

Idejni projekt lokalne ceste

Lugović, Bruno

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UNIVERSITY OF SPLIT



DIGITALNI AKADEMSKI ARHIVI I REPOZITORIJI

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE

Idejni projekt lokalne ceste

Završni rad

Split, 2019.

**SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE**

Split, Matice Hrvatske 15

**STUDIJ: PREDDIPLOMSKI SVEUČILIŠNI STUDIJ
GRAĐEVINARSTVA**
KANDIDAT: BRUNO LUGOVIĆ
BROJ INDEKSA: 4547
KATEDRA: Katedra za prometnice i geodeziju
PREDMET: Ceste

ZADATAK ZA ZAVRŠNI RAD

Tema: IDEJNI PROJEKT LOKALNE CESTE

Opis zadatka: uz pomoć programa za projektiranje cesta Autodesk AutoCAD Civil 3D potrebno je izraditi idejni projekt ceste na geodetskoj podlozi koja je korištena za izradu programa u okviru kolegija Ceste. Trasu treba položiti od točke A do točke B prema svim podacima iz programskog zadatka.

Zadatak treba sadržavati:

1. Kopiju programskog zadatka
2. Tehnički opis
3. Građevinsku situaciju u M 1:1000
4. Uzdužni presjek u M 1:1000/100
5. Karakteristične poprečne presjeke u M 1:100
6. Računalne ispise koordinatnih točaka osi
7. Proračun količina zemljanih radova
8. Proračun količine radova po presjecima

U Splitu, lipanj 2019.

Voditelj Završnog rada:

Prof.dr.sc. Dražen Cvitanić

IDEJNI PROJEKT LOKALNE CESTE

Sažetak:

Idejni projekt lokalne ceste izrađen je na geodetskoj podlozi, prema zadatku iz kolegija Ceste, služeći se programom Autodesk AutoCAD Civil 3D. Cesta je projektirana za godišnji dnevni promet (PGDP) od 950 vozila na dan, na brdovitom terenu. Projektna brzina ceste iznosi 40 km/h. Idejno rješenje izrađeno je prema Pravilniku o osnovnim uvjetima za projektiranje ceste s elementima koji zadovoljavaju važeće propise, kao i sigurnosne i estetske kriterije.

Ključne riječi:

Idejni projekt, lokalna cesta, projektna brzina, os ceste, niveleta, poprečni presjek

CONCEPTUAL PROJECT OF LOCAL ROAD

Abstract:

A conceptual project of local road, on a geodetic ground according to the task from course „Roads“, is made using software Autodesk AutoCAD 3D. The road is designed for the annual average daily traffic (AADT) of 950 vehicles per day, on the hilly terrain. Design speed for the road is 40 km/h. Preliminary design of local road was created according to the Regulations on the basic conditions for the design of public roads with the elements that meet the applicable rules, as well as safety and aesthetic criteria

Keywords:

Conceptual project, local road, design speed, the road axis, profile, cross-section

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1. PROGRAMSKI ZADATAK

SVEUČILIŠTE U SPLITU
FAKULTET GRAĐEVINARSTVA, ARHITEKTURE
I GEODEZIJE

Split, ak.god. 2016/2017.

Katedra za prometnice

Studij: Preddiplomski

Nastavni predmet: CESTE

Student: BRUNO LUGOVIĆ

ZADATAK

Treba izraditi idejni projekt dionice ceste između točaka A i B naznačenih na priloženoj geodetskoj podlozi u mjerilu 1:1000.


Zadano je:

- PGDP - prosječni godišnji dnevni promet: **950 voz/dan**,
- vrsta terena: **brdovit**.

Idejni projekt treba sadržavati:

1. Tehnički opis
2. Proračun horizontalne geometrije
3. Proračun proširenja kolnika u krivini
4. Proračun vertikalne geometrije i kota nivelete
5. Proračun vitoperenja kolnika
6. Građevinska situacija MJ. 1:1000
7. Uzdužni presjek MJ. 1:1000/100
8. Normalni poprečni presjek MJ. 1:50 ✓
9. Karakteristični poprečni presjeci MJ. 1:100
10. Predmjer radova
11. Aproksimativni troškovnik

Predmetni nastavnik:



izv.prof.dr.sc. Deana Breški, dipl.ing.građ.

2. TEHNIČKI OPIS

OPĆI PODACI

Ovim idejnim projektom obuhvaćeno je projektiranje lokalne ceste na dionici od točke A (266 m.n.m) do točke B (246 m.n.m) u dužini od 410.07 m koja se proteže smjeru zapad-istok na brdovitom terenu.

Za izradu idejnog rješenja korištena je katastarsko-topografska podloga u mjerilu 1:1000, prilog iz programa predmeta Ceste. Situacija je priložena u mjerilu 1:1000.

TEHNIČKI ELEMENTI IZGRADNJE:

Opis trase:

Početak prometnice je u točki A (266 m.n.m) na stacionaži 0+000,00, a završava u točki B (246 m.n.m) na stacionaži 0+410,07. Na prostorno vođenje prometnice utječu topografske karakteristike terena. Prometnica se nalazi na brdovitom krškom terenu.

Temeljem „Pravilnika o osnovnim uvjetima kojima javne ceste izvan naselja i njihovi elementi moraju udovoljavati sa stajališta sigurnosti prometa“, definirani su projektni elementi trase i elementi poprečnog profila.

U tablici 1.2, koja je dio Pravilnika, dani su elementi za definiciju kategorije prometnice.

Tabl. 1.2

| Kategorija ceste | Društ. gospod. značenje (1.1.1.) | Vrsta prometa (1.1.2.) | Veličina prometa (1.1.3.) | Zadaća povezivanja (1.1.4.) | Srednja duljina putovanja (km) |
|------------------|----------------------------------|-------------------------------|---------------------------|----------------------------------|--------------------------------|
| AC | Državna | Prom. mot. vozila | >14000 | Međudržavno i državno | >100 |
| 1. kat. | Državna | Prom. mot. vozila | >12000 | Međudržavno i državno-regionalno | 50-100 |
| 2. kat. | Državna | Prom. mot. v. mješoviti prom. | 7000-12000 | Državno i županijsko | 20-50 |
| 3. kat. | Državna; županijska | Mješoviti promet | 3000-7000 | Međuopćinsko | 5-50 |
| 4. kat. | Županijska; lokalna | Mješoviti promet | 1000-3000 | Općinsko | 5-20 |
| 5. kat. | Lokalna | Mješoviti promet | <1000 | Općinsko-lokalno | <5 |

U pravilu se usvaja najviša kategorija ceste koja se dobije primjenom kriterija iz tablice 1.2.

Predmetna cesta je lokalnog značaja s PGDP-om od 950 voz/dan što je svrstava u petu kategoriju.

Prema tablici 1.3. 1 iz Pravilnika, ceste pete kategorije projektiraju se za projektne brzine 40-60 km/h ovisno o terenskim ograničenjima.

Tabl. 1.3.1. Projektne brzine i najveći nagibi nivelete

| PROMETNO -TEHNIČKO RAZVRSTAVANJE | | PROJEKTNA BRZINA V_p (km/h) / NAGIB s_{max} (%) | | | | | | | |
|-------------------------------------|------------------|-----------------------------------------------------|----------|----------|---------|---------|---------|---------|-------------------------|
| KAT. | Razina usluge | 120 | 100 | 90 | 80 | 70 | 60 | 50 | 40 |
| | | a. | b. | c. | d. | e. | f. | g. | h. |
| AC | C/D | $\geq 120/4^\circ$ | 100/5* | 90/5.5** | 80/6*** | | | | |
| 1. kat. | D | | 100/5.5° | 90/5.5* | 80/6** | 70/7*** | | | |
| 2. kat. | D | | 100/5.5° | 90/5.5* | 80/6* | 70/7** | 60/8*** | | |
| 3. kat. | E | | | | 80/7* | 70/7* | 60/8** | 50/9*** | |
| 4. kat. | E | | | | | 70/8° | 60/9* | 50/10** | 40/11*** |
| 5. kat. | E | | | | | | 60/10° | 50/11* | 40/12** 40(30)/12*** |

OZNAKE: ° BEZ OGRANIČENJA BO
 * UMJERENA OGRANIČENJA UO
 ** ZNATNA OGRANIČENJA ZO
 *** VELIKA OGRANIČENJA VO

Vrijednost u zagradi primjenjuje se iznimno

Za predmetnu prometnicu, obzirom da se radi o brdovitom terenu sa značajnim ograničenjima, prema navedenoj tablici, projektna brzina je 40km/h i maksimalni uzdužni nagib je 12%.

Iz odabrane projektne brzine proizlaze i projektni elementi horizontalne i vertikalne geometrije trase:

- minimalni radijus horizontalne krivine $R = 45$ m
- minimalna duljina klotoidne prelazne krivine $L = 30$ m
- maksimalni uzdužni nagib $i = 12$ %
- minimalni polumjer konkavnog zaobljenja nivelete (za 0%) $R = 200$ m
- minimalni polumjere konveksnog zaobljenja nivelete (za 0%) $R = 300$ m

Tlocrtni elementi trase:

Trasa ceste ima duljinu od 410.07 m, sastoji se od četiri pravca i tri krivine.

Prva krivina ima radijus $R = 70$ m i duljinu prijelazne krivine $L = 40$ m, druga ima radijus $R = 45$ m i duljinu prijelazne krivine $L = 30$ m, a treća ima radijus $R = 60$ m i duljinu prijelazne krivine $L = 40$ m.

Duljina prvog pravca iznosi 11.02 m, duljina drugog pravca je 64.28 m, duljina trećeg pravca iznosi 6,37 m, a duljina četvrtog pravca iznosi 22.33 m.

Krivine su konstruirane pomoću tri prijelazne krivine oblika klotoide i kružnog luka.

Vertikalni elementi trase:

Vertikalni tok trase sastoji se od dva pravca i jedn konkavne krivine. Radijus krivine je $R = 7500$ m i pripadajuća tangenta je duljine 38.36 m.

Uzdužni nagib prvog pravca iznosi $S_1 = 5.08\%$, a drugog $S_2 = 4.57\%$.

Elementi poprečnog profila:

Planirana prometnica predviđena je za dvosmjerni promet, s po jednim voznim trakom za svaki smjer.

Širina voznog traka poprečnog presjeka iznosi 2.75 m, a širina rubnog traka 0.20 m.

U nasipu se izvodi bankina širine 1.0 m i nagiba 5%, a u usjeku berma širine 1.0 m, a nagiba 5%. U usjecima se izvode i rigoli za odvodnju vode širine 0.65 m i drenaža koja je postavljena u glinenu posteljicu. Cesta se u većem dijelu nalazi u zasjeku.

Poprečni nagib ceste u pravcu iznosi 2.5%, a u krivinama je u ovisnosti od polumjera kružnog luka i usvojene računске brzine, $V_r = 40$ km/h.

Poprečni nagib prve krivine je $q_1 = 5.1\%$, druge krivine $q_2 = 7.0\%$, a treće krivine $q_3 = 5.8\%$

Nagibi usjeka su 2:1, dok su nagibi nasipa 1:1.5.

Kolnička konstrukcija:

Projektom je predviđena sljedeća kolnička konstrukcija:

- asfaltbeton habajući sloj AB 11 4 cm
- bitumenizirani nosivi sloj BNS 22 6 cm
- mehanički zbijeni nosivi sloj MZNS 30 cm

Odvodnja:

Odvodnja prometnice predviđa izvedbu otvorenog sustava odvodnje kojim se vrši prihvat voda s kolnika i pribrežnih voda izvedbom betonskih rigola. Uzdužnim i poprečnim nagibima kolnika vode se usmjeravaju u betonske rigole u koje se vrši i prihvat pribrežnih voda u usjecima i ispuštaju u teren.

Oprema ceste:

Idejnim rješenjem predviđena je horizontalna signalizacija koja se sastoji od jedne pune razdjelne crte širine 10 cm, koja se postavlja u osi prometnice i punih rubnih crta širine 10 cm koje se postavljaju na svaki od rubnih trakova. Na nasip se postavlja jednostrana zaštitna čelična ograda.

3. GRAFIČKI PRILOZI

3.1 SITUACIJA

M 1:1000

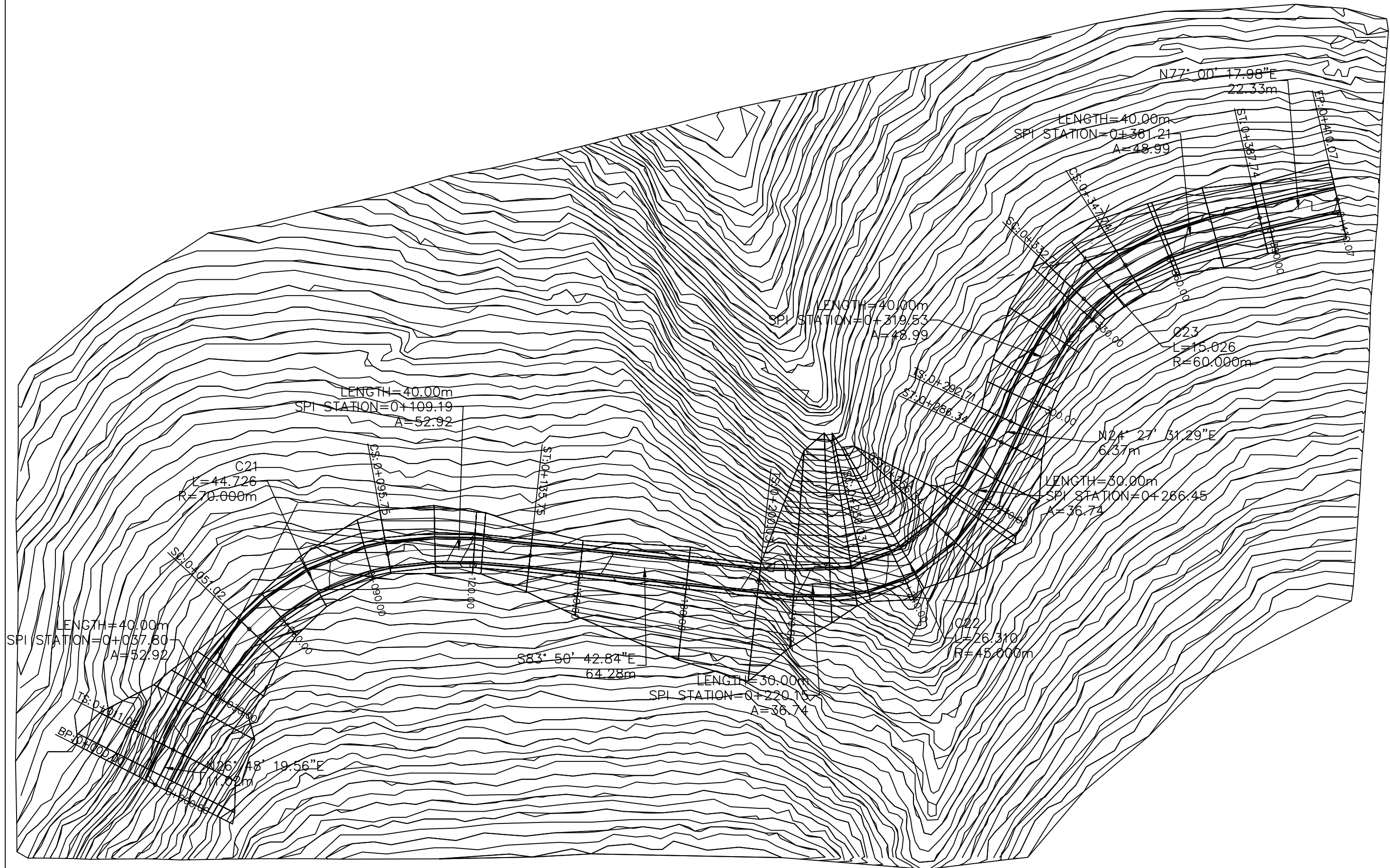
3.2 UZDUŽNI PRESJEK

M 1.1000/100

3.3 KARAKTERISTIČNI POPREČNI PRESJECI

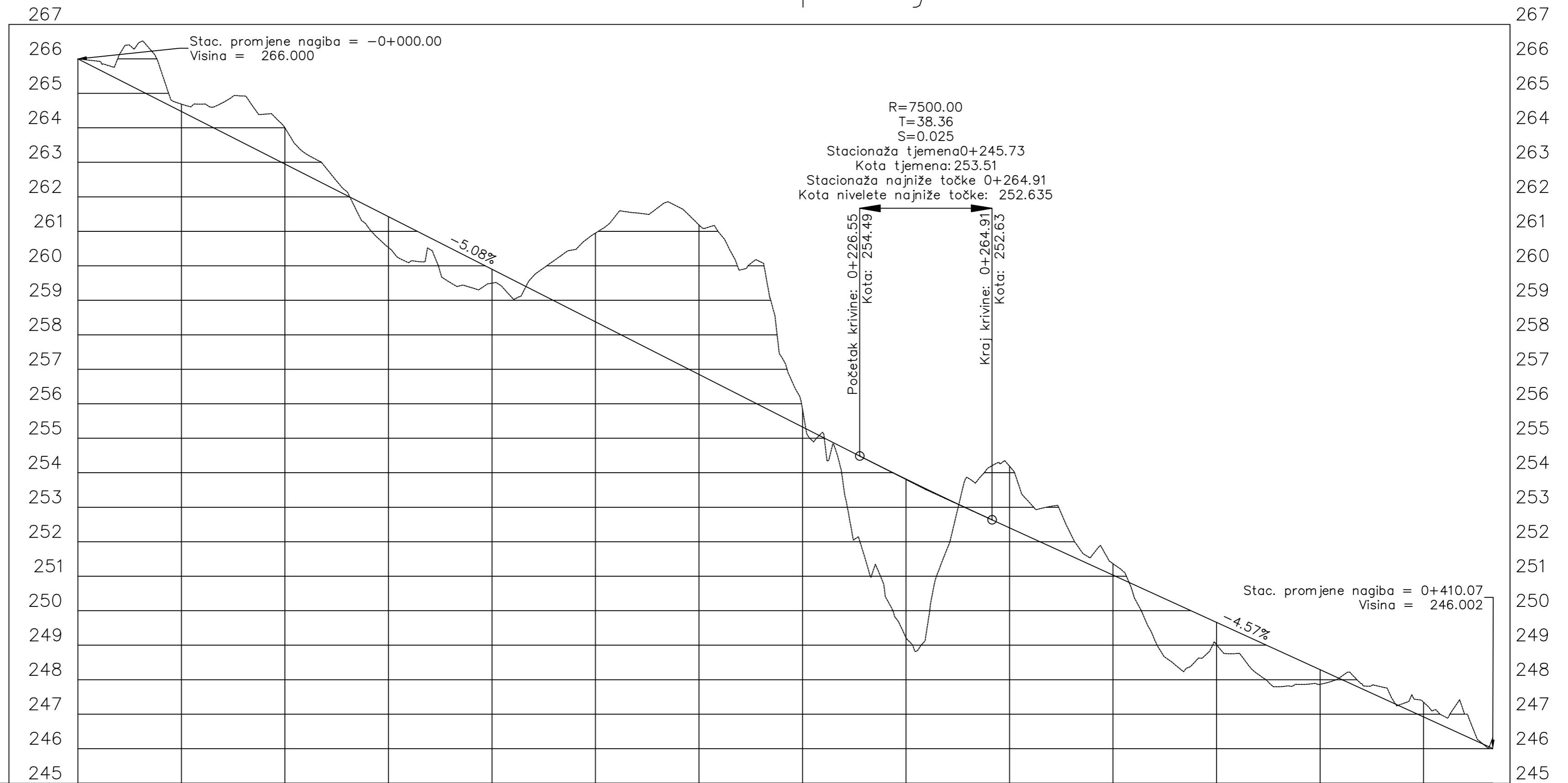
M 1:200

3.4 TABLICA UKUPNOG VOLUMENA ZEMLJANIH RADOVA



| | | |
|-----------------------------------------------------------|------------------------------------|------------------------|
| FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE U SPLITU | | |
| PREDMET : | ZAVRŠNI RAD - PROMETNICA | DATUM: lipanj 2019. |
| STUDIJ : | PREDDIPLOMSKI GRAĐEVINSKI FAKULTET | |
| SADRŽAJ LISTA : | SITUACIJA | |
| STUDENT : | BRUNO LUGOVIĆ | M 1:1000 |

Uzdužni presjek



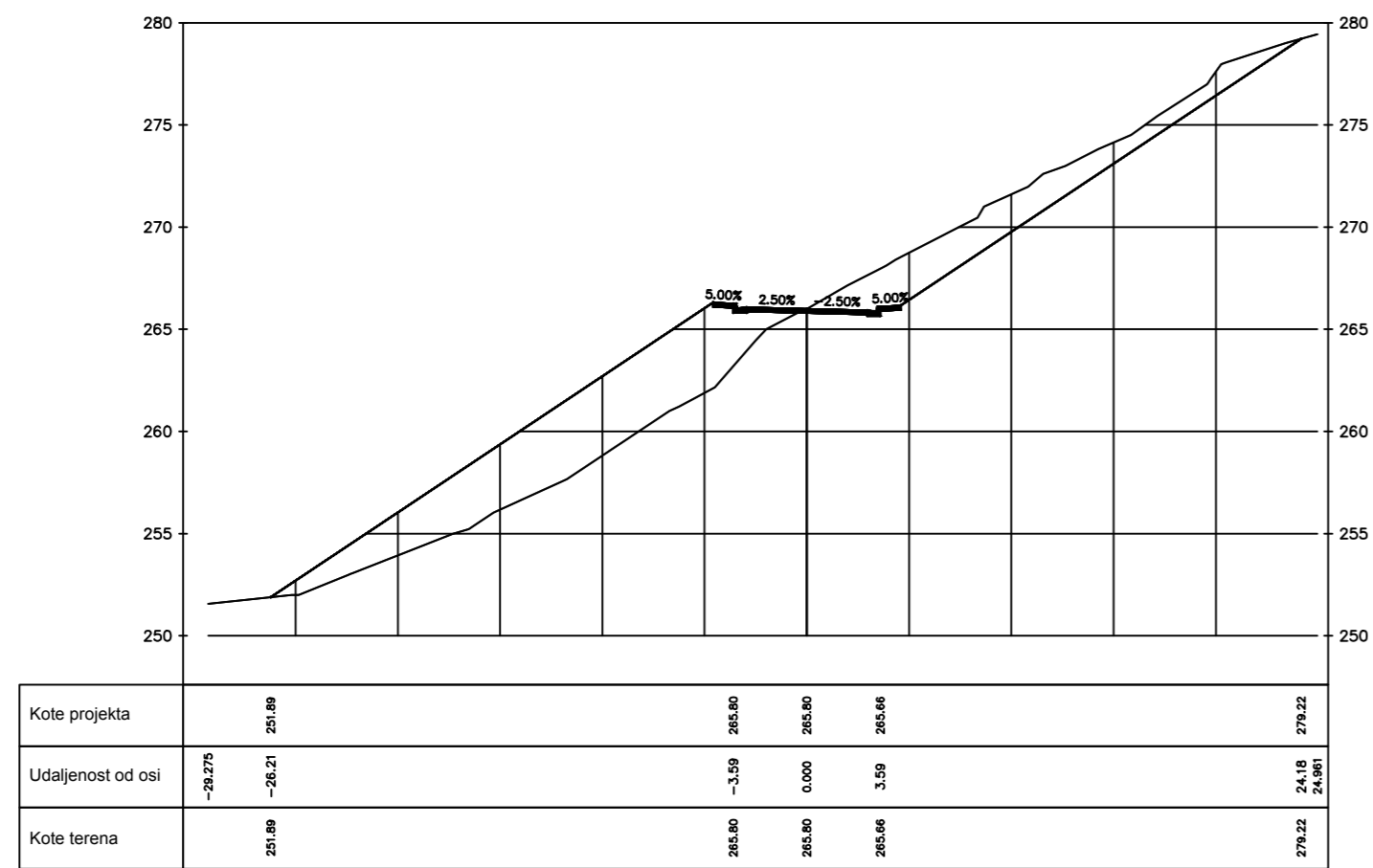
| | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|-----------------------------|----------|----------------------------------------|----------------------|----------------------------------------|----------|-----------------------------|----------|-----------------------------|----------------------|-------------------|----------|----------------------------------------|----------|-----------------------------|---------|----------------------------------------|--|----------------------------------------|--|-----------------------------|--|
| Stacionaža | 0+000.00 | 0+030.00 | 0+060.00 | 0+090.00 | 0+120.00 | 0+150.00 | 0+180.00 | 0+210.00 | 0+240.00 | 0+270.00 | 0+300.00 | 0+330.00 | 0+360.00 | 0+390.00 | 0+410.07 | | | | | | | |
| Kote nivelete | 266.00 | 264.48 | 262.95 | 261.43 | 259.90 | 258.38 | 256.85 | 255.33 | 253.81 | 252.40 | 251.03 | 249.66 | 248.29 | 246.92 | 246.00 | | | | | | | |
| Kote terena | 266.00 | 264.69 | 264.00 | 260.53 | 259.49 | 260.95 | 261.18 | 255.85 | 249.21 | 254.19 | 251.36 | 249.01 | 247.87 | 247.35 | 246.32 | | | | | | | |
| Horizontalni elementi | L=11.02 N26° 48' 20"E | | L=40.00 | R: 70.00 L: 44.73 | | L=40.00 | L=64.28 S83° 50' 43"E | | L=30.00 | R: 45.00 L: 26.31 | | L=30.00 | L=6.57 L: 40.00 N24° 27' 31"E | | R: 60.00 L: 15.03 | L=40.00 | L=22.33 N77° 00' 18"E | | | | | |
| Vertikalni elementi | G = -5.08% L = 226.55 | | | | | | | | | | | | | | | | | | | | | |
| Vitoperenje | 2.50% 0+011.02 -2.50% | | L: 5.10% sta: 0+051.02 D: -5.10% | | L: 5.10% sta: 0+095.75 D: -5.10% | | -2.50% 0+135.75 2.50% | | -2.50% 0+200.03 2.50% | | P+230.03 7.00% | | L: -7.00% sta: 0+256.37 D: 7.00% | | 0.41% 0+292.71 -0.41% | | L: 5.80% sta: 0+332.71 D: -5.80% | | L: 5.80% sta: 0+347.74 D: -5.80% | | 2.50% 0+387.74 -2.50% | |



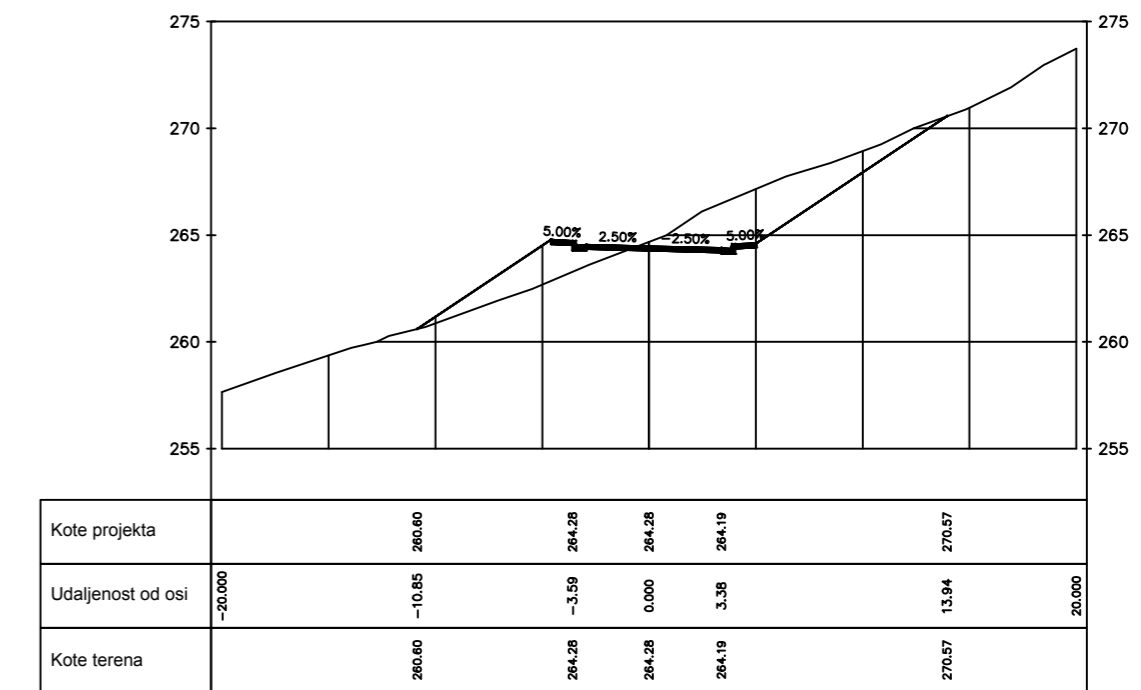
FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE U SPLITU

| | | | |
|----------------|------------------------------------|----------|--------------|
| PREDMET: | ZAVRŠNI RAD - PROMETNICA | DATUM: | lipanj 2019. |
| STUDIJ: | PREDDIPLOMSKI GRAĐEVINSKI FAKULTET | | |
| SADRŽAJ LISTA: | UZDUŽNI PRESJEK | M 1:1000 | |
| STUDENT: | BRUNO LUGOVIĆ | M 1:100 | |

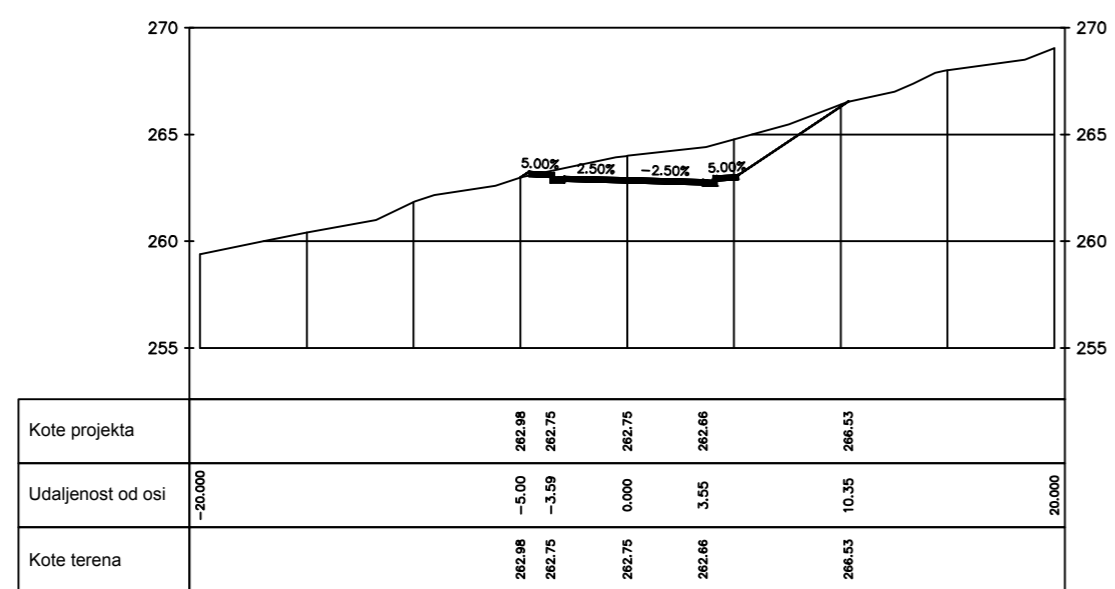
0+000.00



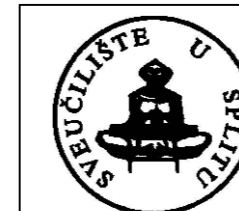
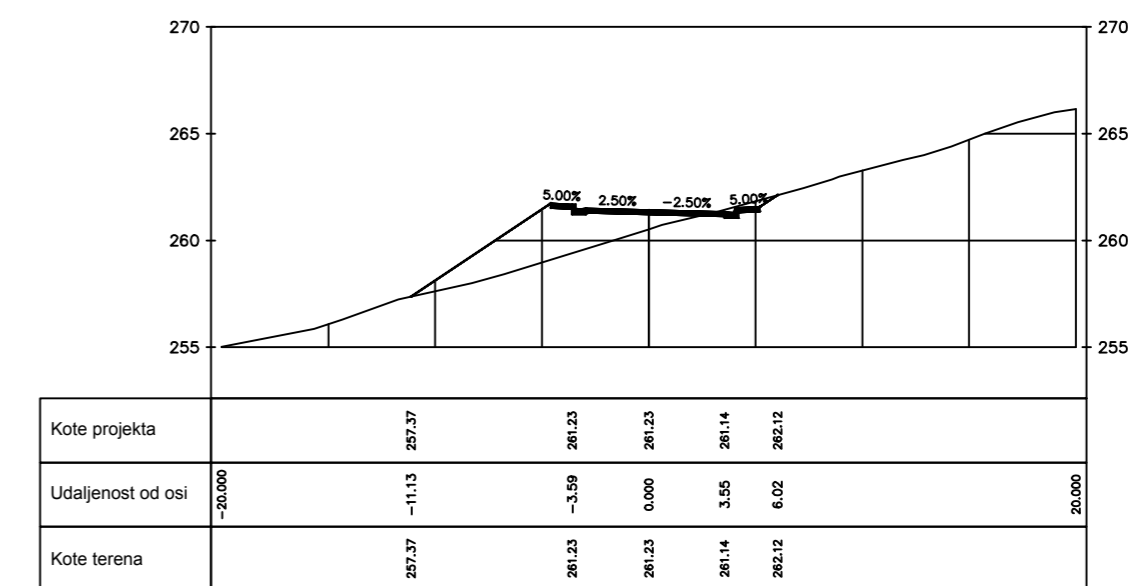
0+030.00



0+060.00



0+090.00



FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE U SPLITU

PREDMET : ZAVRŠNI RAD - PROMETNICA

STUDIJ : PREDDIPLOMSKI GRAĐEVINSKI FAKULTET

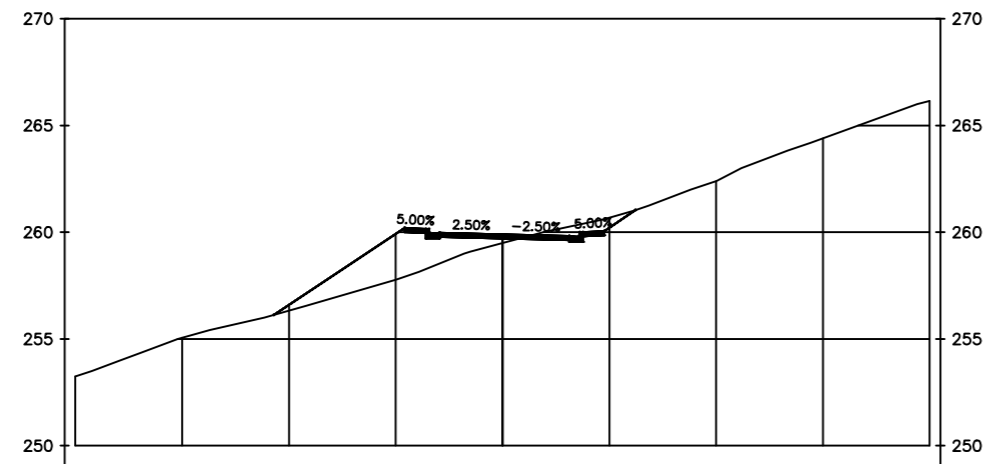
SADRŽAJ LISTA : KARAKTERISTIČNI POPREČNI PRESJECI

STUDENT : BRUNO LUGOVIĆ

DATUM:
lipanj 2019.

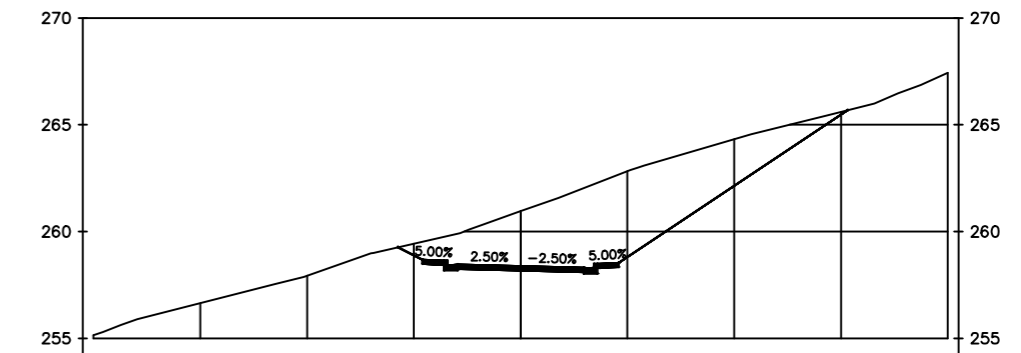
M 1:100

0+120.00



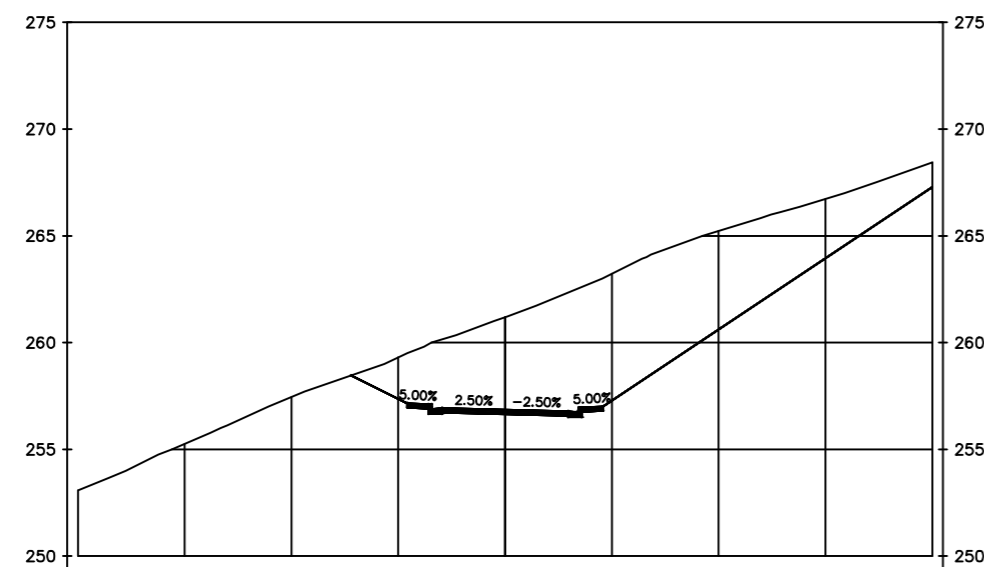
| | | | | | | | |
|-------------------|---------|--------|--------|--------|--------|--------|--------|
| Kote projekta | | 256.12 | 256.70 | 259.70 | 259.70 | 256.62 | 261.03 |
| Udaljenost od osi | -20.000 | -10.72 | -3.59 | 0.000 | 3.12 | 6.23 | 20.000 |
| Kote terena | | 256.12 | 259.70 | 259.70 | 256.62 | 261.03 | |

0+150.00



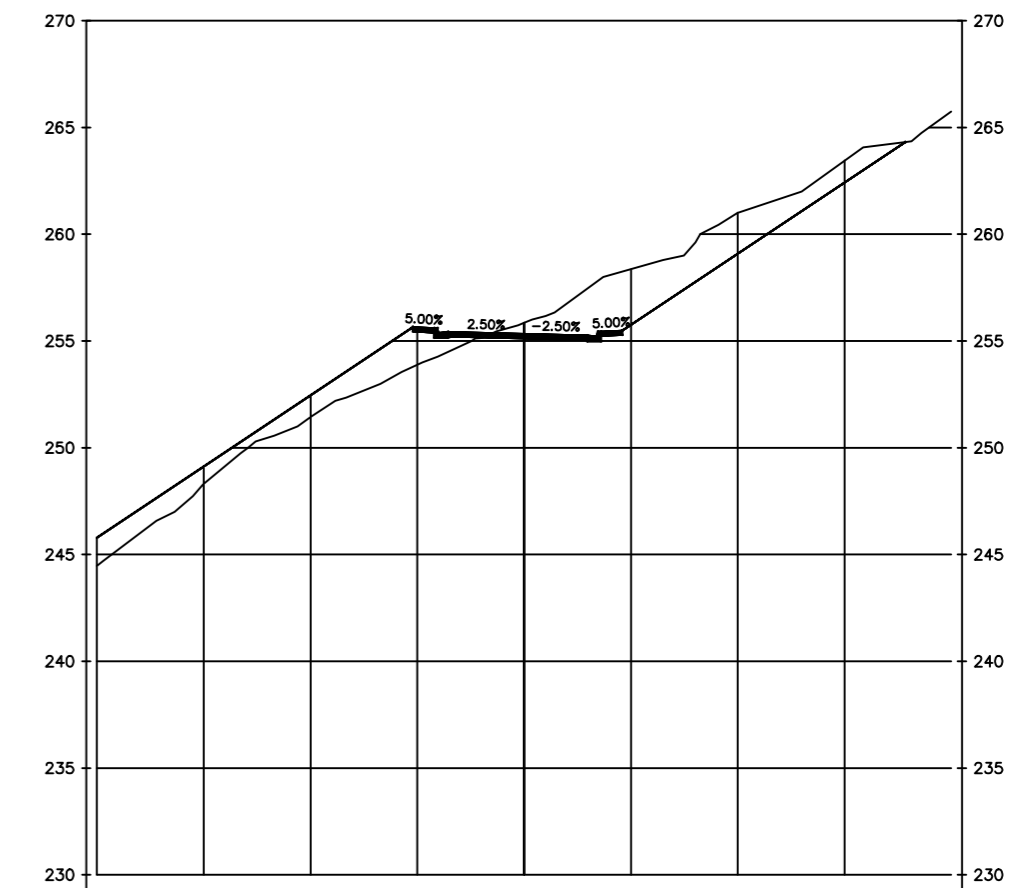
| | | | | | | |
|-------------------|---------|--------|--------|--------|--------|--------|
| Kote projekta | | 259.26 | 256.18 | 256.18 | 256.03 | 265.68 |
| Udaljenost od osi | -20.000 | -5.75 | -3.59 | 0.00 | 3.59 | 15.31 |
| Kote terena | | 259.26 | 256.18 | 256.18 | 256.03 | 265.68 |

0+180.00

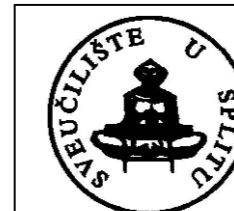


| | | | | | | |
|-------------------|---------|--------|--------|--------|--------|---------|
| Kote projekta | | 258.46 | 256.66 | 256.65 | 256.51 | 267.280 |
| Udaljenost od osi | -20.000 | -7.20 | -3.59 | 0.000 | 3.59 | 20.000 |
| Kote terena | | 258.46 | 256.66 | 256.65 | 256.51 | 267.28 |

0+210.00



| | | | | | | |
|-------------------|---------|--------|---------|--------|--------|--------|
| Kote projekta | 245.787 | 255.22 | 255.127 | 255.13 | 254.98 | 264.31 |
| Udaljenost od osi | -20.000 | -3.57 | 0.000 | 0.00 | 3.59 | 17.84 |
| Kote terena | 245.79 | 255.22 | 255.13 | 255.13 | 254.98 | 264.31 |



FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE U SPLITU

PREDMET : ZAVRŠNI RAD - PROMETNICA

STUDIJ : PREDDIPLOMSKI GRAĐEVINSKI FAKULTET

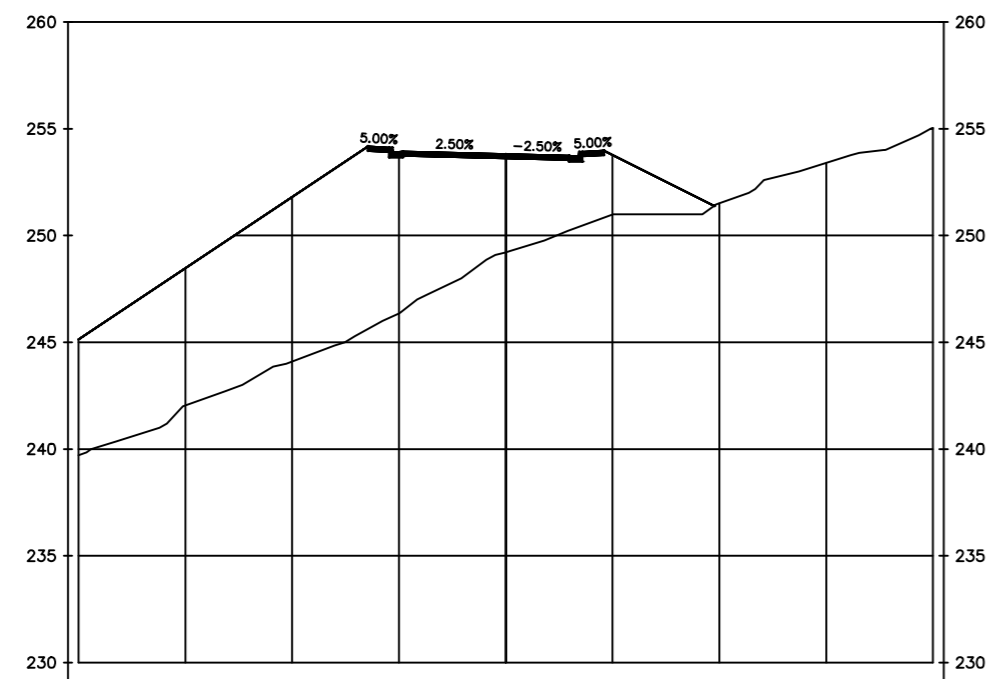
SADRŽAJ LISTA : KARAKTERISTIČNI POPREČNI PRESJECI

STUDENT : BRUNO LUGOVIĆ

DATUM:
lipanj 2019.

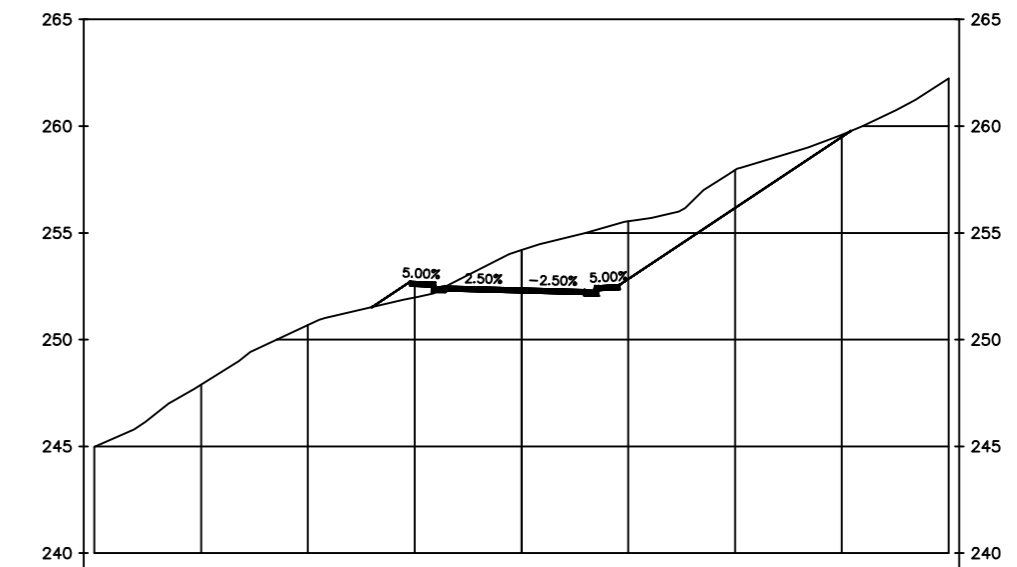
M 1:100

0+240.00



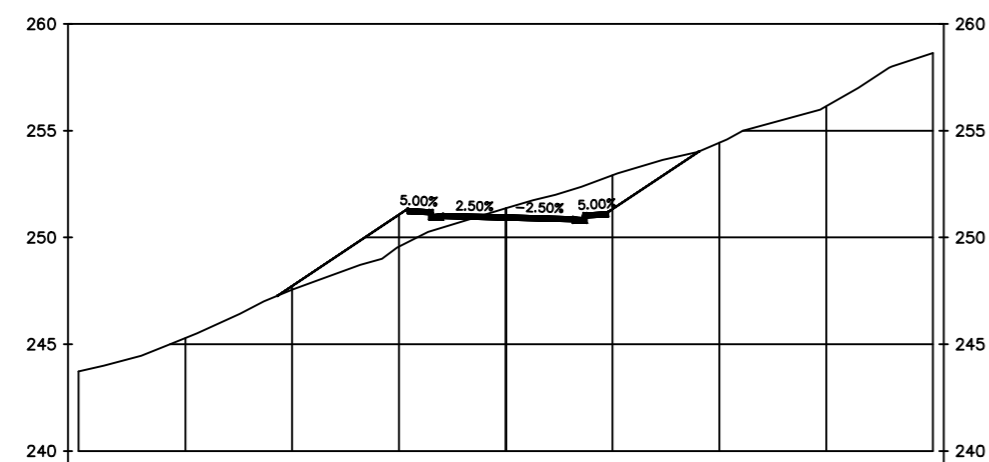
| | | | | | | |
|-------------------|---------|--------|--------|--------|--------|--------|
| Kote projekta | 245.139 | 253.74 | 253.61 | 253.47 | 251.39 | |
| Udaljenost od osi | -20.000 | -4.82 | 0.000 | 3.59 | 9.76 | 20.000 |
| Kote terena | 245.14 | 253.74 | 253.61 | 253.47 | 251.39 | |

0+270.00



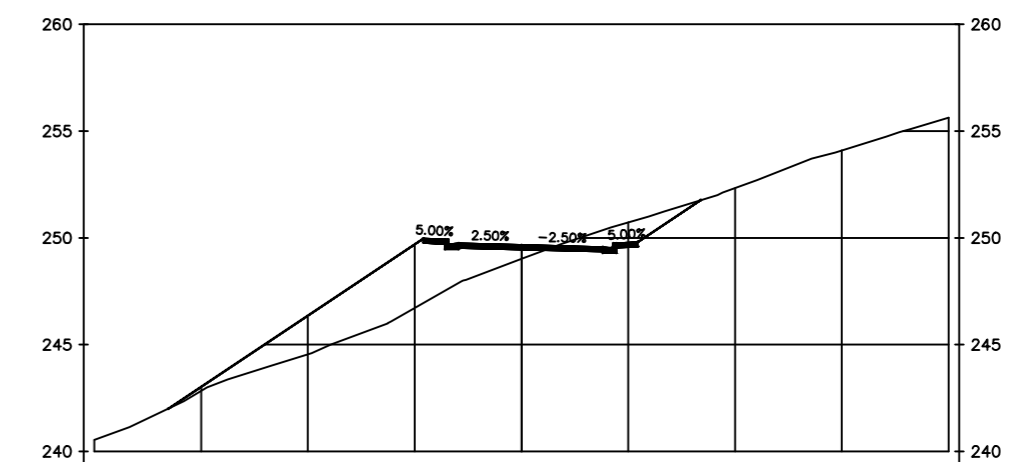
| | | | | | | |
|-------------------|---------|--------|--------|--------|--------|--------|
| Kote projekta | | 251.52 | 252.29 | 252.20 | 252.06 | 259.76 |
| Udaljenost od osi | -20.000 | -7.01 | -3.57 | 0.000 | 3.59 | 15.39 |
| Kote terena | | 251.52 | 252.29 | 252.20 | 252.06 | 259.76 |

0+300.00

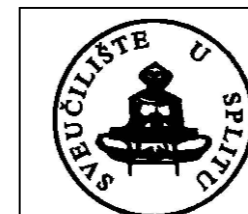


| | | | | | | |
|-------------------|---------|--------|--------|--------|--------|--------|
| Kote projekta | | 247.27 | 250.84 | 250.83 | 250.75 | 254.02 |
| Udaljenost od osi | -20.000 | -10.69 | -3.59 | 0.000 | 3.14 | 9.04 |
| Kote terena | | 247.27 | 250.84 | 250.83 | 250.75 | 254.02 |

0+330.00



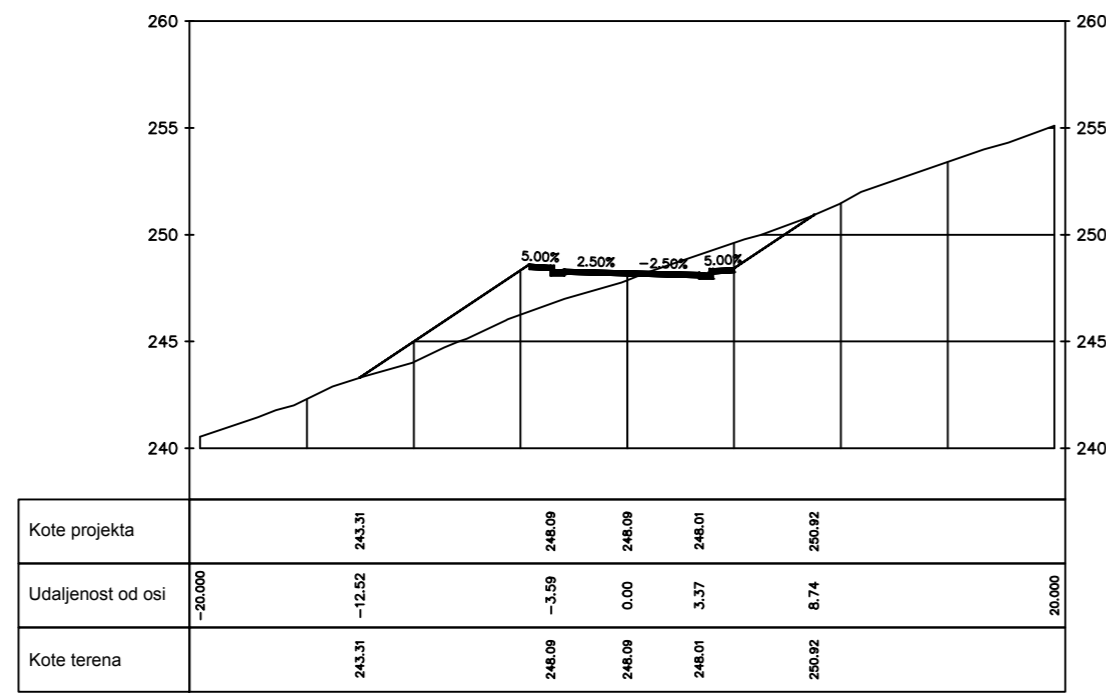
| | | | | | | |
|-------------------|---------|--------|--------|--------|--------|--------|
| Kote projekta | | 242.00 | 249.46 | 249.46 | 249.37 | 251.76 |
| Udaljenost od osi | -20.000 | -16.54 | -3.59 | 0.000 | 3.60 | 6.38 |
| Kote terena | | 242.00 | 249.46 | 249.46 | 249.37 | 251.76 |



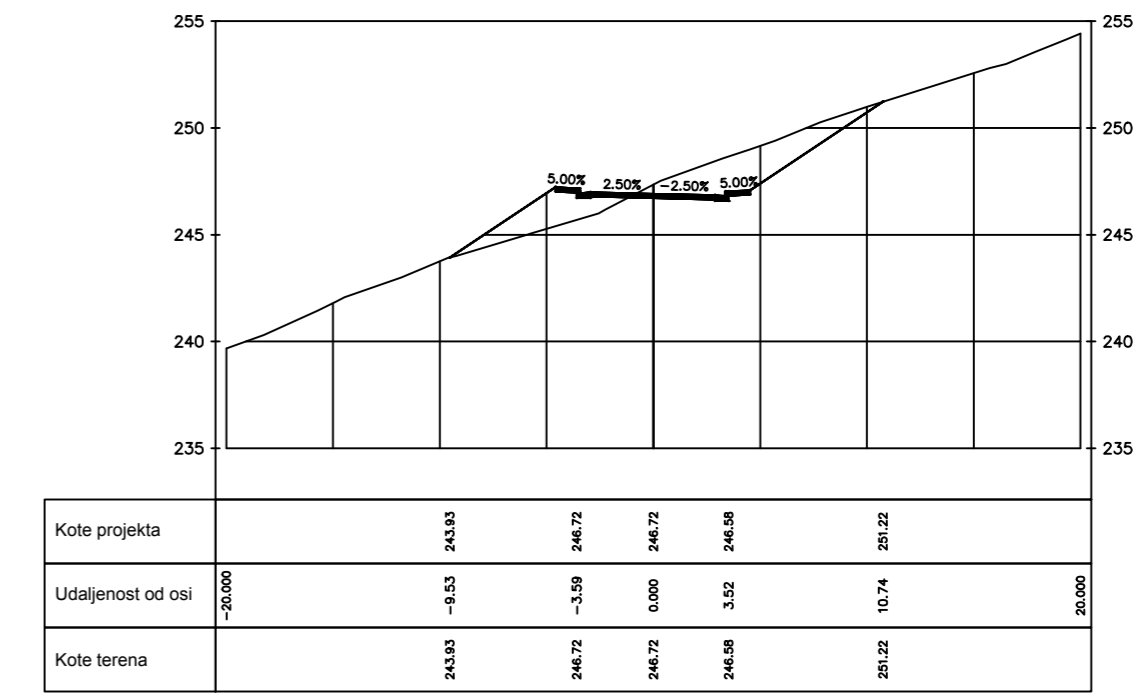
FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE U SPLITU

| | | | |
|-----------------|------------------------------------|--------|--------------|
| PREDMET : | ZAVRŠNI RAD - PROMETNICA | DATUM: | lipanj 2019. |
| STUDIJ : | PREDDIPLOMSKI GRAĐEVINSKI FAKULTET | | |
| SADRŽAJ LISTA : | KARAKTERISTIČNI POPREČNI PRESJECI | | |
| STUDENT : | BRUNO LUGOVIĆ | | M 1:100 |

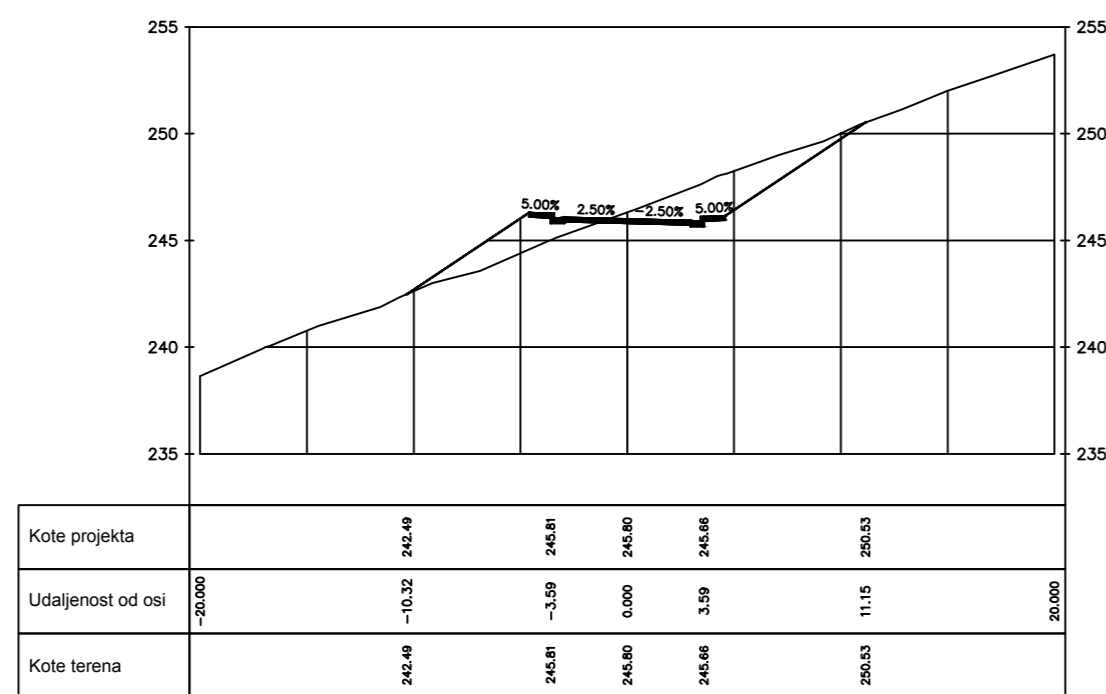
0+360.00




0+390.00



0+410.07



| | | | |
|---------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------|------------------------|
|  | FAKULTET GRAĐEVINARSTVA, ARHITEKTURE I GEODEZIJE U SPLITU | | |
| | PREDMET : | ZAVRŠNI RAD - PROMETNICA | DATUM: lipanj 2019. |
| | STUDIJ : | PREDDIPLOMSKI GRAĐEVINSKI FAKULTET | M 1:100 |
| | SADRŽAJ LISTA : | KARAKTERISTIČNI POPREČNI PRESJECI | |
| STUDENT : | BRUNO LUGOVIĆ | | |

3.4 TABLICA UKUPNOG VOLUMENA ZEMLJANIH RADOVA

PREDMJER RADOVA

Alignment: Glavna OS
 Sample Line Group: Poprečni presjeci
 Start Sta: -0+000.000
 End Sta: 0+410.071

| Station | Cut Area (Sq.m.) | Cut Volume (Cu.m.) | Reusable Volume (Cu.m.) | Fill Area (Sq.m.) | Fill Volume (Cu.m.) | Cum. Cut Vol. (Cu.m.) | Cum. Reusable Vol. (Cu.m.) | Cum. Fill Vol. (Cu.m.) | Cum. Net Vol. (Cu.m.) |
|------------|------------------|--------------------|-------------------------|-------------------|---------------------|-----------------------|----------------------------|------------------------|-----------------------|
| -0+000.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0+000.000 | 33.14 | 0.00 | 0.00 | 67.80 | 0.00 | 0.00 | 0.00 | 0.00 | -0.00 |
| 0+030.000 | 19.92 | 781.27 | 781.27 | 9.07 | 1180.89 | 781.27 | 781.27 | 1180.89 | -399.61 |
| 0+060.000 | 15.76 | 507.22 | 507.22 | 0.04 | 145.67 | 1288.49 | 1288.49 | 1326.55 | -38.06 |
| 0+090.000 | 1.00 | 240.66 | 240.66 | 16.77 | 269.25 | 1529.15 | 1529.15 | 1595.80 | -66.65 |
| 0+120.000 | 2.38 | 48.61 | 48.61 | 11.89 | 452.69 | 1577.76 | 1577.76 | 2048.49 | -470.73 |
| 0+150.000 | 49.05 | 766.55 | 766.55 | 0.00 | 179.64 | 2344.31 | 2344.31 | 2228.14 | 116.18 |
| 0+180.000 | 102.19 | 2268.56 | 2268.56 | 0.00 | 0.00 | 4612.87 | 4612.87 | 2228.14 | 2384.74 |
| 0+210.000 | 28.85 | 1980.77 | 1980.77 | 18.46 | 273.08 | 6593.64 | 6593.64 | 2501.22 | 4092.42 |
| 0+210.032 | 28.75 | 0.91 | 0.91 | 18.67 | 0.59 | 6594.55 | 6594.55 | 2501.80 | 4092.75 |
| 0+240.000 | 0.00 | 485.22 | 485.22 | 160.94 | 2309.60 | 7079.77 | 7079.77 | 4811.41 | 2268.37 |
| 0+270.000 | 31.58 | 519.70 | 519.70 | 1.17 | 2050.82 | 7599.47 | 7599.47 | 6862.23 | 737.25 |
| 0+300.000 | 10.08 | 633.40 | 633.40 | 7.00 | 120.35 | 8232.88 | 8232.88 | 6982.58 | 1250.30 |
| 0+330.000 | 4.79 | 214.39 | 214.39 | 25.39 | 515.75 | 8447.27 | 8447.27 | 7498.33 | 948.94 |
| 0+360.000 | 5.61 | 144.89 | 144.89 | 14.24 | 654.74 | 8592.16 | 8592.16 | 8153.07 | 439.10 |
| 0+390.000 | 13.39 | 278.23 | 278.23 | 7.49 | 335.86 | 8870.39 | 8870.39 | 8488.93 | 381.46 |
| 0+410.071 | 12.87 | 263.49 | 263.49 | 7.41 | 149.55 | 9133.88 | 9133.88 | 8638.48 | 495.40 |

UKUPNI VOLUMEN

| Volume Summary | | | | | | | |
|---------------------------|------|------------|-------------|----------------|--------------|---------------|--------------|
| Name | Type | Cut Factor | Fill Factor | 2d Area (sq.m) | Cut (Cu. M.) | Fill (Cu. M.) | Net (Cu. M.) |
| Kolicina zemljanih radova | full | 1.000 | 1.000 | 10458.25 | 10285.88 | 8883.08 | 1402.80<Cut> |

| Totals | | | | |
|--------|----------------|--------------|---------------|--------------|
| | 2d Area (sq.m) | Cut (Cu. M.) | Fill (Cu. M.) | Net (Cu. M.) |
| Total | 10458.25 | 10285.88 | 8883.08 | 1402.80<Cut> |

4. OBRADA NA RAČUNALU

Prilikom izrade predmetnog zadatka korišteno je računalo uz odgovarajući program Autodesk AutoCad Civil 3D. Postupak projektiranja trase na računalu je sličan ručnoj izradi rješenja, no mnogo brži. Radu na računalu prethodi definiranje problema, uočavanje nedostataka te određivanje načina na koje bi se idejno rješenje kvalitetno izradilo.

Prvi korak pri izradi idejnog rješenja na računalu je digitaliziranje terena na temelju zadanih slojnica. Unošenjem slojnica u obliku 3D polilinja sa zadanim nadmorskim visinama pomoću kojih definiramo površinu odnosno trodimenzionalni model terena postojećeg stanja na području obuhvaćenim predmetnim zadatkom.

Nadalje se unose koordinate točaka tangenti (po dvije za svaku tangentu) koje ih definiraju na terenu. Sjecišta tangenti se definiraju ubacivanjem odgovarajućih kružnih lukova i prijelaznih krivina čime se dobije horizontalni tok ceste.

Sljedeći korak je izrada uzdužnog presjeka ceste. Linija terena se automatski generira iz zadane horizontalne osi ceste. Niveleta se postavlja tako da se riješe geometrijski i sigurnosni elementi i odvodnja. Između tangenti se umeće kružna krivina radijusa prema potrebi.

Treba definirati i poprečni profil prometnice. Poprečnim presjekom su definirani: poprečni nagib i širina kolnika, te pokosi usjeka i nasipa.

Iz definirane osi trase, nivelete i poprečnog presjeka definira se koridor. Tako se dođe do poprečnih presjeka u svim karakterističnim i zadanim točkama osi ceste, a time i točke spajanja pokosa usjeka i nasipa s terenom. S navedenim se može definirati cijela dionica ceste u prostoru.

Kao izlazni podatci dobiju se računalni ispisi koordinatnih točaka osi, točaka svakog poprečnog presjeka, te količina zemljanih radova po presjeku.

5. IZLAZNI PODACI PROGRAMA

5.1 TOČKE HORIZONTALNE GEOMETRIJE

KOORDINATNI RAČUN GLAVNIH TOČAKA OSI

Alignment: Glavna_OS

Description:

| <u>Tangent Data</u> | | | |
|---------------------|------------|---------------|----------------|
| Description | PT Station | Northing | Easting |
| Start: | 0+000.000 | 277965050.656 | -166330708.261 |
| End: | 0+011.022 | 277965060.494 | -166330703.290 |

| <u>Tangent Data</u> | | | |
|---------------------|--------|-----------|----------------------|
| Parameter | Value | Parameter | Value |
| Length: | 11.022 | Course: | N 26° 48' 19.5552" E |

| <u>Spiral Point Data</u> | | | |
|--------------------------|-----------|---------------|----------------|
| Description | Station | Northing | Easting |
| TS: | 0+011.022 | 277965060.494 | -166330703.290 |
| SPI: | | 277965084.398 | -166330691.212 |
| SC: | 0+051.022 | 277965094.198 | -166330682.018 |

| <u>Spiral Curve Data: clothoid</u> | | | |
|------------------------------------|------------------|-----------|----------------------|
| Parameter | Value | Parameter | Value |
| Length: | 40.000 | L Tan: | 26.782 |
| Radius: | 70.000 | S Tan: | 13.438 |
| Theta: | 16° 22' 12.8018" | P: | 0.950 |
| X: | 39.675 | K: | 19.946 |
| Y: | 3.787 | A: | 52.915 |
| Chord: | 39.855 | Course: | N 32° 15' 30.2195" E |

| <u>Curve Point Data</u> | | | |
|-------------------------|-----------|---------------|----------------|
| Description | Station | Northing | Easting |
| SC: | 0+051.022 | 277965094.198 | -166330682.018 |
| RP: | | 277965046.301 | -166330630.970 |
| CS: | 0+095.749 | 277965115.191 | -166330643.384 |

| <u>Circular Curve Data</u> | | | |
|----------------------------|------------------|-----------|--------|
| Parameter | Value | Parameter | Value |
| Delta: | 36° 36' 32.0055" | Type: | RIGHT |
| Radius: | 70.000 | | |
| Length: | 44.726 | Tangent: | 23.156 |

Mid-Ord: 3.542 External: 3.731
 Chord: 43.969 Course: N 61° 28' 48.3596" E

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| CS: | 0+095.749 | 277965115.191 | -166330643.384 |
| SPI: | | 277965117.575 | -166330630.159 |
| ST: | 0+135.749 | 277965114.703 | -166330603.532 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Length: | 40.000 | L Tan: | 26.782 |
| Radius: | 70.000 | S Tan: | 13.438 |
| Theta: | 16° 22' 12.8018" | P: | 0.950 |
| X: | 39.675 | K: | 19.946 |
| Y: | 3.787 | A: | 52.915 |
| Chord: | 39.855 | Course: | S 89° 17' 53.5009" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+135.749 | 277965114.703 | -166330603.532 |
| End: | 0+200.032 | 277965107.811 | -166330539.620 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 64.283 | Course: | S 83° 50' 42.8360" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| TS: | 0+200.032 | 277965107.811 | -166330539.620 |
| SPI: | | 277965105.654 | -166330519.618 |
| SC: | 0+230.032 | 277965107.918 | -166330509.768 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Length: | 30.000 | L Tan: | 20.118 |
| Radius: | 45.000 | S Tan: | 10.107 |
| Theta: | 19° 05' 54.9354" | P: | 0.830 |
| X: | 29.668 | K: | 14.945 |
| Y: | 3.307 | A: | 36.742 |
| Chord: | 29.852 | Course: | N 89° 47' 40.4677" E |

Curve Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| SC: | 0+230.032 | 277965107.918 | -166330509.768 |

RP: 277965151.775 -166330519.847
 CS: 0+256.342 277965120.766 -166330487.237

Circular Curve Data

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Delta: | 33° 29' 56.0021" | Type: | LEFT |
| Radius: | 45.000 | | |
| Length: | 26.310 | Tangent: | 13.543 |
| Mid-Ord: | 1.909 | External: | 1.994 |
| Chord: | 25.937 | Course: | N 60° 18' 24.2278" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| CS: | 0+256.342 | 277965120.766 | -166330487.237 |
| SPI: | | 277965128.091 | -166330480.272 |
| ST: | 0+286.342 | 277965146.403 | -166330471.943 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Length: | 30.000 | L Tan: | 20.118 |
| Radius: | 45.000 | S Tan: | 10.107 |
| Theta: | 19° 05' 54.9354" | P: | 0.830 |
| X: | 29.668 | K: | 14.945 |
| Y: | 3.307 | A: | 36.742 |
| Chord: | 29.852 | Course: | N 30° 49' 07.9872" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+286.342 | 277965146.403 | -166330471.943 |
| End: | 0+292.711 | 277965152.200 | -166330469.306 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|-------|-----------|----------------------|
| Length: | 6.369 | Course: | N 24° 27' 31.2906" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| TS: | 0+292.711 | 277965152.200 | -166330469.306 |
| SPI: | | 277965176.617 | -166330458.200 |
| SC: | 0+332.711 | 277965186.383 | -166330448.914 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|--------|
| Length: | 40.000 | L Tan: | 26.824 |
| Radius: | 60.000 | S Tan: | 13.476 |
| Theta: | 19° 05' 54.9354" | P: | 1.107 |

| | | | |
|--------|--------|---------|----------------------|
| X: | 39.558 | K: | 19.926 |
| Y: | 4.409 | A: | 48.990 |
| Chord: | 39.803 | Course: | N 30° 49' 07.9872" E |

Curve Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| SC: | 0+332.711 | 277965186.383 | -166330448.914 |
| RP: | | 277965145.038 | -166330405.432 |
| CS: | 0+347.737 | 277965195.869 | -166330437.311 |

Circular Curve Data

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Delta: | 14° 20' 56.8190" | Type: | RIGHT |
| Radius: | 60.000 | | |
| Length: | 15.026 | Tangent: | 7.553 |
| Mid-Ord: | 0.470 | External: | 0.473 |
| Chord: | 14.987 | Course: | N 50° 43' 54.6358" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| CS: | 0+347.737 | 277965195.869 | -166330437.311 |
| SPI: | | 277965203.029 | -166330425.894 |
| ST: | 0+387.737 | 277965209.060 | -166330399.757 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Length: | 40.000 | L Tan: | 26.824 |
| Radius: | 60.000 | S Tan: | 13.476 |
| Theta: | 19° 05' 54.9354" | P: | 1.107 |
| X: | 39.558 | K: | 19.926 |
| Y: | 4.409 | A: | 48.990 |
| Chord: | 39.803 | Course: | N 70° 38' 41.2848" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+387.737 | 277965209.060 | -166330399.757 |
| End: | 0+410.071 | 277965214.083 | -166330377.996 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 22.334 | Course: | N 77° 00' 17.9810" E |

Alignment: Prosirenje desno

Description:

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+000.000 | 277965049.326 | -166330705.628 |
| End: | 0+011.022 | 277965059.164 | -166330700.657 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 11.022 | Course: | N 26° 48' 19.5552" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+011.022 | 277965059.164 | -166330700.657 |
| End: | 0+024.259 | 277965070.821 | -166330694.387 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 13.236 | Course: | N 28° 16' 30.5706" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+024.259 | 277965070.821 | -166330694.387 |
| End: | 0+037.278 | 277965081.871 | -166330687.503 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 13.019 | Course: | N 31° 55' 17.4082" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+037.278 | 277965081.871 | -166330687.503 |
| End: | 0+050.051 | 277965091.769 | -166330679.429 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 12.773 | Course: | N 39° 12' 23.2493" E |

Curve Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| PC: | 0+050.051 | 277965091.769 | -166330679.429 |
| RP: | | 277965046.301 | -166330630.970 |
| PT: | 0+092.509 | 277965111.698 | -166330642.755 |

Circular Curve Data

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Delta: | 36° 36' 32.0058" | Type: | RIGHT |
| Radius: | 66.450 | | |
| Length: | 42.458 | Tangent: | 21.982 |
| Mid-Ord: | 3.362 | External: | 3.541 |
| Chord: | 41.739 | Course: | N 61° 28' 48.3597" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+092.509 | 277965111.698 | -166330642.755 |
| End: | 0+105.281 | 277965113.087 | -166330630.058 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 12.773 | Course: | N 83° 45' 13.4691" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+105.281 | 277965113.087 | -166330630.058 |
| End: | 0+118.301 | 277965112.851 | -166330617.040 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 13.019 | Course: | S 88° 57' 40.6895" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+118.301 | 277965112.851 | -166330617.040 |
| End: | 0+131.537 | 277965111.770 | -166330603.848 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 13.236 | Course: | S 85° 18' 53.8513" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+131.537 | 277965111.770 | -166330603.848 |
| End: | 0+195.820 | 277965104.878 | -166330539.936 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 64.283 | Course: | S 83° 50' 42.8360" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| TS: | 0+195.820 | 277965104.878 | -166330539.936 |

SPI: 277965102.668 -166330519.441
 SC: 0+226.803 277965105.043 -166330509.107

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Length: | 30.983 | L Tan: | 20.770 |
| Radius: | 47.950 | S Tan: | 10.432 |
| Theta: | 18° 30' 39.9504" | P: | 0.831 |
| X: | 30.661 | K: | 15.438 |
| Y: | 3.312 | A: | 38.544 |
| Chord: | 30.829 | Course: | N 89° 41' 36.1588" E |

Curve Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| SC: | 0+226.803 | 277965105.043 | -166330509.107 |
| RP: | | 277965151.775 | -166330519.847 |
| CS: | 0+254.838 | 277965118.733 | -166330485.099 |

Circular Curve Data

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Delta: | 33° 29' 56.0017" | Type: | LEFT |
| Radius: | 47.950 | | |
| Length: | 28.035 | Tangent: | 14.431 |
| Mid-Ord: | 2.034 | External: | 2.124 |
| Chord: | 27.637 | Course: | N 60° 18' 24.2278" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| CS: | 0+254.838 | 277965118.733 | -166330485.099 |
| SPI: | | 277965126.418 | -166330477.792 |
| ST: | 0+285.822 | 277965145.182 | -166330469.257 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Length: | 30.983 | L Tan: | 20.770 |
| Radius: | 47.950 | S Tan: | 10.432 |
| Theta: | 18° 30' 39.9504" | P: | 0.831 |
| X: | 30.661 | K: | 15.438 |
| Y: | 3.312 | A: | 38.544 |
| Chord: | 30.829 | Course: | N 30° 55' 12.2962" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+285.822 | 277965145.182 | -166330469.257 |
| End: | 0+292.190 | 277965150.979 | -166330466.620 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|-------|-----------|----------------------|
| Length: | 6.369 | Course: | N 24° 27' 31.2898" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+292.190 | 277965150.979 | -166330466.620 |
| End: | 0+305.410 | 277965162.843 | -166330460.789 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 13.220 | Course: | N 26° 10' 26.9970" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+305.410 | 277965162.843 | -166330460.789 |
| End: | 0+318.371 | 277965174.018 | -166330454.225 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 12.961 | Course: | N 30° 25' 48.2184" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+318.371 | 277965174.018 | -166330454.225 |
| End: | 0+331.032 | 277965183.868 | -166330446.268 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 12.661 | Course: | N 38° 55' 52.9389" E |

Curve Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| PC: | 0+331.032 | 277965183.868 | -166330446.268 |
| RP: | | 277965145.038 | -166330405.432 |
| PT: | 0+345.144 | 277965192.777 | -166330435.371 |

Circular Curve Data

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Delta: | 14° 20' 56.8186" | Type: | RIGHT |
| Radius: | 56.350 | | |
| Length: | 14.112 | Tangent: | 7.093 |
| Mid-Ord: | 0.441 | External: | 0.445 |
| Chord: | 14.075 | Course: | N 50° 43' 54.6357" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+345.144 | 277965192.777 | -166330435.371 |
| End: | 0+357.806 | 277965198.617 | -166330424.137 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 12.661 | Course: | N 62° 31' 56.3340" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+357.806 | 277965198.617 | -166330424.137 |
| End: | 0+370.766 | 277965202.829 | -166330411.880 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 12.961 | Course: | N 71° 02' 01.0534" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+370.766 | 277965202.829 | -166330411.880 |
| End: | 0+383.986 | 277965206.186 | -166330399.094 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 13.220 | Course: | N 75° 17' 22.2752" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+383.986 | 277965206.186 | -166330399.094 |
| End: | 0+406.320 | 277965211.208 | -166330377.332 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 22.334 | Course: | N 77° 00' 17.9810" E |

Alignment: Prosirenje lijevo

Description:

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+000.000 | 277965051.987 | -166330710.894 |
| End: | 0+011.022 | 277965061.825 | -166330705.923 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 11.022 | Course: | N 26° 48' 19.5552" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| TS: | 0+011.022 | 277965061.825 | -166330705.923 |
| SPI: | | 277965086.107 | -166330693.654 |
| SC: | 0+051.865 | 277965096.216 | -166330684.169 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Length: | 40.843 | L Tan: | 27.341 |
| Radius: | 72.950 | S Tan: | 13.717 |
| Theta: | 16° 02' 21.2201" | P: | 0.950 |
| X: | 40.524 | K: | 20.368 |
| Y: | 3.790 | A: | 54.585 |
| Chord: | 40.694 | Course: | N 32° 18' 53.1682" E |

Curve Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| SC: | 0+051.865 | 277965096.216 | -166330684.169 |
| RP: | | 277965046.301 | -166330630.970 |
| CS: | 0+098.476 | 277965118.095 | -166330643.907 |

Circular Curve Data

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Delta: | 36° 36' 32.0044" | Type: | RIGHT |
| Radius: | 72.950 | | |
| Length: | 46.611 | Tangent: | 24.132 |
| Mid-Ord: | 3.691 | External: | 3.888 |
| Chord: | 45.822 | Course: | N 61° 28' 48.3596" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|---------|----------|---------|
|-------------|---------|----------|---------|

| | | | |
|------|-----------|---------------|----------------|
| CS: | 0+098.476 | 277965118.095 | -166330643.907 |
| SPI: | | 277965120.553 | -166330630.265 |
| ST: | 0+139.319 | 277965117.636 | -166330603.216 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Length: | 40.843 | L Tan: | 27.341 |
| Radius: | 72.950 | S Tan: | 13.717 |
| Theta: | 16° 02' 21.2201" | P: | 0.950 |
| X: | 40.524 | K: | 20.368 |
| Y: | 3.790 | A: | 54.585 |
| Chord: | 40.694 | Course: | S 89° 21' 16.4498" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+139.319 | 277965117.636 | -166330603.216 |
| End: | 0+203.602 | 277965110.744 | -166330539.303 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 64.283 | Course: | S 83° 50' 42.8360" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+203.602 | 277965110.744 | -166330539.303 |
| End: | 0+213.497 | 277965110.426 | -166330529.414 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|-------|-----------|----------------------|
| Length: | 9.894 | Course: | S 88° 09' 34.3004" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+213.497 | 277965110.426 | -166330529.414 |
| End: | 0+223.076 | 277965110.845 | -166330519.844 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|-------|-----------|----------------------|
| Length: | 9.580 | Course: | N 87° 29' 39.6651" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+223.076 | 277965110.845 | -166330519.844 |
| End: | 0+232.245 | 277965112.616 | -166330510.847 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|-------|-----------|-------|
|-----------|-------|-----------|-------|

Length: 9.169 Course: N 78° 51' 57.8871" E

Curve Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| PC: | 0+232.245 | 277965112.616 | -166330510.847 |
| RP: | | 277965151.775 | -166330519.847 |
| PT: | 0+255.737 | 277965124.088 | -166330490.730 |

Circular Curve Data

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Delta: | 33° 29' 56.0000" | Type: | LEFT |
| Radius: | 40.180 | | |
| Length: | 23.492 | Tangent: | 12.092 |
| Mid-Ord: | 1.705 | External: | 1.780 |
| Chord: | 23.159 | Course: | N 60° 18' 24.2278" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+255.737 | 277965124.088 | -166330490.730 |
| End: | 0+264.906 | 277965130.928 | -166330484.624 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|-------|-----------|----------------------|
| Length: | 9.169 | Course: | N 41° 44' 50.5674" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+264.906 | 277965130.928 | -166330484.624 |
| End: | 0+274.485 | 277965138.952 | -166330479.390 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|-------|-----------|----------------------|
| Length: | 9.580 | Course: | N 33° 07' 08.7908" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+274.485 | 277965138.952 | -166330479.390 |
| End: | 0+284.380 | 277965147.624 | -166330474.628 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|-------|-----------|----------------------|
| Length: | 9.894 | Course: | N 28° 46' 22.7558" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+284.380 | 277965147.624 | -166330474.628 |

End: 0+290.749 277965153.422 -166330471.991

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|-------|-----------|----------------------|
| Length: | 6.369 | Course: | N 24° 27' 31.2906" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| TS: | 0+290.749 | 277965153.422 | -166330471.991 |
| SPI: | | 277965178.290 | -166330460.679 |
| SC: | 0+331.732 | 277965188.416 | -166330451.051 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Length: | 40.983 | L Tan: | 27.475 |
| Radius: | 62.950 | S Tan: | 13.800 |
| Theta: | 18° 39' 03.9183" | P: | 1.108 |
| X: | 40.551 | K: | 20.419 |
| Y: | 4.413 | A: | 50.793 |
| Chord: | 40.780 | Course: | N 30° 53' 43.4015" E |

Curve Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| SC: | 0+331.732 | 277965188.416 | -166330451.051 |
| RP: | | 277965145.038 | -166330405.432 |
| CS: | 0+347.497 | 277965198.368 | -166330438.878 |

Circular Curve Data

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|----------------------|
| Delta: | 14° 20' 56.8212" | Type: | RIGHT |
| Radius: | 62.950 | | |
| Length: | 15.765 | Tangent: | 7.924 |
| Mid-Ord: | 0.493 | External: | 0.497 |
| Chord: | 15.724 | Course: | N 50° 43' 54.6357" E |

Spiral Point Data

| Description | Station | Northing | Easting |
|-------------|-----------|---------------|----------------|
| CS: | 0+347.497 | 277965198.368 | -166330438.878 |
| SPI: | | 277965205.792 | -166330427.041 |
| ST: | 0+388.481 | 277965211.935 | -166330400.421 |

Spiral Curve Data: clothoid

| Parameter | Value | Parameter | Value |
|-----------|------------------|-----------|--------|
| Length: | 40.983 | L Tan: | 27.475 |
| Radius: | 62.950 | S Tan: | 13.800 |
| Theta: | 18° 39' 03.9183" | P: | 1.108 |

| | | | |
|--------|--------|---------|----------------------|
| X: | 40.551 | K: | 20.419 |
| Y: | 4.413 | A: | 50.793 |
| Chord: | 40.780 | Course: | N 70° 34' 05.8703" E |

Tangent Data

| Description | PT Station | Northing | Easting |
|-------------|------------|---------------|----------------|
| Start: | 0+388.481 | 277965211.935 | -166330400.421 |
| End: | 0+410.814 | 277965216.957 | -166330378.659 |

Tangent Data

| Parameter | Value | Parameter | Value |
|-----------|--------|-----------|----------------------|
| Length: | 22.334 | Course: | N 77° 00' 17.9810" E |

KOORDINATNI RAČUN DETALJNIH TOČAKA OSI

Alignment Name: Glavna OS

Description:

Station Range: Start: 0+000.00, End: 0+410.07

Station Increment: 30.00

| Station | Northing | Easting | Tangential Direction |
|----------|-------------------|--------------------|----------------------|
| 0+000.00 | 277,965,050.6564m | -166,330,708.2606m | N26° 48' 20"E |
| 0+030.00 | 277,965,077.2423m | -166,330,694.3723m | N30° 29' 25"E |
| 0+060.00 | 277,965,100.3335m | -166,330,675.4725m | N50° 31' 26"E |
| 0+090.00 | 277,965,113.9410m | -166,330,648.9933m | N75° 04' 45"E |
| 0+120.00 | 277,965,116.1603m | -166,330,619.2117m | S86° 22' 58"E |
| 0+150.00 | 277,965,113.1754m | -166,330,589.3627m | S83° 50' 43"E |
| 0+180.00 | 277,965,109.9589m | -166,330,559.5357m | S83° 50' 43"E |
| 0+210.00 | 277,965,106.8642m | -166,330,529.6968m | S85° 57' 14"E |
| 0+240.00 | 277,965,111.2046m | -166,330,500.3781m | N64° 21' 50"E |
| 0+270.00 | 277,965,131.7654m | -166,330,479.1920m | N30° 07' 32"E |
| 0+300.00 | 277,965,158.8245m | -166,330,466.2630m | N25° 05' 35"E |
| 0+330.00 | 277,965,184.3778m | -166,330,450.7373m | N41° 03' 24"E |
| 0+360.00 | 277,965,201.3981m | -166,330,426.3820m | N67° 49' 18"E |
| 0+390.00 | 277,965,209.5693m | -166,330,397.5522m | N77° 00' 18"E |
| 0+410.07 | 277,965,214.0824m | -166,330,377.9962m | N77° 00' 18"E |

Alignment Name: Prosirenje desno

Description:

Station Range: Start: 0+000.00, End: 0+406.32

Station Increment: 30.00

| Station | Northing | Easting | Tangential Direction |
|----------|-------------------|--------------------|----------------------|
| 0+000.00 | 277,965,049.3261m | -166,330,705.6276m | N26° 48' 20"E |
| 0+030.00 | 277,965,075.6941m | -166,330,691.3510m | N31° 55' 17"E |
| 0+060.00 | 277,965,098.4885m | -166,330,672.1045m | N51° 45' 15"E |
| 0+090.00 | 277,965,111.2064m | -166,330,645.2144m | N77° 37' 17"E |
| 0+120.00 | 277,965,112.7127m | -166,330,615.3468m | S85° 18' 54"E |
| 0+150.00 | 277,965,109.7908m | -166,330,585.4918m | S83° 50' 43"E |
| 0+180.00 | 277,965,106.5744m | -166,330,555.6647m | S83° 50' 43"E |
| 0+210.00 | 277,965,103.7096m | -166,330,526.0521m | S87° 50' 44"E |
| 0+240.00 | 277,965,109.7207m | -166,330,496.8115m | N61° 17' 15"E |
| 0+270.00 | 277,965,131.2027m | -166,330,476.1152m | N29° 26' 20"E |

| | | | |
|----------|-------------------|--------------------|---------------|
| 0+300.00 | 277,965,157.9877m | -166,330,463.1755m | N26° 10' 27"E |
| 0+330.00 | 277,965,183.0647m | -166,330,446.9170m | N38° 55' 53"E |
| 0+360.00 | 277,965,199.3298m | -166,330,422.0622m | N71° 02' 01"E |
| 0+390.00 | 277,965,207.5383m | -166,330,393.2340m | N77° 00' 18"E |

Alignment Name: Prosirenje lijevo

Description:

Station Range: Start: 0+000.00, End: 0+410.81

Station Increment: 30.00

| Station | Northing | Easting | Tangential Direction |
|----------------|-------------------|--------------------|-----------------------------|
| 0+000.00 | 277,965,051.9868m | -166,330,710.8936m | N26° 48' 20"E |
| 0+030.00 | 277,965,078.3947m | -166,330,697.1165m | N30° 20' 23"E |
| 0+060.00 | 277,965,101.8263m | -166,330,678.2841m | N49° 33' 53"E |
| 0+090.00 | 277,965,116.1107m | -166,330,652.1432m | N73° 07' 38"E |
| 0+120.00 | 277,965,119.2775m | -166,330,622.2507m | S87° 30' 28"E |
| 0+150.00 | 277,965,116.4912m | -166,330,592.5965m | S83° 50' 43"E |
| 0+180.00 | 277,965,113.2747m | -166,330,562.7694m | S83° 50' 43"E |
| 0+210.00 | 277,965,110.5388m | -166,330,532.9087m | S88° 09' 34"E |
| 0+240.00 | 277,965,115.0692m | -166,330,503.5033m | N65° 59' 52"E |
| 0+270.00 | 277,965,135.1950m | -166,330,481.8411m | N33° 07' 09"E |
| 0+300.00 | 277,965,161.6649m | -166,330,468.1848m | N25° 25' 55"E |
| 0+330.00 | 277,965,187.1147m | -166,330,452.2543m | N41° 58' 38"E |
| 0+360.00 | 277,965,204.1063m | -166,330,427.5533m | N67° 46' 54"E |
| 0+390.00 | 277,965,212.2766m | -166,330,398.9401m | N77° 00' 18"E |

5.2 TOČKE VERTIKALNE GEOMETRIJE

VERTIKALNI TOK TRASE

Vertical Alignment: Niveleta

Description:

Station Range: Start: 0+000.00, End: 0+410.07

| PVI | Station | Grade Out | Curve Length |
|----------------------------------------|----------|------------|--------------|
| 0.00 | 0+245.73 | -4.57% | 38.358m |
| Vertical Curve Information:(sag curve) | | | |
| ----- | | | |
| PVC Station: | 0+226.55 | Elevation: | 254.486m |
| PVI Station: | 0+245.73 | Elevation: | 253.511m |
| PVT Station: | 0+264.91 | Elevation: | 252.635m |
| Low Point: | 0+264.91 | Elevation: | 252.635m |
| Grade in: | -5.08% | Grade out: | -4.57% |
| Change: | 0.51% | K: | |
| Curve Length: | 38.358m | | |
| Headlight Distance: | | | |

5.3 TOČKE POPREČNIH PRESJEKA

RAČUN KOTA KOLNIKA

Corridor Name: Corridor

Description:

Base Alignment Name: Glavna OS

Station Range: Start: 0+000.00, End: 0+410.07

CHAINAGE 0+000.00

CHAINAGE 0+030.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|----------|-----------------|
| 1 | -166,330,703.7247 | 277,965,082.7492 | 260.6041 | -10.853m | Daylight |
| 2 | -166,330,698.3283 | 277,965,079.5717 | 264.7790 | -4.591m | Hinge |
| 3 | -166,330,698.3274 | 277,965,079.5712 | 264.5790 | -4.590m | EPS_Sub |
| 4 | -166,330,697.4666 | 277,965,079.0643 | 264.7290 | -3.591m | Back_Curb |
| 5 | -166,330,697.3373 | 277,965,078.9882 | 264.7290 | -3.441m | Top_Curb |
| 6 | -166,330,697.3014 | 277,965,078.9670 | 264.5040 | -3.399m | Flowline_Gutter |
| 7 | -166,330,696.9136 | 277,965,078.7387 | 264.5490 | -2.949m | ETW |
| 8 | -166,330,696.9136 | 277,965,078.7387 | 264.3490 | -2.949m | ETW_SubBase |
| 9 | -166,330,691.4562 | 277,965,075.5253 | 264.3907 | 3.384m | Flange |
| 10 | -166,330,691.4562 | 277,965,075.5253 | 264.1907 | 3.384m | ETW_SubBase |
| 11 | -166,330,691.0684 | 277,965,075.2969 | 264.3457 | 3.834m | Flowline_Gutter |
| 12 | -166,330,691.0325 | 277,965,075.2758 | 264.5707 | 3.876m | Top_Curb |
| 13 | -166,330,690.9032 | 277,965,075.1997 | 264.5707 | 4.026m | Back_Curb |
| 14 | -166,330,690.0424 | 277,965,074.6928 | 264.4207 | 5.025m | EPS_Sub |
| 15 | -166,330,690.0415 | 277,965,074.6923 | 264.6207 | 5.026m | Hinge_Cut |
| 16 | -166,330,682.3571 | 277,965,070.1675 | 270.5658 | 13.943m | Daylight |

CHAINAGE 0+060.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|---------|-----------------|
| 1 | -166,330,678.6501 | 277,965,104.1916 | 262.9833 | -4.998m | Daylight |
| 2 | -166,330,678.3917 | 277,965,103.8778 | 263.2544 | -4.592m | Hinge |
| 3 | -166,330,678.3910 | 277,965,103.8770 | 263.0544 | -4.591m | EPS_Sub |
| 4 | -166,330,677.7559 | 277,965,103.1059 | 263.2044 | -3.592m | Back_Curb |
| 5 | -166,330,677.6606 | 277,965,102.9901 | 263.2044 | -3.442m | Top_Curb |
| 6 | -166,330,677.6341 | 277,965,102.9579 | 262.9794 | -3.400m | Flowline_Gutter |
| 7 | -166,330,677.3480 | 277,965,102.6106 | 263.0244 | -2.950m | ETW |
| 8 | -166,330,677.3480 | 277,965,102.6106 | 262.8244 | -2.950m | ETW_SubBase |
| 9 | -166,330,673.2155 | 277,965,097.5933 | 262.8619 | 3.550m | Flange |
| 10 | -166,330,673.2155 | 277,965,097.5933 | 262.6619 | 3.550m | ETW_SubBase |
| 11 | -166,330,672.9295 | 277,965,097.2459 | 262.8169 | 4.000m | Flowline_Gutter |

| | | | | | |
|----|-------------------|------------------|----------|---------|-----------|
| 12 | -166,330,672.9029 | 277,965,097.2137 | 263.0419 | 4.042m | Top_Curb |
| 13 | -166,330,672.8076 | 277,965,097.0979 | 263.0419 | 4.192m | Back_Curb |
| 14 | -166,330,672.1725 | 277,965,096.3268 | 262.8919 | 5.191m | EPS_Sub |
| 15 | -166,330,672.1718 | 277,965,096.3261 | 263.0919 | 5.192m | Hinge_Cut |
| 16 | -166,330,668.8897 | 277,965,092.3412 | 266.5335 | 10.354m | Daylight |

CHAINAGE 0+090.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|----------|-----------------|
| 1 | -166,330,651.8584 | 277,965,124.6930 | 257.3727 | -11.127m | Daylight |
| 2 | -166,330,650.1756 | 277,965,118.3778 | 261.7297 | -4.592m | Hinge |
| 3 | -166,330,650.1754 | 277,965,118.3769 | 261.5297 | -4.591m | EPS_Sub |
| 4 | -166,330,649.9181 | 277,965,117.4116 | 261.6797 | -3.592m | Back_Curb |
| 5 | -166,330,649.8795 | 277,965,117.2666 | 261.6797 | -3.442m | Top_Curb |
| 6 | -166,330,649.8688 | 277,965,117.2263 | 261.4547 | -3.400m | Flowline_Gutter |
| 7 | -166,330,649.7529 | 277,965,116.7915 | 261.4997 | -2.950m | ETW |
| 8 | -166,330,649.7529 | 277,965,116.7915 | 261.2997 | -2.950m | ETW_SubBase |
| 9 | -166,330,648.0793 | 277,965,110.5107 | 261.3372 | 3.550m | Flange |
| 10 | -166,330,648.0793 | 277,965,110.5107 | 261.1372 | 3.550m | ETW_SubBase |
| 11 | -166,330,647.9634 | 277,965,110.0758 | 261.2922 | 4.000m | Flowline_Gutter |
| 12 | -166,330,647.9527 | 277,965,110.0355 | 261.5172 | 4.042m | Top_Curb |
| 13 | -166,330,647.9141 | 277,965,109.8906 | 261.5172 | 4.192m | Back_Curb |
| 14 | -166,330,647.6568 | 277,965,108.9253 | 261.3672 | 5.191m | EPS_Sub |
| 15 | -166,330,647.6566 | 277,965,108.9243 | 261.5672 | 5.192m | Hinge_Cut |
| 16 | -166,330,647.4420 | 277,965,108.1191 | 262.1227 | 6.025m | Daylight |

CHAINAGE 0+120.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|----------|-----------------|
| 1 | -166,330,618.5356 | 277,965,126.8542 | 256.1227 | -10.715m | Daylight |
| 2 | -166,330,618.9220 | 277,965,120.7429 | 260.2050 | -4.592m | Hinge |
| 3 | -166,330,618.9220 | 277,965,120.7419 | 260.0050 | -4.591m | EPS_Sub |
| 4 | -166,330,618.9851 | 277,965,119.7449 | 260.1550 | -3.592m | Back_Curb |
| 5 | -166,330,618.9945 | 277,965,119.5952 | 260.1550 | -3.442m | Top_Curb |
| 6 | -166,330,618.9972 | 277,965,119.5536 | 259.9300 | -3.400m | Flowline_Gutter |
| 7 | -166,330,619.0255 | 277,965,119.1045 | 259.9750 | -2.950m | ETW |
| 8 | -166,330,619.0255 | 277,965,119.1045 | 259.7750 | -2.950m | ETW_SubBase |
| 9 | -166,330,619.4086 | 277,965,113.0455 | 259.8232 | 3.121m | Flange |
| 10 | -166,330,619.4086 | 277,965,113.0455 | 259.6232 | 3.121m | ETW_SubBase |
| 11 | -166,330,619.4370 | 277,965,112.5964 | 259.7782 | 3.571m | Flowline_Gutter |
| 12 | -166,330,619.4396 | 277,965,112.5548 | 260.0032 | 3.613m | Top_Curb |
| 13 | -166,330,619.4491 | 277,965,112.4051 | 260.0032 | 3.763m | Back_Curb |
| 14 | -166,330,619.5121 | 277,965,111.4081 | 259.8532 | 4.762m | EPS_Sub |

| | | | | | |
|----|-------------------|------------------|----------|--------|-----------|
| 15 | -166,330,619.5121 | 277,965,111.4071 | 260.0532 | 4.763m | Hinge_Cut |
| 16 | -166,330,619.6046 | 277,965,109.9448 | 261.0300 | 6.228m | Daylight |

CHAINAGE 0+150.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|---------|-----------------|
| 1 | -166,330,588.7464 | 277,965,118.8913 | 259.2589 | -5.749m | Daylight |
| 2 | -166,330,588.8704 | 277,965,117.7406 | 258.6803 | -4.592m | EPS |
| 3 | -166,330,588.8705 | 277,965,117.7396 | 258.4803 | -4.591m | EPS_Sub |
| 4 | -166,330,588.9777 | 277,965,116.7464 | 258.6303 | -3.592m | Back_Curb |
| 5 | -166,330,588.9937 | 277,965,116.5972 | 258.6303 | -3.442m | Top_Curb |
| 6 | -166,330,588.9982 | 277,965,116.5558 | 258.4053 | -3.400m | Flowline_Gutter |
| 7 | -166,330,589.0465 | 277,965,116.1084 | 258.4503 | -2.950m | ETW |
| 8 | -166,330,589.0465 | 277,965,116.1084 | 258.2503 | -2.950m | ETW_SubBase |
| 9 | -166,330,589.6790 | 277,965,110.2424 | 258.1028 | 2.950m | ETW_SubBase |
| 10 | -166,330,589.6790 | 277,965,110.2424 | 258.3028 | 2.950m | ETW |
| 11 | -166,330,589.7273 | 277,965,109.7950 | 258.2578 | 3.400m | Flowline_Gutter |
| 12 | -166,330,589.7317 | 277,965,109.7535 | 258.4828 | 3.442m | Top_Curb |
| 13 | -166,330,589.7478 | 277,965,109.6044 | 258.4828 | 3.592m | Back_Curb |
| 14 | -166,330,589.8549 | 277,965,108.6111 | 258.3328 | 4.591m | EPS_Sub |
| 15 | -166,330,589.8550 | 277,965,108.6101 | 258.5328 | 4.592m | Hinge_Cut |
| 16 | -166,330,591.0038 | 277,965,097.9572 | 265.6759 | 15.306m | Daylight |

CHAINAGE 0+180.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|---------|-----------------|
| 1 | -166,330,558.7633 | 277,965,117.1217 | 258.4618 | -7.204m | Daylight |
| 2 | -166,330,559.0434 | 277,965,114.5242 | 257.1556 | -4.592m | EPS |
| 3 | -166,330,559.0435 | 277,965,114.5232 | 256.9556 | -4.591m | EPS_Sub |
| 4 | -166,330,559.1506 | 277,965,113.5299 | 257.1056 | -3.592m | Back_Curb |
| 5 | -166,330,559.1667 | 277,965,113.3808 | 257.1056 | -3.442m | Top_Curb |
| 6 | -166,330,559.1711 | 277,965,113.3393 | 256.8806 | -3.400m | Flowline_Gutter |
| 7 | -166,330,559.2194 | 277,965,112.8919 | 256.9256 | -2.950m | ETW |
| 8 | -166,330,559.2194 | 277,965,112.8919 | 256.7256 | -2.950m | ETW_SubBase |
| 9 | -166,330,559.8519 | 277,965,107.0259 | 256.5781 | 2.950m | ETW_SubBase |
| 10 | -166,330,559.8519 | 277,965,107.0259 | 256.7781 | 2.950m | ETW |
| 11 | -166,330,559.9002 | 277,965,106.5785 | 256.7331 | 3.400m | Flowline_Gutter |
| 12 | -166,330,559.9047 | 277,965,106.5371 | 256.9581 | 3.442m | Top_Curb |
| 13 | -166,330,559.9207 | 277,965,106.3879 | 256.9581 | 3.592m | Back_Curb |
| 14 | -166,330,560.0278 | 277,965,105.3947 | 256.8081 | 4.591m | EPS_Sub |
| 15 | -166,330,560.0280 | 277,965,105.3937 | 257.0081 | 4.592m | Hinge_Cut |
| 16 | -166,330,562.1683 | 277,965,085.5457 | 270.3168 | 24.555m | Daylight |

CHAINAGE 0+210.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|----------|-----------------|
| 1 | -166,330,527.0713 | 277,965,143.9823 | 234.3135 | -37.211m | Daylight |
| 2 | -166,330,529.3291 | 277,965,112.0627 | 255.6464 | -5.212m | Hinge |
| 3 | -166,330,529.3292 | 277,965,112.0617 | 255.4464 | -5.211m | EPS_Sub |
| 4 | -166,330,529.3997 | 277,965,111.0652 | 255.5964 | -4.212m | Back_Curb |
| 5 | -166,330,529.4102 | 277,965,110.9156 | 255.5964 | -4.062m | Top_Curb |
| 6 | -166,330,529.4132 | 277,965,110.8740 | 255.3714 | -4.020m | Flowline_Gutter |
| 7 | -166,330,529.4449 | 277,965,110.4251 | 255.4164 | -3.570m | ETW |
| 8 | -166,330,529.4449 | 277,965,110.4251 | 255.2164 | -3.570m | ETW_SubBase |
| 9 | -166,330,529.9050 | 277,965,103.9215 | 255.2534 | 2.950m | Flange |
| 10 | -166,330,529.9050 | 277,965,103.9215 | 255.0534 | 2.950m | ETW_SubBase |
| 11 | -166,330,529.9367 | 277,965,103.4726 | 255.2084 | 3.400m | Flowline_Gutter |
| 12 | -166,330,529.9397 | 277,965,103.4310 | 255.4334 | 3.442m | Top_Curb |
| 13 | -166,330,529.9502 | 277,965,103.2814 | 255.4334 | 3.592m | Back_Curb |
| 14 | -166,330,530.0207 | 277,965,102.2849 | 255.2834 | 4.591m | EPS_Sub |
| 15 | -166,330,530.0208 | 277,965,102.2839 | 255.4834 | 4.592m | Hinge_Cut |
| 16 | -166,330,530.9553 | 277,965,089.0727 | 264.3128 | 17.836m | Daylight |

CHAINAGE 0+240.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|----------|-----------------|
| 1 | -166,330,516.5699 | 277,965,144.9451 | 233.5231 | -37.425m | Daylight |
| 2 | -166,330,503.1737 | 277,965,117.0302 | 254.1650 | -6.462m | Hinge |
| 3 | -166,330,503.1733 | 277,965,117.0293 | 253.9650 | -6.461m | EPS_Sub |
| 4 | -166,330,502.7411 | 277,965,116.1287 | 254.1150 | -5.462m | Back_Curb |
| 5 | -166,330,502.6762 | 277,965,115.9934 | 254.1150 | -5.312m | Top_Curb |
| 6 | -166,330,502.6581 | 277,965,115.9558 | 253.8900 | -5.270m | Flowline_Gutter |
| 7 | -166,330,502.4634 | 277,965,115.5501 | 253.7350 | -4.820m | ETW_SubBase |
| 8 | -166,330,502.4634 | 277,965,115.5501 | 253.9350 | -4.820m | Flange |
| 9 | -166,330,499.1017 | 277,965,108.5450 | 253.7408 | 2.950m | Flange |
| 10 | -166,330,499.1017 | 277,965,108.5450 | 253.5408 | 2.950m | ETW_SubBase |
| 11 | -166,330,498.9070 | 277,965,108.1393 | 253.6958 | 3.400m | Flowline_Gutter |
| 12 | -166,330,498.8890 | 277,965,108.1017 | 253.9208 | 3.442m | Top_Curb |
| 13 | -166,330,498.8241 | 277,965,107.9665 | 253.9208 | 3.592m | Back_Curb |
| 14 | -166,330,498.3919 | 277,965,107.0658 | 253.7708 | 4.591m | EPS_Sub |
| 15 | -166,330,498.3915 | 277,965,107.0649 | 253.9708 | 4.592m | EPS |
| 16 | -166,330,496.1555 | 277,965,102.4055 | 251.3867 | 9.760m | Daylight |

CHAINAGE 0+270.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|---------|------------|
| 1 | -166,330,485.2576 | 277,965,135.2851 | 251.5201 | -7.013m | Daylight |
| 2 | -166,330,483.6989 | 277,965,134.3806 | 252.7215 | -5.211m | Hinge |

| | | | | | |
|----|-------------------|------------------|----------|---------|-----------------|
| 3 | -166,330,483.6980 | 277,965,134.3801 | 252.5215 | -5.210m | EPS_Sub |
| 4 | -166,330,482.8339 | 277,965,133.8787 | 252.6715 | -4.211m | Back_Curb |
| 5 | -166,330,482.7042 | 277,965,133.8034 | 252.6715 | -4.061m | Top_Curb |
| 6 | -166,330,482.6681 | 277,965,133.7825 | 252.4465 | -4.019m | Flowline_Gutter |
| 7 | -166,330,482.2789 | 277,965,133.5566 | 252.4915 | -3.569m | ETW |
| 8 | -166,330,482.2789 | 277,965,133.5566 | 252.2915 | -3.569m | ETW_SubBase |
| 9 | -166,330,476.6402 | 277,965,130.2846 | 252.3285 | 2.950m | Flange |
| 10 | -166,330,476.6402 | 277,965,130.2846 | 252.1285 | 2.950m | ETW_SubBase |
| 11 | -166,330,476.2510 | 277,965,130.0588 | 252.2835 | 3.400m | Flowline_Gutter |
| 12 | -166,330,476.2149 | 277,965,130.0379 | 252.5085 | 3.442m | Top_Curb |
| 13 | -166,330,476.0852 | 277,965,129.9626 | 252.5085 | 3.592m | Back_Curb |
| 14 | -166,330,475.2211 | 277,965,129.4612 | 252.3585 | 4.591m | EPS_Sub |
| 15 | -166,330,475.2203 | 277,965,129.4607 | 252.5585 | 4.592m | Hinge_Cut |
| 16 | -166,330,465.8795 | 277,965,124.0404 | 259.7582 | 15.392m | Daylight |

CHAINAGE 0+300.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|----------|-----------------|
| 1 | -166,330,475.9458 | 277,965,163.3588 | 247.2685 | -10.692m | Daylight |
| 2 | -166,330,470.4213 | 277,965,160.7718 | 251.3353 | -4.592m | Hinge |
| 3 | -166,330,470.4204 | 277,965,160.7714 | 251.1353 | -4.591m | EPS_Sub |
| 4 | -166,330,469.5157 | 277,965,160.3477 | 251.2853 | -3.592m | Back_Curb |
| 5 | -166,330,469.3798 | 277,965,160.2841 | 251.2853 | -3.442m | Top_Curb |
| 6 | -166,330,469.3421 | 277,965,160.2664 | 251.0603 | -3.400m | Flowline_Gutter |
| 7 | -166,330,468.9346 | 277,965,160.0756 | 251.1053 | -2.950m | ETW |
| 8 | -166,330,468.9346 | 277,965,160.0756 | 250.9053 | -2.950m | ETW_SubBase |
| 9 | -166,330,463.4188 | 277,965,157.4926 | 250.9530 | 3.141m | Flange |
| 10 | -166,330,463.4188 | 277,965,157.4926 | 250.7530 | 3.141m | ETW_SubBase |
| 11 | -166,330,463.0113 | 277,965,157.3018 | 250.9080 | 3.591m | Flowline_Gutter |
| 12 | -166,330,462.9735 | 277,965,157.2841 | 251.1330 | 3.632m | Top_Curb |
| 13 | -166,330,462.8377 | 277,965,157.2205 | 251.1330 | 3.782m | Back_Curb |
| 14 | -166,330,461.9330 | 277,965,156.7968 | 250.9830 | 4.781m | EPS_Sub |
| 15 | -166,330,461.9321 | 277,965,156.7964 | 251.1830 | 4.782m | Hinge_Cut |
| 16 | -166,330,458.0787 | 277,965,154.9919 | 254.0197 | 9.037m | Daylight |

CHAINAGE 0+330.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|-------|-------------------|------------------|----------|----------|------------|
| 1 | -166,330,463.2126 | 277,965,195.2441 | 241.9966 | -16.544m | Daylight |
| 2 | -166,330,454.2001 | 277,965,187.3940 | 249.9646 | -4.592m | Hinge |
| 3 | -166,330,454.1994 | 277,965,187.3934 | 249.7646 | -4.591m | EPS_Sub |
| 4 | -166,330,453.4461 | 277,965,186.7372 | 249.9146 | -3.592m | Back_Curb |
| 5 | -166,330,453.3330 | 277,965,186.6387 | 249.9146 | -3.442m | Top_Curb |

| | | | | | |
|----|-------------------|------------------|----------|---------|-----------------|
| 6 | -166,330,453.3015 | 277,965,186.6113 | 249.6896 | -3.400m | Flowline_Gutter |
| 7 | -166,330,452.9622 | 277,965,186.3157 | 249.7346 | -2.950m | ETW |
| 8 | -166,330,452.9622 | 277,965,186.3157 | 249.5346 | -2.950m | ETW_SubBase |
| 9 | -166,330,447.8722 | 277,965,181.8822 | 249.5658 | 3.800m | Flange |
| 10 | -166,330,447.8722 | 277,965,181.8822 | 249.3658 | 3.800m | ETW_SubBase |
| 11 | -166,330,447.5329 | 277,965,181.5867 | 249.5208 | 4.250m | Flowline_Gutter |
| 12 | -166,330,447.5014 | 277,965,181.5593 | 249.7458 | 4.291m | Top_Curb |
| 13 | -166,330,447.3883 | 277,965,181.4608 | 249.7458 | 4.441m | Back_Curb |
| 14 | -166,330,446.6350 | 277,965,180.8046 | 249.5958 | 5.440m | EPS_Sub |
| 15 | -166,330,446.6343 | 277,965,180.8040 | 249.7958 | 5.441m | Hinge_Cut |
| 16 | -166,330,444.4162 | 277,965,178.8720 | 251.7568 | 8.383m | Daylight |

CHAINAGE 0+360.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|--------------|-------------------|------------------|----------|---------------|-------------------|
| 1 | -166,330,431.1097 | 277,965,212.9956 | 243.3051 | -12.524m | Daylight |
| 2 | -166,330,428.1151 | 277,965,205.6495 | 248.5938 | -4.591m | Hinge |
| 3 | -166,330,428.1147 | 277,965,205.6486 | 248.3938 | -4.590m | EPS_Sub |
| 4 | -166,330,427.7376 | 277,965,204.7235 | 248.5438 | -3.591m | Back_Curb |
| 5 | -166,330,427.6809 | 277,965,204.5846 | 248.5438 | -3.441m | Top_Curb |
| 6 | -166,330,427.6652 | 277,965,204.5459 | 248.3188 | -3.399m | Flowline_Gutter |
| 7 | -166,330,427.4953 | 277,965,204.1292 | 248.3638 | -2.949m | ETW |
| 8 | -166,330,427.4953 | 277,965,204.1292 | 248.1638 | -2.949m | ETW_SubBase |
| 9 | -166,330,425.1116 | 277,965,198.2818 | 248.2059 | 3.365m | Flange |
| 10 | -166,330,425.1116 | 277,965,198.2818 | 248.0059 | 3.365m | ETW_SubBase |
| 11 | -166,330,424.9418 | 277,965,197.8651 | 248.1609 | 3.815m | Flowline_Gutter |
| 12 | -166,330,424.9260 | 277,965,197.8265 | 248.3859 | 3.857m | Top_Curb |
| 13 | -166,330,424.8694 | 277,965,197.6876 | 248.3859 | 4.007m | Back_Curb |
| 14 | -166,330,424.4923 | 277,965,196.7625 | 248.2359 | 5.006m | EPS_Sub |
| 15 | -166,330,424.4919 | 277,965,196.7616 | 248.4359 | 5.007m | Hinge_Cut |
| 16 | -166,330,423.0842 | 277,965,193.3085 | 250.9220 | 8.736m | Daylight |

CHAINAGE 0+390.00

| POINT | X | Y | Z | OFFSET | STRING CUT |
|--------------|-------------------|------------------|----------|---------------|-------------------|
| 1 | -166,330,399.6951 | 277,965,218.8547 | 243.9312 | -9.529m | Daylight |
| 2 | -166,330,398.5848 | 277,965,214.0434 | 247.2231 | -4.592m | Hinge |
| 3 | -166,330,398.5845 | 277,965,214.0425 | 247.0231 | -4.591m | EPS_Sub |
| 4 | -166,330,398.3599 | 277,965,213.0690 | 247.1731 | -3.592m | Back_Curb |
| 5 | -166,330,398.3262 | 277,965,212.9229 | 247.1731 | -3.442m | Top_Curb |
| 6 | -166,330,398.3168 | 277,965,212.8823 | 246.9481 | -3.400m | Flowline_Gutter |
| 7 | -166,330,398.2156 | 277,965,212.4438 | 246.9931 | -2.950m | ETW |
| 8 | -166,330,398.2156 | 277,965,212.4438 | 246.7931 | -2.950m | ETW_SubBase |

| | | | | | |
|----|-------------------|------------------|----------|---------|-----------------|
| 9 | -166,330,396.9041 | 277,965,206.7609 | 246.8473 | 2.882m | Flange |
| 10 | -166,330,396.9041 | 277,965,206.7609 | 246.6473 | 2.882m | ETW_SubBase |
| 11 | -166,330,396.8029 | 277,965,206.3224 | 246.8023 | 3.332m | Flowline_Gutter |
| 12 | -166,330,396.7936 | 277,965,206.2818 | 247.0273 | 3.374m | Top_Curb |
| 13 | -166,330,396.7598 | 277,965,206.1357 | 247.0273 | 3.524m | Back_Curb |
| 14 | -166,330,396.5352 | 277,965,205.1622 | 246.8773 | 4.523m | EPS_Sub |
| 15 | -166,330,396.5350 | 277,965,205.1613 | 247.0773 | 4.524m | Hinge_Cut |
| 16 | -166,330,395.1361 | 277,965,199.0998 | 251.2245 | 10.745m | Daylight |

6. LITERATURA

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