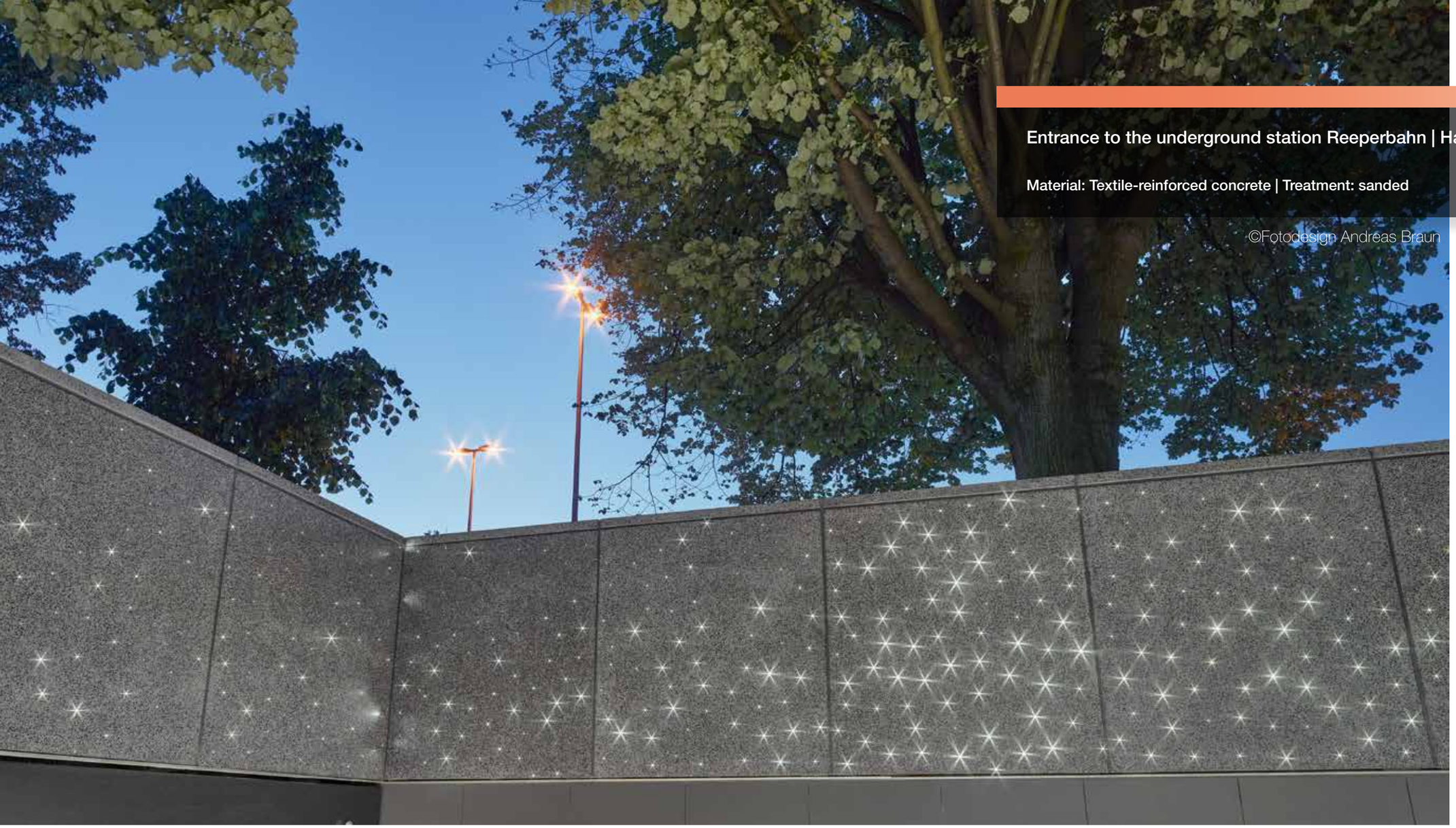
Hering
Architectural
Concrete

SIUT

betoShellSiut®

Functional principle & technology



Entrance to the underground station Reeperbahn | Hamburg, Germany

Material: Textile-reinforced concrete | Treatment: sanded

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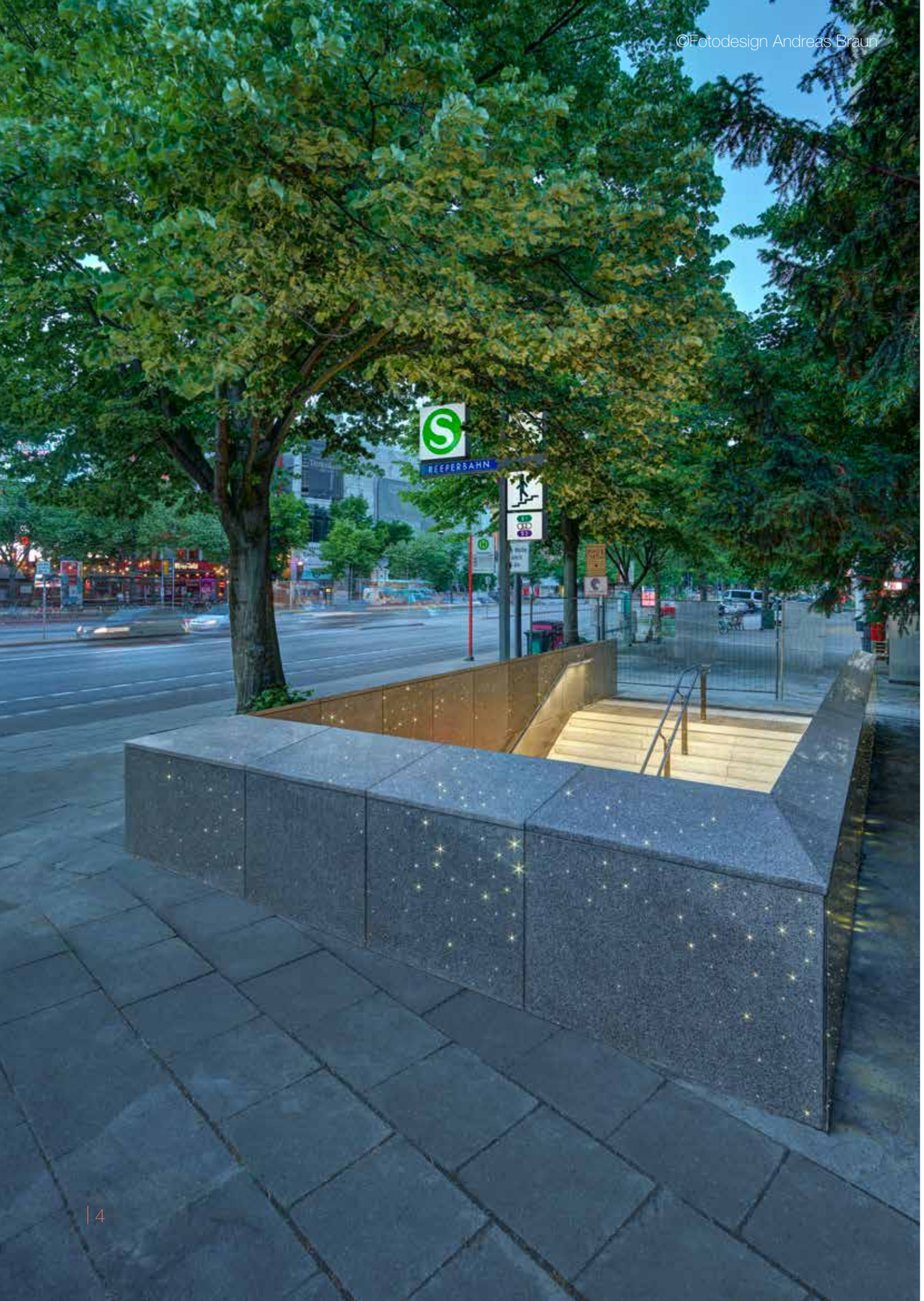
Luminous concrete façades

The combination of the betoShell® textile-reinforced concrete system with the licensed SIUT lighting technology opens up unparalleled opportunities for design in the field of building construction: Luminous façades. The targeted integration of fibre-optic cables into the concrete façade elements transforms the material itself into an innovative source of light and allows individual lighting concepts to be realised in new buldings and refurbishment projects. Discreet lighting may be used to create pleasant environments and enhance the aesthetics of façade sections and even large building fronts.

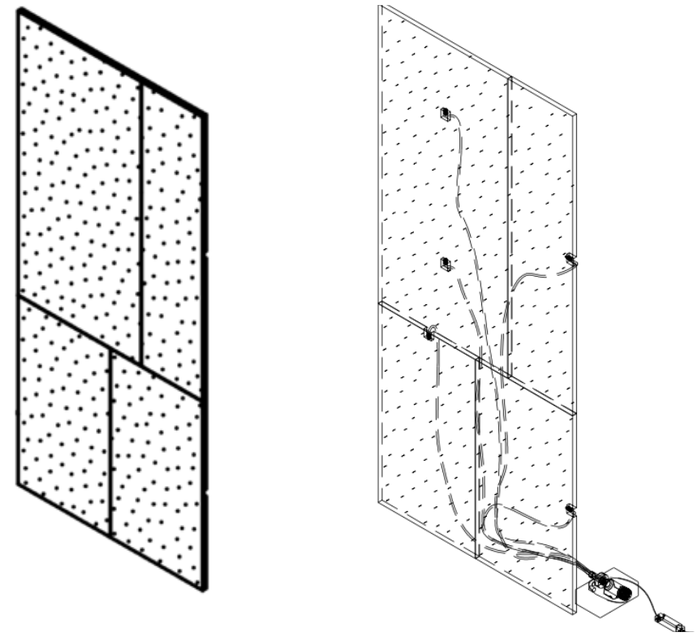
About betoShell®

betoShell® is a textile-reinforced, slim and light concrete façade that meets the highest quality demands. The elements in the betoShell® FLEX40 system, with a material thickness of 40 millimetres, for example, allow a wide range of design options to be realised in the field of innovative architectural concrete. The elements are fitted with undercut anchors on the rear to enable them to be easily attached to a system substructure. A variety of attractive finishes and colours. Concrete slabs that have been reinforced with carbon or glass-fibre are many times lighter and thus much more resource-efficient than those where conventional materials are used for reinforcement.



SIUT Technology

SIUT Technology offers a patented manufacturing process that permits the targeted and individual intergration of optical fibres into pre-cast concrete elements. These fibres radiate light from within the concrete; but are neither discernible or visible when switched off. And therefore helping to maintain the cocnrete‘s natural properties along with its look and feel.



General functional principle

The betoShell®SIUT façade elements use SIUT technology. The light is supplied externally and centrally. The façade elements and the light sources are consequently separated from each other, which makes carrying out inspections much easier.

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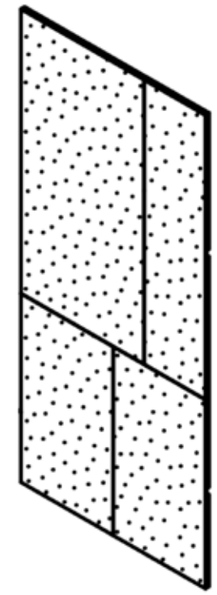
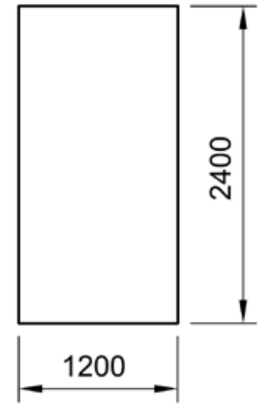
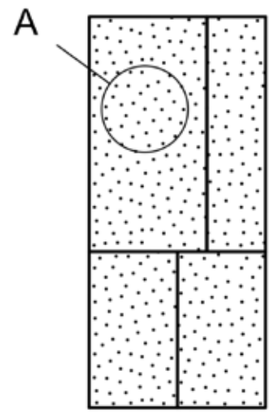
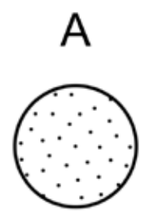
Sizes of the façade elements

The sizes of the facade elements are variable. But the maximum is 240 x 120 cm.









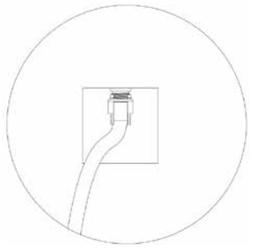
75 light points / m²
Fiber optic cross section 0,75 mm

Design example

Flexible light supply

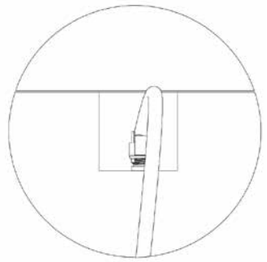
B

Light supply: central



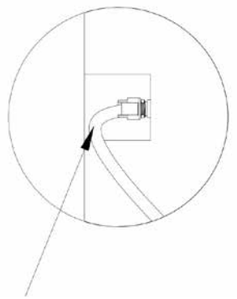
C

Light supply: upper / lower edge

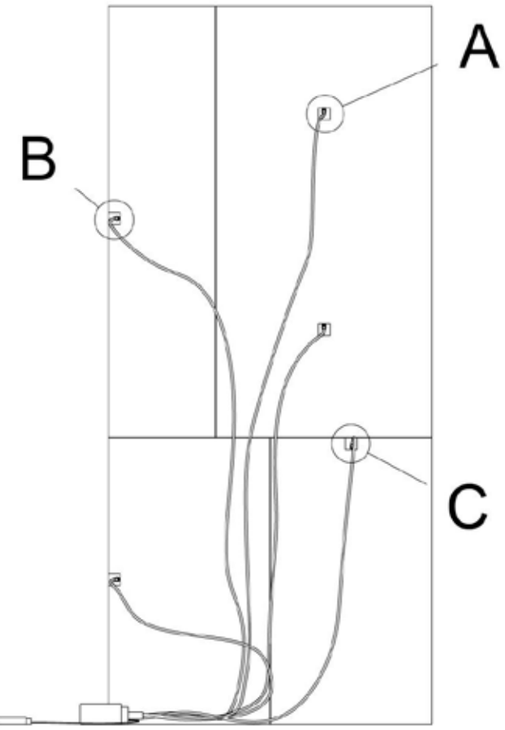


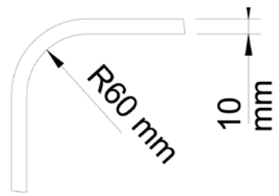
D

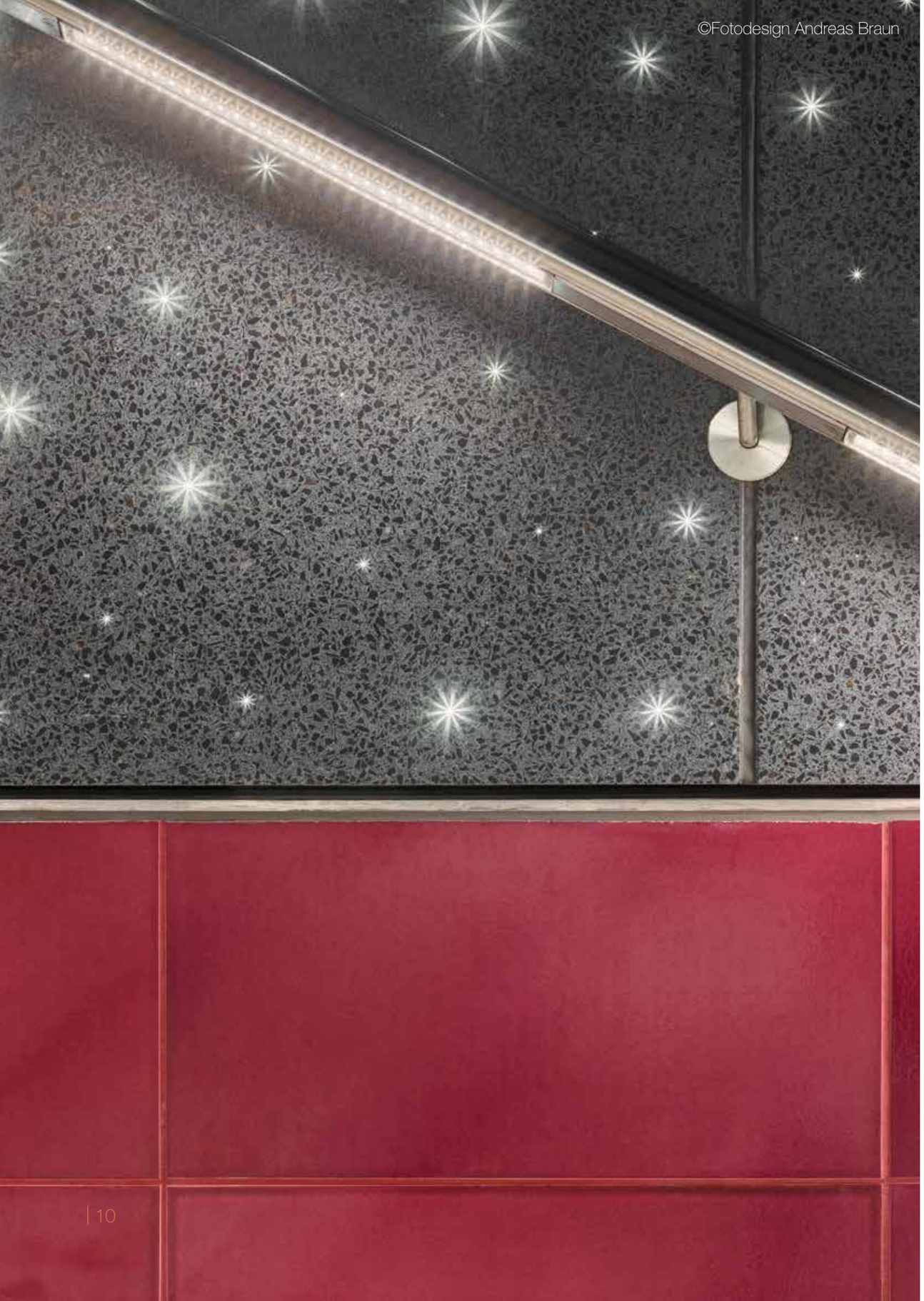
Light supply: side



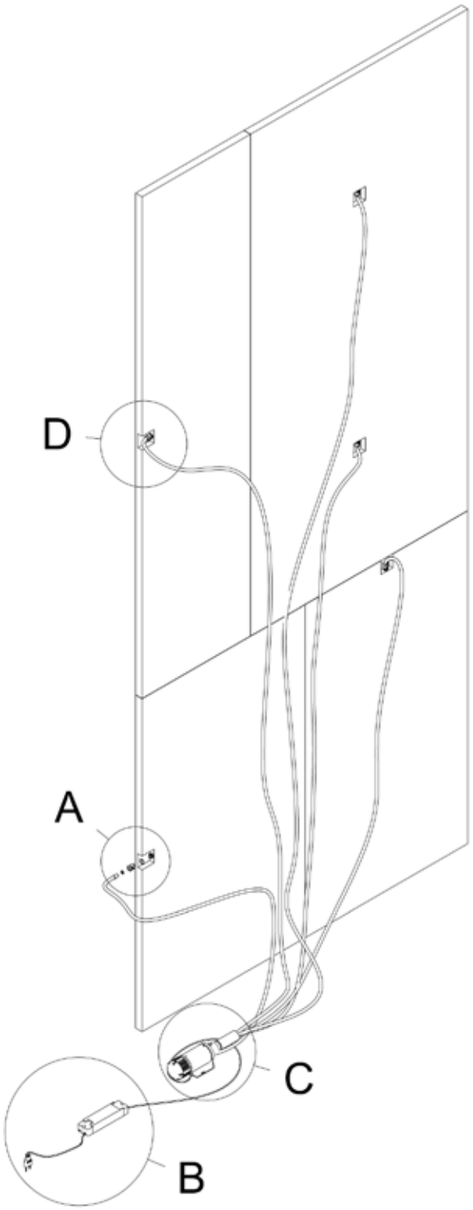
Minimal bending radius of fibre optic supply cable

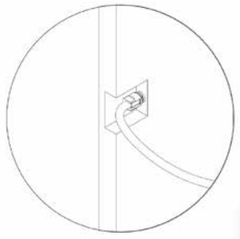






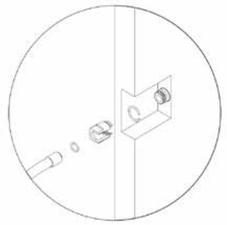
Electronic components





D

Fiber optic supply cable

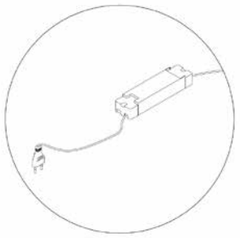


A

Coupling mechanism of fibre optic supply cable to facade element

C

Light generator with waterproof housing IP67



C

Power supply

Light generator technical characteristics

The light generator can serve as a light source for a maximum of 10 square metres of façade. The strand length can be defined as required. If several strands are used, they should have the same length to ensure uniform light intensity and colour uniformity. The longer the fibre arms are chosen, the higher the light loss. The fibre arms must be routed behind the façade. The light engine should be easily accessible and optimally installed for inspection.

Connector size	Ø9/Ø28	**Lightsource**	LED
Fiber type	PMMA	Lifetime	50,000 Hours
Size	298 x 193 x 95 mm	Manufacturer	Philips
Colour	black RAL 9005	Catalog no.	Luxeon S 1000
Supply voltage	230-240 V / 50-60 Hz	Colour temperature	4,000 K
Light source power	19.3 W	CRI	85
Total power	24 W	IP	65
Main fuse	Integrated automatically	Protection class	I
Power cord	Power cord with plug	Material	EN AW-5754 (AlMg3)
Power supply unit	Electronic	Weight	2.8 kg
LED lifetime	50,000 Hours	Surface treatment	Lacquered
Thermal insulation	Automatic approval		
Ventilation	Natural ventilation		
Fan noise level	N/a dB(A)		
Lifetime of ventilation	N/a		
Max. ambient temperature	45 °C		
Min. ambient temperature	-20 °C		

Requirements for installation in enclosed spaces:

- Sufficient space for natural heat transfer via surfaces, surfaces should not be insulated.
- Air volume per light generator at least 0.03 m^3.
- Ventilation openings per light generator with min. 20 cm^2 air inlet and min. 20 cm^2 air outlet.
- Max. ambient temperature of 45°C.

Requirements for installing several light engines:

- Min. 100 mm distance between adjacent light engines, to ensure sufficient heat transfer.

Light supply technical characteristics

	Façade panels
Supply principle:	Central
Type of light source:	Light generator central installed for max. 10 m²
Light points / m² façade panel:	75
Optical fiber cross section:	0,75 mm
Optical fiber supply cable / m²:	1
Max. facade panels per light source:	10
Supply cable:	Optical fiber supply cable Ø 10 mm
Connection system: optical fibre supply line to facade panel:	Screw coupling on the concrete slab corresponds to protection class IP66
Bending radius of the supply cable:	60 mm
Max. Length of supply cable:	<10 m (recommended)
Lifetime:	50 000 Hours
Light colour:	standard white, RGB possible

Installation instructions

During installation, make sure that the material is handeld carefully and without damaging it. It should be avoided, for example, that fibre strands can be stepped on or otherwise be compressed (run over by a lift truck, etc.). The minimum bending radius must always be respected when routing the fibre arms. The fibre arms must be protected against tension, pressure and buckling.

Revision

The betoShell®Siut facade elements are equipped with SIUT technology. As shown, the light is supplied externally and centrally from one location. Thus the component and the light supply are separated from each other. During the planning phase, care must be taken to ensure that the light generator is easily accessible for the inspection.

Exclusion of liability revision

Siut accepts no liability for the planning and dimensioning of the components and fastenings by third parties. There is no examination of the design documents provided by third parties.

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Façade elements betoShell® FLEX40

Element thickness:	40 mm
Maximum dimension:	2.400 x 1.200 mm
Tare weight:	96 kg/m²
Joint width :	≥ 10 mm
Anchorage:	FZP-II 13x21 M8 A4
General type approval:	Z-21.9-2072
Textile reinforcement:	Alkaline-resistant glass fiber scrim

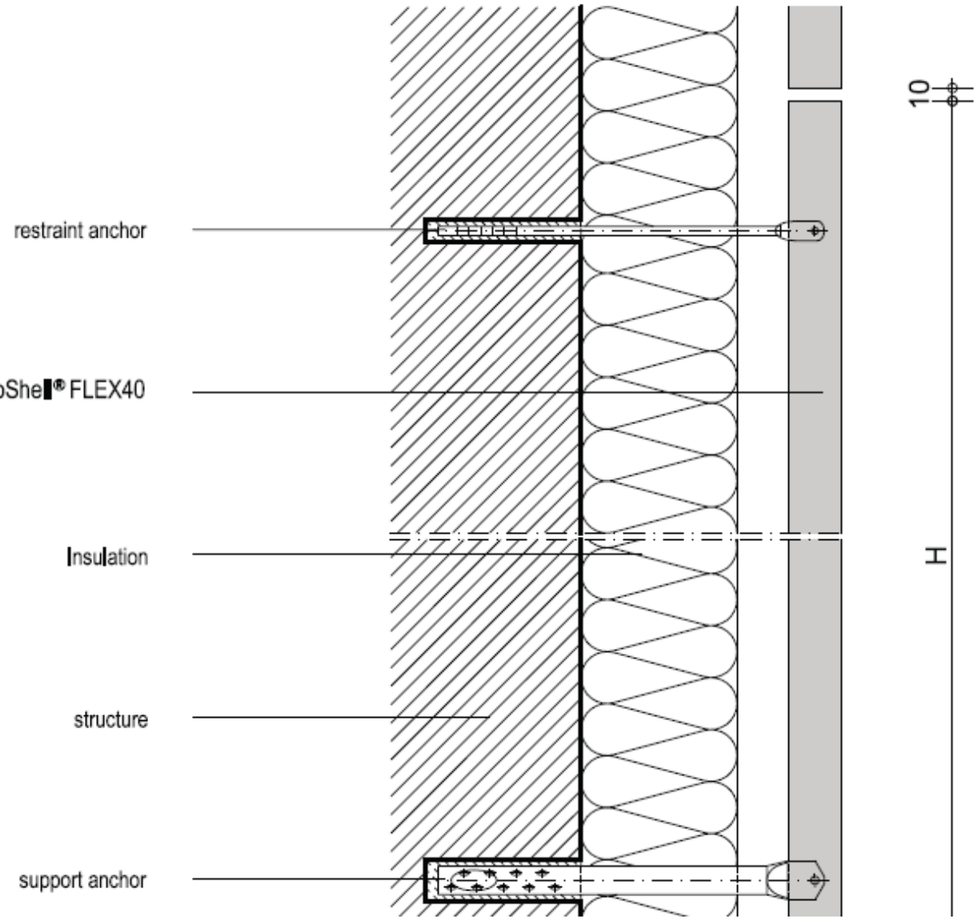
Planning aid

Surface:	according to FDB data sheets nr. 1 and 8
Tolerances:	according to DIN 18500-1 and DIN EN 14992 (Class A)
Mounting:	Fischer Zykon plate anchor FZP-II agraff system and Mandrel bearing
Anchor arrangement:	according to statics Edge distance ≥ 50 mm or 100 mm
Undercut anchor:	according to the following table

Undercut anchor FZP-II 13x21	Element thickness d	Structure a	Remaining wall thickness c	Thread length b
M8/9 A4	30 mm	33 mm	12 mm	9 mm
M8/17 A4	30 mm	33 mm	12 mm	17 mm
M8/21 A4	30 mm	33 mm	12 mm	21 mm

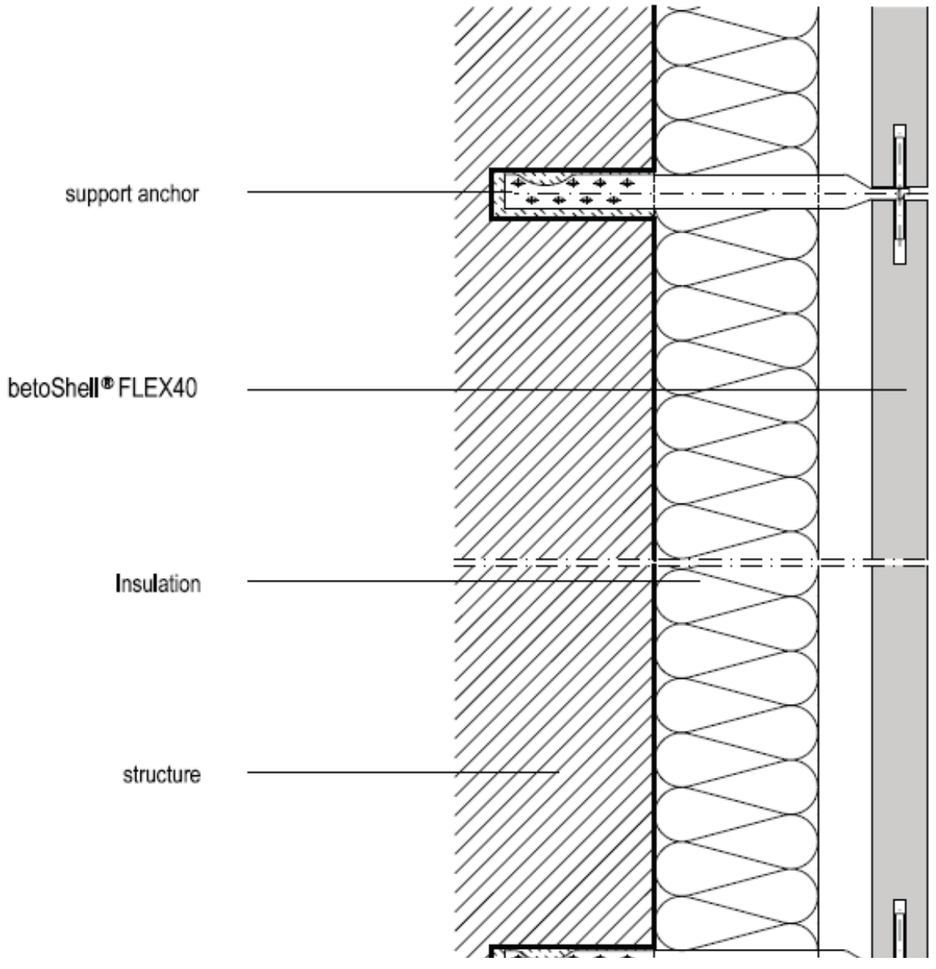
Planning aid

Vertical section: Fixing Anchoring vertical joint



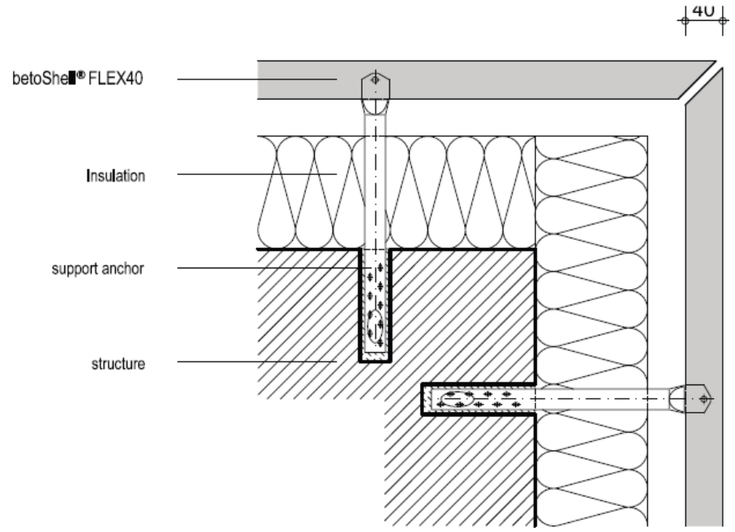
Planning aid

Vertical section: Fixing anchoring horizontal joint

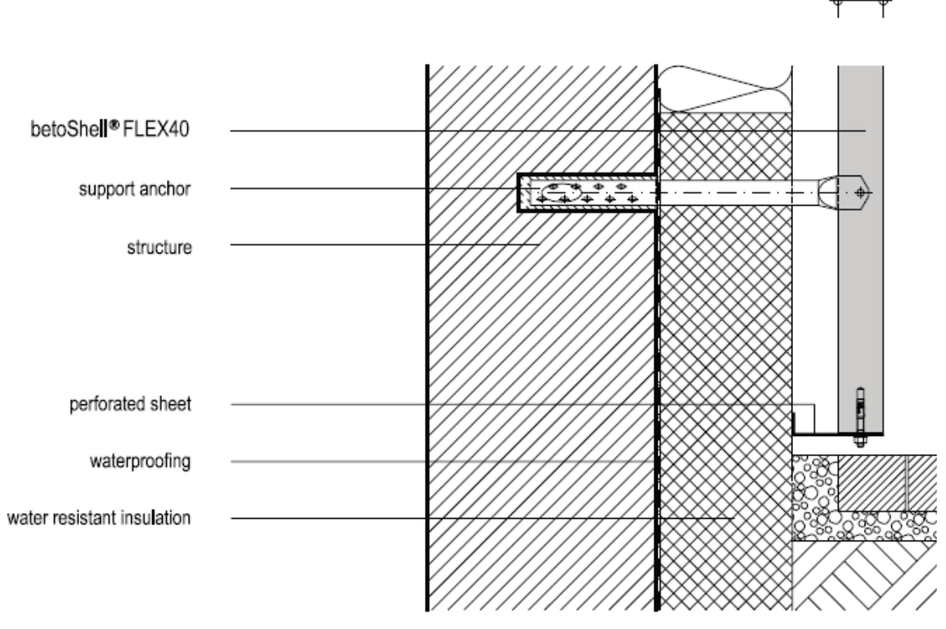


Planning aid

Horizontal section: External corner

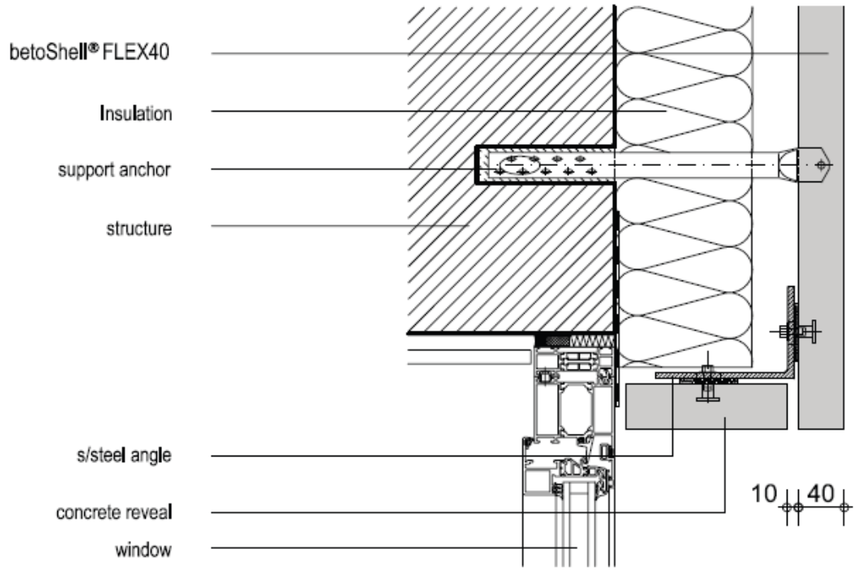


Vertical section: Plinth

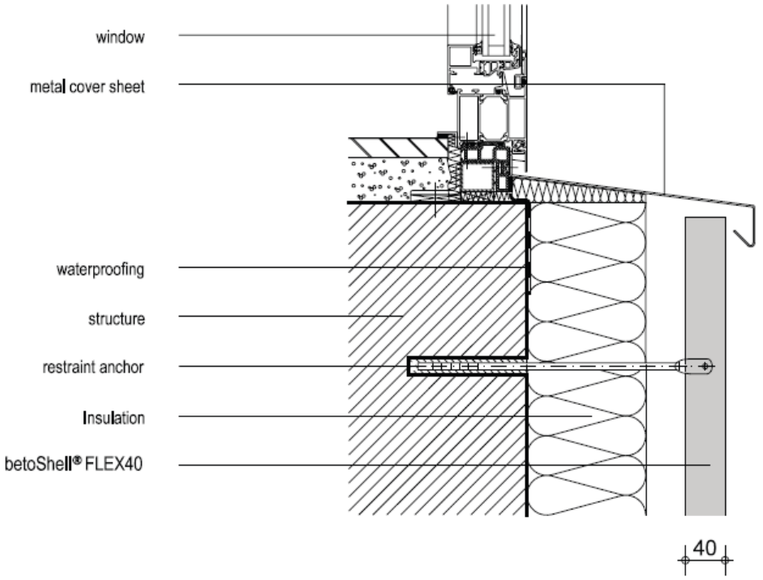


Planning aid

Vertical section: Lintel



Vertical section: Window sill



Measurement

General type approval:	Z-21.9-2072
Design standard:	ABg und DIN 18516-5:2013-09
Weight:	Tare weight (24 kN/m³), Wind pressure according to DIN EN 1991
Determination of section forces:	Formulas and diagram Approval Annex 9-15 FE-Programm (Observe instructions AbZ Annex 16)
Anchor:	Load transfer see ABg Annex 1 Observe further provisions of ABg (e.g. edge distance, embedment depth) Anchor resistances according to ABg Annex 7+8
Evidence:	ABg Chapter III - Design method Bending: against concrete tensile strength Anchor pullout: Longitudinal and transverse tension, interaction
Strength class	According to DIN 18516-5:

LVB 7/12	pure white	3
LVB 11/06	white	4
LVB 9/12	grey	5
LVB 15/06	anthracite	4
LVB 12/11	charcoal	4

Pre-dimensioning

Internal force calculation with FEM program

Maximum wind pressures for a symmetrical support in the chamfer points, edge distance a_R ≥ 100 mm, embedment depth of the undercut anchor h_v = 17 mm, slab without recess and reveal.

Plate size [m]	Strength class	Absorbable characteristic wind pressure [kN/m²]
2,40 x 1,20 m	3	± 0,5
	4	± 0,6
	5	± 0,7
2,00 x 1,00 m	3	± 1,1
	4	± 1,3
	5	± 1,4
1,50 x 1,00 m	3	± 1,8
	4	± 2,2
	5	± 2,5
1,20 x 0,60 m	3	± 5,0
	4	± 5,8
	5	± 6,5

Installation instructions

The agraffe is screwed tightly against the undercut anchor without an intermediate layer. Suitable securing of the screws or nuts must be provided. Fischer recommends securing with an adhesive, e.g. Loctite.

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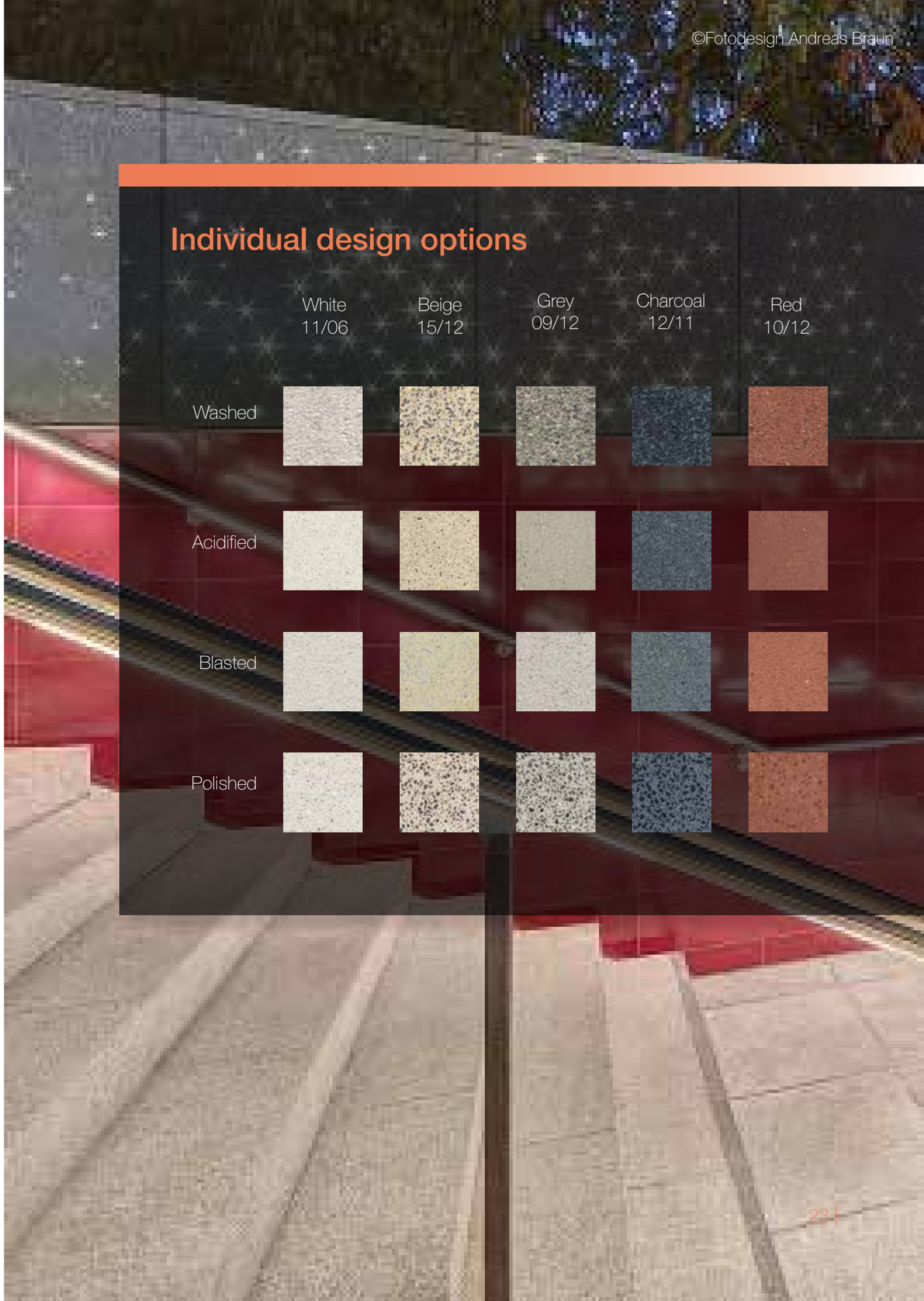

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