – Face A

Table H3-A. Bug holes in the formed faces of element H3. ">10mm" refers to holes with smallest dimension larger than 10mm. "5-10mm" refers to holes with smallest dimension between 5-10mm. "Distance" is the distance from the bug hole to the surface position right above the working electrode with 16mm cover. Bug holes with yellow marking has been sealed with epoxy.

Bug hole ID	H3 Bug holes - face A					
	Measures values [mm]				Category	
	Length	Width	Depth	Distance	>10mm	5-10mm
1	8.8	4.7	3.6	63		
2	9.9	7.8	4.5	111		X
3	9.1	5.9	2.5	14		X
4	8.0	7.5	3.5	13		X
5	9.8	5.5	3.6	57		X
6	7.4	7.4	2.9	72		X
7	12.2	6.8	5.7	48		X
8	9.9	7.7	1.8	107		X
9	7.8	5.9	3.3	3		X
10	8.2	8.2	6.4	89		X
11	12.5	6.0	5.0	29		X
12	6.3	5.0	3.2	79		X
13	11.4	6.9	4.2	81		X
14	7.5	5.0	3.1	32		X
15	7.4	4.3	3.4	8		
16	9.7	6.7	5.6	68		X
17	6.5	4.0	2.5	136		
18	15.5	5.2	4.8	0		X
19	6.8	4.4	2.5	83		
20	7.0	5.2	2.4	53		X
21	7.2	4.2	3.7	90		
22	11.5	5.0	3.2	6		X
23	7.6	4.6	3.1	140		
24	7.7	3.9	2.0	97		
25	8.6	4.3	3.2	61		
26	6.8	5.0	1.8	107		X
27	9.1	7.0	2.9	84		X
28	14.8	5.3	3.6	101		X
29	9.7	6.8	5.7	53		X

Position of working electrodes with 16mm cover is shown by grey line.




12
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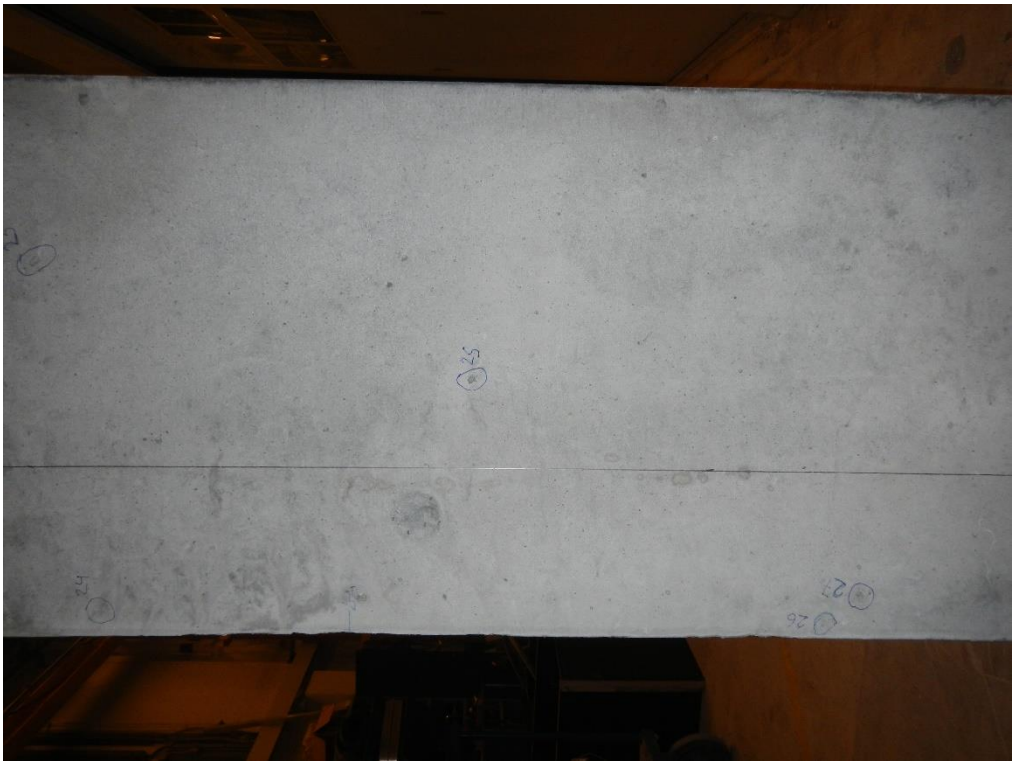
18


24
25
26
27

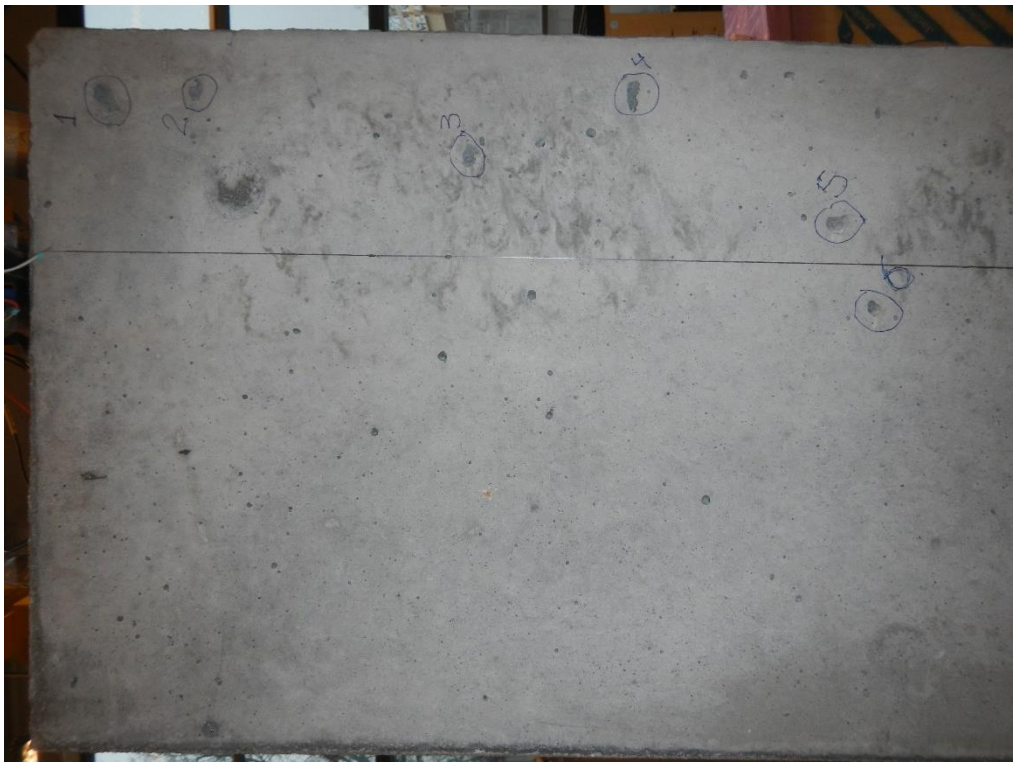
Element H3 – Face B

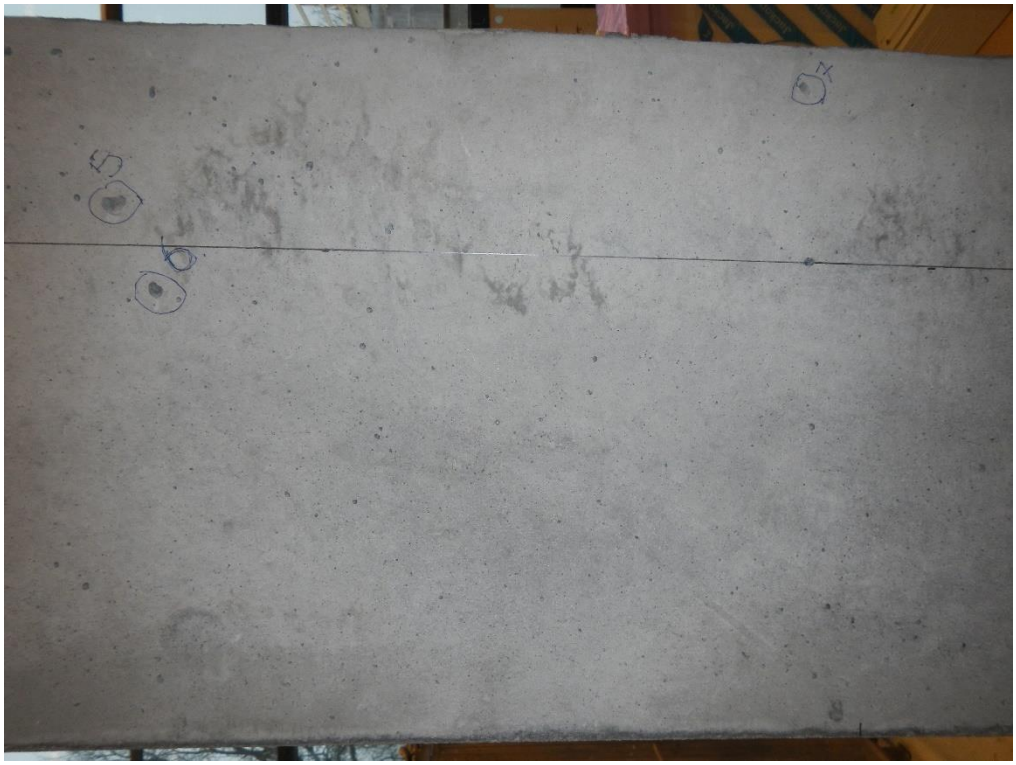
Table H3-B. Bug holes in the formed faces of element H3. ">10mm" refers to holes with smallest dimension larger than 10mm. "5-10mm" refers to holes with smallest dimension between 5-10mm. "Distance" is the distance from the bug hole to the surface position right above the working electrode with 16mm cover. Bug holes with yellow marking has been sealed with epoxy.

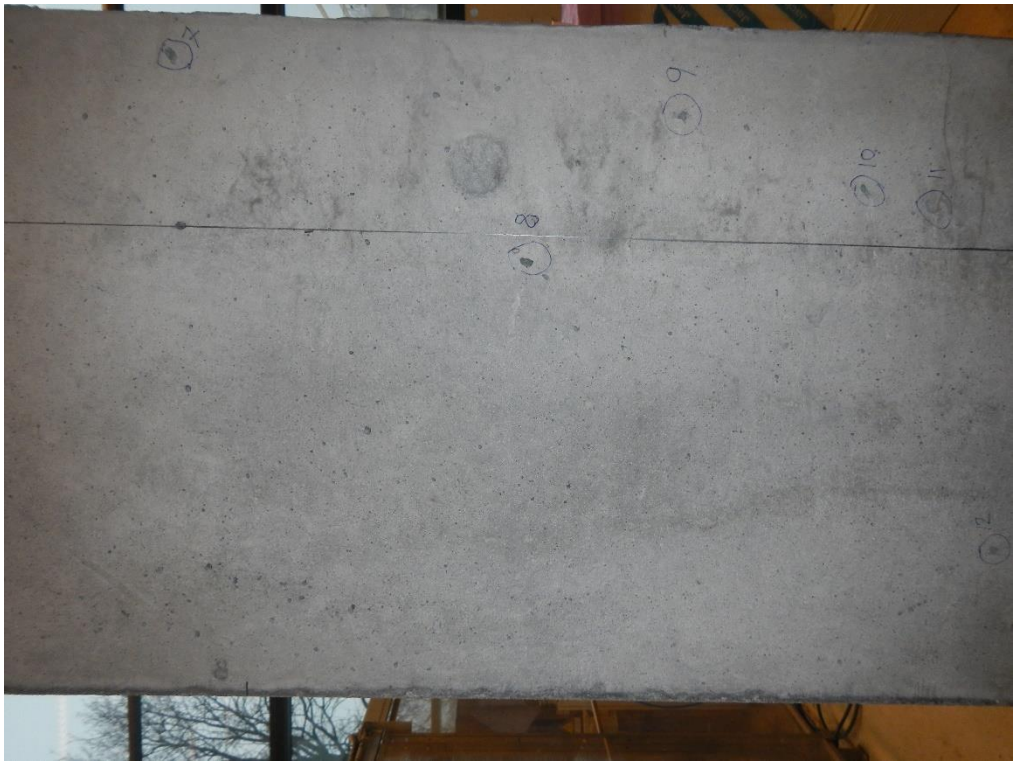
Bug hole ID	H3 Bug holes - face B					
	Measured values [mm]				Category	
	Length	Width	Depth	Distance	>10mm	5-10mm
1	16.3	9.6	4.0	74		X
2	11.1	6.2	3.5	80		X
3	10.9	9.2	3.9	49		X
4	16.5	7.0	5.2	79		X
5	11.9	9.1	2.7	16		X
6	8.4	6.4	4.5	20		X
7	8.8	5.9	2.8	91		X
8	7.2	5.4	5.1	13		X
9	7.9	5.1	3.5	69		X
10	9.9	3.2	2.3	26		
11	11.4	5.9	2.6	19		X
12	6.1	4.8	1.5	174		
13	8.3	5.6	2.9	50		X
14	12.3	4.0	2.4	28		
15	6.2	3.5	1.0	106		
16	7.5	4.4	2.0	12		
17	14.6	7.5	4.1	68		X
18	11.0	8.1	4.2	35		X
19	17.5	11.2	5.7	90	X	

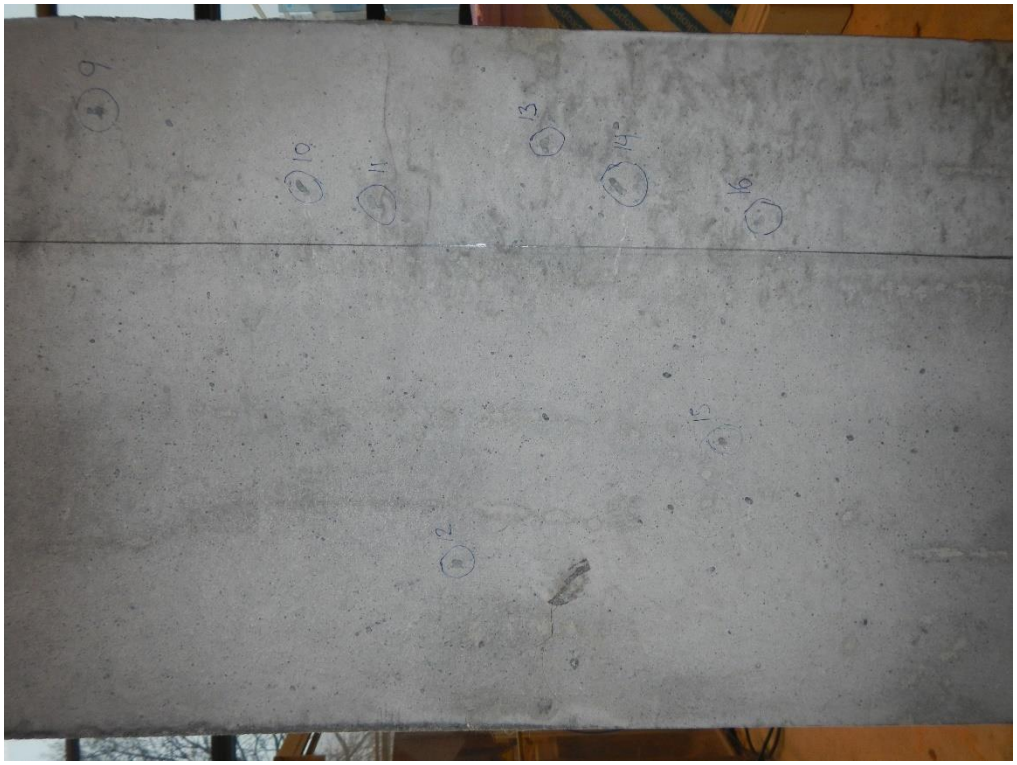
Photos of H3 – face B

Position of working electrodes with 16mm cover is shown by grey line.

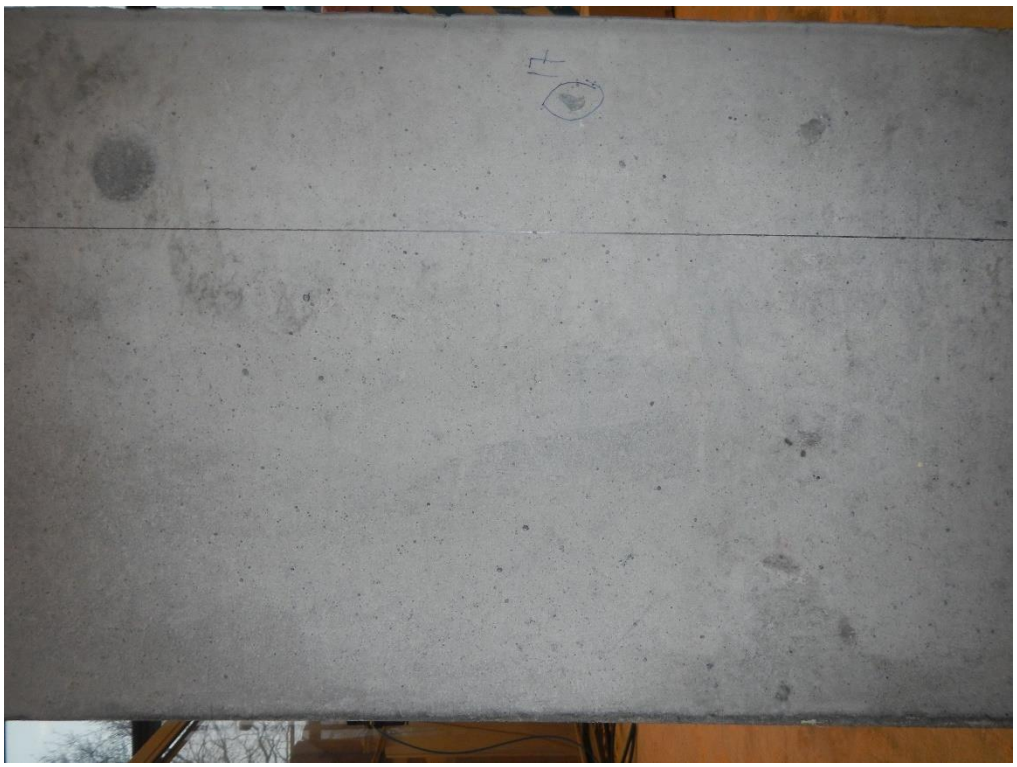







9
10
11
13
14
16
15
12


16

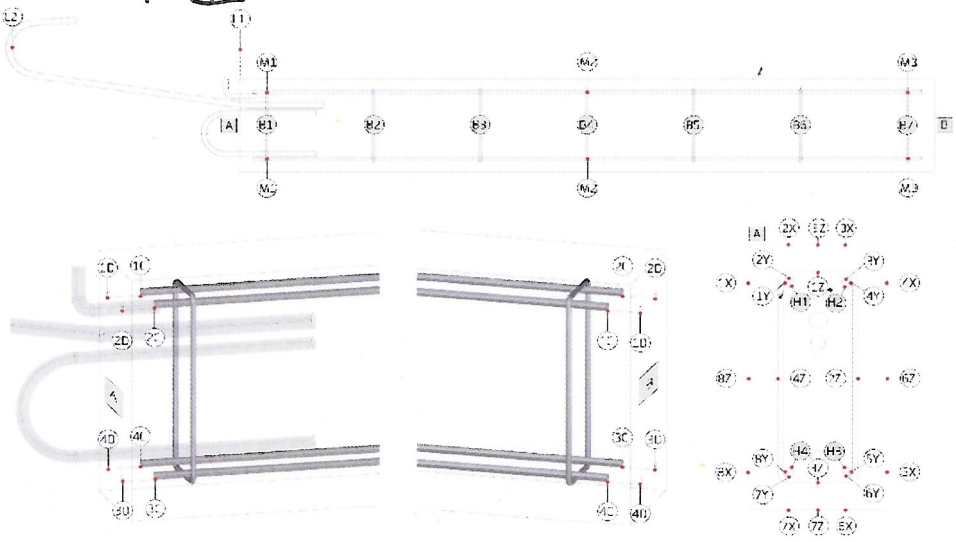


5.8. Annex 8
Concrete cover to reinforcement and working electrodes

Laboratory sheets with covermeter measurements of concrete cover to reinforcement and working electrodes are presented on the following 12 pages.

Cover verification (beam)

Beam ID: F9



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	53
	2X-2Y	52
H2	3X-3Y	53
	4X-4Y	51
H3	5X-5Y	50
	6X-6Y	53
H4	7X-7Y	54
	8X-8Y	51

M2-M3		
H1	1X-1Y	53
	2X-2Y	48
H2	3X-3Y	48
	4X-4Y	52
H3	5X-5Y	53
	6X-6Y	54
H4	7X-7Y	55
	8X-8Y	51

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	41
2Z-6Z	42
3Z-7Z	38
4Z-8Z	41

B4	
1Z-5Z	38
2Z-6Z	43
3Z-7Z	40
4Z-8Z	43

B7	
1Z-5Z	39
2Z-6Z	41
3Z-7Z	41
4Z-8Z	43

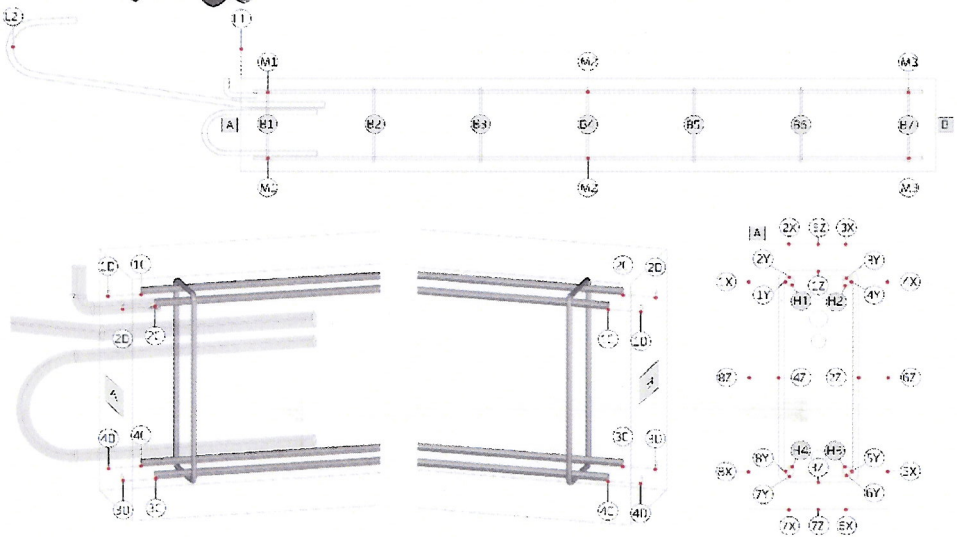
Equipment used: PROFOMETER 5, PROCEQ

Date: 2018-12-06

Measurement performed by:

Cover verification (beam)

Beam ID: F2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	52
	2X-2Y	50
H2	3X-3Y	49
	4X-4Y	52
H3	5X-5Y	51
	6X-6Y	53
H4	7X-7Y	53
	8X-8Y	52

M2-M3		
H1	1X-1Y	52
	2X-2Y	50
H2	3X-3Y	50
	4X-4Y	52
H3	5X-5Y	51
	6X-6Y	52
H4	7X-7Y	53
	8X-8Y	51

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	36
2Z-6Z	41
3Z-7Z	39
4Z-8Z	40

B4	
1Z-5Z	39
2Z-6Z	42
3Z-7Z	39
4Z-8Z	42

B7	
1Z-5Z	37
2Z-6Z	40
3Z-7Z	37
4Z-8Z	41

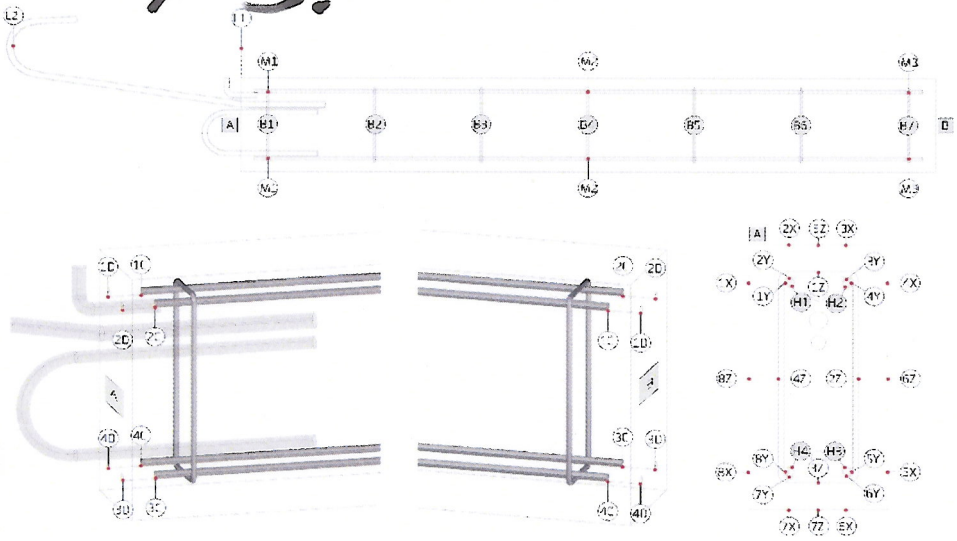
Equipment used: PROFOMETER 5, PROCEQ

Date: 2018-12-06

Measurement performed by:

Cover verification (beam)

Beam ID: F3.



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	49
	2X-2Y	48
H2	3X-3Y	49
	4X-4Y	49
H3	5X-5Y	50
	6X-6Y	53
H4	7X-7Y	53
	8X-8Y	50

M2-M3		
H1	1X-1Y	51
	2X-2Y	48
H2	3X-3Y	49
	4X-4Y	48
H3	5X-5Y	49
	6X-6Y	50
H4	7X-7Y	48
	8X-8Y	51

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	39
2Z-6Z	38
3Z-7Z	39
4Z-8Z	35

B4	
1Z-5Z	37
2Z-6Z	37
3Z-7Z	40
4Z-8Z	36

B7	
1Z-5Z	41
2Z-6Z	41
3Z-7Z	37
4Z-8Z	36

Equipment used: PROFOMETER 5, PROCEQ

Date: 06/12-18

Measurement performed by:

Cover verification (beam)

Beam ID: F3

Cover to working electrodes

Cover to Working Electrodes in face A:

M1 (Atmospheric)		
16_L_A 16±2 mm	1A-1T	17
	2A-2T	17
25_L_A 25±2 mm	1B-1T	24
	2B-2T	24
50_L_A 50±2 mm	1C-1T	51
	2C-2T	49

M2 (Splash)		
16_T_A 16±2 mm	3A-3T	17
	4A-4T	18
25_T_A 25±2 mm	3B-3T	25
	4B-4T	26
50_T_A 50±2 mm	3C-3T	50
	4C-4T	51

M3 (Immersed)		
16_N_A 16±2 mm	5A-5T	17
	6A-6T	17
25_N_A 25±2 mm	5B-5T	25
	6B-6T	26
50_N_A 50±2 mm	5C-5T	51
	6C-6T	51

Cover to Working Electrodes in face B:

M1 (Atmospheric)		
16_L_B 16±2 mm	1X-1S	18
	2X-2S	19
25_L_B 25±2 mm	1Y-1S	26
	2Y-2S	25
50_L_B 50±2 mm	1Z-1S	50
	2Z-2S	50

M2 (Splash)		
16_T_B 16±2 mm	3X-3S	18
	4X-4S	18
25_T_B 25±2 mm	3Y-3S	25
	4Y-4S	25
50_T_B 50±2 mm	3Z-3S	50
	4Z-4S	50

M3 (Immersed)		
16_N_B 16±2 mm	5X-5S	17
	6X-6S	17
25_N_B 25±2 mm	5Y-5S	25
	6Y-6S	25
50_N_B 50±2 mm	5Z-5S	50
	6Z-6S	49

Position of working electrodes

Distance from formwork in face A

M1 (Atmospheric)		
16_L_A 271 mm	1K-1U	
	2K-2U	
25_L_A 195 mm	1L-1U	
	2L-2U	
50_L_A 119 mm	1M-1U	
	2M-2U	

M2 (Splash)		
16_T_A 271 mm	3K-3U	
	4K-4U	
25_T_A 195 mm	3L-3U	
	4L-4U	
50_T_A 119 mm	3M-3U	
	4M-4U	

M3 (Immersed)		
16_N_A 271 mm	5K-5U	
	6K-6U	
25_N_A 195 mm	5L-5U	
	6L-6U	
50_N_A 119 mm	5M-5U	
	6M-6U	

Distance from formwork in face B

M1 (Atmospheric)		
16_L_B 271 mm	1K-1U	
	2K-2U	
25_L_B 195 mm	1L-1U	
	2L-2U	
50_L_B 119 mm	1M-1U	
	2M-2U	

M2 (Splash)		
16_T_B 271 mm	3K-3U	
	4K-4U	
25_T_B 195 mm	3L-3U	
	4L-4U	
50_T_B 119 mm	3M-3U	
	4M-4U	

M3 (Immersed)		
16_N_B 271 mm	5K-5U	
	6K-6U	
25_N_B 195 mm	5L-5U	
	6L-6U	
50_N_B 119 mm	5M-5U	
	6M-6U	

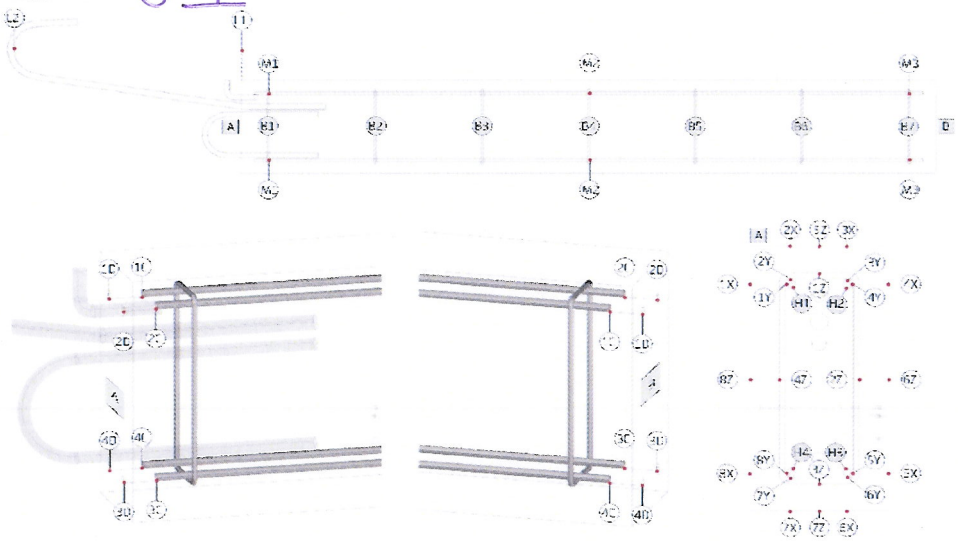
Equipment used: PROFOMETER 5. PROCEQ

Date: 03/03-19

Measurement performed by: Martin Thurn **Photo documentation taken:**

Cover verification (beam)

Beam ID: G1



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	53
	2X-2Y	55
H2	3X-3Y	53
	4X-4Y	53
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	53
	8X-8Y	53

M2-M3		
H1	1X-1Y	49
	2X-2Y	54
H2	3X-3Y	53
	4X-4Y	54
H3	5X-5Y	55
	6X-6Y	52
H4	7X-7Y	53
	8X-8Y	50

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	42
2Z-6Z	41
3Z-7Z	39
4Z-8Z	42

B4	
1Z-5Z	42
2Z-6Z	43
3Z-7Z	39
4Z-8Z	43

B7	
1Z-5Z	41
2Z-6Z	42
3Z-7Z	37
4Z-8Z	43

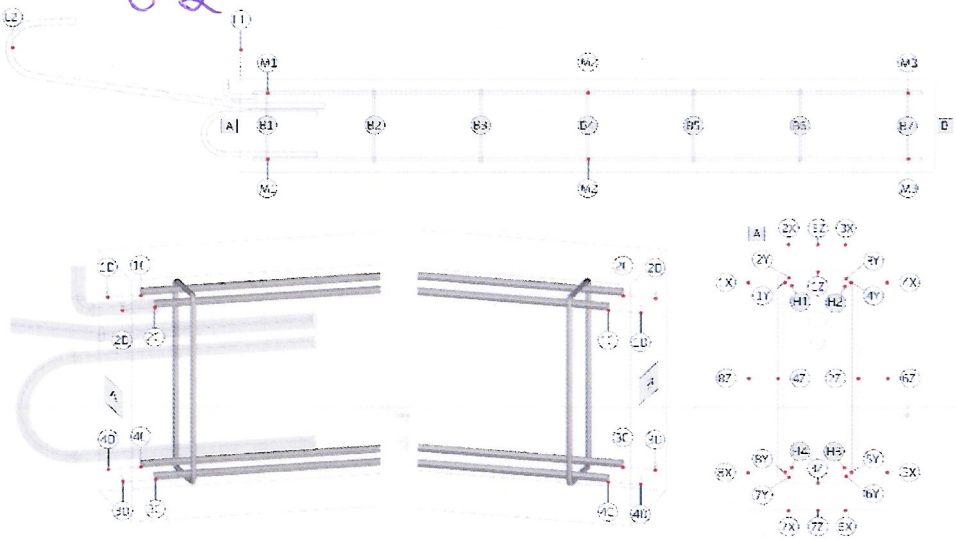
Equipment used: PROFOMETER 5, PROCEQ

Date: 2018-12-10

Measurement performed by:

Cover verification (beam)

Beam ID: G2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	52
	2X-2Y	53
H2	3X-3Y	51
	4X-4Y	53
H3	5X-5Y	52
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	54

M2-M3		
H1	1X-1Y	53
	2X-2Y	52
H2	3X-3Y	52
	4X-4Y	53
H3	5X-5Y	55
	6X-6Y	54
H4	7X-7Y	55
	8X-8Y	50

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	39
2Z-6Z	40
3Z-7Z	39
4Z-8Z	41

B4	
1Z-5Z	45
2Z-6Z	43
3Z-7Z	40
4Z-8Z	43

B7	
1Z-5Z	40
2Z-6Z	43
3Z-7Z	40
4Z-8Z	41

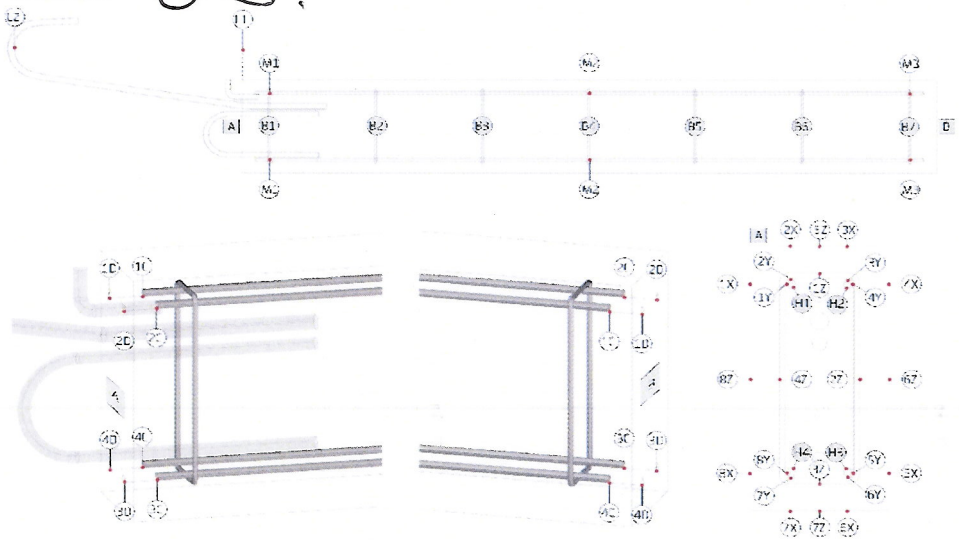
Equipment used: PROFOMETER 5, PROCEQ

Date: 2018-12-10

Measurement performed by:

Cover verification (beam)

Beam ID: G3.



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	52
	2X-2Y	50
H2	3X-3Y	51
	4X-4Y	51
H3	5X-5Y	52
	6X-6Y	54
H4	7X-7Y	53
	8X-8Y	53

M2-M3		
H1	1X-1Y	50
	2X-2Y	46
H2	3X-3Y	48
	4X-4Y	48
H3	5X-5Y	49
	6X-6Y	47
H4	7X-7Y	46
	8X-8Y	52

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	39
2Z-6Z	36
3Z-7Z	36
4Z-8Z	39

B4	
1Z-5Z	37
2Z-6Z	37
3Z-7Z	40
4Z-8Z	36

B7	
1Z-5Z	39
2Z-6Z	39
3Z-7Z	39
4Z-8Z	37

Equipment used: QA 139869

Date: 2018-12-10

Measurement performed by:

Cover verification (beam)

Beam ID: G3

Cover to working electrodes

Cover to Working Electrodes in face A:

M1 (Atmospheric)		
16_L_A	1A-1T	18
16±2 mm	2A-2T	17
25_L_A	1B-1T	25
25±2 mm	2B-2T	26
50_L_A	1C-1T	51
50±2 mm	2C-2T	50

M2 (Splash)		
16_T_A	3A-3T	17
16±2 mm	4A-4T	17
25_T_A	3B-3T	27
25±2 mm	4B-4T	24
50_T_A	3C-3T	51
50±2 mm	4C-4T	49

M3 (Immersed)		
16_N_A	5A-5T	17
16±2 mm	6A-6T	17
25_N_A	5B-5T	24
25±2 mm	6B-6T	25
50_N_A	5C-5T	51
50±2 mm	6C-6T	49

Cover to Working Electrodes in face B:

M1 (Atmospheric)		
16_L_B	1X-1S	17
16±2 mm	2X-2S	18
25_L_B	1Y-1S	25
25±2 mm	2Y-2S	26
50_L_B	1Z-1S	49
50±2 mm	2Z-2S	50

M2 (Splash)		
16_T_B	3X-3S	17
16±2 mm	4X-4S	17
25_T_B	3Y-3S	25
25±2 mm	4Y-4S	25
50_T_B	3Z-3S	51
50±2 mm	4Z-4S	52

M3 (Immersed)		
16_N_B	5X-5S	18
16±2 mm	6X-6S	17
25_N_B	5Y-5S	25
25±2 mm	6Y-6S	23
50_N_B	5Z-5S	51
50±2 mm	6Z-6S	50

Position of working electrodes

Distance from formwork in face A

M1 (Atmospheric)		
16_L_A	1K-1U	
271 mm	2K-2U	
25_L_A	1L-1U	
195 mm	2L-2U	
50_L_A	1M-1U	
119 mm	2M-2U	

M2 (Splash)		
16_T_A	3K-3U	
271 mm	4K-4U	
25_T_A	3L-3U	
195 mm	4L-4U	
50_T_A	3M-3U	
119 mm	4M-4U	

M3 (Immersed)		
16_N_A	5K-5U	
271 mm	6K-6U	
25_N_A	5L-5U	
195 mm	6L-6U	
50_N_A	5M-5U	
119 mm	6M-6U	

Distance from formwork in face B

M1 (Atmospheric)		
16_L_B	1K-1U	
271 mm	2K-2U	
25_L_B	1L-1U	
195 mm	2L-2U	
50_L_B	1M-1U	
119 mm	2M-2U	

M2 (Splash)		
16_T_B	3K-3U	
271 mm	4K-4U	
25_T_B	3L-3U	
195 mm	4L-4U	
50_T_B	3M-3U	
119 mm	4M-4U	

M3 (Immersed)		
16_N_B	5K-5U	
271 mm	6K-6U	
25_N_B	5L-5U	
195 mm	6L-6U	
50_N_B	5M-5U	
119 mm	6M-6U	

Equipment used: PROFOMETER 5, PROCEQ

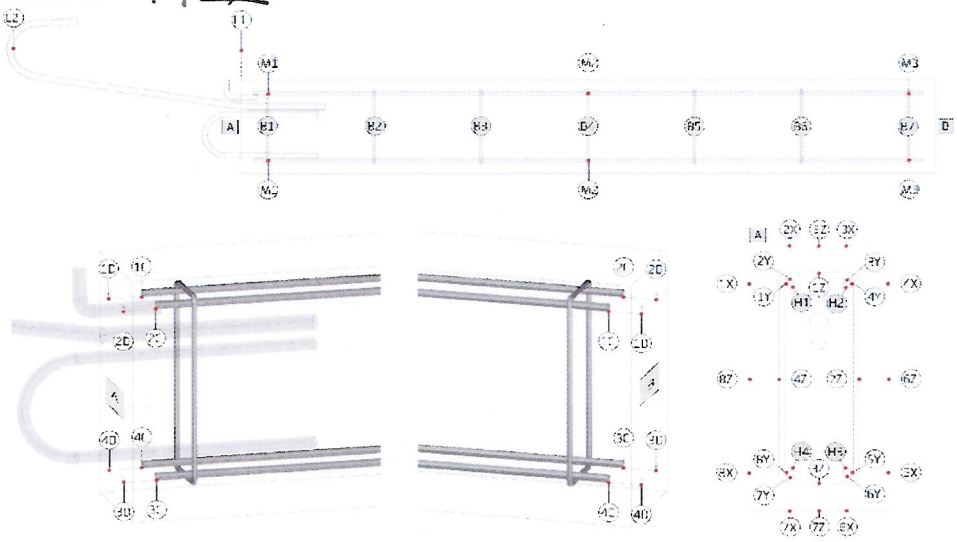
Date: 2018-12-10

Measurement performed by:

Photo documentation taken:

Cover verification (beam)

Beam ID: H1



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	50
	2X-2Y	53
H2	3X-3Y	51
	4X-4Y	54
H3	5X-5Y	52
	6X-6Y	49
H4	7X-7Y	49
	8X-8Y	53

M2-M3			
H1	1X-1Y	51	53
	2X-2Y	54	55
H2	3X-3Y	51	52
	4X-4Y	53	53
H3	5X-5Y	54	51
	6X-6Y	53	56
H4	7X-7Y	54	52
	8X-8Y		55

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	41
2Z-6Z	40
3Z-7Z	40
4Z-8Z	40

B4	
1Z-5Z	41
2Z-6Z	43
3Z-7Z	39
4Z-8Z	44

B7	
1Z-5Z	40
2Z-6Z	40
3Z-7Z	39
4Z-8Z	42

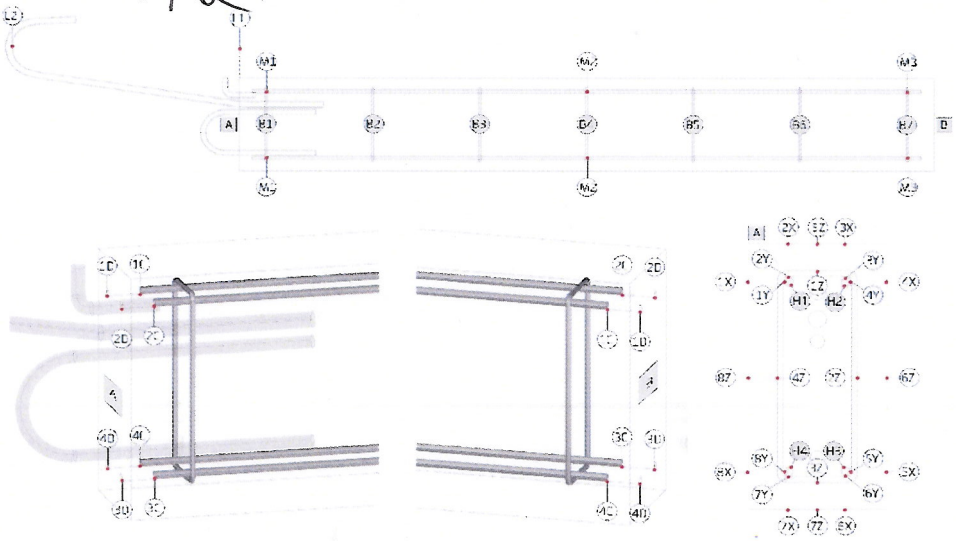
Equipment used: PROFOMETER 5, PROCEQ

Date: 2018-12-13

Measurement performed by:

Cover verification (beam)

Beam ID: H2



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	50
	2X-2Y	48
H2	3X-3Y	49
	4X-4Y	52
H3	5X-5Y	52
	6X-6Y	54
H4	7X-7Y	56
	8X-8Y	52

M2-M3		
H1	1X-1Y	52
	2X-2Y	50
H2	3X-3Y	49
	4X-4Y	52
H3	5X-5Y	52
	6X-6Y	52
H4	7X-7Y	54
	8X-8Y	51

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	40
2Z-6Z	40
3Z-7Z	39
4Z-8Z	42

B4	
1Z-5Z	39
2Z-6Z	42
3Z-7Z	40
4Z-8Z	43

B7	
1Z-5Z	37
2Z-6Z	42
3Z-7Z	37
4Z-8Z	41

Equipment used: PROFOMETER 5, PROCEQ

Date: 2018-12-13

Measurement performed by:

Cover verification (beam)

Beam ID: F13

Cover to working electrodes

Cover to Working Electrodes in face A:

M1 (Atmospheric)		
16_L_A 16±2 mm	1A-1T	18
	2A-2T	19
25_L_A 25±2 mm	1B-1T	28
	2B-2T	27
50_L_A 50±2 mm	1C-1T	49
	2C-2T	50

M2 (Splash)		
16_T_A 16±2 mm	3A-3T	18
	4A-4T	18
25_T_A 25±2 mm	3B-3T	28
	4B-4T	29
50_T_A 50±2 mm	3C-3T	49
	4C-4T	50

M3 (Immersed)		
16_N_A 16±2 mm	5A-5T	18
	6A-6T	18
25_N_A 25±2 mm	5B-5T	27
	6B-6T	29
50_N_A 50±2 mm	5C-5T	51
	6C-6T	52

Cover to Working Electrodes in face B:

M1 (Atmospheric)		
16_L_B 16±2 mm	1X-1S	18
	2X-2S	19
25_L_B 25±2 mm	1Y-1S	28
	2Y-2S	29
50_L_B 50±2 mm	1Z-1S	51
	2Z-2S	51

M2 (Splash)		
16_T_B 16±2 mm	3X-3S	18
	4X-4S	19
25_T_B 25±2 mm	3Y-3S	28
	4Y-4S	29
50_T_B 50±2 mm	3Z-3S	52
	4Z-4S	52

M3 (Immersed)		
16_N_B 16±2 mm	5X-5S	19
	6X-6S	20
25_N_B 25±2 mm	5Y-5S	28
	6Y-6S	28
50_N_B 50±2 mm	5Z-5S	50
	6Z-6S	51

Position of working electrodes

Distance from formwork in face A

M1 (Atmospheric)		
16_L_A 271 mm	1K-1U	
	2K-2U	
25_L_A 195 mm	1L-1U	
	2L-2U	
50_L_A 119 mm	1M-1U	
	2M-2U	

M2 (Splash)		
16_T_A 271 mm	3K-3U	
	4K-4U	
25_T_A 195 mm	3L-3U	
	4L-4U	
50_T_A 119 mm	3M-3U	
	4M-4U	

M3 (Immersed)		
16_N_A 271 mm	5K-5U	
	6K-6U	
25_N_A 195 mm	5L-5U	
	6L-6U	
50_N_A 119 mm	5M-5U	
	6M-6U	

Distance from formwork in face B

M1 (Atmospheric)		
16_L_B 271 mm	1K-1U	
	2K-2U	
25_L_B 195 mm	1L-1U	
	2L-2U	
50_L_B 119 mm	1M-1U	
	2M-2U	

M2 (Splash)		
16_T_B 271 mm	3K-3U	
	4K-4U	
25_T_B 195 mm	3L-3U	
	4L-4U	
50_T_B 119 mm	3M-3U	
	4M-4U	

M3 (Immersed)		
16_N_B 271 mm	5K-5U	
	6K-6U	
25_N_B 195 mm	5L-5U	
	6L-6U	
50_N_B 119 mm	5M-5U	
	6M-6U	

Equipment used: PROFOMETER 5, PROCEQ

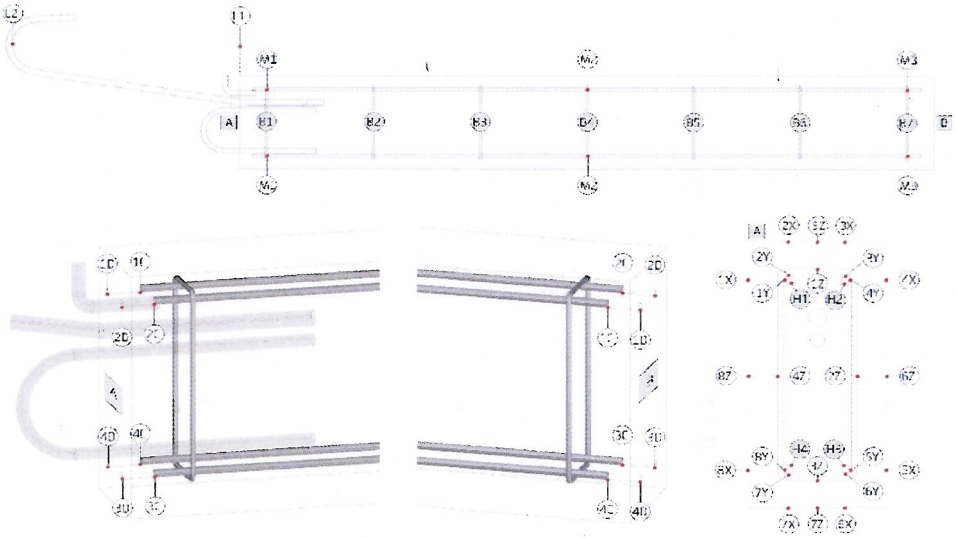
Date: 2018-12-13

Measurement performed by:

Photo documentation taken:

Cover verification (beam)

Beam ID: H3



Cover to reinforcement:

Cover to longitudinal reinforcement: (50 ± 5 mm.)

M1-M2		
H1	1X-1Y	48
	2X-2Y	49
H2	3X-3Y	49
	4X-4Y	48
H3	5X-5Y	51
	6X-6Y	52
H4	7X-7Y	49
	8X-8Y	47

M2-M3		
H1	1X-1Y	48
	2X-2Y	54
H2	3X-3Y	53
	4X-4Y	50
H3	5X-5Y	50
	6X-6Y	54
H4	7X-7Y	54
	8X-8Y	56

Cover to stirrups: (40 ± 5 mm.)

B1	
1Z-5Z	39
2Z-6Z	37
3Z-7Z	39
4Z-8Z	38

B4	
1Z-5Z	40
2Z-6Z	—
3Z-7Z	39
4Z-8Z	—

B7	
1Z-5Z	41
2Z-6Z	38
3Z-7Z	37
4Z-8Z	36

Equipment used: PROFOMETER 5, PROCEQ

Date: 2018-12-13

Measurement performed by:

5.9. Annex 9
Compressive strength

Report from testing of compressive strength is presented on the following 7 pages.

Test report

REPORT NO.:
866865-1

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Init: Foe/Thsv
Order no.: 866865-1
Appendix: 0

Assigner: Company: Teknologisk Institut
Address: Gregersensvej 1
City: DK-2630 Taastrup

Material: 3 mix x 6 cast concrete cubes 100 x 100 x 100 mm.
Project: Austefjorden Exposure Site.

Sampling: The material for testing was cast by the Danish Technological Institute and marked:
Mix F1, F2, F3. Date of casting 2018-12-04.
Mix G1, G2, G3. Date of casting 2018-12-07
Mix H1, H2, H3. Date of casting 2018-12-11.

Period: The testing was completed 2019-01-01 – 2019-03-12.

Test method: DS/EN 12390-3 + AC :2012 Testing hardened concrete - Part 3: Compressive strength of test specimens.

DS/EN 12390-7:2012 Testing hardened concrete - Part 7: Density of hardened concrete.

Results: Result of the test is given on page 2 - 7 of this report.

Storage: The tested material will be destroyed after testing unless something else is pre-agreed in writing.

Terms: Accredited testing was carried out in compliance with international requirements (EN/ISO/IEC 17025:2005) and in compliance with Danish Technological Institute's General Terms and Conditions regarding Commissioned Work accepted by Danish Technological Institute. The test results apply to the tested products only. This report may be quoted in extract only if the laboratory has granted its written consent.

Place: Date 2019-04-05, Danish Technological Institute, Taastrup, Concrete Centre

Signature:

Finn Østergård
Lab technician

Thomas Svensson
Team Manager

ilac-MRA DANAK
Test Reg. no. 2

Remarks to the tests:

The samples have been tested at a water saturated surface dry condition. The density has been determined using measured dimensions.

Results:

Cubes no: F1
Age: 28 days
Date of testing: 2019-01-01

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,1	100,5	100,2	2300	391	38,8
2	100,1	101,3	100,2	2290	405	39,9
3	100,1	101,1	100,1	2290	391	38,6
Mean						39,1
Standard deviation						0,7

Cubes no: F2
Age: 28 days
Date of testing: 2019-01-01

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,1	101,3	100,2	2300	402	39,6
2	100,0	100,7	100,1	2300	402	39,9
3	100,2	101,5	100,1	2290	391	38,5
Mean						39,3
Standard deviation						0,7

Cubes no: F3
Age: 28 days
Date of testing: 2019-01-01

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,2	100,6	100,2	2310	403	40,0
2	100,1	101,9	100,2	2270	400	39,2
3	100,2	100,6	100,2	2290	403	40,0
Mean						39,7
Standard deviation						0,5

Cubes no: G1
Age: 28 days
Date of testing: 2019-01-04

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,1	101,6	100,1	2340	700	68,8
2	100,1	101,9	100,1	2330	684	67,1
3	100,0	101,7	100,1	2330	682	67,0
Mean						67,6
Standard deviation						1,0

Cubes no: G2
Age: 28 days
Date of testing: 2019-01-04

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,0	101,2	100,0	2320	656	64,8
2	100,1	101,9	100,0	2300	677	66,4
3	100,0	102,1	100,0	2330	660	64,6
Mean						65,3
Standard deviation						1,0

Cubes no: G3
Age: 28 days
Date of testing: 2019-01-04

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,1	101,2	100,1	2330	662	65,3
2	100,0	102,1	100,1	2320	652	63,8
3	100,0	101,8	100,0	2300	677	66,5
Mean						65,2
Standard deviation						1,4

Cubes no: H1
Age: 28 days
Date of testing: 2019-01-08

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,0	100,1	101,4	2350	750	73,9
2	100,0	100,1	102,0	2320	747	73,2
3	100,1	100,1	102,2	2320	737	72,0
Mean						73,0
Standard deviation						0,9

Cubes no: H2
Age: 28 days
Date of testing: 2019-01-08

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,1	100,0	101,7	2320	736	72,4
2	100,1	100,0	101,6	2330	744	73,2
3	100,1	100,0	102,0	2320	732	71,8
Mean						72,5
Standard deviation						0,7

Cubes no: H3
Age: 28 days
Date of testing: 2019-01-08

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,1	100,0	101,9	2320	713	70,0
2	100,1	100,1	101,4	2330	702	69,2
3	100,1	100,1	101,7	2320	721	70,8
Mean						70,0
Standard deviation						0,8

Cubes no: F1
Age: 91 days
Date of testing: 2019-03-05

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,1	101,5	100,0	2290	507	50,0
2	100,1	101,0	100,1	2300	502	49,7
3	99,9	102,3	100,1	2290	506	49,4
Mean						49,7
Standard deviation						0,3

Cubes no: F2
Age: 91 days
Date of testing: 2019-03-05

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,0	101,0	99,9	2290	522	51,7
2	100,2	101,9	100,2	2270	515	50,4
3	100,2	101,0	100,1	2270	524	51,8
Mean						51,3
Standard deviation						0,8

Cubes no: F3
Age: 91 days
Date of testing: 2019-03-05

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,1	101,5	100,1	2310	521	51,3
2	100,0	101,3	100,1	2290	516	50,9
3	100,2	100,9	100,0	2300	506	50,1
Mean						50,8
Standard deviation						0,6

Cubes no: G1
Age: 91 days
Date of testing: 2019-03-08

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,0	101,9	100,1	2330	752	73,7
2	100,2	104,0	100,1	2270	767	73,7
3	100,0	102,3	100,0	2340	742	72,5
Mean						73,3
Standard deviation						0,7

Cubes no: G2
Age: 91 days
Date of testing: 2019-03-08

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,0	103,2	100,1	2310	727	70,4
2	100,0	101,9	100,3	2320	712	69,7
3	100,2	102,1	100,2	2300	720	70,4
Mean						70,1
Standard deviation						0,4

Cubes no: G3
Age: 91 days
Date of testing: 2019-03-08

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,0	102,2	100,1	2310	721	70,5
2	100,1	100,8	100,1	2330	750	74,3
3	100,0	100,9	100,1	2320	724	71,7
Mean						72,2
Standard deviation						2,0

Cubes no: H1
Age: 91 days
Date of testing: 2019-03-12

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,1	101,6	100,1	2340	847	83,3
2	100,1	101,8	100,1	2340	824	80,9
3	100,0	101,9	100,1	2330	870	85,3
Mean						83,1
Standard deviation						2,2

Cubes no: H2
Age: 91 days
Date of testing: 2019-03-12

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,0	102,2	100,1	2320	830	81,1
2	100,1	101,8	99,9	2340	846	83,2
3	100,0	101,3	100,1	2340	844	83,2
Mean						82,5
Standard deviation						1,2

Cubes no: H3
Age: 91 days
Date of testing: 2019-03-12

Sample id	Height [mm]	Width 1 [mm]	Width 2 [mm]	Density [kg/m^3]	Load [kN]	Compressive strength Cube [MPa]
1	100,0	101,2	100,1	2330	832	82,1
2	100,0	100,6	100,0	2340	820	81,5
3	100,0	102,0	100,1	2320	844	82,7
Mean						82,1
Standard deviation						0,6

5.10. Annex 10
Resistivity

Report from testing of concrete resistivity is presented on the following 4 pages.

Test report

REPORT NO.:
861486-1

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
DK-2630 Taastrup
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Init: FOE/THSV
Order no.: 861486-1
Appendix: 0

Assigner:
Contact person: Henrik Sørensen
Company: Teknologisk Institut
Address: Gregersensvej 1
City: DK-2630 Taastrup

Material:
3 mix x 12 cast concrete cubes 100 x 100 x 100 mm.
Project: Austefjorden Exposure Site.

Sampling:
The material for testing was cast by the Danish Technological Institute and marked:
Mix F1, F2, F3. Date of casting 2018-12-04.
Mix G1, G2, G3. Date of casting 2018-12-07
Mix H1, H2, H3. Date of casting 2018-12-11.

Period:
The testing was completed 2019-01-01 to 2019-03-12.

Test method:
Statens vegvesen, R210 Laboratorieundersøkelser.
443 Spesifikk elektrisk motstand (resistivitet).

Results:
Results of the test is given on page 2 to 4.

Storage:
The tested material will be stored in water bath after testing.

Remarks:
Exposure temperature: Water bath 20°C ±1 °C.
Testing temperature: Climate chamber 20°C ±1 °C.
Resistance in the electronics circuit: <10 Ω.

Terms:
The test has been performed according to the Danish Technological Institute's general terms and conditions, which apply to the date of conclusion of the contract. The test results are only valid for the tested specimens. The test report may only be extracted, if the laboratory has approved the extract in writing

Place:
Date 2019-03-14, Danish Technological Institute, Taastrup, Concrete Centre.

Signature:

Finn Østergård
Laboratory Technician

Thomas Lennart Svensson
Teamleader

443 Spesifikk elektrisk motstand (resistivitet)

Testing Date:
28 days: 2019-01-01
91 days: 2019-03-05

ID: Mix F1

Dimension	1	2	3	4
Length m	0,1013	0,1013	0,1005	0,1011
Width m	0,1001	0,1001	0,1001	0,1002
Height m	0,1001	0,1001	0,1000	0,1002
Cross-sectional area m^2	0,0101	0,0101	0,0101	0,0101

					Temperature °C	
Resistance Ω	1	2	3	4	Laboratory	Water bath
28 days	988,8	1094,8	1052,9	1090	20,6	20,3
91 days	2197	2216	2186	2183	20,0	20,0

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	100,2	110,9	105,9	110,2	**106,8**
91 days	222,6	224,5	219,9	220,7	**221,9**

ID: Mix F2

Dimension	1	2	3	4
Length m	0,1010	0,1012	0,1014	0,1014
Width m	0,1002	0,1002	0,1001	0,1001
Height m	0,1000	0,1001	0,1001	0,1002
Cross-sectional area m^2	0,0101	0,0101	0,0102	0,0102

					Temperature °C	
Resistance Ω	1	2	3	4	Laboratory	Water bath
28 days	979,8	949,4	1002,9	1056,2	20,6	20,3
91 days	2208	2164	2240	2358	20,0	20,0

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	99,2	96,2	101,7	107,0	**101,0**
91 days	223,5	219,2	227,1	238,9	**227,2**

ID: Mix F3

Dimension	1	2	3	4
Length m	0,1005	0,1011	0,1006	0,1008
Width m	0,1001	0,1002	0,1002	0,1002
Height m	0,1001	0,1001	0,1001	0,1002
Cross-sectional area m^2	0,0101	0,0101	0,0101	0,0101

					Temperature °C	
Resistance Ω	1	2	3	4	Laboratory	Water bath
28 days	970,2	978,5	964,3	1000,6	20,6	20,3
91 days	2208	2189	2124	2214	20,0	20,0

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	97,5	99,0	97,1	100,9	**98,6**
91 days	221,9	221,5	213,9	223,2	**220,1**

443 Spesifikk elektrisk motstand (resistivitet)

Testing Date:
28 days: 2019-01-04
91 days: 2019-03-08

ID: Mix G1

Dimension	1	2	3	4
Length m	0,1000	0,1001	0,1001	0,1001
Width m	0,1018	0,1013	0,1016	0,1015
Height m	0,1000	0,1001	0,1000	0,1002
Cross-sectional area m^2	0,0102	0,0101	0,0102	0,0102

					Temperature °C	
Resistance Ω	1	2	3	4	Laboratory	Water bath
28 days	2200	2198	2170	2196	19,8	20,2
91 days	3669	3626	3519	3511	19,8	20,0

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	224,0	222,7	220,7	222,7	**222,5**
91 days	373,5	367,3	357,9	356,0	**363,7**

ID: Mix G2

Dimension	1	2	3	4
Length m	0,1001	0,1001	0,1001	0,1001
Width m	0,1013	0,1015	0,1013	0,1021
Height m	0,1000	0,1001	0,1000	0,1000
Cross-sectional area m^2	0,0101	0,0102	0,0101	0,0102

					Temperature °C	
Resistance Ω	1	2	3	4	Laboratory	Water bath
28 days	2096	2078	2061	2047	19,8	20,2
91 days	3409	3435	3301	3349	19,8	20,0

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	212,5	210,9	209,0	209,2	**210,4**
91 days	345,7	348,7	334,7	342,3	**342,8**

ID: Mix G3

Dimension	1	2	3	4
Length m	0,1001	0,1002	0,1002	0,1001
Width m	0,1015	0,1014	0,1023	0,1007
Height m	0,1001	0,1001	0,1002	0,1002
Cross-sectional area m^2	0,0102	0,0102	0,0103	0,0101

					Temperature °C	
Resistance Ω	1	2	3	4	Laboratory	Water bath
28 days	2110	2150	2080	2117	19,8	20,2
91 days	3430	3480	3372	3539	19,8	20,0

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	214,2	218,2	212,8	213,0	**214,5**
91 days	348,1	353,2	345,0	356,0	**350,6**

443 Spesifikk elektrisk motstand (resistivitet)

Testing Date:
28 days: 2019-01-08
91 days: 2019-03-12

ID: Mix H1

Dimension	1	2	3	4
Length m	0,1015	0,1011	0,1019	0,1016
Width m	0,1001	0,1001	0,1001	0,1001
Height m	0,1002	0,1001	0,1002	0,1002
Cross-sectional area m^2	0,0102	0,0101	0,0102	0,0102

					Temperature °C	
Resistance Ω	1	2	3	4	Laboratory	Water bath
28 days	1279	1265	1292	1336	20,1	20,3
91 days	2816	2783	2835	3085	19,9	19,9

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	129,7	127,9	131,5	135,6	**131,2**
91 days	285,5	281,4	288,6	313,1	**292,2**

ID: Mix H2

Dimension	1	2	3	4
Length m	0,1014	0,1018	0,1008	0,1010
Width m	0,1001	0,1001	0,1000	0,1001
Height m	0,1001	0,1000	0,1001	0,1001
Cross-sectional area m^2	0,0102	0,0102	0,0101	0,0101

					Temperature °C	
Resistance Ω	1	2	3	4	Laboratory	Water bath
28 days	1333	1331	1307	1304	20,1	20,3
91 days	2943	2928	2849	2905	19,9	19,9

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	135,2	135,6	131,6	131,7	**133,5**
91 days	298,4	298,4	286,9	293,4	**294,3**

ID: Mix H3

Dimension	1	2	3	4
Length m	0,1015	0,1011	0,1011	0,1012
Width m	0,1002	0,1002	0,1002	0,1002
Height m	0,1002	0,1002	0,1001	0,1000
Cross-sectional area m^2	0,0102	0,0101	0,0101	0,0101

					Temperature °C	
Resistance Ω	1	2	3	4	Laboratory	Water bath
28 days	1226	1234	1233	1227	20,1	20,3
91 days	2717	2748	2739	2775	19,9	19,9

Resistivitet Ωm	1	2	3	4	**Mean**
28 days	124,4	124,8	124,8	124,4	**124,6**
91 days	275,8	277,8	277,2	281,4	**278,0**

5.11. Annex 11
Production of working electrodes

Procedure from Statens vegvesen regarding the production of working electrodes is presented on the following 2 pages.

Please note that according to agreement with Statens vegvesen the following changes of the procedure was applied:

- The length was reduced to 800mm to give room for the cables and the required cover depth
- Both ends were coated with Renderoc ST 05 from Fosroc (substituting SBR Febond)

Statens vegvesen

Notat

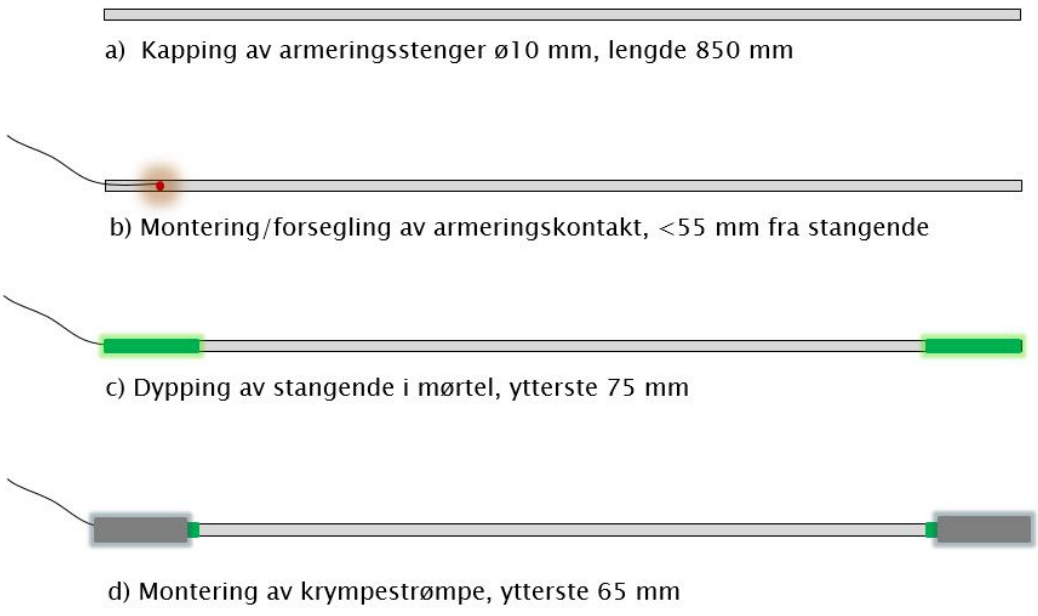
Til: Fyll inn.
Fra: Karla Hornbostel
Kopi til:

Saksbehandler/telefon:
Karla Hornbostel/ 45069884
Vår dato: 20.03.2018
Vår referanse: Betongelementer Austefjorden

Produksjon av arbeidselektroder

Arbeidselektrodene tildannes fra armeringsstenger ø10 mm til lengde 850 mm. Armeringsstål som brukes skal være produsert av Celsa Armeringsstål AS, Mo i Rana, Norge (Tempcore® process), kamstål av teknisk klasse B500NC i samsvar med NS 3576-3, diameter 10 mm.

De ytterste 5 cm av stengene skal sikres mot korrosjon. Før endene sikres mot korrosjon skal det monteres en armeringskontakt på den ene enden av arbeidselektroden, se Figur 1 og beskrivelse «*Etablering av armeringskontakter*». Korrosjonsbeskyttelsen gjøres ved å danne et belegg av slitasjebestandig sementpasta (Portland sement blandet med en styrene butadiene co-polymer (SBR Febond) i et passende blandingsforhold og tykkelse som gitt i produktbeskrivelsen). Etter herdning av pastaen (> 1 døgn) skal det i tillegg brukes en krympestrømpe over området med pasta. Etter montering av krympestrømpe skal den eksponerte ståloverflaten rengjøres med aceton, deretter skal det unngås at stålet kommer i kontakt med fett, olje eller lignende.



Figur 1 – Produksjon av arbeidselektroder.

Etablering av armeringskontakter

På hver arbeidselektrode skal det festes én kabel (armeringskontakt) med lengde >4m.
Kablene som anvendes skal være slik at

- de er bestandige i norsk kystklima og i pH opp til 13.5, det inkluderer isolasjon, leder og merking.
- de er tilstrekkelig skjermet mot påvirkning fra omgivelsene slik at signalkvalitet opprettholdes i aktuelt miljø.

Videre gjelder:

- Skjøting av kabel er ikke tillatt.
- Det skal utvises varsomhet ved håndtering og installasjon av kabel slik at den ikke skades. Kabler skal ikke bøyes med en radius mindre enn 10 ganger sin diameter. Alle kabler skal sikres god strekkavlastning.

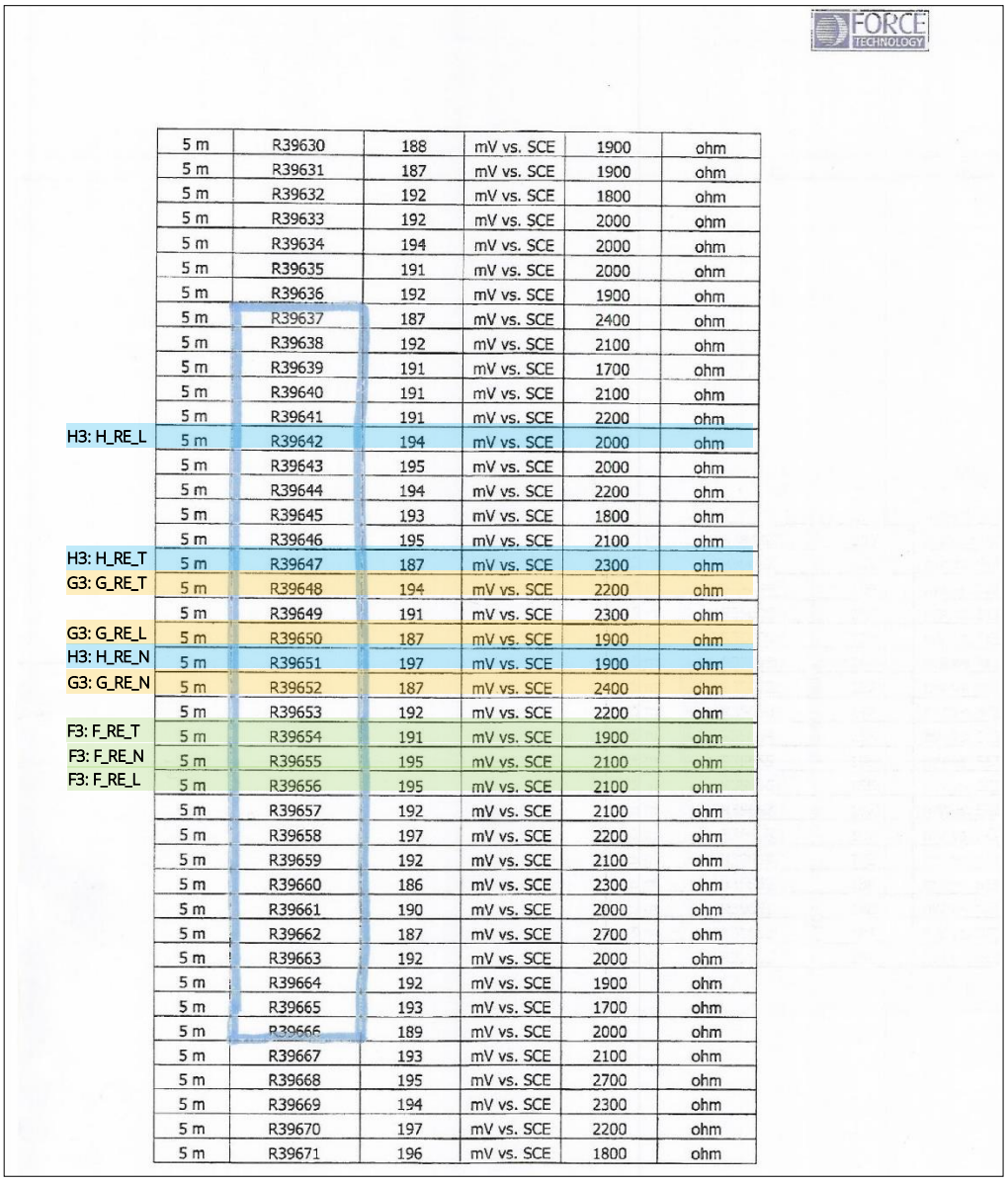
Ren, blank stålflate etableres i kontaktpunktet f.eks. ved sliping eller boring for å sikre god kontakt. Armeringskontakten etableres på en slik måte at den er mekanisk solid og gir god, varig elektrisk kontakt mellom armeringsstål og ledning. Dette kan gjøres med kabelsko og skrue eller eksoterm sveiseteknikk. Metoden som benyttes for å etablere armeringskontakten skal beskrives og gjennomføringen av den skal dokumenteres.
Den ferdige koblingen mellom armeringsstål og ledning skal forsegles med herdeplast (epoksy eller tilsvarende ikke-ledende masse) som er vanntett og alkaliebestandig.
Forseglingen skal omfatte hele koblingspunktet inklusiv eventuelle skruer og klemmer og all måleledning uten isolasjonskappe.

Antall arbeidselektroder

Det bestilles minst 36 arbeidselektroder og maksimal 72.

5.12. Annex 12
Potentials of ERE-20 Reference Electrodes

Calibration sheet from FORCE Technology is shown below. The nine ERE-20 reference electrodes used for the concrete elementes are marked with colored bars.



	5 m	R39630	188	mV vs. SCE	1900	ohm
	5 m	R39631	187	mV vs. SCE	1900	ohm
	5 m	R39632	192	mV vs. SCE	1800	ohm
	5 m	R39633	192	mV vs. SCE	2000	ohm
	5 m	R39634	194	mV vs. SCE	2000	ohm
	5 m	R39635	191	mV vs. SCE	2000	ohm
	5 m	R39636	192	mV vs. SCE	1900	ohm
	5 m	R39637	187	mV vs. SCE	2400	ohm
	5 m	R39638	192	mV vs. SCE	2100	ohm
	5 m	R39639	191	mV vs. SCE	1700	ohm
	5 m	R39640	191	mV vs. SCE	2100	ohm
	5 m	R39641	191	mV vs. SCE	2200	ohm
H3: H_RE_L	5 m	R39642	194	mV vs. SCE	2000	ohm
	5 m	R39643	195	mV vs. SCE	2000	ohm
	5 m	R39644	194	mV vs. SCE	2200	ohm
	5 m	R39645	193	mV vs. SCE	1800	ohm
	5 m	R39646	195	mV vs. SCE	2100	ohm
H3: H_RE_T	5 m	R39647	187	mV vs. SCE	2300	ohm
G3: G_RE_T	5 m	R39648	194	mV vs. SCE	2200	ohm
	5 m	R39649	191	mV vs. SCE	2300	ohm
G3: G_RE_L	5 m	R39650	187	mV vs. SCE	1900	ohm
H3: H_RE_N	5 m	R39651	197	mV vs. SCE	1900	ohm
G3: G_RE_N	5 m	R39652	187	mV vs. SCE	2400	ohm
	5 m	R39653	192	mV vs. SCE	2200	ohm
F3: F_RE_T	5 m	R39654	191	mV vs. SCE	1900	ohm
F3: F_RE_N	5 m	R39655	195	mV vs. SCE	2100	ohm
F3: F_RE_L	5 m	R39656	195	mV vs. SCE	2100	ohm
	5 m	R39657	192	mV vs. SCE	2100	ohm
	5 m	R39658	197	mV vs. SCE	2200	ohm
	5 m	R39659	192	mV vs. SCE	2100	ohm
	5 m	R39660	186	mV vs. SCE	2300	ohm
	5 m	R39661	190	mV vs. SCE	2000	ohm
	5 m	R39662	187	mV vs. SCE	2700	ohm
	5 m	R39663	192	mV vs. SCE	2000	ohm
	5 m	R39664	192	mV vs. SCE	1900	ohm
	5 m	R39665	193	mV vs. SCE	1700	ohm
	5 m	R39666	189	mV vs. SCE	2000	ohm
	5 m	R39667	193	mV vs. SCE	2100	ohm
	5 m	R39668	195	mV vs. SCE	2700	ohm
	5 m	R39669	194	mV vs. SCE	2300	ohm
	5 m	R39670	197	mV vs. SCE	2200	ohm
	5 m	R39671	196	mV vs. SCE	1800	ohm

The potentials of the ERE-20 reference electrodes were checked by relative electrochemical potential measurements in a saturated $Ca(OH)_2$ solution. ERE-20 No. R39652 was used as reference.

	Data from FORCE		10 min.	20 min.
ERE20	mV vs. SCE	Difference	mV vs. REF	mV vs. REF
R39652	187	-	-	-
R39642	194	7	14	13
R39647	187	0	6	6
R39648	194	7	15	13
R39650	187	0	2	1
R39651	197	10	10	11
R39653	192	5	11	11
R39654	191	4	7	7
R39655	195	8	11	11
R39656	195	8	9	10

Maximum deviation from values specified by FORCE Technology after 20 minutes in $Ca(OH)_2$ solution was 6 mV, which was evaluated as being acceptable.

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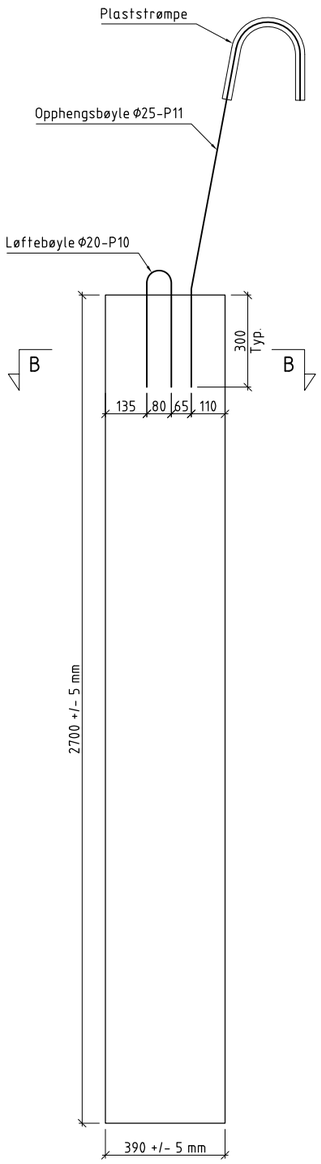
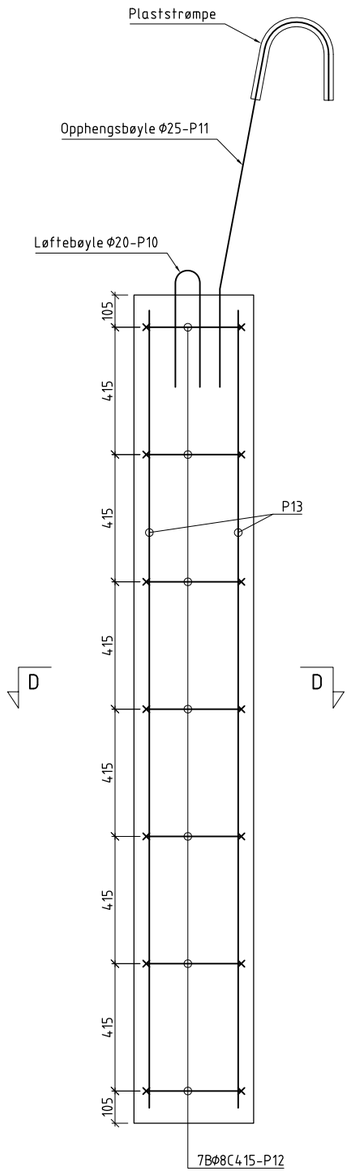
TECHNOLOGICAL
INSTITUTE

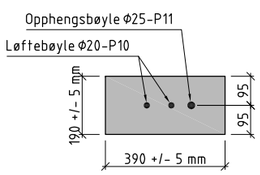
Vedlegg C



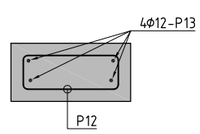
A OPPRISS Form
1:10



C OPPRISS Armering
1:10



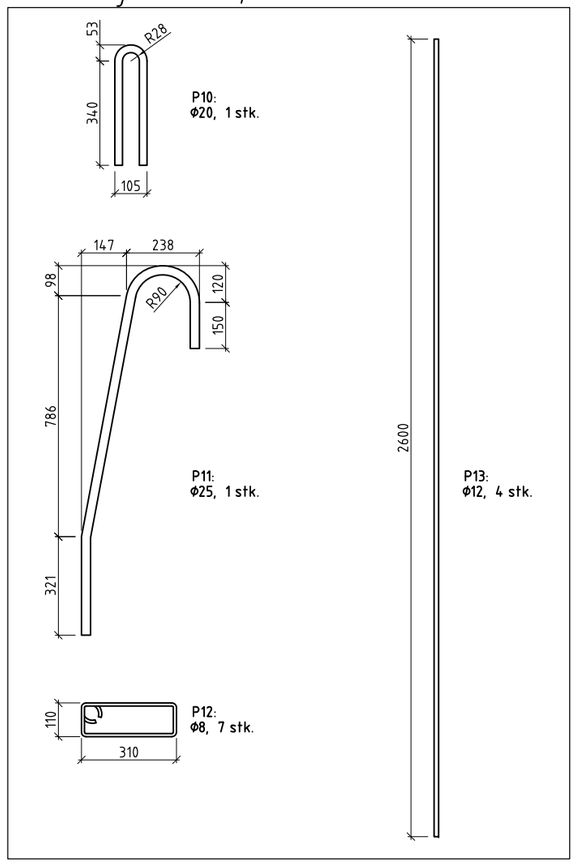
B SNITT
1:10



D SNITT
1:10

V

Bøyeliste, 1 stk. element



BEMERKNINGER

1. Armering: B500NC ihht. NS3576-3

   Overdekning :
   40 mm til bøyler, ± 5 mm tillatt avvik
   50 mm til langsgående armering, ± 5 mm tillatt avvik

2. Bøyeliste er vist på tegning.

ANGITT MÅLESTOKK GJELDER A1-FORMAT

A	31.01.2017	Arbeidstegning	MAGTYS	OLABLI	STIPER
Rev.	Dato	Erstatning - endring	Tegn. av	Kontr.	Godkj./sign

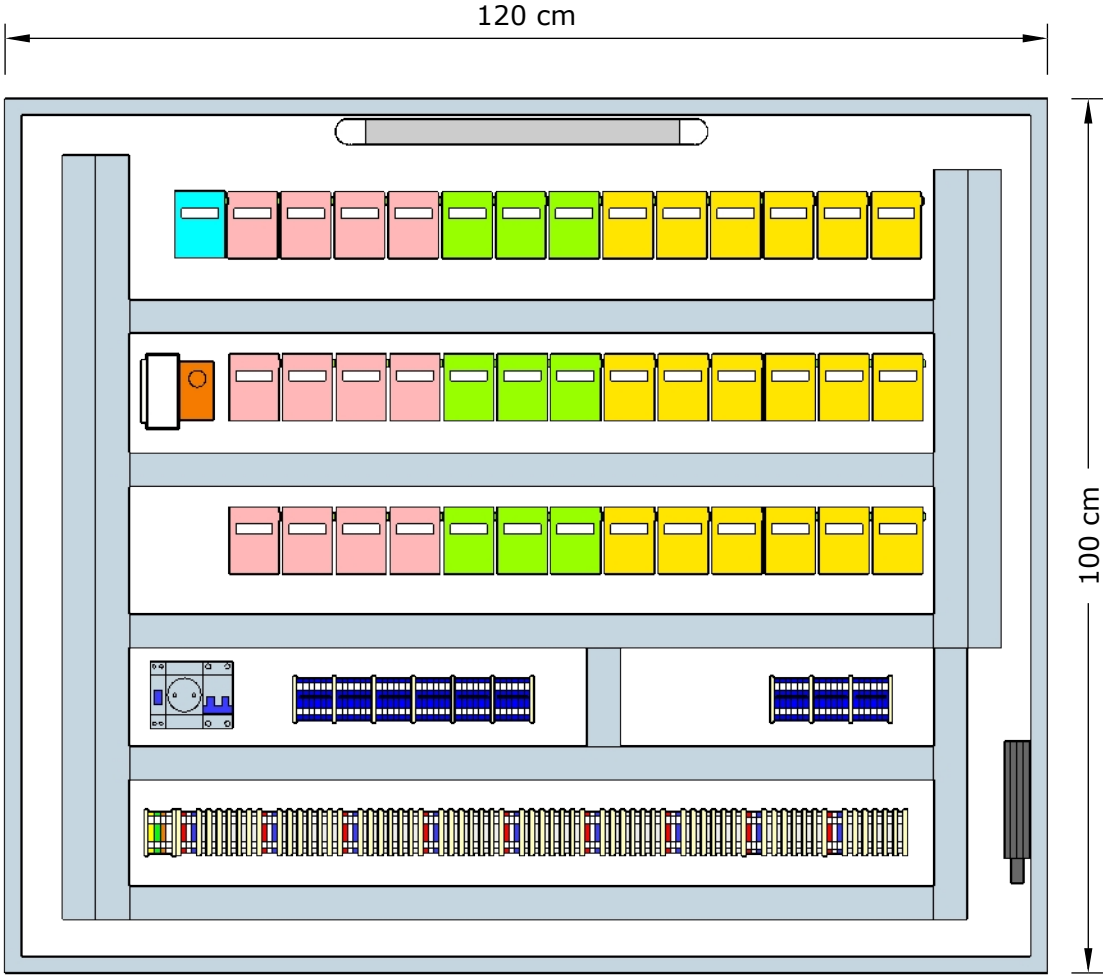
Statens vegvesen

Tegn. av:	MAGTYS 31.01.2017
Kontr:	OLABLI
Godkj./sign:	STIPER
Saksb:	M. Tysse
Bru nr:	12-2672
PROFnr:	12-2672 Austefjorden
Arkiv ref:	
Målestokk:	Som vist
Tegn. nr:	K11 Rev. A

Fv 153
Austefjorden ferjekai, teststasjon
Typisk betongelement
Form og armering

Produsert av: Bruseksjonen Region vest

Vedlegg D



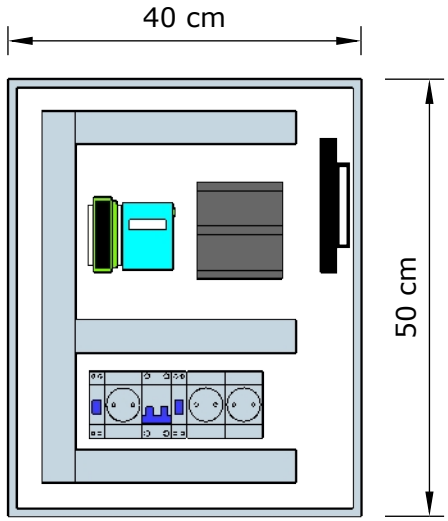
Underskap

P4-Quick

P+t

ZRA

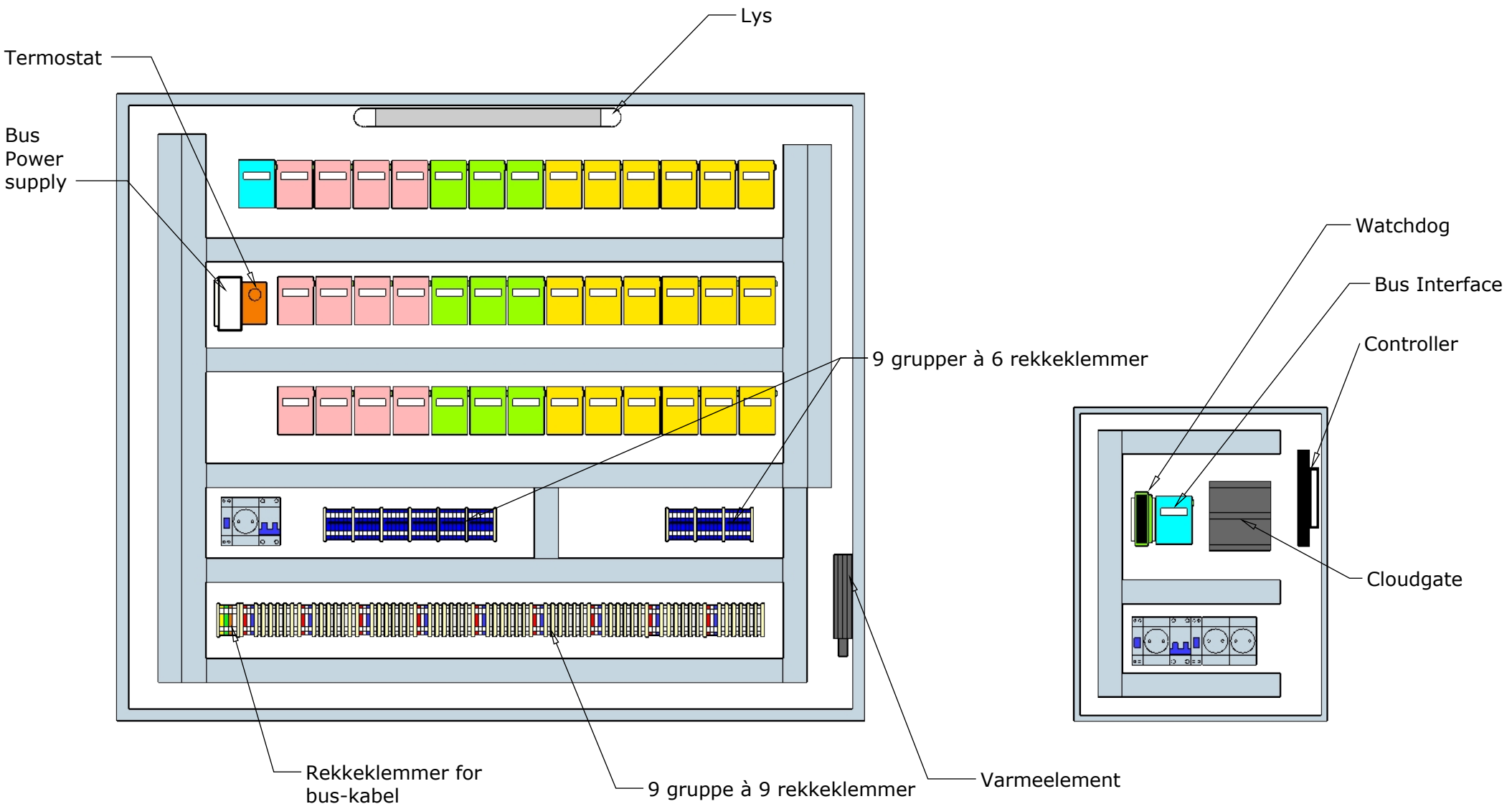
Bus Interface



Hovedskap

Feltstasjon Austefjorden. Ver. 01. 24.10.18/TH

PROTECTOR



Feltstasjon Austefjorden. Ver. 01. 24.10.18/TH

PROTECTOR