

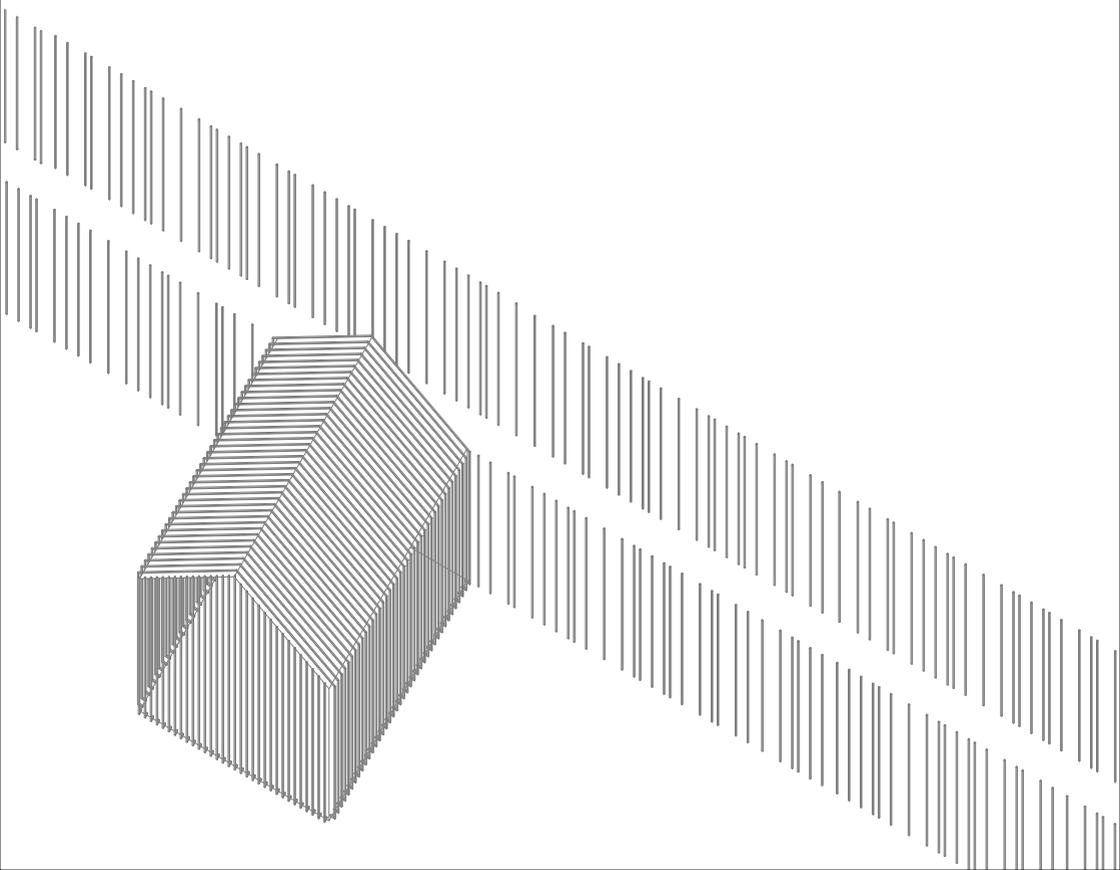
Kontor

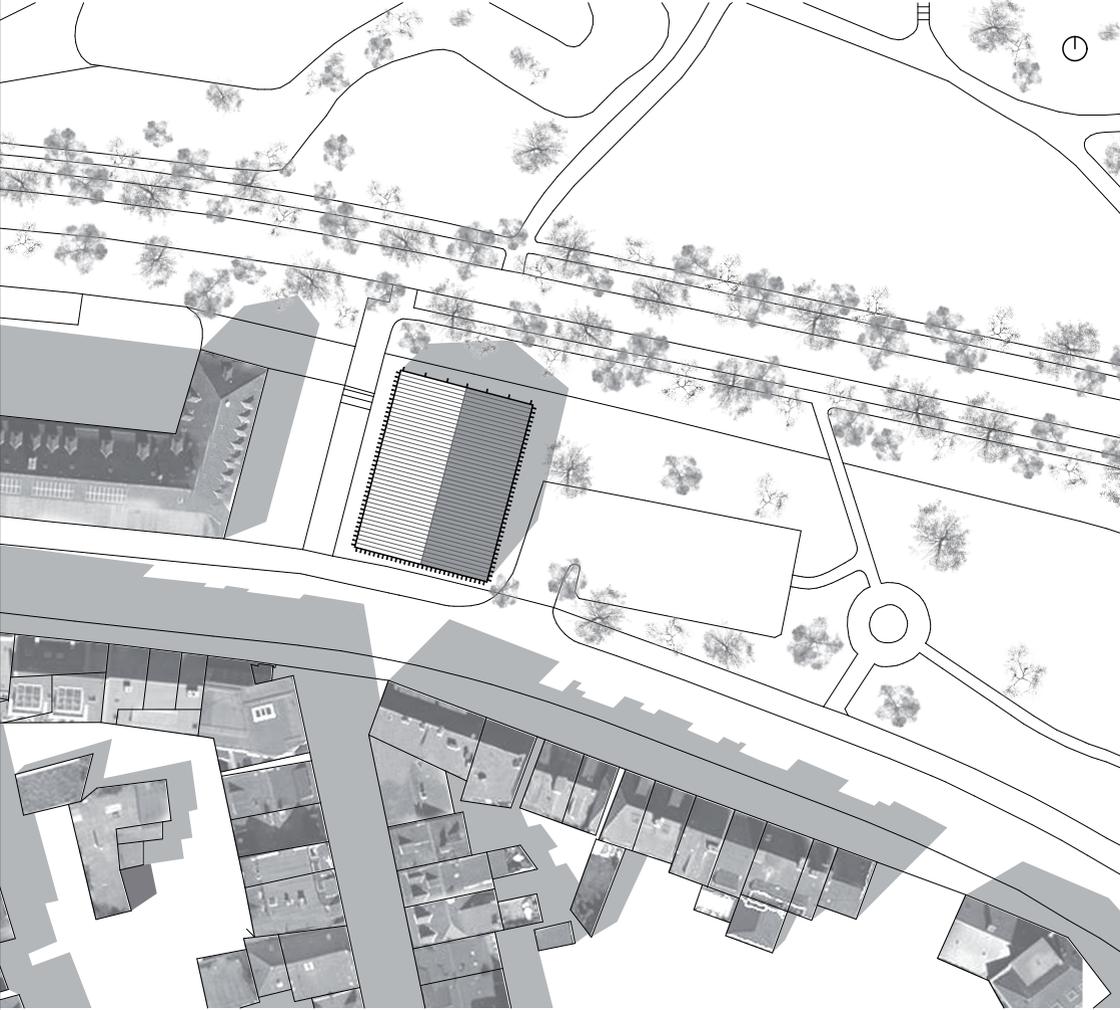
Redaktionsgebäude
Münzstraße | Münster

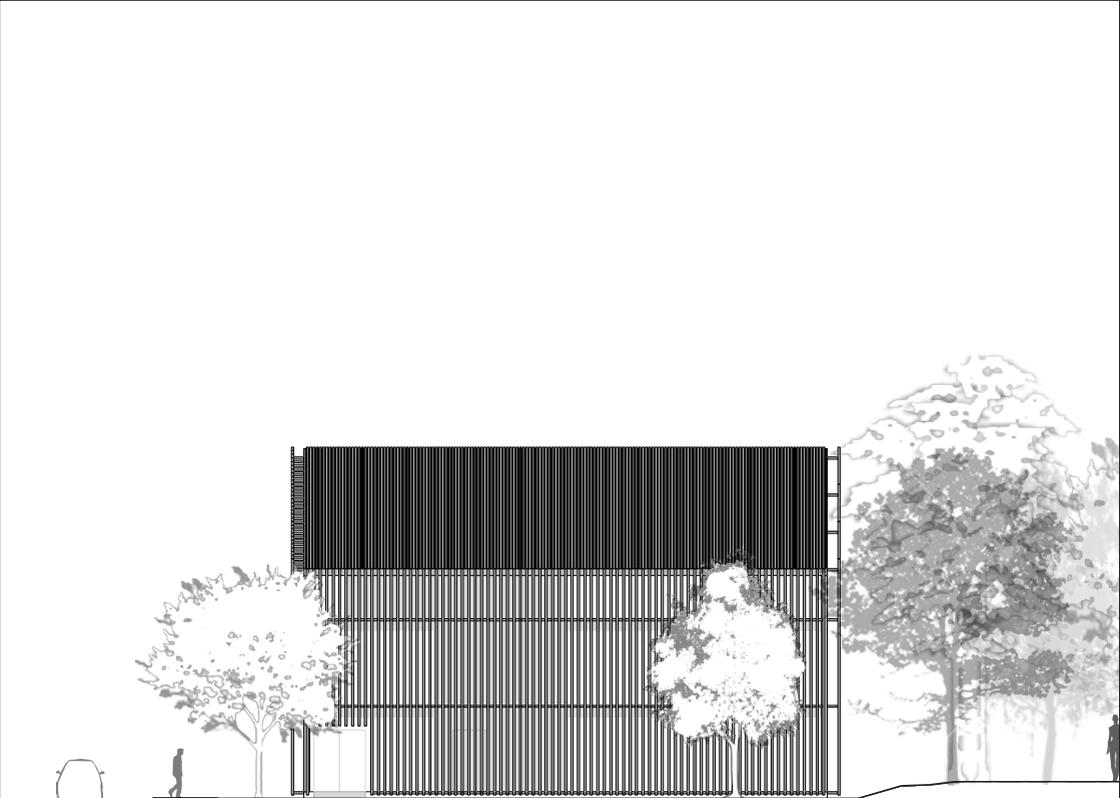
Katharina Westphalen | Andrea Artimez Wetz

ba.m3.3 Grundlagen der Baukonstruktion
Skelettbau | Wintersemester 2014/15
Prof. Dipl.-Ing. Martin Ebert
MSA Münster School of Architecture

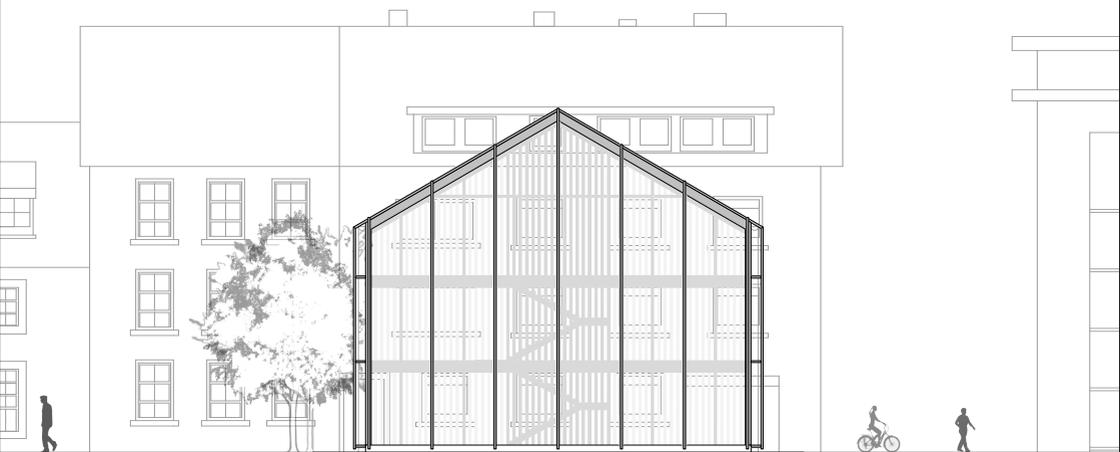
05 | Februar | 2015



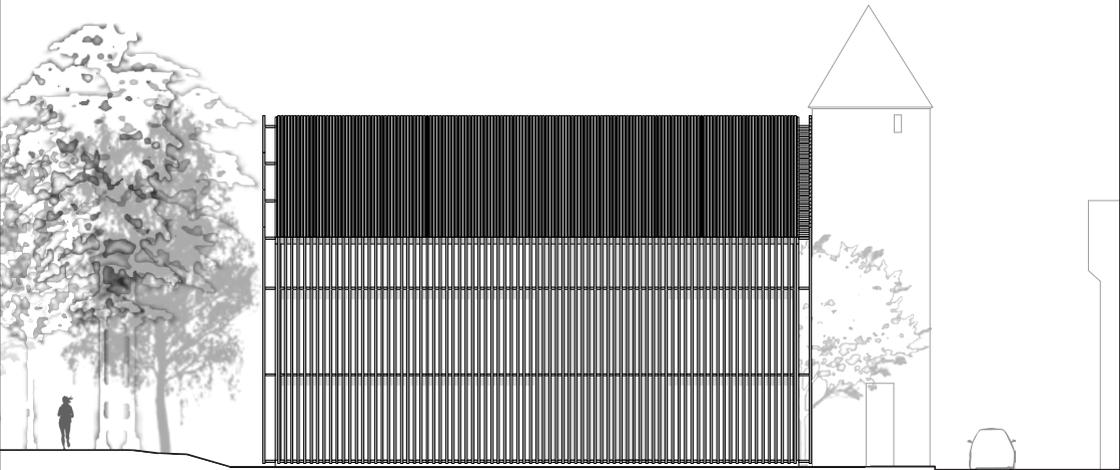




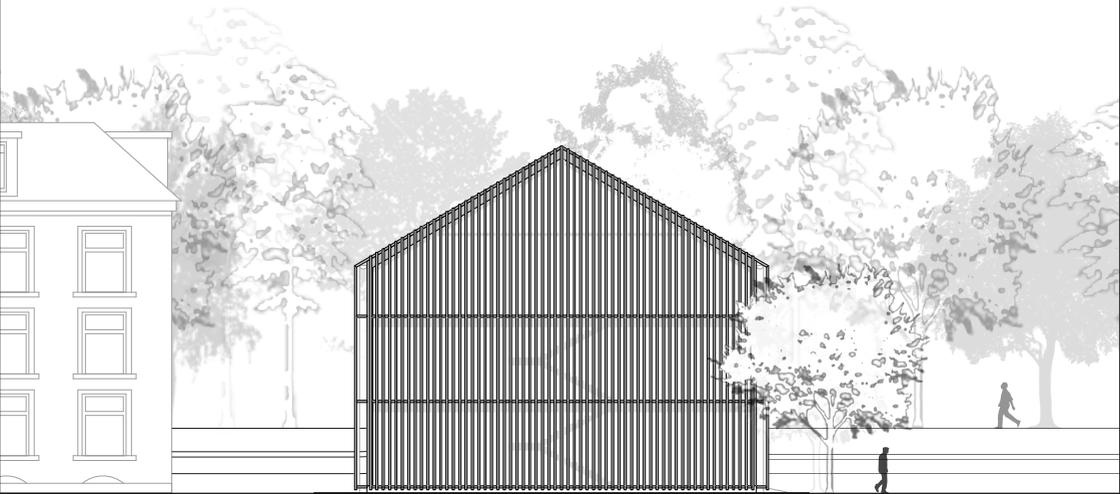
Ansicht Ost M 1 | 400



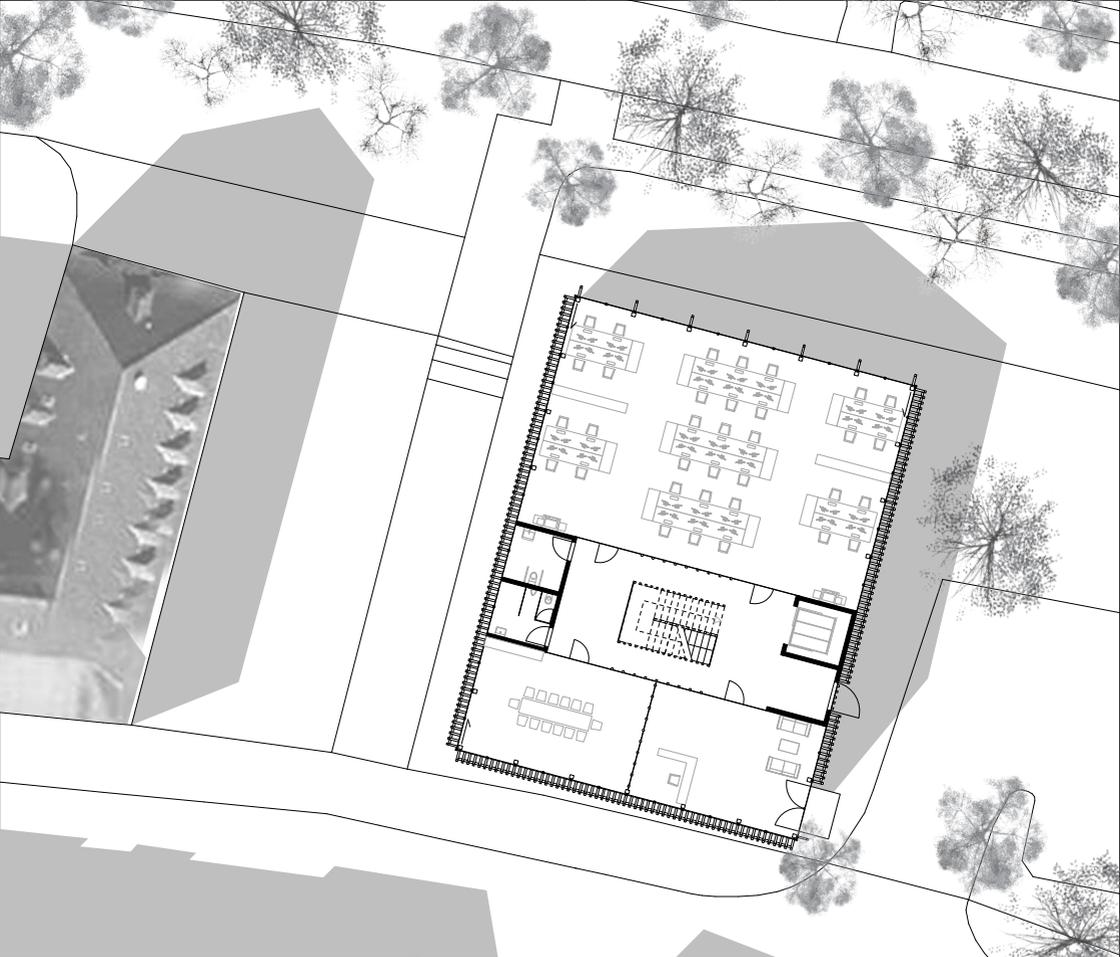
Ansicht Nord M 1 | 400



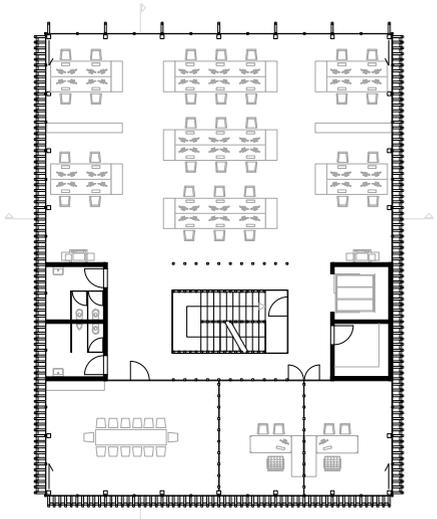
Ansicht West M 1 | 400



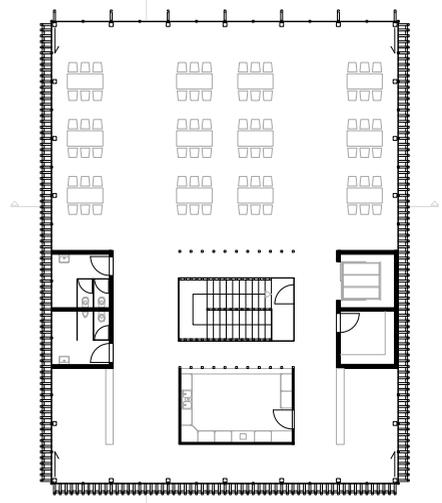
Ansicht Süd M 1 | 400



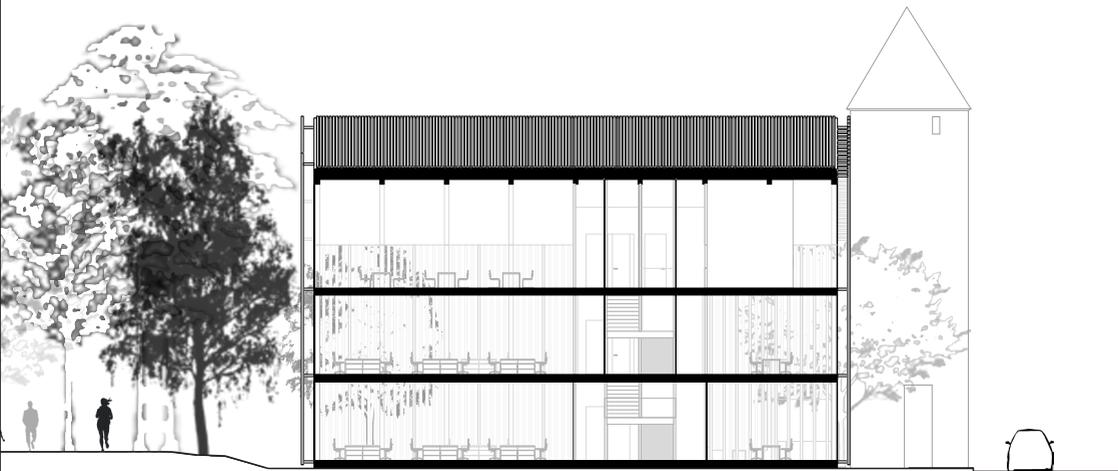
Grundriss EG M 1 | 400



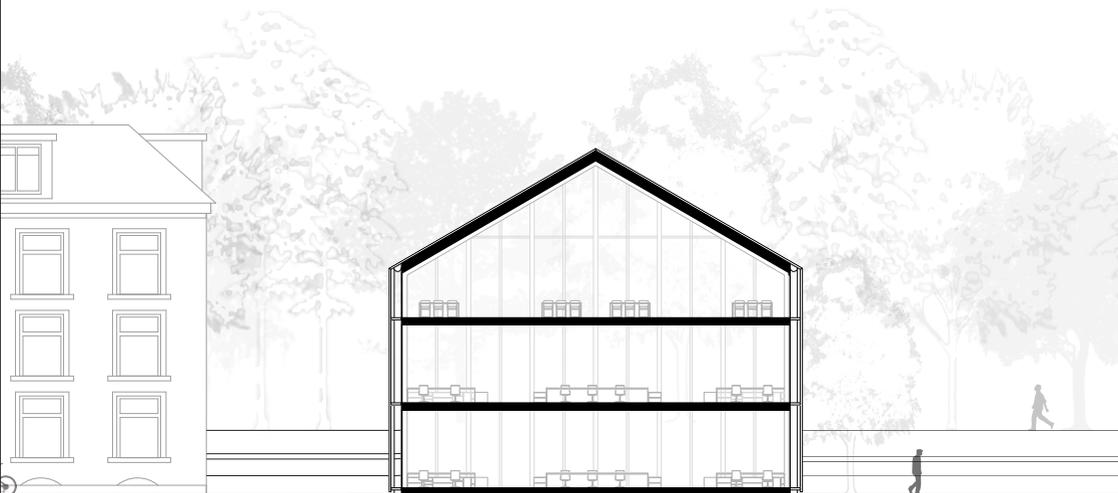
Grundriss 1. OG M 1 | 400



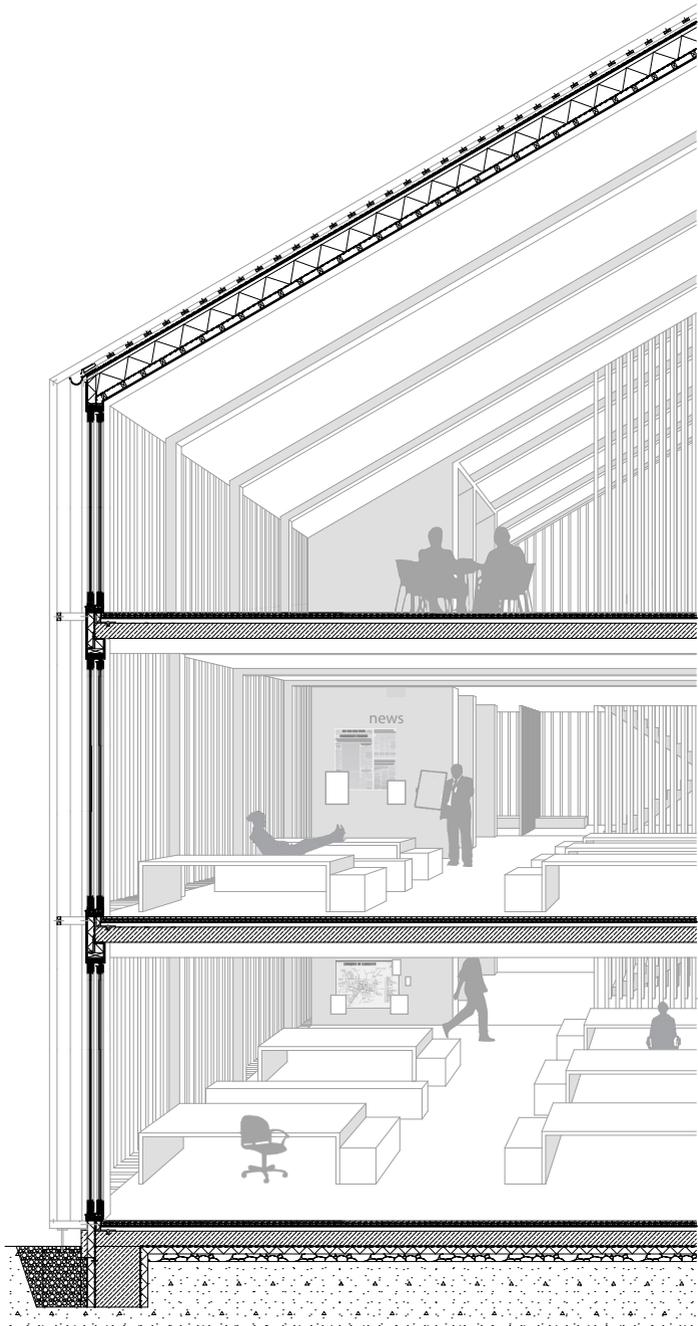
Grundriss 2. OG M 1 | 400



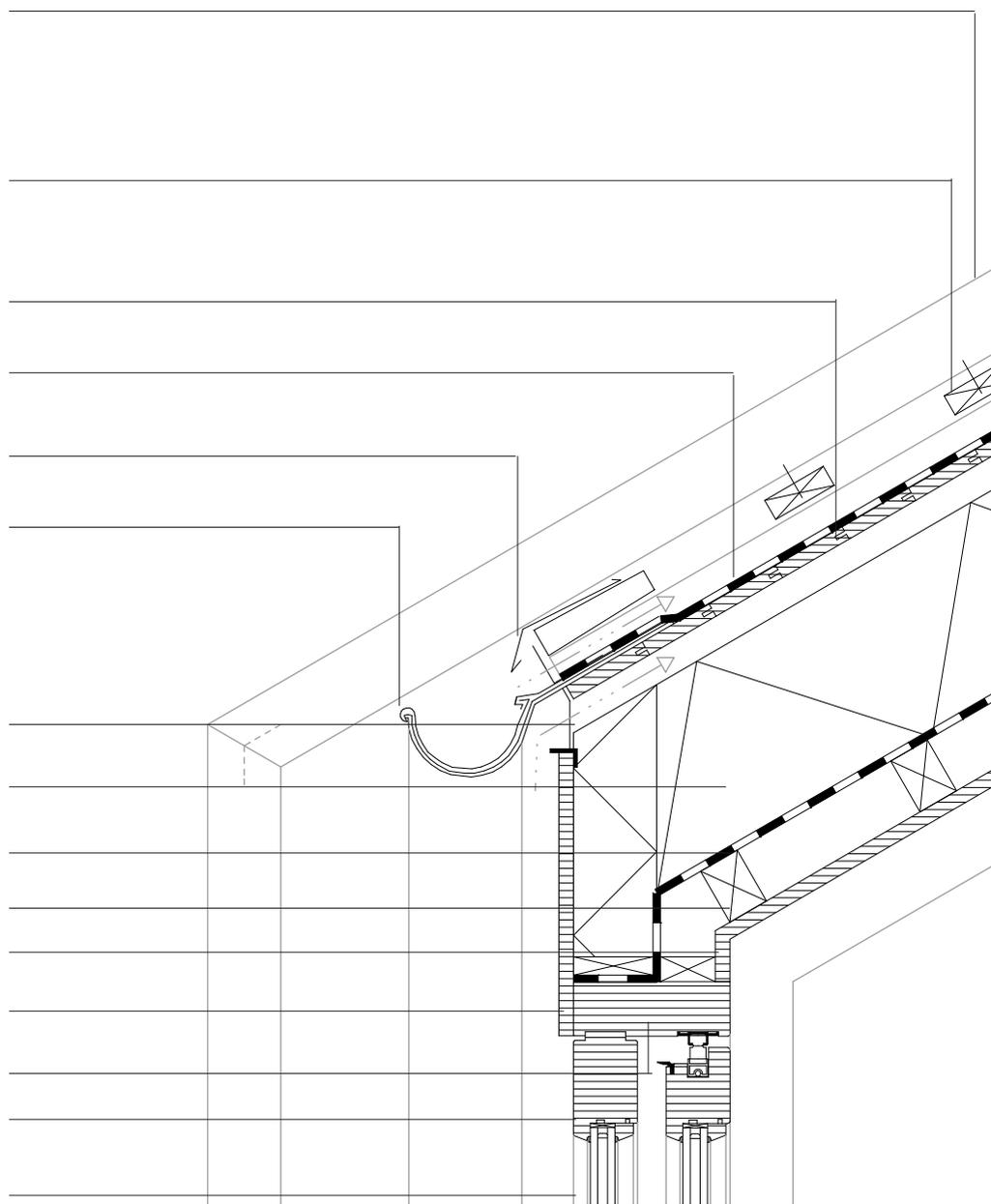
Schnitt Nord-Süd Achse M 1 | 400

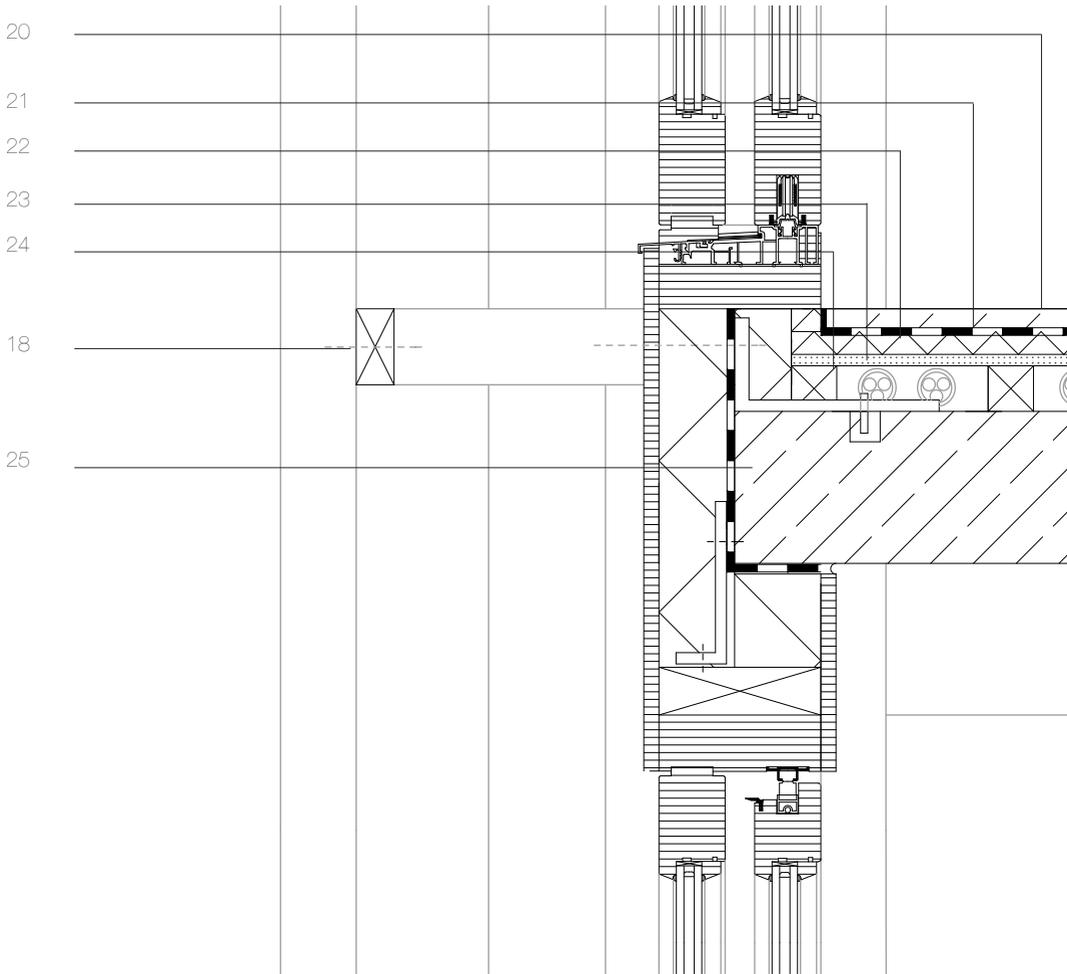


Schnitt West-Ost Achse M 1 | 400



1
2
7
3
4
5
6
8
9
10
11
12
13
14
15





Detail M 1 | 10

- | | | | |
|----|------------------------------------|----|--|
| 1 | Rotzeder 10 x 10 cm | 16 | Stahlbetonunterzug |
| 2 | Holzsparen 3 x 9 cm | 17 | Stahlbetonstütze |
| 3 | Wasserführende Schicht | 18 | Besfestigungsmodul für Fassade |
| 4 | Tropfnase | 19 | Abdeckblech |
| 5 | Regenrinne | 20 | Estrich |
| 6 | Lüftungsgitter | 21 | PE-Folie |
| 7 | Holzschalung | 22 | Trittschalldämmung |
| 8 | Dämmung | 23 | Gipsfaserplatte |
| 9 | Dampfsperre | 24 | Holzsparen 6 x 6 cm |
| 10 | Holzsparen 8 x 5 cm | 25 | Stahlbetonplatte 20 cm |
| 11 | Innenverkleidung aus Rotzedernholz | 26 | Fassadenträger |
| 12 | Holzabdeckleiste | 27 | Stahlbetonfundament für Fassade 75,8 x 50 cm |
| 13 | Schienen für Hebe-Schiebe-Tür | 28 | Betonfertigteile 35,5 x 8 cm |
| 14 | Fensterrahmen | 29 | Schutzmantel |
| 15 | Doppelverglasung | 30 | Stahlbetonfundament 80 x 60 cm |
| | | 31 | Kiesschüttung |

30

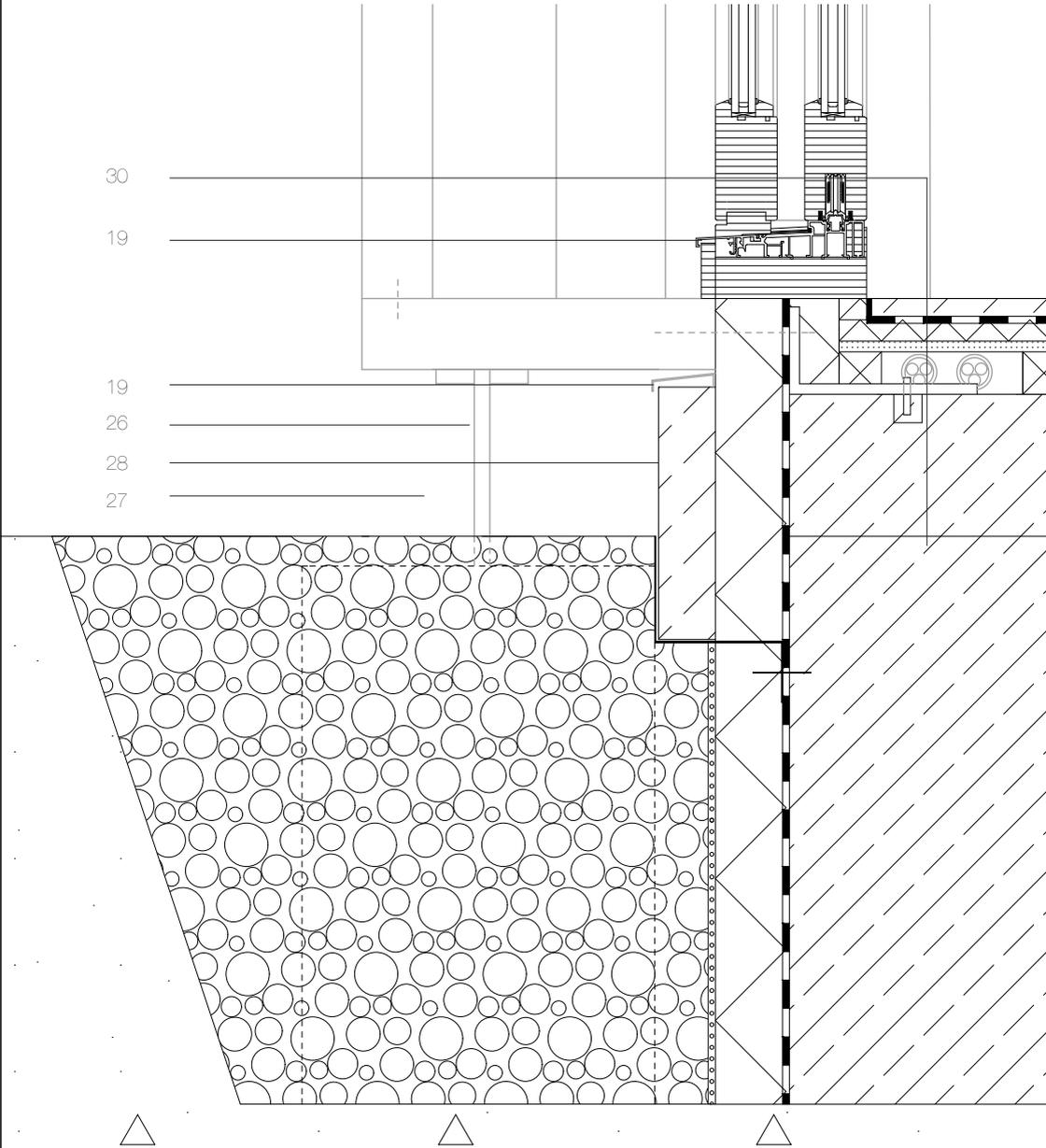
19

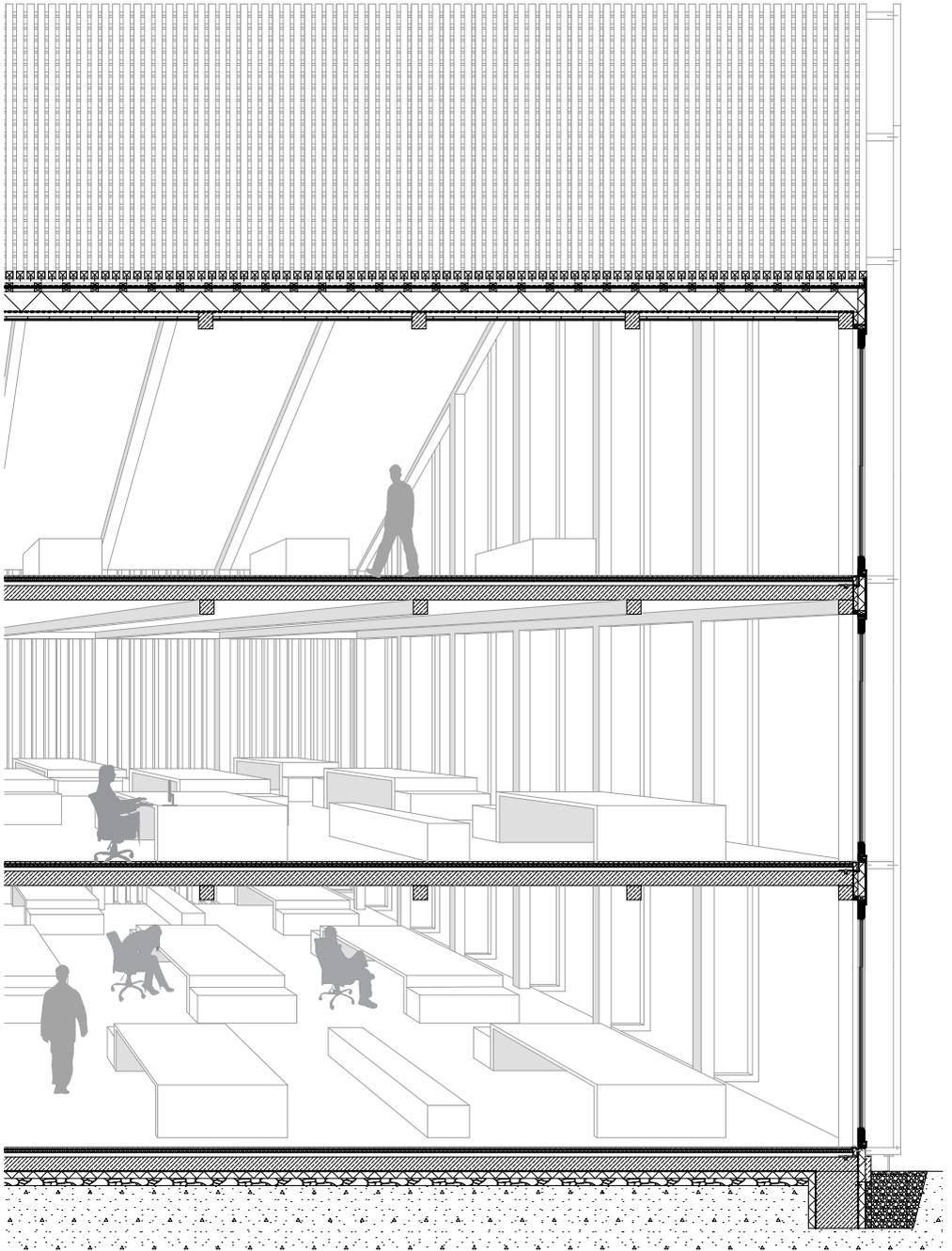
19

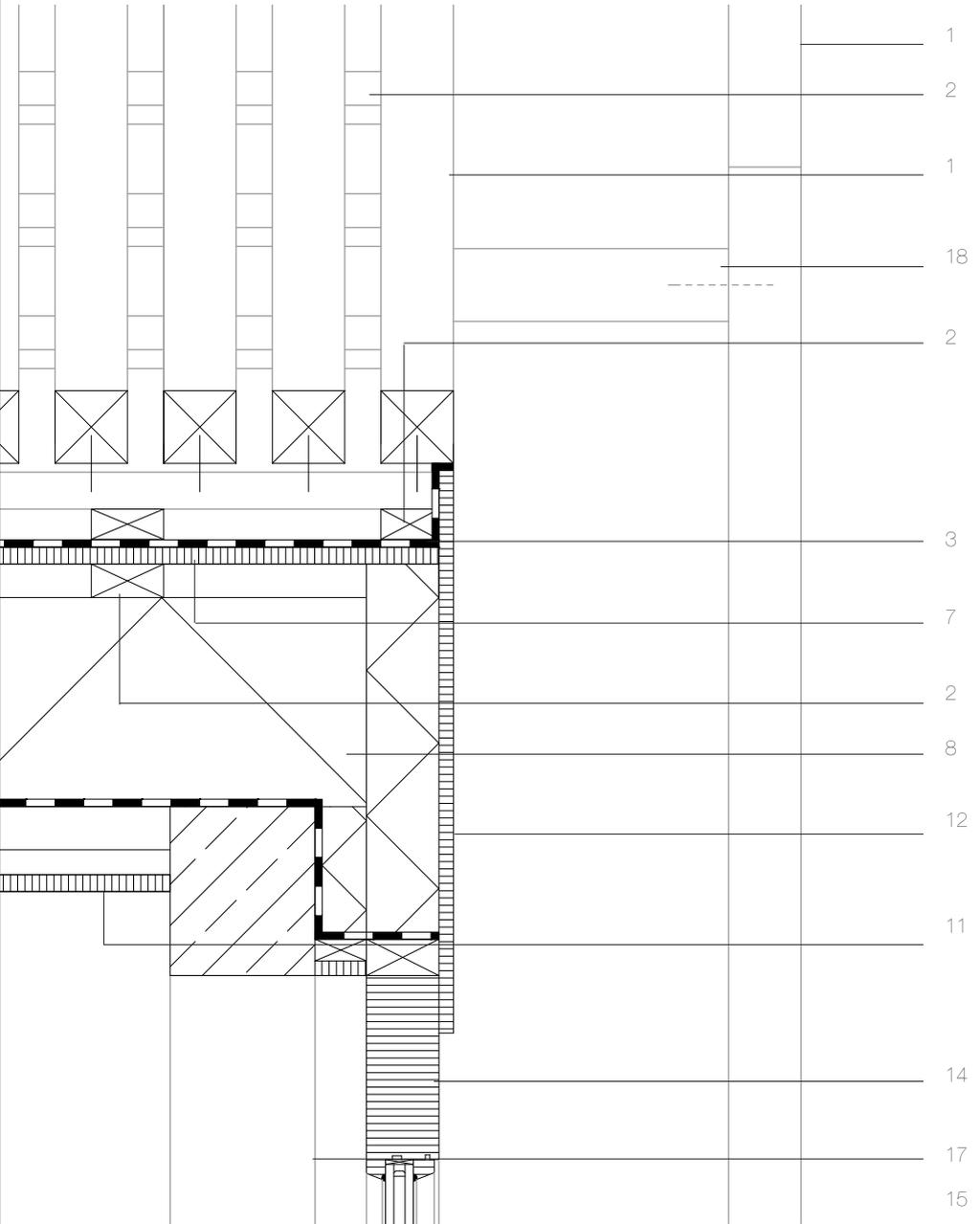
26

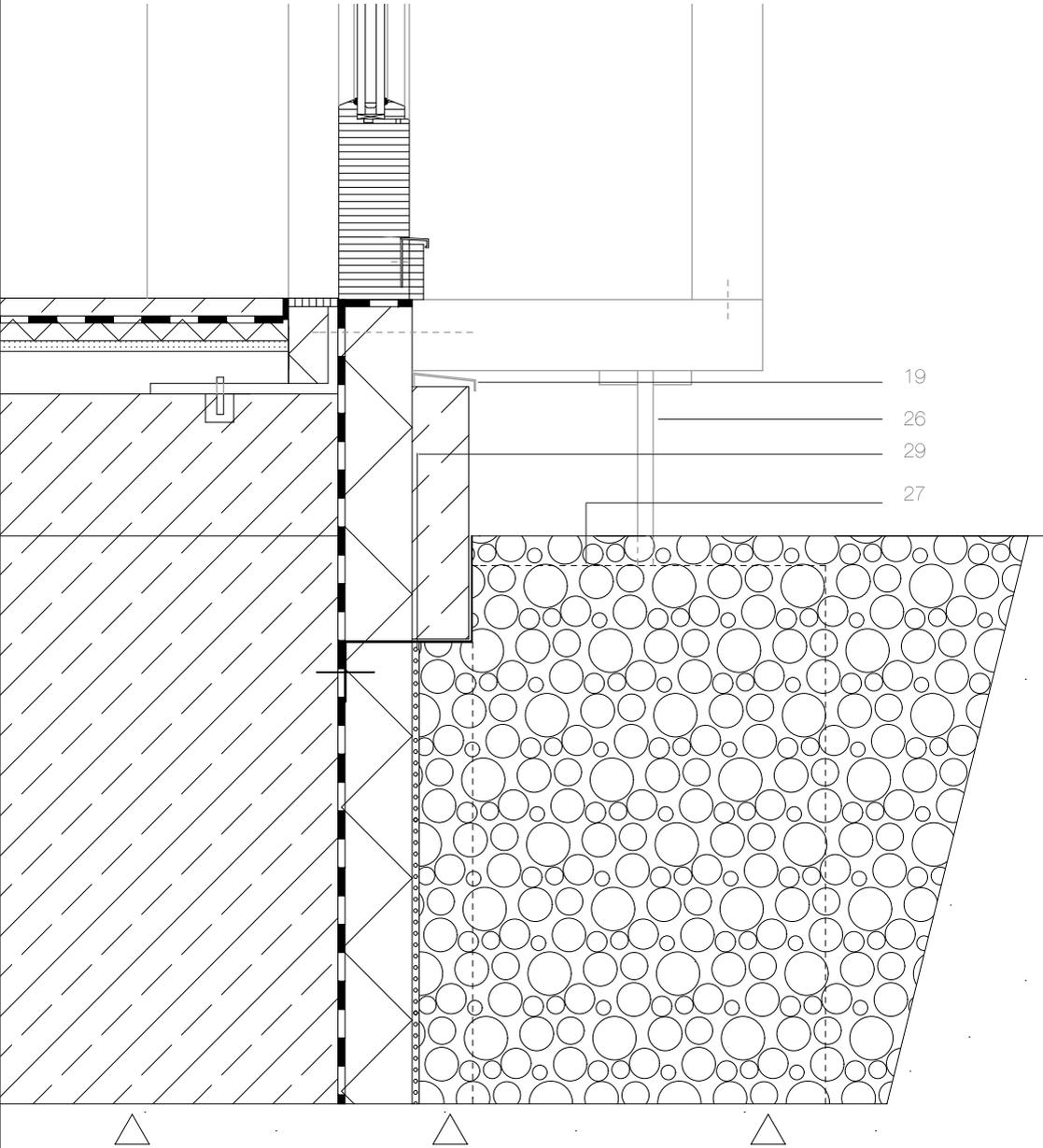
28

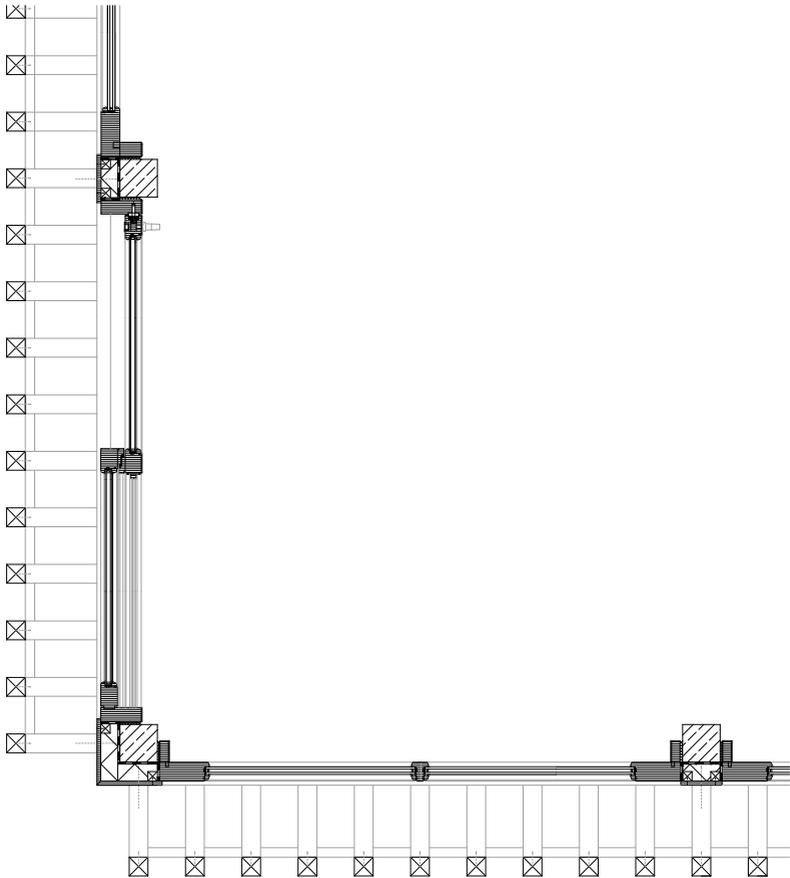
27



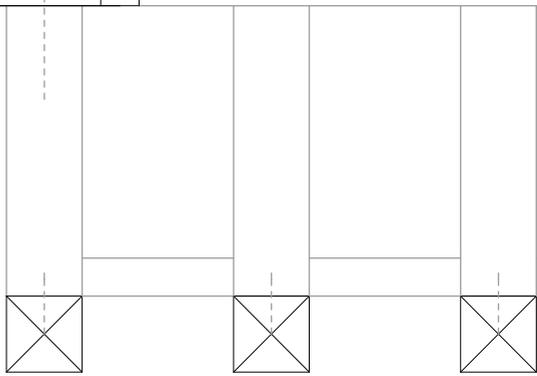
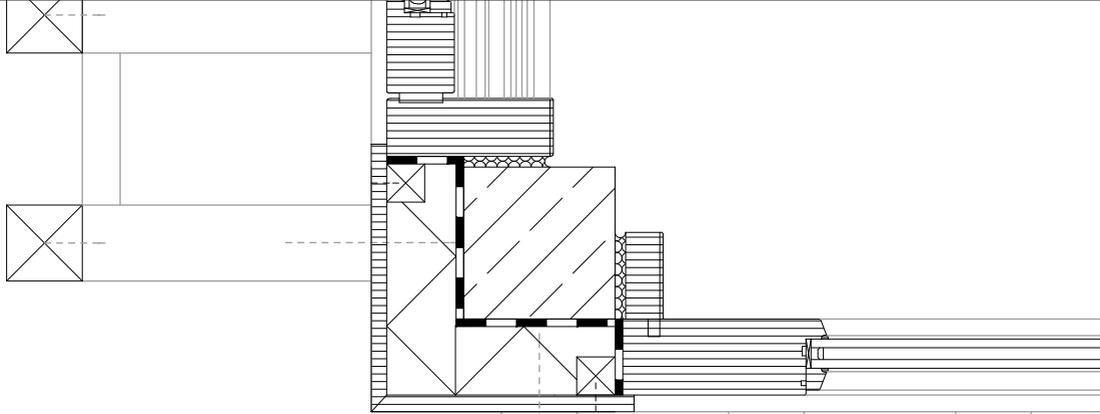




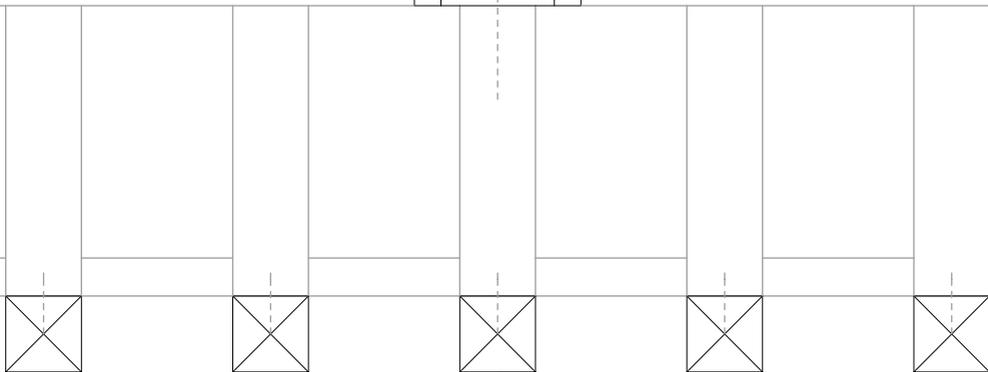
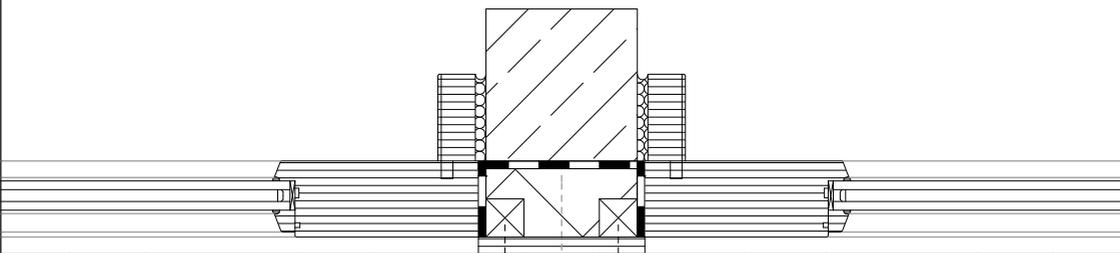




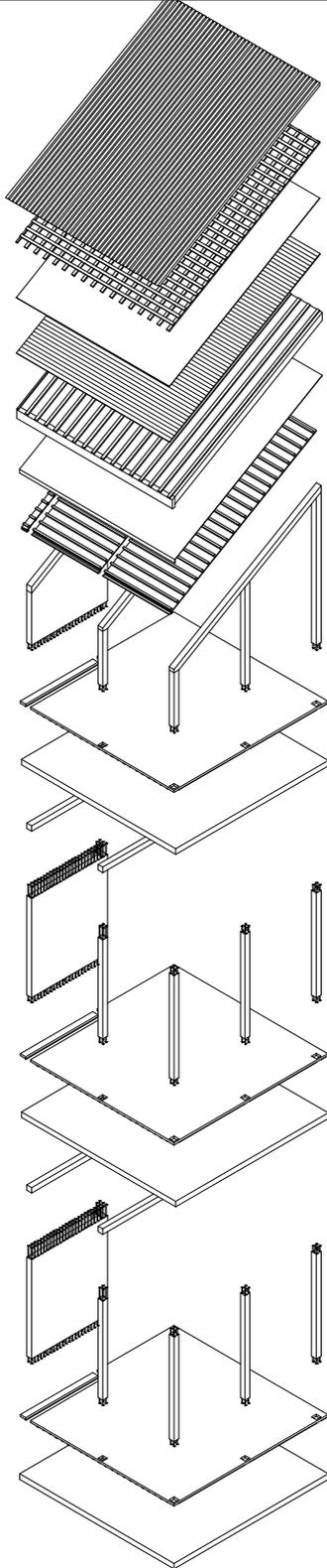
Horizontalschnitt der linken Südecke M 1 | 100

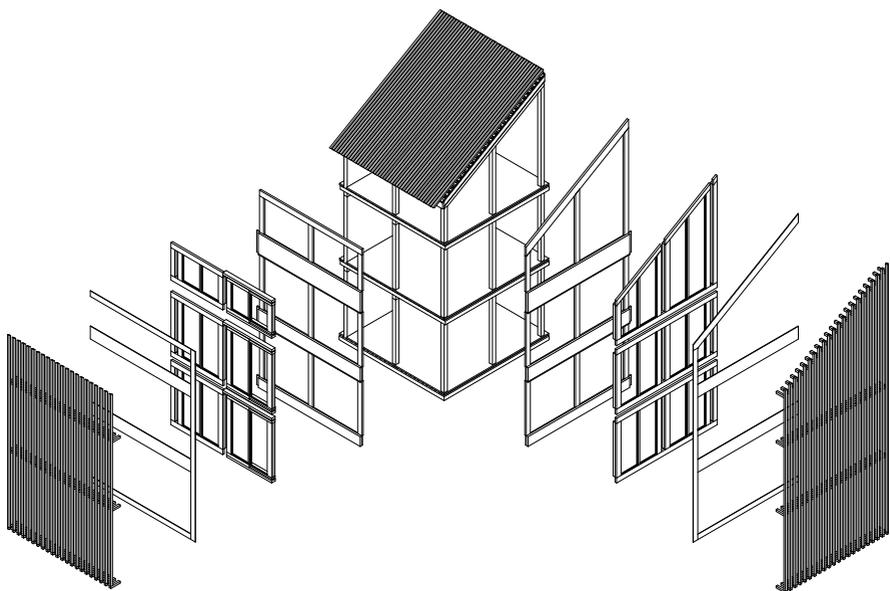


Ausschnitt 1 M 1 | 10

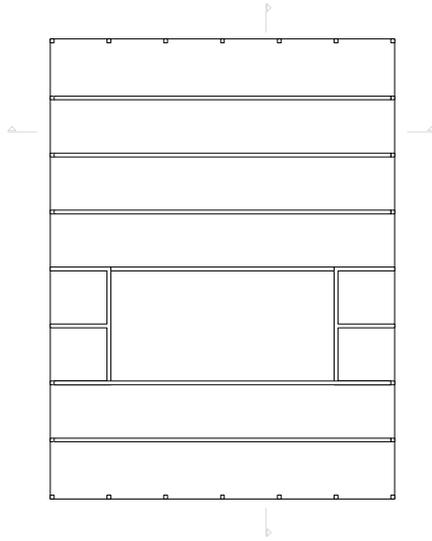


Ausschnitt 2 M 1 | 10

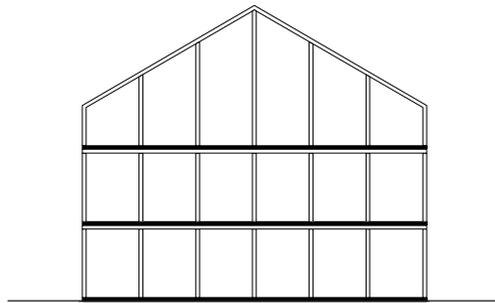




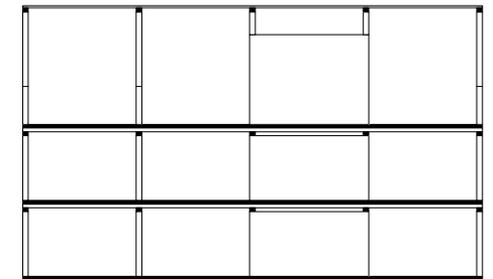
Montagezeichnung



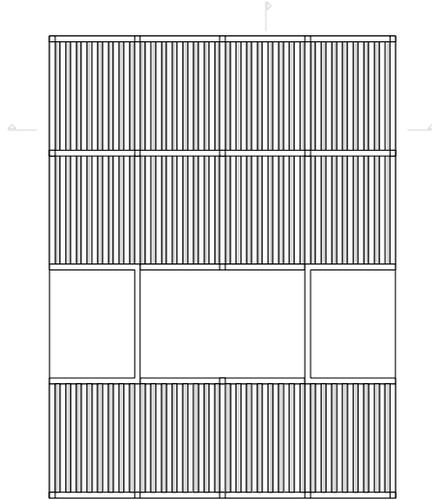
Deckenaufsicht Stahlbeton M 1 | 400



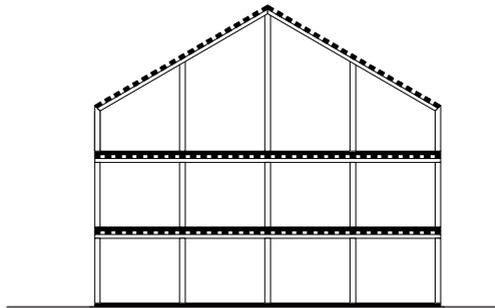
Schnitt 1 Stahlbeton M 1 | 400



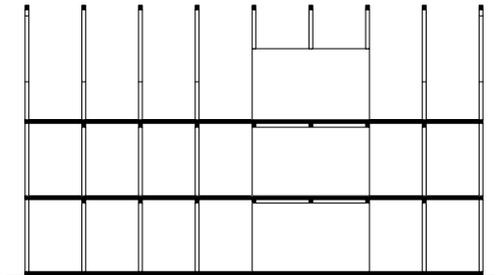
Schnitt 2 Stahlbeton M 1 | 400



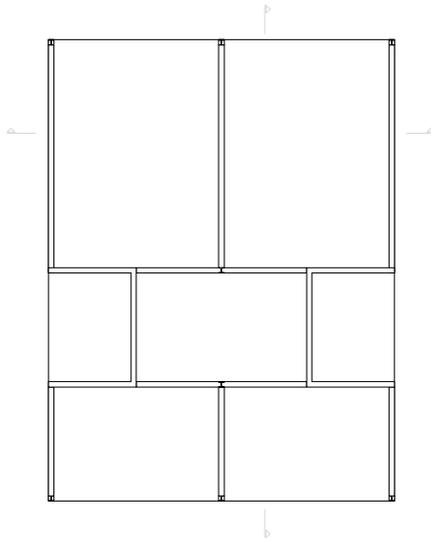
Deckenaufsicht Holz M 1 | 400



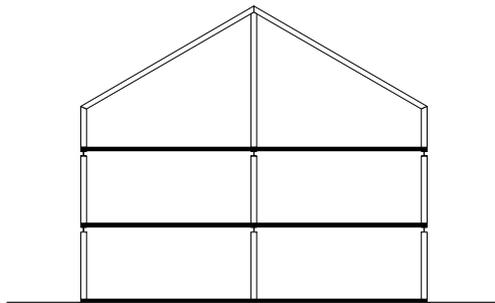
Schnitt 1 Holz M 1 | 400



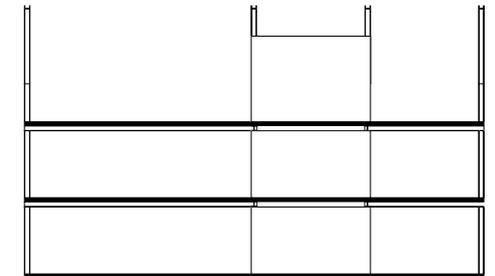
Schnitt 2 Holz M 1 | 400



Deckenaufsicht Stahl M 1 | 400



Schnitt 1 Stahl M 1 | 400



Schnitt 2 Stahl M 1 | 400

Flächenlasten:

Dach:

$$\text{Nadelholz } 0,1 \text{ m} \cdot 0,1 \text{ m} \cdot 5 \text{ kN/m}^3 \cdot \frac{1 \text{ m}}{0,15 \text{ m}} = 0,33 \text{ kN/m}^2$$

$$\text{Sparren } 0,09 \text{ m} \cdot 0,08 \text{ m} \cdot 5 \text{ kN/m}^3 \cdot \frac{1 \text{ m}}{0,21 \text{ m}} = 0,05 \text{ kN/m}^2$$

$$\text{Dachabdichtung } 0,15 \text{ kN/m}^2$$

$$\text{Holzschalung } 0,02 \text{ m} \cdot 6 \text{ kN/m}^3 = 0,12 \text{ kN/m}^2$$

$$\text{Dämmung } 0,005 \text{ kN/m}^2 \cdot 20 \text{ cm} = 0,10 \text{ kN/m}^2$$

$$\text{Sparren } 0,05 \text{ m} \cdot 0,08 \text{ m} \cdot 5 \text{ kN/m}^3 \cdot \frac{1 \text{ m}}{0,15 \text{ m}} = 0,07 \text{ kN/m}^2$$

$$\text{Nadelholz } 0,02 \text{ m} \cdot 5 \text{ kN/m}^3 = 0,10 \text{ kN/m}^2$$

$$\underline{\bar{q} = 0,92 \text{ kN/m}^2}$$

$$g_{\perp} = \frac{0,92}{\cos(30^\circ)} = 1,06 \text{ kN/m}^2$$

$$\bar{p} = 0,65 \cdot 0,8 = 0,52 \text{ kN/m}^2$$

$$\bar{q} = 1,06 \text{ kN/m}^2 + 0,52 \text{ kN/m}^2$$

$$= 1,58 \text{ kN/m}^2$$

Geschossdecken:

$$\text{Estrich } 0,12 \text{ kN/m}^2 \cdot 3 \text{ cm} = 0,66 \text{ kN/m}^2$$

$$\text{Folie } 0,005 \text{ kN/m}^2$$

$$\text{Dämmung } 0,01 \text{ kN/m}^2 \cdot 3 \text{ cm} = 0,03 \text{ kN/m}^2$$

$$\text{Gipsfaserplatte } 0,11 \text{ kN/m}^2 \cdot 1,5 \text{ cm} = 0,165 \text{ kN/m}^2$$

$$\text{Holzsparrn } 0,06 \text{ m} \cdot 0,06 \text{ m} \cdot 5 \text{ kN/m}^3 \cdot \frac{1 \text{ m}}{0,21 \text{ m}} = 0,069 \text{ kN/m}^2$$

$$\text{Stahlbeton } 0,2 \text{ m} \cdot 25 \text{ kN/m}^3 = 5,0 \text{ kN/m}^2$$

$$\underline{\bar{q} = 5,93 \text{ kN/m}^2}$$

$$\bar{p} = 2,0 \text{ kN/m}^2$$

$$\bar{q} = 5,93 \text{ kN/m}^2 + 2,0 \text{ kN/m}^2$$

$$= 7,93 \text{ kN/m}^2$$

Linienlasten:

Dach:

$$1,58 \text{ kN/m}^2 \cdot 3 \text{ m} = 4,74 \text{ kN/m}$$

$$0,2 \text{ m} \cdot 0,2 \text{ m} \cdot 25 \text{ kN/m}^3 = 1,0 \text{ kN/m}$$

$$\underline{q = 5,74 \text{ kN/m}}$$

Geschossdecken:

$$7,93 \text{ kN/m}^2 \cdot 3 \text{ m} = 23,79 \text{ kN/m}$$

$$0,2 \text{ m} \cdot 0,2 \text{ m} \cdot 25 \text{ kN/m}^3 = 1,0 \text{ kN/m}$$

$$\underline{q = 24,79 \text{ kN/m}}$$

Punktlasten:

Dach:

$$5,74 \text{ kN/m} \cdot 9 \text{ m} = 51,66 \text{ kN}$$

Geschossdecken:

$$24,79 \text{ kN/m} \cdot 9 \text{ m} = 223,11 \text{ kN}$$

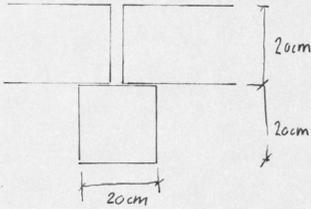
Punktlasten Dach und 2 OG:

$$51,66 \text{ kN} + 223,11 \text{ kN} = 274,77 \text{ kN}$$

Σ aller Punktlasten:

$$274,77 \text{ kN} + 223,11 \text{ kN} = 497,88 \text{ kN}$$

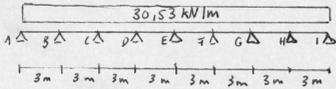
Fertigteilbauweise:



$$p = 2,52 \text{ kN/m}^2$$

$$g = 6,99 \text{ kN/m}^2$$

$$p : g = 0,36$$



$$A \cdot I, B \cdot H, C \cdot G, D \cdot F$$

$$\max M_B = \frac{30,53 \text{ kN/m} \cdot 3 \text{ m}^2}{9}$$

$$= 30,53 \text{ kN} \cdot \text{m}$$

$$\max M_{A6} = \frac{30,53 \text{ kN/m} \cdot 3^2}{11,9}$$

$$= 23,09 \text{ kN} \cdot \text{m}$$

$$\max M_{C6} = \frac{30,53 \text{ kN/m} \cdot 3^2}{19,6}$$

$$= 14,02 \text{ kN} \cdot \text{m}$$

$$M_{A6d} = 23,09 \text{ kN} \cdot \text{m} \cdot 1,4 = 32,33 \text{ kN} \cdot \text{m}$$

$$k_{ed} = \frac{d}{\sqrt{\frac{M_d}{b}}} = \frac{16,2 \text{ cm}}{\sqrt{\frac{32,33 \text{ kNm}}{0,2 \text{ m}}}}$$

$$= 1,17$$

$$[d = 20 \text{ cm} - \text{nom c} - (\frac{\sigma}{2} + \sigma_{Bü}) = 16,2 \text{ cm}]$$

$$k_s = 3,07$$

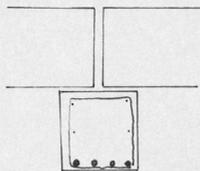
$$\text{erf } A_s = 3,07 \cdot \frac{32,33 \text{ kN} \cdot \text{m}}{16,2 \text{ cm}}$$

$$= 6,13 \text{ cm}^2$$

$$\text{gew.: } 4 \text{ } \varnothing 14$$

$$B_{ü} = 8 \text{ mm}$$

1 Montageisen



Stahlbetonstütze :

Beton C30/37

4 \varnothing 12

$$s_k = 3,80 \text{ m}$$

$$\lambda = \frac{3,46 \cdot 3,8}{0,2}$$

$$= 65,74$$

$$N_{Rd} = A_c \cdot \sigma_{Ri} \cdot k$$

$$A_c = 20 \cdot 20 = 400 \text{ cm}^2$$

$$A_s = 4 \cdot \left(\frac{12}{2}\right)^2 \pi$$

$$= 4,52 \text{ cm}^2$$

$$\rho = \frac{A_s}{A_c} = \frac{4,52}{400}$$

$$= 0,0113$$

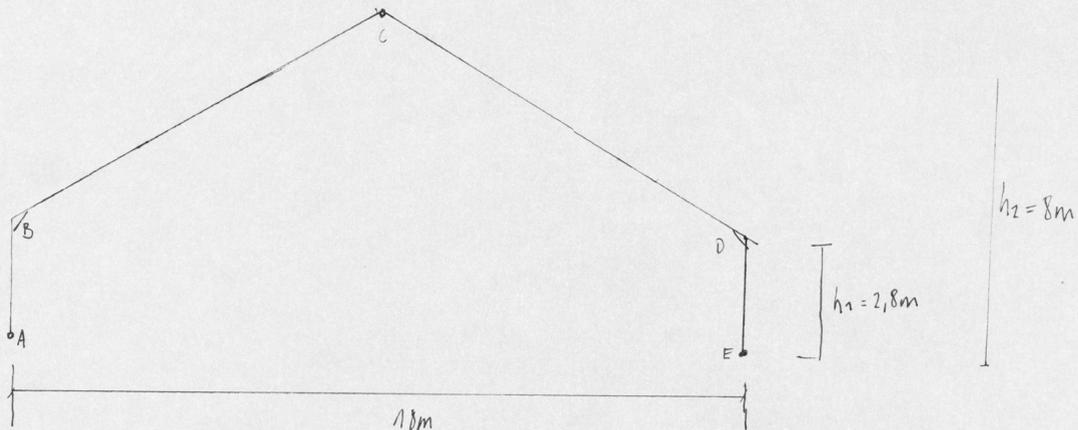
$$\approx 1,13 \text{ \%.}$$

$$\sigma_{Ri} = 2,15$$

$$k = 0,64$$

$$N_{Rd} = 576,2 \text{ kN}$$

$$\text{Streckenlast} = 5,74 \text{ kN/m}$$



$$\begin{aligned} V_A = V_E &= q \cdot \frac{l}{2} \\ &= 5,74 \cdot \frac{18}{2} \\ &= 51,66 \end{aligned}$$

$$\begin{aligned} \sum M = 0: H_A \cdot h_2 - V_A \cdot \frac{l}{2} + q \cdot \frac{l}{2} \cdot \frac{l}{4} &= 0 \\ H_E = H_A &= \frac{q \cdot l^2}{8 \cdot h_2} \\ &= \frac{5,74 \cdot 18^2}{8 \cdot 8} \\ &= 29,06 \end{aligned}$$

$$\begin{aligned} M_B &= 29,06 \cdot 2,8 \\ &= 81,37 \text{ kN}\cdot\text{m} \end{aligned}$$

$$\begin{aligned} M_D &= -29,06 \cdot 2,8 \\ &= -81,37 \text{ kN}\cdot\text{m} \end{aligned}$$

$$\text{Probe: } \sum M = 0: 29,06 \cdot 8 - 51,66 \cdot \frac{18}{2} + 5,74 \cdot \frac{18}{2} \cdot \frac{18}{4} = 0$$

$$\begin{aligned} M_a &= \frac{q \cdot l^2}{8} \\ &= \frac{5,74 \cdot 9^2}{8} \end{aligned}$$



$$= 58,12 \text{ kN}\cdot\text{m}$$

$$M_d = 81,36 \text{ kN}\cdot\text{m}$$