

|                                |                              |
|--------------------------------|------------------------------|
| elektronski potpis projektanta | elektronski potpis revidenta |
|--------------------------------|------------------------------|

INVESTITOR: **SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I  
INVESTICIJU OPŠTINE BAR**

OBJEKAT: **Pješačka staza i taksi stajalište sa pratećom  
infrastrukturom na dijelu Ulice Jovana Tomaševića  
između raskrsnica sa Bulevarom revolucije i  
Ulicom Maršala Tita**

LOKACIJA: **Kat. parcele broj 5730 i 6458/1 KO Novi Bar**

VRSTA TEHNIČKE  
DOKUMENTACIJE: **GLAVNI PROJEKAT**

PROJEKTANT:



ODGOVORNO LICE: **dr Biljana Ivanović, dipl.inž.građ.**

GLAVNI INŽENJER: **dr Biljana Ivanović, dipl.inž.građ.**

|                                |                               |
|--------------------------------|-------------------------------|
| elektronski potpis projektanta | „elektronski potpis revidenta |
|--------------------------------|-------------------------------|

**10/24**

**Knjiga 3**

INVESTITOR: **SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I  
INVESTICIJU OPŠTINE BAR**

OBJEKAT: **Pješačka staza i taksi stajalište sa pratećom  
infrastrukturuom na dijelu Ulice Jovana Tomaševića  
između raskrsnica sa Bulevarom revolucije i  
Ulicom Maršala Tita**

LOKACIJA: **Kat. parcele broj 5730 i 6458/1 KO Novi Bar**

DIO TEHNIČKE  
DOKUMENTACIJE: **GLAVNI PROJEKAT POTPORNIH KONSTRUKCIJA**

PROJEKTANT: **GeoT d.o.o. Podgorica**  
Đoka Miraševića br.6

ODGOVORNO LICE: **Zvonko Tomanović, dipl.inž.građ.**

OVLAŠĆENI INŽENJER: **Dr Zvonko Tomanović, dipl.inž.građ.**  
Licenca br. UPI 107/7 – 1295/2 od 14.05.2018.

SARADNICI NA PROJEKTU: **Katarina Vučinić, spec.sci.građ.**

# **S A D R Ź A J   P R O J E K T A**

**KNJIGA 0            Opšta dokumentacija**

**KNJIGA PZ           Projektni zadatak**

## *DJELOVI PROJEKTA*

**KNJIGA 1           Građevinski projekat saobraćajnih površina**

**KNJIGA 2           Građevinski projekat hidrotehničkih instalacija**

**KNJIGA 3           Glavni projekat potpornih konstrukcija**

## *OSTALI DJELOVI PROJEKTA*

**KNJIGA 5           Glavni projekat saobraćajne signalizacije**

# **SADRŽAJ KNJIGE**

## **GRAĐEVINSKI PROJEKAT POTPORNIH ZIDOVA**

- 0.1 Naslovne strane – Obrasci 1 i 1a
- 0.2 Sadržaj predmetne knjige

### **1. TEKSTUALNA DOKUMENTACIJA**

- 1.1 Tehnički izvještaj
- 1.2 Predmjer radova
- 1.3 Predračun radova

### **2. NUMERIČKA DOKUMENTACIJA**

- 2.1 Statički proračun  
Proračun potpornog zida (*GEO5, Finesoftware*)
- 2.2 Dokaznica mjera
- 2.3 Specifikacija armature

### **3. GRAFIČKA DOKUMENTACIJA**

- |     |                                  |       |
|-----|----------------------------------|-------|
| 3.1 | Situacioni plan                  | 1:100 |
| 3.2 | Podužni profil – Zid 1           | 1:100 |
| 3.3 | Poprečni profili - Zid 1         | 1:100 |
| 3.4 | Podužni profil – Zid 2           | 1:100 |
| 3.5 | Poprečni profili - Zid 2         | 1:100 |
| 3.6 | Karakteristični poprečni presjek | 1:20  |
| 3.7 | Detalji                          |       |
| 3.8 | Plan oplata                      | 1:50  |
| 3.9 | Plan armature                    | 1:50  |

# **1. TEKSTUALNA DOKUMENTACIJA**

## **1.1      TEHNIČKI IZVJEŠTAJ**

### **- uz građevinski projekat potpornih zidova -**

#### **1.      UVOD**

Građevinski projekat potpornih zidova na parking

#### **OSVRT NA OSNOVE ZA PROJEKTOVANJE**

#### **2.      Geodetske podloge**

Geodetske podloge sadrže poprečne profile na svakih 5-10m.

Prije izvođenja radova treba obilježiti teren, prenijeti položaj zidova na teren i po potrebi izvršiti manje ispravke u cilju boljeg uklapanja u postojeće stanje. Izraditi profile na početku i kraju potpornog zida.

##### **a) Seizmogeološke odlike terena**

Prema karti seizmičke mikrorejonizacije ovog područja, ovaj dio terena pripada zoni  $a_{max}=0,32g$ .

#### **3.      OPIS KONSTRUKTIVNOG RJEŠENJA**

Zid je projektovan kao AB "L" poprečnog presjeka. Zid je vertikalni sa unutrašnje strane i pod nagibom sa spoljašnje strane približno pod nagibom 1:15.

U čitavoj zoni zahvata projektovan je potporni zid visine od 1.3, 1.7m i 2.20m. Zid je kampadiran, dužine kampada su od 1.5 do 4.0m.

**Karakteristike materijala;** Za zidove je projektovana marka betona C25/30 XC4, maksimalne veličine zrna agregata 32mm. Zidovi su armirani rebrastom armaturom B500B. Zaštitni sloj do armature je  $a=5.00cm$ .

**Barbarkane** su kružnog oblika prečnika 100mm. Postavljaju se dva reda barbarkana - prvi na visini od cca 50cm od gornje ivice temelja, a drugi red na 1.00m iznad prvog reda, u cik cak rasporedu na 2.00m rastojanja.

**Izvođenje;** Temelji i tijelo potporne konstrukcije – zida izvodi se u obostranoj oplati, u kampadama dužine 1.5m do 4.0m. Odmah nakon iskopa u temeljnoj jami treba izvesti sloj "mršavog" betona, (ne manje od C16/20 XC1) debljine 5-10cm, koji je podloga za formiranje armaturnih koševa.

Nasipe ispod saobraćajnice zbijati do modula stišljivosti  $M_{smin}=30MPa$ , a izvan saobraćajnice sa spoljne strane zida  $M_s=20MPa$ .

Oplata treba da bude glatka (blažujka ili sl.) i bez uočljivih spojeva i teksture. Sve vidljive ivice pojedinih kampada su "oborene" trougaono  $4.00cm \times 4.00cm$ , kako je prikazano u grafičkoj dokumentaciji (prilog 3.7).

#### **4. PRORAČUN POTPORNIH ZIDOVA**

Proračun potpornih konstrukcija je izvršen prema konceptu aktivnog zemljanog pritiska i dozvoljenog opterećenja na temeljno tlo, uz provjeru faktora sigurnosti na prevrtanje i klizanje prema EC 7 i EC 8.

Detalji proračuna su dati u dijelu 3.1. Statički proračun.

#### **5. OSVRT NA PREDMJER I PREDRAČUN RADOVA**

Predmjerom i predračunom radova su obuhvaćeni: iskopi za temeljne jame i nasipanje ispred i iza zidova, beton, armatura i barbakane. Ostale količine nasipa, su obuhvaćene kroz predmjer saobraćajnice.

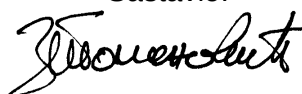
U cijenu betona zida uključeni su: beton temelja i tijela zida i podložni sloj ispod temelja zida.

#### **6. MJERE I RJEŠENJA ZA OBEZBJEĐENJE TRAJNOSTI**

Osnovna mjera za obezbjeđenje trajnosti objekta je primjena kvalitetnog materijala i odvođenje vode kao osnovnog uzroka oštećenja betonskih konstrukcija. Projektovana je marka betona C25/30 XC4 koja pored nosivosti, kroz adekvatnu količinu cementa, obezbjeđuje trajnost betona.

Podgorica,  
mart 2023.god.

Sastavio:



Dr Zvonko Tomanović, dipl.inž.građ.

Spisak osnovnih propisa, pravilnika i standarda koji su korišćeni pri projektovanju:

Zakon o planiranju prostora i izgradnji objekata  
("Sl.list Crne Gore", br. 64/17, 44/18, 63/18, 11/19 i 82/20)

Pravilnik o načinu izrade i sadržini tehničke dokumentacije za građenje objekata  
(Sl. list CG br. 44/18 i 43/19)

Pravilnik o načinu izrade i sadržini tehničke dokumentacije za složene inženjerske objekte  
(Sl. list CG br. 71/18)

MEST EN 1997-1:2017

Eurokod 7: Geotehničko projektovanje - Dio 1: Opšta pravila

MEST EN 1997-1:2017/NA:2017 - Nacionalni aneks

MEST EN 1998-5:2019

Eurokod 8: Projektovanje seizmički otpornih konstrukcija - Dio 5: Temelji, potporne konstrukcije i geotehnički aspekti

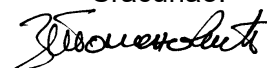
MEST EN 1998-5:2019/NA:2019 - Nacionalni aneks

## 1.2. PREDMJER RADOVA

| Redni broj                            | Opis pozicije                                                                                                                                               | Jed. mjere | Količina |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|
| <b>A. PRIPREMNI I ZEMLJANI RADOVI</b> |                                                                                                                                                             |            |          |
| 1                                     | Transport opreme i materijala, priprema i organizacija gradilišta i postavljanje potrebnih instalacija za izvođenje radova.                                 | paušalno   | 1.00     |
| 2                                     | Čišćenje terena, geodetsko snimanje i obilježavanje terena i izrada pristupnih puteva.                                                                      | paušalno   | 1.00     |
| 3                                     | Iskop za zidove u stijenskoj masi II i III kategorije sa odvozom na lokalnu deponiju do 5000m udaljenosti.                                                  | m3         | 534.22   |
| 4                                     | Rušenje postojećeg kanala i odvoz materijala na deponiju do 5000m.                                                                                          | m          | 6.80     |
| 5                                     | Izrada nasipa od šljunkovito-pjeskovitog materijala maksimalne veličine zrna 60mm. Nasip se zbija do modula stišljivosti $M_s=30\text{MPa}$ . (Nasip 2)     | m3         | 282.07   |
| 6                                     | Izrada nasipa od šljunkovito-pjeskovitog materijala maksimalne veličine zrna 200mm. Nasip se zbija do modula stišljivosti $M_s=20\text{MPa}$ . (Nasip 1)    | m3         | 96.63    |
| <b>B. BETONSKI RADOVI</b>             |                                                                                                                                                             |            |          |
| 7                                     | Podložni sloj C16/20 XC1, $d=10\text{cm}$ ispod temelja potpornog zida. Radovi obuhvataju proizvodnju, transport i ugradnju betona C16/20 XC1.              | m3         | 21.20    |
| 8                                     | AB temelj potpornog zida C25/30 XC4. Radovi obuhvataju proizvodnju, transport i ugradnju betona C25/30 XC4, u obostranoj oplati.                            | m3         | 92.15    |
| 9                                     | AB tijelo potpornog zida C25/30 XC4. Radovi obuhvataju proizvodnju, transport i ugradnju betona C25/30 XC4, u obostranoj oplati.                            | m3         | 60.98    |
| 10                                    | Izrada dijela kanala koji se rekonstruiše. Radovi obuhvataju proizvodnju, transport i ugradnju betona C37/40 XC4, u jednostranoj oplati kao i armaturu Q335 | m          | 6.80     |
| <b>C. ARMIRAČKI RADOVI</b>            |                                                                                                                                                             |            |          |
| 11                                    | Nabavka, transport, siječenje prema specifikaciji, formiranje armaturnih koševa i postavljanje u projektovani položaj rebraste armature B500B.              | kg         | 6,772.59 |
| <b>D. OSTALI RADOVI</b>               |                                                                                                                                                             |            |          |
| 12                                    | Izrada barbakana prečnika 100mm.                                                                                                                            | m          | 23.64    |

Podgorica, mart 2024.god.

Sračunao:



Dr Zvonko Tomanović, dipl.ing. građ.

## **2. NUMERIČKA DOKUMENTACIJA**

## 2.1. STATIČKI PRORAČUN

### Proračun betonskog AB zida

Statički proračun je sproveden primjenom koncepta aktivnih pritisaka tla, kao opterećenja i usvajanje dimenzija temelja koje obezbjeđuju dozvoljene pritiske u temeljnoj spojnici i obezbjeđuju faktore sigurnosti na prevrtanje i klizanje prema EC7.

Proračun je proveden primjenom softvera GEO5 po EC7 i EC8 (i drugim dijelovima EC vezanim za dimenzionisanje betonskog presjeka).

Zbog dejstva seizmičkih sila (VII<sup>o</sup> MSC) obezbjeđenje potrebnog faktora sigurnosti na klizanje zida je uglavnom diktiralo usvajanje dimenzija zida.

Usvojeni parametri fizičko-mehaničkih svojstava za prirodnu geotehničku sredinu Glacial:

|                           |                                |
|---------------------------|--------------------------------|
| - Zapreminska težina      | $\gamma = 20.0 \text{ kN/m}^3$ |
| - Ugao unutrašnjeg trenja | $\varphi = 26^\circ$           |
| - Kohezija                | $c = 7.0 \text{ MPa}$          |

dok su za za prirodnu geotehničku sredinu Glacial:

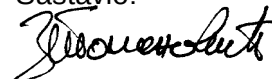
|                           |                                |
|---------------------------|--------------------------------|
| - Zapreminska težina      | $\gamma = 20.0 \text{ kN/m}^3$ |
| - Ugao unutrašnjeg trenja | $\varphi = 30^\circ$           |
| - Kohezija                | $c = 0.0 \text{ MPa}$          |

Iz proračuna se vidi da su zadovoljeni faktori sigurnosti prema EC 7.

Izvod iz proračuna je dat u prilogu koji slijedi (geometrija, mehaničke karakteristike materijala i sračunati faktori sigurnosti).

Podgorica, Mart 2024.god.

Sastavio:



Dr Zvonko Tomanović, dipl.inž.građ.

## Cantilever wall analysis

### Input data

Date : 3/13/2024

### Settings

Standard - safety factors

### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)

Coefficients EN 1992-1-1 : standard

Circle pile shear : simplified method

### Wall analysis

Verification methodology : Safety factors (ASD)

Active earth pressure calculation : Coulomb

Passive earth pressure calculation : Caquot-Kerisel

Earthquake analysis : Mononobe-Okabe

Shape of earth wedge : Calculate as skew

Base key : The base key is considered as inclined footing bottom

Allowable eccentricity : 0.333

| Safety factors                         |          |      |     |
|----------------------------------------|----------|------|-----|
| Permanent design situation             |          |      |     |
| Safety factor for overturning :        | $SF_o =$ | 1.50 | [-] |
| Safety factor for sliding resistance : | $SF_s =$ | 1.50 | [-] |
| Safety factor for bearing capacity :   | $SF_b =$ | 1.50 | [-] |

### Material of structure

Unit weight  $\gamma = 23.00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

### Concrete: C 20/25

Cylinder compressive strength  $f_{ck} = 20.00 \text{ MPa}$

Tensile strength  $f_{ctm} = 2.20 \text{ MPa}$

Elasticity modulus  $E_{cm} = 30000.00 \text{ MPa}$

### Longitudinal reinforcement: B500B

Yield strength  $f_{yk} = 500.00 \text{ MPa}$

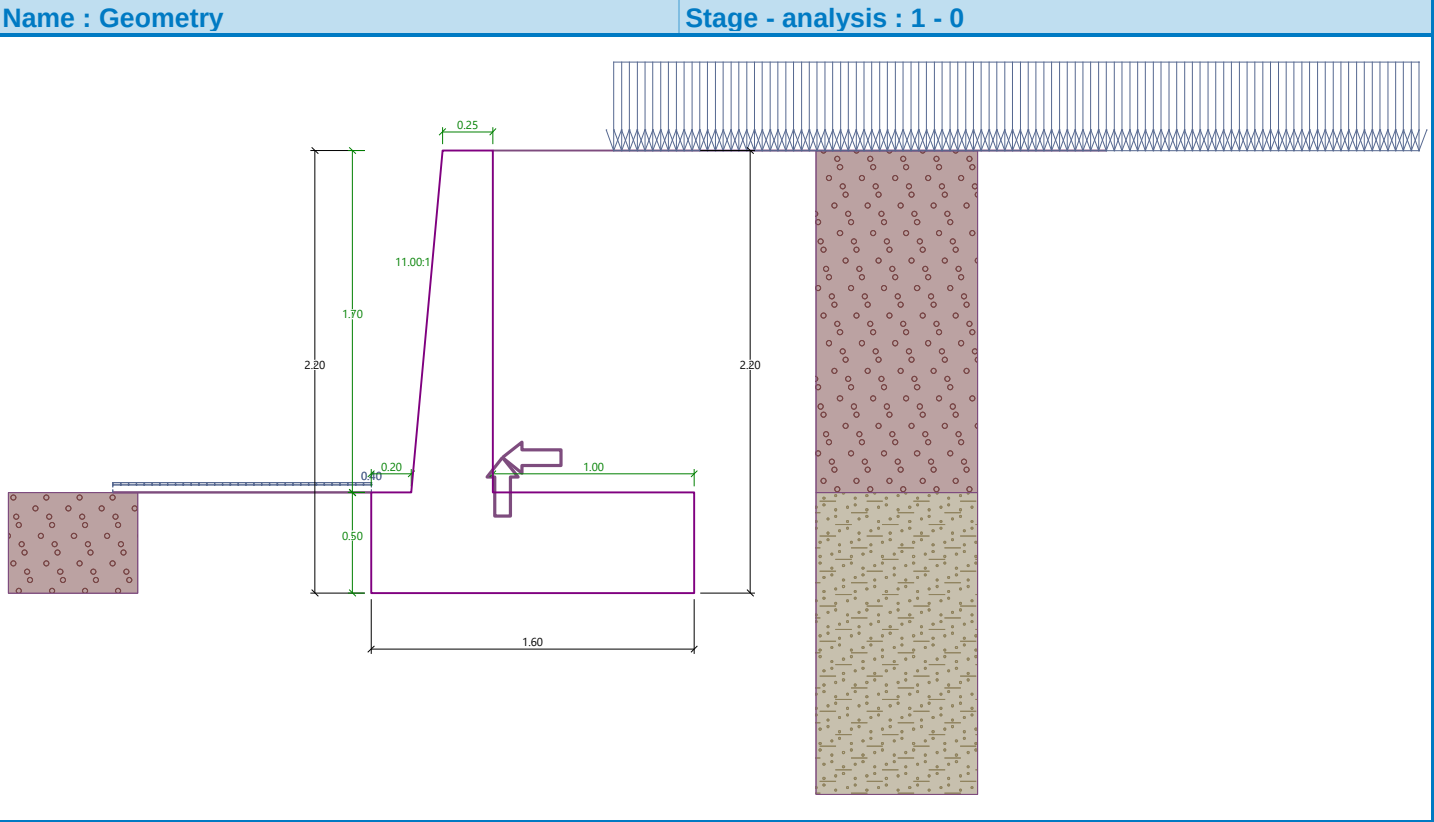
### Geometry of structure

| No. | Coordinate<br>X [m] | Depth<br>Z [m] |
|-----|---------------------|----------------|
| 1   | 0.00                | 0.00           |
| 2   | 0.00                | 1.70           |
| 3   | 1.00                | 1.70           |
| 4   | 1.00                | 2.20           |
| 5   | -0.60               | 2.20           |
| 6   | -0.60               | 1.70           |
| 7   | -0.40               | 1.70           |

ZID 1

| No. | Coordinate | Depth |
|-----|------------|-------|
|     | X [m]      | Z [m] |
| 8   | -0.25      | 0.00  |

The origin [0,0] is located at the most upper right point of the wall.  
Wall section area = 1.36 m<sup>2</sup>.



Basic soil parameters

| No. | Name                    | Pattern | $\varphi_{ef}$<br>[°] | $c_{ef}$<br>[kPa] | $\gamma$<br>[kN/m <sup>3</sup> ] | $\gamma_{su}$<br>[kN/m <sup>3</sup> ] | $\delta$<br>[°] |
|-----|-------------------------|---------|-----------------------|-------------------|----------------------------------|---------------------------------------|-----------------|
| 1   | Nasip                   |         | 30.00                 | 0.00              | 20.00                            | 10.50                                 | 20.00           |
| 2   | Glinovito-pjekovito tlo |         | 26.00                 | 7.00              | 20.00                            | 10.50                                 | 20.00           |

Soil parameters to compute pressure at rest

| No. | Name                    | Pattern | Type<br>calculation | $\varphi_{ef}$<br>[°] | $\nu$<br>[-] | OCR<br>[-] | $K_r$<br>[-] |
|-----|-------------------------|---------|---------------------|-----------------------|--------------|------------|--------------|
| 1   | Nasip                   |         | cohesionless        | 30.00                 | -            | -          | -            |
| 2   | Glinovito-pjekovito tlo |         | cohesive            | -                     | 0.30         | -          | -            |

Soil parameters

Nasip

Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 30.00^\circ$   
 Cohesion of soil :  $c_{ef} = 0.00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20.00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

#### Glinovito-pjekovito tlo

Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 26.00^\circ$   
 Cohesion of soil :  $c_{ef} = 7.00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20.00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0.30$   
 Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

#### Geological profile and assigned soils

| No. | Thickness of layer<br>t [m] | Depth<br>z [m] | Assigned soil           | Pattern                                                                               |
|-----|-----------------------------|----------------|-------------------------|---------------------------------------------------------------------------------------|
| 1   | 1.70                        | 0.00 .. 1.70   | Nasip                   |   |
| 2   | -                           | 1.70 .. ∞      | Glinovito-pjekovito tlo |  |

#### Foundation

Type of foundation : soil from geological profile

#### Terrain profile

Terrain behind the structure is flat.

#### Water influence

Ground water table is located below the structure.

#### Input surface surcharges

| No. | Surcharge |        | Action   | Mag.1<br>[kN/m <sup>2</sup> ] | Mag.2<br>[kN/m <sup>2</sup> ] | Ord.x<br>x [m] | Length<br>l [m] | Depth<br>z [m] |
|-----|-----------|--------|----------|-------------------------------|-------------------------------|----------------|-----------------|----------------|
|     | new       | change |          |                               |                               |                |                 |                |
| 1   | Yes       |        | variable | 16.70                         |                               | 0.60           | 4.00            | on terrain     |

#### Resistance on front face of the structure

Resistance on front face of the structure: at rest

Soil on front face of the structure - Nasip

Soil thickness in front of structure  $h = 0.50 \text{ m}$

Terrain surcharge  $f = 0.40 \text{ kN/m}^2$

Terrain in front of structure is flat.

#### Earthquake

Factor of horizontal acceleration  $K_h = 0.1400$

Factor of vertical acceleration  $K_v = 0.0200$

Water below the GWT is restricted.

#### Settings of the stage of construction

Design situation : permanent

The wall is free to move. Active earth pressure is therefore assumed.

Reduction of soil/soil friction angle : do not reduce

## Verification No. 1

### Forces acting on construction

| Name                     | F <sub>hor</sub><br>[kN/m] | App.Pt.<br>z [m] | F <sub>vert</sub><br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|--------------------------|----------------------------|------------------|-----------------------------|------------------|-----------------------|
| Weight - wall            | 0.00                       | -0.67            | 31.25                       | 0.65             | 1.000                 |
| Earthq.- constr.         | 4.37                       | -0.67            | -0.62                       | 0.65             | 1.000                 |
| FF resistance            | -1.25                      | -0.17            | 0.00                        | 0.00             | 1.000                 |
| Resistance on front face | -0.10                      | -0.25            | 0.00                        | 0.00             | 1.000                 |
| Weight - earth wedge     | 0.00                       | -1.08            | 17.31                       | 0.94             | 1.000                 |
| Earthquake - soil wedge  | 2.42                       | -1.08            | -0.35                       | 0.94             | 1.000                 |
| Active pressure          | 12.51                      | -0.87            | 17.73                       | 1.30             | 1.000                 |
| Earthq.- act.pressure    | 5.20                       | -1.47            | 8.63                        | 1.02             | 1.000                 |
| Surch.1 - strip          | 5.94                       | -0.77            | 6.69                        | 1.26             | 1.000                 |

### Verification of complete wall

#### Check for overturning stability

Resisting moment  $M_{res} = 76.15$  kNm/m

Overturning moment  $M_{ovr} = 28.46$  kNm/m

Safety factor = 2.68 > 1.50

**Wall for overturning is SATISFACTORY**

#### Check for slip

Resisting horizontal force  $H_{res} = 47.61$  kN/m

Active horizontal force  $H_{act} = 29.09$  kN/m

Safety factor = 1.64 > 1.50

**Wall for slip is SATISFACTORY**

**Overall check - WALL is SATISFACTORY**

### Bearing capacity of foundation soil

#### Design load acting at the center of footing bottom

| No. | Moment<br>[kNm/m] | Norm. force<br>[kN/m] | Shear Force<br>[kN/m] | Eccentricity<br>[-] | Stress<br>[kPa] |
|-----|-------------------|-----------------------|-----------------------|---------------------|-----------------|
| 1   | 17.01             | 80.65                 | 29.09                 | 0.131               | 68.18           |

#### Service load acting at the center of footing bottom

| No. | Moment<br>[kNm/m] | Norm. force<br>[kN/m] | Shear Force<br>[kN/m] |
|-----|-------------------|-----------------------|-----------------------|
| 1   | 17.01             | 80.65                 | 29.09                 |

### Spread footing verification

### Input data

### Settings

Standard - safety factors

Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard  
Circle pile shear : simplified method

Settlement

Analysis method : Analysis using oedometric modulus  
Restriction of influence zone : by percentage of Sigma,Or  
Coeff. of restriction of influence zone : 10.0 [%]

Spread Footing

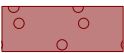
Verification methodology : Safety factors (ASD)  
Analysis for drained conditions : Standard approach  
Analysis of uplift : Standard  
Allowable eccentricity : 0.333

| Safety factors                                |                   |      |     |
|-----------------------------------------------|-------------------|------|-----|
| Permanent design situation                    |                   |      |     |
| Safety factor for vertical bearing capacity : | SF <sub>v</sub> = | 1.50 | [-] |
| Safety factor for sliding resistance :        | SF <sub>h</sub> = | 1.50 | [-] |

Basic soil parameters

| No. | Name                    | Pattern                                                                             | Φ <sub>ef</sub><br>[°] | C <sub>ef</sub><br>[kPa] | γ<br>[kN/m³] | γ <sub>su</sub><br>[kN/m³] | δ<br>[°] |
|-----|-------------------------|-------------------------------------------------------------------------------------|------------------------|--------------------------|--------------|----------------------------|----------|
| 1   | Nasip                   |  | 30.00                  | 0.00                     | 20.00        | 10.50                      | 20.00    |
| 2   | Glinovito-pjekovito tlo |  | 26.00                  | 7.00                     | 20.00        | 10.50                      | 20.00    |

Soil parameters to compute pressure at rest

| No. | Name                    | Pattern                                                                             | Type calculation | Φ <sub>ef</sub><br>[°] | v<br>[-] | OCR<br>[-] | K <sub>r</sub><br>[-] |
|-----|-------------------------|-------------------------------------------------------------------------------------|------------------|------------------------|----------|------------|-----------------------|
| 1   | Nasip                   |  | cohesionless     | 30.00                  | -        | -          | -                     |
| 2   | Glinovito-pjekovito tlo |  | cohesive         | -                      | 0.30     | -          | -                     |

Soil parameters

Nasip

Unit weight : γ = 20.00 kN/m³  
Angle of internal friction : φ<sub>ef</sub> = 30.00 °  
Cohesion of soil : C<sub>ef</sub> = 0.00 kPa  
Oedometric modulus : E<sub>oed</sub> = 80.00 MPa  
Saturated unit weight : γ<sub>sat</sub> = 20.50 kN/m³

Glinovito-pjekovito tlo

Unit weight : γ = 20.00 kN/m³  
Angle of internal friction : φ<sub>ef</sub> = 26.00 °

Cohesion of soil :  $c_{ef} = 7.00$  kPa  
 Oedometric modulus :  $E_{oed} = 80.00$  MPa  
 Saturated unit weight :  $\gamma_{sat} = 20.50$  kN/m<sup>3</sup>

## Foundation

### Foundation type: strip footing

Depth from original ground surface  $h_z = 2.20$  m  
 Depth of footing bottom  $d = 0.50$  m  
 Foundation thickness  $t = 0.50$  m  
 Incl. of finished grade  $s_1 = 0.00^\circ$   
 Incl. of footing bottom  $s_2 = 0.00^\circ$

### Overburden

Type: input unit weight  
 Unit weight of soil above foundation =  $20.00$  kN/m<sup>3</sup>

### Geometry of structure

### Foundation type: strip footing

Overall strip footing length =  $10.00$  m  
 Strip footing width (x) =  $1.60$  m  
 Column width in the direction of x =  $0.10$  m

Inserted loading is considered per unit length of continuous footing span.

Volume of strip footing =  $0.80$  m<sup>3</sup>/m  
 Volume of excavation =  $0.80$  m<sup>3</sup>/m  
 Volume of fill =  $0.00$  m<sup>3</sup>/m

### Material of structure

Unit weight  $\gamma = 23.00$  kN/m<sup>3</sup>  
 Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

### Concrete: C 20/25

Cylinder compressive strength  $f_{ck} = 20.00$  MPa  
 Tensile strength  $f_{ctm} = 2.20$  MPa  
 Elasticity modulus  $E_{cm} = 30000.00$  MPa

### Longitudinal reinforcement: B500B

Yield strength  $f_{yk} = 500.00$  MPa

### Transverse reinforcement: B500B

Yield strength  $f_{yk} = 500.00$  MPa

### Geological profile and assigned soils

| No. | Thickness of layer<br>$t$ [m] | Depth<br>$z$ [m] | Assigned soil           | Pattern                                                                               |
|-----|-------------------------------|------------------|-------------------------|---------------------------------------------------------------------------------------|
| 1   | 1.70                          | 0.00 .. 1.70     | Nasip                   |  |
| 2   | -                             | 1.70 .. ∞        | Glinovito-pjekovito tlo |  |

### Load

ZID 1

| No. | new | Load<br>change | Name | Type    | N<br>[kN/m] | M <sub>y</sub><br>[kNm/m] | H <sub>x</sub><br>[kN/m] |
|-----|-----|----------------|------|---------|-------------|---------------------------|--------------------------|
| 1   | Yes |                | LC 1 | Design  | 62.20       | 2.46                      | -29.09                   |
| 2   | Yes |                | LC 2 | Service | 62.20       | 2.46                      | -29.09                   |

Global settings

Type of analysis : analysis for drained conditions

Settings of the stage of construction

Design situation : permanent

Verification No. 1

Load case verification

| Name | e <sub>x</sub><br>[m] | e <sub>y</sub><br>[m] | σ<br>[kPa] | R <sub>d</sub><br>[kPa] | Utilization<br>[%] | Is satisfactory |
|------|-----------------------|-----------------------|------------|-------------------------|--------------------|-----------------|
| LC 1 | -0.21                 | 0.00                  | 68.18      | 160.32                  | 63.79              | Yes             |

Analysis carried out with automatic selection of the most unfavourable load cases.

Computed self weight of strip foundation G = 18.45 kN/m

Computed weight of overburden Z = 0.00 kN/m

Vertical bearing capacity check

Shape of contact stress : rectangle

Most unfavorable load case No. 1. (LC 1)

Parameters of slip surface below foundation:

Depth of slip surface z<sub>sp</sub> = 2.23 m

Length of slip surface l<sub>sp</sub> = 6.33 m

Design bearing capacity of found. soil R<sub>d</sub> = 160.32 kPa

Extreme contact stress σ = 68.18 kPa

Factor of safety = 2.35 > 1.50

Bearing capacity in the vertical direction is SATISFACTORY

Verification of load eccentricity

Max. eccentricity in direction of base length e<sub>x</sub> = 0.131<0.333

Max. eccentricity in direction of base width e<sub>y</sub> = 0.000<0.333

Max. overall eccentricity e<sub>t</sub> = 0.131<0.333

Eccentricity of load is SATISFACTORY

Horizontal bearing capacity check

Most unfavorable load case No. 1. (LC 1)

Earth resistance: not considered

Horizontal bearing capacity R<sub>dh</sub> = 47.61 kN

Extreme horizontal force H = 29.09 kN

Factor of safety = 1.64 > 1.50

Bearing capacity in the horizontal direction is SATISFACTORY

Bearing capacity of foundation is SATISFACTORY

## Verification No. 1

### Settlement and rotation of foundation - input data

Analysis carried out with automatic selection of the most unfavourable load cases.  
 Analysis carried out with accounting for coefficient  $\kappa_1$  (influence of foundation depth).  
 Stress at the footing bottom considered from the finished grade.  
 Computed self weight of strip foundation  $G = 18.45 \text{ kN/m}$   
 Computed weight of overburden  $Z = 0.00 \text{ kN/m}$   
 Settlement of mid point of longitudinal edge  $= 0.3 \text{ mm}$   
 Settlement of mid point of transverse edge 1  $= 0.8 \text{ mm}$   
 Settlement of mid point of transverse edge 2  $= 0.0 \text{ mm}$   
 (1-max.compressed edge; 2-min.compressed edge)

### Settlement and rotation of foundation - results

#### Foundation stiffness:

Computed weighted average modulus of deformation  $E_{\text{def}} = 59.43 \text{ MPa}$   
 Foundation in the longitudinal direction is rigid ( $k=15.27$ )  
 Foundation in the direction of width is rigid ( $k=63.10$ )

#### Verification of load eccentricity

Max. eccentricity in direction of base length  $e_x = 0.131 < 0.333$   
 Max. eccentricity in direction of base width  $e_y = 0.000 < 0.333$   
 Max. overall eccentricity  $e_t = 0.131 < 0.333$

**Eccentricity of load is SATISFACTORY**

#### Overall settlement and rotation of foundation:

Foundation settlement  $= 0.6 \text{ mm}$   
 Depth of influence zone  $= 2.65 \text{ m}$   
 Rotation in direction of width  $= 0.481 (\tan^*1000)$ ;  $(2.8E-02^\circ)$

## Dimensioning No. 1

Analysis carried out with automatic selection of the most unfavourable load cases.

### Verification of longitudinal reinforcement of foundation in the direction of x

4 prof. 14.0 mm, cover 40.0 mm  
 Cross-section width  $= 1.00 \text{ m}$   
 Cross-section depth  $= 0.50 \text{ m}$   
 Reinforcement ratio  $\rho = 0.14 \% > 0.13 \% = \rho_{\text{min}}$   
 Position of neutral axis  $x = 0.03 \text{ m} < 0.28 \text{ m} = x_{\text{max}}$   
 Ultimate moment  $M_{\text{Rd}} = 118.59 \text{ kNm} > 16.91 \text{ kNm} = M_{\text{Ed}}$

**Cross-section is SATISFACTORY.**

### Spread footing for punching shear failure check

Column normal force  $= 62.20 \text{ kN}$

#### Maximum resistance at the column perimeter

Force transferred into found. soil  $= 3.88 \text{ kN}$   
 Force transferred by shear strength of foundation  $= 58.32 \text{ kN}$   
 Considered column perimeter  $u_0 = 2.00 \text{ m}$   
 Shear resistance at the column perimeter  $v_{\text{Ed,max}} = 0.09 \text{ MPa}$   
 Resistance at the column perimeter  $v_{\text{Rd,max}} = 2.94 \text{ MPa}$

#### Critical section without shear reinforcement

Force transferred into found. soil = 30.22 kN  
 Force transferred by shear strength of foundation = 31.98 kN  
 Distance of section from the column = 0.34 m  
 Section perimeter  $u$  = 2.00 m  
 Shear stress at section  $v_{Ed}$  = 0.04 MPa  
 Shear resistance of section without shear reinforcement  $v_{Rd,c}$  = 0.90 MPa

$v_{Ed} < v_{Rd,c} \Rightarrow$  Reinforcement is not required

**Spread footing for punching shear is SATISFACTORY**

### Dimensioning No. 1

Wall stem check - back reinf.

Forces acting on construction

| Name                          | $F_{hor}$<br>[kN/m] | App.Pt.<br>z [m] | $F_{vert}$<br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|-------------------------------|---------------------|------------------|----------------------|------------------|-----------------------|
| Weight - wall                 | 0.00                | -0.78            | 12.78                | 0.24             | 1.000                 |
| Earthq.- constr.              | 1.79                | -0.78            | -0.26                | 0.24             | 1.000                 |
| Pressure at rest              | 14.43               | -0.57            | 0.00                 | 0.40             | 1.000                 |
| Earthquake - pressure at rest | 7.92                | -0.85            | 0.00                 | 0.40             | 1.000                 |
| Surch.1 - strip               | 12.93               | -0.78            | 0.00                 | 0.40             | 1.000                 |

Wall stem check - back reinf.

Wall check at the construction joint 1.70 m from the wall crest

Reinforcement and dimensions of the cross-section

5 prof. 14.0 mm, cover 40.0 mm

Inputted reinforcement area = 769.7 mm<sup>2</sup>

Required reinforcement area = 464.7 mm<sup>2</sup>

Cross-section width = 1.00 m

Cross-section height = 0.40 m

Reinforcement ratio  $\rho$  = 0.22 % > 0.13 % =  $\rho_{min}$

Position of neutral axis  $x$  = 0.03 m < 0.22 m =  $x_{max}$

Ultimate shear force  $V_{Rd}$  = 129.30 kN > 37.07 kN =  $V_{Ed}$

Ultimate moment  $M_{Rd}$  = 115.41 kNm > 25.90 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**

Wall heel check

Forces acting on construction

| Name                 | $F_{hor}$<br>[kN/m] | App.Pt.<br>z [m] | $F_{vert}$<br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|----------------------|---------------------|------------------|----------------------|------------------|-----------------------|
| Weight - wall        | 0.00                | -0.25            | 11.50                | 1.10             | 1.000                 |
| Weight - earth wedge | 0.00                | -1.08            | 17.31                | 0.94             | 1.000                 |
| Active pressure      | 12.51               | -0.87            | 17.73                | 1.30             | 1.000                 |
| Surch.1 - strip      | 5.94                | -0.77            | 6.69                 | 1.26             | 1.000                 |
| Contact stress       | 0.00                | 0.00             | -35.33               | 0.99             | 1.000                 |

Wall heel check

Reinforcement and dimensions of the cross-section

5 prof. 14.0 mm, cover 40.0 mm

Inputted reinforcement area = 769.7 mm<sup>2</sup>  
Required reinforcement area = 588.9 mm<sup>2</sup>  
Cross-section width = 1.00 m  
Cross-section height = 0.50 m  
Reinforcement ratio  $\rho$  = 0.17 % > 0.13 % =  $\rho_{\min}$   
Position of neutral axis  $x$  = 0.03 m < 0.28 m =  $x_{\max}$   
Ultimate shear force  $V_{Rd}$  = 152.26 kN > 17.91 kN =  $V_{Ed}$   
Ultimate moment  $M_{Rd}$  = 147.40 kNm > 25.90 kNm =  $M_{Ed}$

Cross-section is SATISFACTORY.

Slope stability analysis

Input data (Construction stage 1)

Project

Settings

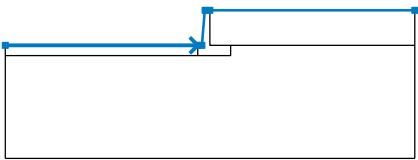
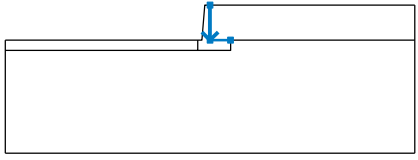
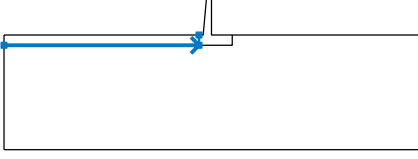
Standard - safety factors

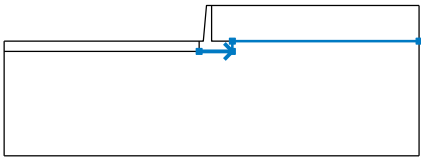
Stability analysis

Verification methodology : Safety factors (ASD)  
Earthquake analysis : Standard

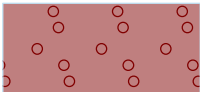
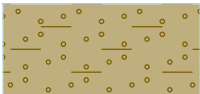
| Safety factors             |                   |      |     |
|----------------------------|-------------------|------|-----|
| Permanent design situation |                   |      |     |
| Safety factor :            | SF <sub>s</sub> = | 1.50 | [-] |

Interface

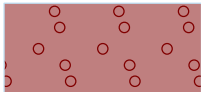
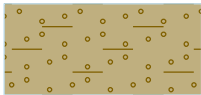
| No. | Interface location                                                                  | Coordinates of interface points [m] |       |       |       |       |       |
|-----|-------------------------------------------------------------------------------------|-------------------------------------|-------|-------|-------|-------|-------|
|     |                                                                                     | x                                   | z     | x     | z     | x     | z     |
| 1   |  | -10.00                              | -1.70 | -0.60 | -1.70 | -0.40 | -1.70 |
|     |                                                                                     | -0.25                               | 0.00  | 0.00  | 0.00  | 10.00 | 0.00  |
| 2   |  | 0.00                                | 0.00  | 0.00  | -1.70 | 1.00  | -1.70 |
|     |                                                                                     |                                     |       |       |       |       |       |
| 3   |  | -10.00                              | -2.20 | -0.60 | -2.20 | -0.60 | -1.70 |
|     |                                                                                     |                                     |       |       |       |       |       |

| No. | Interface location                                                                | Coordinates of interface points [m] |       |      |       |      |       |
|-----|-----------------------------------------------------------------------------------|-------------------------------------|-------|------|-------|------|-------|
|     |                                                                                   | x                                   | z     | x    | z     | x    | z     |
| 4   |  | -0.60                               | -2.20 | 1.00 | -2.20 | 1.00 | -1.70 |
|     |                                                                                   | 10.00                               | -1.70 |      |       |      |       |
|     |                                                                                   |                                     |       |      |       |      |       |

Soil parameters - effective stress state

| No. | Name                    | Pattern                                                                           | $\varphi_{ef}$<br>[°] | $c_{ef}$<br>[kPa] | $\gamma$<br>[kN/m <sup>3</sup> ] |
|-----|-------------------------|-----------------------------------------------------------------------------------|-----------------------|-------------------|----------------------------------|
| 1   | Nasip                   |  | 30.00                 | 0.00              | 20.00                            |
| 2   | Glinovito-pjekovito tlo |  | 26.00                 | 7.00              | 20.00                            |

Soil parameters - uplift

| No. | Name                    | Pattern                                                                             | $\gamma_{sat}$<br>[kN/m <sup>3</sup> ] | $\gamma_s$<br>[kN/m <sup>3</sup> ] | n<br>[-] |
|-----|-------------------------|-------------------------------------------------------------------------------------|----------------------------------------|------------------------------------|----------|
| 1   | Nasip                   |  | 20.50                                  |                                    |          |
| 2   | Glinovito-pjekovito tlo |  | 20.50                                  |                                    |          |

Soil parameters

Nasip

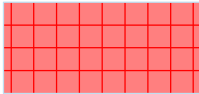
Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
Stress-state : effective  
Shear strength : Mohr-Coulomb  
Angle of internal friction :  $\varphi_{ef} = 30.00^\circ$   
Cohesion of soil :  $c_{ef} = 0.00 \text{ kPa}$   
Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

Glinovito-pjekovito tlo

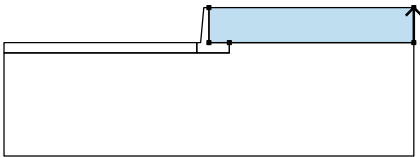
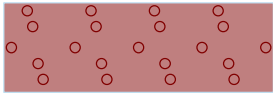
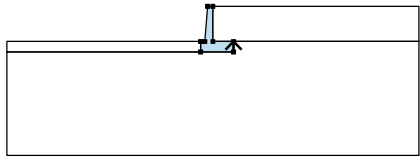
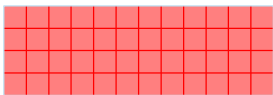
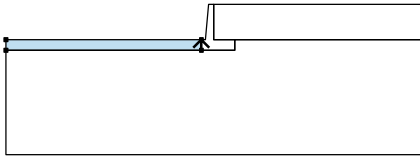
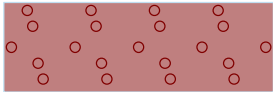
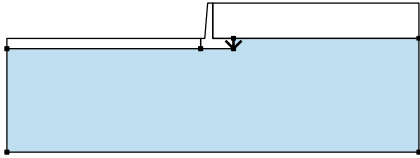
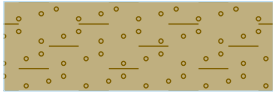
Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
Stress-state : effective  
Shear strength : Mohr-Coulomb  
Angle of internal friction :  $\varphi_{ef} = 26.00^\circ$   
Cohesion of soil :  $c_{ef} = 7.00 \text{ kPa}$   
Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

Rigid Bodies

|       |
|-------|
| ZID 1 |
|-------|

| No. | Name                  | Sample                                                                             | Y<br>[kN/m <sup>3</sup> ] |
|-----|-----------------------|------------------------------------------------------------------------------------|---------------------------|
| 1   | Material of structure |  | 23.00                     |

### Assigning and surfaces

| No. | Surface position                                                                    | Coordinates of surface points [m] |       |        |       | Assigned soil                                                                                                    |
|-----|-------------------------------------------------------------------------------------|-----------------------------------|-------|--------|-------|------------------------------------------------------------------------------------------------------------------|
|     |                                                                                     | x                                 | z     | x      | z     |                                                                                                                  |
| 1   |    | 10.00                             | -1.70 | 10.00  | 0.00  | Nasip<br>                     |
|     |                                                                                     | 0.00                              | 0.00  | 0.00   | -1.70 |                                                                                                                  |
|     |                                                                                     | 1.00                              | -1.70 |        |       |                                                                                                                  |
| 2   |    | 1.00                              | -2.20 | 1.00   | -1.70 | Material of structure<br>     |
|     |                                                                                     | 0.00                              | -1.70 | 0.00   | 0.00  |                                                                                                                  |
|     |                                                                                     | -0.25                             | 0.00  | -0.40  | -1.70 |                                                                                                                  |
|     |                                                                                     | -0.60                             | -1.70 | -0.60  | -2.20 |                                                                                                                  |
| 3   |   | -0.60                             | -2.20 | -0.60  | -1.70 | Nasip<br>                   |
|     |                                                                                     | -10.00                            | -1.70 | -10.00 | -2.20 |                                                                                                                  |
|     |                                                                                     |                                   |       |        |       |                                                                                                                  |
| 4   |  | 1.00                              | -1.70 | 1.00   | -2.20 | Glinovito-pjekovito tlo<br> |
|     |                                                                                     | -0.60                             | -2.20 | -10.00 | -2.20 |                                                                                                                  |
|     |                                                                                     | -10.00                            | -7.20 | 10.00  | -7.20 |                                                                                                                  |
|     |                                                                                     | 10.00                             | -1.70 |        |       |                                                                                                                  |

### Surcharge

| No. | Type  | Type of action | Location<br>z [m] | Origin<br>x [m] | Length<br>l [m] | Width<br>b [m] | Slope<br>$\alpha$ [°] | Magnitude                   |                    |                   |
|-----|-------|----------------|-------------------|-----------------|-----------------|----------------|-----------------------|-----------------------------|--------------------|-------------------|
|     |       |                |                   |                 |                 |                |                       | q, q <sub>1</sub> , f, F, x | q <sub>2</sub> , z | unit              |
| 1   | strip | variable       | on terrain        | x = 0.60        | l = 4.00        |                | 0.00                  | 16.70                       |                    | kN/m <sup>2</sup> |
| 2   | strip | permanent      | on terrain        | x = -10.00      | l = 9.40        |                | 0.00                  | 0.40                        |                    | kN/m <sup>2</sup> |

### Water

Water type : No water

### Tensile crack

Tensile crack not input.

### Earthquake

Horizontal seismic coefficient :  $K_h = 0.1400$

Vertical seismic coefficient :  $K_v = 0.0200$

Settings of the stage of construction

Design situation : permanent

Results (Construction stage 1)

Analysis 1

Circular slip surface

| Slip surface parameters              |     |           |          |              |            |
|--------------------------------------|-----|-----------|----------|--------------|------------|
| Center :                             | x = | -0.42 [m] | Angles : | $\alpha_1$ = | -34.99 [°] |
|                                      | z = | 1.70 [m]  |          | $\alpha_2$ = | 65.82 [°]  |
| Radius :                             | R = | 4.15 [m]  |          |              |            |
| The slip surface after optimization. |     |           |          |              |            |

Total weight of soil above the slip surface: 158.08 kN/m

Slope stability verification (Bishop)

Sum of active forces :  $F_a = 84.26 \text{ kN/m}$

Sum of passive forces :  $F_p = 132.05 \text{ kN/m}$

Sliding moment :  $M_a = 349.68 \text{ kNm/m}$

Resisting moment :  $M_p = 547.99 \text{ kNm/m}$

Factor of safety = 1.57 > 1.50

Slope stability ACCEPTABLE

## Cantilever wall analysis

### Input data

Date : 3/13/2024

### Settings

Standard - safety factors

### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)

Coefficients EN 1992-1-1 : standard

Circle pile shear : simplified method

### Wall analysis

Verification methodology : Safety factors (ASD)

Active earth pressure calculation : Coulomb

Passive earth pressure calculation : Caquot-Kerisel

Earthquake analysis : Mononobe-Okabe

Shape of earth wedge : Calculate as skew

Base key : The base key is considered as inclined footing bottom

Allowable eccentricity : 0.333

| Safety factors                         |          |      |     |
|----------------------------------------|----------|------|-----|
| Permanent design situation             |          |      |     |
| Safety factor for overturning :        | $SF_o =$ | 1.50 | [-] |
| Safety factor for sliding resistance : | $SF_s =$ | 1.50 | [-] |
| Safety factor for bearing capacity :   | $SF_b =$ | 1.50 | [-] |

### Material of structure

Unit weight  $\gamma = 23.00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

### Concrete: C 20/25

Cylinder compressive strength  $f_{ck} = 20.00 \text{ MPa}$

Tensile strength  $f_{ctm} = 2.20 \text{ MPa}$

Elasticity modulus  $E_{cm} = 30000.00 \text{ MPa}$

### Longitudinal reinforcement: B500B

Yield strength  $f_{yk} = 500.00 \text{ MPa}$

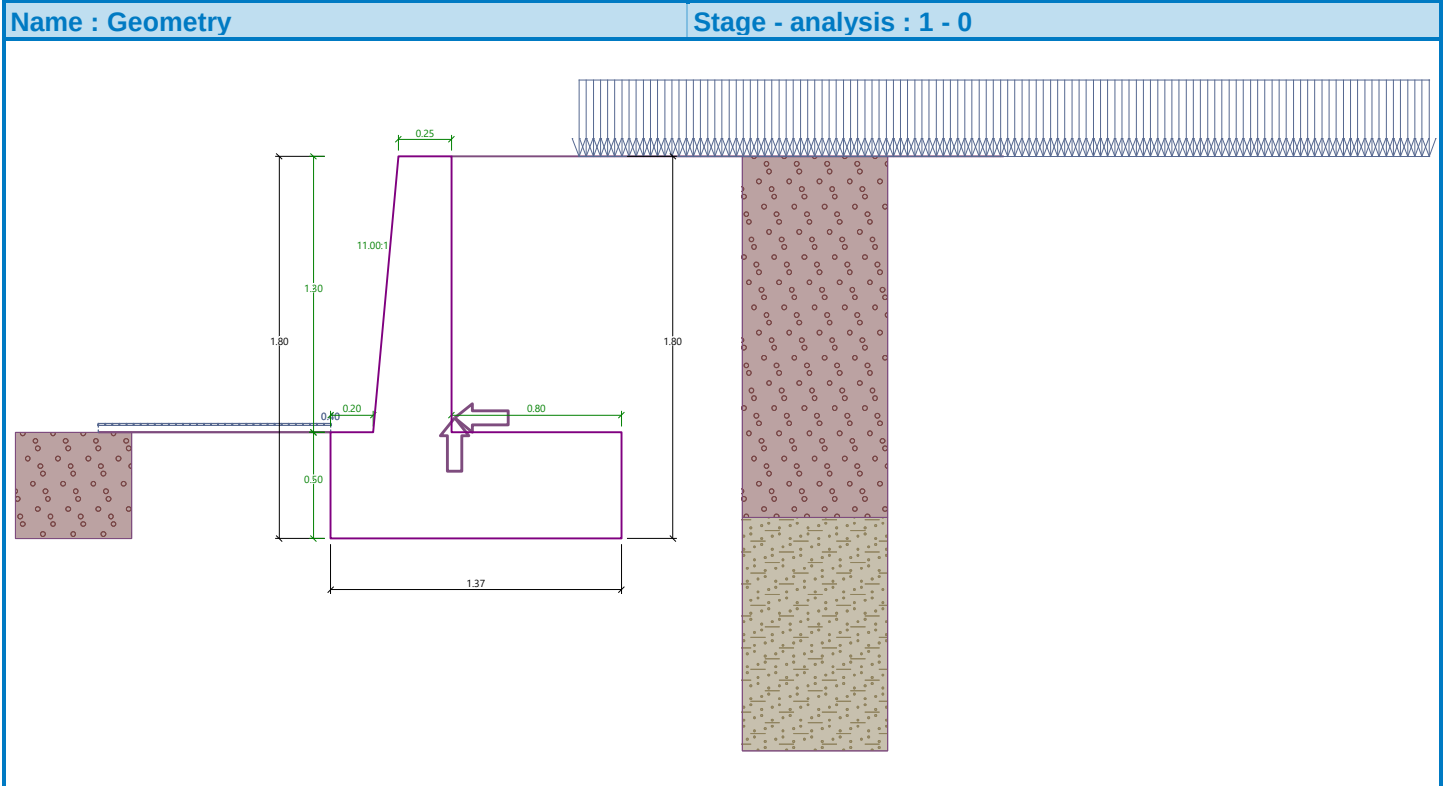
### Geometry of structure

| No. | Coordinate<br>X [m] | Depth<br>Z [m] |
|-----|---------------------|----------------|
| 1   | 0.00                | 0.00           |
| 2   | 0.00                | 1.30           |
| 3   | 0.80                | 1.30           |
| 4   | 0.80                | 1.80           |
| 5   | -0.57               | 1.80           |
| 6   | -0.57               | 1.30           |
| 7   | -0.37               | 1.30           |

| No. | Coordinate<br>X [m] | Depth<br>Z [m] |
|-----|---------------------|----------------|
| 8   | -0.25               | 0.00           |

The origin [0,0] is located at the most upper right point of the wall.

Wall section area = 1.09 m<sup>2</sup>.



### Basic soil parameters

| No. | Name                    | Pattern | $\Phi_{ef}$<br>[°] | $C_{ef}$<br>[kPa] | $\gamma$<br>[kN/m <sup>3</sup> ] | $\gamma_{su}$<br>[kN/m <sup>3</sup> ] | $\delta$<br>[°] |
|-----|-------------------------|---------|--------------------|-------------------|----------------------------------|---------------------------------------|-----------------|
| 1   | Nasip                   |         | 30.00              | 0.00              | 20.00                            | 10.50                                 | 20.00           |
| 2   | Glinovito-pjekovito tlo |         | 26.00              | 7.00              | 20.00                            | 10.50                                 | 20.00           |

### Soil parameters to compute pressure at rest

| No. | Name                    | Pattern | Type<br>calculation | $\Phi_{ef}$<br>[°] | $\nu$<br>[-] | OCR<br>[-] | $K_r$<br>[-] |
|-----|-------------------------|---------|---------------------|--------------------|--------------|------------|--------------|
| 1   | Nasip                   |         | cohesionless        | 30.00              | -            | -          | -            |
| 2   | Glinovito-pjekovito tlo |         | cohesive            | -                  | 0.30         | -          | -            |

### Soil parameters

#### Nasip

Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$

Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 30.00^\circ$   
 Cohesion of soil :  $c_{ef} = 0.00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20.00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

#### Glinovito-pjekovito tlo

Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 26.00^\circ$   
 Cohesion of soil :  $c_{ef} = 7.00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20.00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0.30$   
 Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

#### Geological profile and assigned soils

| No. | Thickness of layer<br>t [m] | Depth<br>z [m] | Assigned soil           | Pattern                                                                               |
|-----|-----------------------------|----------------|-------------------------|---------------------------------------------------------------------------------------|
| 1   | 1.70                        | 0.00 .. 1.70   | Nasip                   |    |
| 2   | -                           | 1.70 .. ∞      | Glinovito-pjekovito tlo |  |

#### Foundation

Type of foundation : soil from geological profile

#### Terrain profile

Terrain behind the structure is flat.

#### Water influence

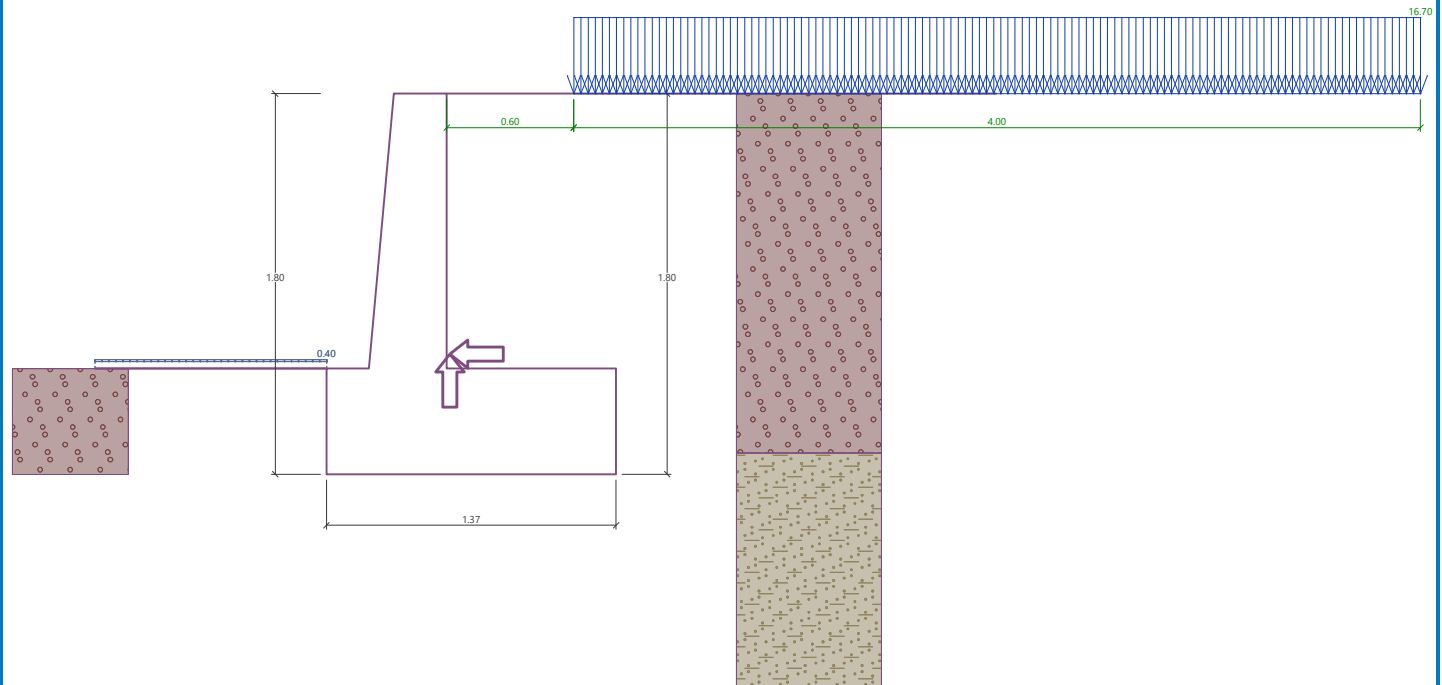
Ground water table is located below the structure.

#### Input surface surcharges

| No. | Surcharge |        | Action   | Mag.1<br>[kN/m <sup>2</sup> ] | Mag.2<br>[kN/m <sup>2</sup> ] | Ord.x<br>x [m] | Length<br>l [m] | Depth<br>z [m] |
|-----|-----------|--------|----------|-------------------------------|-------------------------------|----------------|-----------------|----------------|
|     | new       | change |          |                               |                               |                |                 |                |
| 1   | Yes       |        | variable | 16.70                         |                               | 0.60           | 4.00            | on terrain     |

Name : Surcharge

Stage - analysis : 1 - 0



### Resistance on front face of the structure

Resistance on front face of the structure: at rest

Soil on front face of the structure - Nasip

Soil thickness in front of structure  $h = 0.50 \text{ m}$

Terrain surcharge  $f = 0.40 \text{ kN/m}^2$

Terrain in front of structure is flat.

### Earthquake

Factor of horizontal acceleration  $K_h = 0.1400$

Factor of vertical acceleration  $K_v = 0.0200$

Water below the GWT is restricted.

### Settings of the stage of construction

Design situation : permanent

The wall is free to move. Active earth pressure is therefore assumed.

Reduction of soil/soil friction angle : do not reduce

### Verification No. 1

#### Forces acting on construction

| Name                     | $F_{hor}$<br>[kN/m] | App.Pt.<br>z [m] | $F_{vert}$<br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|--------------------------|---------------------|------------------|----------------------|------------------|-----------------------|
| Weight - wall            | 0.00                | -0.57            | 24.98                | 0.58             | 1.000                 |
| Earthq.- constr.         | 3.50                | -0.57            | -0.50                | 0.58             | 1.000                 |
| FF resistance            | -1.25               | -0.17            | 0.00                 | 0.00             | 1.000                 |
| Resistance on front face | -0.10               | -0.25            | 0.00                 | 0.00             | 1.000                 |
| Weight - earth wedge     | 0.00                | -0.96            | 11.04                | 0.84             | 1.000                 |
| Earthquake - soil wedge  | 1.55                | -0.96            | -0.22                | 0.84             | 1.000                 |

| Name                  | $F_{hor}$<br>[kN/m] | App.Pt.<br>z [m] | $F_{vert}$<br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|-----------------------|---------------------|------------------|----------------------|------------------|-----------------------|
| Active pressure       | 9.43                | -0.66            | 11.14                | 1.15             | 1.000                 |
| Earthq.- act.pressure | 3.45                | -1.21            | 5.65                 | 0.93             | 1.000                 |
| Surch.1 - strip       | 4.77                | -0.62            | 5.02                 | 1.13             | 1.000                 |

### Verification of complete wall

#### Check for overturning stability

Resisting moment  $M_{res} = 47.05$  kNm/m

Overturning moment  $M_{ovr} = 16.62$  kNm/m

Safety factor =  $2.83 > 1.50$

**Wall for overturning is SATISFACTORY**

#### Check for slip

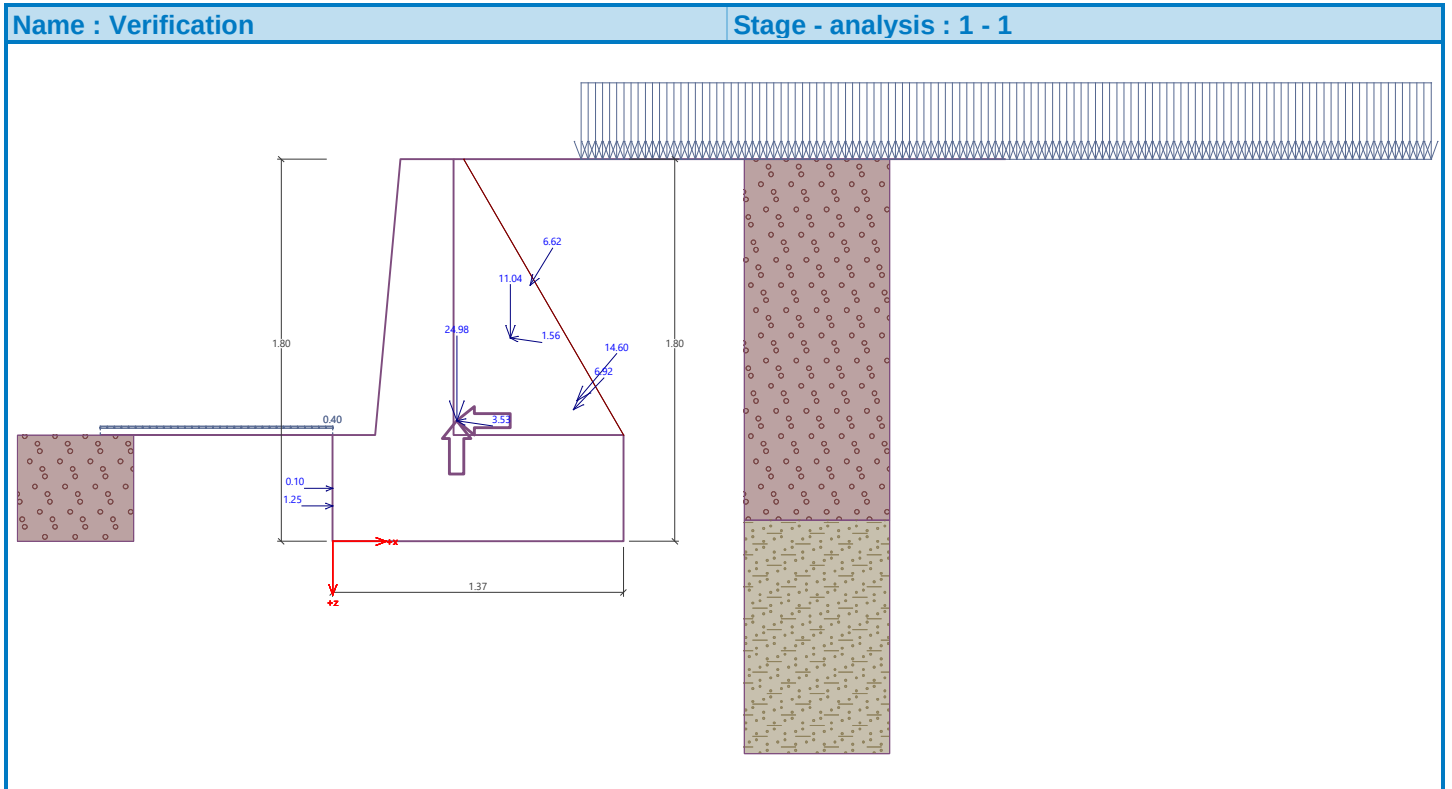
Resisting horizontal force  $H_{res} = 35.31$  kN/m

Active horizontal force  $H_{act} = 21.35$  kN/m

Safety factor =  $1.65 > 1.50$

**Wall for slip is SATISFACTORY**

### Overall check - WALL is SATISFACTORY



### Bearing capacity of foundation soil

Design load acting at the center of footing bottom

| No. | Moment<br>[kNm/m] | Norm. force<br>[kN/m] | Shear Force<br>[kN/m] | Eccentricity<br>[-] | Stress<br>[kPa] |
|-----|-------------------|-----------------------|-----------------------|---------------------|-----------------|
| 1   | 8.63              | 57.10                 | 21.35                 | 0.110               | 53.57           |

Service load acting at the center of footing bottom

| No. | Moment<br>[kNm/m] | Norm. force<br>[kN/m] | Shear Force<br>[kN/m] |
|-----|-------------------|-----------------------|-----------------------|
| 1   | 8.63              | 57.10                 | 21.35                 |

## Dimensioning No. 1

Wall stem check - back reinf.

Forces acting on construction

| Name                          | $F_{hor}$<br>[kN/m] | App.Pt.<br>z [m] | $F_{vert}$<br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|-------------------------------|---------------------|------------------|----------------------|------------------|-----------------------|
| Weight - wall                 | 0.00                | -0.61            | 9.23                 | 0.21             | 1.000                 |
| Earthq.- constr.              | 1.29                | -0.61            | -0.18                | 0.21             | 1.000                 |
| Pressure at rest              | 8.43                | -0.43            | 0.00                 | 0.37             | 1.000                 |
| Earthquake - pressure at rest | 4.63                | -0.65            | 0.00                 | 0.37             | 1.000                 |
| Surch.1 - strip               | 9.60                | -0.58            | 0.00                 | 0.37             | 1.000                 |

Wall stem check - back reinf.

Wall check at the construction joint 1.30 m from the wall crest

Reinforcement and dimensions of the cross-section

5 prof. 14.0 mm, cover 40.0 mm

Inputted reinforcement area = 769.7 mm<sup>2</sup>

Required reinforcement area = 417.4 mm<sup>2</sup>

Cross-section width = 1.00 m

Cross-section height = 0.37 m

Reinforcement ratio  $\rho$  = 0.24 % > 0.13 % =  $\rho_{min}$

Position of neutral axis x = 0.03 m < 0.20 m =  $x_{max}$

Ultimate shear force  $V_{Rd}$  = 120.28 kN > 23.95 kN =  $V_{Ed}$

Ultimate moment  $M_{Rd}$  = 103.25 kNm > 12.74 kNm =  $M_{Ed}$

Cross-section is **SATISFACTORY**.

Wall heel check

Forces acting on construction

| Name                 | $F_{hor}$<br>[kN/m] | App.Pt.<br>z [m] | $F_{vert}$<br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|----------------------|---------------------|------------------|----------------------|------------------|-----------------------|
| Weight - wall        | 0.00                | -0.25            | 9.20                 | 0.97             | 1.000                 |
| Weight - earth wedge | 0.00                | -0.96            | 11.04                | 0.84             | 1.000                 |
| Active pressure      | 9.43                | -0.66            | 11.14                | 1.15             | 1.000                 |
| Surch.1 - strip      | 4.77                | -0.62            | 5.02                 | 1.13             | 1.000                 |
| Contact stress       | 0.00                | 0.00             | -24.20               | 0.90             | 1.000                 |

Wall heel check

Reinforcement and dimensions of the cross-section

5 prof. 14.0 mm, cover 40.0 mm

Inputted reinforcement area = 769.7 mm<sup>2</sup>

Required reinforcement area = 588.9 mm<sup>2</sup>

Cross-section width = 1.00 m

Cross-section height = 0.50 m

Reinforcement ratio  $\rho = 0.17 \% > 0.13 \% = \rho_{\min}$

Position of neutral axis  $x = 0.03 \text{ m} < 0.28 \text{ m} = x_{\max}$

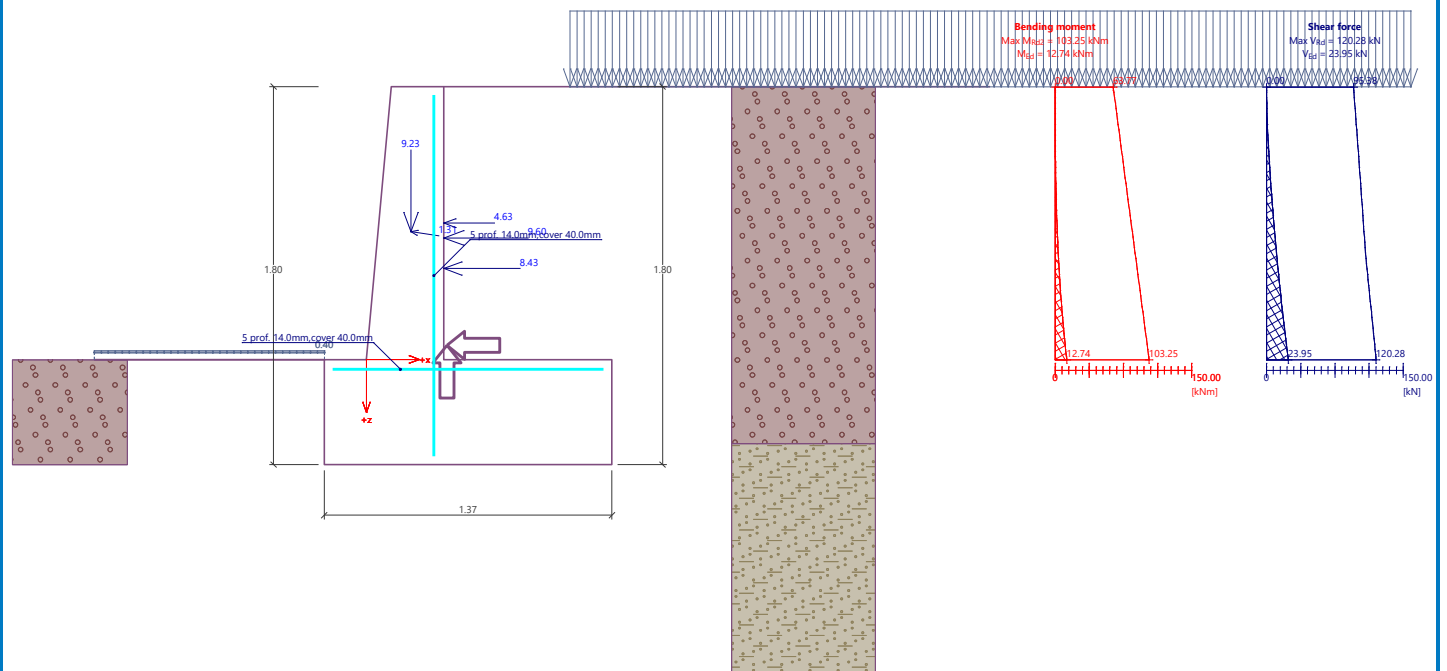
Ultimate shear force  $V_{Rd} = 152.26 \text{ kN} > 12.20 \text{ kN} = V_{Ed}$

Ultimate moment  $M_{Rd} = 147.40 \text{ kNm} > 12.74 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

Name : Dimensioning

Stage - analysis : 1 - 1



## Slope stability analysis

### Input data (Construction stage 1)

#### Project

#### Settings

Standard - safety factors

#### Stability analysis

Verification methodology : Safety factors (ASD)

Earthquake analysis : Standard

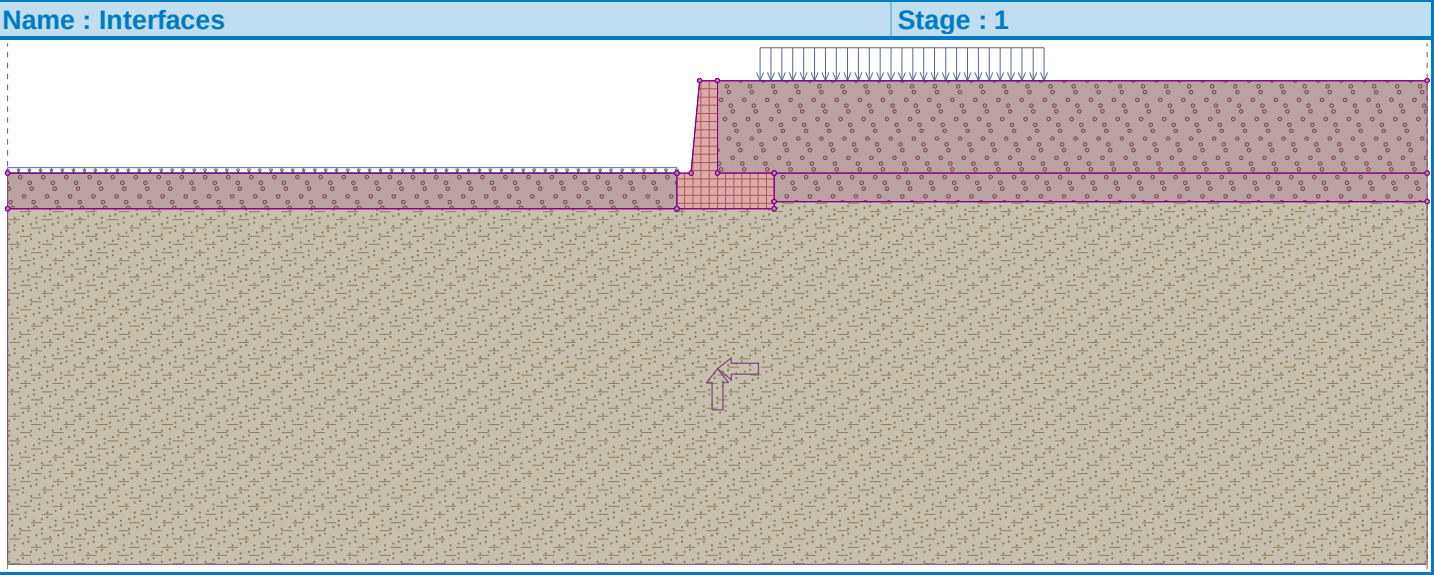
Safety factors

Permanent design situation

Safety factor :  $SF_s = 1.50 [-]$

Interface

| No. | Interface location | Coordinates of interface points [m] |       |       |       |       |       |
|-----|--------------------|-------------------------------------|-------|-------|-------|-------|-------|
|     |                    | x                                   | z     | x     | z     | x     | z     |
| 1   |                    | -10.00                              | -1.30 | -0.57 | -1.30 | -0.37 | -1.30 |
|     |                    | -0.25                               | 0.00  | 0.00  | 0.00  | 10.00 | 0.00  |
| 2   |                    | 0.00                                | 0.00  | 0.00  | -1.30 | 0.80  | -1.30 |
|     |                    |                                     |       |       |       |       |       |
| 3   |                    | -10.00                              | -1.80 | -0.57 | -1.80 | -0.57 | -1.30 |
|     |                    |                                     |       |       |       |       |       |
| 4   |                    | -0.57                               | -1.80 | 0.80  | -1.80 | 0.80  | -1.70 |
|     |                    | 0.80                                | -1.30 | 10.00 | -1.30 |       |       |
| 5   |                    | 0.80                                | -1.70 | 10.00 | -1.70 |       |       |
|     |                    |                                     |       |       |       |       |       |



Soil parameters - effective stress state

| No. | Name                    | Pattern | $\varphi_{ef}$<br>[°] | $c_{ef}$<br>[kPa] | $\gamma$<br>[kN/m <sup>3</sup> ] |
|-----|-------------------------|---------|-----------------------|-------------------|----------------------------------|
| 1   | Nasip                   |         | 30.00                 | 0.00              | 20.00                            |
| 2   | Glinovito-pjekovito tlo |         | 26.00                 | 7.00              | 20.00                            |

Soil parameters - uplift

| No. | Name                    | Pattern | $\gamma_{sat}$<br>[kN/m <sup>3</sup> ] | $\gamma_s$<br>[kN/m <sup>3</sup> ] | $n$<br>[–] |
|-----|-------------------------|---------|----------------------------------------|------------------------------------|------------|
| 1   | Nasip                   |         | 20.50                                  |                                    |            |
| 2   | Glinovito-pjekovito tlo |         | 20.50                                  |                                    |            |

Soil parameters

**Nasip**  
Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
Stress-state : effective  
Shear strength : Mohr-Coulomb  
Angle of internal friction :  $\varphi_{ef} = 30.00^\circ$   
Cohesion of soil :  $c_{ef} = 0.00 \text{ kPa}$   
Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

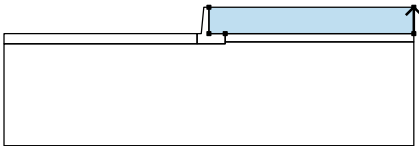
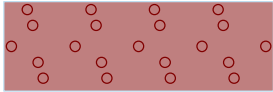
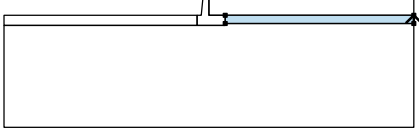
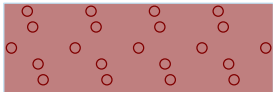
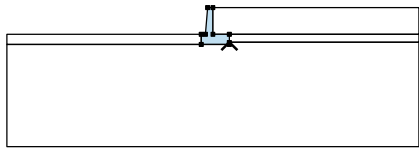
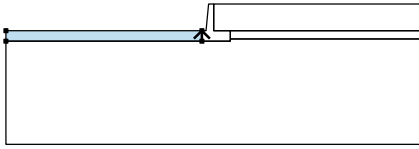
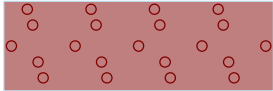
Glinovito-pjekovito tlo

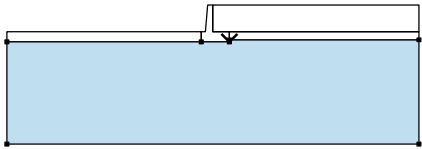
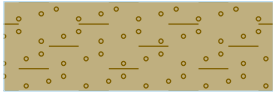
Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
Stress-state : effective  
Shear strength : Mohr-Coulomb  
Angle of internal friction :  $\varphi_{\text{ef}} = 26.00^\circ$   
Cohesion of soil :  $c_{\text{ef}} = 7.00 \text{ kPa}$   
Saturated unit weight :  $\gamma_{\text{sat}} = 20.50 \text{ kN/m}^3$

Rigid Bodies

| No. | Name                  | Sample                                                                             | $\gamma$<br>[kN/m <sup>3</sup> ] |
|-----|-----------------------|------------------------------------------------------------------------------------|----------------------------------|
| 1   | Material of structure |  | 23.00                            |

Assigning and surfaces

| No. | Surface position                                                                    | Coordinates of surface points [m] |       |        |       | Assigned soil                                                                                                  |
|-----|-------------------------------------------------------------------------------------|-----------------------------------|-------|--------|-------|----------------------------------------------------------------------------------------------------------------|
|     |                                                                                     | x                                 | z     | x      | z     |                                                                                                                |
| 1   |   | 10.00                             | -1.30 | 10.00  | 0.00  | Nasip<br>                  |
|     |                                                                                     | 0.00                              | 0.00  | 0.00   | -1.30 |                                                                                                                |
|     |                                                                                     | 0.80                              | -1.30 |        |       |                                                                                                                |
| 2   |  | 10.00                             | -1.70 | 10.00  | -1.30 | Nasip<br>                 |
|     |                                                                                     | 0.80                              | -1.30 | 0.80   | -1.70 |                                                                                                                |
|     |                                                                                     |                                   |       |        |       |                                                                                                                |
| 3   |  | 0.80                              | -1.80 | 0.80   | -1.70 | Material of structure<br> |
|     |                                                                                     | 0.80                              | -1.30 | 0.00   | -1.30 |                                                                                                                |
|     |                                                                                     | 0.00                              | 0.00  | -0.25  | 0.00  |                                                                                                                |
|     |                                                                                     | -0.37                             | -1.30 | -0.57  | -1.30 |                                                                                                                |
|     |                                                                                     | -0.57                             | -1.80 |        |       |                                                                                                                |
| 4   |  | -0.57                             | -1.80 | -0.57  | -1.30 | Nasip<br>                 |
|     |                                                                                     | -10.00                            | -1.30 | -10.00 | -1.80 |                                                                                                                |
|     |                                                                                     |                                   |       |        |       |                                                                                                                |

| No. | Surface position                                                                  | Coordinates of surface points [m] |       |        |       | Assigned soil                                                                                                  |
|-----|-----------------------------------------------------------------------------------|-----------------------------------|-------|--------|-------|----------------------------------------------------------------------------------------------------------------|
|     |                                                                                   | x                                 | z     | x      | z     |                                                                                                                |
| 5   |  | 0.80                              | -1.70 | 0.80   | -1.80 | Glinovito-pjekovito tlo<br> |
|     |                                                                                   | -0.57                             | -1.80 | -10.00 | -1.80 |                                                                                                                |
|     |                                                                                   | -10.00                            | -6.80 | 10.00  | -6.80 |                                                                                                                |
|     |                                                                                   | 10.00                             | -1.70 |        |       |                                                                                                                |

Surcharge

| No. | Type  | Type of action | Location<br>z [m] | Origin<br>x [m] | Length<br>l [m] | Width<br>b [m] | Slope<br>$\alpha$ [°] | Magnitude                   |                    |                   |
|-----|-------|----------------|-------------------|-----------------|-----------------|----------------|-----------------------|-----------------------------|--------------------|-------------------|
|     |       |                |                   |                 |                 |                |                       | q, q <sub>1</sub> , f, F, x | q <sub>2</sub> , z | unit              |
| 1   | strip | variable       | on terrain        | x = 0.60        | l = 4.00        |                | 0.00                  | 16.70                       |                    | kN/m <sup>2</sup> |
| 2   | strip | permanent      | on terrain        | x = -10.00      | l = 9.43        |                | 0.00                  | 0.40                        |                    | kN/m <sup>2</sup> |

Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient :  $K_h = 0.1400$

Vertical seismic coefficient :  $K_v = 0.0200$

Settings of the stage of construction

Design situation : permanent

Results (Construction stage 1)

Analysis 1

Circular slip surface

| Slip surface parameters              |     |           |          |              |            |
|--------------------------------------|-----|-----------|----------|--------------|------------|
| Center :                             | x = | -0.32 [m] | Angles : | $\alpha_1$ = | -38.19 [°] |
|                                      | z = | 1.27 [m]  |          | $\alpha_2$ = | 67.15 [°]  |
| Radius :                             | R = | 3.27 [m]  |          |              |            |
| The slip surface after optimization. |     |           |          |              |            |

Total weight of soil above the slip surface: 109.07 kN/m

Slope stability verification (Bishop)

Sum of active forces :  $F_a = 58.31$  kN/m

Sum of passive forces :  $F_p = 95.11$  kN/m

Sliding moment :  $M_a = 190.66$  kNm/m

Resisting moment :  $M_p = 311.00$  kNm/m

Factor of safety = 1.63 > 1.50

Slope stability **ACCEPTABLE**

## Cantilever wall analysis

### Input data

Date : 3/13/2024

### Settings

Standard - safety factors

### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)

Coefficients EN 1992-1-1 : standard

Circle pile shear : simplified method

### Wall analysis

Verification methodology : Safety factors (ASD)

Active earth pressure calculation : Coulomb

Passive earth pressure calculation : Caquot-Kerisel

Earthquake analysis : Mononobe-Okabe

Shape of earth wedge : Calculate as skew

Base key : The base key is considered as inclined footing bottom

Allowable eccentricity : 0.333

| Safety factors                         |          |      |     |
|----------------------------------------|----------|------|-----|
| Permanent design situation             |          |      |     |
| Safety factor for overturning :        | $SF_o =$ | 1.50 | [-] |
| Safety factor for sliding resistance : | $SF_s =$ | 1.50 | [-] |
| Safety factor for bearing capacity :   | $SF_b =$ | 1.50 | [-] |

### Material of structure

Unit weight  $\gamma = 23.00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

### Concrete: C 20/25

Cylinder compressive strength  $f_{ck} = 20.00 \text{ MPa}$

Tensile strength  $f_{ctm} = 2.20 \text{ MPa}$

Elasticity modulus  $E_{cm} = 30000.00 \text{ MPa}$

### Longitudinal reinforcement: B500B

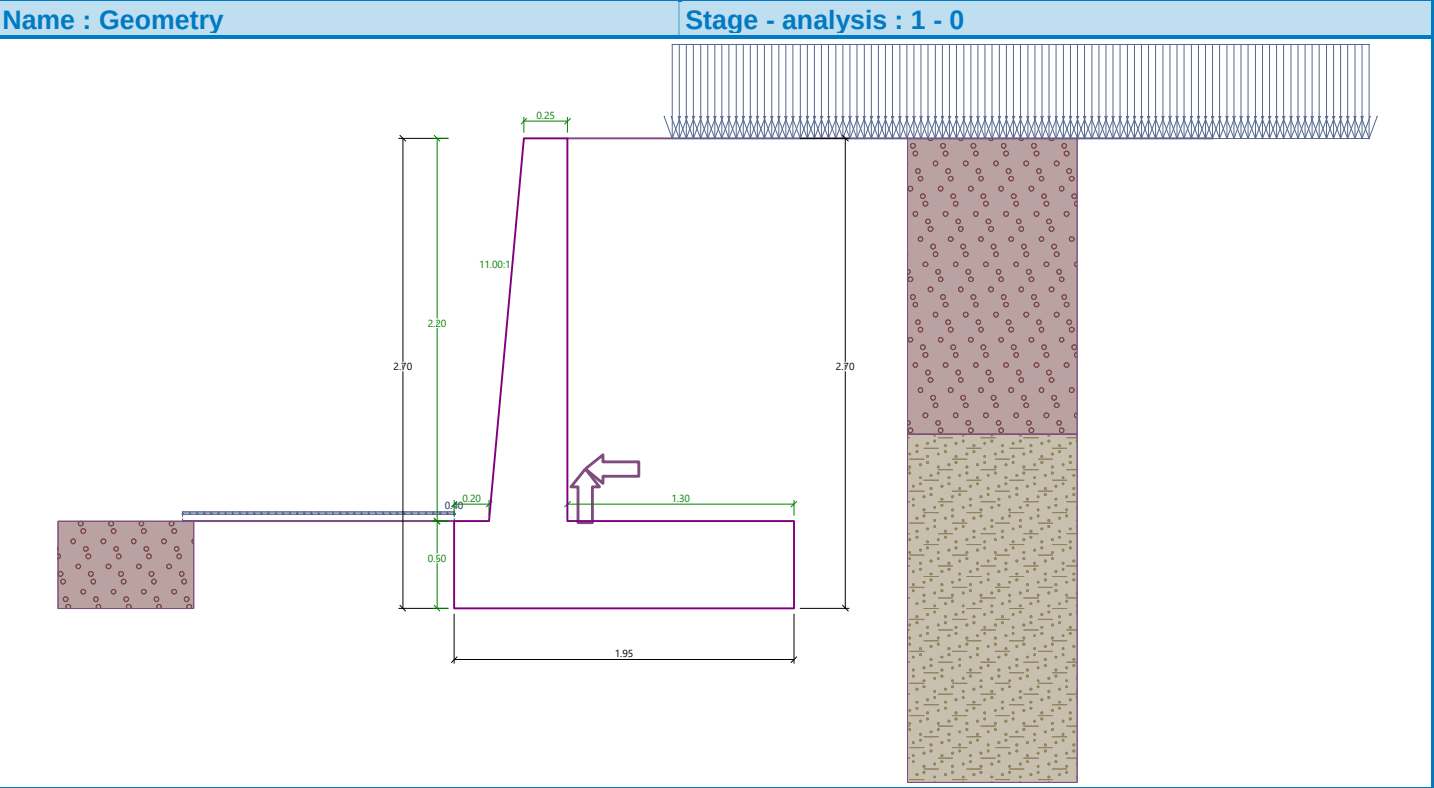
Yield strength  $f_{yk} = 500.00 \text{ MPa}$

### Geometry of structure

| No. | Coordinate<br>X [m] | Depth<br>Z [m] |
|-----|---------------------|----------------|
| 1   | 0.00                | 0.00           |
| 2   | 0.00                | 2.20           |
| 3   | 1.30                | 2.20           |
| 4   | 1.30                | 2.70           |
| 5   | -0.65               | 2.70           |
| 6   | -0.65               | 2.20           |
| 7   | -0.45               | 2.20           |

| No. | Coordinate<br>X [m] | Depth<br>Z [m] |
|-----|---------------------|----------------|
| 8   | -0.25               | 0.00           |

The origin [0,0] is located at the most upper right point of the wall.  
Wall section area = 1.75 m<sup>2</sup>.



Basic soil parameters

| No. | Name                    | Pattern | $\varphi_{ef}$<br>[°] | $c_{ef}$<br>[kPa] | $\gamma$<br>[kN/m <sup>3</sup> ] | $\gamma_{su}$<br>[kN/m <sup>3</sup> ] | $\delta$<br>[°] |
|-----|-------------------------|---------|-----------------------|-------------------|----------------------------------|---------------------------------------|-----------------|
| 1   | Nasip                   |         | 30.00                 | 0.00              | 20.00                            | 10.50                                 | 20.00           |
| 2   | Glinovito-pjekovito tlo |         | 26.00                 | 7.00              | 20.00                            | 10.50                                 | 20.00           |

Soil parameters to compute pressure at rest

| No. | Name                    | Pattern | Type<br>calculation | $\varphi_{ef}$<br>[°] | $\nu$<br>[-] | OCR<br>[-] | $K_r$<br>[-] |
|-----|-------------------------|---------|---------------------|-----------------------|--------------|------------|--------------|
| 1   | Nasip                   |         | cohesionless        | 30.00                 | -            | -          | -            |
| 2   | Glinovito-pjekovito tlo |         | cohesive            | -                     | 0.30         | -          | -            |

Soil parameters

**Nasip**  
Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$

Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 30.00^\circ$   
 Cohesion of soil :  $c_{ef} = 0.00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20.00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

#### Glinovito-pjekovito tlo

Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 26.00^\circ$   
 Cohesion of soil :  $c_{ef} = 7.00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20.00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0.30$   
 Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

#### Geological profile and assigned soils

| No. | Thickness of layer<br>t [m] | Depth<br>z [m] | Assigned soil           | Pattern                                                                               |
|-----|-----------------------------|----------------|-------------------------|---------------------------------------------------------------------------------------|
| 1   | 1.70                        | 0.00 .. 1.70   | Nasip                   |    |
| 2   | -                           | 1.70 .. ∞      | Glinovito-pjekovito tlo |  |

#### Foundation

Type of foundation : soil from geological profile

#### Terrain profile

Terrain behind the structure is flat.

#### Water influence

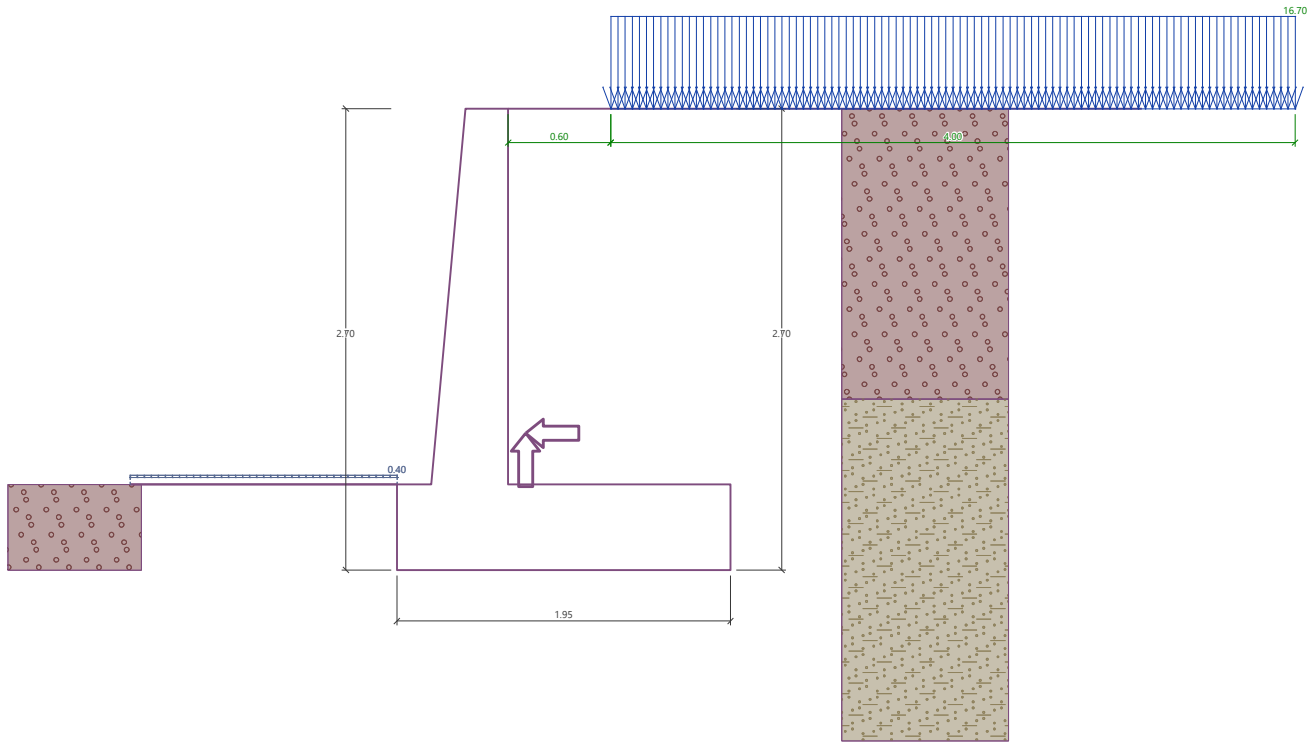
Ground water table is located below the structure.

#### Input surface surcharges

| No. | Surcharge |        | Action   | Mag.1<br>[kN/m <sup>2</sup> ] | Mag.2<br>[kN/m <sup>2</sup> ] | Ord.x<br>x [m] | Length<br>l [m] | Depth<br>z [m] |
|-----|-----------|--------|----------|-------------------------------|-------------------------------|----------------|-----------------|----------------|
|     | new       | change |          |                               |                               |                |                 |                |
| 1   | Yes       |        | variable | 16.70                         |                               | 0.60           | 4.00            | on terrain     |

Name : Surcharge

Stage - analysis : 1 - 0



### Resistance on front face of the structure

Resistance on front face of the structure: at rest

Soil on front face of the structure - Nasip

Soil thickness in front of structure  $h = 0.50$  m

Terrain surcharge  $f = 0.40$  kN/m<sup>2</sup>

Terrain in front of structure is flat.

### Earthquake

Factor of horizontal acceleration  $K_h = 0.1400$

Factor of vertical acceleration  $K_v = 0.0200$

Water below the GWT is restricted.

### Settings of the stage of construction

Design situation : permanent

The wall is free to move. Active earth pressure is therefore assumed.

Reduction of soil/soil friction angle : do not reduce

### Verification No. 1

#### Forces acting on construction

| Name                     | $F_{hor}$<br>[kN/m] | App.Pt.<br>z [m] | $F_{vert}$<br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|--------------------------|---------------------|------------------|----------------------|------------------|-----------------------|
| Weight - wall            | 0.00                | -0.80            | 40.14                | 0.75             | 1.000                 |
| Earthq.- constr.         | 5.62                | -0.80            | -0.80                | 0.75             | 1.000                 |
| FF resistance            | -1.25               | -0.17            | 0.00                 | 0.00             | 1.000                 |
| Resistance on front face | -0.10               | -0.25            | 0.00                 | 0.00             | 1.000                 |
| Weight - earth wedge     | 0.00                | -1.24            | 28.73                | 1.08             | 1.000                 |
| Earthquake - soil wedge  | 4.02                | -1.24            | -0.57                | 1.08             | 1.000                 |

| Name                  | F <sub>hor</sub><br>[kN/m] | App.Pt.<br>z [m] | F <sub>vert</sub><br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|-----------------------|----------------------------|------------------|-----------------------------|------------------|-----------------------|
| Active pressure       | 19.99                      | -1.02            | 27.48                       | 1.52             | 1.000                 |
| Earthq.- act.pressure | 7.92                       | -1.79            | 13.38                       | 1.16             | 1.000                 |
| Surch.1 - strip       | 7.24                       | -0.99            | 8.79                        | 1.46             | 1.000                 |

Verification of complete wall

Check for overturning stability

Resisting moment  $M_{res} = 130.09 \text{ kNm/m}$

Overturning moment  $M_{ovr} = 51.05 \text{ kNm/m}$

Safety factor = 2.55 > 1.50

Wall for overturning is SATISFACTORY

Check for slip

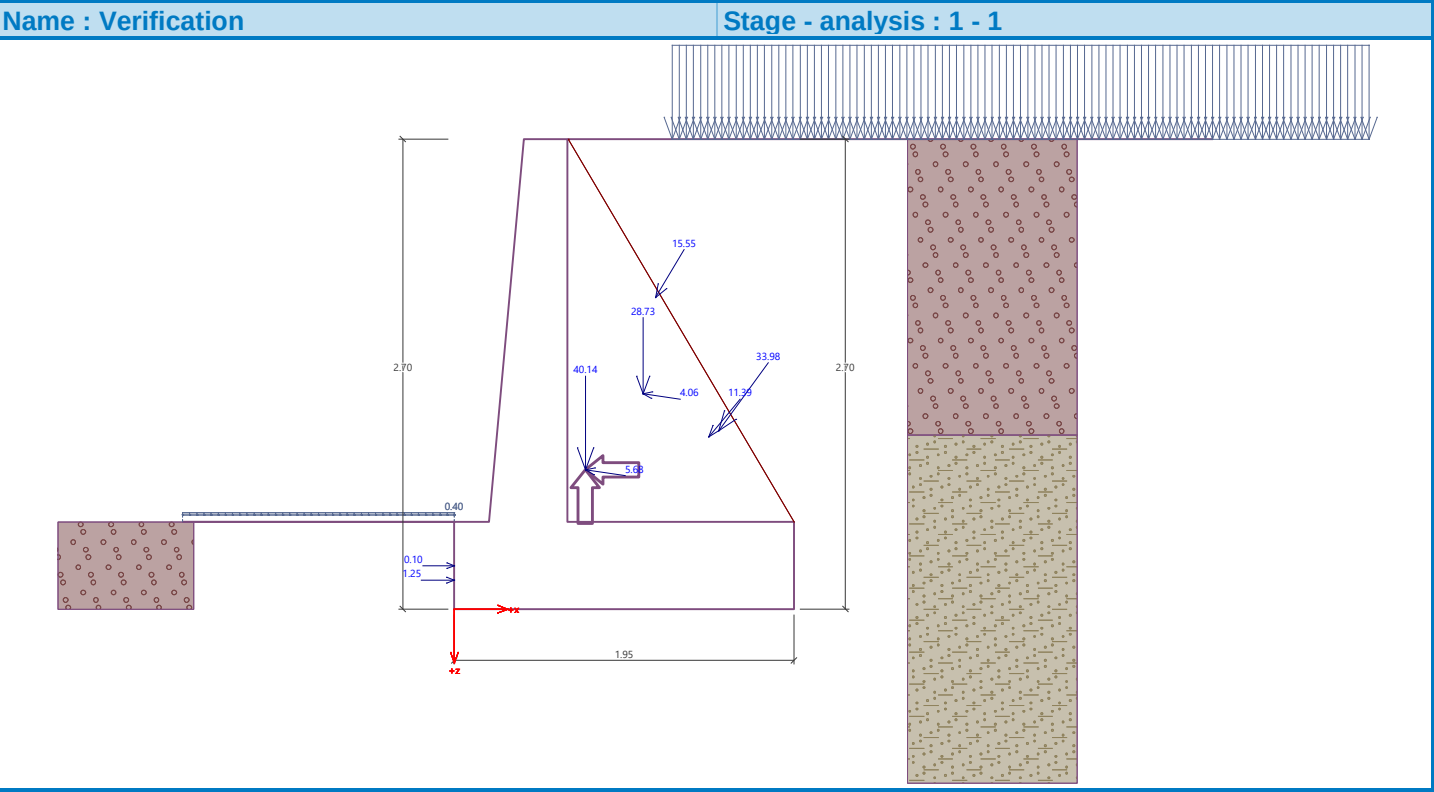
Resisting horizontal force  $H_{res} = 66.58 \text{ kN/m}$

Active horizontal force  $H_{act} = 43.45 \text{ kN/m}$

Safety factor = 1.53 > 1.50

Wall for slip is SATISFACTORY

Overall check - WALL is SATISFACTORY



Bearing capacity of foundation soil

Design load acting at the center of footing bottom

| No. | Moment<br>[kNm/m] | Norm. force<br>[kN/m] | Shear Force<br>[kN/m] | Eccentricity<br>[-] | Stress<br>[kPa] |
|-----|-------------------|-----------------------|-----------------------|---------------------|-----------------|
| 1   | 35.17             | 117.14                | 43.45                 | 0.154               | 86.80           |

Service load acting at the center of footing bottom

| No. | Moment<br>[kNm/m] | Norm. force<br>[kN/m] | Shear Force<br>[kN/m] |
|-----|-------------------|-----------------------|-----------------------|
| 1   | 35.17             | 117.14                | 43.45                 |

Spread footing verification

Input data

Settings

Standard - safety factors

Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard  
Circle pile shear : simplified method

Settlement

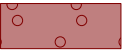
Analysis method : Analysis using oedometric modulus  
Restriction of influence zone : by percentage of Sigma,Or  
Coeff. of restriction of influence zone : 10.0 [%]

Spread Footing

Verification methodology : Safety factors (ASD)  
Analysis for drained conditions : Standard approach  
Analysis of uplift : Standard  
Allowable eccentricity : 0.333

| Safety factors                                |  |                   |          |
|-----------------------------------------------|--|-------------------|----------|
| Permanent design situation                    |  |                   |          |
| Safety factor for vertical bearing capacity : |  | SF <sub>v</sub> = | 1.50 [-] |
| Safety factor for sliding resistance :        |  | SF <sub>h</sub> = | 1.50 [-] |

Basic soil parameters

| No. | Name                    | Pattern                                                                             | Φ <sub>ef</sub><br>[°] | C <sub>ef</sub><br>[kPa] | γ<br>[kN/m³] | γ <sub>su</sub><br>[kN/m³] | δ<br>[°] |
|-----|-------------------------|-------------------------------------------------------------------------------------|------------------------|--------------------------|--------------|----------------------------|----------|
| 1   | Nasip                   |  | 30.00                  | 0.00                     | 20.00        | 10.50                      | 20.00    |
| 2   | Glinovito-pjekovito tlo |  | 26.00                  | 7.00                     | 20.00        | 10.50                      | 20.00    |

Soil parameters to compute pressure at rest

| No. | Name  | Pattern                                                                             | Type<br>calculation | Φ <sub>ef</sub><br>[°] | v<br>[-] | OCR<br>[-] | K <sub>r</sub><br>[-] |
|-----|-------|-------------------------------------------------------------------------------------|---------------------|------------------------|----------|------------|-----------------------|
| 1   | Nasip |  | cohesionless        | 30.00                  | -        | -          | -                     |

| No. | Name                    | Pattern                                                                           | Type calculation | $\varphi_{ef}$<br>[°] | $\nu$<br>[-] | OCR<br>[-] | $K_r$<br>[-] |
|-----|-------------------------|-----------------------------------------------------------------------------------|------------------|-----------------------|--------------|------------|--------------|
| 2   | Glinovito-pjekovito tlo |  | cohesive         | -                     | 0.30         | -          | -            |

### Soil parameters

#### Nasip

Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 30.00^\circ$   
 Cohesion of soil :  $c_{ef} = 0.00 \text{ kPa}$   
 Oedometric modulus :  $E_{oed} = 80.00 \text{ MPa}$   
 Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

#### Glinovito-pjekovito tlo

Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 26.00^\circ$   
 Cohesion of soil :  $c_{ef} = 7.00 \text{ kPa}$   
 Oedometric modulus :  $E_{oed} = 80.00 \text{ MPa}$   
 Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

### Foundation

#### Foundation type: strip footing

Depth from original ground surface  $h_z = 2.70 \text{ m}$   
 Depth of footing bottom  $d = 0.50 \text{ m}$   
 Foundation thickness  $t = 0.50 \text{ m}$   
 Incl. of finished grade  $s_1 = 0.00^\circ$   
 Incl. of footing bottom  $s_2 = 0.00^\circ$

#### Overburden

Type: input unit weight  
 Unit weight of soil above foundation =  $20.00 \text{ kN/m}^3$

### Geometry of structure

#### Foundation type: strip footing

Overall strip footing length =  $10.00 \text{ m}$   
 Strip footing width (x) =  $1.95 \text{ m}$   
 Column width in the direction of x =  $0.10 \text{ m}$

Inserted loading is considered per unit length of continuous footing span.

Volume of strip footing =  $0.98 \text{ m}^3/\text{m}$   
 Volume of excavation =  $0.98 \text{ m}^3/\text{m}$   
 Volume of fill =  $0.00 \text{ m}^3/\text{m}$

### Material of structure

Unit weight  $\gamma = 23.00 \text{ kN/m}^3$   
 Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

#### Concrete: C 20/25

Cylinder compressive strength  $f_{ck} = 20.00 \text{ MPa}$   
 Tensile strength  $f_{ctm} = 2.20 \text{ MPa}$   
 Elasticity modulus  $E_{cm} = 30000.00 \text{ MPa}$

#### Longitudinal reinforcement: B500B

Yield strength  $f_{yk} = 500.00$  MPa

Transverse reinforcement: **B500B**

Yield strength  $f_{yk} = 500.00$  MPa

Geological profile and assigned soils

| No. | Thickness of layer<br>t [m] | Depth<br>z [m] | Assigned soil           | Pattern                                                                             |
|-----|-----------------------------|----------------|-------------------------|-------------------------------------------------------------------------------------|
| 1   | 1.70                        | 0.00 .. 1.70   | Nasip                   |  |
| 2   | -                           | 1.70 .. ∞      | Glinovito-pjekovito tlo |  |

Load

| No. | new | Load<br>change | Name | Type    | N<br>[kN/m] | $M_y$<br>[kNm/m] | $H_x$<br>[kN/m] |
|-----|-----|----------------|------|---------|-------------|------------------|-----------------|
| 1   | Yes |                | LC 1 | Design  | 94.72       | 13.45            | -43.45          |
| 2   | Yes |                | LC 2 | Service | 94.72       | 13.45            | -43.45          |

Global settings

Type of analysis : analysis for drained conditions

Settings of the stage of construction

Design situation : permanent

Verification No. 1

Load case verification

| Name | $e_x$<br>[m] | $e_y$<br>[m] | $\sigma$<br>[kPa] | $R_d$<br>[kPa] | Utilization<br>[%] | Is satisfactory |
|------|--------------|--------------|-------------------|----------------|--------------------|-----------------|
| LC 1 | -0.30        | 0.00         | 86.80             | 160.24         | 81.26              | Yes             |

Analysis carried out with automatic selection of the most unfavourable load cases.

Computed self weight of strip foundation  $G = 22.42$  kN/m

Computed weight of overburden  $Z = 0.00$  kN/m

Vertical bearing capacity check

Shape of contact stress : rectangle

Most unfavorable load case No. 1. (LC 1)

Parameters of slip surface below foundation:

Depth of slip surface  $z_{sp} = 2.71$  m

Length of slip surface  $l_{sp} = 7.69$  m

Design bearing capacity of found. soil  $R_d = 160.24$  kPa

Extreme contact stress  $\sigma = 86.80$  kPa

Factor of safety = 1.85 > 1.50

Bearing capacity in the vertical direction is **SATISFACTORY**

Verification of load eccentricity

Max. eccentricity in direction of base length  $e_x = 0.154 < 0.333$

Max. eccentricity in direction of base width  $e_y = 0.000 < 0.333$

Max. overall eccentricity  $e_t = 0.154 < 0.333$

**Eccentricity of load is SATISFACTORY**

**Horizontal bearing capacity check**

Most unfavorable load case No. 1. (LC 1)

Earth resistance: not considered

Horizontal bearing capacity  $R_{dh} = 66.58 \text{ kN}$

Extreme horizontal force  $H = 43.45 \text{ kN}$

Factor of safety = 1.53 > 1.50

**Bearing capacity in the horizontal direction is SATISFACTORY**

**Bearing capacity of foundation is SATISFACTORY**

**Verification No. 1**

**Settlement and rotation of foundation - input data**

Analysis carried out with automatic selection of the most unfavourable load cases.

Analysis carried out with accounting for coefficient  $\kappa_1$  (influence of foundation depth).

Stress at the footing bottom considered from the finished grade.

Computed self weight of strip foundation  $G = 22.42 \text{ kN/m}$

Computed weight of overburden  $Z = 0.00 \text{ kN/m}$

Settlement of mid point of longitudinal edge = 0.5 mm

Settlement of mid point of transverse edge 1 = 1.3 mm

Settlement of mid point of transverse edge 2 = 0.0 mm

(1-max.compressed edge; 2-min.compressed edge)

**Settlement and rotation of foundation - results**

**Foundation stiffness:**

Computed weighted average modulus of deformation  $E_{def} = 59.43 \text{ MPa}$

Foundation in the longitudinal direction is rigid ( $k=8.51$ )

Foundation in the direction of width is rigid ( $k=63.10$ )

**Verification of load eccentricity**

Max. eccentricity in direction of base length  $e_x = 0.154 < 0.333$

Max. eccentricity in direction of base width  $e_y = 0.000 < 0.333$

Max. overall eccentricity  $e_t = 0.154 < 0.333$

**Eccentricity of load is SATISFACTORY**

**Overall settlement and rotation of foundation:**

Foundation settlement = 0.9 mm

Depth of influence zone = 3.18 m

Rotation in direction of width = 0.660 ( $\tan \cdot 1000$ ); ( $3.8E-02^\circ$ )

**Dimensioning No. 1**

Analysis carried out with automatic selection of the most unfavourable load cases.

**Verification of longitudinal reinforcement of foundation in the direction of x**

5 prof. 14.0 mm, cover 40.0 mm

Cross-section width = 1.00 m

Cross-section depth = 0.50 m

Reinforcement ratio  $\rho = 0.17 \% > 0.13 \% = \rho_{\min}$   
 Position of neutral axis  $x = 0.03 \text{ m} < 0.28 \text{ m} = x_{\max}$   
 Ultimate moment  $M_{Rd} = 147.40 \text{ kNm} > 33.91 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

#### Spread footing for punching shear failure check

Column normal force = 94.72 kN

#### Maximum resistance at the column perimeter

Force transferred into found. soil = 4.86 kN  
 Force transferred by shear strength of foundation = 89.86 kN  
 Considered column perimeter  $u_0 = 2.00 \text{ m}$   
 Shear resistance at the column perimeter  $v_{Ed, \max} = 0.23 \text{ MPa}$   
 Resistance at the column perimeter  $v_{Rd, \max} = 2.94 \text{ MPa}$

#### Critical section without shear reinforcement

Force transferred into found. soil = 48.86 kN  
 Force transferred by shear strength of foundation = 45.85 kN  
 Distance of section from the column = 0.45 m  
 Section perimeter  $u = 2.00 \text{ m}$   
 Shear stress at section  $v_{Ed} = 0.06 \text{ MPa}$   
 Shear resistance of section without shear reinforcement  $v_{Rd, c} = 0.67 \text{ MPa}$

$v_{Ed} < v_{Rd, c} \Rightarrow$  Reinforcement is not required

**Spread footing for punching shear is SATISFACTORY**

#### Dimensioning No. 1

#### Wall stem check - back reinf.

#### Forces acting on construction

| Name                          | $F_{hor}$<br>[kN/m] | App.Pt.<br>z [m] | $F_{vert}$<br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|-------------------------------|---------------------|------------------|----------------------|------------------|-----------------------|
| Weight - wall                 | 0.00                | -0.99            | 17.70                | 0.27             | 1.000                 |
| Earthq.- constr.              | 2.48                | -0.99            | -0.35                | 0.27             | 1.000                 |
| Pressure at rest              | 22.78               | -0.76            | 0.00                 | 0.45             | 1.000                 |
| Earthquake - pressure at rest | 13.27               | -1.10            | 0.00                 | 0.45             | 1.000                 |
| Surch.1 - strip               | 16.51               | -1.05            | 0.00                 | 0.45             | 1.000                 |

#### Wall stem check - back reinf.

Wall check at the construction joint 2.20 m from the wall crest

Reinforcement and dimensions of the cross-section

5 prof. 14.0 mm, cover 40.0 mm

Inputted reinforcement area = 769.7 mm<sup>2</sup>

Required reinforcement area = 523.8 mm<sup>2</sup>

Cross-section width = 1.00 m

Cross-section height = 0.45 m

Reinforcement ratio  $\rho = 0.19 \% > 0.13 \% = \rho_{\min}$

Position of neutral axis  $x = 0.03 \text{ m} < 0.25 \text{ m} = x_{\max}$

Ultimate shear force  $V_{Rd} = 140.34 \text{ kN} > 55.03 \text{ kN} = V_{Ed}$

Ultimate moment  $M_{Rd} = 130.63 \text{ kNm} > 51.05 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

Wall heel check

Forces acting on construction

| Name                 | F <sub>hor</sub><br>[kN/m] | App.Pt.<br>z [m] | F <sub>vert</sub><br>[kN/m] | App.Pt.<br>x [m] | Design<br>coefficient |
|----------------------|----------------------------|------------------|-----------------------------|------------------|-----------------------|
| Weight - wall        | 0.00                       | -0.25            | 14.95                       | 1.30             | 1.000                 |
| Weight - earth wedge | 0.00                       | -1.24            | 28.73                       | 1.08             | 1.000                 |
| Active pressure      | 19.99                      | -1.02            | 27.48                       | 1.52             | 1.000                 |
| Surch.1 - strip      | 7.24                       | -0.99            | 8.79                        | 1.46             | 1.000                 |
| Contact stress       | 0.00                       | 0.00             | -54.04                      | 1.11             | 1.000                 |

Wall heel check

Reinforcement and dimensions of the cross-section

5 prof. 14.0 mm, cover 40.0 mm

Inputted reinforcement area = 769.7 mm<sup>2</sup>

Required reinforcement area = 588.9 mm<sup>2</sup>

Cross-section width = 1.00 m

Cross-section height = 0.50 m

Reinforcement ratio ρ = 0.17 % > 0.13 % = ρ<sub>min</sub>

Position of neutral axis x = 0.03 m < 0.28 m = x<sub>max</sub>

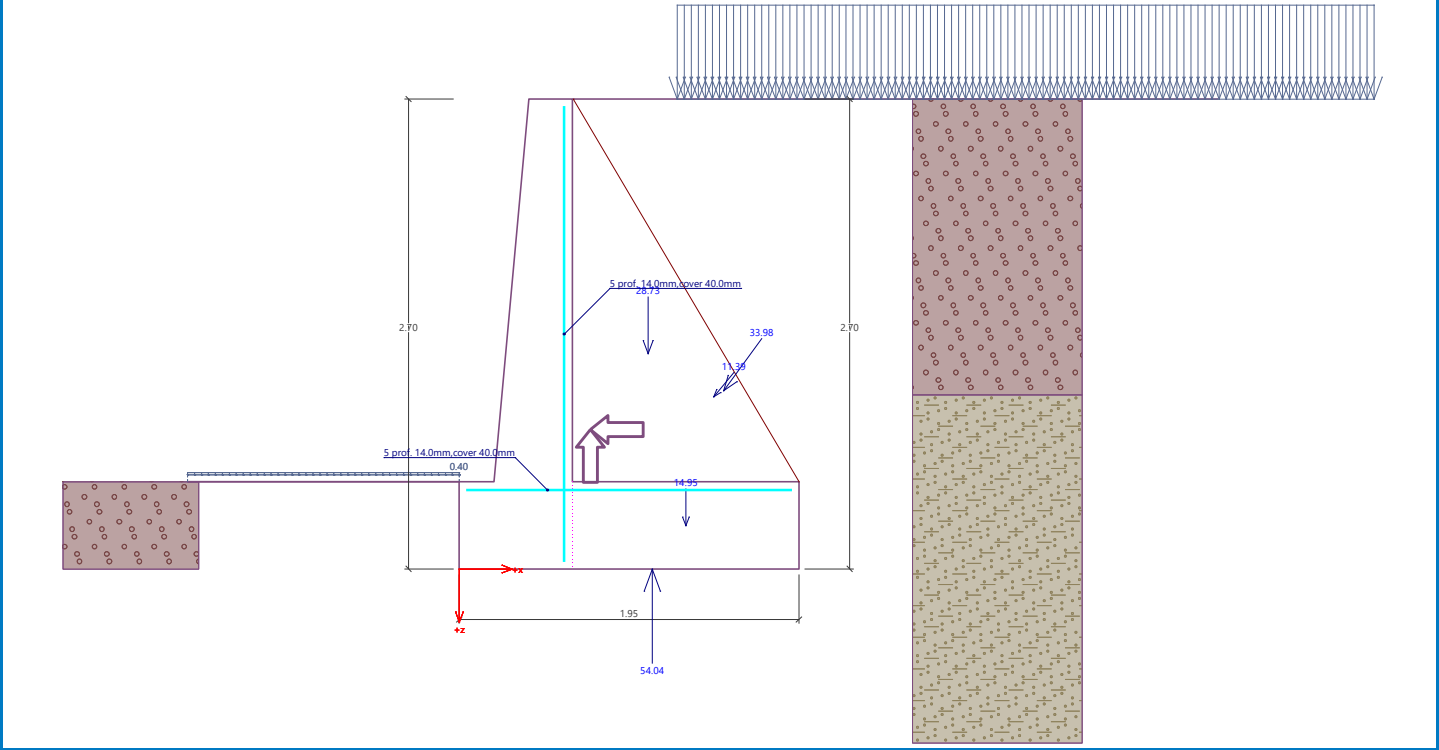
Ultimate shear force V<sub>Rd</sub> = 152.26 kN > 25.91 kN = V<sub>Ed</sub>

Ultimate moment M<sub>Rd</sub> = 147.40 kNm > 51.05 kNm = M<sub>Ed</sub>

Cross-section is **SATISFACTORY**.

Name : Dimensioning

Stage - analysis : 1 - 1



Slope stability analysis

Input data (Construction stage 1)

Project

Settings

Standard - safety factors

Stability analysis

Verification methodology : Safety factors (ASD)

Earthquake analysis : Standard

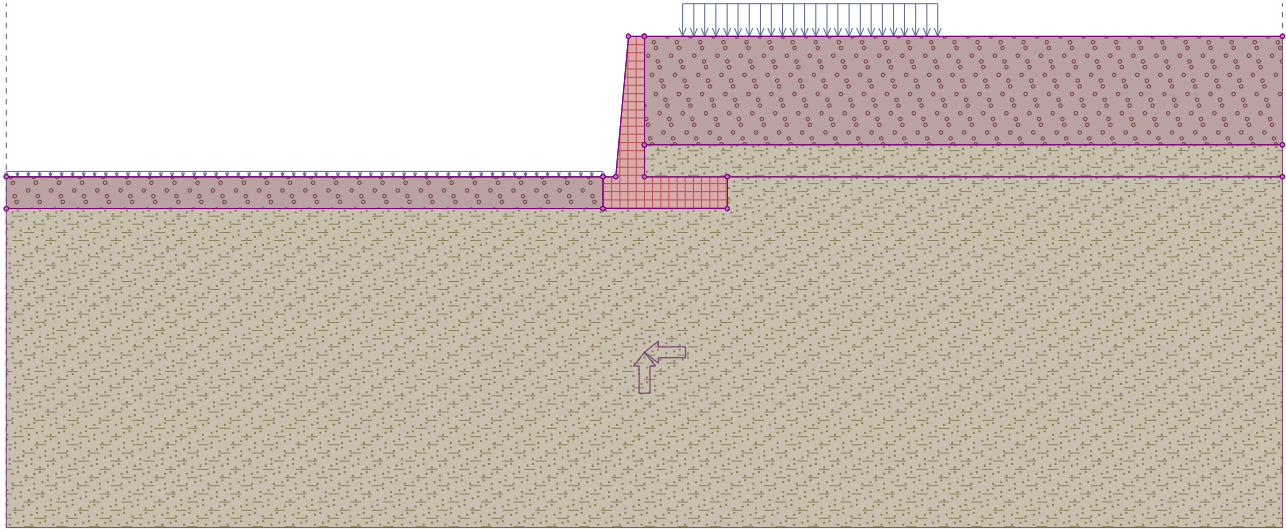
| Safety factors             |                   |          |
|----------------------------|-------------------|----------|
| Permanent design situation |                   |          |
| Safety factor :            | SF <sub>s</sub> = | 1.50 [-] |

Interface

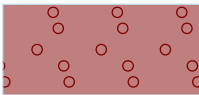
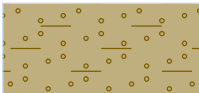
| No. | Interface location | Coordinates of interface points [m] |       |       |       |       |       |
|-----|--------------------|-------------------------------------|-------|-------|-------|-------|-------|
|     |                    | x                                   | z     | x     | z     | x     | z     |
| 1   |                    | 0.00                                | 0.00  | 0.00  | -1.70 | 10.00 | -1.70 |
|     |                    |                                     |       |       |       |       |       |
| 2   |                    | -10.00                              | -2.20 | -0.65 | -2.20 | -0.45 | -2.20 |
|     |                    | -0.25                               | 0.00  | 0.00  | 0.00  | 10.00 | 0.00  |
| 3   |                    | 0.00                                | -1.70 | 0.00  | -2.20 | 1.30  | -2.20 |
|     |                    |                                     |       |       |       |       |       |
| 4   |                    | -10.00                              | -2.70 | -0.65 | -2.70 | -0.65 | -2.20 |
|     |                    |                                     |       |       |       |       |       |
| 5   |                    | -0.65                               | -2.70 | 1.30  | -2.70 | 1.30  | -2.20 |
|     |                    | 10.00                               | -2.20 |       |       |       |       |

Name : Interfaces

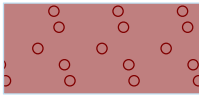
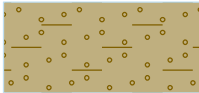
Stage : 1



Soil parameters - effective stress state

| No. | Name                    | Pattern                                                                             | $\varphi_{ef}$<br>[°] | $c_{ef}$<br>[kPa] | $\gamma$<br>[kN/m <sup>3</sup> ] |
|-----|-------------------------|-------------------------------------------------------------------------------------|-----------------------|-------------------|----------------------------------|
| 1   | Nasip                   |   | 30.00                 | 0.00              | 20.00                            |
| 2   | Glinovito-pjekovito tlo |  | 26.00                 | 7.00              | 20.00                            |

Soil parameters - uplift

| No. | Name                    | Pattern                                                                             | $\gamma_{sat}$<br>[kN/m <sup>3</sup> ] | $\gamma_s$<br>[kN/m <sup>3</sup> ] | n<br>[-] |
|-----|-------------------------|-------------------------------------------------------------------------------------|----------------------------------------|------------------------------------|----------|
| 1   | Nasip                   |  | 20.50                                  |                                    |          |
| 2   | Glinovito-pjekovito tlo |  | 20.50                                  |                                    |          |

Soil parameters

Nasip

Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
Stress-state : effective  
Shear strength : Mohr-Coulomb  
Angle of internal friction :  $\varphi_{ef} = 30.00^\circ$   
Cohesion of soil :  $c_{ef} = 0.00 \text{ kPa}$   
Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

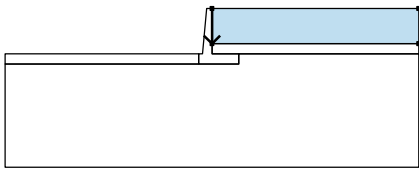
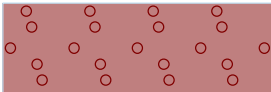
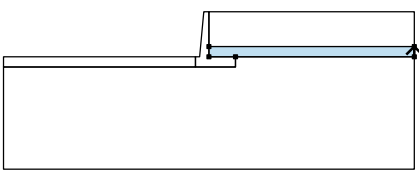
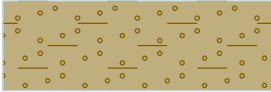
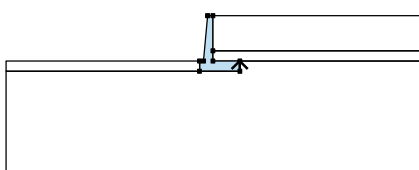
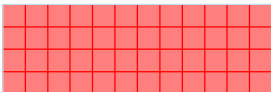
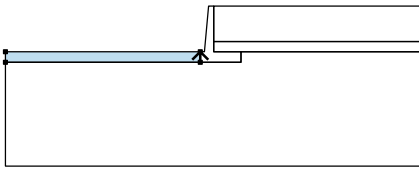
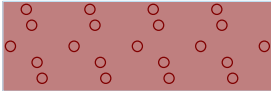
Glinovito-pjekovito tlo

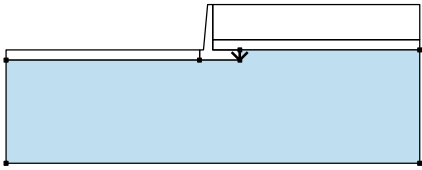
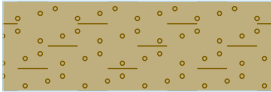
Unit weight :  $\gamma = 20.00 \text{ kN/m}^3$   
Stress-state : effective  
Shear strength : Mohr-Coulomb  
Angle of internal friction :  $\varphi_{ef} = 26.00^\circ$   
Cohesion of soil :  $c_{ef} = 7.00 \text{ kPa}$   
Saturated unit weight :  $\gamma_{sat} = 20.50 \text{ kN/m}^3$

Rigid Bodies

| No. | Name                  | Sample                                                                             | $\gamma$<br>[kN/m <sup>3</sup> ] |
|-----|-----------------------|------------------------------------------------------------------------------------|----------------------------------|
| 1   | Material of structure |  | 23.00                            |

Assigning and surfaces

| No. | Surface position                                                                    | Coordinates of surface points [m] |       |        |       | Assigned soil                                                                                                    |
|-----|-------------------------------------------------------------------------------------|-----------------------------------|-------|--------|-------|------------------------------------------------------------------------------------------------------------------|
|     |                                                                                     | x                                 | z     | x      | z     |                                                                                                                  |
| 1   |   | 0.00                              | 0.00  | 0.00   | -1.70 | Nasip<br>                    |
|     |                                                                                     | 10.00                             | -1.70 | 10.00  | 0.00  |                                                                                                                  |
| 2   |  | 10.00                             | -2.20 | 10.00  | -1.70 | Glinovito-pjekovito tlo<br> |
|     |                                                                                     | 0.00                              | -1.70 | 0.00   | -2.20 |                                                                                                                  |
|     |                                                                                     | 1.30                              | -2.20 |        |       |                                                                                                                  |
| 3   |  | 1.30                              | -2.70 | 1.30   | -2.20 | Material of structure<br>   |
|     |                                                                                     | 0.00                              | -2.20 | 0.00   | -1.70 |                                                                                                                  |
|     |                                                                                     | 0.00                              | 0.00  | -0.25  | 0.00  |                                                                                                                  |
|     |                                                                                     | -0.45                             | -2.20 | -0.65  | -2.20 |                                                                                                                  |
|     |                                                                                     | -0.65                             | -2.70 |        |       |                                                                                                                  |
| 4   |  | -0.65                             | -2.70 | -0.65  | -2.20 | Nasip<br>                   |
|     |                                                                                     | -10.00                            | -2.20 | -10.00 | -2.70 |                                                                                                                  |

| No. | Surface position                                                                  | Coordinates of surface points [m] |       |        |       | Assigned soil                                                                                                  |
|-----|-----------------------------------------------------------------------------------|-----------------------------------|-------|--------|-------|----------------------------------------------------------------------------------------------------------------|
|     |                                                                                   | x                                 | z     | x      | z     |                                                                                                                |
| 5   |  | 1.30                              | -2.20 | 1.30   | -2.70 | Glinovito-pjekovito tlo<br> |
|     |                                                                                   | -0.65                             | -2.70 | -10.00 | -2.70 |                                                                                                                |
|     |                                                                                   | -10.00                            | -7.70 | 10.00  | -7.70 |                                                                                                                |
|     |                                                                                   | 10.00                             | -2.20 |        |       |                                                                                                                |

### Surcharge

| No. | Type  | Type of action | Location<br>z [m] | Origin<br>x [m] | Length<br>l [m] | Width<br>b [m] | Slope<br>$\alpha$ [°] | Magnitude                   |                    |                   |
|-----|-------|----------------|-------------------|-----------------|-----------------|----------------|-----------------------|-----------------------------|--------------------|-------------------|
|     |       |                |                   |                 |                 |                |                       | q, q <sub>1</sub> , f, F, x | q <sub>2</sub> , z | unit              |
| 1   | strip | variable       | on terrain        | x = 0.60        | l = 4.00        |                | 0.00                  | 16.70                       |                    | kN/m <sup>2</sup> |
| 2   | strip | permanent      | on terrain        | x = -10.00      | l = 9.35        |                | 0.00                  | 0.40                        |                    | kN/m <sup>2</sup> |

### Water

Water type : No water

### Tensile crack

Tensile crack not input.

### Earthquake

Horizontal seismic coefficient :  $K_h = 0.1400$

Vertical seismic coefficient :  $K_v = 0.0200$

### Settings of the stage of construction

Design situation : permanent

## Results (Construction stage 1)

### Analysis 1

#### Circular slip surface

| Slip surface parameters              |     |           |          |              |            |
|--------------------------------------|-----|-----------|----------|--------------|------------|
| Center :                             | x = | -0.58 [m] | Angles : | $\alpha_1$ = | -33.79 [°] |
|                                      | z = | 2.03 [m]  |          | $\alpha_2$ = | 66.50 [°]  |
| Radius :                             | R = | 5.09 [m]  |          |              |            |
| The slip surface after optimization. |     |           |          |              |            |

Total weight of soil above the slip surface: 233.40 kN/m

#### Slope stability verification (Bishop)

Sum of active forces :  $F_a = 122.46$  kN/m

Sum of passive forces :  $F_p = 184.48$  kN/m

Sliding moment :  $M_a = 623.30$  kNm/m

Resisting moment :  $M_p = 938.99$  kNm/m

Factor of safety = 1.51 > 1.50

**Slope stability ACCEPTABLE**

## 2.2. Dokaznica mjera

### Zid 1

#### ISKOP I NASIP

| dio | rastojanje<br>(m) | iskop  |             | nasip 1  |             | nasip 2  |             |
|-----|-------------------|--------|-------------|----------|-------------|----------|-------------|
|     |                   | A (m²) | ukupno (m³) | A (m²)   | ukupno (m³) | A (m²)   | ukupno (m³) |
| 1   | 22.09             | 3.90   | 86.15       | 0.47     | 10.38       | 2.26     | 49.92       |
|     |                   | 22.09  |             | 86.15 m³ |             | 10.38 m³ |             |
|     |                   |        |             |          |             | 49.92 m³ |             |

#### BETON

| tip | kampada | visina<br>(m) | dužina<br>(m) | temelj |             | zid      |             | podložni sloj |             |
|-----|---------|---------------|---------------|--------|-------------|----------|-------------|---------------|-------------|
|     |         |               |               | A (m²) | ukupno (m³) | A (m²)   | ukupno (m³) | A (m²)        | ukupno (m³) |
| 1   | 1-5     | 1.70          | 22.100        | 0.80   | 17.68       | 0.55     | 12.16       | 0.21          | 2.21        |
|     |         |               | 22.100        |        |             | 17.68 m³ |             | 12.16 m³      |             |
|     |         |               |               |        |             |          |             | 2.21 m³       |             |

#### BARBAKANE

| tip | kampada | broj | Ld (m) | ukupno (m) |
|-----|---------|------|--------|------------|
| 1   | 1-5     | 11   | 0.37   | 4.07       |
|     |         | 11   |        | 4.07 m     |

## Zid 2

### ISKOP I NASIP

| dio                 | rastojanje<br>(m) | iskop     |             | nasip 1  |             | nasip 2   |             |
|---------------------|-------------------|-----------|-------------|----------|-------------|-----------|-------------|
|                     |                   | A (m²)    | ukupno (m³) | A (m²)   | ukupno (m³) | A (m²)    | ukupno (m³) |
| 1 (5-)              | 9.63              | 3.00      | 28.89       | 0.45     | 4.33        | 1.50      | 14.45       |
| 2 (oko sahta)       | 13.20             | 8.40      | 110.88      | 2.60     | 34.32       | 3.70      | 48.84       |
| 3 (posle 6-prije 7) | 7.82              | 3.00      | 23.46       | 0.45     | 3.52        | 1.50      | 11.73       |
| 4 (7-8)             | 9.40              | 6.90      | 64.86       | 1.20     | 11.28       | 3.90      | 36.66       |
| 5 (8-9)             | 6.60              | 5.80      | 38.28       | 0.30     | 1.98        | 3.95      | 26.07       |
| 6 (9-10)            | 10.70             | 3.00      | 32.10       | 0.45     | 4.82        | 1.50      | 16.05       |
| 7(10-15)            | 8.00              | 2.80      | 22.40       | 0.40     | 3.20        | 1.70      | 13.60       |
| 8 (14-15)           | 8.00              | 3.40      | 27.20       | 0.55     | 4.40        | 1.75      | 14.00       |
| 9 (13-14)           | 10.00             | 3.45      | 34.50       | 0.70     | 7.00        | 1.75      | 17.50       |
| 10(12-13)           | 10.00             | 3.40      | 34.00       | 0.60     | 6.00        | 1.75      | 17.50       |
| 11(11-12)           | 9.00              | 3.50      | 31.50       | 0.60     | 5.40        | 1.75      | 15.75       |
| 102.35              |                   | 448.07 m³ |             | 86.25 m³ |             | 232.15 m³ |             |

### BETON

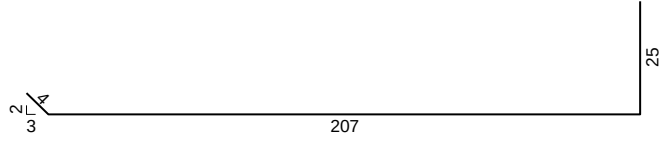
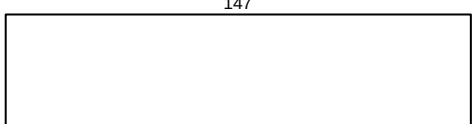
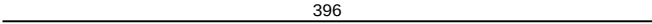
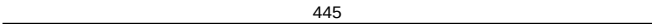
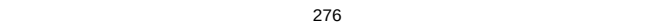
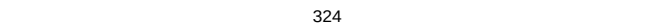
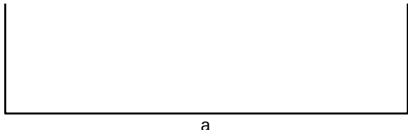
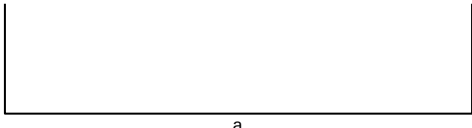
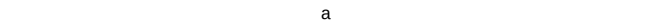
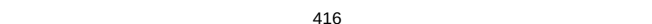
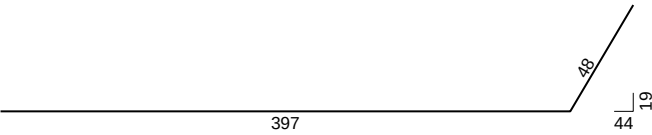
| tip     | kampada       | visina<br>(m) | dužina<br>(m) | temelj   |             | zid      |             | podložni sloj |             |
|---------|---------------|---------------|---------------|----------|-------------|----------|-------------|---------------|-------------|
|         |               |               |               | A (m²)   | ukupno (m³) | A (m²)   | ukupno (m³) | A (m²)        | ukupno (m³) |
| 1       | 1-3,8-9,14-27 | 1.30          | 73.500        | 0.70     | 51.45       | 0.42     | 30.87       | 0.18          | 13.23       |
| 2       | 4-7           | 1.42          | 12.500        | 0.60     | 7.50        | 0.45     | 5.63        | 0.16          | 2.00        |
| 3       | 10-13         | 2.20          | 16.000        | 0.97     | 15.52       | 0.77     | 12.32       | 0.24          | 3.76        |
| 102.000 |               |               |               | 74.47 m³ |             | 48.82 m³ |             | 18.99         |             |

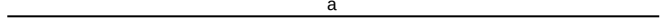
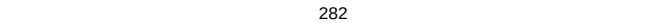
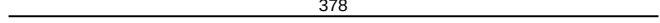
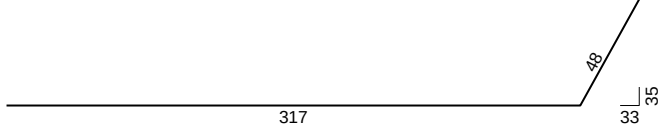
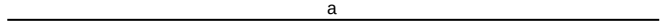
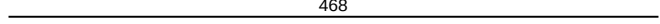
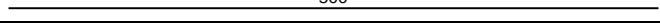
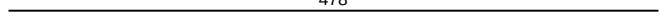
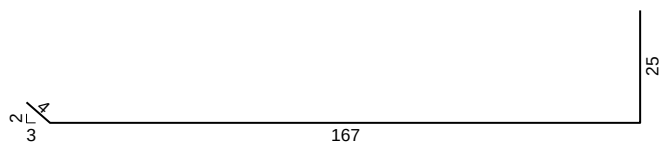
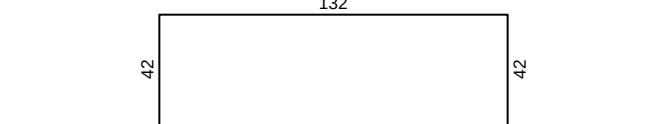
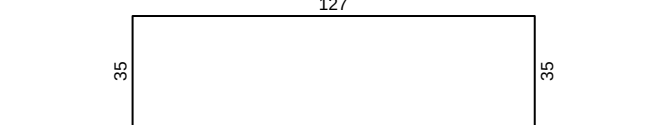
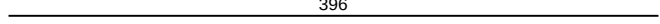
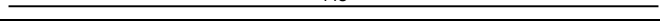
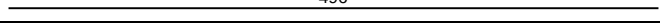
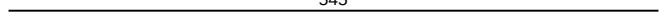
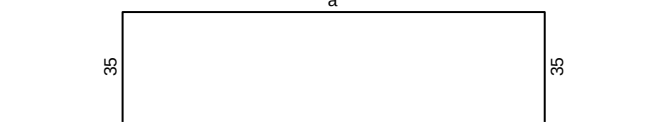
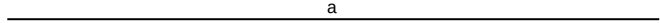
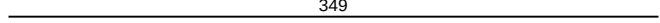
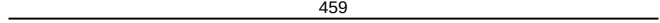
### BARBAKANE

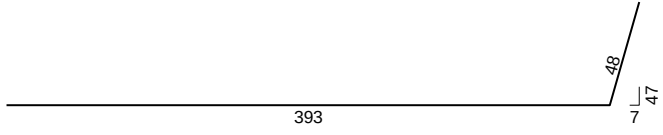
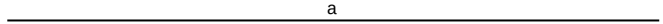
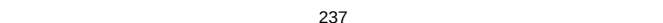
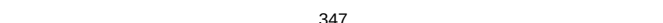
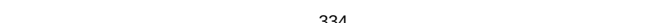
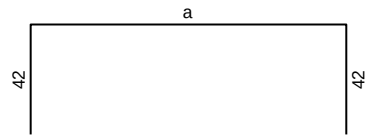
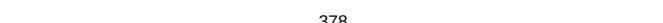
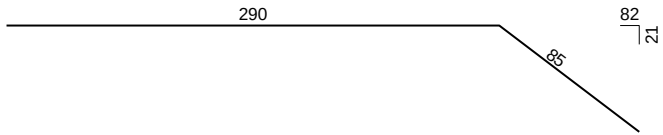
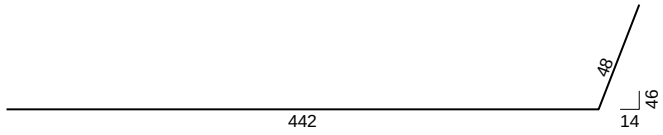
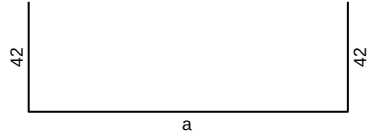
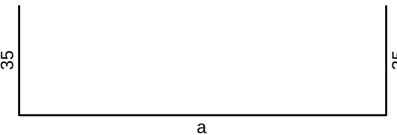
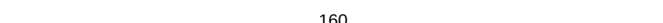
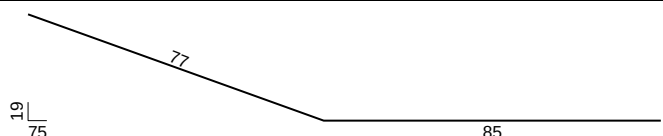
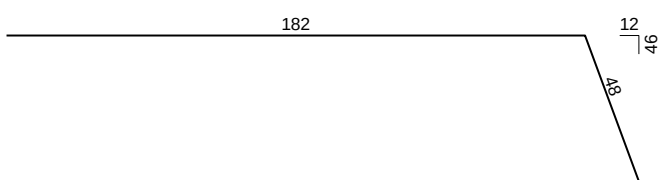
| tip | kampada       | broj | Ld (m) | ukupno (m) |
|-----|---------------|------|--------|------------|
| 1   | 1-3,8-9,14-27 | 37   | 0.37   | 13.69      |
| 2   | 4-7           | 7    | 0.36   | 2.52       |

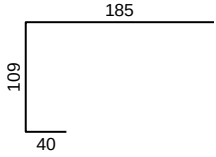
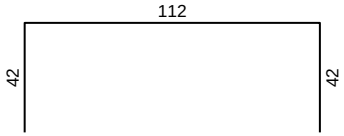
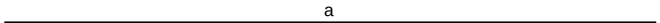
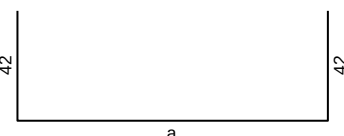
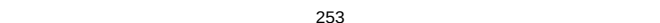
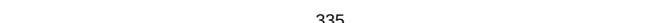
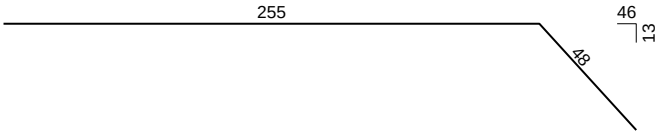
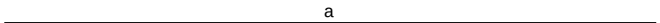
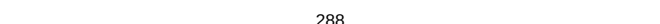
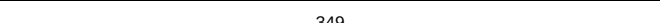
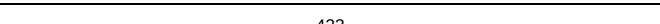
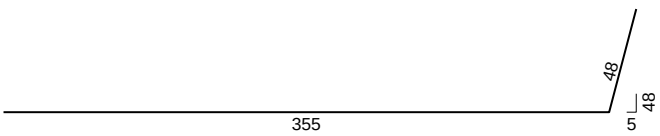
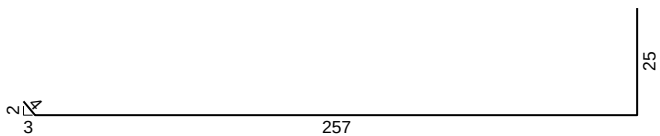
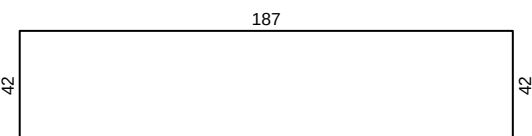
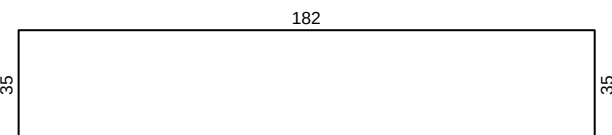
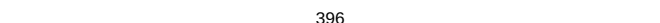
|    |       |   |         |      |
|----|-------|---|---------|------|
| 3  | 10-13 | 8 | 0.42    | 3.36 |
| 52 |       |   | 19.57 m |      |

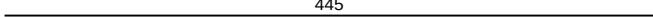
$\text{m}^3$

| Šipke - specifikacija |                                                                                                                                |    |           |            |            |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------|----|-----------|------------|------------|
| ozn.                  | oblik i mere<br>[cm]                                                                                                           | Ø  | lg<br>[m] | n<br>[kom] | lgn<br>[m] |
| ZID 1 (1 kom)         |                                                                                                                                |    |           |            |            |
| 1                     |                                               | 14 | 2.36      | 110        | 259.60     |
| 2                     |                                               | 14 | 2.36      | 96         | 226.56     |
| 3                     |                                               | 14 | 2.17      | 96         | 208.32     |
| 4                     |                                               | 10 | 3.96      | 16         | 63.36      |
| 5                     |                                               | 10 | 4.45      | 7          | 31.15      |
| 6                     |                                               | 10 | 2.76      | 16         | 44.16      |
| 7                     |                                               | 10 | 3.24      | 7          | 22.68      |
| 8                     | <br>4 x :<br>1. a = 154, 153, 152            | 14 | *2.37     | 4 x 3      | 28.44      |
| 9                     | <br>4 x :<br>1. a = 149, 147, 147           | 14 | *2.18     | 4 x 3      | 26.12      |
| 10                    | <br>2 x :<br>a = 416 - 385 da = -5.2        | 10 | *4.00     | 2 x 7      | 56.04      |
| 11                    |                                             | 10 | 3.85      | 1          | 3.85       |
| 12                    |                                             | 10 | 4.16      | 1          | 4.16       |
| 13                    |                                             | 10 | 4.45      | 7          | 31.15      |
| 14                    | <br>2 x :<br>1. a = 162, 158, 155, 153, 152 | 14 | *2.40     | 2 x 5      | 24.00      |
| 15                    | <br>2 x :<br>1. a = 157, 153, 149, 148, 147 | 14 | *2.21     | 2 x 5      | 22.08      |

| Šipke - specifikacija |                                                                                                                                |    |           |            |            |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------|----|-----------|------------|------------|
| ozn.                  | oblik i mere<br>[cm]                                                                                                           | Ø  | lg<br>[m] | n<br>[kom] | lgn<br>[m] |
| 16                    | <br>4 x :<br>a = 378 - 282 da = -16.1         | 10 | *3.30     | 4 x 7      | 92.40      |
| 17                    | <br>282                                       | 10 | 2.82      | 2          | 5.64       |
| 18                    | <br>378                                       | 10 | 3.78      | 2          | 7.56       |
| 19                    | <br>317                                       | 10 | 3.65      | 14         | 51.10      |
| 20                    | <br>2 x :<br>a = 468 - 500 da = 5.2           | 10 | *4.84     | 2 x 7      | 67.74      |
| 21                    | <br>468                                       | 10 | 4.68      | 1          | 4.68       |
| 22                    | <br>500                                       | 10 | 5.00      | 1          | 5.00       |
| 23                    | <br>478                                       | 10 | 4.78      | 7          | 33.46      |
| ZID 2 (1 kom)         |                                                                                                                                |    |           |            |            |
| 1                     | <br>167                                       | 14 | 1.96      | 370        | 725.20     |
| 2                     | <br>132                                      | 14 | 2.16      | 335        | 723.60     |
| 3                     | <br>127                                     | 14 | 1.97      | 335        | 659.95     |
| 4                     | <br>396                                     | 10 | 3.96      | 196        | 776.16     |
| 5                     | <br>445                                     | 10 | 4.45      | 84         | 373.80     |
| 6                     | <br>496                                     | 10 | 4.96      | 14         | 69.44      |
| 7                     | <br>545                                     | 10 | 5.45      | 6          | 32.70      |
| 8                     | <br>2 x :<br>1. a = 162, 147, 138, 134, 132 | 14 | *2.27     | 2 x 5      | 22.66      |
| 9                     | <br>2 x :<br>1. a = 155, 142, 133, 129, 127 | 14 | *2.07     | 2 x 5      | 20.72      |
| 10                    | <br>2 x :<br>a = 459 - 349 da = -21.9       | 10 | *4.04     | 2 x 6      | 48.48      |
| 11                    | <br>349                                     | 10 | 3.49      | 1          | 3.49       |
| 12                    | <br>459                                     | 10 | 4.59      | 1          | 4.59       |

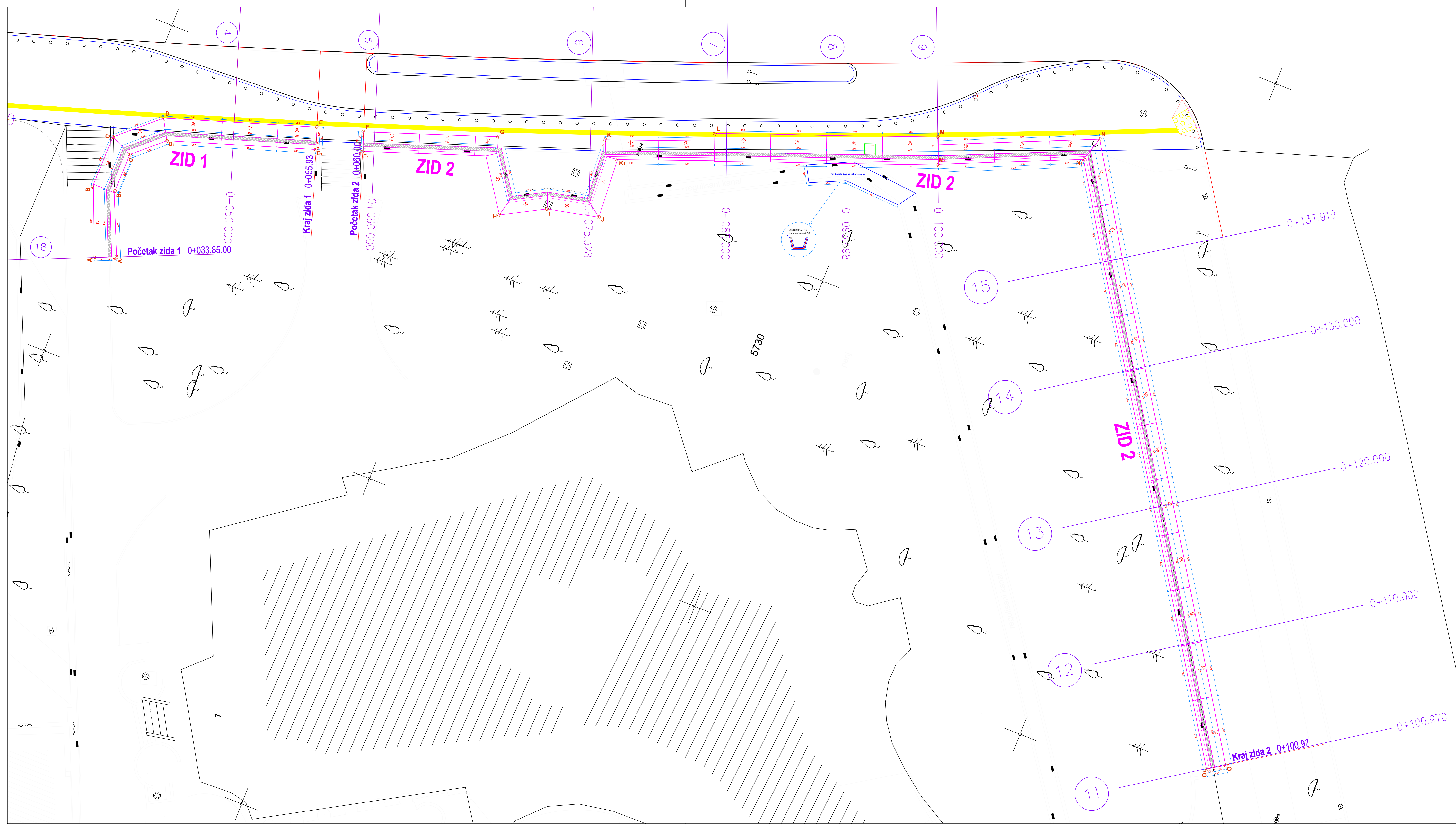
| Šipke - specifikacija |                                                                                                                        |    |           |            |            |
|-----------------------|------------------------------------------------------------------------------------------------------------------------|----|-----------|------------|------------|
| ozn.                  | oblik i mere<br>[cm]                                                                                                   | Ø  | lg<br>[m] | n<br>[kom] | lgn<br>[m] |
| 13                    |                                       | 10 | 4.41      | 6          | 26.46      |
| 14                    | <br>2 x :<br>a = 347 - 237 da = -21.9 | 10 | *2.92     | 2 x 6      | 35.04      |
| 15                    |                                       | 10 | 2.37      | 1          | 2.37       |
| 16                    |                                       | 10 | 3.47      | 1          | 3.47       |
| 17                    |                                       | 10 | 3.34      | 6          | 20.04      |
| 18                    | <br>1. a = 127 - 112 da = -5.2        | 14 | *2.04     | 1 x 4      | 8.14       |
| 19                    | <br>1. a = 122 - 107 da = -5.2        | 14 | *1.84     | 1 x 4      | 7.38       |
| 20                    |                                       | 10 | 3.78      | 11         | 41.58      |
| 21                    |                                      | 10 | 3.75      | 3          | 11.25      |
| 22                    |                                     | 10 | 4.90      | 6          | 29.40      |
| 23                    | <br>1. a = 112 - 130 da = 4.7       | 14 | *2.05     | 1 x 5      | 10.25      |
| 24                    | <br>1. a = 106 - 125 da = 4.7       | 14 | *1.86     | 1 x 5      | 9.29       |
| 25                    |                                     | 10 | 1.60      | 11         | 17.60      |
| 26                    |                                     | 10 | 1.62      | 3          | 4.86       |
| 27                    |                                     | 10 | 2.30      | 6          | 13.80      |

| Šipke - specifikacija |                                                                                                                              |    |        |         |         |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------|----|--------|---------|---------|
| ozn.                  | oblik i mere [cm]                                                                                                            | Ø  | lg [m] | n [kom] | lgn [m] |
| 31                    |                                             | 14 | 3.34   | 64      | 213.76  |
| 32                    |                                             | 14 | 1.96   | 56      | 109.76  |
| 33                    | <br>2 x :<br>a = 253 - 335 da = 20.5        | 10 | *2.94  | 2 x 5   | 29.38   |
| 34                    | <br>4 x :<br>1. a = 137, 125, 117, 113, 112 | 14 | *2.05  | 4 x 5   | 40.96   |
| 35                    |                                             | 10 | 2.53   | 1       | 2.53    |
| 36                    |                                             | 10 | 3.35   | 1       | 3.35    |
| 37                    |                                            | 10 | 3.03   | 6       | 18.18   |
| 38                    | <br>2 x :<br>a = 288 - 366 da = 19.3      | 10 | *3.27  | 2 x 5   | 32.70   |
| 39                    |                                           | 10 | 2.88   | 7       | 20.16   |
| 40                    |                                           | 10 | 3.66   | 1       | 3.66    |
| 41                    | <br>4 x :<br>a = 424, 405, 386, 367, 348  | 10 | *3.86  | 4 x 5   | 77.20   |
| 42                    |                                           | 10 | 3.49   | 2       | 6.98    |
| 43                    |                                           | 10 | 4.23   | 2       | 8.46    |
| 44                    |                                           | 10 | 4.03   | 12      | 48.36   |
| 51                    |                                           | 14 | 2.86   | 80      | 228.80  |
| 52                    |                                           | 14 | 2.71   | 80      | 216.80  |
| 53                    |                                           | 14 | 2.52   | 80      | 201.60  |
| 54                    |                                           | 10 | 3.96   | 81      | 320.76  |

| Šipke - specifikacija |                                                                                       |    |           |            |            |
|-----------------------|---------------------------------------------------------------------------------------|----|-----------|------------|------------|
| ozn.                  | oblik i mere<br>[cm]                                                                  | Ø  | lg<br>[m] | n<br>[kom] | lgn<br>[m] |
| 55                    |  445 | 10 | 4.45      | 27         | 120.15     |

| Šipke - rekapitulacija |            |                             |                |
|------------------------|------------|-----------------------------|----------------|
| Ø<br>[mm]              | lgn<br>[m] | Jedinična težina<br>[kg/m'] | Težina<br>[kg] |
| RA1                    |            |                             |                |
| 10                     | 2730.53    | 0.65                        | 1772.11        |
| 14                     | 3993.99    | 1.25                        | 5000.48        |
| Ukupno                 |            |                             | 6772.59        |

### **3. GRAFIČKA DOKUMENTACIJA**

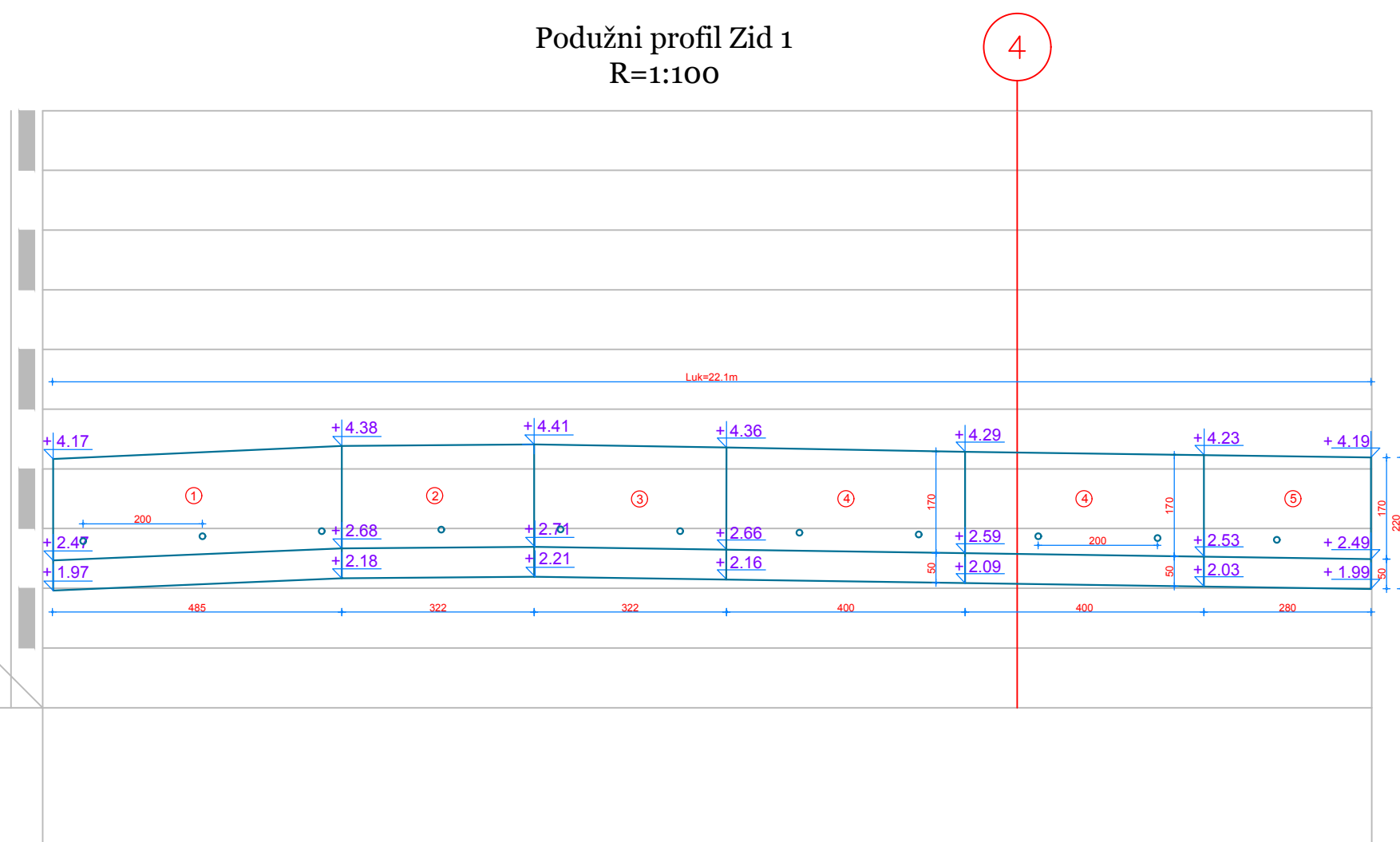


| KOORDINATE KARAKTERISTIČNIH<br>TAČKA |                |                 |    |                |                |
|--------------------------------------|----------------|-----------------|----|----------------|----------------|
| <b>ZID 1</b>                         |                |                 |    |                |                |
| A                                    | X=6590807.5188 | Y= 4662424.1071 | A1 | X=6590808.1399 | Y=4662422.6379 |
| B                                    | X=6590812.1673 | Y=4662426.0724  | B1 | X=6590812.4830 | Y=4662424.4625 |
| C                                    | X=6590816.0319 | Y=4662426.0194  | C1 | X=6590815.3085 | Y=4662424.4292 |
| D                                    | X=6590818.5815 | Y=4662423.1231  | D1 | X=6590817.1645 | Y=4662422.3089 |
| E                                    | X=6590822.0286 | Y=4662412.6769  | E1 | X=6590820.5078 | Y=4662412.1775 |
| <b>ZID 2</b>                         |                |                 |    |                |                |
| G                                    | X=6590822.9326 | Y=4662409.4584  | F1 | X=6590821.6116 | Y=4662408.9948 |
| H                                    | X=6590826.1242 | Y=4662400.3654  | K1 | X=6590827.7298 | Y=4662391.8338 |
| I                                    | X=6590820.9583 | Y=4662398.2504  | M1 | X=6590835.7542 | Y=4662370.3295 |
| J                                    | X=6590822.9587 | Y=4662395.2247  | N1 | X=6590839.9354 | Y=4662360.8135 |
| K                                    | X=6590823.3937 | Y=4662391.5654  | O1 | X=6590802.5571 | Y=4662336.6755 |
| L                                    | X=6590828.2728 | Y=4662393.1513  |    |                |                |
| M                                    | X=6590832.0117 | Y=4662386.0379  |    |                |                |
| N                                    | X=6590837.6157 | Y=4662371.0643  |    |                |                |
| O                                    | X=6590841.6946 | Y=4662360.2708  |    |                |                |
| X                                    | X=6590803.3181 | Y=4662335.5000  |    |                |                |

Situacija  
R=1:100



|                                                                                                                                                                                                                                               |  |                                                                                 |                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------|----------------------------------------------------------|
| PROJEKTANT:<br>                                                                                                                                          |  | INVESTITOR:<br>SEKRETARUJAT ZA IMOVINU, ZAŠTAPUNJE I<br>INVESTICIJU OPŠTINE BAR |                                                          |
| Objekt:<br>Pitačka staza i takvi stajalište sa pratećom infrastrukturom na dijelu<br>Ulice Jovana Tomasevića između nasrtenica sa Bulevatom<br>revolucije i Ulicom Maršala Tita<br>Glavni interjer:<br>dr. Biljana Ivanović, dipl. inž. grad. |  | Lokacija:<br>Kat. parcele broj 5730 i 6458/1 KO Novi Bar                        |                                                          |
| Osposobiti i nadzorovati:<br>dr. Zvonko Tomasević, dipl. inž. grad.                                                                                                                                                                           |  | Vrsta tehničke dokumentacije:<br>Glavni projekat                                |                                                          |
| Saradnik:<br>Katarina Vučinić, spec. sci. grad.                                                                                                                                                                                               |  | Dio tehničke dokumentacije:<br>Osnovni projekat potpornog zida                  |                                                          |
| Datum izrade (M.P.):                                                                                                                                                                                                                          |  | Privlog: Situacija                                                              | RAZMJERA:<br>1:100<br>Br. priloga: 3.1<br>Br. strane: 63 |
| Mart. 2024.                                                                                                                                                                                                                                   |  | Datum revizije (M.P.):                                                          |                                                          |

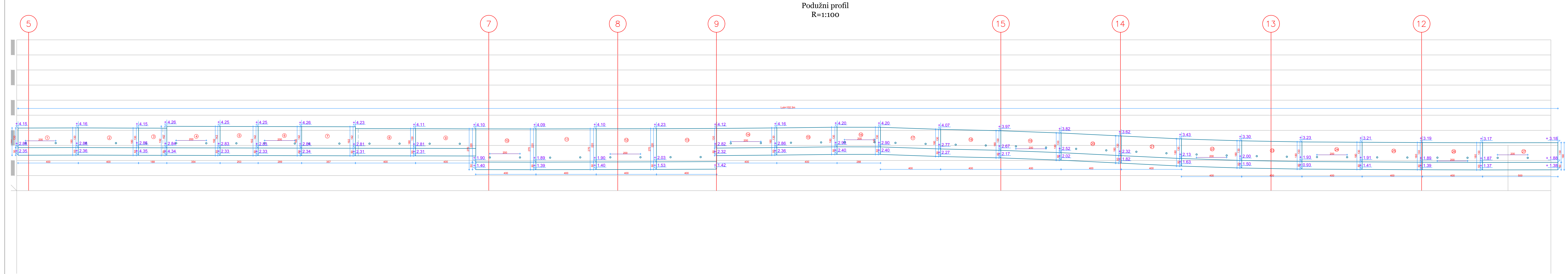


Podužni profil  
Zid 1  
R=1:100



|                                                                                                                                                                                  |                                                                                       |                                                                                 |                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------|
| PROJEKTANT:<br>                                                                             |                                                                                       | INVESTITOR:<br>SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br>INVESTICIJU OPŠTINE BAR |                                    |
| Objekt:<br>Pješačka staza i taksi stajalište sa pratećom infrastrukturom na dijelu<br>Ulice Jovana Tomaševića između raskrsnica sa Bulevarom<br>revolucije i Ulicom Maršala Tita |                                                                                       | Lokacija:<br>Kat. parcele broj 5730 i 6458/1 KO Novi Bar                        |                                    |
| Glavni inženjer:<br>dr Biljana Ivanović, dipl.inž.građ.                                                                                                                          |  | Vrsta tehničke dokumentacije:<br>Glavni projekat                                |                                    |
| Odgovorni inženjer:<br>dr Zvonko Tomanović, dipl.inž.građ.                                                                                                                       |  | Dio tehničke dokumentacije:<br>Građevinski projekat potpornog zida              | RAZMJERA:<br>1:100                 |
| Saradnik:<br>Katarina Vučinić, spec.sci.građ.                                                                                                                                    |                                                                                       | Prilog:<br>Podužni profil - Zid 1                                               | Br. priloga: 3.2<br>Br. strane: 64 |
| Datum izrade i M.P.:<br><br>Mart, 2024.                                                                                                                                          |                                                                                       | Datum revizije i M.P.:                                                          |                                    |

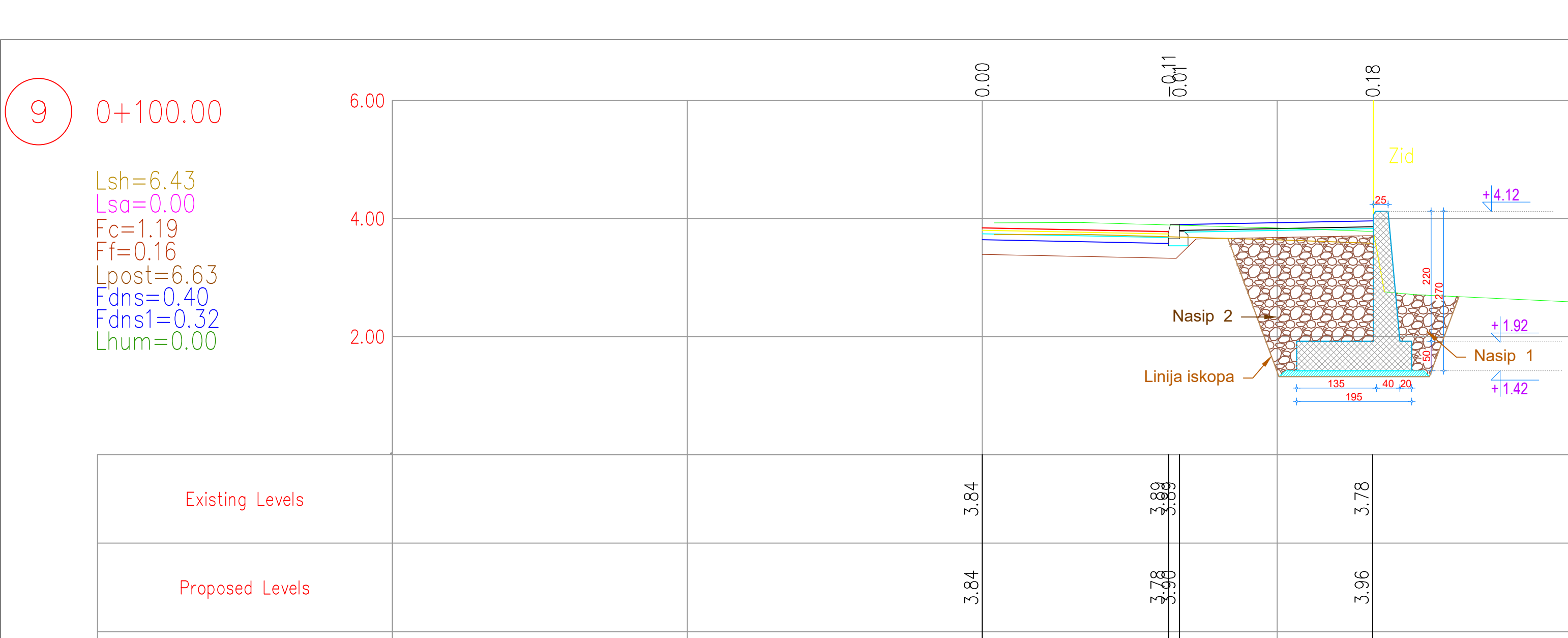
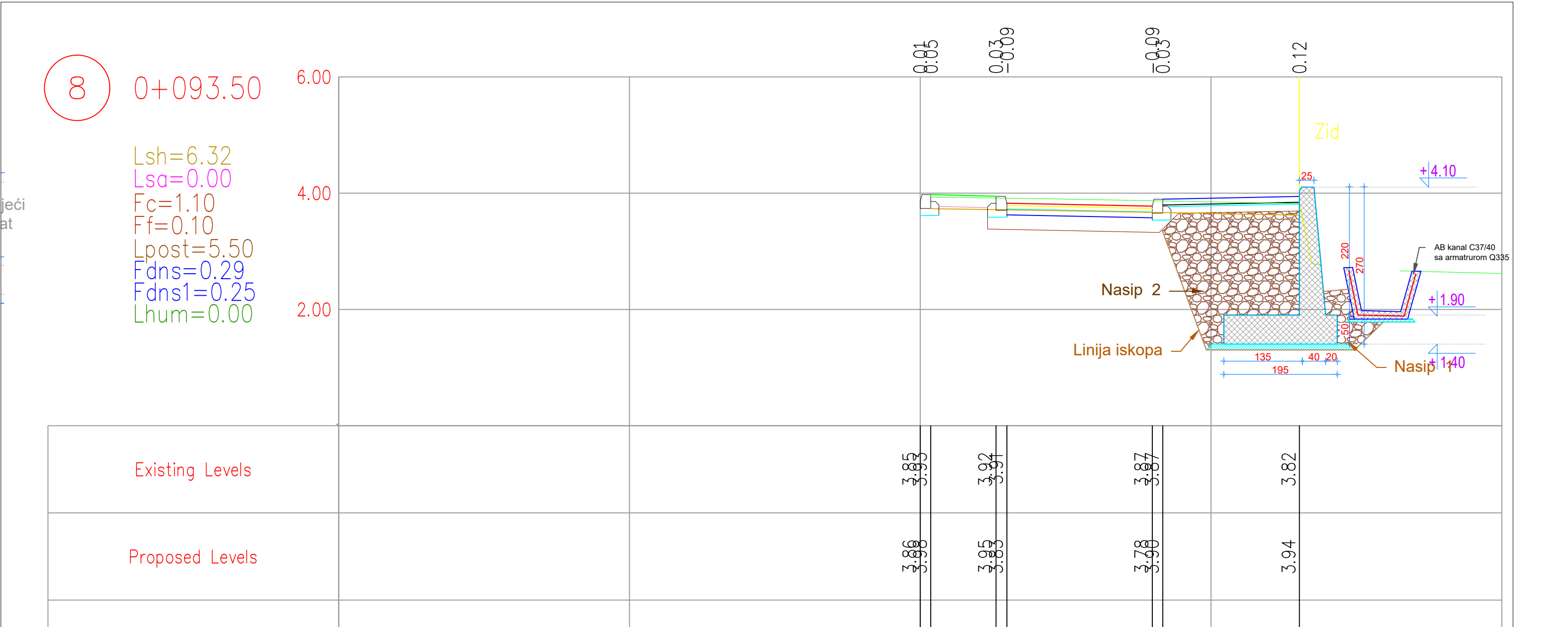
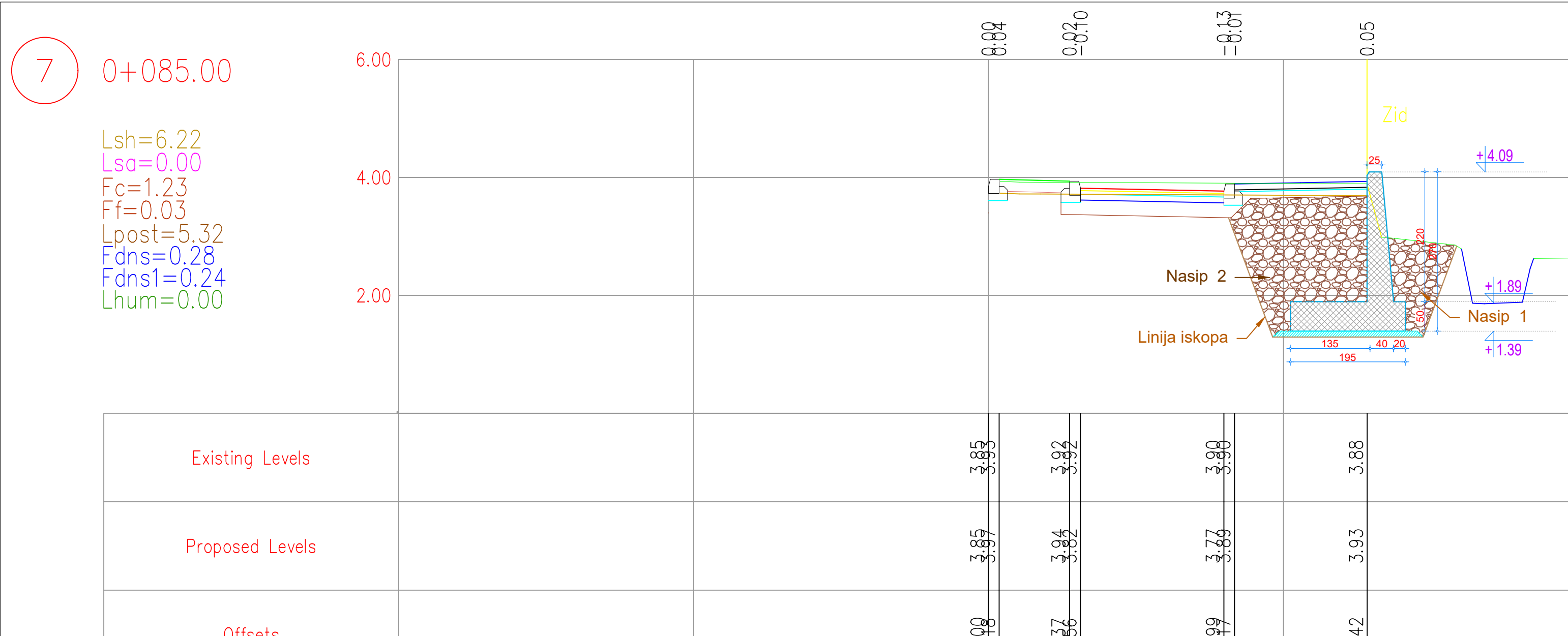
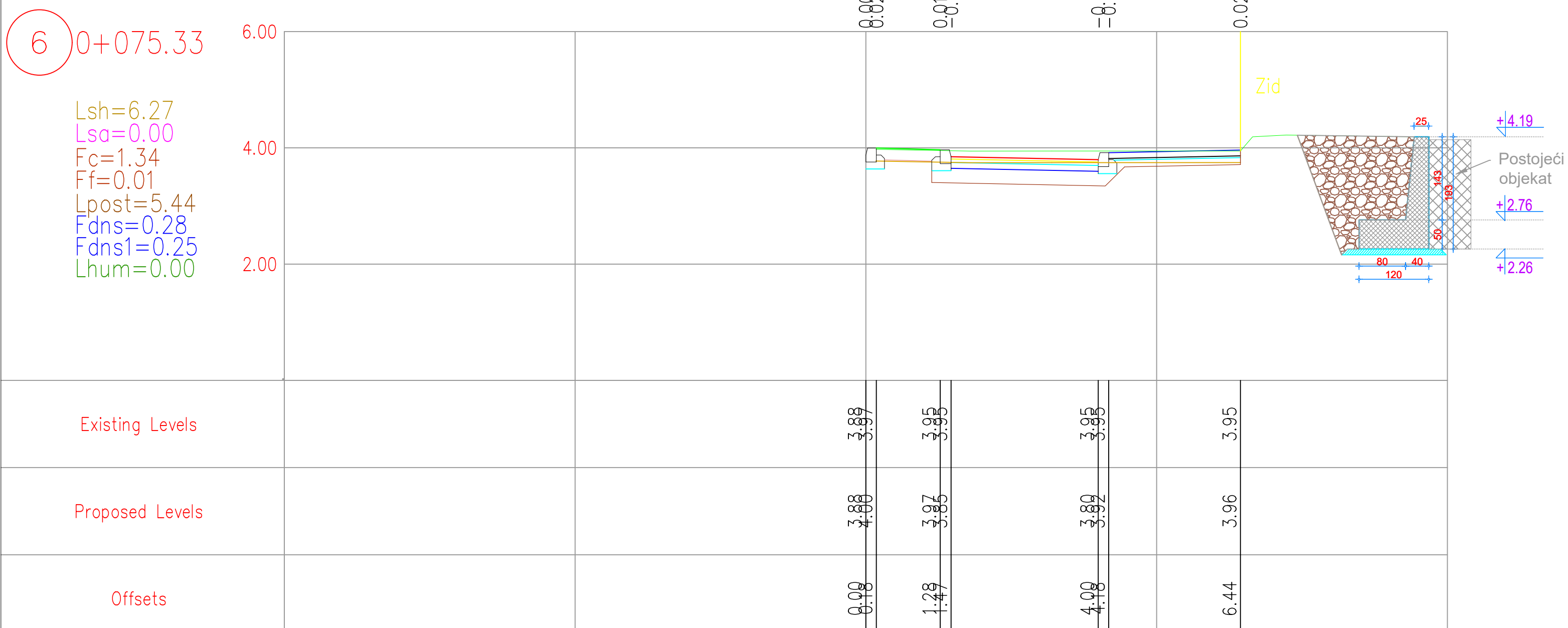




Podužni profil  
Zid 2  
R=1:100



|                                                                                                                                                                                    |  |                                                                                 |                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------|--------------------|
| PROJEKTANT:<br>                                                                                                                                                                    |  | INVESTITOR:<br>SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br>INVESTICIJU OPŠTINE BAR |                    |
| Objekat:<br>Pješačka staza i taksij stajalište sa pratećom infrastrukturom na dijelu<br>Ulice Jovana Tomaševića između raskrsnica sa Bulevarom<br>revolucije i Ulicom Maršala Tita |  | Lokacija:<br>Kat. parcele broj 5730 i 6458/1 KO Novi Bar                        |                    |
| Glavni inženjer:<br>dr Biljana Ivanović, dipl.inž.građ.                                                                                                                            |  | Vrsta tehničke dokumentacije:<br>Glavni projekat                                |                    |
| Odgovorni inženjer:<br>dr Zvonko Tomanović, dipl.inž.građ.                                                                                                                         |  | Dio tehničke dokumentacije:<br>Građevinski projekat potpornog zida              | RAZMJERA:<br>1:100 |
| Saradnik:<br>Katarina Vučinić, spec.sci.građ.                                                                                                                                      |  | Prilog:<br>Podužni profil - Zid 2                                               | Br. strane:<br>66  |
| Datum izrade i M.P.:<br><br>Mart, 2024.                                                                                                                                            |  | Datum revizije i M.P.:<br><br>                                                  |                    |



Poprečni presjeci 5-9

Zid 2

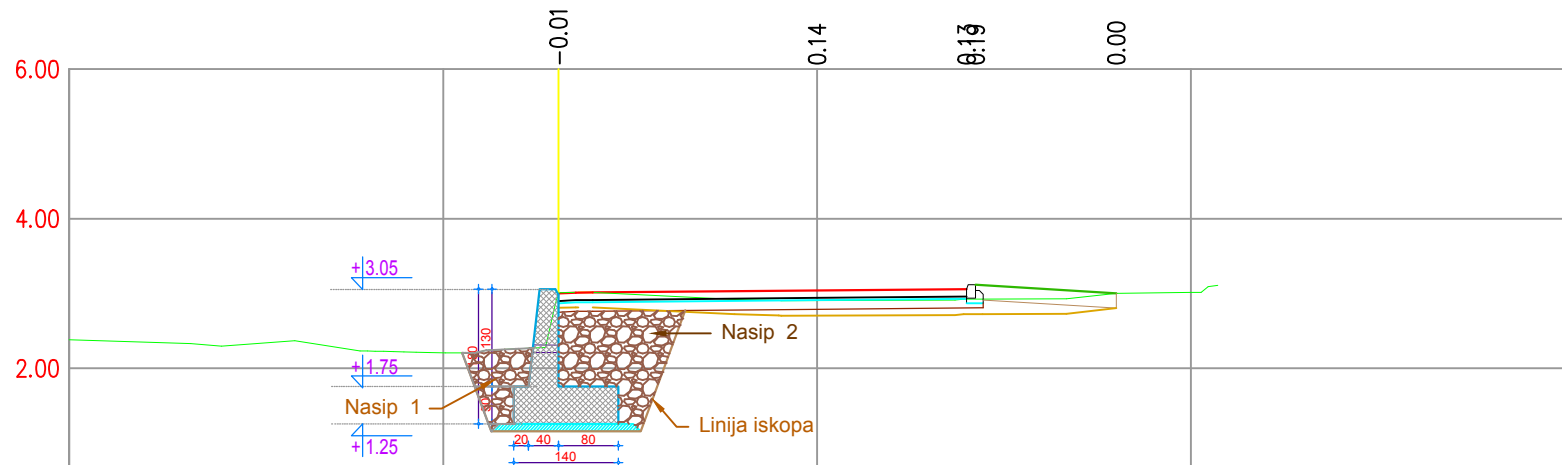
R=1:100



|                                                                                                                                                                                             |             |                                                                                          |                               |                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------|-------------------------------|----------------------------|
| PROJEKTANT: <div><div>GEOT</div><div>PROF. DR. TOMANOVIĆ</div></div>                                                                                                                        |             | INVESTITOR: <div>SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br/>INVESTICIJU OPŠTINE BAR</div> |                               |                            |
| Objekat: <div>Pješačka staza i taksi stajalište sa pratećom infrastrukturom na dijelu<br/>Ulice Jovana Tomaševića između raskrsnica sa Bulevarom<br/>revolucije i Ulicom Maršala Tita</div> |             | Lokacija: <div>Kat. parcele broj 5730 i 6458/1 KO Novi Bar</div>                         |                               |                            |
| Glavni inženjer: <div>dr Biljana Ivanović, dipl.inž.grad.</div>                                                                                                                             | <div></div> | Vrsta tehničke dokumentacije: <div>Glavni projekat</div>                                 |                               |                            |
| Odgovorni inženjer: <div>dr Zvonko Tomanović, dipl.inž.grad.</div>                                                                                                                          | <div></div> | Dio tehničke dokumentacije: <div>Građevinski projekat potpornog zida</div>               |                               | RAZMJERA: <div>1:100</div> |
| Saradnik: <div>Katarina Vučinić, spec.sci.grad.</div>                                                                                                                                       |             | Prilog: <div>Poprečni profil 5-9</div>                                                   | Br. priloga: <div>3.5.1</div> | Br. strane: <div>67</div>  |
| Datum izrade i M.P.: <div>Mart, 2024.</div>                                                                                                                                                 |             | Datum revizije i M.P.: <div></div>                                                       |                               |                            |

11 0+100.97

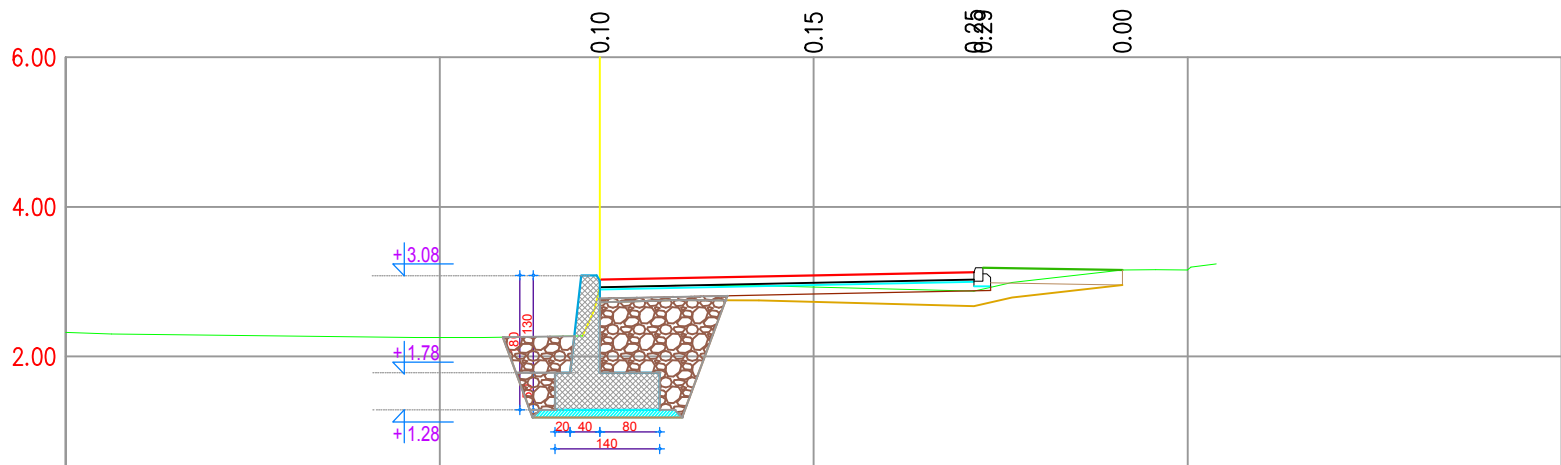
Lsh=7.27  
Fc=0.04  
Ff=0.52  
Lpost=5.68  
Fdns=0.65  
Lhum=1.78



|                 |  |       |      |      |      |
|-----------------|--|-------|------|------|------|
| Existing Levels |  | 3.01  | 2.90 | 2.92 | 3.00 |
| Proposed Levels |  | 3.00  | 3.04 | 3.06 | 3.00 |
| Offsets         |  | -3.46 | 0.00 | 2.09 | 4.00 |

12 0+110.00

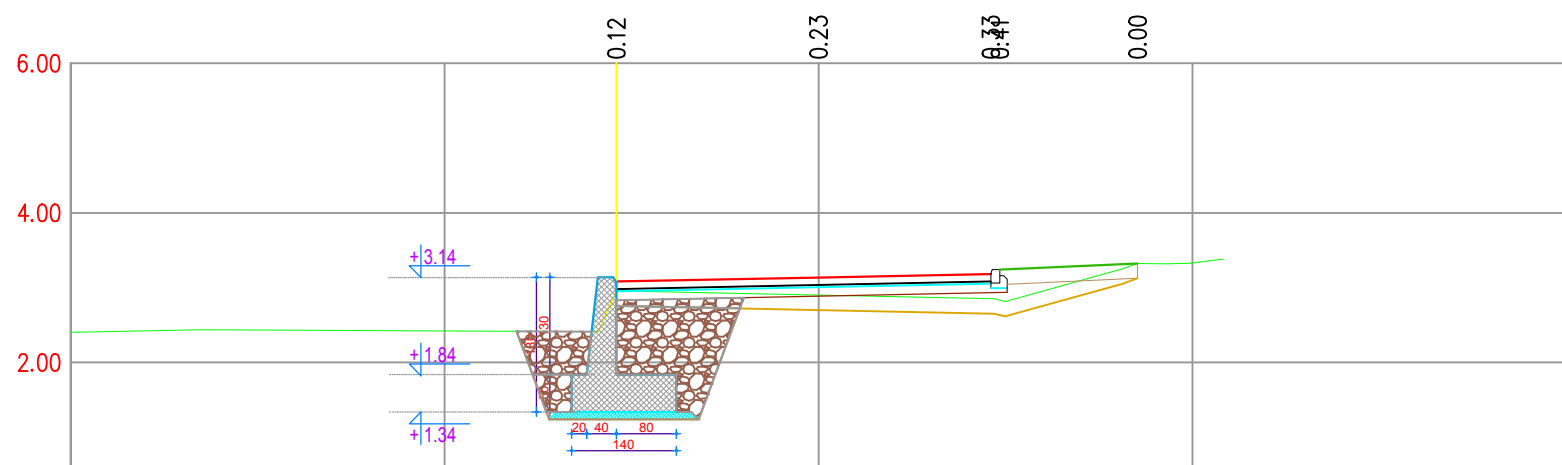
Lsh=6.99  
Fc=0.00  
Ff=0.75  
Lpost=5.22  
Fdns=0.60  
Lhum=1.76



|                 |  |       |      |      |      |
|-----------------|--|-------|------|------|------|
| Existing Levels |  | 2.93  | 2.93 | 2.95 | 3.16 |
| Proposed Levels |  | 3.03  | 3.08 | 3.13 | 3.16 |
| Offsets         |  | -2.86 | 0.00 | 2.14 | 4.13 |

13 0+120.00

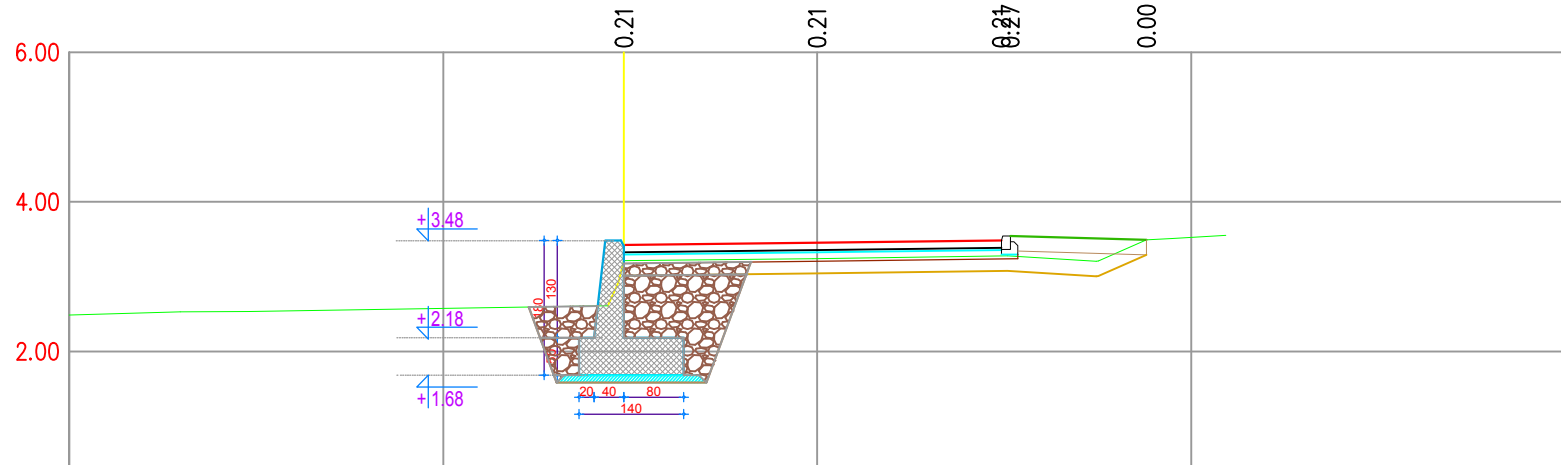
Lsh=6.97  
Fc=0.00  
Ff=1.32  
Lpost=5.23  
Fdns=0.60  
Lhum=1.74



|                 |  |       |      |      |      |
|-----------------|--|-------|------|------|------|
| Existing Levels |  | 2.96  | 2.90 | 2.85 | 3.32 |
| Proposed Levels |  | 3.08  | 3.14 | 3.18 | 3.32 |
| Offsets         |  | -2.70 | 0.00 | 2.42 | 4.27 |

14 0+130.00

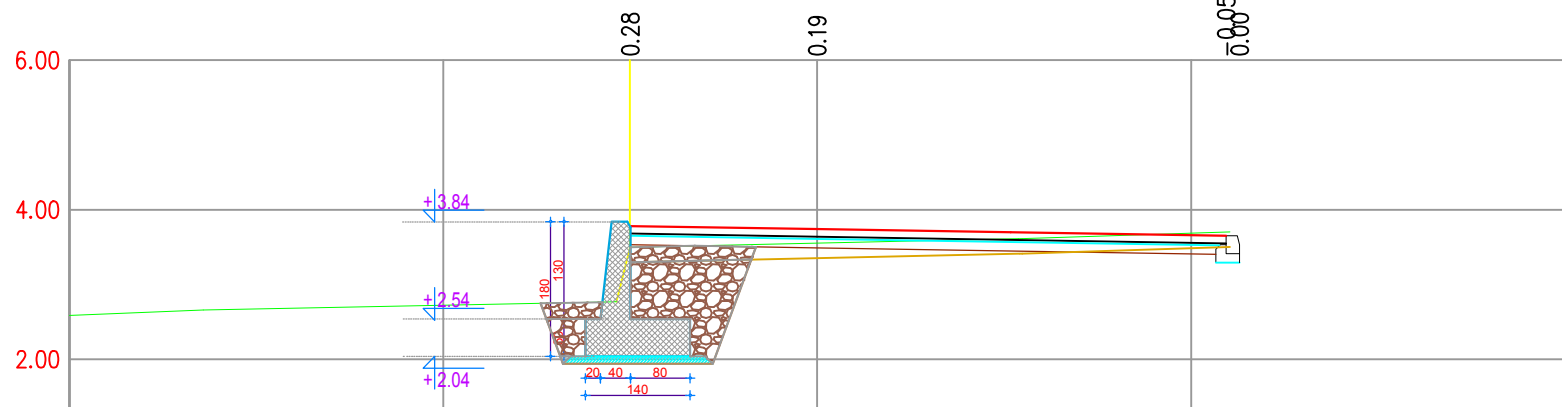
Lsh=6.99  
Fc=0.00  
Ff=1.26  
Lpost=5.27  
Fdns=0.61  
Lhum=1.72



|                 |  |       |      |      |      |
|-----------------|--|-------|------|------|------|
| Existing Levels |  | 3.21  | 3.24 | 3.28 | 3.49 |
| Proposed Levels |  | 3.42  | 3.46 | 3.48 | 3.49 |
| Offsets         |  | -2.58 | 0.00 | 2.46 | 4.40 |

15 0+137.92

Lsh=8.01  
Fc=0.09  
Ff=0.71  
Lpost=7.83  
Fdns=0.94  
Lhum=0.00



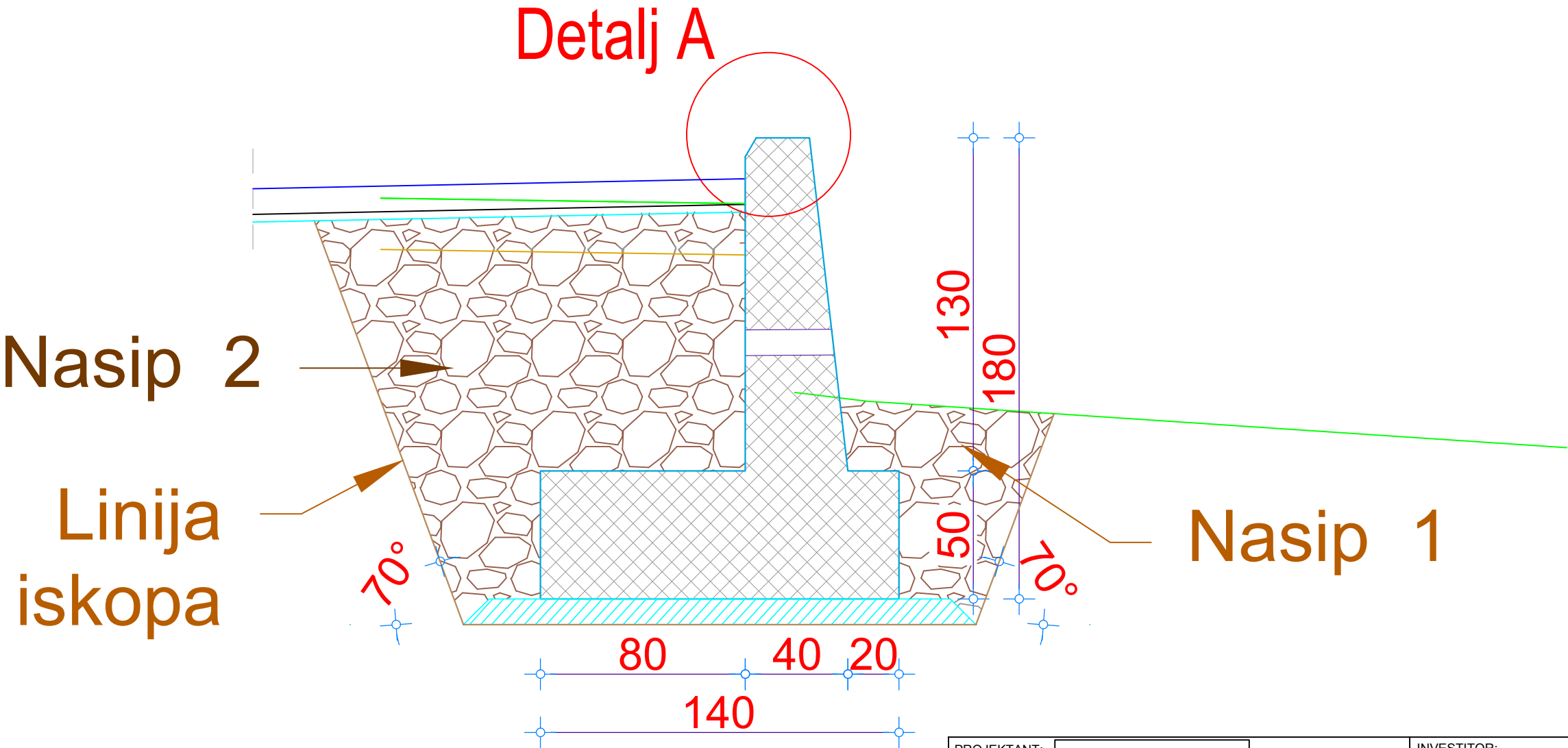
|                 |  |       |      |      |  |
|-----------------|--|-------|------|------|--|
| Existing Levels |  | 3.50  | 3.55 | 3.70 |  |
| Proposed Levels |  | 3.78  | 3.74 | 3.63 |  |
| Offsets         |  | -2.50 | 0.00 | 5.62 |  |

Poprečni presjeci 11-15  
Zid 2  
R=1:100



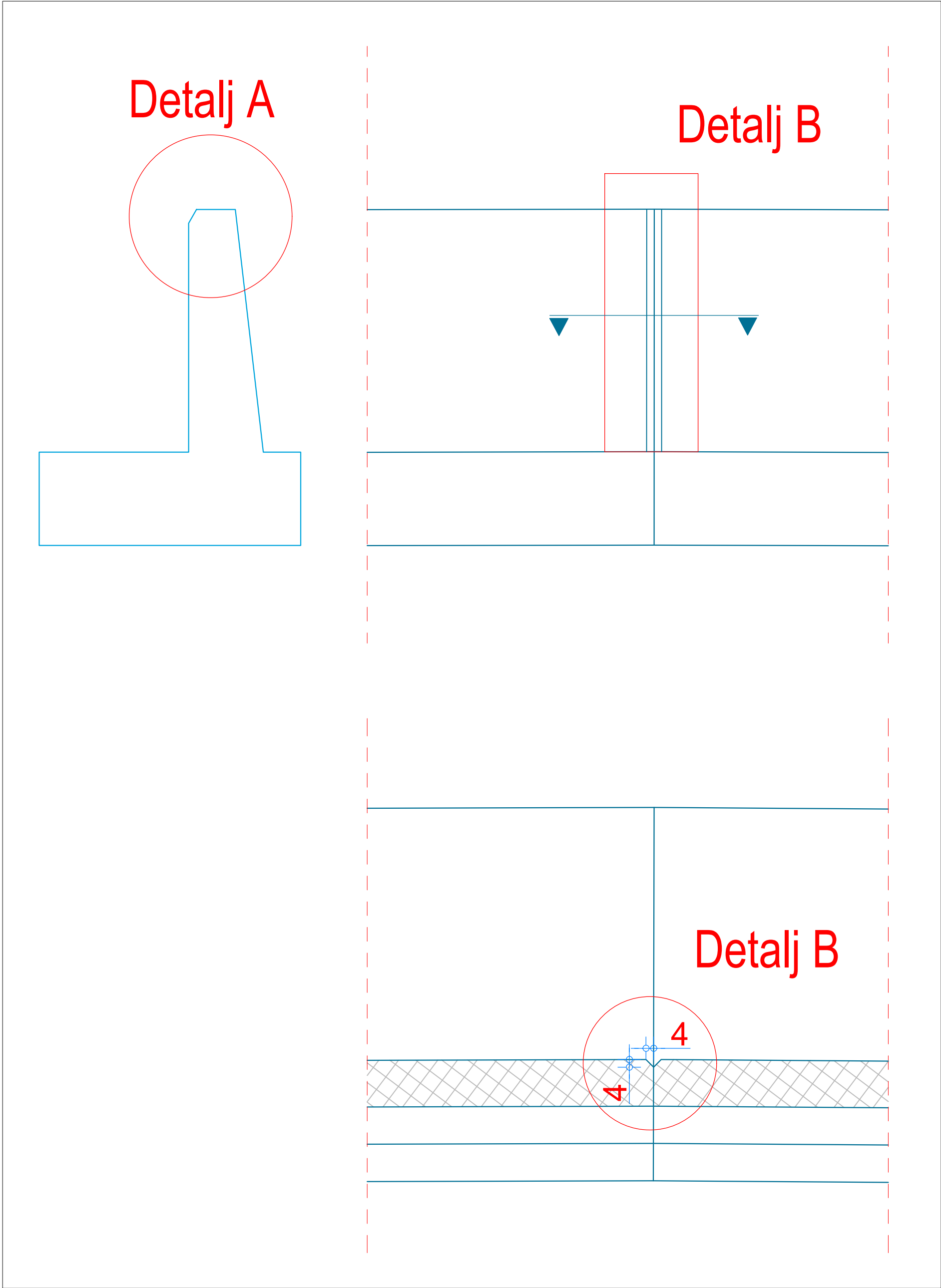
|                      |                                                                                                                                                                        |                                     |                                                                  |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------|
| PROJEKTANT:          | <b>GEOT</b><br>PROF. DR. TOMANOVIĆ                                                                                                                                     | INVESTITOR:                         | SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br>INVESTICIJU OPŠTINE BAR |
| Objekat:             | Pješačka staza i taksij stajalište sa pratećom infrastrukturom na dijelu<br>Ulice Jovana Tomaševića između raskrsnica sa Bulevarom<br>revolucije i Ulicom Maršala Tita | Lokacija:                           | Kat. parcele broj 5730 i 6458/1 KO Novi Bar                      |
| Glavni inženjer:     | dr Biljana Ivanović, dipl.inž.građ.                                                                                                                                    | Vrsta tehničke dokumentacije:       | Glavni projekat                                                  |
| Odgovorni inženjer:  | dr Zvonko Tomanović, dipl.inž.građ.                                                                                                                                    | Dio tehničke dokumentacije:         | RAZMJERA:                                                        |
| Saradnik:            | Katarina Vučinić, spec.sci.građ.                                                                                                                                       | Gradjevinski projekat potpunog zida | 1:100                                                            |
| Datum izrade i M.P.: |                                                                                                                                                                        | Prilog:                             | Br. priloga: Br. strane:                                         |
|                      |                                                                                                                                                                        | Poprečni profili 11-15              | 3.5.2 68                                                         |
|                      |                                                                                                                                                                        | Datum revizije i M.P.:              |                                                                  |

Karakteristični poprečni presjek  
R 1:20

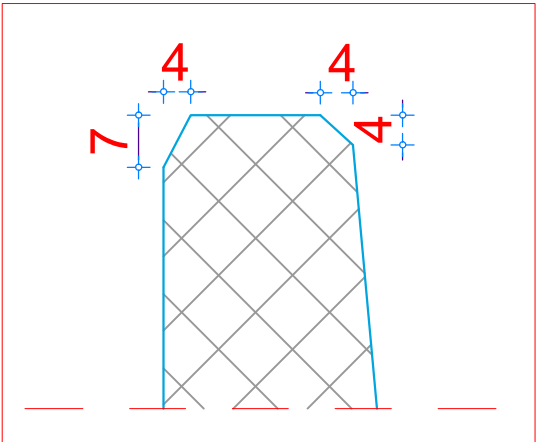


|                                                                                                                                                                                    |                                                                                       |                                                                                                                 |                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------|
| PROJEKTANT:<br><br>PROF. DR. TOMANOVIĆ                                                        |                                                                                       | INVESTITOR:<br>SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br>INVESTICIJU OPŠTINE BAR                                 |                                          |
| Objekat:<br>Pješačka staza i taksij stajalište sa pratećom infrastrukturom na dijelu<br>Ulice Jovana Tomaševića između raskrsnica sa Bulevarom<br>revolucije i Ulicom Maršala Tita |                                                                                       | Lokacija:<br>Kat. parcele broj 5730 i 6458/1 KO Novi Bar                                                        |                                          |
| Glavni inženjer:<br>dr Biljana Ivanović, dipl.inž.građ.                                                                                                                            |  | Vrsta tehničke dokumentacije:<br>Glavni projekat                                                                |                                          |
| Odgovorni inženjer:<br>dr Zvonko Tomanović, dipl.inž.građ.                                                                                                                         |  | Dio tehničke dokumentacije:<br>Građevinski projekat potpornog zida                                              | RAZMJERA:<br>1:20                        |
| Saradnik:<br>Katarina Vučinić, spec.sci.građ.                                                                                                                                      |                                                                                       | Prilog:<br>Karakteristični poprečni presjek                                                                     | Br. priloga:<br>3.6<br>Br. strane:<br>69 |
| Datum izrade i M.P.:<br><br>Mart, 2024.                                                                                                                                            |                                                                                       | Datum revizije i M.P.:<br> |                                          |

Detalji A i B  
R 1:20



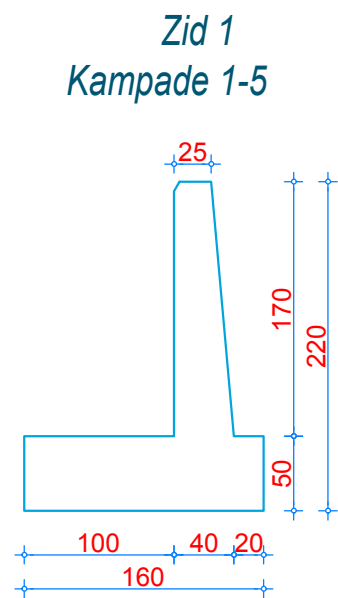
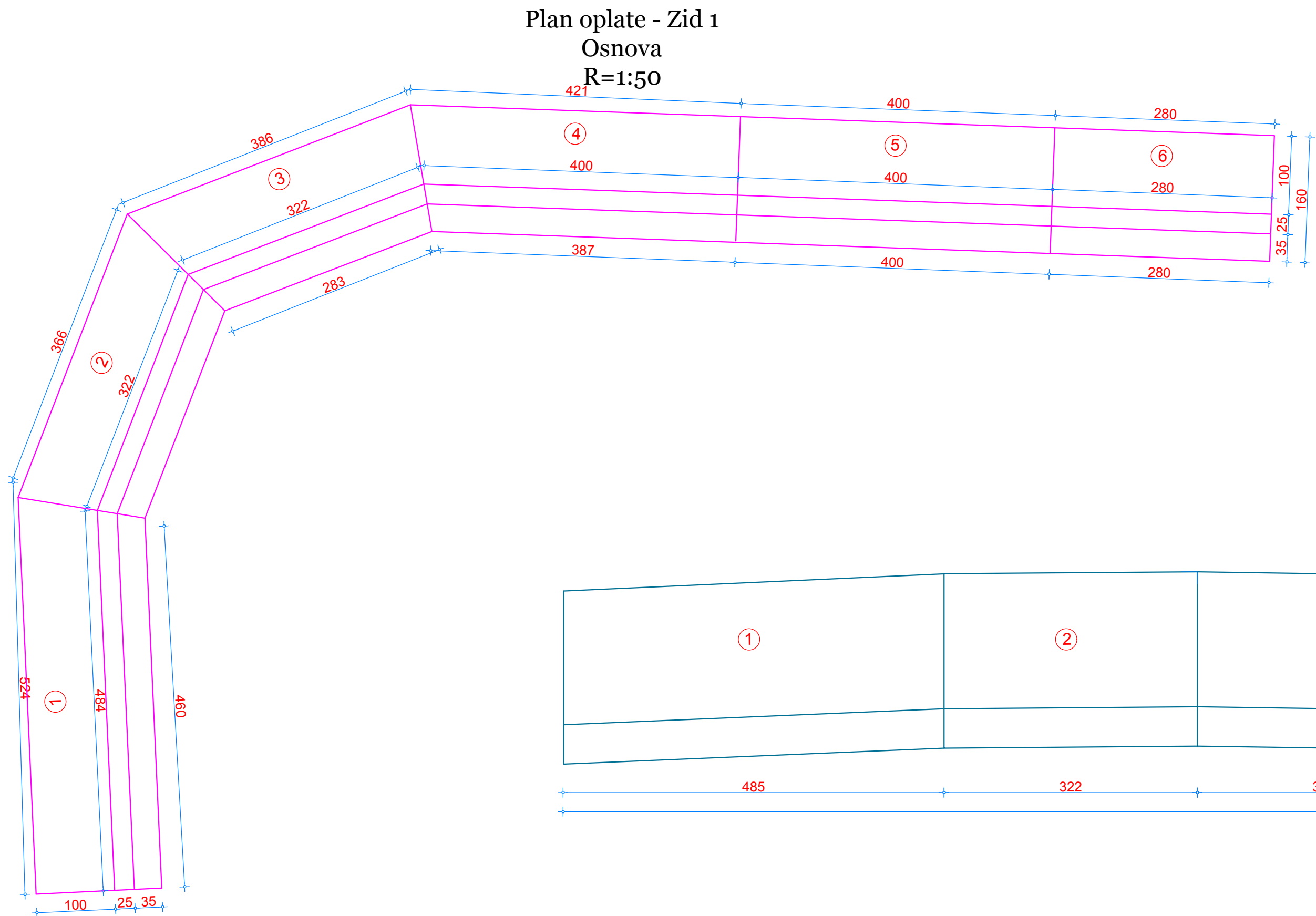
Detalji A  
R 1:10



Detalji  
R=1:20, R=1:10



|                                                                                                                                                                                   |                                                                                       |                                                                                                                     |                     |                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------|
| PROJEKTANT:<br><div><br/>PROF. DR. TOMANOVIĆ</div>                                           |                                                                                       | INVESTITOR:<br>SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br>INVESTICIJU OPŠTINE BAR                                     |                     |                         |
| Objekat:<br>Pješačka staza i taksi stajalište sa pratećom infrastrukturom na dijelu<br>Ulice Jovana Tomaševića između raskrsnica sa Bulevarom<br>revolucije i Ulicom Maršala Tita |                                                                                       | Lokacija:<br>Kat. parcele broj 5730 i 6458/1 KO Novi Bar                                                            |                     |                         |
| Glavni inženjer:<br>dr Biljana Ivanović, dipl.inž.građ.                                                                                                                           |  | Vrsta tehničke dokumentacije:<br>Glavni projekat                                                                    |                     |                         |
| Odgovorni inženjer:<br>dr Zvonko Tomanović, dipl.inž.građ.                                                                                                                        |  | Dio tehničke dokumentacije:<br>Građevinski projekat potpornog zida                                                  |                     | RAZMJERA:<br>1:20, 1:10 |
| Saradnik:<br>Katarina Vučinić, spec.sci.građ.                                                                                                                                     |                                                                                       | Prilog:<br>Detalji                                                                                                  | Br. priloga:<br>3.7 | Br. strane:<br>70       |
| Datum izrade i M.P.:<br><br>Mart, 2024.                                                                                                                                           |                                                                                       | Datum revizije i M.P.:<br><br> |                     |                         |

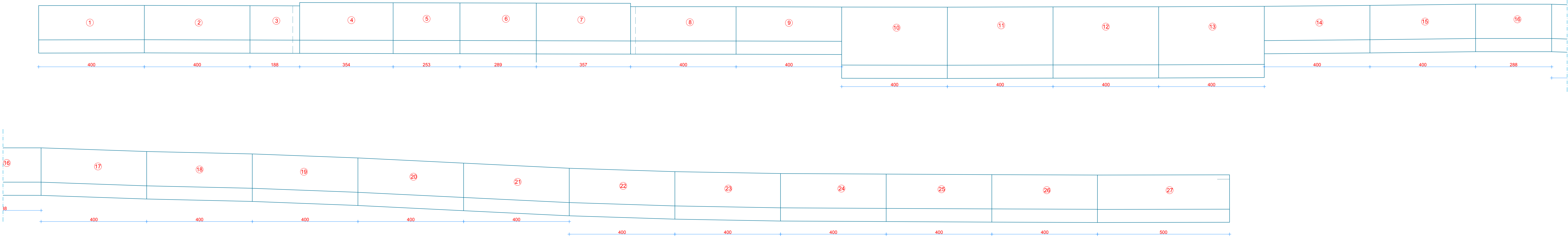


Plan oplata  
Zid 1  
R=1:50

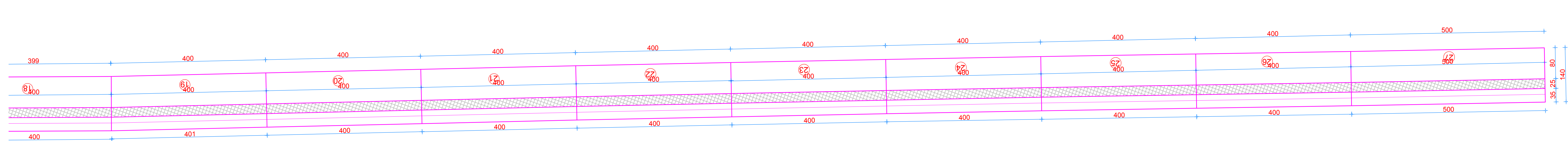
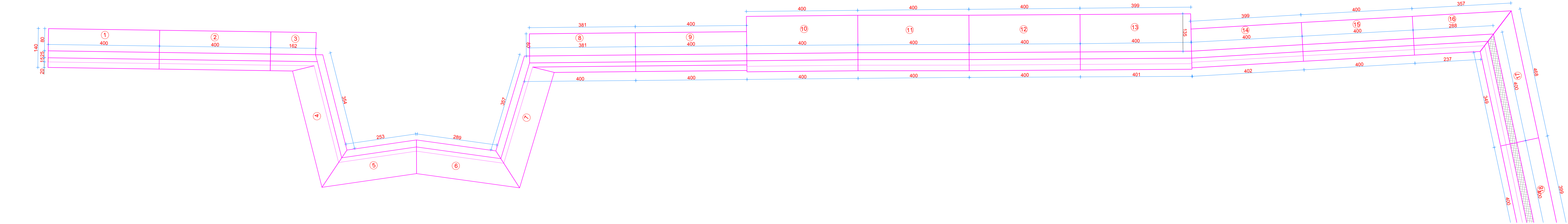


|                                                                                                                                                                                    |  |                                                                                 |                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------|-----------------------|
| PROJEKTANT:<br>                                                                                                                                                                    |  | INVESTITOR:<br>SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br>INVESTICIJU OPŠTINE BAR |                       |
| Objekat:<br>Pješačka staza i taksij stajalište sa pratećom infrastrukturom na dijelu<br>Ulice Jovana Tomaševića između raskrsnica sa Bulevarom<br>revolucije i Ulicom Maršala Tita |  | Lokacija:<br>Kat. parcele broj 5730 i 6458/1 KO Novi Bar                        |                       |
| Glavni inženjer:<br>dr Biljana Ivanović, dipl.inž.građ.                                                                                                                            |  | Vrsta tehničke dokumentacije:<br>Glavni projekat                                |                       |
| Odgovorni inženjer:<br>dr Zvonko Tomanović, dipl.inž.građ.                                                                                                                         |  | Dio tehničke dokumentacije:<br>Građevinski projekat potpornog zida              | RAZMJERA:<br>1:50     |
| Saradnik:<br>Katarina Vučinić, spec.sci.građ.                                                                                                                                      |  | Prilog:<br>Plan oplata - Zid 1                                                  | Br. priloga:<br>3.8.1 |
| Datum izrade i M.P.:<br><br>Mart, 2024.                                                                                                                                            |  | Datum revizije i M.P.:<br><br>                                                  |                       |

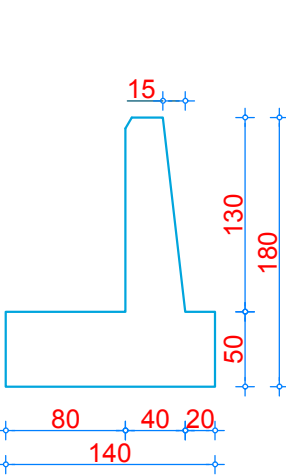
Plan oplate - Zid 2  
Podužni presjek  
R=1:50



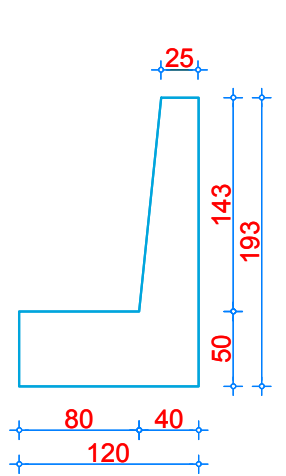
Plan oplate - Zid 2  
Osnova  
R=1:50



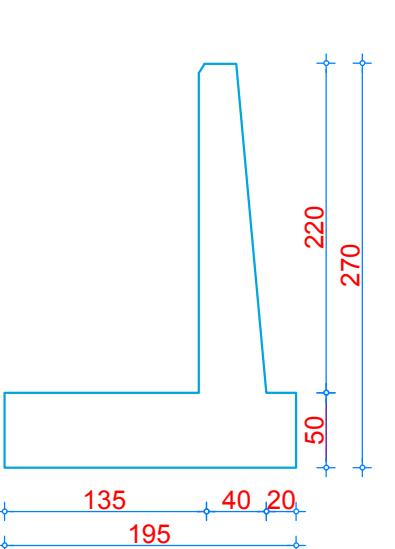
Tip 1  
Kampade 1-3, 8-9, 14-27



Tip 2  
Kampade 4-7



Tip 3  
Kampade 10-13



Plan oplate  
Zid 2  
R=1:50

|                                                                                                                                                                                  |  |                                                                                 |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------|--|
| PROJEKTANT:<br><b>GEOT</b><br>POSREDOVANJE I PROJEKTOVANJE                                                                                                                       |  | INVESTITOR:<br>SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br>INVESTICIJU OPŠTINE BAR |  |
| Objekat:<br>Pješačka staza i tako stajalište sa pratećom infrastrukturom na djelu<br>Ulice Jovana Tomasevića između naseljenice sa Bujevanom<br>revolucije i Ulicom Maršala Tita |  | Lokacija:<br>Kat. parcele broj 5730 i 6458/1 KO Novi Bar                        |  |
| Glavni inženjer:<br>dr. Biljana Ivanović, dipl. inž. grad.                                                                                                                       |  | Vrsta tehničke dokumentacije:<br>Glavni projekat                                |  |
| Odgovorni inženjer:<br>dr. Zvonko Tomanović, dipl. inž. grad.                                                                                                                    |  | Dio tehničke dokumentacije:<br>Građevinski projekat potpornog zida              |  |
| Saradnik:<br>Katarina Vučinić, spec. sci. grad.                                                                                                                                  |  | Prilog:<br>Plan oplate - Zid 2                                                  |  |
| Datum izdaje: 1. M. P.                                                                                                                                                           |  | Datum revizije: 1. M. P.                                                        |  |
| Mart, 2024.                                                                                                                                                                      |  | RAZMJERA:<br>1:50<br>Br. stranice:<br>72                                        |  |

**Osnova R=1:50**

The drawing illustrates the reinforcement layout for a slab. The plan view shows a rectangular slab with dimensions 471 (width) and 505 (length). The reinforcement is detailed as follows:

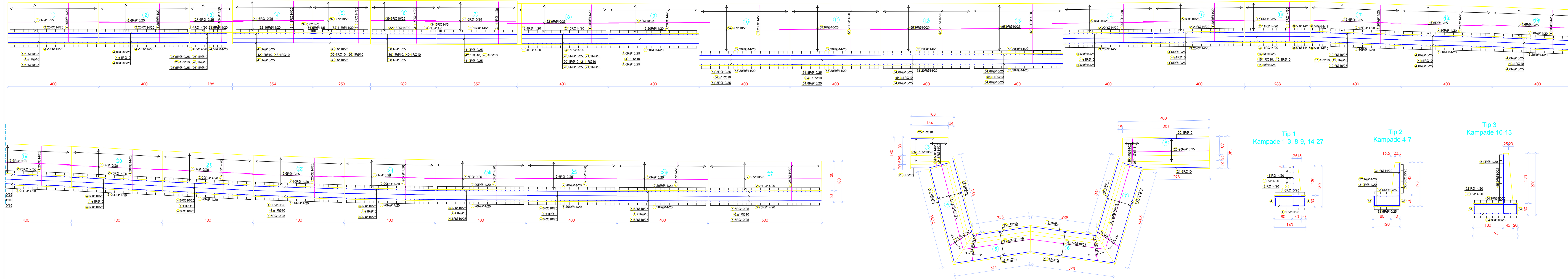
- Top Reinforcement (Numbered 1-18):**
  - 1: 20  $\pm 7R\emptyset 10/25$  (bottom longitudinal bar)
  - 2: 18  $1R\emptyset 10$  (top longitudinal bar)
  - 3: 16  $\pm 7R\emptyset 10/25$  (bottom longitudinal bar)
  - 4: 14  $5R\emptyset 14/5$  (top longitudinal bar)
  - 5: 14  $5R\emptyset 14/5$  (top longitudinal bar)
  - 6: 16  $\pm 7R\emptyset 10/25$  (bottom longitudinal bar)
  - 7: 17  $1R\emptyset 10$  (top longitudinal bar)
  - 8: 3  $R\emptyset 14/10$  (top longitudinal bar)
  - 9: 3  $R\emptyset 14/10$  (top longitudinal bar)
  - 10: 10  $\pm 7R\emptyset 10/25$  (bottom longitudinal bar)
  - 11: 18  $1R\emptyset 10$  (top longitudinal bar)
  - 12: 18  $1R\emptyset 10$  (top longitudinal bar)
  - 13: 16  $\pm 7R\emptyset 10/25$  (bottom longitudinal bar)
  - 14: 14  $5R\emptyset 14/5$  (top longitudinal bar)
  - 15: 14  $5R\emptyset 14/5$  (top longitudinal bar)
  - 16: 16  $\pm 7R\emptyset 10/25$  (bottom longitudinal bar)
  - 17: 17  $1R\emptyset 10$  (top longitudinal bar)
  - 18: 18  $1R\emptyset 10$  (top longitudinal bar)
- Bottom Reinforcement (Numbered 19-23):**
  - 19: 20  $\pm 7R\emptyset 10/25$  (bottom longitudinal bar)
  - 20: 20  $\pm 7R\emptyset 10/25$  (bottom longitudinal bar)
  - 21: 18  $1R\emptyset 10$  (top longitudinal bar)
  - 22: 18  $1R\emptyset 10$  (top longitudinal bar)
  - 23: 7  $R\emptyset 10/25$  (top longitudinal bar)
- Section View (Right):**
  - Shows the vertical distribution of reinforcement bars.
  - Dimensions: 220 (total height), 171 (height to top reinforcement), 50 (height to bottom reinforcement).
  - Reinforcement details: 23  $7R\emptyset 10/25$ , 22  $R\emptyset 14/20$ , 20  $R\emptyset 10/25$ , 21  $1R\emptyset 10$ , 22  $1R\emptyset 10$ , 20  $R\emptyset 10/25$ .

[illegible]

 **via project**  
ENGINEERING ♦ DESIGNING ♦ CONSULTING  
PODGORICA, ul 13. jula 1, tel/fax 020 239 053, [viaproject@t-com.m](mailto:viaproject@t-com.m)

|                                                                                                                                                                                   |                                                                                       |                                                                                 |                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------|
| PROJEKTANT:<br>                                                                               |                                                                                       | INVESTITOR:<br>SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br>INVESTICIJU OPŠTINE BAR |                       |
| Objekat:<br>Pješačka staza i taksi stajalište sa pratećom infrastrukturom na dijelu<br>Ulice Jovana Tomaševića između raskrsnica sa Bulevarem<br>revolucije i Ulicom Maršala Tita |                                                                                       | Lokacija:<br>Kat. parcele broj 5730 i 6458/1 KO Novi Bar                        |                       |
| Glavni inženjer:<br>dr Biljana Ivanović, dipl.inž.građ.                                                                                                                           |  | Vrsta tehničke dokumentacije:<br>Glavni projekat                                |                       |
| Odgovorni inženjer:<br>dr Zvonko Tomanović, dipl.inž.građ.                                                                                                                        |  | Dio tehničke dokumentacije:<br>Građevinski projekat potpornog zida              | RAZMJERA:<br>1:50     |
| Saradnik:<br>Katarina Vučinić, spec.sci.građ.                                                                                                                                     |                                                                                       | Prilog:<br>Plan armature - Zid 1                                                | Br. priloga:<br>3.9.1 |
| Datum izrade i M.P.:<br><br>Mart, 2023.                                                                                                                                           |  | Datum revizije i M.P.:                                                          | Br. strane:<br>73     |

Plan armature - Zid 2  
 Podužni presjek  
 R=1:50



### Plan armature - Zid 2



|                                                                                                                                                                                           |  |                                                                                     |  |                                                                                                               |  |                                                                  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------|--|
| PROJEKTANT:                                                                                                                                                                               |  |  |  | INVESTITOR:                                                                                                   |  | SEKRETARIJAT ZA IMOVINU, ZASTUPANJE I<br>INVESTICIJU OPŠTINE BAR |  |
| <b>Objekat:</b><br>Pješačka staza i taksli stajalište sa pratećom infrastrukturom na dijelu<br>Ulice Jovana Tomaševića između raskrsnica sa Bulevarom<br>revolucije i Ulicom Maršala Tita |  |                                                                                     |  | <b>Lokacija:</b><br>Kat. parcele broj 5730 i 6458/1 KO Novi Bar                                               |  |                                                                  |  |
| <b>Glavni inženjer:</b><br>dr Biljana Ivanović, dipl.inž.grad.                                                                                                                            |  |                                                                                     |  | <br><b>Glavni projekat</b> |  |                                                                  |  |
| <b>Odgovorni inženjer:</b><br>dr Zvonko Tomaniović, dipl.inž.grad.                                                                                                                        |  |                                                                                     |  | <b>Vrsta tehničke dokumentacije:</b><br>Građevinski projekat potpornog zida                                   |  |                                                                  |  |
| <b>Saradnik:</b><br>Katarina Vučinić, spec.sci.grad.                                                                                                                                      |  |                                                                                     |  | <b>RAZM/JERA:</b><br>1:50                                                                                     |  |                                                                  |  |
| <b>Datum izrade i M.P.:</b>                                                                                                                                                               |  |                                                                                     |  | <b>Prilog:</b><br>Plan armature - Zid 2                                                                       |  | <b>Br. priloga:</b><br>3.9.2                                     |  |
| <b>Datum revizije i M.P.:</b>                                                                                                                                                             |  |                                                                                     |  | <b>Br. strane:</b><br>74                                                                                      |  |                                                                  |  |