

Auftrag-Nr.: 20010  
 Objekt: Rampe Stal  
 Thema: stätt. Berechnung  
 Datum/Ersteller: 14.05.2021/IT



Wismer+Partner AG · Beratende Ingenieure und Planer SIA

1. Einwirkungen Platte max. ohne Auftrieb

$$g_k = 0.50 \times 25 = 12.5 \text{ kN/m}^2 \quad q_d = 16.3$$

$$q_{Ak} = (1.50 + 0.25) \times 20 = 35 \text{ kN/m}^2 \quad q_{Ad} = 49.0$$

$$q_k = 4.0 \text{ kN/m}^2 \quad q_d = 6.0$$

$$(g+q)_k = 52 \text{ kN/m}^2 \quad \alpha_d = 71.3$$

Einwirkungen Platte min. mit Auftrieb

$$g_k = 0.50 \times 25 = 12.5 \text{ kN/m}^2$$

$$a_k = (414.50 - 411.82) \times 10 = 26.8 \text{ kN/m}^2$$

$$(g+a)_k = -14.3 \text{ kN/m}^2$$

Bemessungswerte:

$$(g+q)_d^+ = 1.35 (12.5 + 35) + 1.50 \times 4 = 71.3 \frac{\text{kN}}{\text{m}^2}$$

$$(g+a)_d^- = 0.9 \times 12.5 - 1.2 \times 26.8 = -20.9 \frac{\text{kN}}{\text{m}^2}$$

$$(g+q)_d^- = 0.95 \times 12.5 - 1.05 \times 26.8 = -16.3 \frac{\text{kN}}{\text{m}^2}$$

2. Platte  $h = 500 \text{ mm}$ :

$$L \times B \approx 4.6 \times 4.6 \text{ m}$$

Durchstrecken Positiv

$$V_d = 4.6 \times 4.6 \times 71.3 = 1510 \text{ kN}$$

⇒ kein Verb

Durchstrecken Negativ

$$V_d = 4.6 \times 4.6 \times 20.9 = -443 \text{ kN}$$

⇒ kein Verb

**Projekt Daten**

|               |                   |                            |
|---------------|-------------------|----------------------------|
| Objekt        | Bauteil / Adresse | <b>Durchstanzbewehrung</b> |
| Ingenieurbüro | Position          | <b>positiv</b>             |
|               | Anzahl            | 1                          |

**Belastungen**

|  |             |         |    |                 |                          |
|--|-------------|---------|----|-----------------|--------------------------|
| Durchstanzlast                           | $V_d$       | = 1'510 | kN | $k_{e,Eingabe}$ | = 0.90                   |
| Bemessungswert der massg. Durchstanzlast | $V_{d,eff}$ | = 1'450 | kN | $Q_{d,N}$       | = 55.0 kN/m <sup>2</sup> |

**Stütze**

|                    |     |                   |                     |           |    |
|--------------------|-----|-------------------|---------------------|-----------|----|
| Stützenabmessungen | Art | Innenstütze, rund | $e_{u,x} / e_{u,y}$ | = 81 / 81 | mm |
|--------------------|-----|-------------------|---------------------|-----------|----|

**Geometrie**

|                               |                         |                 |          |             |       |    |
|-------------------------------|-------------------------|-----------------|----------|-------------|-------|----|
| Plattenstärke                 | Typ                     | Flachdecke      | $h_{SE}$ | = 50        | mm    |    |
| Spannweiten                   | $l_x / l_y$             | = 4'600 / 4'600 | mm       |             |       |    |
| Betonüberdeckung (oben/unten) | $C_{nom,o} / C_{nom,u}$ | = 40 / 40       | mm       |             |       |    |
| Statische Höhe                | $d_{v,0}$               | = 392           | mm       | $d_{v,out}$ | = 331 | mm |

**Material**

|           |          |          |                 |                   |           |         |                    |
|-----------|----------|----------|-----------------|-------------------|-----------|---------|--------------------|
| Beton     | C25/30   | $f_{cd}$ | = 16.5          | N/mm <sup>2</sup> | $T_{cd}$  | = 1.00  | N/mm <sup>2</sup>  |
| Bewehrung | B500B    | $f_{sd}$ | = 435           | N/mm <sup>2</sup> | $D_{max}$ | = 32    | mm                 |
| 4. Lage   | $\rho_x$ | = 0.56 % | $\emptyset / s$ | = 18 / 100        | $A_s$     | = 2'545 | mm <sup>2</sup> /m |
| 3. Lage   | $\rho_y$ | = 0.59 % | $\emptyset / s$ | = 18 / 100        | $A_s$     | = 2'545 | mm <sup>2</sup> /m |
| 2. Lage   | $\rho_y$ | = 0.36 % | $\emptyset / s$ | = 14 / 100        | $A_s$     | = 1'539 | mm <sup>2</sup> /m |
| 1. Lage   | $\rho_x$ | = 0.34 % | $\emptyset / s$ | = 14 / 100        | $A_s$     | = 1'539 | mm <sup>2</sup> /m |

**Resultate**

|  |                                   |                 |     |
|--|-----------------------------------|-----------------|-----|
| Massgebende statische Höhe             | $d_{v,x} / d_{v,y}$               | = 451 / 433     | mm  |
| Länge Nachweisschnitt innen (u-Δu)     | $u_i$                             | = 3'242         | mm  |
| Länge Nachweisschnitt aussen (u-Δu)    | $u_a$                             | = 0             | mm  |
| $m_{sd,x} / m_{sd,y}$ = 220 / 220 kNm  | $m_{sd,x} / m_{sd,y}$             | = 465 / 442     | kNm |
| $r_{s,x} / r_{s,y}$ = 1'012 / 1'012 mm | $b_{s,x}^{Rd,x} / b_{s,y}^{Rd,y}$ | = 1'518 / 1'518 | mm  |
| Widerstand ohne Durchstanzbewehrung    | $V_{Rd,c}$                        | = 1'645         | kN  |

**Lösung**

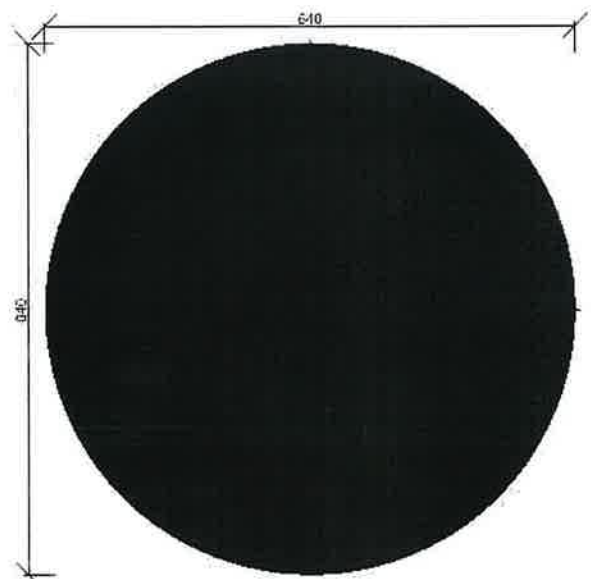
Keine FIDECA® Durchstanzbewehrung erforderlich

**Absturzicherung**

nach SIA 262 4.3.6.7: mind. 4 Stäbe  
 $A_s \geq V_d / 1.4 / f_{sd} / k_\beta = 6'701 \text{ mm}^2$

**Hinweise / Warnungen**

- Plattenrotation sollte grösser als 0.020 sein (nach SIA 262 4.3.6.1.2). Ansonsten:
  - Anordnung einer konstruktiven Durchstanzbewehrung (z.B. FIDECA - Korbbewehrung über Durchstanzkegelbereich) oder
  - die aufgezwungenen Verformungen sind zu berücksichtigen
- \* Beitrag des Betons zum Durchstanzwiderstand



**Projekt Daten**

|               |                   |          |               |
|---------------|-------------------|----------|---------------|
| Objekt        | Bauteil / Adresse | Position | DEFAULT Werte |
| Ingenieurbüro | Anzahl            |          | 1             |

**Belastungen**

|  |             |       |    |                 |                          |
|--|-------------|-------|----|-----------------|--------------------------|
| Durchstanzlast                           | $V_d$       | = 443 | kN | $k_{e,Eingabe}$ | = 0.90                   |
| Bemessungswert der massg. Durchstanzlast | $V_{d,eff}$ | = 412 | kN | $q_{d,N}$       | = 28.1 kN/m <sup>2</sup> |

**Stütze**

|                    |     |                   |                     |           |    |
|--------------------|-----|-------------------|---------------------|-----------|----|
| Stützenabmessungen | Art | Innenstütze, rund | $e_{u,x} / e_{u,y}$ | = 73 / 73 | mm |
|--------------------|-----|-------------------|---------------------|-----------|----|

**Geometrie**

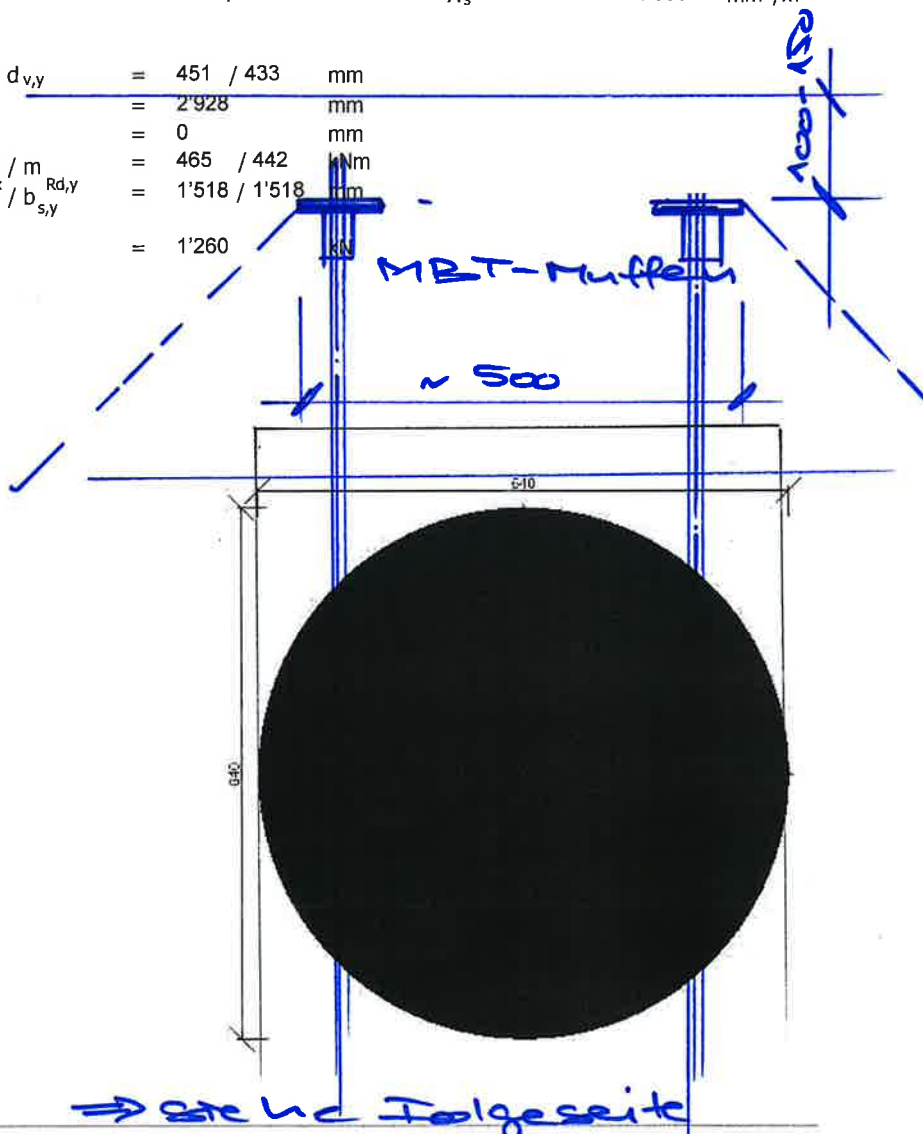
|                               |                         |                 |    |             |       |    |
|-------------------------------|-------------------------|-----------------|----|-------------|-------|----|
| Plattenstärke                 | Typ                     | Flachdecke      |    |             |       |    |
| Spannweiten                   | h                       | = 500           | mm | $h_{SE}$    | = 150 | mm |
| Betonüberdeckung (oben/unten) | $l_x / l_y$             | = 4'600 / 4'600 | mm |             |       |    |
| Statische Höhe                | $C_{nom,o} / C_{nom,u}$ | = 40 / 40       | mm | $d_{v,out}$ | = 231 | mm |
|                               | $d_{v,0}$               | = 292           | mm |             |       |    |

**Material**

|           |            |          |        |                   |            |        |                   |                    |
|-----------|------------|----------|--------|-------------------|------------|--------|-------------------|--------------------|
| Beton     | C25/30     | $f_{cd}$ | = 16.5 | N/mm <sup>2</sup> | $T_{cd}$   | = 1.00 | N/mm <sup>2</sup> |                    |
| Bewehrung | B500B      | $f_{sd}$ | = 435  | N/mm <sup>2</sup> | $D_{max}$  | = 32   | mm                |                    |
| 4. Lage   | $\rho_x^*$ | = 0.56   | %      | $\emptyset / s$   | = 18 / 100 | $A_s$  | = 2'545           | mm <sup>2</sup> /m |
| 3. Lage   | $\rho_y^*$ | = 0.59   | %      | $\emptyset / s$   | = 18 / 100 | $A_s$  | = 2'545           | mm <sup>2</sup> /m |
| 2. Lage   | $\rho_y$   | = 0.36   | %      | $\emptyset / s$   | = 14 / 100 | $A_s$  | = 1'539           | mm <sup>2</sup> /m |
| 1. Lage   | $\rho_x$   | = 0.34   | %      | $\emptyset / s$   | = 14 / 100 | $A_s$  | = 1'539           | mm <sup>2</sup> /m |

**Resultate**

|                                     |                     |             |    |
|-------------------------------------|---------------------|-------------|----|
| Massgebende statische Höhe          | $d_{v,x} / d_{v,y}$ | = 451 / 433 | mm |
| Länge Nachweisschnitt innen (u-Δu)  | $u_i$               | = 2'928     | mm |
| Länge Nachweisschnitt aussen (u-Δu) | $u_a$               | = 0         | mm |
| $m_{sd,x} / m_{sd,y}$               | = 61 / 61           | kNm         |    |
| $r_{s,x} / r_{s,y}$                 | = 1'012 / 1'012     | mm          |    |
| Widerstand ohne Durchstanzbewehrung | $V_{Rd,c}$          | = 1'260     | kN |



**Lösung**

Keine FIDECA® Durchstanzbewehrung erforderlich

**Absturzicherung**

nach SIA 262 4.3.6.7: mind. 4 Stäbe  
 $A_s \geq V_d / 1.4 / f_{sd} / k_\beta = 1'966 \text{ mm}^2$

**Hinweise / Warnungen**

- Plattenrotation sollte grösser als 0.020 sein (nach SIA 262 4.3.6.1.2).
- Ansonsten:
  - Anordnung einer konstruktiven Durchstanzbewehrung (z.B. FIDECA - Korbbewehrung über Durchstanzkegelbereich) oder
  - die aufgezwungenen Verformungen sind zu berücksichtigen
- \* Beitrag des Betons zum Durchstanzwiderstand

**Projekt Daten**

|               |                   |          |               |
|---------------|-------------------|----------|---------------|
| Objekt        | Bauteil / Adresse | Position | DEFAULT Werte |
| Ingenieurbüro | Anzahl            |          | 1             |

**Belastungen**

|  |             |       |    |                 |                          |
|--|-------------|-------|----|-----------------|--------------------------|
| Durchstanzlast                           | $V_d$       | = 443 | kN | $k_{e,Eingabe}$ | = 0.90                   |
| Bemessungswert der massg. Durchstanzlast | $V_{d,eff}$ | = 421 | kN | $q_{d,N}$       | = 28.1 kN/m <sup>2</sup> |

**Stütze**

|                    |     |                   |    |                     |              |
|--------------------|-----|-------------------|----|---------------------|--------------|
| Stützenabmessungen | Art | Innenstütze, rund |    | $e_{u,x} / e_{u,y}$ | = 62 / 62 mm |
|                    | d   | = 500             | mm |                     |              |

**Geometrie**

|                               |                         |                 |    |             |          |
|-------------------------------|-------------------------|-----------------|----|-------------|----------|
| Plattenstärke                 | Typ                     | Flachdecke      |    |             |          |
| Spannweiten                   | h                       | = 500           | mm | $h_{SE}$    | = 150 mm |
| Betonüberdeckung (oben/unten) | $l_x / l_y$             | = 4'600 / 4'600 | mm |             |          |
| Statische Höhe                | $C_{nom,o} / C_{nom,u}$ | = 40 / 40       | mm | $d_{v,out}$ | = 231 mm |
|                               | $d_{v,0}$               | = 292           | mm |             |          |

**Material**

|           |            |          |                 |                   |           |        |                            |
|-----------|------------|----------|-----------------|-------------------|-----------|--------|----------------------------|
| Beton     | C25/30     | $f_{cd}$ | = 16.5          | N/mm <sup>2</sup> | $T_{cd}$  | = 1.00 | N/mm <sup>2</sup>          |
| Bewehrung | B500B      | $f_{sd}$ | = 435           | N/mm <sup>2</sup> | $D_{max}$ | = 32   | mm                         |
| 4. Lage   | $\rho_x^*$ | = 0.56 % | $\emptyset / s$ | = 18 / 100        | mm        | $A_s$  | = 2'545 mm <sup>2</sup> /m |
| 3. Lage   | $\rho_y^*$ | = 0.59 % | $\emptyset / s$ | = 18 / 100        | mm        | $A_s$  | = 2'545 mm <sup>2</sup> /m |
| 2. Lage   | $\rho_y$   | = 0.36 % | $\emptyset / s$ | = 14 / 100        | mm        | $A_s$  | = 1'539 mm <sup>2</sup> /m |
| 1. Lage   | $\rho_x$   | = 0.34 % | $\emptyset / s$ | = 14 / 100        | mm        | $A_s$  | = 1'539 mm <sup>2</sup> /m |

**Resultate**

|  |                       |                 |     |
|--|-----------------------|-----------------|-----|
| Massgebende statische Höhe             | $d_{v,x} / d_{v,y}$   | = 451 / 433     | mm  |
| Länge Nachweisschnitt innen (u-Δu)     | $u_i$                 | = 2'488         | mm  |
| Länge Nachweisschnitt aussen (u-Δu)    | $u_a$                 | = 0             | mm  |
| $m_{sd,x} / m_{sd,y}$ = 61 / 61 kNm    | $m_{Rd,x} / m_{Rd,y}$ | = 465 / 442     | kNm |
| $r_{s,x} / r_{s,y}$ = 1'012 / 1'012 mm | $b_{s,x} / b_{s,y}$   | = 1'518 / 1'518 | mm  |
| Widerstand ohne Durchstanzbewehrung    | $V_{Rd,c}$            | = 1'126         | kN  |

**Lösung**

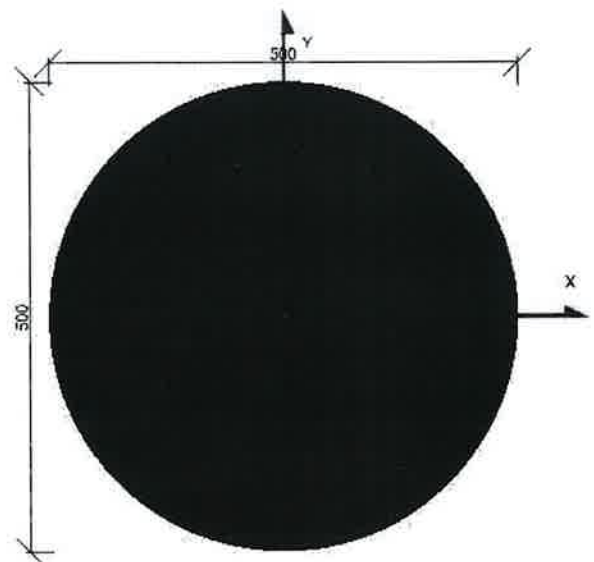
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**Absturzicherung**

nach SIA 262 4.3.6.7: mind. 4 Stäbe  
 $A_s \geq V_d / 1.4 / f_{sd} / k_{\beta} = 1'966 \text{ mm}^2$

**Hinweise / Warnungen**

- Plattenrotation sollte grösser als 0.020 sein (nach SIA 262 4.3.6.1.2).  
 Ansonsten:  
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 oder  
 - die aufgezwungenen Verformungen sind zu berücksichtigen  
 \* Beitrag des Betons zum Durchstanzwiderstand





### 3. Pfähle

#### 3.1 Pfahlverankerung

$$N_{dmax} = -443 \text{ kN}$$

$$A_{min} = 8 + 16$$

$$N_{Ber} = 1610 \times 455 \times 10^{-3} = 700 \text{ kN} > N_{d} = 443 \text{ kN}$$

#### 3.2 Pfahlbohrung

$$N_{dmax} = 1510 \text{ kN} \quad / \quad N_{dmin} = -443 \text{ kN}$$

##### - Mantelreibung

$$\begin{aligned} M_{kmin} &= u \cdot h \cdot K \cdot G_2 \cdot \tan \varphi \\ &= 0.64 \times \pi \times 12 \cdot \tan \left( \frac{2}{3} 20^\circ \right) \times 20.5 (20-10) \\ &\quad + 0.64 \times \pi \times 4 \cdot \tan \left( \frac{2}{3} 32^\circ \right) \times 28.0 (20-10) \\ &= \underline{2052 \text{ kN}} \end{aligned}$$

##### - Spitzenwiderstand

$$\begin{aligned} S_{kmin} &= A \cdot \beta_x \cdot N_q \cdot X \quad \beta_x = u \cdot \gamma' = 30 (20-10) \\ &= \frac{0.64^2 \pi \cdot 30 \cdot (20-10)}{7 \times \frac{1}{2} \cdot 2} \cdot N_{d_{30}} = 22 \\ &= \underline{1487 \text{ kN}} \quad \begin{matrix} N_{d_{30}} = 7 \\ X = 2.2 \end{matrix} \end{aligned}$$

##### - Negative Mantelreibung

$$\begin{aligned} M_{kd} &= u \cdot h \cdot \beta_{min} \cdot \tan \varphi \\ &= 0.64 \times \pi \cdot 12 \cdot 0 \times 23 \cdot \frac{1}{2} \\ &= \underline{572 \text{ kN}} \end{aligned}$$

Auftrag-Nr.: \_\_\_\_\_

Objekt: \_\_\_\_\_

Thema: \_\_\_\_\_

Datum/Ersteller: \_\_\_\_\_



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$$R_{2d1}^+ = \frac{R_{2k} \cdot R_{2k}}{f_{m2}} = \frac{0,7 \cdot (2052 + 1487)}{1,3}$$
$$= 1906 \text{ kN}$$

$$N_{dmax} = 1510 + 572 = 2082 \text{ kN}$$

$$R_{2d1} = 1906 \text{ kN} \geq N_{dmax} = 2082 \text{ kN}$$

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$$R_{2d1}^- = \frac{R_{2k} \cdot R_{2k}}{f_{m2}} = \frac{0,7 \cdot 2052}{1,6} = 898 \text{ kN}$$

$$N_{dmin} = 443 \text{ kN} < R_{2d1}^- = 898 \text{ kN}$$

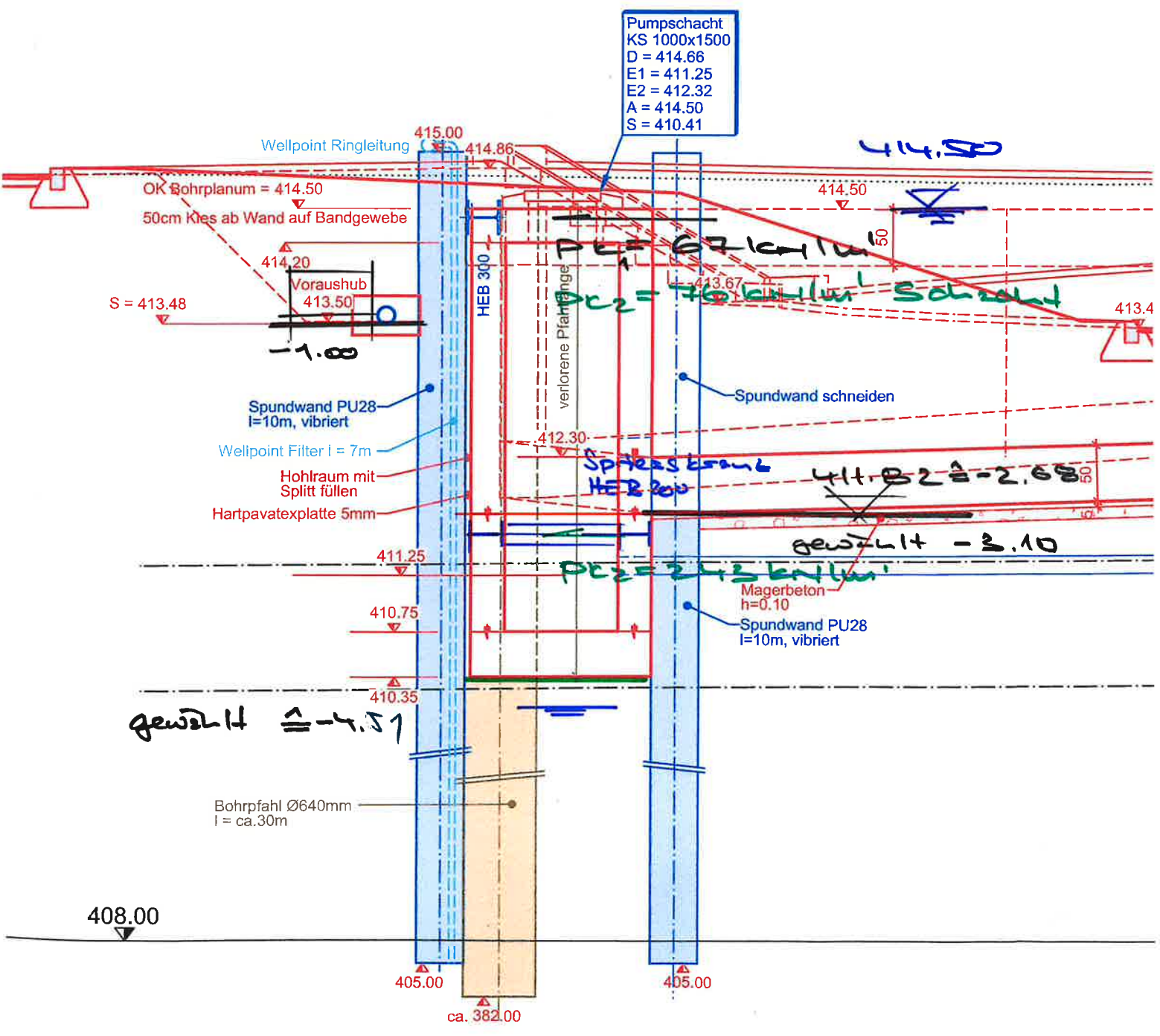
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Stelle auch Afzklbemessung  
Lorzebrücke Brüggei Kap. 11

H. Spundwand

# Schnitt A-A 1:50

- Bereich Eckabmessung
- Bereich Schacht



Auftrag-Nr.: \_\_\_\_\_  
 Objekt: \_\_\_\_\_  
 Thema: \_\_\_\_\_  
 Datum/Ersteller: \_\_\_\_\_



IV. Sandwand

$$I_{y28} = \frac{I}{mm^2} \quad mm^4$$

$$E \times I \quad [kNm^2/m] = 210000 \times 64460 \times 10^4$$

$$= 1.35 \times 10^{14} \quad kNm^2$$

$$\hat{=} \underline{\underline{1.35 \times 10^5 \quad kNm^2/m}}$$

$$M_{Ra} = \alpha \times p_1 \times f_y / \gamma_{Ra}$$

$$= 2840 \times 10^3 \quad mm \times 235 \frac{N}{mm^2} / 1.05$$

$$= \underline{\underline{625 \quad kNm/m}}$$

Nachweise:

- Bereich Schutz + Seite SG  
 $M_{Ra} = 625 \quad kNm/m > M_{a} = 386 \quad kNm/m$
- Bereich Eckspitzung Seite EG  
 $M_{Ra} = 625 \quad kNm/m > M_{a} = 223 \quad kNm/m$

V. Longrine + Spitzung  
 HEB300 bzw. HEB300/240

HEB300:  $M_d^0 = 1.4 \times 76 \times 4.0^2 \times \frac{1}{8} = 213 \quad kNm$   
 Long.  $M_{Ra} = 418 \quad kNm > M_a = 213 \quad kNm$

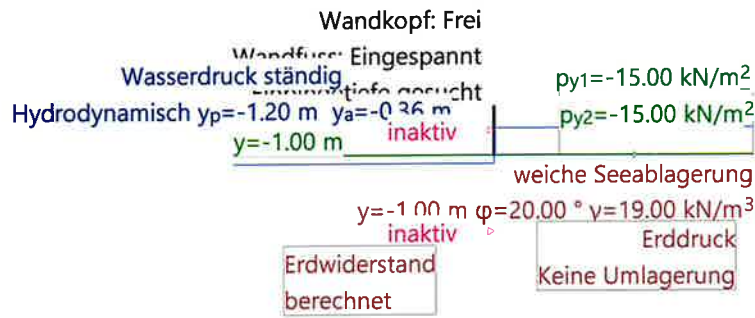
HEB300:  $N_a = 12 \times 4.5m \times 1.4 \times 76 = 675 \quad kN$   
 var.  $N_{Ra} \approx 700 \quad kN > N_a = 675 \quad kN \rightarrow$  Hilfsprofil HEB 100 einführen

HEB240  $N_a = 12 \times 4.5m \times 1.4 \times 76 = 675 \quad kN$   
 var.  $N_{Ra} = 764 \quad kN > N_a = 675 \quad kN$



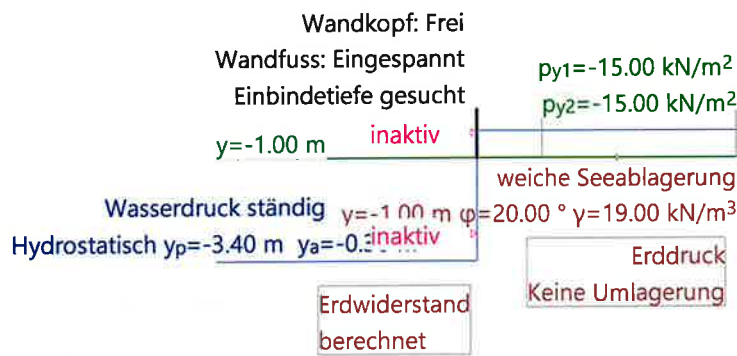
Belastung q: Nutzlast, Etappe 1: 1. Etappe -1.0

Mstb. 1:175.9



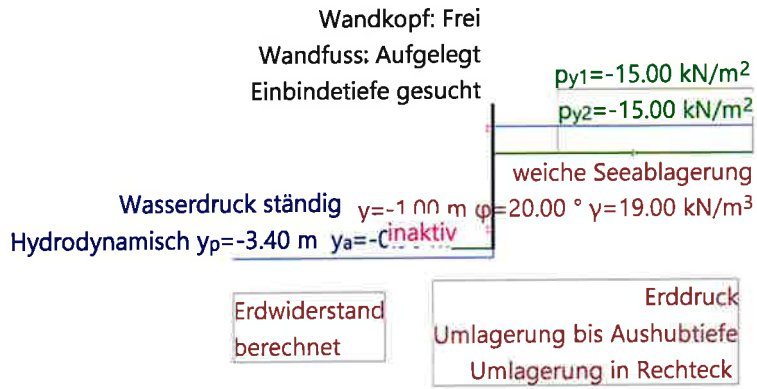
Belastung q: Nutzlast, Etappe 2: Absenkung Wasserspiegel -3.4

Mstb. 1:175.9



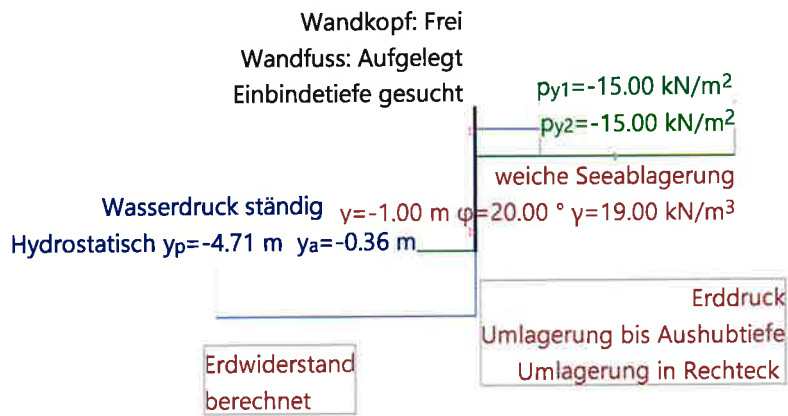
Belastung q: Nutzlast, Etappe 3: Aushubsole mit Abspriessung -3.2

Mstb. 1 :175.9



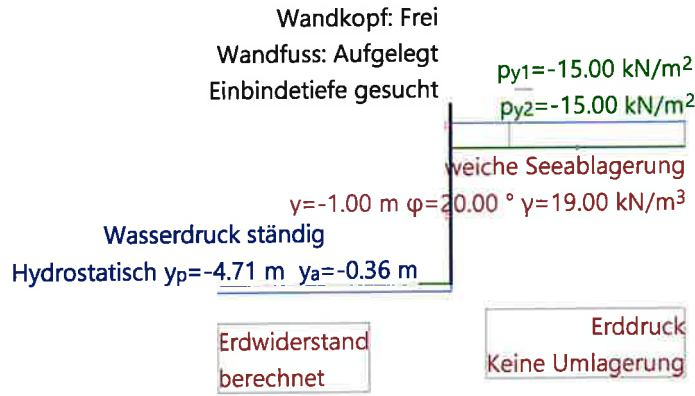
Belastung q: Nutzlast, Etappe 4: Absenkung Wasserspiegel -4.71

Mstb. 1 :175.9



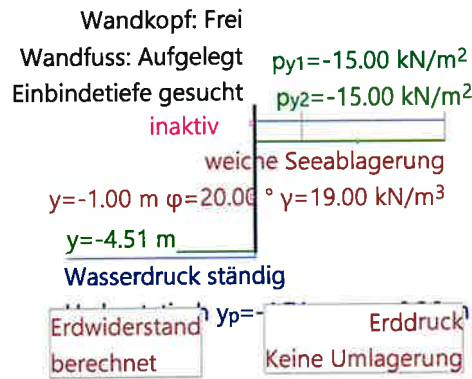
Belastung q: Nutzlast, Etappe 5: max Aushubsohle mit Abspriessung -4.51

Mstb. 1 :195.4



Belastung q: Nutzlast, Etappe 6: Endzustand

Mstb. 1 :241.3



**Numerische Resultate aller EWK**

**Wandlänge**

| Etappe | GWS | EWK | y<br>[m] | t<br>[m] | Sohle<br>[m] | Bemerkungen |
|--------|-----|-----|----------|----------|--------------|-------------|
| 1      | 1   | 1   | -3.86    | 2.86     | -1.00        |             |
| 2      | 1   | 1   | -2.97    | 1.97     | -1.00        |             |
| 3      | 1   | 1   | -9.23    | 6.03     | -3.20        |             |
| 4      | 1   | 1   | -9.96    | 6.76     | -3.20        |             |
| 5      | 1   | 1   | -12.21   | 7.70     | -4.51        |             |
| 6      | 1   | 1   | -12.39   | 7.88     | -4.51        |             |

GWS : Grenzwertspezifikation  
 EWK : Einwirkungskombination  
 y : Kote UK Wand  
 t : Einbindetiefe  
 Sohle : Kote Baugrubensohle

**Abstützkräfte (geneigt)**

| Etappe | GWS | EWK | P <sub>1</sub><br>[kN/m] | P <sub>2</sub><br>[kN/m] |  |
|--------|-----|-----|--------------------------|--------------------------|--|
| 1      | 1   | 1   | inaktiv                  | inaktiv                  |  |
| 2      | 1   | 1   | inaktiv                  | inaktiv                  |  |
| 3      | 1   | 1   | 76.39                    | inaktiv                  |  |
| 4      | 1   | 1   | 50.08                    | 118.94                   |  |
| 5      | 1   | 1   | -29.35                   | 243.52                   |  |
| 6      | 1   | 1   | inaktiv                  | 206.94                   |  |

GWS : Grenzwertspezifikation  
 EWK : Einwirkungskombination  
 P<sub>1</sub> : Kraft auf Abstützung auf Kote = -0.41  
 P<sub>2</sub> : Kraft auf Abstützung auf Kote = -2.76

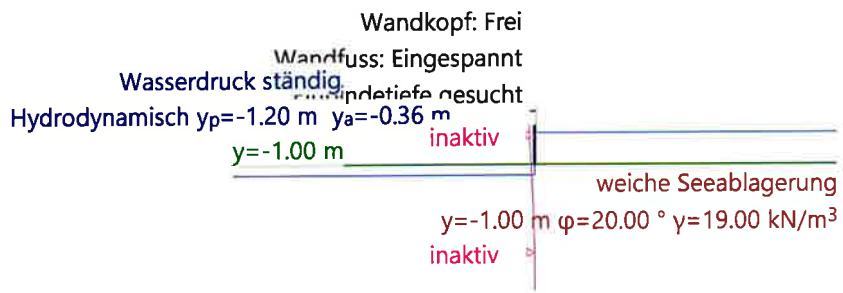
**Etappen**

| Etappe | Titel                                  | Sohle<br>[m] |
|--------|--|--------------|
| 1      | 1. Etappe -1.0                         | -1.00        |
| 2      | Absenkung Wasserspiegel -3.4           | -1.00        |
| 3      | Aushubsohle mit Abspriessung -3.2      | -3.20        |
| 4      | Absenkung Wasserspiegel -4.71          | -3.20        |
| 5      | max Aushubsohle mit Abspriessung -4.51 | -4.51        |
| 6      | Endzustand                             | -4.51        |

Sohle : Kote Baugrubensohle

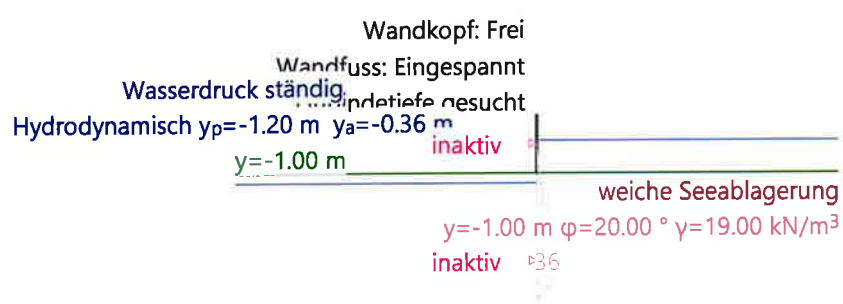
1. Etappe -1.0, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :151.6



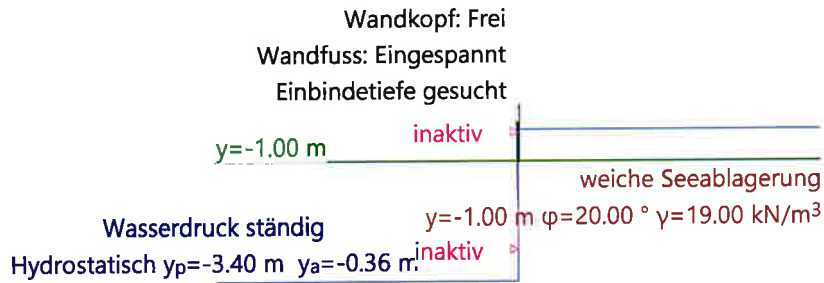
1. Etappe -1.0, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
1. Etappe -1.0, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

Mstb. 1 :151.6



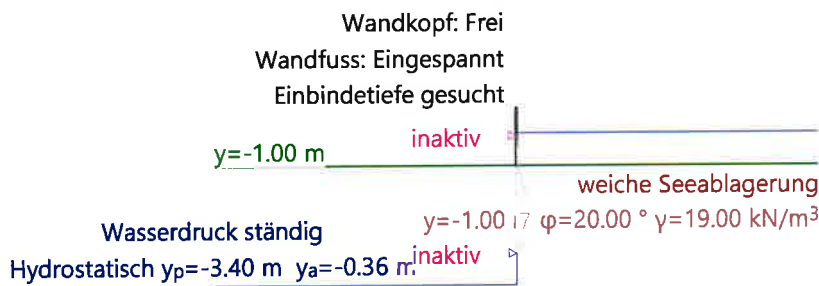
Absenkung Wasserspiegel -3.4, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :151.6



Absenkung Wasserspiegel -3.4, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
Absenkung Wasserspiegel -3.4, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

Mstb. 1 :151.6



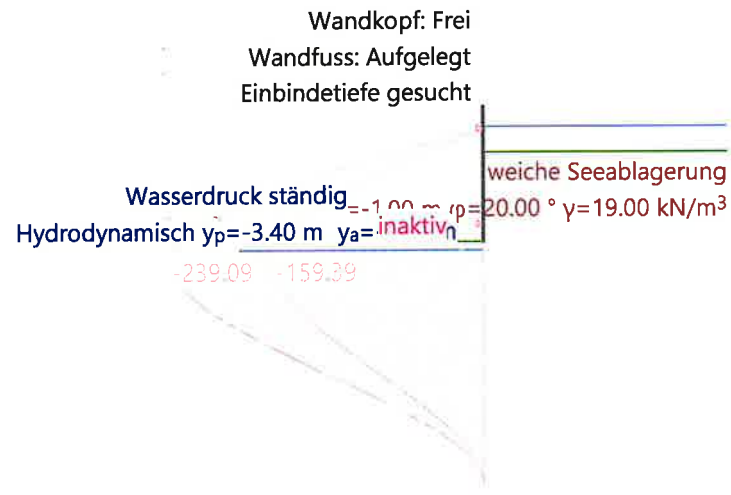
Aushubsohle mit Absperrung -3.2, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :187.1



Aushubsohle mit Absperrung -3.2, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
Aushubsohle mit Absperrung -3.2, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

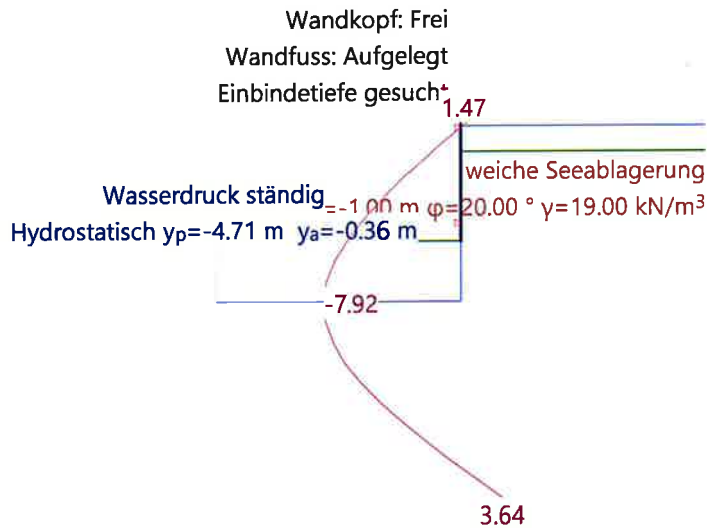
Mstb. 1 :187.1



$M_{Ba} = 635 \text{ kNm/m} > M_a = 239 \text{ kNm/m}$

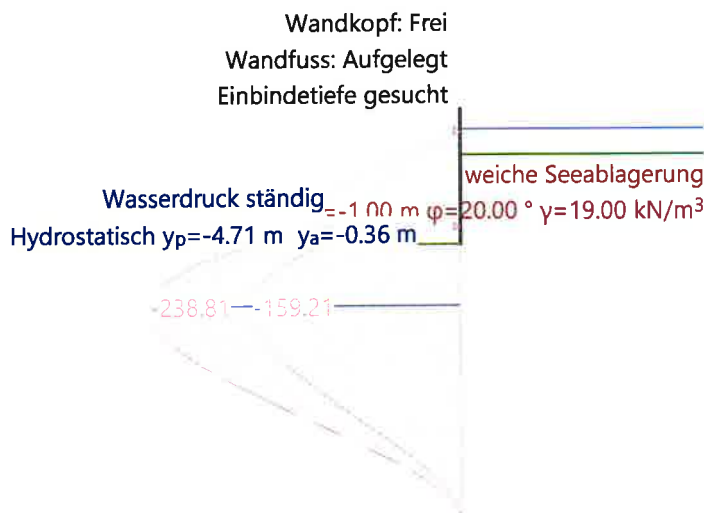
Absenkung Wasserspiegel -4.71, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstab. 1 :187.1



Absenkung Wasserspiegel -4.71, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
Absenkung Wasserspiegel -4.71, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

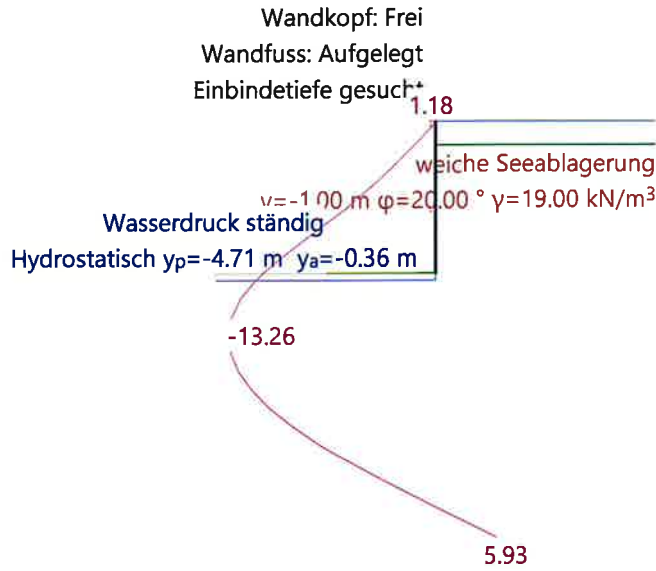
Mstab. 1 :187.1





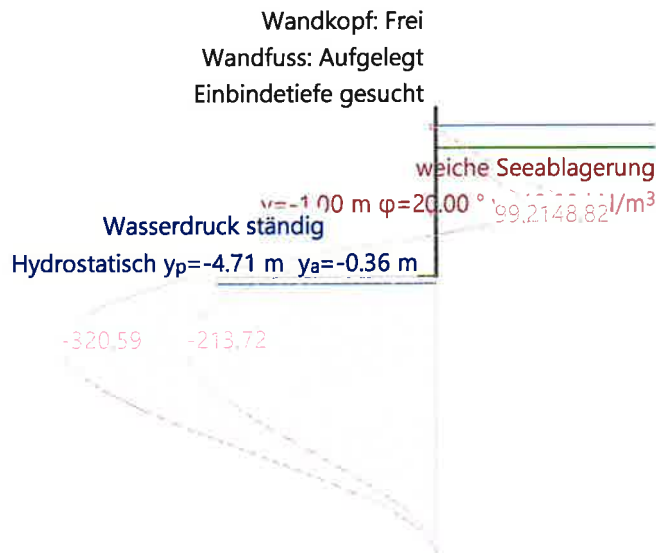
max Aushubsohle mit Abspriessung -4.51, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :207.9



max Aushubsohle mit Abspriessung -4.51, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
max Aushubsohle mit Abspriessung -4.51, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

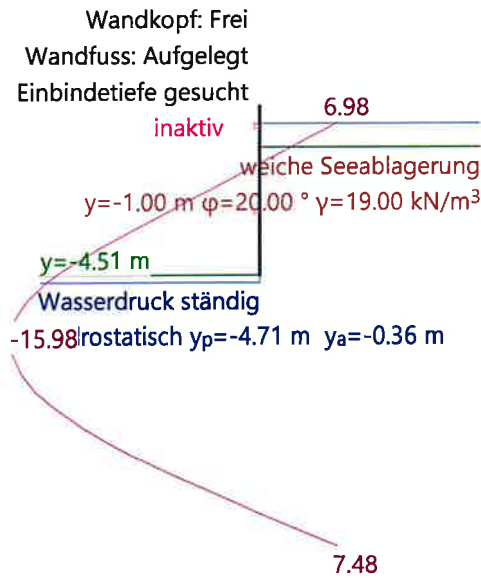
Mstb. 1 :207.9



$M_{201} = 635 \text{ kNm/m} \rightarrow M_{01} = 239 \text{ kNm/m}$

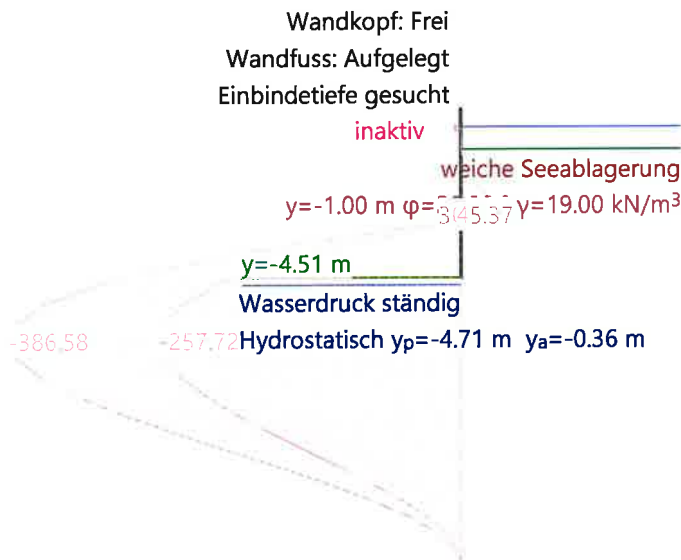
Endzustand, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :207.9



Endzustand, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
Endzustand, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

Mstb. 1 :207.9



$M_{rot} = 655 \text{ kNm/m} \rightarrow M_a = 386 \text{ kNm/m}$

**Grenzwerte**

**Wandlänge**

| Etappe | y [m]  | t [m] | Sohle [m] | Werte aus                            |
|--------|--------|-------|-----------|--------------------------------------|
| 1      | -3.86  | 2.86  | -1.00     | Etappe 1, !Globale Sicherheit, EWK 1 |
| 2      | -3.86  | 2.86  | -1.00     | Etappe 1, !Globale Sicherheit, EWK 1 |
| 3      | -9.23  | 6.03  | -3.20     | Etappe 3, !Globale Sicherheit, EWK 1 |
| 4      | -9.96  | 6.76  | -3.20     | Etappe 4, !Globale Sicherheit, EWK 1 |
| 5      | -12.21 | 7.70  | -4.51     | Etappe 5, !Globale Sicherheit, EWK 1 |
| 6      | -12.39 | 7.88  | -4.51     | Etappe 6, !Globale Sicherheit, EWK 1 |

y : Kote UK Wand  
t : Einbindetiefe  
Sohle : Kote Baugrubensohle

**Hydraulischer Grundbruch**

| Etappe | F vorh [-] | F erf [-] | y [m] | t [m] | Werte aus  |
|--------|------------|-----------|-------|-------|--|
| 1      | 3.82       | 1.00      | -3.86 | 2.86  | Etappe 1, !Globale Sicherheit, EWK 1             |
| 2      | -          | -         | -     | -     | Berechnung nicht erforderlich oder nicht möglich |
| 3      | 2.33       | 1.00      | -9.23 | 6.03  | Etappe 3, !Globale Sicherheit, EWK 1             |
| 4      | -          | -         | -     | -     | Berechnung nicht erforderlich oder nicht möglich |
| 5      | -          | -         | -     | -     | Berechnung nicht erforderlich oder nicht möglich |
| 6      | -          | -         | -     | -     | Berechnung nicht erforderlich oder nicht möglich |

F vorh : vorhandene Sicherheit hydraulischer Grundbruch  
F erf : erforderliche Sicherheit hydraulischer Grundbruch  
y : zu 'F vorh' zugehörige Kote UK Wand  
t : zu 'F vorh' zugehörige Einbindetiefe

**Abstützungen**

| y [m] | P [kN/m] | P max     |         | Et,GWS,EWK |
|-------|----------|-----------|---------|------------|
|       |          | Px [kN/m] |         |            |
| -0.41 | 76.39    | 76.39     | 3, 1, 1 |            |
| -2.76 | 243.52   | 243.52    | 5, 1, 1 |            |

Px : horizontale Komponente der Abstützungskraft P  
Et,GWS,EWK : Etappe, Grenzwertspezifikation, Einwirkungskombination  
GWS 1 = !Globale Sicherheit

**Biegemomente mit zugehörigen Schnittkräften**

| y [m] | Mz1 max       |            | Et,GWS,EWK | Mz1 min     |            | Et,GWS,EWK |
|-------|---------------|------------|------------|-------------|------------|------------|
|       | Mz1 [kNm/m]   | Vx1 [kN/m] |            | Mz1 [kNm/m] | Vx1 [kN/m] |            |
| 0.14  | 0.00          | -0.00      | 2, 1, 1    | -0.00       | -0.00      | 4, 1, 1    |
| -0.36 | 0.00          | -0.00      | 6, 1, 1    | -0.00       | -0.00      | 4, 1, 1    |
| -0.41 | 0.00          | -0.02      | 5, 1, 1    | 0.00        | -0.02      | 6, 1, 1    |
| -0.41 | 0.00          | -0.02      | 2, 1, 1    | 0.00        | -0.02      | 6, 1, 1    |
| -0.41 | 0.00          | -0.02      | 2, 1, 1    | 0.00        | 114.57     | 3, 1, 1    |
| -0.41 | 0.00          | -0.02      | 2, 1, 1    | 0.00        | 114.57     | 3, 1, 1    |
| -0.91 | 22.43         | -46.29     | 5, 1, 1    | -56.88      | 112.32     | 3, 1, 1    |
| -1.00 | 26.63         | -47.09     | 5, 1, 1    | -66.95      | 111.52     | 3, 1, 1    |
| -1.20 | 36.70         | -50.05     | 5, 1, 1    | -88.17      | 106.97     | 3, 1, 1    |
| -1.50 | 51.81         | -54.49     | 5, 1, 1    | -119.99     | 100.15     | 3, 1, 1    |
| -1.55 | 54.33         | -55.43     | 5, 1, 1    | -124.57     | 98.96      | 3, 1, 1    |
| -1.60 | 57.86         | -57.30     | 5, 1, 1    | -129.57     | 96.92      | 3, 1, 1    |
| -1.85 | 73.59         | -65.66     | 5, 1, 1    | -151.90     | 87.80      | 3, 1, 1    |
| -2.05 | 86.04         | -72.28     | 5, 1, 1    | -169.58     | 80.59      | 3, 1, 1    |
| -2.10 | 90.65         | -74.72     | 5, 1, 1    | -173.48     | 78.22      | 3, 1, 1    |
| -2.35 | 111.20        | -85.66     | 5, 1, 1    | -190.89     | 67.65      | 3, 1, 1    |
| -2.55 | 127.47        | -94.31     | 5, 1, 1    | -204.67     | 59.28      | 3, 1, 1    |
| -2.60 | 133.01        | -97.17     | 5, 1, 1    | -207.68     | 56.68      | 3, 1, 1    |
| -2.74 | 146.99        | -104.38    | 5, 1, 1    | -215.29     | 50.12      | 3, 1, 1    |
| -2.76 | 148.82        | -105.33    | 5, 1, 1    | -216.29     | 49.26      | 3, 1, 1    |
| -2.76 | 148.82        | 193.49     | 5, 1, 1    | -216.29     | 49.26      | 3, 1, 1    |
| -2.76 | <b>148.82</b> | 259.95     | 5, 1, 1    | -216.29     | 49.26      | 3, 1, 1    |
| -2.76 | 148.82        | 259.95     | 5, 1, 1    | -216.29     | 49.26      | 3, 1, 1    |
| -3.20 | 40.73         | 234.04     | 5, 1, 1    | -233.14     | 26.96      | 3, 1, 1    |
| -3.26 | 25.99         | 230.50     | 5, 1, 1    | -234.42     | 23.62      | 3, 1, 1    |
| -3.40 | 2.05          | 15.47      | 1, 1, 1    | -237.40     | 15.82      | 3, 1, 1    |
| -3.52 | 0.17          | 18.76      | 1, 1, 1    | -237.82     | 9.83       | 3, 1, 1    |
| -3.70 | -68.00        | 200.03     | 5, 1, 1    | -238.41     | 1.31       | 3, 1, 1    |
| -3.76 | -80.82        | 195.87     | 5, 1, 1    | -238.62     | -1.59      | 3, 1, 1    |
| -3.90 | -105.51       | 184.72     | 5, 1, 1    | -239.09     | -8.37      | 3, 1, 1    |
| -4.20 | -158.43       | 160.83     | 5, 1, 1    | -246.25     | 149.97     | 6, 1, 1    |
| -4.26 | -169.01       | 156.05     | 5, 1, 1    | -256.18     | 145.19     | 6, 1, 1    |

Nr.:

| y<br>[m] | Mz1<br>[kNm/m] | Mz1 max       |            |                | Mz1<br>[kNm/m] | Mz1 min       |            |  |
|----------|----------------|---------------|------------|----------------|----------------|---------------|------------|--|
|          |                | Vx1<br>[kN/m] | Et,GWS,EWK |                |                | Vx1<br>[kN/m] | Et,GWS,EWK |  |
| -4.40    | -189.34        | 143.81        | 5, 1, 1    | -274.99        | 132.95         | 6, 1, 1       |            |  |
| -4.51    | -205.32        | 134.19        | 5, 1, 1    | -289.77        | 123.33         | 6, 1, 1       |            |  |
| -4.70    | -218.81        | -37.67        | 3, 1, 1    | -311.53        | 106.77         | 6, 1, 1       |            |  |
| -4.71    | -218.44        | -37.98        | 3, 1, 1    | -312.67        | 105.90         | 6, 1, 1       |            |  |
| -4.90    | -211.52        | -43.93        | 3, 1, 1    | -328.93        | 90.72          | 6, 1, 1       |            |  |
| -5.21    | -196.03        | -50.98        | 3, 1, 1    | -355.45        | 65.95          | 6, 1, 1       |            |  |
| -5.40    | -186.53        | -55.30        | 3, 1, 1    | -364.54        | 52.44          | 6, 1, 1       |            |  |
| -5.71    | -168.18        | -59.69        | 3, 1, 1    | -379.35        | 30.39          | 6, 1, 1       |            |  |
| -5.90    | -156.93        | -62.39        | 3, 1, 1    | -382.10        | 18.56          | 6, 1, 1       |            |  |
| -6.21    | -137.04        | -64.14        | 3, 1, 1    | <b>-386.58</b> | -0.76          | 6, 1, 1       |            |  |
| -6.40    | -124.86        | -65.21        | 3, 1, 1    | -383.83        | -10.92         | 6, 1, 1       |            |  |
| -6.48    | -119.66        | -65.26        | 3, 1, 1    | -382.67        | -15.19         | 6, 1, 1       |            |  |
| -6.71    | -104.79        | -64.28        | 3, 1, 1    | -379.33        | -27.51         | 6, 1, 1       |            |  |
| -6.98    | -87.38         | -63.12        | 3, 1, 1    | -368.80        | -39.56         | 6, 1, 1       |            |  |
| -7.21    | -73.50         | -60.17        | 3, 1, 1    | -359.81        | -49.86         | 6, 1, 1       |            |  |
| -7.48    | -57.24         | -56.71        | 3, 1, 1    | -343.84        | -59.54         | 6, 1, 1       |            |  |
| -7.55    | -53.53         | -55.18        | 3, 1, 1    | -339.60        | -62.11         | 6, 1, 1       |            |  |
| -7.71    | -45.33         | -51.79        | 3, 1, 1    | -330.21        | -67.80         | 6, 1, 1       |            |  |
| -7.98    | -31.38         | -46.03        | 3, 1, 1    | -310.00        | -75.11         | 6, 1, 1       |            |  |
| -7.98    | -31.25         | -45.95        | 3, 1, 1    | -309.78        | -75.19         | 6, 1, 1       |            |  |
| -7.98    | -31.25         | -45.51        | 3, 1, 1    | -309.78        | -75.19         | 6, 1, 1       |            |  |
| -8.05    | -28.61         | -43.45        | 3, 1, 1    | -304.62        | -77.05         | 6, 1, 1       |            |  |
| -8.21    | -22.52         | -38.70        | 3, 1, 1    | -292.74        | -81.35         | 6, 1, 1       |            |  |
| -8.48    | -12.06         | -30.53        | 3, 1, 1    | -269.22        | -86.33         | 6, 1, 1       |            |  |
| -8.55    | -10.60         | -27.87        | 3, 1, 1    | -263.28        | -87.59         | 6, 1, 1       |            |  |
| -8.71    | -7.23          | -21.77        | 3, 1, 1    | -249.59        | -90.49         | 6, 1, 1       |            |  |
| -8.82    | -4.84          | -17.44        | 3, 1, 1    | -239.13        | -91.56         | 6, 1, 1       |            |  |
| -8.82    | -4.84          | -17.44        | 3, 1, 1    | -239.13        | -91.56         | 6, 1, 1       |            |  |
| -8.98    | -1.43          | -11.27        | 3, 1, 1    | -224.19        | -93.08         | 6, 1, 1       |            |  |
| -9.21    | -0.13          | -1.05         | 3, 1, 1    | -202.98        | -95.23         | 6, 1, 1       |            |  |
| -9.23    | -0.00          | 0.00          | 3, 1, 1    | -200.75        | -95.29         | 6, 1, 1       |            |  |
| -9.32    | -14.39         | -38.24        | 4, 1, 1    | -192.23        | -95.52         | 6, 1, 1       |            |  |
| -9.50    | -8.35          | -32.36        | 4, 1, 1    | -175.34        | -95.97         | 6, 1, 1       |            |  |
| -9.57    | -5.95          | -30.02        | 4, 1, 1    | -168.61        | -95.93         | 6, 1, 1       |            |  |
| -9.96    | 0.00           | -0.00         | 4, 1, 1    | -132.29        | -90.76         | 6, 1, 1       |            |  |
| -10.07   | -98.01         | -78.46        | 5, 1, 1    | -122.12        | -89.32         | 6, 1, 1       |            |  |
| -10.57   | -61.35         | -67.45        | 5, 1, 1    | -80.02         | -78.31         | 6, 1, 1       |            |  |
| -10.95   | -38.00         | -56.26        | 5, 1, 1    | -53.21         | -66.77         | 6, 1, 1       |            |  |
| -10.95   | -38.00         | -55.63        | 5, 1, 1    | -53.21         | -66.77         | 6, 1, 1       |            |  |
| -11.05   | -33.06         | -51.67        | 5, 1, 1    | -45.66         | -63.52         | 6, 1, 1       |            |  |
| -11.05   | -33.06         | -51.67        | 5, 1, 1    | -45.66         | -62.73         | 6, 1, 1       |            |  |
| -11.45   | -14.68         | -36.91        | 5, 1, 1    | -24.67         | -47.24         | 6, 1, 1       |            |  |
| -11.55   | -11.95         | -32.01        | 5, 1, 1    | -19.03         | -43.08         | 6, 1, 1       |            |  |
| -11.95   | -1.82          | -13.79        | 5, 1, 1    | -6.65          | -24.12         | 6, 1, 1       |            |  |
| -12.05   | -1.08          | -8.18         | 5, 1, 1    | -3.32          | -19.02         | 6, 1, 1       |            |  |
| -12.21   | -0.00          | 0.00          | 5, 1, 1    | -1.82          | -10.44         | 6, 1, 1       |            |  |
| -12.39   | -0.00          | -0.00         | 6, 1, 1    | -0.00          | -0.00          | 6, 1, 1       |            |  |

Et,GWS,EWK : Etappe, Grenzwertspezifikation, Einwirkungskombination  
GWS 1 = !Globale Sicherheit

**Deformationen**

| y<br>[m] | Dx<br>[mm] | Dx max     |       |         | Dx min     |  |  |
|----------|------------|------------|-------|---------|------------|--|--|
|          |            | Et,GWS,EWK |       |         | Et,GWS,EWK |  |  |
| 0.14     | 6.98       | 6, 1, 1    | -0.15 | 1, 1, 1 |            |  |  |
| -0.36    | 4.79       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.36    | 4.79       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.36    | 4.79       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.36    | 4.79       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.36    | 4.79       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.36    | 4.79       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.41    | 4.57       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.41    | 4.57       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.41    | 4.57       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.41    | 4.57       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.41    | 4.57       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.41    | 4.57       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.41    | 4.57       | 6, 1, 1    | -0.12 | 1, 1, 1 |            |  |  |
| -0.91    | 2.38       | 6, 1, 1    | -1.50 | 3, 1, 1 |            |  |  |
| -1.00    | 1.99       | 6, 1, 1    | -1.75 | 3, 1, 1 |            |  |  |
| -1.00    | 1.99       | 6, 1, 1    | -1.75 | 3, 1, 1 |            |  |  |
| -1.00    | 1.99       | 6, 1, 1    | -1.75 | 3, 1, 1 |            |  |  |
| -1.00    | 1.99       | 6, 1, 1    | -1.75 | 3, 1, 1 |            |  |  |
| -1.00    | 1.99       | 6, 1, 1    | -1.75 | 3, 1, 1 |            |  |  |
| -1.00    | 1.99       | 6, 1, 1    | -1.75 | 3, 1, 1 |            |  |  |

Nr.:

| y<br>[m] | Dx<br>[mm] | Dx max<br>Et,GWS,EWK |   |   | Dx<br>[mm]    | Dx min<br>Et,GWS,EWK |   |   |
|----------|------------|----------------------|---|---|---------------|----------------------|---|---|
|          |            |                      |   |   |               |                      |   |   |
| -1.00    | 1.99       | 6                    | 1 | 1 | -1.75         | 3                    | 1 | 1 |
| -1.20    | 1.11       | 6                    | 1 | 1 | -2.30         | 3                    | 1 | 1 |
| -1.20    | 1.11       | 6                    | 1 | 1 | -2.30         | 3                    | 1 | 1 |
| -1.50    | -0.01      | 2                    | 1 | 1 | -3.12         | 3                    | 1 | 1 |
| -1.55    | -0.01      | 2                    | 1 | 1 | -3.24         | 3                    | 1 | 1 |
| -1.55    | -0.01      | 2                    | 1 | 1 | -3.24         | 3                    | 1 | 1 |
| -1.55    | -0.01      | 2                    | 1 | 1 | -3.24         | 3                    | 1 | 1 |
| -1.55    | -0.01      | 2                    | 1 | 1 | -3.24         | 3                    | 1 | 1 |
| -1.55    | -0.01      | 2                    | 1 | 1 | -3.24         | 3                    | 1 | 1 |
| -1.55    | -0.01      | 2                    | 1 | 1 | -3.24         | 3                    | 1 | 1 |
| -1.60    | -0.01      | 2                    | 1 | 1 | -3.37         | 3                    | 1 | 1 |
| -1.60    | -0.01      | 2                    | 1 | 1 | -3.37         | 3                    | 1 | 1 |
| -1.85    | -0.01      | 2                    | 1 | 1 | -3.97         | 3                    | 1 | 1 |
| -1.85    | -0.01      | 2                    | 1 | 1 | -3.97         | 3                    | 1 | 1 |
| -2.05    | -0.00      | 2                    | 1 | 1 | -4.44         | 3                    | 1 | 1 |
| -2.10    | -0.00      | 2                    | 1 | 1 | -4.55         | 3                    | 1 | 1 |
| -2.35    | -0.00      | 2                    | 1 | 1 | -5.04         | 3                    | 1 | 1 |
| -2.55    | -0.00      | 2                    | 1 | 1 | -5.43         | 3                    | 1 | 1 |
| -2.60    | -0.00      | 2                    | 1 | 1 | -5.52         | 3                    | 1 | 1 |
| -2.74    | 0.00       | 2                    | 1 | 1 | -5.75         | 3                    | 1 | 1 |
| -2.76    | -0.01      | 1                    | 1 | 1 | -5.78         | 5                    | 1 | 1 |
| -2.76    | -0.01      | 1                    | 1 | 1 | -5.78         | 5                    | 1 | 1 |
| -2.76    | -0.01      | 1                    | 1 | 1 | -5.78         | 5                    | 1 | 1 |
| -2.76    | -0.01      | 1                    | 1 | 1 | -5.78         | 4                    | 1 | 1 |
| -2.76    | -0.01      | 1                    | 1 | 1 | -5.78         | 4                    | 1 | 1 |
| -3.20    | -0.00      | 1                    | 1 | 1 | -7.76         | 6                    | 1 | 1 |
| -3.20    | -0.00      | 1                    | 1 | 1 | -7.76         | 6                    | 1 | 1 |
| -3.20    | -0.00      | 1                    | 1 | 1 | -7.76         | 6                    | 1 | 1 |
| -3.26    | -0.00      | 1                    | 1 | 1 | -8.04         | 6                    | 1 | 1 |
| -3.40    | -0.00      | 1                    | 1 | 1 | -8.64         | 6                    | 1 | 1 |
| -3.40    | -0.00      | 1                    | 1 | 1 | -8.64         | 6                    | 1 | 1 |
| -3.52    | 0.00       | 1                    | 1 | 1 | -9.18         | 6                    | 1 | 1 |
| -3.70    | -6.68      | 3                    | 1 | 1 | -9.94         | 6                    | 1 | 1 |
| -3.76    | -6.71      | 3                    | 1 | 1 | -10.20        | 6                    | 1 | 1 |
| -3.90    | -6.78      | 3                    | 1 | 1 | -10.75        | 6                    | 1 | 1 |
| -4.20    | -6.74      | 3                    | 1 | 1 | -11.93        | 6                    | 1 | 1 |
| -4.26    | -6.74      | 3                    | 1 | 1 | -12.17        | 6                    | 1 | 1 |
| -4.40    | -6.72      | 3                    | 1 | 1 | -12.65        | 6                    | 1 | 1 |
| -4.51    | -6.65      | 3                    | 1 | 1 | -13.03        | 6                    | 1 | 1 |
| -4.51    | -6.65      | 3                    | 1 | 1 | -13.03        | 6                    | 1 | 1 |
| -4.51    | -6.65      | 3                    | 1 | 1 | -13.03        | 6                    | 1 | 1 |
| -4.70    | -6.52      | 3                    | 1 | 1 | -13.63        | 6                    | 1 | 1 |
| -4.71    | -6.52      | 3                    | 1 | 1 | -13.66        | 6                    | 1 | 1 |
| -4.71    | -6.52      | 3                    | 1 | 1 | -13.66        | 6                    | 1 | 1 |
| -4.71    | -6.52      | 3                    | 1 | 1 | -13.66        | 6                    | 1 | 1 |
| -4.71    | -6.52      | 3                    | 1 | 1 | -13.66        | 6                    | 1 | 1 |
| -4.90    | -6.39      | 3                    | 1 | 1 | -14.14        | 6                    | 1 | 1 |
| -5.21    | -6.03      | 3                    | 1 | 1 | -14.91        | 6                    | 1 | 1 |
| -5.40    | -5.81      | 3                    | 1 | 1 | -15.20        | 6                    | 1 | 1 |
| -5.71    | -5.32      | 3                    | 1 | 1 | -15.68        | 6                    | 1 | 1 |
| -5.90    | -5.01      | 3                    | 1 | 1 | -15.79        | 6                    | 1 | 1 |
| -6.21    | -4.40      | 3                    | 1 | 1 | <b>-15.98</b> | 6                    | 1 | 1 |
| -6.40    | -4.02      | 3                    | 1 | 1 | -15.93        | 6                    | 1 | 1 |
| -6.48    | -3.84      | 3                    | 1 | 1 | -15.91        | 6                    | 1 | 1 |
| -6.48    | -3.84      | 3                    | 1 | 1 | -15.91        | 6                    | 1 | 1 |
| -6.71    | -3.30      | 3                    | 1 | 1 | -15.84        | 6                    | 1 | 1 |
| -6.98    | -2.66      | 3                    | 1 | 1 | -15.54        | 6                    | 1 | 1 |
| -7.21    | -2.07      | 3                    | 1 | 1 | -15.29        | 6                    | 1 | 1 |
| -7.48    | -1.37      | 3                    | 1 | 1 | -14.78        | 6                    | 1 | 1 |
| -7.55    | -1.17      | 3                    | 1 | 1 | -14.64        | 6                    | 1 | 1 |
| -7.55    | -1.17      | 3                    | 1 | 1 | -14.64        | 6                    | 1 | 1 |
| -7.71    | -0.74      | 3                    | 1 | 1 | -14.34        | 6                    | 1 | 1 |
| -7.98    | -0.01      | 3                    | 1 | 1 | -13.62        | 6                    | 1 | 1 |
| -7.98    | -0.00      | 3                    | 1 | 1 | -13.62        | 6                    | 1 | 1 |
| -7.98    | -0.00      | 3                    | 1 | 1 | -13.62        | 6                    | 1 | 1 |
| -8.05    | 0.19       | 3                    | 1 | 1 | -13.43        | 6                    | 1 | 1 |
| -8.21    | 0.64       | 3                    | 1 | 1 | -13.01        | 6                    | 1 | 1 |
| -8.48    | 1.40       | 3                    | 1 | 1 | -12.10        | 6                    | 1 | 1 |
| -8.55    | 1.60       | 3                    | 1 | 1 | -11.87        | 6                    | 1 | 1 |
| -8.71    | 2.04       | 3                    | 1 | 1 | -11.34        | 6                    | 1 | 1 |
| -8.82    | 2.36       | 3                    | 1 | 1 | -10.89        | 6                    | 1 | 1 |
| -8.82    | 2.36       | 3                    | 1 | 1 | -10.89        | 6                    | 1 | 1 |
| -8.98    | 2.82       | 3                    | 1 | 1 | -10.24        | 6                    | 1 | 1 |
| -9.21    | 3.46       | 3                    | 1 | 1 | -9.33         | 6                    | 1 | 1 |
| -9.23    | 3.53       | 3                    | 1 | 1 | -9.22         | 6                    | 1 | 1 |

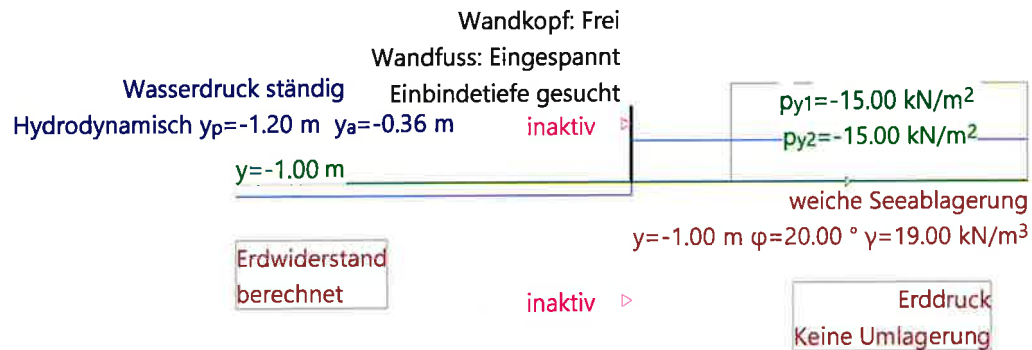
Nr.:

| y<br>[m] | Dx<br>[mm]  | Dx max     |  |  | Dx min     |         |  |
|----------|-------------|------------|--|--|------------|---------|--|
|          |             | Et,GWS,EWK |  |  | Et,GWS,EWK |         |  |
| -9.32    | 1.59        | 4, 1, 1    |  |  | -8.82      | 6, 1, 1 |  |
| -9.50    | 2.16        | 4, 1, 1    |  |  | -8.03      | 6, 1, 1 |  |
| -9.50    | 2.16        | 4, 1, 1    |  |  | -8.03      | 6, 1, 1 |  |
| -9.50    | 2.16        | 4, 1, 1    |  |  | -8.03      | 6, 1, 1 |  |
| -9.57    | 2.38        | 4, 1, 1    |  |  | -7.70      | 6, 1, 1 |  |
| -9.57    | 2.38        | 4, 1, 1    |  |  | -7.70      | 6, 1, 1 |  |
| -9.57    | 2.38        | 4, 1, 1    |  |  | -7.70      | 6, 1, 1 |  |
| -9.57    | 2.38        | 4, 1, 1    |  |  | -7.70      | 6, 1, 1 |  |
| -9.96    | 3.64        | 4, 1, 1    |  |  | -5.77      | 6, 1, 1 |  |
| -10.07   | -3.97       | 5, 1, 1    |  |  | -5.23      | 6, 1, 1 |  |
| -10.57   | -1.73       | 5, 1, 1    |  |  | -2.62      | 6, 1, 1 |  |
| -10.95   | -0.00       | 5, 1, 1    |  |  | -0.58      | 6, 1, 1 |  |
| -10.95   | -0.00       | 5, 1, 1    |  |  | -0.58      | 6, 1, 1 |  |
| -11.05   | 0.50        | 5, 1, 1    |  |  | -0.00      | 6, 1, 1 |  |
| -11.05   | 0.50        | 5, 1, 1    |  |  | -0.00      | 6, 1, 1 |  |
| -11.45   | 2.34        | 5, 1, 1    |  |  | 2.18       | 6, 1, 1 |  |
| -11.55   | 2.84        | 5, 1, 1    |  |  | 2.77       | 6, 1, 1 |  |
| -11.95   | 4.97        | 6, 1, 1    |  |  | 4.70       | 5, 1, 1 |  |
| -12.05   | 5.56        | 6, 1, 1    |  |  | 5.20       | 5, 1, 1 |  |
| -12.21   | 6.43        | 6, 1, 1    |  |  | 5.93       | 5, 1, 1 |  |
| -12.39   | <b>7.48</b> | 6, 1, 1    |  |  | 7.48       | 6, 1, 1 |  |

Dx : Verschiebungen  
 Et,GWS,EWK : Etappe, Grenzwertspezifikation, Einwirkungskombination  
 GWS 1 = !Globale Sicherheit

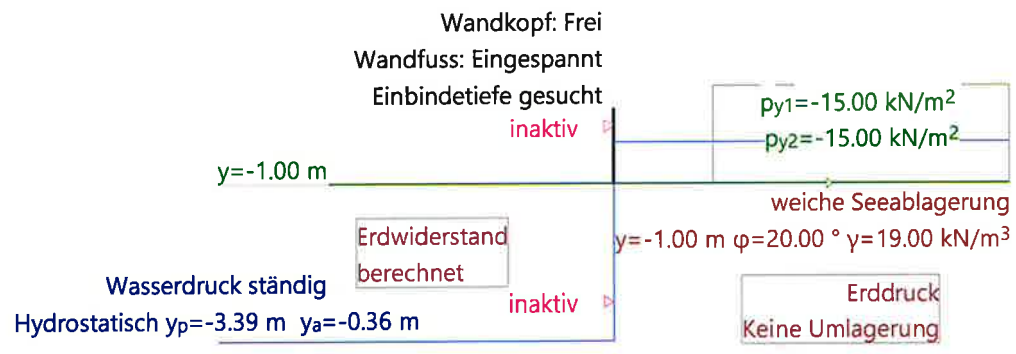
Belastung q: Nutzlast, Etappe 1: 1. Etappe -1.0

Mstb. 1 :115.4



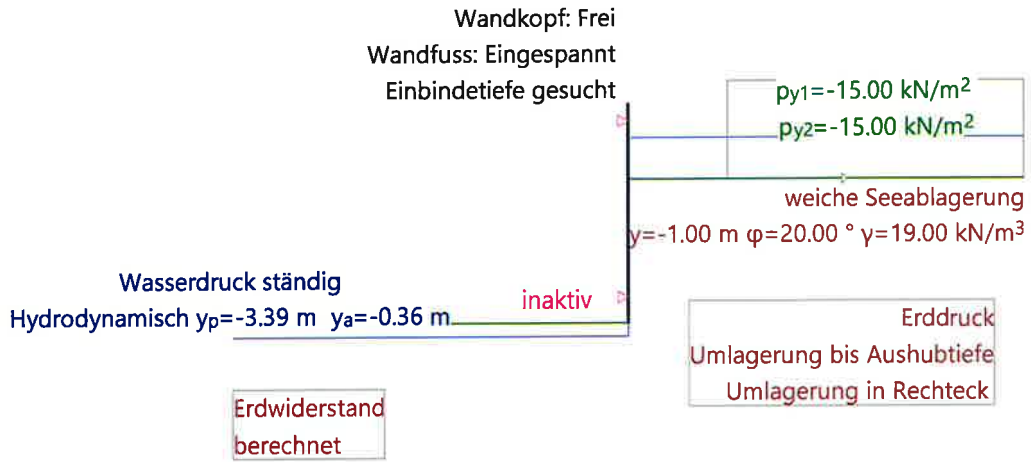
Belastung q: Nutzlast, Etappe 2: Absenkung Wasserspiegel -3.39

Mstb. 1 :115.4



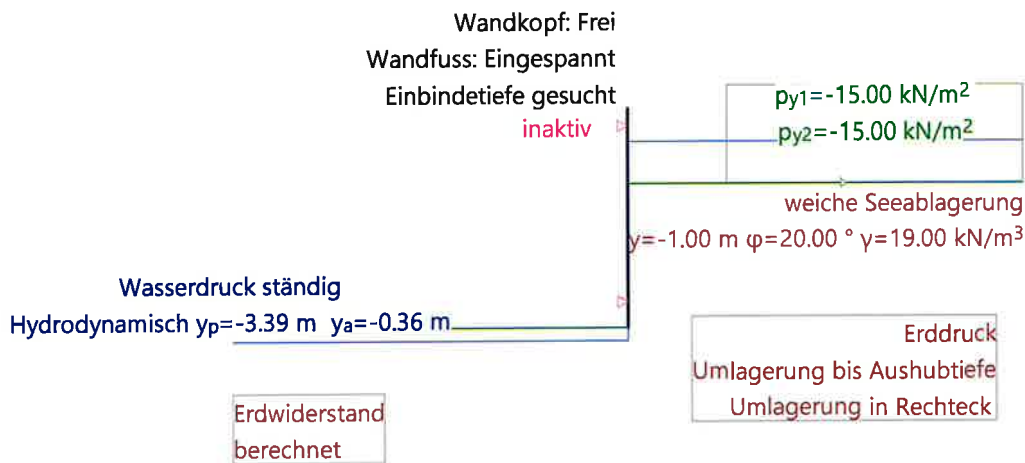
Belastung q: Nutzlast, Etappe 3: max. Aushubsohle mit Absprissung -3.19

Mstab. 1 :115.4



Belastung q: Nutzlast, Etappe 4: Endzustand

Mstab. 1 :115.4





**Numerische Resultate aller EWK****Wandlänge**

| Etappe | GWS | EWK | y<br>[m] | t<br>[m] | Sohle<br>[m] | Bemerkungen |
|--------|-----|-----|----------|----------|--------------|-------------|
| 1      | 1   | 1   | -3.86    | 2.86     | -1.00        |             |
| 2      | 1   | 1   | -2.97    | 1.97     | -1.00        |             |
| 3      | 1   | 1   | -12.47   | 9.28     | -3.19        |             |
| 4      | 1   | 1   | -11.13   | 7.94     | -3.19        |             |

GWS : Grenzwertspezifikation  
 EWK : Einwirkungskombination  
 y : Kote UK Wand  
 t : Einbindtiefe  
 Sohle : Kote Baugrubensohle

**Abstützkräfte (geneigt)**

| Etappe | GWS | EWK | P <sub>1</sub><br>[kN/m] | P <sub>2</sub><br>[kN/m] |  |
|--------|-----|-----|--------------------------|--------------------------|--|
| 1      | 1   | 1   | inaktiv                  | inaktiv                  |  |
| 2      | 1   | 1   | inaktiv                  | inaktiv                  |  |
| 3      | 1   | 1   | 66.60                    | inaktiv                  |  |
| 4      | 1   | 1   | inaktiv                  | 98.59                    |  |

GWS : Grenzwertspezifikation  
 EWK : Einwirkungskombination  
 P<sub>1</sub> : Kraft auf Abstützung auf Kote = -0.11  
 P<sub>2</sub> : Kraft auf Abstützung auf Kote = -2.79

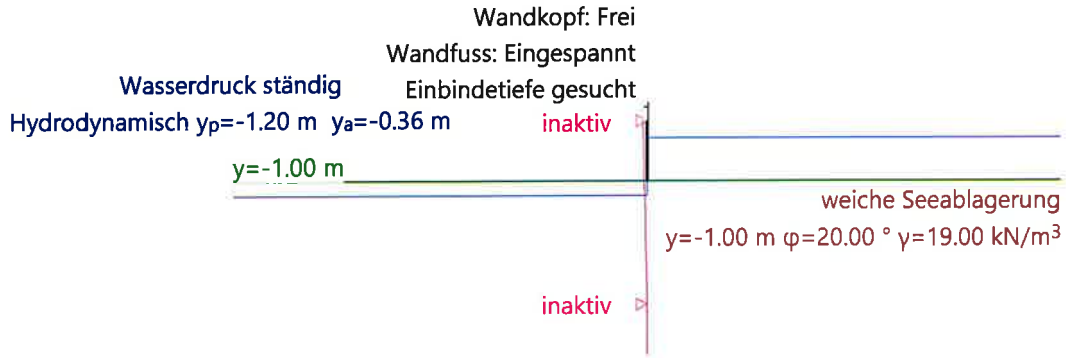
**Etappen**

| Etappe | Titel                                  | Sohle<br>[m] |                        |
|--------|--|--------------|------------------------|
| 1      | 1. Etappe -1.0                         | -1.00        |                        |
| 2      | Absenkung Wasserspiegel -3.39          | -1.00        |                        |
| 3      | max. Aushubsohle mit Abspriessung -3.1 | -3.19        |                        |
| 4      | Endzustand                             | -3.19        | <i>mit Spikesplatt</i> |

Sohle : Kote Baugrubensohle

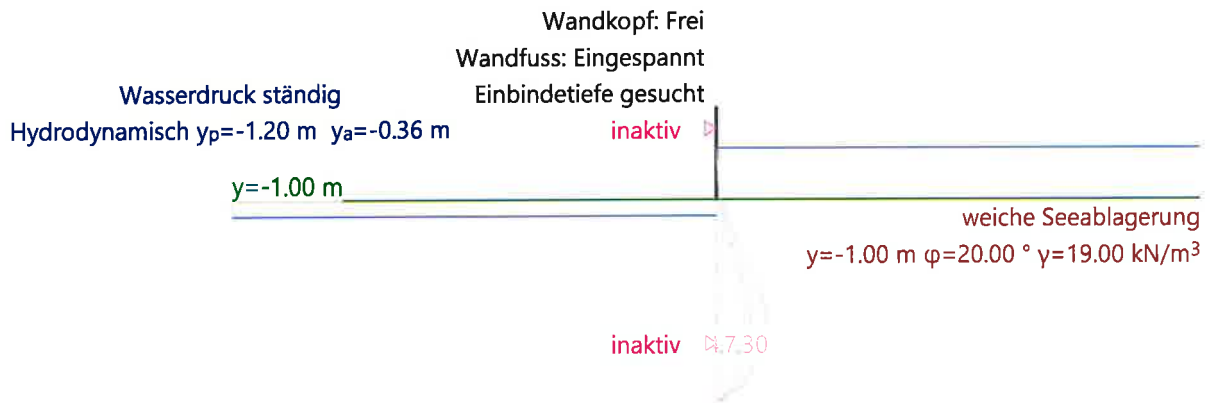
1. Etappe -1.0, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :110.5



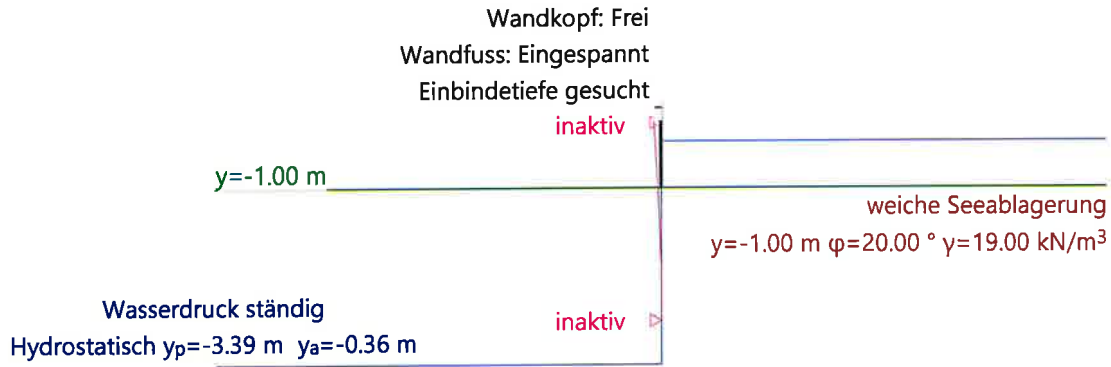
1. Etappe -1.0, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
1. Etappe -1.0, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

Mstb. 1 :94.3



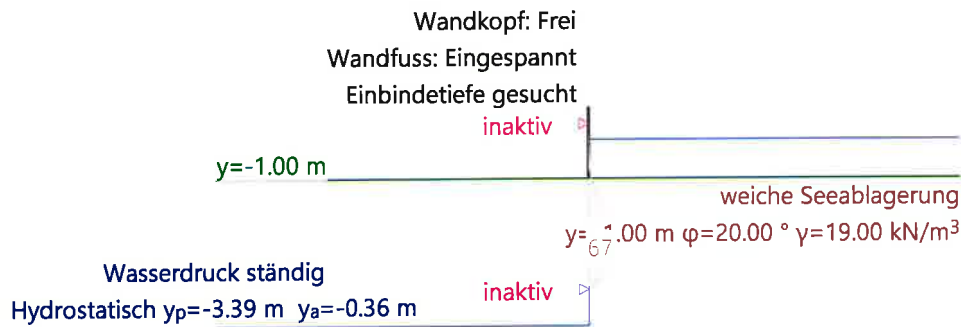
Absenkung Wasserspiegel -3.39, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :102.7



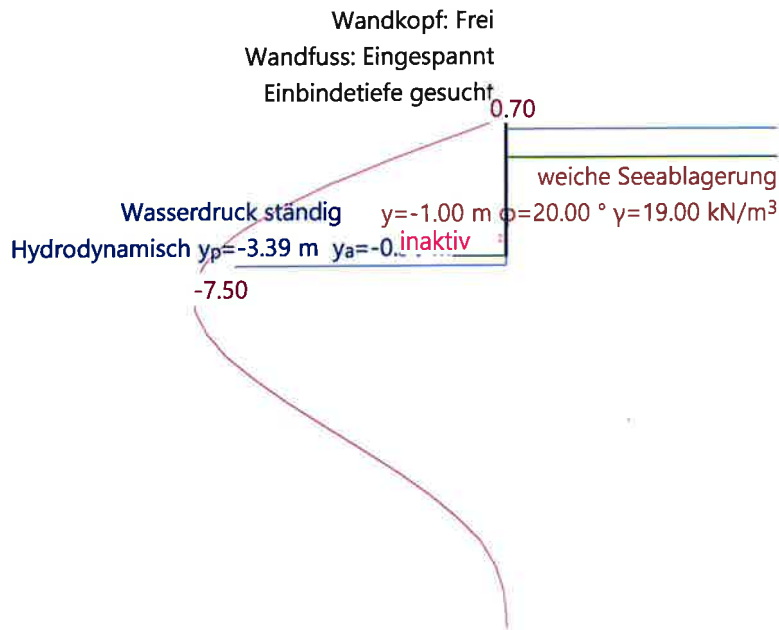
Absenkung Wasserspiegel -3.39, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
Absenkung Wasserspiegel -3.39, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

Mstb. 1 :122.8



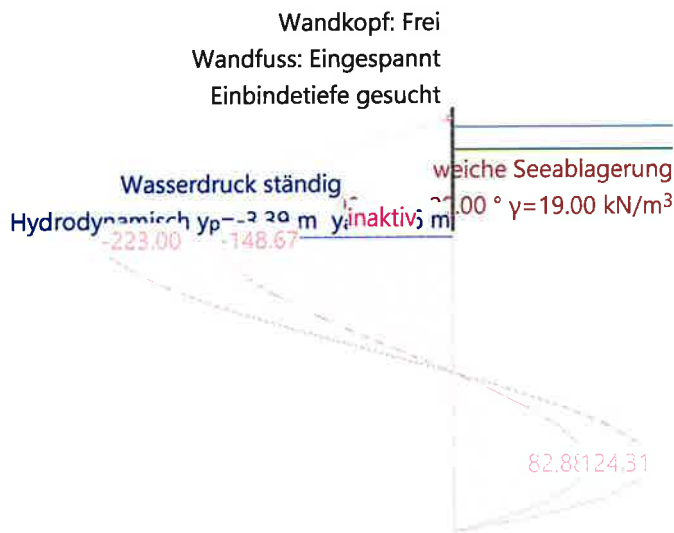
max. Aushubsohle mit Absprissung -3.19, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :168.4



max. Aushubsohle mit Absprissung -3.19, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
max. Aushubsohle mit Absprissung -3.19, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

Mstb. 1 :207.9



$M_{\text{max}} = 635 \text{ kNm/m} > M_{\text{max}} = 223 \text{ kNm/m}$

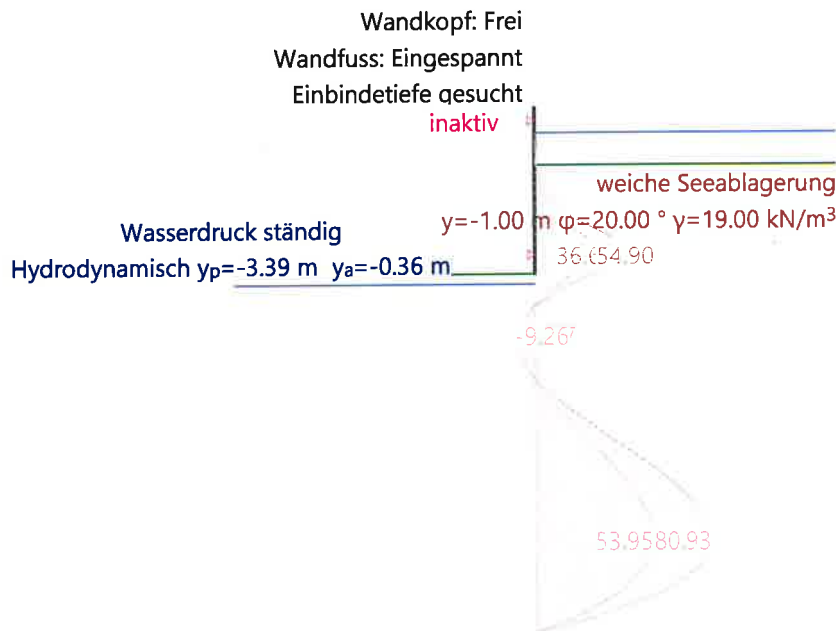
Endzustand, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :256.7



Endzustand, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
 Endzustand, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

Mstb. 1 :151.6



**Grenzwerte****Wandlänge**

| Etappe | y [m]  | t [m] | Sohle [m] | Werte aus                            |
|--------|--------|-------|-----------|--------------------------------------|
| 1      | -3.86  | 2.86  | -1.00     | Etappe 1, !Globale Sicherheit, EWK 1 |
| 2      | -3.86  | 2.86  | -1.00     | Etappe 1, !Globale Sicherheit, EWK 1 |
| 3      | -12.47 | 9.28  | -3.19     | Etappe 3, !Globale Sicherheit, EWK 1 |
| 4      | -12.47 | 9.28  | -3.19     | Etappe 3, !Globale Sicherheit, EWK 1 |

y : Kote UK Wand  
t : Einbindetiefe  
Sohle : Kote Baugrubensohle

**Hydraulischer Grundbruch**

| Etappe | F vorh [-] | F erf [-] | y [m]  | t [m] | Werte aus  |
|--------|------------|-----------|--------|-------|--|
| 1      | 3.82       | 1.00      | -3.86  | 2.86  | Etappe 1, !Globale Sicherheit, EWK 1             |
| 2      | -          | -         | -      | -     | Berechnung nicht erforderlich oder nicht möglich |
| 3      | 3.29       | 1.00      | -12.47 | 9.28  | Etappe 3, !Globale Sicherheit, EWK 1             |
| 4      | 3.29       | 1.00      | -12.47 | 9.28  | Etappe 4, !Globale Sicherheit, EWK 1             |

F vorh : vorhandene Sicherheit hydraulischer Grundbruch  
F erf : erforderliche Sicherheit hydraulischer Grundbruch  
y : zu 'F vorh' zugehörige Kote UK Wand  
t : zu 'F vorh' zugehörige Einbindetiefe

**Abstützungen**

| y [m] | P [kN/m] | P max     |         | Et,GWS,EWK |
|-------|----------|-----------|---------|------------|
|       |          | Px [kN/m] |         |            |
| -0.11 | 66.60    | 66.60     | 3, 1, 1 |            |
| -2.79 | 98.59    | 98.59     | 4, 1, 1 |            |

Px : horizontale Komponente der Abstützungskraft P  
Et,GWS,EWK : Etappe, Grenzwertspezifikation, Einwirkungskombination  
GWS 1 = !Globale Sicherheit

**Biegemomente mit zugehörigen Schnittkräften**

| y [m] | Mz1 max     |            |            | Mz1 min     |            |            |
|-------|-------------|------------|------------|-------------|------------|------------|
|       | Mz1 [kNm/m] | Vx1 [kN/m] | Et,GWS,EWK | Mz1 [kNm/m] | Vx1 [kN/m] | Et,GWS,EWK |
| 0.14  | 0.00        | 0.00       | 2, 1, 1    | -0.00       | -0.00      | 4, 1, 1    |
| -0.11 | 0.00        | -0.00      | 4, 1, 1    | -0.00       | 0.00       | 3, 1, 1    |
| -0.11 | 0.00        | -0.00      | 4, 1, 1    | -0.00       | 99.90      | 3, 1, 1    |
| -0.36 | 0.00        | 0.00       | 1, 1, 1    | -24.97      | 99.90      | 3, 1, 1    |
| -0.86 | 0.31        | -1.88      | 4, 1, 1    | -74.61      | 98.02      | 3, 1, 1    |
| -1.00 | 0.66        | -3.07      | 4, 1, 1    | -88.26      | 96.83      | 3, 1, 1    |
| -1.20 | 2.34        | -7.56      | 4, 1, 1    | -106.56     | 92.36      | 3, 1, 1    |
| -1.50 | 4.87        | -14.30     | 4, 1, 1    | -134.01     | 85.66      | 3, 1, 1    |
| -1.55 | 5.55        | -15.48     | 4, 1, 1    | -137.92     | 84.48      | 3, 1, 1    |
| -1.60 | 6.91        | -17.53     | 4, 1, 1    | -142.12     | 82.43      | 3, 1, 1    |
| -1.85 | 12.97       | -26.67     | 4, 1, 1    | -160.85     | 73.28      | 3, 1, 1    |
| -2.05 | 17.77       | -33.90     | 4, 1, 1    | -175.68     | 66.03      | 3, 1, 1    |
| -2.10 | 20.23       | -36.29     | 4, 1, 1    | -178.76     | 63.63      | 3, 1, 1    |
| -2.35 | 31.25       | -46.97     | 4, 1, 1    | -192.53     | 52.89      | 3, 1, 1    |
| -2.55 | 39.97       | -55.42     | 4, 1, 1    | -203.42     | 44.39      | 3, 1, 1    |
| -2.60 | 43.37       | -58.07     | 4, 1, 1    | -205.56     | 41.72      | 3, 1, 1    |
| -2.74 | 51.93       | -64.75     | 4, 1, 1    | -210.97     | 34.99      | 3, 1, 1    |
| -2.79 | 54.90       | -67.06     | 4, 1, 1    | -212.84     | 32.67      | 3, 1, 1    |
| -2.79 | 54.90       | 80.83      | 4, 1, 1    | -212.84     | 32.67      | 3, 1, 1    |
| -3.19 | 26.64       | 60.15      | 4, 1, 1    | -221.80     | 11.80      | 3, 1, 1    |
| -3.29 | 21.20       | 54.50      | 4, 1, 1    | -222.40     | 6.12       | 3, 1, 1    |
| -3.39 | 15.76       | 48.86      | 4, 1, 1    | -223.00     | 0.43       | 3, 1, 1    |
| -3.52 | 10.91       | 42.28      | 4, 1, 1    | -221.35     | -6.21      | 3, 1, 1    |
| -3.89 | -2.35       | 24.30      | 4, 1, 1    | -216.84     | -24.35     | 3, 1, 1    |
| -4.39 | -9.26       | 4.04       | 4, 1, 1    | -199.37     | -44.82     | 3, 1, 1    |
| -4.89 | -7.11       | -11.92     | 4, 1, 1    | -172.74     | -60.98     | 3, 1, 1    |
| -5.39 | 1.94        | -23.58     | 4, 1, 1    | -139.11     | -72.81     | 3, 1, 1    |
| -5.89 | 15.75       | -30.93     | 4, 1, 1    | -100.65     | -80.34     | 3, 1, 1    |
| -6.39 | 32.16       | -33.98     | 4, 1, 1    | -59.49      | -83.55     | 3, 1, 1    |
| -6.49 | 35.72       | -34.08     | 4, 1, 1    | -50.73      | -83.66     | 3, 1, 1    |
| -6.51 | 36.29       | -34.00     | 4, 1, 1    | -49.30      | -83.68     | 3, 1, 1    |
| -6.99 | 52.40       | -31.93     | 4, 1, 1    | -9.24       | -81.59     | 3, 1, 1    |
| -7.01 | 52.90       | -31.70     | 4, 1, 1    | -7.82       | -81.52     | 3, 1, 1    |
| -7.49 | 66.93       | -25.47     | 4, 1, 1    | 30.15       | -75.27     | 3, 1, 1    |
| -7.51 | 67.28       | -25.10     | 4, 1, 1    | 31.50       | -75.05     | 3, 1, 1    |
| -7.99 | 77.16       | -14.72     | 4, 1, 1    | 65.31       | -64.63     | 3, 1, 1    |

| y<br>[m] | Mz1<br>[kNm/m] | Mz1 max       |            |       | Mz1<br>[kNm/m] | Mz1 min       |            |  |
|----------|----------------|---------------|------------|-------|----------------|---------------|------------|--|
|          |                | Vx1<br>[kN/m] | Et,GWS,EWK |       |                | Vx1<br>[kN/m] | Et,GWS,EWK |  |
| -8.01    | 77.29          | -14.20        | 4, 1, 1    | 66.50 | -64.26         | 3, 1, 1       | 1          |  |
| -8.49    | 94.06          | -49.67        | 3, 1, 1    | 80.93 | 0.34           | 4, 1, 1       | 1          |  |
| -8.51    | 95.04          | -49.16        | 3, 1, 1    | 80.77 | 1.00           | 4, 1, 1       | 1          |  |
| -8.99    | 114.26         | -30.40        | 3, 1, 1    | 76.10 | 19.70          | 4, 1, 1       | 1          |  |
| -9.01    | 114.94         | -29.74        | 3, 1, 1    | 75.57 | 20.51          | 4, 1, 1       | 1          |  |
| -9.49    | 123.74         | -6.82         | 3, 1, 1    | 60.52 | 43.36          | 4, 1, 1       | 1          |  |
| -9.51    | 124.06         | -6.01         | 3, 1, 1    | 59.74 | 44.25          | 4, 1, 1       | 1          |  |
| -9.57    | <b>124.31</b>  | -3.03         | 3, 1, 1    | 57.16 | 47.23          | 4, 1, 1       | 1          |  |
| -10.07   | 117.92         | 29.30         | 3, 1, 1    | 25.63 | 79.62          | 4, 1, 1       | 1          |  |
| -10.35   | 104.46         | 50.17         | 3, 1, 1    | 0.08  | 99.99          | 4, 1, 1       | 1          |  |
| -10.57   | 94.29          | 65.95         | 3, 1, 1    | 94.29 | 65.95          | 3, 1, 1       | 1          |  |
| -11.07   | 51.26          | 106.91        | 3, 1, 1    | 51.26 | 106.91         | 3, 1, 1       | 1          |  |
| -11.48   | 0.21           | 143.56        | 3, 1, 1    | 0.21  | 143.56         | 3, 1, 1       | 1          |  |

Et,GWS,EWK : Etappe, Grenzwertspezifikation, Einwirkungskombination  
GWS 1 = !Globale Sicherheit

**Deformationen**

| y<br>[m] | Dx<br>[mm]  | Dx max     |        |         | Dx<br>[mm] | Dx min     |   |  |
|----------|-------------|------------|--------|---------|------------|------------|---|--|
|          |             | Et,GWS,EWK |        |         |            | Et,GWS,EWK |   |  |
| 0.14     | <b>0.70</b> | 3, 1, 1    | -10.86 | 4, 1, 1 | 1          | 1          | 1 |  |
| -0.11    | -0.05       | 3, 1, 1    | -10.49 | 4, 1, 1 | 1          | 1          | 1 |  |
| -0.11    | -0.05       | 3, 1, 1    | -10.49 | 4, 1, 1 | 1          | 1          | 1 |  |
| -0.36    | -0.04       | 2, 1, 1    | -10.12 | 4, 1, 1 | 1          | 1          | 1 |  |
| -0.36    | -0.04       | 2, 1, 1    | -10.12 | 4, 1, 1 | 1          | 1          | 1 |  |
| -0.36    | -0.04       | 2, 1, 1    | -10.12 | 4, 1, 1 | 1          | 1          | 1 |  |
| -0.36    | -0.04       | 2, 1, 1    | -10.12 | 4, 1, 1 | 1          | 1          | 1 |  |
| -0.36    | -0.04       | 2, 1, 1    | -10.12 | 4, 1, 1 | 1          | 1          | 1 |  |
| -0.86    | -0.03       | 2, 1, 1    | -9.39  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.00    | -0.03       | 2, 1, 1    | -9.18  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.00    | -0.03       | 2, 1, 1    | -9.18  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.00    | -0.03       | 2, 1, 1    | -9.18  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.00    | -0.03       | 2, 1, 1    | -9.18  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.00    | -0.03       | 2, 1, 1    | -9.18  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.20    | -0.02       | 2, 1, 1    | -8.89  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.20    | -0.02       | 2, 1, 1    | -8.89  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.50    | -0.01       | 2, 1, 1    | -8.45  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.55    | -0.01       | 2, 1, 1    | -8.38  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.55    | -0.01       | 2, 1, 1    | -8.38  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.55    | -0.01       | 2, 1, 1    | -8.38  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.55    | -0.01       | 2, 1, 1    | -8.38  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.55    | -0.01       | 2, 1, 1    | -8.38  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.60    | -0.01       | 2, 1, 1    | -8.30  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.60    | -0.01       | 2, 1, 1    | -8.30  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.85    | -0.01       | 2, 1, 1    | -7.94  | 4, 1, 1 | 1          | 1          | 1 |  |
| -1.85    | -0.01       | 2, 1, 1    | -7.94  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.05    | -0.00       | 2, 1, 1    | -7.65  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.10    | -0.00       | 2, 1, 1    | -7.58  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.35    | -0.00       | 2, 1, 1    | -7.23  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.55    | -0.00       | 2, 1, 1    | -6.95  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.60    | -0.00       | 2, 1, 1    | -6.88  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.74    | 0.00        | 2, 1, 1    | -6.69  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.79    | -0.00       | 1, 1, 1    | -6.62  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.79    | -0.00       | 1, 1, 1    | -6.62  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.79    | -0.00       | 1, 1, 1    | -6.62  | 4, 1, 1 | 1          | 1          | 1 |  |
| -2.79    | -0.00       | 1, 1, 1    | -6.62  | 4, 1, 1 | 1          | 1          | 1 |  |
| -3.19    | -0.00       | 1, 1, 1    | -7.10  | 3, 1, 1 | 1          | 1          | 1 |  |
| -3.19    | -0.00       | 1, 1, 1    | -7.10  | 3, 1, 1 | 1          | 1          | 1 |  |
| -3.19    | -0.00       | 1, 1, 1    | -7.10  | 3, 1, 1 | 1          | 1          | 1 |  |
| -3.29    | -0.00       | 1, 1, 1    | -7.19  | 3, 1, 1 | 1          | 1          | 1 |  |
| -3.39    | -0.00       | 1, 1, 1    | -7.27  | 3, 1, 1 | 1          | 1          | 1 |  |
| -3.39    | -0.00       | 1, 1, 1    | -7.27  | 3, 1, 1 | 1          | 1          | 1 |  |
| -3.39    | -0.00       | 1, 1, 1    | -7.27  | 3, 1, 1 | 1          | 1          | 1 |  |
| -3.52    | 0.00        | 1, 1, 1    | -7.33  | 3, 1, 1 | 1          | 1          | 1 |  |
| -3.89    | -5.26       | 4, 1, 1    | -7.50  | 3, 1, 1 | 1          | 1          | 1 |  |
| -4.39    | -4.65       | 4, 1, 1    | -7.46  | 3, 1, 1 | 1          | 1          | 1 |  |
| -4.89    | -4.03       | 4, 1, 1    | -7.18  | 3, 1, 1 | 1          | 1          | 1 |  |
| -5.39    | -3.41       | 4, 1, 1    | -6.70  | 3, 1, 1 | 1          | 1          | 1 |  |
| -5.89    | -2.81       | 4, 1, 1    | -6.06  | 3, 1, 1 | 1          | 1          | 1 |  |
| -6.39    | -2.22       | 4, 1, 1    | -5.29  | 3, 1, 1 | 1          | 1          | 1 |  |
| -6.49    | -2.10       | 4, 1, 1    | -5.12  | 3, 1, 1 | 1          | 1          | 1 |  |
| -6.49    | -2.10       | 4, 1, 1    | -5.12  | 3, 1, 1 | 1          | 1          | 1 |  |
| -6.51    | -2.08       | 4, 1, 1    | -5.09  | 3, 1, 1 | 1          | 1          | 1 |  |
| -6.51    | -2.08       | 4, 1, 1    | -5.09  | 3, 1, 1 | 1          | 1          | 1 |  |
| -6.99    | -1.56       | 4, 1, 1    | -4.26  | 3, 1, 1 | 1          | 1          | 1 |  |
| -7.01    | -1.55       | 4, 1, 1    | -4.24  | 3, 1, 1 | 1          | 1          | 1 |  |

Nr.:

| y<br>[m] | Dx<br>[mm] | Dx max     |  |  | Dx min     |         |  |
|----------|------------|------------|--|--|------------|---------|--|
|          |            | Et,GWS,EWK |  |  | Et,GWS,EWK |         |  |
| -7.49    | -1.09      | 4, 1, 1    |  |  | -3.41      | 3, 1, 1 |  |
| -7.51    | -1.08      | 4, 1, 1    |  |  | -3.38      | 3, 1, 1 |  |
| -7.99    | -0.70      | 4, 1, 1    |  |  | -2.58      | 3, 1, 1 |  |
| -8.01    | -0.69      | 4, 1, 1    |  |  | -2.55      | 3, 1, 1 |  |
| -8.49    | -0.39      | 4, 1, 1    |  |  | -1.82      | 3, 1, 1 |  |
| -8.51    | -0.38      | 4, 1, 1    |  |  | -1.79      | 3, 1, 1 |  |
| -8.99    | -0.17      | 4, 1, 1    |  |  | -1.16      | 3, 1, 1 |  |
| -9.01    | -0.17      | 4, 1, 1    |  |  | -1.14      | 3, 1, 1 |  |
| -9.49    | -0.04      | 4, 1, 1    |  |  | -0.65      | 3, 1, 1 |  |
| -9.51    | -0.04      | 4, 1, 1    |  |  | -0.63      | 3, 1, 1 |  |
| -9.57    | -0.03      | 4, 1, 1    |  |  | -0.59      | 3, 1, 1 |  |
| -9.57    | -0.03      | 4, 1, 1    |  |  | -0.59      | 3, 1, 1 |  |
| -9.57    | -0.03      | 4, 1, 1    |  |  | -0.59      | 3, 1, 1 |  |
| -10.07   | -0.00      | 4, 1, 1    |  |  | -0.27      | 3, 1, 1 |  |
| -10.35   | 0.00       | 4, 1, 1    |  |  | -0.17      | 3, 1, 1 |  |
| -10.57   | -0.09      | 3, 1, 1    |  |  | -0.09      | 3, 1, 1 |  |
| -11.07   | -0.01      | 3, 1, 1    |  |  | -0.01      | 3, 1, 1 |  |
| -11.48   | 0.00       | 3, 1, 1    |  |  | 0.00       | 3, 1, 1 |  |

Dx : Verschiebungen  
 Et,GWS,EWK : Etappe, Grenzwertspezifikation, Einwirkungskombination  
 GWS 1 = !Globale Sicherheit





## 6. Tragkonzept Rampe Nord

Die Personenunterführung wirkt als Winkelstützwand mit einer minimalen Wandstärke von 30cm. Die Wandstärke ist konstruktiv gewählt und ist statisch ausreichend dimensioniert.

## 7. Hydraulischer Grundbruch Bohrpfehlwand

$$S = \frac{ik}{l} = \frac{f' / f_{\text{W}}}{\Delta H / s} = \frac{1}{2.50 / 23} = \underline{\underline{6.5}}$$

$$\Delta H = 414.50 - 411.00 = 3.50 \text{ m}$$

$$s = 1.0 \text{ m} + 3.2 \text{ m} + 5.0 \text{ m} + 10.0 \text{ m} \approx 23 \text{ m}$$

Richtgröße für mittleres hydr. Gefälle

$$S = 6.5 > S_{\text{erf}} = 5.0 \quad \text{i.o.}$$

## 8. Spundwand Bereich Unterführung / Rampe

$$\underline{\underline{M_{\text{Ed}} = 635 \text{ kNm} > M_{\text{d}} = 302 \text{ kNm} \quad \text{Sicher!}}}$$

## 9. Longrine + Sperrung

HEB300 bzw. HEB240

$$\text{HEB300} \quad M_{\text{d}}^0 = 1.4 \times 105 \times 4.5^2 \times \frac{1}{8} = 372 \text{ kNm}$$

Wsg.

$$\underline{\underline{M_{\text{Ed}} = 418 \text{ kNm} > M_{\text{d}} = 372 \text{ kNm}}}$$

HEB240

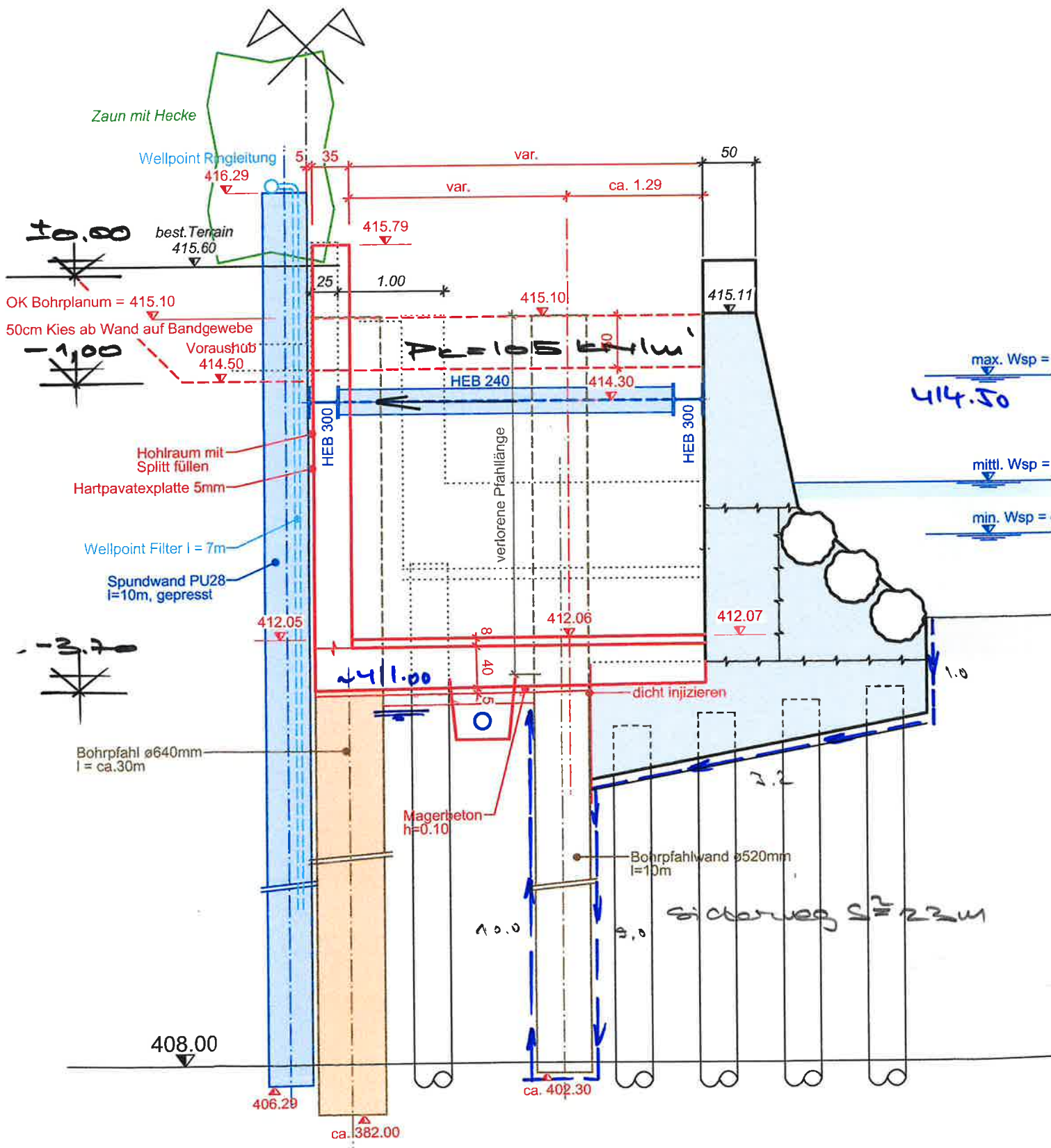
Sperrung

lx=3.5m

$$N_{\text{d}} = 4.5 \text{ m} \times 1.4 \times 105 = 660 \text{ kN}$$

$$\underline{\underline{N_{\text{Ed}} = 2430 \text{ kN} \gg N_{\text{d}} = 660 \text{ kN}}}$$

# Schnitt C-C 1:50



Zaun mit Hecke

Wellpoint Ringleitung

416.29

best. Terrain  
415.60

OK Bohrplanum = 415.10

50cm Kies ab Wand auf Bandgewebe

Voraushub  
414.50

Hohraum mit  
Splitt füllen

Hartpavateplatte 5mm

Wellpoint Filter l = 7m

Spundwand PU28  
l=10m, gepresst

Bohrpfahl ø640mm  
l = ca.30m

408.00

406.29

ca. 382.00

10.0

3.0

Magerbeton  
h=0.10

Bohrpfahlwand ø520mm  
l=10m

Sicherweg S=22m

dicht injizieren

verlorene Pfahlänge

HEB 240

HEB 300

415.10

415.11

1.00

415.79

5

35

25

var.

var.

ca. 1.29

50

max. Wsp =

414.50

mittl. Wsp =

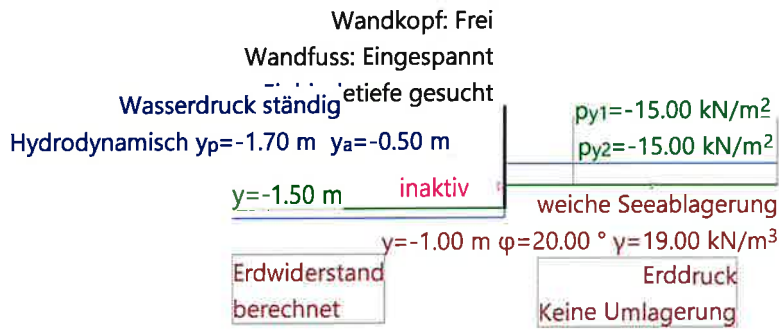
min. Wsp =

1.0

2.2

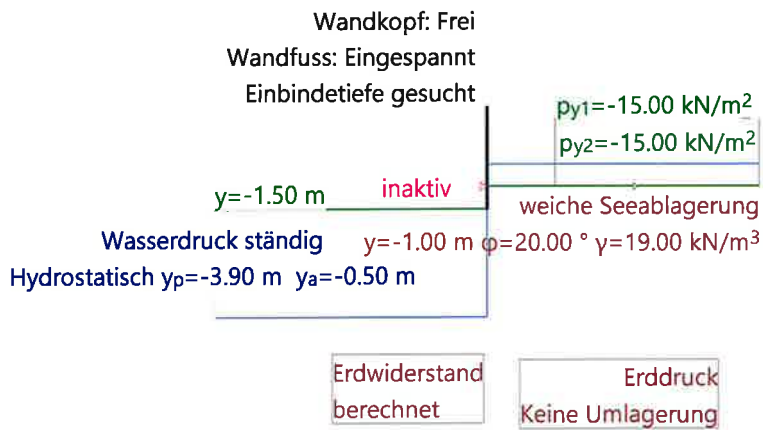
Belastung q: Nutzlast, Etappe 1: 1. Etappe -1.5

Mstb. 1 :167.9



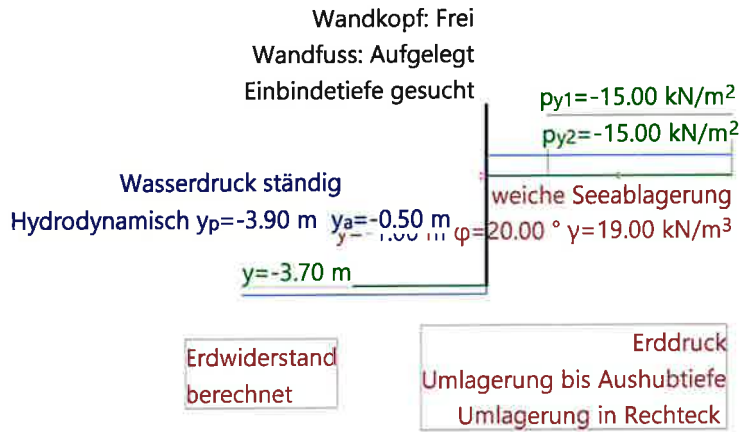
Belastung q: Nutzlast, Etappe 2: Absenkung Wasserspiegel -3.9

Mstb. 1 :167.9



Belastung q: Nutzlast, Etappe 3: Endzustand

Mstb. 1 :186.6



**Numerische Resultate aller EWK****Wandlänge**

| Etappe | GWS | EWK | y<br>[m] | t<br>[m] | Sohle<br>[m] | Bemerkungen |
|--------|-----|-----|----------|----------|--------------|-------------|
| 1      | 1   | 1   | -6.69    | 5.19     | -1.50        |             |
| 2      | 1   | 1   | -5.21    | 3.71     | -1.50        |             |
| 3      | 1   | 1   | -10.29   | 6.59     | -3.70        |             |

GWS : Grenzwertspezifikation  
 EWK : Einwirkungskombination  
 y : Kote UK Wand  
 t : Einbindetiefe  
 Sohle : Kote Baugrubensohle

**Abstützkräfte (geneigt)**

| Etappe | GWS | EWK | P <sub>1</sub><br>[kN/m] |  |
|--------|-----|-----|--------------------------|--|
| 1      | 1   | 1   | inaktiv                  |  |
| 2      | 1   | 1   | inaktiv                  |  |
| 3      | 1   | 1   | 104.33                   |  |

GWS : Grenzwertspezifikation  
 EWK : Einwirkungskombination  
 P<sub>1</sub> : Kraft auf Abstützung auf Kote = -1.00

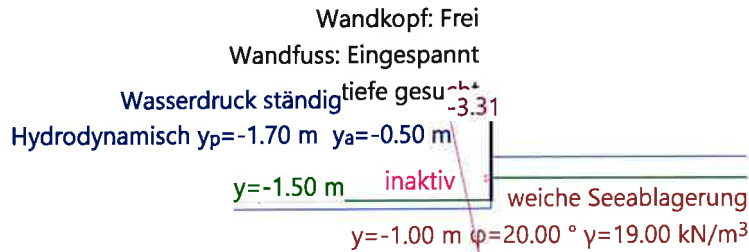
**Etappen**

| Etappe | Titel                        | Sohle<br>[m] |  |
|--------|------------------------------|--------------|--|
| 1      | 1. Etappe -1.5               | -1.50        |  |
| 2      | Absenkung Wasserspiegel -3.9 | -1.50        |  |
| 3      | Endzustand                   | -3.70        |  |

Sohle : Kote Baugrubensohle

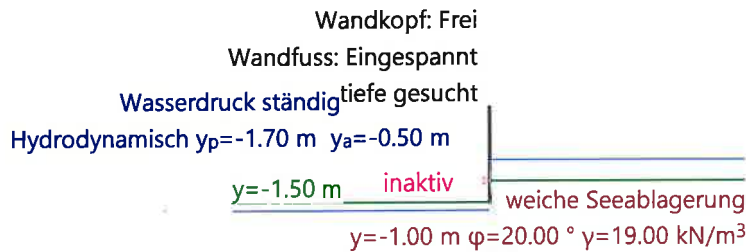
1. Etappe -1.5, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :178.2



1. Etappe -1.5, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
1. Etappe -1.5, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

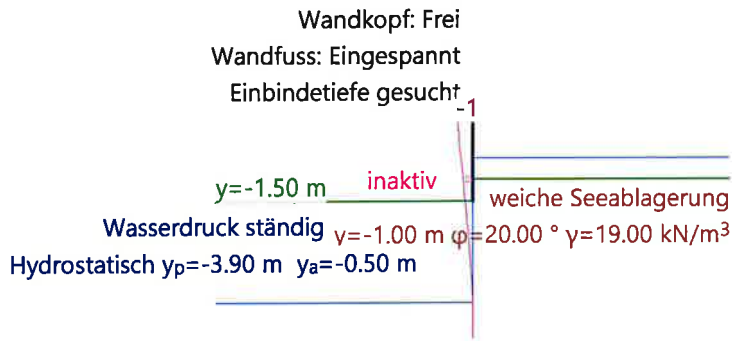
Mstb. 1 :178.2



49,86

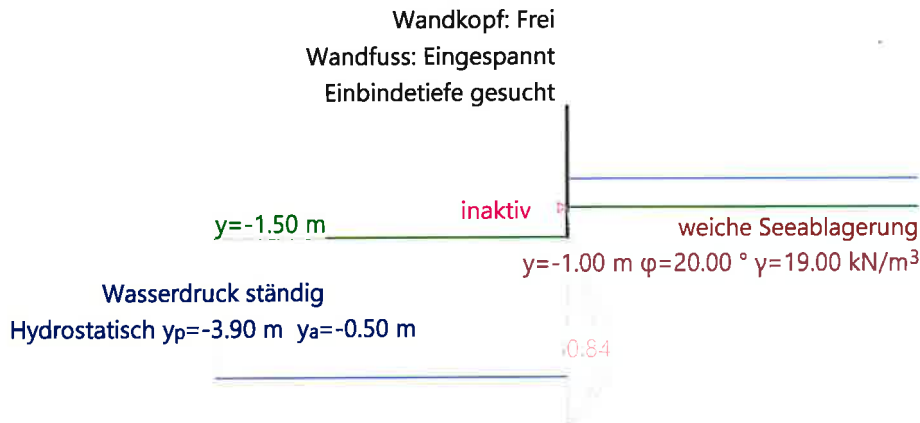
Absenkung Wasserspiegel -3.9, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :178.2



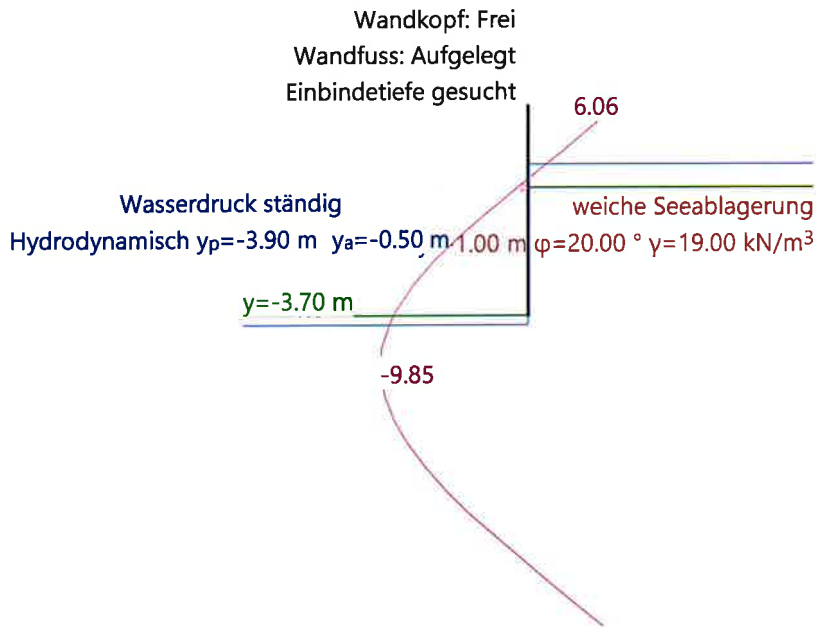
Absenkung Wasserspiegel -3.9, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
Absenkung Wasserspiegel -3.9, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

Mstb. 1 :129.9



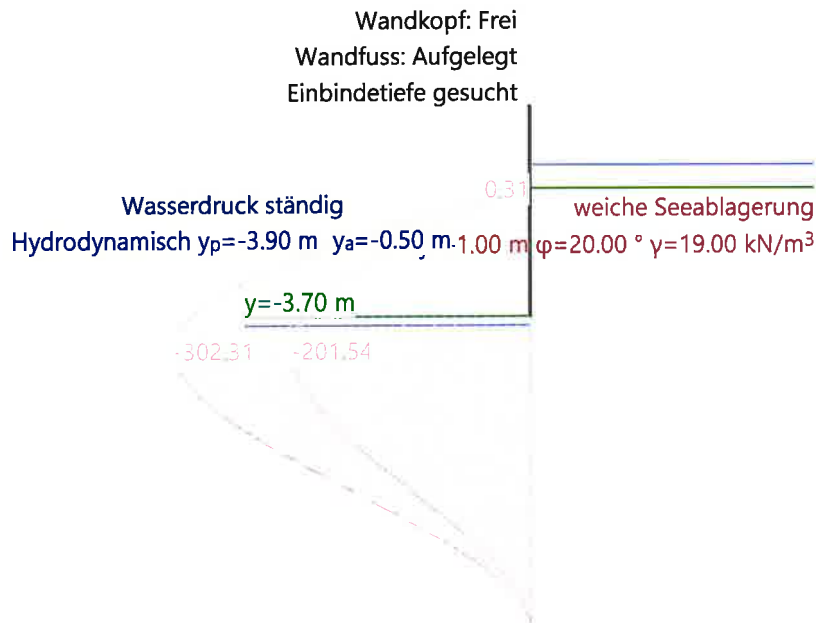
Endzustand, !Globale Sicherheit, EWK 1: horizontale Deformation [mm]

Mstb. 1 :160.4



Endzustand, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]  
Endzustand, !Globale Sicherheit, EWK 1: Biegemoment [kNm/m]

Mstb. 1 :160.4



$M_{201} = 635 \text{ kNm} > M_d = 302 \text{ kNm}$



**Grenzwerte**

**Wandlänge**

| Etappe | y [m]  | t [m] | Sohle [m] | Werte aus                            |
|--------|--------|-------|-----------|--------------------------------------|
| 1      | -6.69  | 5.19  | -1.50     | Etappe 1, !Globale Sicherheit, EWK 1 |
| 2      | -6.69  | 5.19  | -1.50     | Etappe 1, !Globale Sicherheit, EWK 1 |
| 3      | -10.29 | 6.59  | -3.70     | Etappe 3, !Globale Sicherheit, EWK 1 |

y : Kote UK Wand  
t : Einbindetiefe  
Sohle : Kote Baugrubensohle

**Hydraulischer Grundbruch**

| Etappe | F vorh [-] | F erf [-] | y [m]  | t [m] | Werte aus  |
|--------|------------|-----------|--------|-------|--|
| 1      | 4.54       | 1.00      | -6.69  | 5.19  | Etappe 1, !Globale Sicherheit, EWK 1             |
| 2      | -          | -         | -      | -     | Berechnung nicht erforderlich oder nicht möglich |
| 3      | 2.28       | 1.00      | -10.29 | 6.59  | Etappe 3, !Globale Sicherheit, EWK 1             |

F vorh : vorhandene Sicherheit hydraulischer Grundbruch  
F erf : erforderliche Sicherheit hydraulischer Grundbruch  
y : zu 'F vorh' zugehörige Kote UK Wand  
t : zu 'F vorh' zugehörige Einbindetiefe

**Abstützungen**

| y [m] | P max    |           | Et,GWS,EWK |
|-------|----------|-----------|------------|
|       | P [kN/m] | Px [kN/m] |            |
| -1.00 | 104.33   | 104.33    | 3, 1, 1    |

Px : horizontale Komponente der Abstützungskraft P  
Et,GWS,EWK : Etappe, Grenzwertspezifikation, Einwirkungskombination  
GWS 1 = !Globale Sicherheit

**Biegemomente mit zugehörigen Schnittkräften**

| y [m] | Mz1 max      |            |            | Mz1 min        |            |            |
|-------|--------------|------------|------------|----------------|------------|------------|
|       | Mz1 [kNm/m]  | Vx1 [kN/m] | Et,GWS,EWK | Mz1 [kNm/m]    | Vx1 [kN/m] | Et,GWS,EWK |
| 0.75  | -0.00        | 0.00       | 1, 1, 1    | -0.00          | -0.00      | 2, 1, 1    |
| 0.25  | -0.00        | -0.00      | 3, 1, 1    | -0.00          | 0.00       | 1, 1, 1    |
| -0.25 | -0.00        | -0.00      | 3, 1, 1    | -0.00          | 0.00       | 1, 1, 1    |
| -0.50 | 0.00         | -0.00      | 3, 1, 1    | -0.00          | 0.00       | 1, 1, 1    |
| -1.00 | 0.31         | -1.87      | 1, 1, 1    | 0.31           | -1.87      | 2, 1, 1    |
| -1.00 | 0.31         | -1.88      | 1, 1, 1    | 0.31           | 154.62     | 3, 1, 1    |
| -1.50 | 2.62         | -8.22      | 2, 1, 1    | -74.25         | 143.14     | 3, 1, 1    |
| -1.55 | 3.02         | -9.01      | 2, 1, 1    | -80.80         | 141.94     | 3, 1, 1    |
| -1.70 | 5.15         | -11.63     | 2, 1, 1    | -101.28        | 136.25     | 3, 1, 1    |
| -2.05 | 10.22        | -17.25     | 1, 1, 1    | -147.27        | 123.46     | 3, 1, 1    |
| -2.20 | 12.82        | -18.27     | 2, 1, 1    | -164.68        | 116.86     | 3, 1, 1    |
| -2.39 | 16.81        | -20.68     | 1, 1, 1    | -186.30        | 108.67     | 3, 1, 1    |
| -2.55 | 20.12        | -21.62     | 1, 1, 1    | -203.77        | 102.04     | 3, 1, 1    |
| -2.70 | 23.41        | -22.55     | 1, 1, 1    | -217.65        | 94.54      | 3, 1, 1    |
| -2.80 | 25.66        | -22.63     | 1, 1, 1    | -226.61        | 89.70      | 3, 1, 1    |
| -2.89 | 27.67        | -22.24     | 1, 1, 1    | -234.89        | 85.22      | 3, 1, 1    |
| -3.05 | 31.06        | -21.57     | 1, 1, 1    | -248.83        | 77.69      | 3, 1, 1    |
| -3.30 | 36.62        | -20.47     | 1, 1, 1    | -265.12        | 63.86      | 3, 1, 1    |
| -3.39 | 38.23        | -19.27     | 1, 1, 1    | -271.03        | 58.84      | 3, 1, 1    |
| -3.55 | 40.95        | -17.26     | 1, 1, 1    | -280.98        | 50.40      | 3, 1, 1    |
| -3.70 | 43.66        | -15.26     | 1, 1, 1    | -288.05        | 41.40      | 3, 1, 1    |
| -3.80 | 45.41        | -13.96     | 1, 1, 1    | -291.53        | 35.14      | 3, 1, 1    |
| -3.89 | 46.22        | -11.97     | 1, 1, 1    | -294.75        | 29.35      | 3, 1, 1    |
| -3.90 | 46.30        | -11.78     | 1, 1, 1    | -295.05        | 28.80      | 3, 1, 1    |
| -4.30 | <b>49.86</b> | -3.12      | 1, 1, 1    | -300.85        | 6.55       | 3, 1, 1    |
| -4.40 | 49.45        | -0.07      | 1, 1, 1    | <b>-302.31</b> | 0.94       | 3, 1, 1    |
| -4.74 | 48.06        | 10.20      | 1, 1, 1    | -298.52        | -15.02     | 3, 1, 1    |
| -4.80 | 47.81        | 12.05      | 1, 1, 1    | -297.83        | -17.89     | 3, 1, 1    |
| -4.90 | 45.65        | 15.97      | 1, 1, 1    | -296.70        | -22.64     | 3, 1, 1    |
| -5.30 | 37.09        | 31.56      | 1, 1, 1    | -283.66        | -38.06     | 3, 1, 1    |
| -5.40 | 32.75        | 36.36      | 1, 1, 1    | -280.38        | -41.95     | 3, 1, 1    |
| -5.80 | 15.53        | 55.40      | 1, 1, 1    | -260.48        | -53.95     | 3, 1, 1    |
| -5.90 | 9.31         | 60.85      | 1, 1, 1    | -255.47        | -56.98     | 3, 1, 1    |
| -6.04 | 0.75         | 68.34      | 1, 1, 1    | -246.78        | -59.96     | 3, 1, 1    |
| -6.40 | -224.11      | -67.74     | 3, 1, 1    | -224.11        | -67.74     | 3, 1, 1    |
| -6.90 | -188.45      | -74.22     | 3, 1, 1    | -188.45        | -74.22     | 3, 1, 1    |
| -7.40 | -150.60      | -76.43     | 3, 1, 1    | -150.60        | -76.43     | 3, 1, 1    |
| -7.41 | -149.95      | -76.43     | 3, 1, 1    | -149.95        | -76.43     | 3, 1, 1    |
| -7.91 | -112.09      | -74.30     | 3, 1, 1    | -112.09        | -74.30     | 3, 1, 1    |

| y<br>[m] | Mz1 max        |               |            | Mz1 min        |               |            |
|----------|----------------|---------------|------------|----------------|---------------|------------|
|          | Mz1<br>[kNm/m] | Vx1<br>[kN/m] | Et,GWS,EWK | Mz1<br>[kNm/m] | Vx1<br>[kN/m] | Et,GWS,EWK |
| -8.41    | -76.36         | -67.88        | 3, 1, 1    | -76.36         | -67.88        | 3, 1, 1    |
| -8.91    | -44.92         | -57.20        | 3, 1, 1    | -44.92         | -57.20        | 3, 1, 1    |
| -8.97    | -41.24         | -55.49        | 3, 1, 1    | -41.24         | -55.49        | 3, 1, 1    |
| -8.97    | -41.24         | -55.38        | 3, 1, 1    | -41.24         | -55.38        | 3, 1, 1    |
| -9.47    | -17.25         | -39.86        | 3, 1, 1    | -17.25         | -39.86        | 3, 1, 1    |
| -9.57    | -13.62         | -36.42        | 3, 1, 1    | -13.62         | -36.42        | 3, 1, 1    |
| -10.07   | -1.33          | -12.03        | 3, 1, 1    | -1.33          | -12.03        | 3, 1, 1    |
| -10.29   | 0.00           | 0.00          | 3, 1, 1    | 0.00           | 0.00          | 3, 1, 1    |

Et,GWS,EWK : Etappe, Grenzwertspezifikation, Einwirkungskombination  
GWS 1 = !Globale Sicherheit

## Deformationen

| y<br>[m] | Dx<br>[mm] | Dx max     |  | Dx min     |         |
|----------|------------|------------|--|------------|---------|
|          |            | Et,GWS,EWK |  | Et,GWS,EWK |         |
| 0.75     | 6.06       | 3, 1, 1    |  | -3.31      | 1, 1, 1 |
| 0.25     | 4.12       | 3, 1, 1    |  | -2.97      | 1, 1, 1 |
| -0.25    | 2.19       | 3, 1, 1    |  | -2.63      | 1, 1, 1 |
| -0.50    | 1.22       | 3, 1, 1    |  | -2.45      | 1, 1, 1 |
| -0.50    | 1.22       | 3, 1, 1    |  | -2.45      | 1, 1, 1 |
| -0.50    | 1.22       | 3, 1, 1    |  | -2.45      | 1, 1, 1 |
| -0.50    | 1.22       | 3, 1, 1    |  | -2.45      | 1, 1, 1 |
| -1.00    | -0.72      | 3, 1, 1    |  | -2.11      | 1, 1, 1 |
| -1.00    | -0.72      | 3, 1, 1    |  | -2.11      | 1, 1, 1 |
| -1.00    | -0.72      | 3, 1, 1    |  | -2.11      | 1, 1, 1 |
| -1.00    | -0.72      | 3, 1, 1    |  | -2.11      | 1, 1, 1 |
| -1.50    | -0.57      | 2, 1, 1    |  | -2.65      | 3, 1, 1 |
| -1.50    | -0.57      | 2, 1, 1    |  | -2.65      | 3, 1, 1 |
| -1.50    | -0.57      | 2, 1, 1    |  | -2.65      | 3, 1, 1 |
| -1.55    | -0.55      | 2, 1, 1    |  | -2.82      | 3, 1, 1 |
| -1.55    | -0.55      | 2, 1, 1    |  | -2.82      | 3, 1, 1 |
| -1.55    | -0.55      | 2, 1, 1    |  | -2.82      | 3, 1, 1 |
| -1.70    | -0.50      | 2, 1, 1    |  | -3.38      | 3, 1, 1 |
| -1.70    | -0.50      | 2, 1, 1    |  | -3.38      | 3, 1, 1 |
| -2.05    | -0.40      | 2, 1, 1    |  | -4.63      | 3, 1, 1 |
| -2.20    | -0.35      | 2, 1, 1    |  | -5.14      | 3, 1, 1 |
| -2.39    | -0.30      | 2, 1, 1    |  | -5.76      | 3, 1, 1 |
| -2.39    | -0.30      | 2, 1, 1    |  | -5.76      | 3, 1, 1 |
| -2.55    | -0.26      | 2, 1, 1    |  | -6.27      | 3, 1, 1 |
| -2.70    | -0.22      | 2, 1, 1    |  | -6.69      | 3, 1, 1 |
| -2.80    | -0.20      | 2, 1, 1    |  | -6.97      | 3, 1, 1 |
| -2.80    | -0.20      | 2, 1, 1    |  | -6.97      | 3, 1, 1 |
| -2.89    | -0.18      | 2, 1, 1    |  | -7.23      | 3, 1, 1 |
| -3.05    | -0.15      | 2, 1, 1    |  | -7.66      | 3, 1, 1 |
| -3.30    | -0.10      | 2, 1, 1    |  | -8.21      | 3, 1, 1 |
| -3.39    | -0.08      | 2, 1, 1    |  | -8.41      | 3, 1, 1 |
| -3.55    | -0.06      | 2, 1, 1    |  | -8.75      | 3, 1, 1 |
| -3.70    | -0.05      | 2, 1, 1    |  | -9.02      | 3, 1, 1 |
| -3.70    | -0.05      | 2, 1, 1    |  | -9.02      | 3, 1, 1 |
| -3.80    | -0.03      | 2, 1, 1    |  | -9.16      | 3, 1, 1 |
| -3.89    | -0.02      | 2, 1, 1    |  | -9.30      | 3, 1, 1 |
| -3.90    | -0.02      | 2, 1, 1    |  | -9.31      | 3, 1, 1 |
| -3.90    | -0.02      | 2, 1, 1    |  | -9.31      | 3, 1, 1 |
| -3.90    | -0.02      | 2, 1, 1    |  | -9.31      | 3, 1, 1 |
| -4.30    | -0.01      | 2, 1, 1    |  | -9.68      | 3, 1, 1 |
| -4.40    | -0.00      | 2, 1, 1    |  | -9.77      | 3, 1, 1 |
| -4.74    | 0.00       | 2, 1, 1    |  | -9.83      | 3, 1, 1 |
| -4.80    | -0.12      | 1, 1, 1    |  | -9.84      | 3, 1, 1 |
| -4.90    | -0.11      | 1, 1, 1    |  | -9.85      | 3, 1, 1 |
| -5.30    | -0.04      | 1, 1, 1    |  | -9.63      | 3, 1, 1 |
| -5.40    | -0.03      | 1, 1, 1    |  | -9.58      | 3, 1, 1 |
| -5.80    | -0.00      | 1, 1, 1    |  | -9.10      | 3, 1, 1 |
| -5.90    | -0.00      | 1, 1, 1    |  | -8.98      | 3, 1, 1 |
| -6.04    | 0.00       | 1, 1, 1    |  | -8.73      | 3, 1, 1 |
| -6.40    | -8.08      | 3, 1, 1    |  | -8.08      | 3, 1, 1 |
| -6.90    | -6.91      | 3, 1, 1    |  | -6.91      | 3, 1, 1 |
| -7.40    | -5.49      | 3, 1, 1    |  | -5.49      | 3, 1, 1 |
| -7.41    | -5.47      | 3, 1, 1    |  | -5.47      | 3, 1, 1 |
| -7.41    | -5.47      | 3, 1, 1    |  | -5.47      | 3, 1, 1 |
| -7.91    | -3.85      | 3, 1, 1    |  | -3.85      | 3, 1, 1 |
| -8.41    | -2.10      | 3, 1, 1    |  | -2.10      | 3, 1, 1 |
| -8.91    | -0.25      | 3, 1, 1    |  | -0.25      | 3, 1, 1 |
| -8.97    | -0.00      | 3, 1, 1    |  | -0.00      | 3, 1, 1 |
| -8.97    | -0.00      | 3, 1, 1    |  | -0.00      | 3, 1, 1 |
| -9.47    | 1.91       | 3, 1, 1    |  | 1.91       | 3, 1, 1 |

Nr.:

| y<br>[m] | Dx<br>[mm] | Dx max<br>Et,GWS,EWK | Dx<br>[mm] | Dx min<br>Et,GWS,EWK |
|----------|------------|----------------------|------------|----------------------|
| -9.57    | 2.28       | 3, 1, 1              | 2.28       | 3, 1, 1              |
| -9.57    | 2.28       | 3, 1, 1              | 2.28       | 3, 1, 1              |
| -10.07   | 4.21       | 3, 1, 1              | 4.21       | 3, 1, 1              |
| -10.29   | 5.06       | 3, 1, 1              | 5.06       | 3, 1, 1              |

Dx : Verschiebungen  
 Et,GWS,EWK : Etappe, Grenzwertspezifikation, Einwirkungskombination  
 GWS 1 = !Globale Sicherheit