

Project: Sports Center [Area = 3.000m²]

Country: Serbia

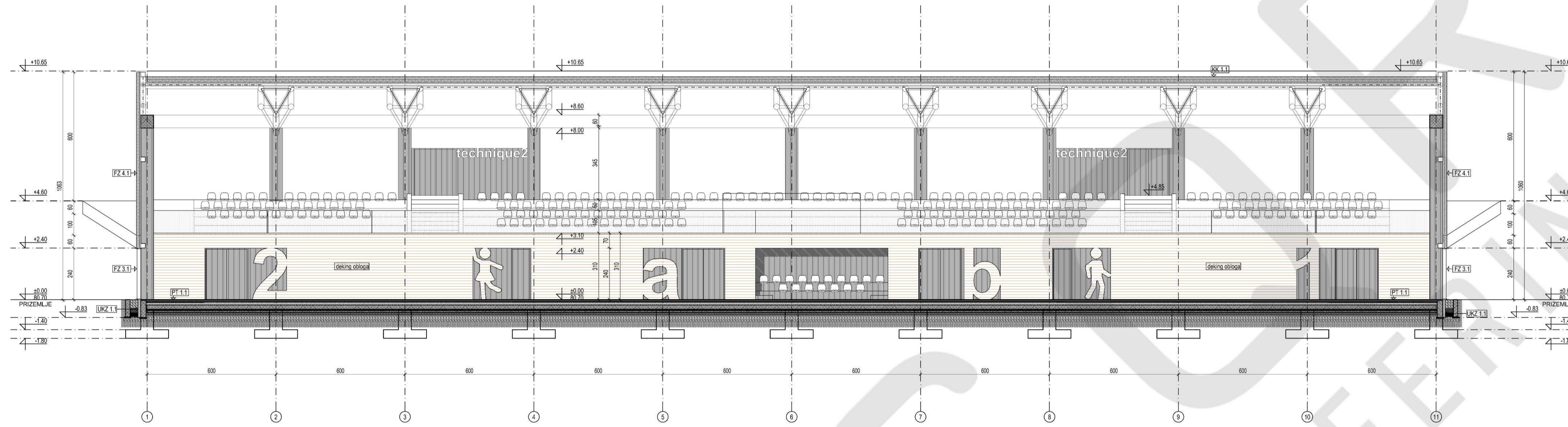
Scope of Work: Complete structural design. The work included:

- Coordination with architects, HVAC design
- Structural Analysis
- Connection Analysis
- Structural Drawings

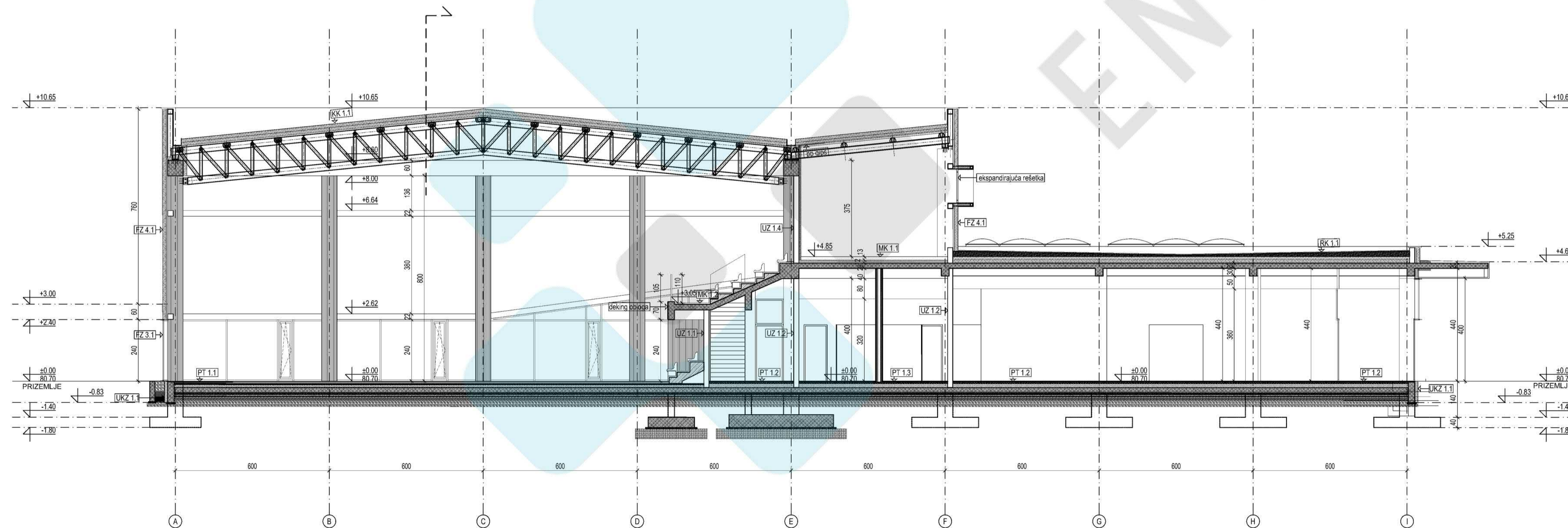




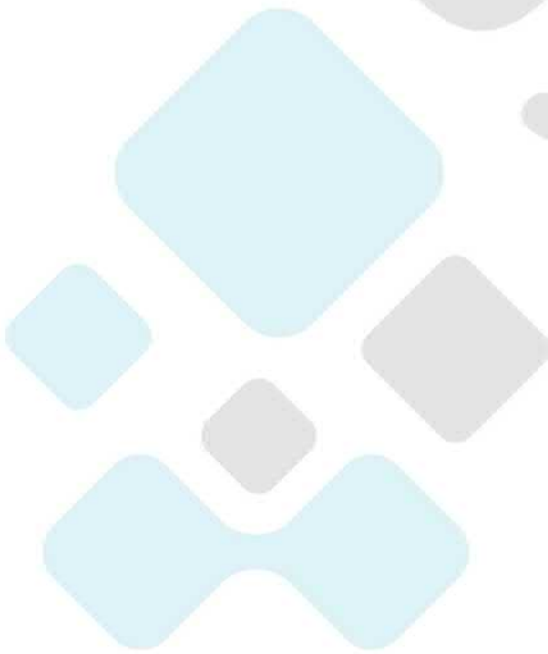
PRESEK 1-1 / SECTION 1-1



PRESEK 2-2 / SECTION 2-2



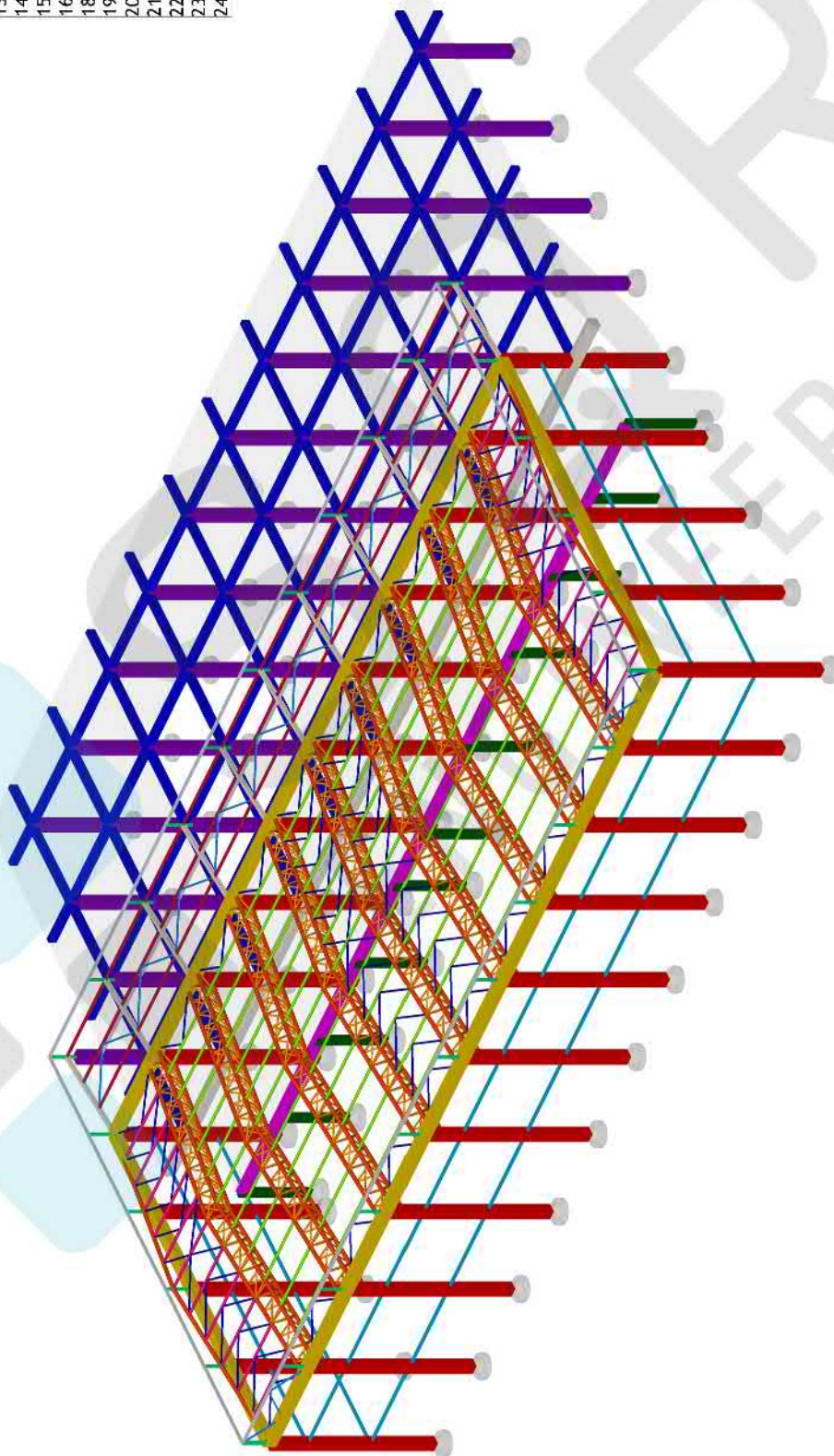
Structural Analysis



SSQR
ENGINEERING

Greda

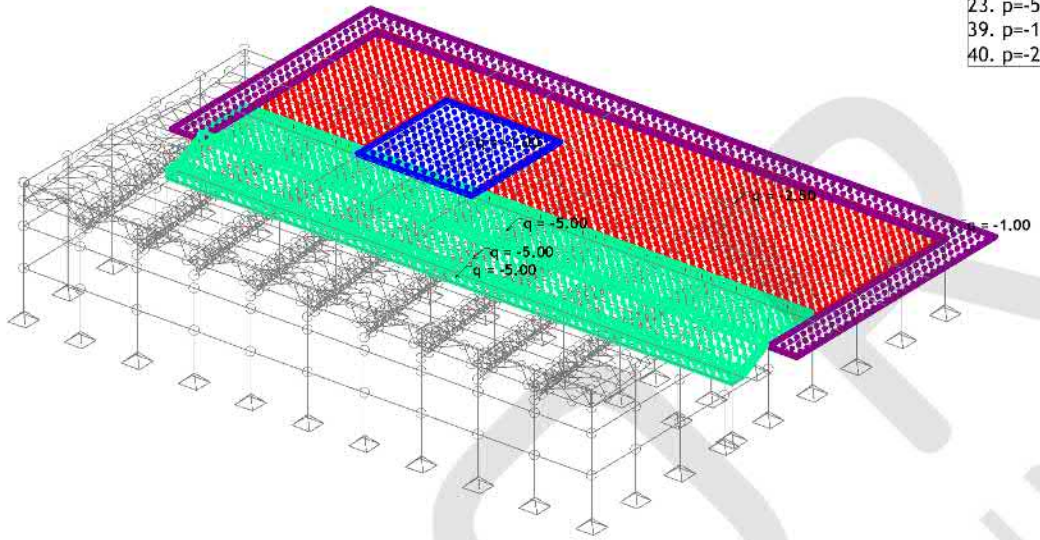
- | | |
|-----|-----------------|
| 1. | b/d=60/60 |
| 2. | b/d=30/50 |
| 3. | b/d=60/60 |
| 4. | b/d=25/60 |
| 5. | b/d=25/70 |
| 10. | b/d=60/60 |
| 11. | b/d=60/60 |
| 12. | HOP □ 200x100x6 |
| 13. | D= 244.5x8 |
| 14. | D= 168.3x4 |
| 15. | D= 114.3x4 |
| 16. | HOP □ 140x140x6 |
| 18. | HOP □ 140x140x6 |
| 19. | IP81 240 |
| 20. | HOP □ 160x100x5 |
| 21. | HOP □ 90x90x4 |
| 22. | D=108x4 |
| 23. | HOP □ 140x140x6 |
| 24. | D=177.8x5 |



Opt. 3: p

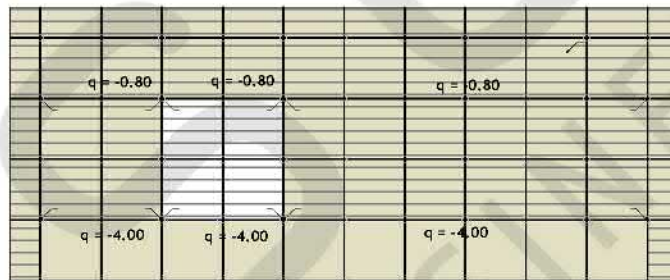
Površinsko opterećenje

2.	$p = -1.00 \text{ kN/m}^2$	
23.	$p = -5.00 \text{ kN/m}^2$	
39.	$p = -1.00 \text{ kN/m}^2$	
40.	$p = -2.50 \text{ kN/m}^2$	

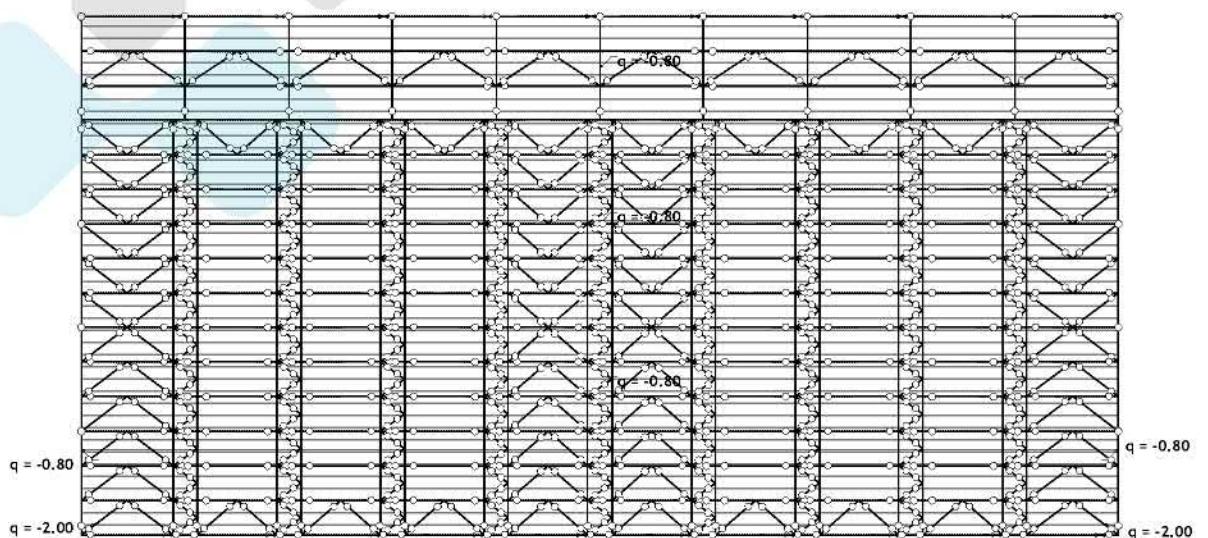


Setovi numeričkih podataka
Površinsko opterećenje (2,23,39,40)

Opt. 4: Sneg

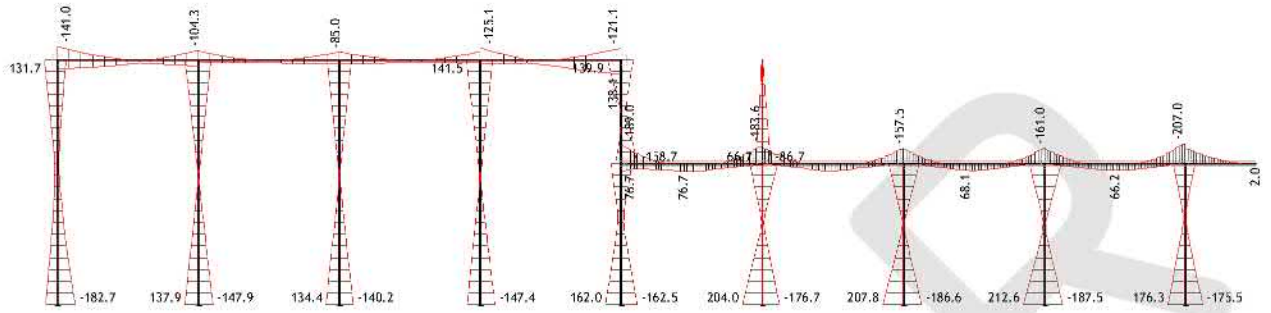


Nivo: Kota Krova Kantine [4.50 m]
Opt. 4: Sneg

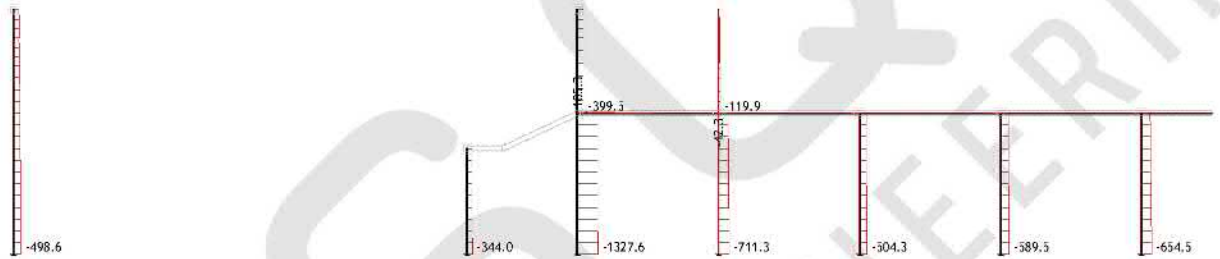


Pogled: krov 1+krov 2+mali krov

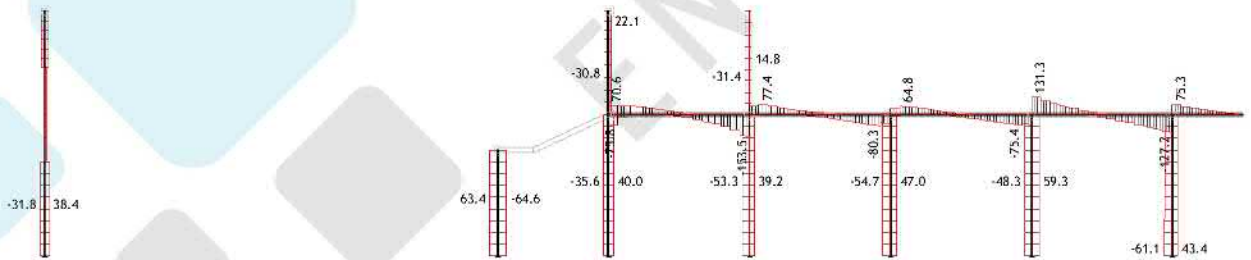
Opt. 427: [Anv] 17-424



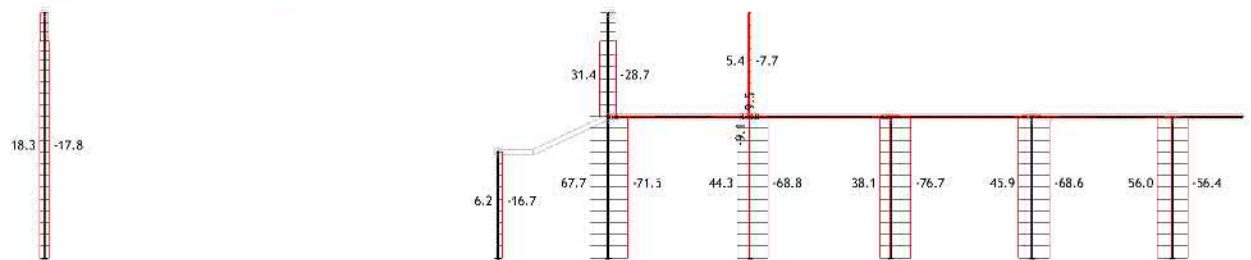
Ram: V_1 - Grupa: AB Konstrukcija
 Uticaji u gredi: max M3= 212.6 / min M3= -207.0 kNm
 Opt. 427: [Anv] 17-424



Ram: V_3 - Grupa: AB Konstrukcija
 Uticaji u gredi: max N1= 1102.8 / min N1= -1327.6 kN
 Opt. 427: [Anv] 17-424

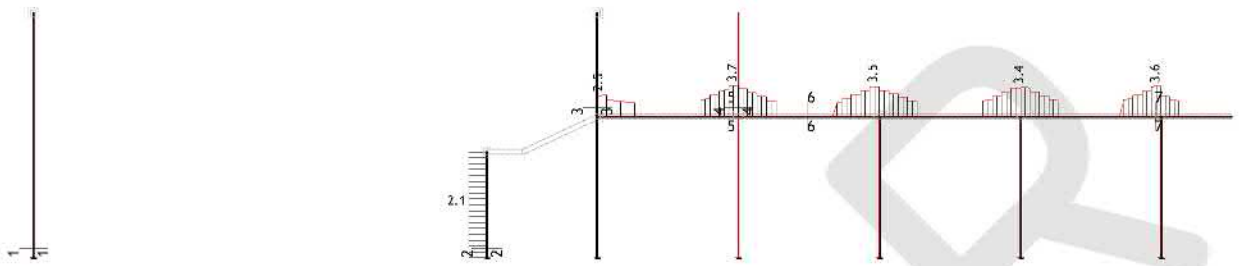


Ram: V_3 - Grupa: AB Konstrukcija
 Uticaji u gredi: max T2= 131.3 / min T2= -153.5 kN
 Opt. 427: [Anv] 17-424



Ram: V_3 - Grupa: AB Konstrukcija
 Uticaji u gredi: max T3= 67.7 / min T3= -76.7 kN

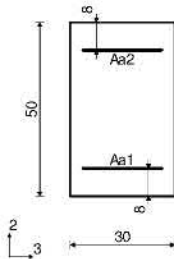
Merodavno opterećenje: Kompletna šema
EC 2 (EN 1992-1-1:2004), C 30, B500



Ram: V_10 - Grupa: AB Konstrukcija
Armatura u gredama: max $A_{a,uz}$ = 3.7 cm²

Greda 13354-9568

EC 2 (EN 1992-1-1:2004)
 $\alpha_{cc} = 0.85$
C 30 ($\gamma_C = 1.50$, $\gamma_S = 1.15$) [SP]
B500
Kompletna šema opterećenja



$A_{a1} = 5.58 \text{ cm}^2$
 $A_{a2} = 0.00 \text{ cm}^2$
 $A_{a3} = 0.00 \text{ cm}^2$
 $A_{a4} = 0.00 \text{ cm}^2$
 $A_{a,uz} = 0.00 \text{ cm}^2/\text{m} \quad (m=2)$

$\Delta e_2 = 5.2 \cdot e_0 + 43.0 \cdot e_{ll} = 48.2 \text{ cm}$
 $\Delta M_2 = 155.19 \text{ kNm}$
 $\Delta e_3 = 5.2 \cdot e_0 + 41.4 \cdot e_{ll} = 46.6 \text{ cm}$
 $\Delta M_3 = 149.88 \text{ kNm}$

Merodavna kombinacija za torziju:
 $1.35xI + 1.35xII + 1.05xIII + 1.50xV$
 $M_{1u} = 0.14 \text{ kNm}$

Merodavna kombinacija za smicanje:
 $1.00xI + 1.00xII + 0.90xVI + 1.50xIX$
 $T_{2u} = -31.60 \text{ kN}$
 $T_{3u} = 8.82 \text{ kN}$
 $M_{1u} = 0.02 \text{ kNm}$

$V_{rd,max,2} = 1365.96 \text{ kN}$
 $V_{rd,max,3} = 1365.96 \text{ kN}$
 $e_b/e_a = -3.500/6.006 \%$

$A_{a1} = 9.56 \text{ cm}^2$
 $A_{a2} = 9.56 \text{ cm}^2$
 $A_{a3} = 6.40 \text{ cm}^2$
 $A_{a4} = 6.40 \text{ cm}^2$
 $A_{a,uz} = 0.00 \text{ cm}^2/\text{m} \quad (m=2)$

Presek 5-5 $x = 21.40\text{m}$

Merodavna kombinacija za savijanje:
 $1.00xI + 1.00xII + 0.60xIII - 1.00xXVI$
 $N_{1u} = 12.74 \text{ kN}$
 $M_{2u} = 0.00 \text{ kNm}$
 $M_{3u} = -130.96 \text{ kNm}$

Merodavna kombinacija za torziju:
 $1.35xI + 1.35xII + 1.05xIII + 1.50xV + 0.90xVIII$
 $M_{1u} = 0.08 \text{ kNm}$

Merodavna kombinacija za smicanje:
 $1.35xI + 1.35xII + 1.50xIII + 0.90xVI + 0.90xX$
 $T_{2u} = -101.65 \text{ kN}$
 $T_{3u} = 0.79 \text{ kN}$
 $M_{1u} = -0.04 \text{ kNm}$

$V_{rd,max,2} = 508.94 \text{ kN}$
 $V_{rd,max,3} = 525.10 \text{ kN}$
 $e_b/e_a = -3.500/14.732 \%$

$A_{a1} = 0.84 \text{ cm}^2$
 $A_{a2} = 7.96 \text{ cm}^2$
 $A_{a3} = 0.00 \text{ cm}^2$
 $A_{a4} = 0.00 \text{ cm}^2$
 $A_{a,uz} = 3.09 \text{ cm}^2/\text{m} \quad (m=2)$

Presek 7-7 $x = 3.20\text{m}$

Merodavna kombinacija za savijanje:
 $1.35xI + 1.35xII + 1.05xIII + 1.50xV + 0.90xX$
 $N_{1u} = -9.90 \text{ kN}$
 $M_{2u} = 0.00 \text{ kNm}$
 $M_{3u} = -186.34 \text{ kNm}$

Merodavna kombinacija za torziju:
 $1.00xI + 1.00xII + 0.60xIII + 1.00xXVI$
 $M_{1u} = 0.19 \text{ kNm}$

Merodavna kombinacija za smicanje:
 $1.35xI + 1.35xII + 1.05xIII + 1.50xV + 0.90xX$
 $T_{2u} = -116.23 \text{ kN}$
 $T_{3u} = -3.86 \text{ kN}$
 $M_{1u} = 0.16 \text{ kNm}$

$V_{rd,max,2} = 508.94 \text{ kN}$

$V_{rd,max,3} = 525.10 \text{ kN}$

$e_b/e_a = -3.500/8.433 \%$

$A_{a1} = 0.00 \text{ cm}^2$
 $A_{a2} = 11.50 \text{ cm}^2$
 $A_{a3} = 0.00 \text{ cm}^2$
 $A_{a4} = 0.00 \text{ cm}^2$
 $A_{a,uz} = 3.55 \text{ cm}^2/\text{m} \quad (m=2)$

Presek 6-6 $x = 18.00\text{m}$

Merodavna kombinacija za savijanje:
 $1.35xI + 1.35xII + 1.50xIV + 0.90xVI + 0.90xIX$
 $N_{1u} = -1.87 \text{ kN}$
 $M_{2u} = 0.00 \text{ kNm}$
 $M_{3u} = 96.33 \text{ kNm}$

Merodavna kombinacija za smicanje:
 $1.00xI + 1.00xII - 1.00xXVI$
 $T_{2u} = -12.82 \text{ kN}$
 $T_{3u} = -0.78 \text{ kN}$
 $M_{1u} = -0.00 \text{ kNm}$

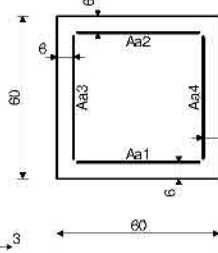
$V_{rd,max,2} = 510.78 \text{ kN}$

$V_{rd,max,3} = 527.00 \text{ kN}$

$e_b/e_a = -3.500/21.264 \%$

Greda 5399-3718

EC 2 (EN 1992-1-1:2004)
 $\alpha_{cc} = 0.85$
C 30 ($\gamma_C = 1.50$, $\gamma_S = 1.15$) [SP]
B500
Kompletna šema opterećenja



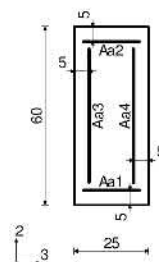
$l_{i,2} = 20.80 \text{ m} \quad (\lambda_2 = 120.09)$
 $l_{i,3} = 20.80 \text{ m} \quad (\lambda_3 = 120.09)$
Nepomerljiva konstrukcija

Presek 1-1 $x = 10.15\text{m}$

Merodavna kombinacija za savijanje:
 $1.35xI + 1.35xII + 1.50xV + 0.90xVIII$
 $N_{1u} = -321.95 \text{ kN}$
 $M_{2u} = -119.58 \text{ kNm}$
 $M_{3u} = -159.12 \text{ kNm}$
Uvećanje momenta savijanja usled izvijanja

Greda 8199-7238

EC 2 (EN 1992-1-1:2004)
 $\alpha_{cc} = 0.85$
C 30 ($\gamma_C = 1.50$, $\gamma_S = 1.15$) [SP]
B500
Kompletna šema opterećenja



$l_{i,2} = 8.10 \text{ m} \quad (\lambda_2 = 112.24)$
 $l_{i,3} = 8.10 \text{ m} \quad (\lambda_3 = 46.77)$
Nepomerljiva konstrukcija

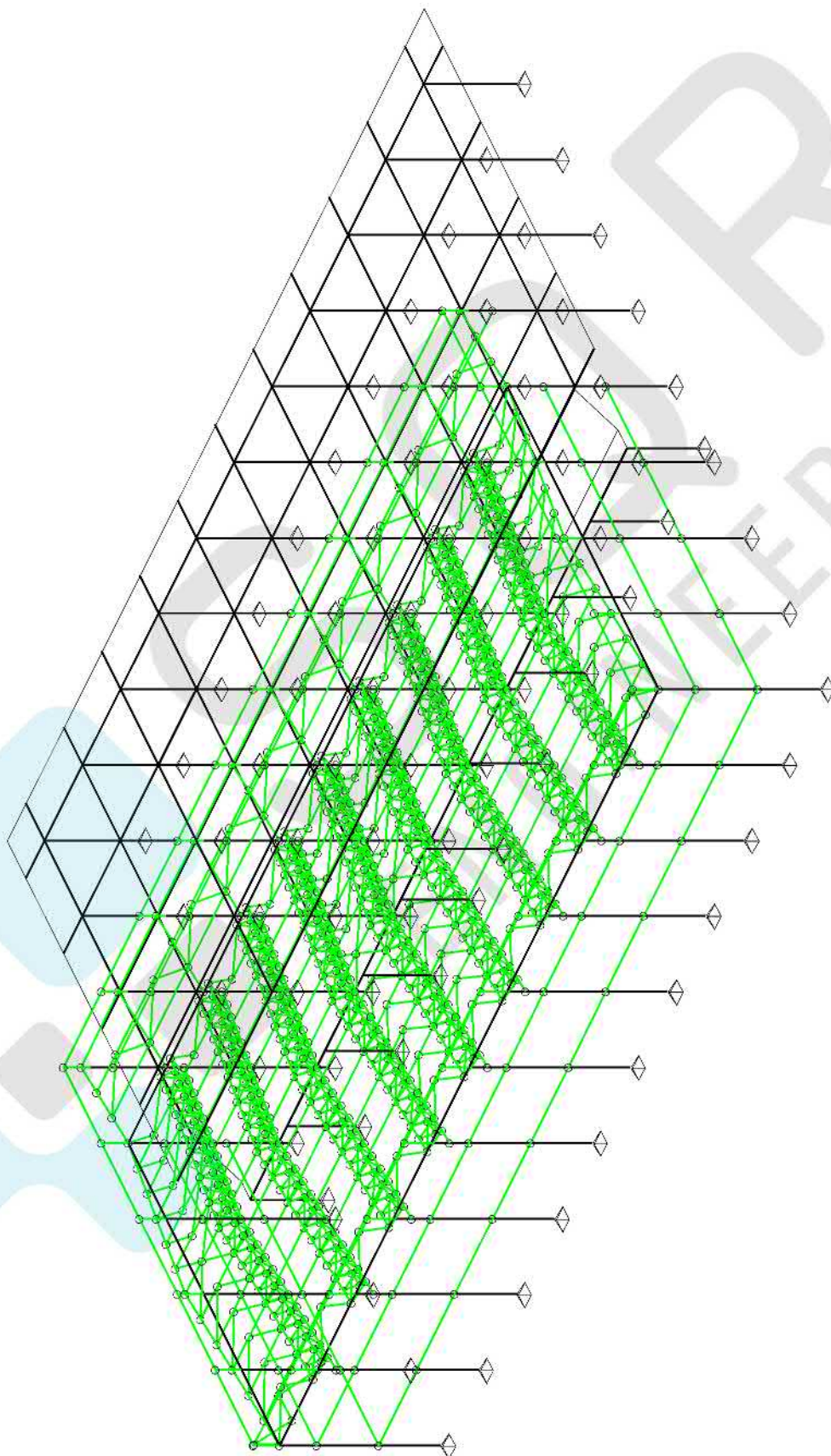
Presek 2-2 $x = 4.25\text{m}$

Merodavna kombinacija za savijanje:
 $1.35xI + 1.35xII + 1.05xIII + 1.50xVI + 0.90xX$
 $N_{1u} = -343.84 \text{ kN}$
 $M_{2u} = 14.99 \text{ kNm}$
 $M_{3u} = -182.21 \text{ kNm}$

Uvećanje momenta savijanja usled izvijanja
 $\Delta e_2 = 2.0 \cdot e_0 + 16.8 \cdot e_{ll} = 18.8 \text{ cm}$
 $\Delta M_2 = 64.57 \text{ kNm}$
 $\Delta e_3 = 2.0 \cdot e_0 + 0.0 \cdot e_{ll} = 2.0 \text{ cm}$
 $\Delta M_3 = 6.96 \text{ kNm}$

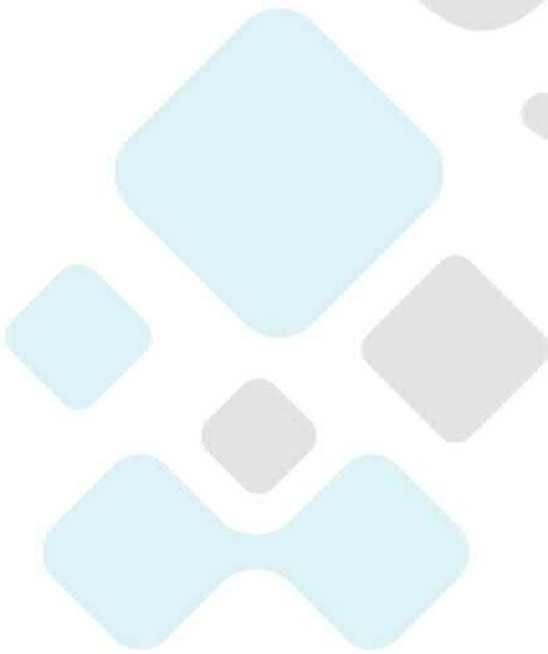
Merodavna kombinacija za torziju:
 $1.00xI + 1.00xII + 0.60xIII - 1.00xXVI$
 $M_{1u} = -0.01 \text{ kNm}$

Dimenzionisanje (čelik)



Izometrija
Kontrola stabilnosti

Structural Drawings

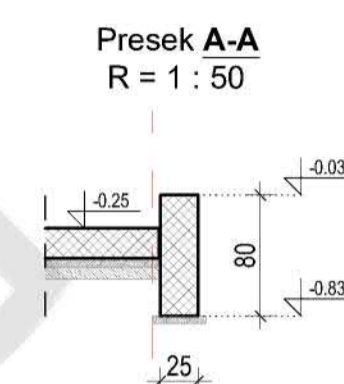
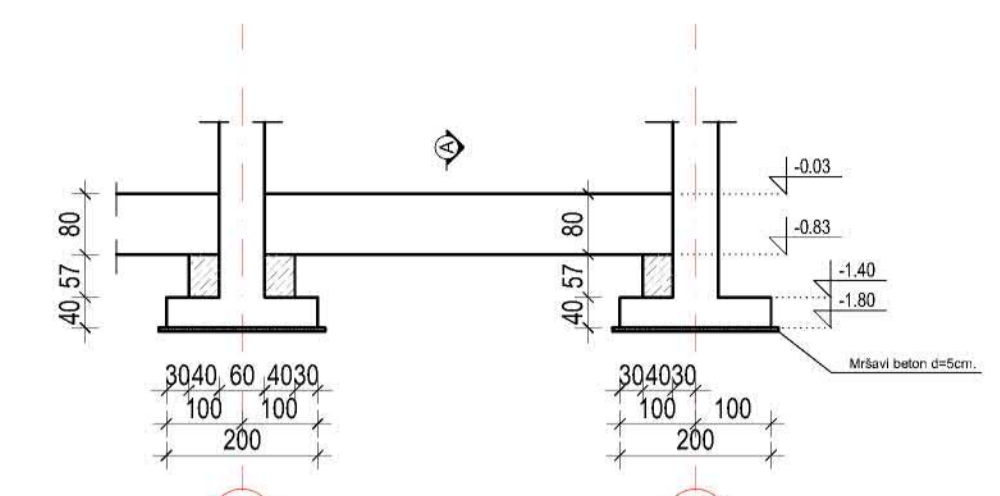
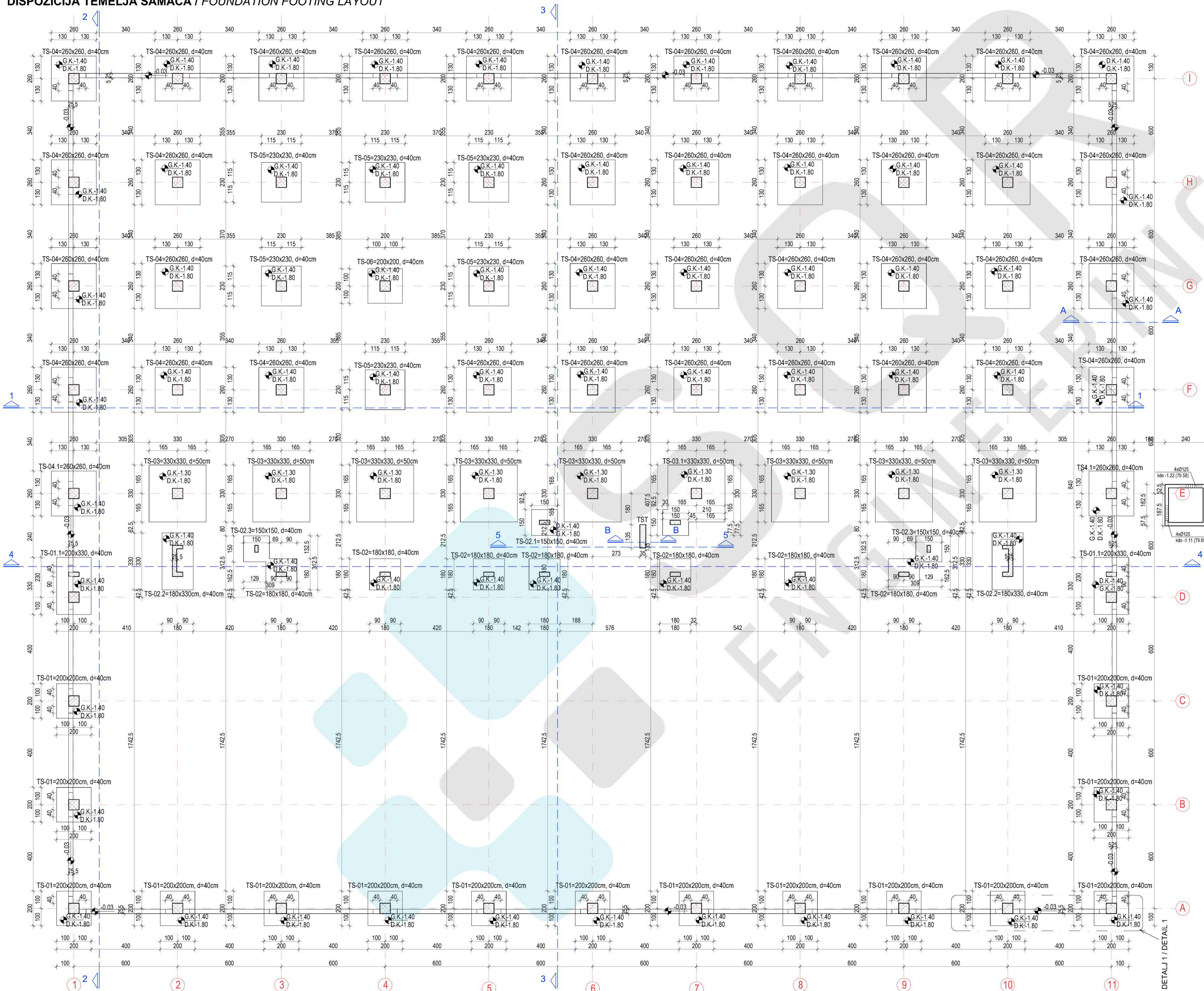


SSQR
ENGINEERING

DISPOZICIJA TEMELJA SAMACA / FOUNDATION FOOTING LAYOUT

DETALJ 1 / DETAIL 1

R 1:100



NOTE:
Under foundation footing, existing soil should be compacted to Ms=25MPa.

NOTE:
Anchor position for foundation beams, which are erected from foundation footings are shown on drawings: 32.134
2020U023-PZI-G01.B0038-032-PA
2020U023-PZI-G01.B0038-034-PA

NAPOMENA:
Ispod temelja samac nabiti postojeće tlo na Ms=25MPa.

NAPOMENA:
Položaj ankera za temeljne grede, koji izlaze iz temeljne stope, prikazani su na planovima armature temeljnih greda - crteži broj 32.134.
2020U023-PZI-G01.B0038-032-PA
2020U023-PZI-G01.B0038-034-PA

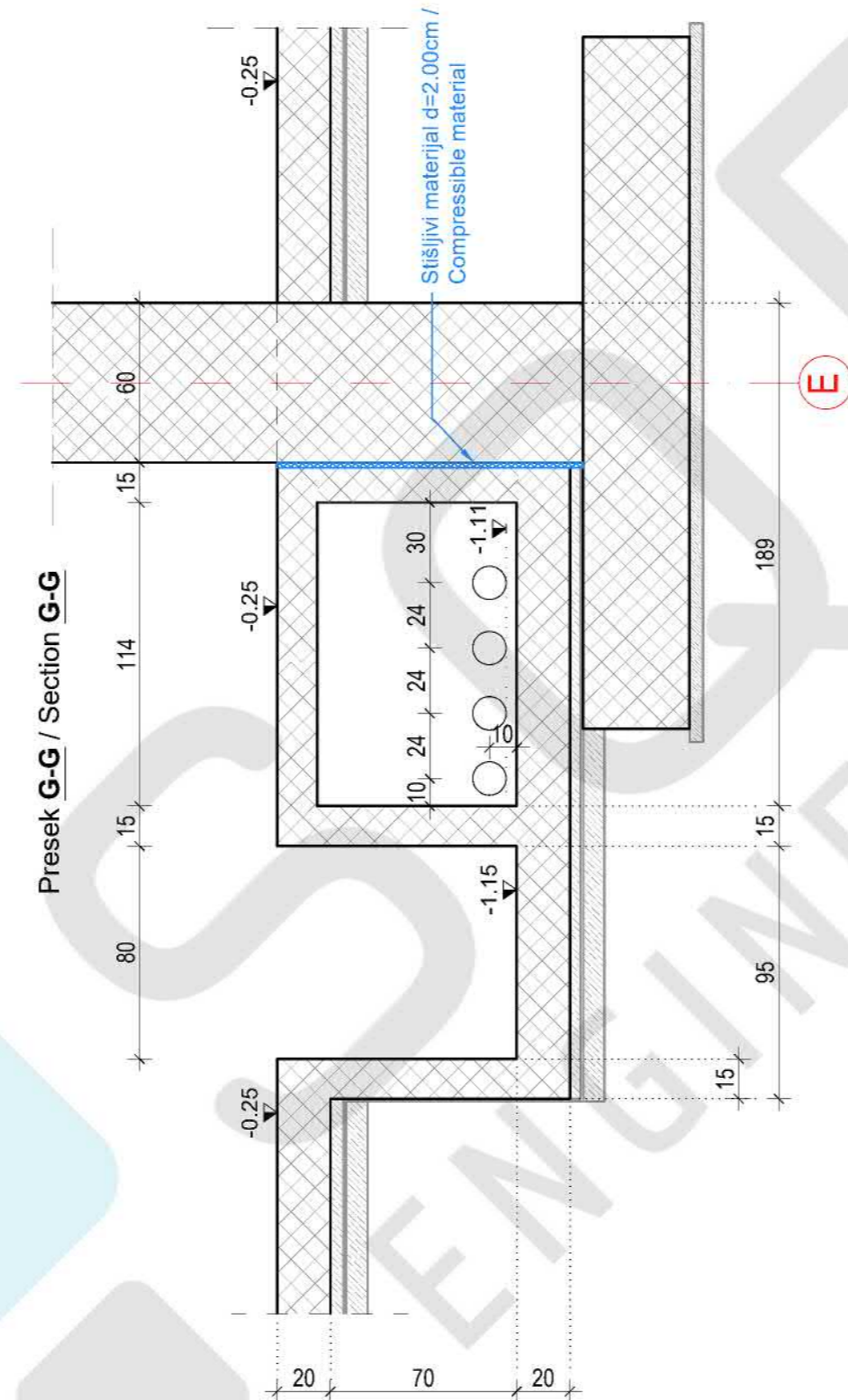
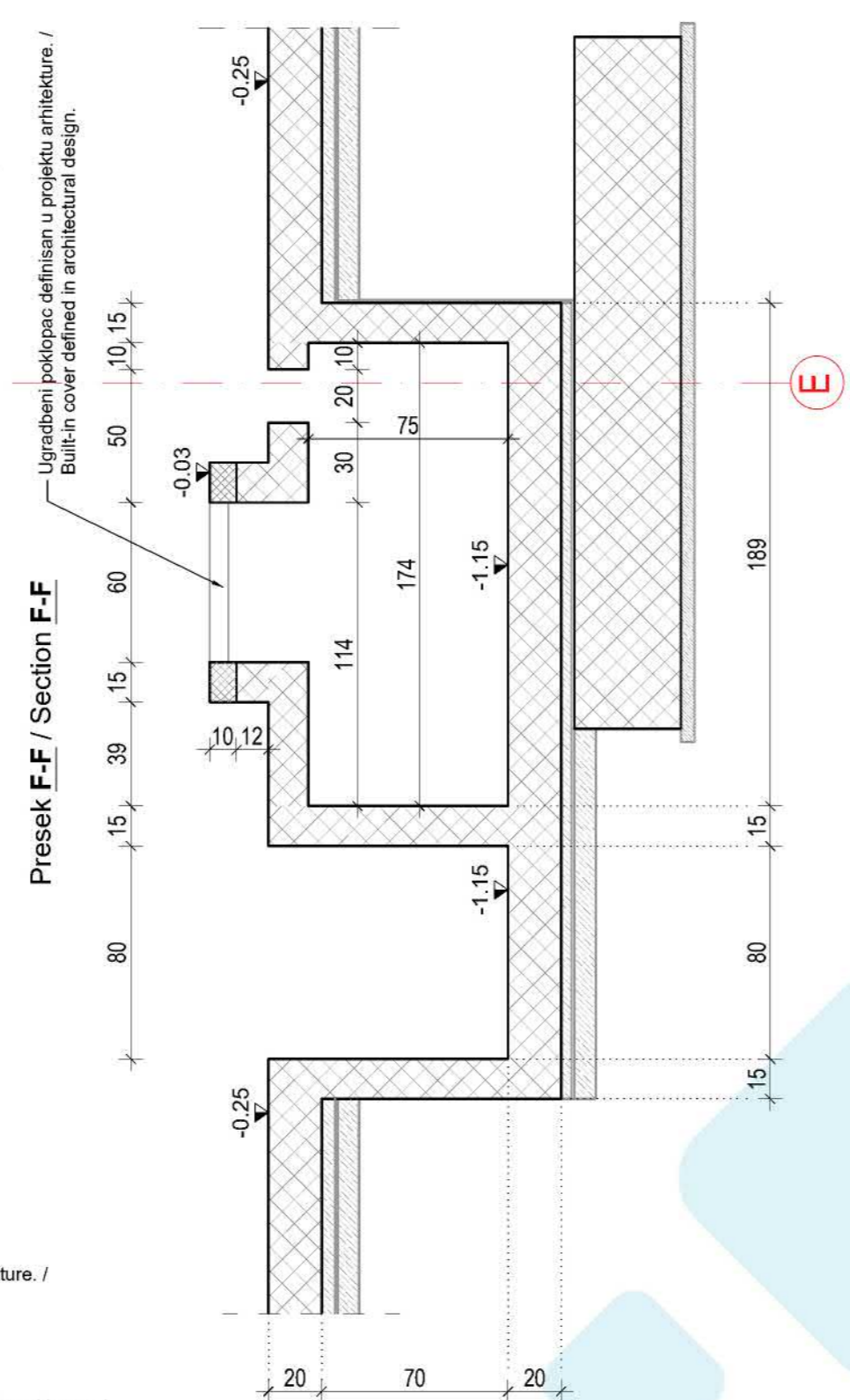
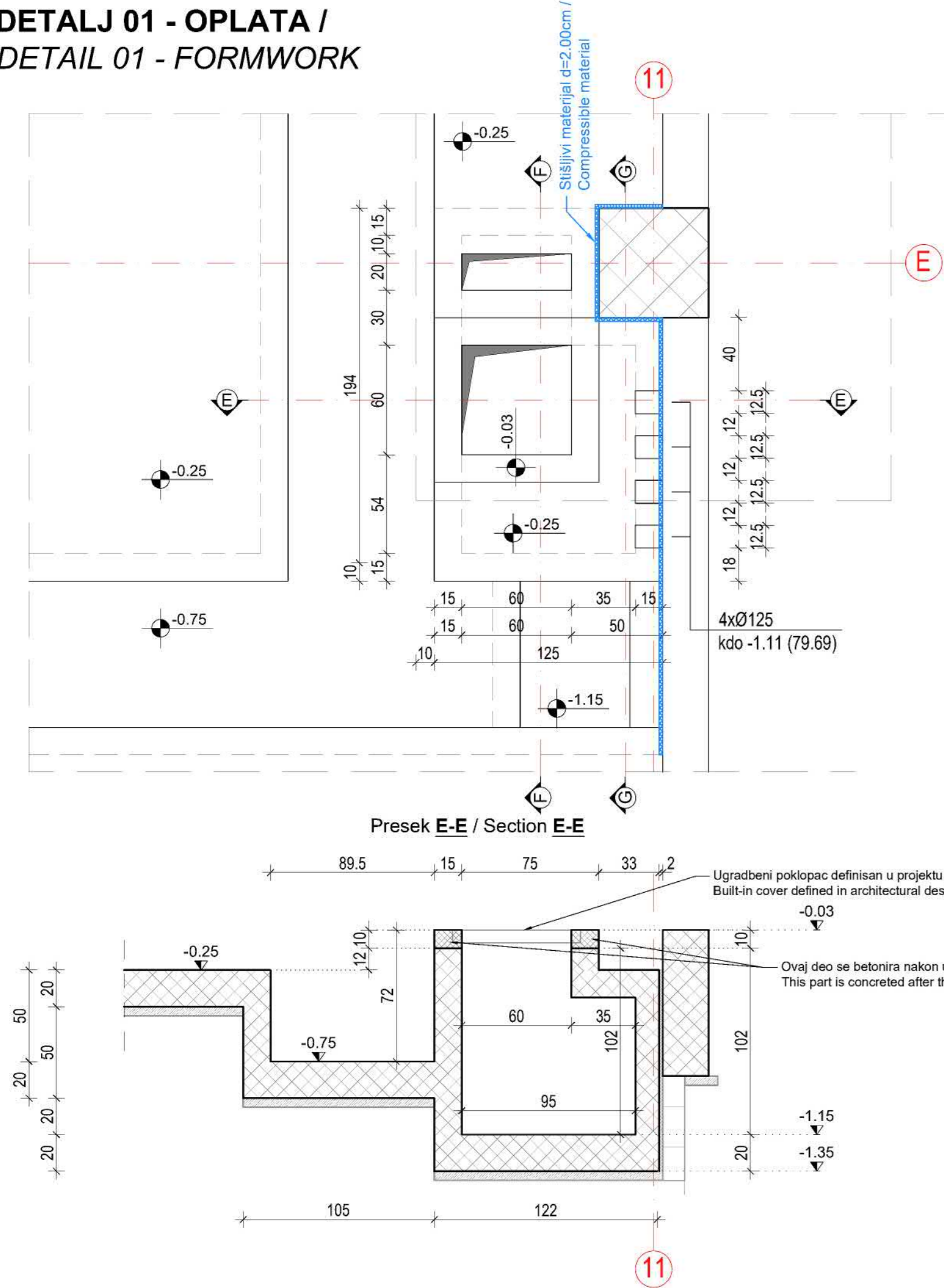
- OPŠTE NAPOMENE:**
1. Pre odobrenja radova sve mere proveriti na licu mesta.
 2. Neusaglašenosti i odstupanja u crtežima i/ili tekstualnim prilozima projekta, obavezno razrešiti sa autorom i odgovornim projektantom.
 3. Izmene u delu projekta za vreme gradnje, vršiti samo uz saglasnost autora i odgovornog projektanta.
 4. Ne dozvoljavaju se izmene na gradilištu za vreme izvođenja radova, bez saglasnosti autora, odgovornog projektanta i tehničkog nadzora.
 5. Odgovornost za izmene snosi lice koje je te izmene odobrio.
 6. Ne premeravati crteže, koje u projektu su merodavne.
 7. Sve instalacione otvore obavezno proveriti u projektima instalacija.

- GENERAL NOTE:**
1. All measurements will be checked prior to commencement of works on site.
 2. Inconsistencies in either drawings and/or textual appendices will have to be resolved with both an Author and a Professional Engineer (PE).
 3. Variations, which may emerge in the design during the construction, are only to be made if the prior approval by both the Author and a Professional Engineer (PE) has been obtained.
 4. No variations will take place in the course of work performance on site unless prior approval by an Author, PE or a Technical Supervisor has been given.
 5. Responsibility will be assumed by a person who authorised variations in the first place.
 6. Drawings will not be checked for accuracy as design levels are correct.
 7. All voids to be checked in the designs of instalations.

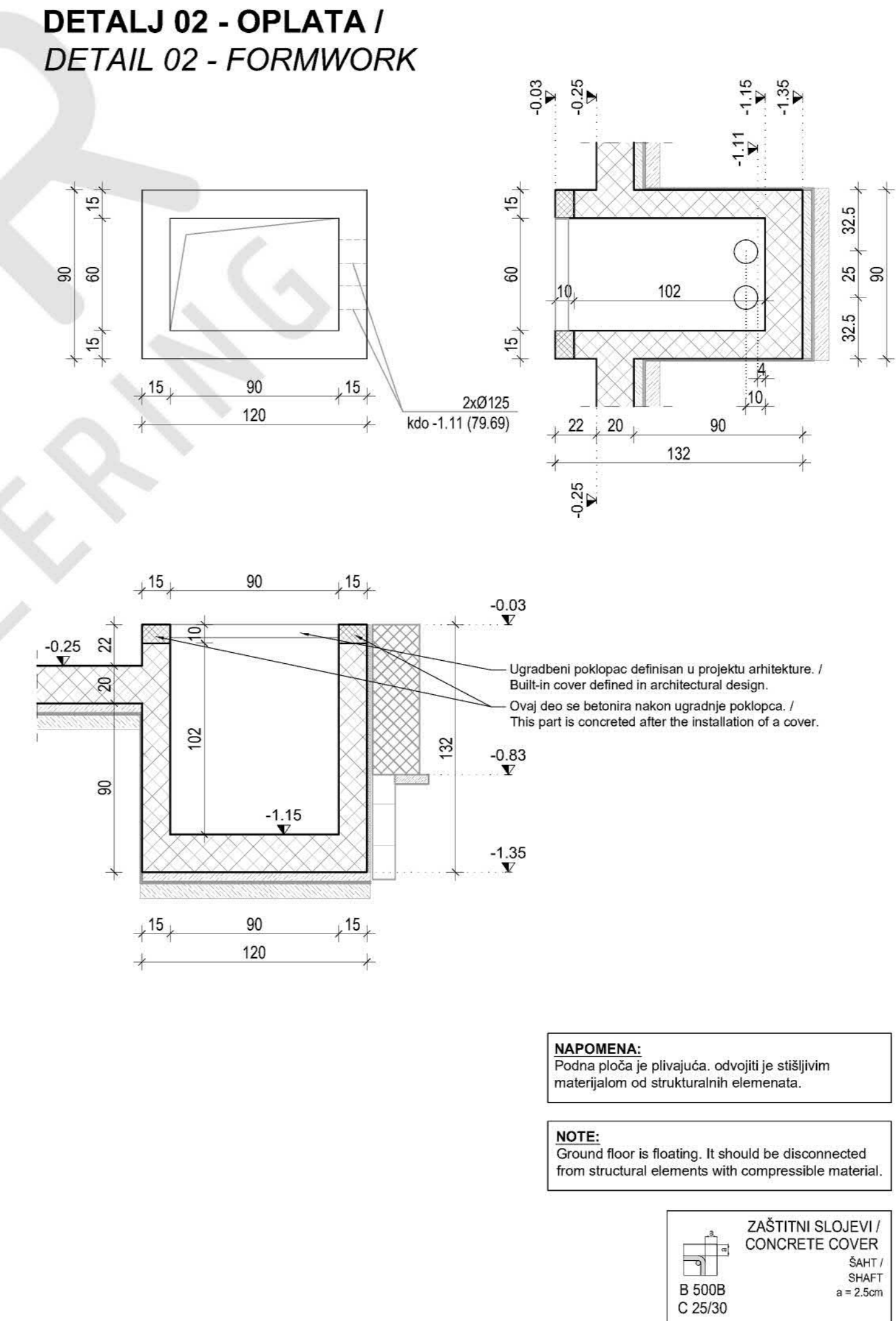
- C 25/30 (MB30) - stubovi, temeljne stope, temeljne grede, grede na +8.60, podna ploča na -0.25, ograda stepeništa na tribinama, ploče, grede, stepeništa / columns, foundations, foundation beams, beams at +8.60, floor slab -0.25, stair railing on the grandstands slabs, beams, stairs
- C 16/20 (MB20) - mrvavi beton-tribine / lean concrete-grandstands

DETALJ 1 / DETAIL 1

DETALJ 01 - OPLATA /
DETAIL 01 - FORMWORK

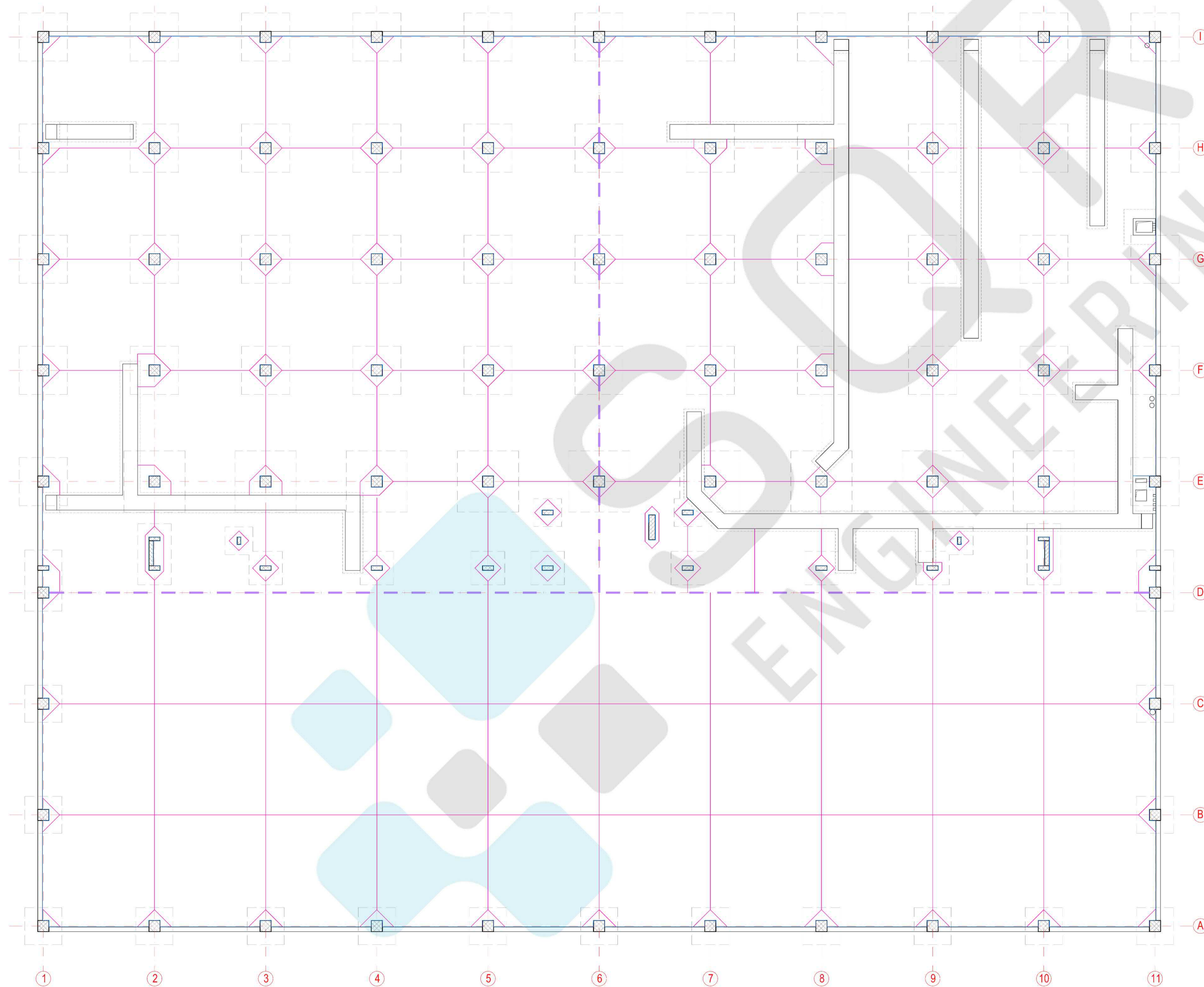


DETALJ 02 - OPLATA /
DETAIL 02 - FORMWORK



- OPŠTE NAPOMENE:**
1. Pre otpočinjanja radova sve mere proveriti na licu mesta.
 2. Neusaglašenosti i odstupanja u crtežima i/ili tekstualnim prilogima projekta, obavezno rešiti sa autorom i odgovornim projektantom.
 3. Izmene u delu projekta za vreme građenja, vršiti samo uz saglasnost autora i odgovornog projektanta.
 4. Ne dozvoljavaju se izmene na gradilištu za vreme izvođenja radova, bez saglasnosti autora, odgovornog projektanta i tehničkog nadzora.
 5. Odgovornost za izmene snosi lice koje je te izmene odobrilo.
 6. Ne premeravati crteže, kote u projektu su merodavne.
 7. Sve instalacione otvore obavezno proveriti u projektima instalacija.
 8. Postaviti sistem za uzemljenje pre izvođenja hidroizolacije.
- GENERAL NOTE:**
1. All measurements will be checked prior to commencement of works on site.
 2. Inconsistencies in either drawings and/or textual appendices will have to be resolved with both an Author and a Professional Engineer (PE).
 3. Variations, which may emerge in the design during the construction, are only to be made if the prior approval by both the Author and a Professional Engineer (PE) has been obtained.
 4. No variations will take place in the course of work performance on site unless prior approval by an Author, PE or a Technical Supervisor has been given.
 5. Responsibility will be assumed by a person who authorised variations in the first place.
 6. Drawings will not be checked for accuracy as design levels are correct.
 7. All voids to be checked in the designs of installations.
 8. Grounding system to be installed before the hydro insulation.

**PLAN DILATACIJA PODNE PLOČE /
JOINT PLAN OF THE GROUND FLOOR**



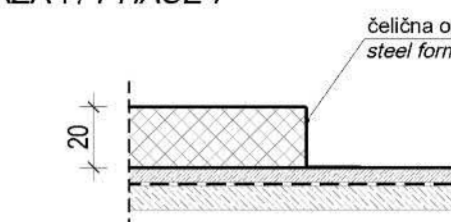
LEGENDA / LEGEND :

- RADNA DILATACIJA / DAILY JOINT
- - - SEKUNDARNA DILATACIJA / CUT JOINT
- DETALJ SPOJA SA VERTIKALNIM ELEMNTIMA /
DETAIL OF THE SPLICE WITH VERTICAL ELEMENTS

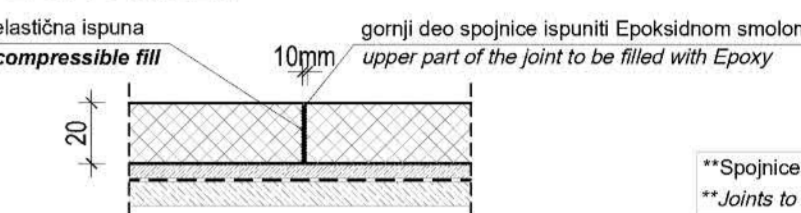
**DETALJ RADNE DILATACIJE SA DEMONTAŽNOM ČELIČNOM OPLATOM R 1:25
DETAIL OF DAILY JOINTS WITH STEEL FORMWORK**

POLJE / FIELD: oko 1000m²

FAZA I / PHASE I



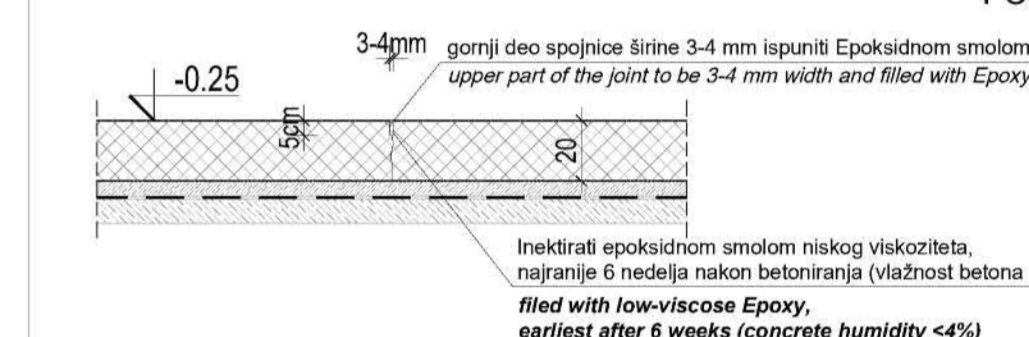
FAZA II / PHASE II



**Spojnice očistiti pre zapunjavanja
**Joints to be cleaned before the sealant application

**SEKUNDARNE DILATACIJE R 1:25
CUT JOINTS**

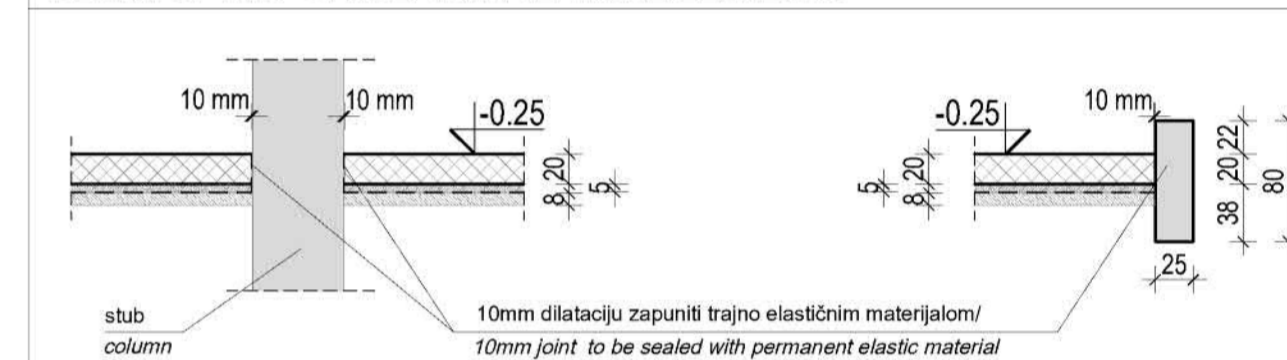
POLJE / FIELD: 6m x 6m



**Sekundarne dilatacije iseci 24 sata nakon betoniranja
**Cut joints cut within 24 hours after concreting

**Širina spojnica je 3-4mm, dubina 50mm / Thickness of cut 3-4mm, depth 50mm

**DETALJ SPOJA SA VERTIKALNIM ELEMNTIMA R 1:50
DETAIL OF THE SPLICE WITH VERTICAL ELEMENTS**



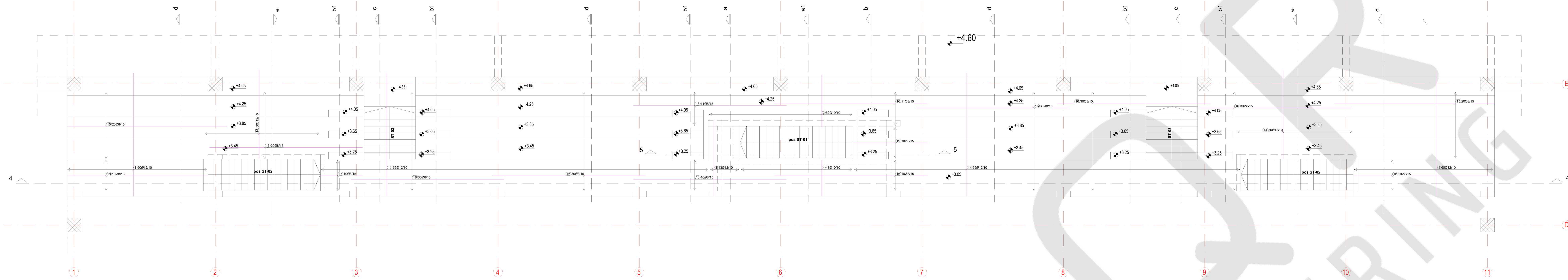
OPŠTE NAPOMENE:

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3. Izmene u delu projekta za vreme građenja, vršiti samo uz saglasnost autora i odgovornog projektanta
4. Ne dozvoljavaju se izmene na gradilištu za vreme izvođenja radova, bez saglasnosti autora, odgovornog projektanta i tehničkog nadzora.
5. Odgovornost za izmene snosi lice koje je te izmene odobrilo.
6. Ne premeravati crteže, kote u projektu su merodavne.
7. Sve instalacione otvore obavezno proveriti u projektima instalacija.
8. Postaviti sistem za uzemljenje pre izvođenja hidroizolacije.

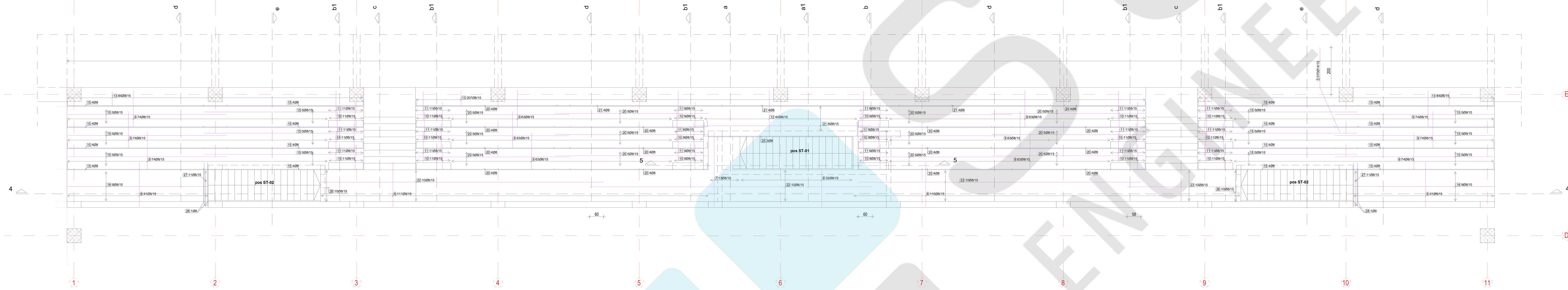
GENERAL NOTE:

1. All measurements will be checked prior to commencement of works on site.
2. Inconsistencies in either drawings and/or textual appendices will have to be resolved with both an Author and a Professional Engineer (PE).
3. Variations, which may emerge in the design during the construction, are only to be made if the prior approval by both the Author and a Professional Engineer (PE) has been obtained.
4. No variations will take place in the course of work performance on site unless prior approval by an Author, PE or a Technical Supervisor has been given.
5. Responsibility will be assumed by a person who authorised variations in the first place.
6. Drawings will not be checked for accuracy as design levels are correct.
7. All voids to be checked in the designs of installations.
8. Grounding system to be installed before the hydro insulation.

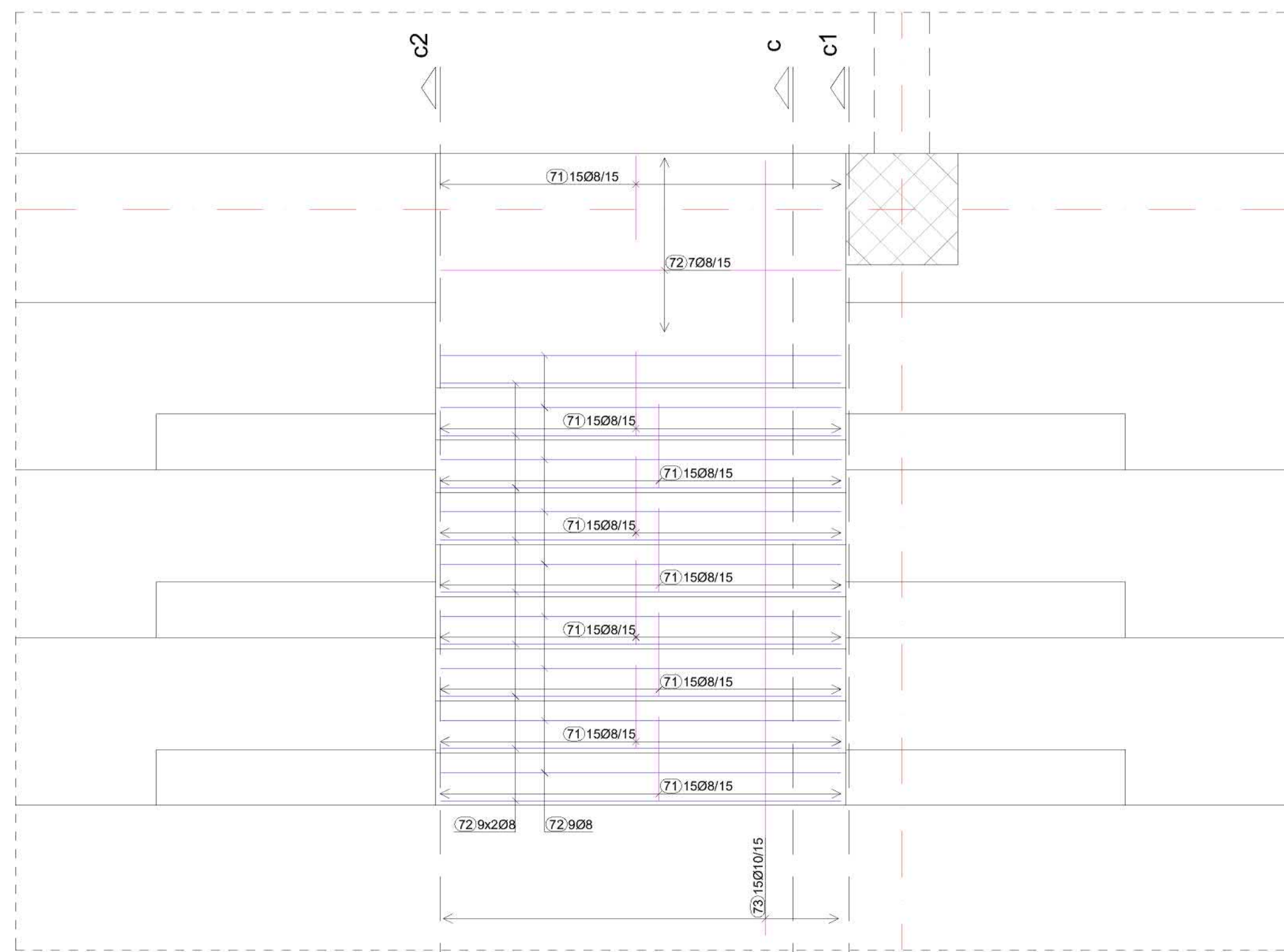
OSNOVA TRIBINE / GRANDSTAND LAYOUT
- Donja zona / Bottom zone -



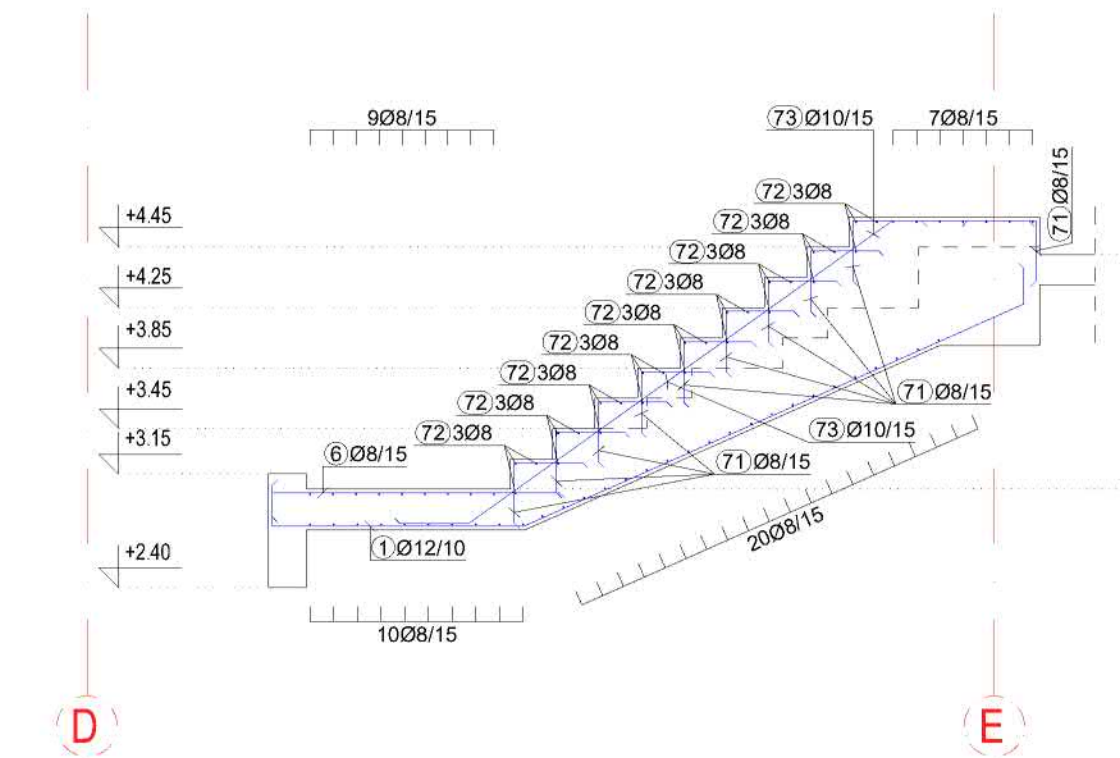
OSNOVA TRIBINE / GRANDSTAND LAYOUT
- Gornja zona / Top zone -



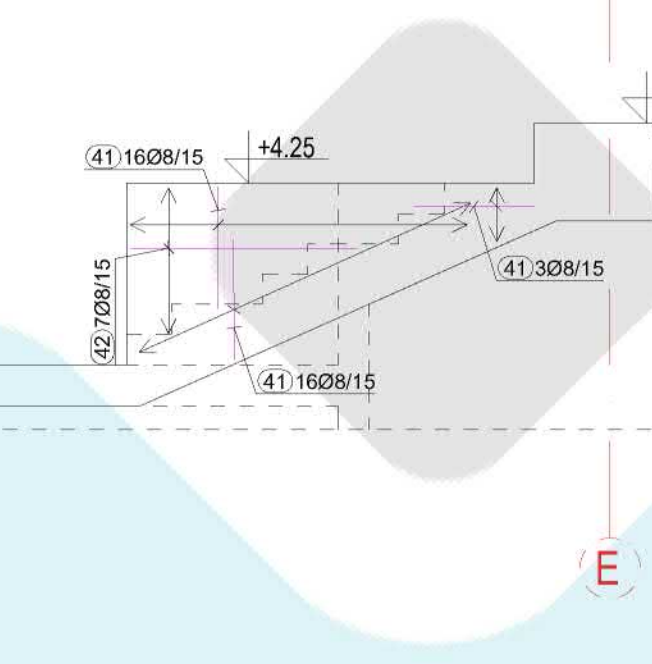
pos ST-03 / pos ST-03
R = 1:25



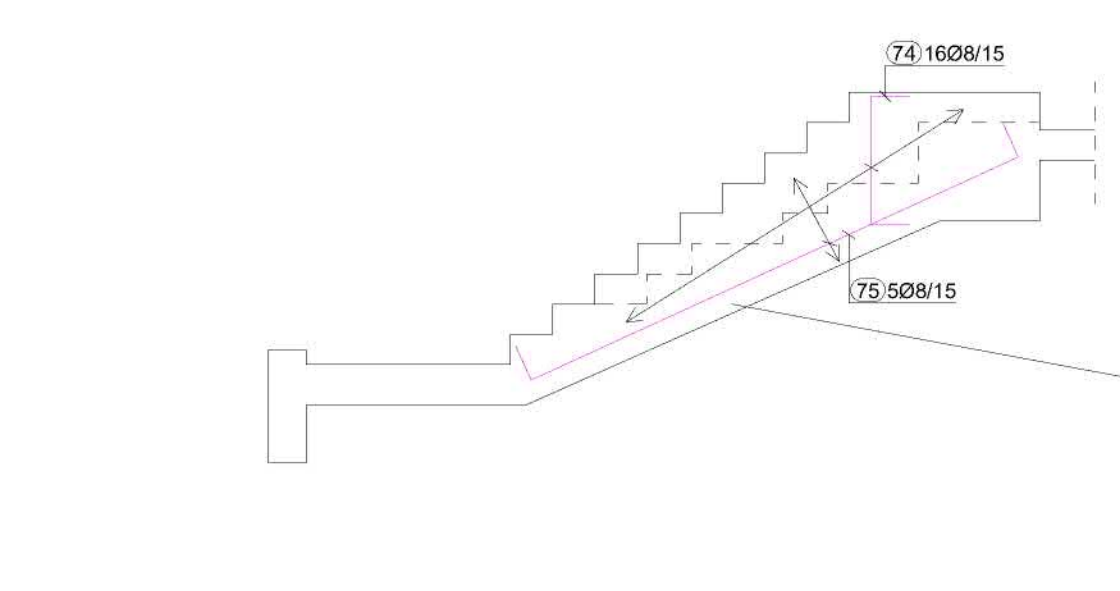
PRESEK c-c / SECTION c-c



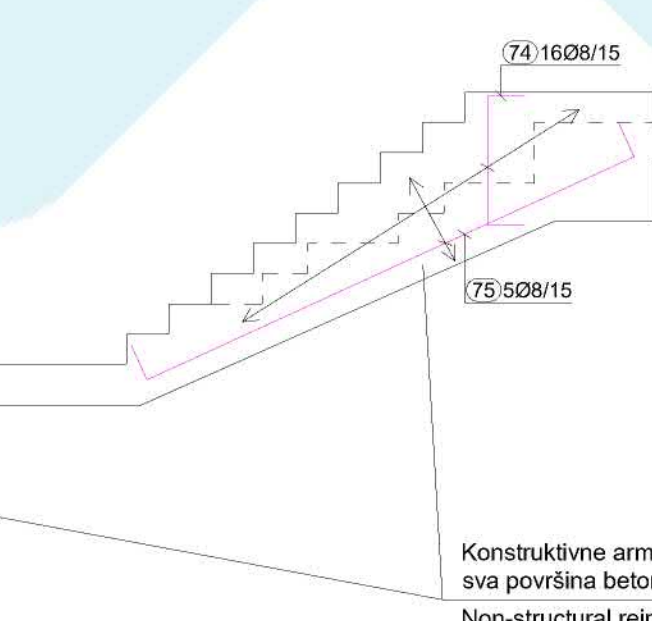
pos PZ1 (parapetni zid) / pos PZ1 (parapet wall)
n=2 kom.pcs.



PRESEK c1-c1 / SECTION c1-c1

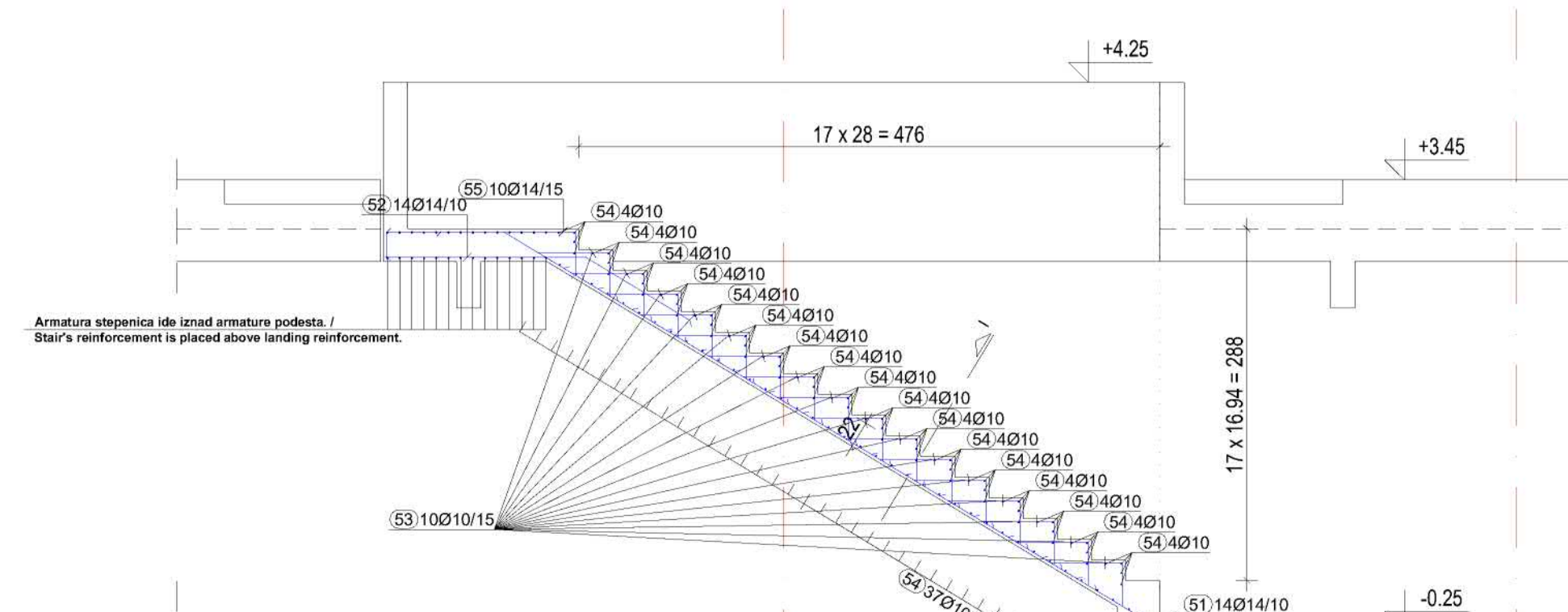


PRESEK c2-c2 / SECTION c2-c2

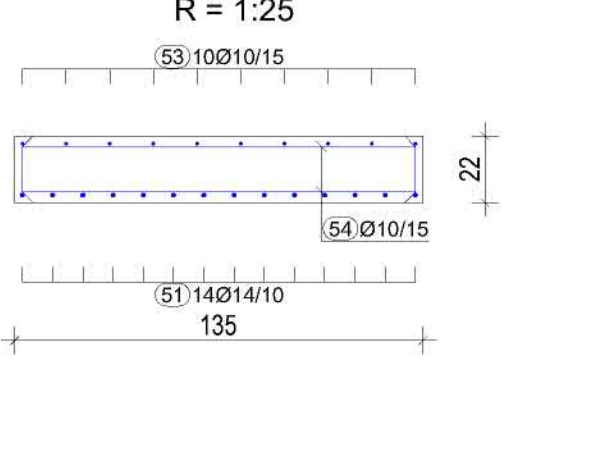


Konstruktivna armatura šipke pos 04 i 05 prilagođeni na lice mesta, tako da se pokriva
sua površina betona šipke pr u koraku sa vazduhom, odnosno površina šipke pr vidljiva.
Non-structural reinforcement bars pos 04 i 05 adjust on site, with the intent to cover all the
concrete surface that is in direct contact with air, that is to cover all the surfaces that are visible.

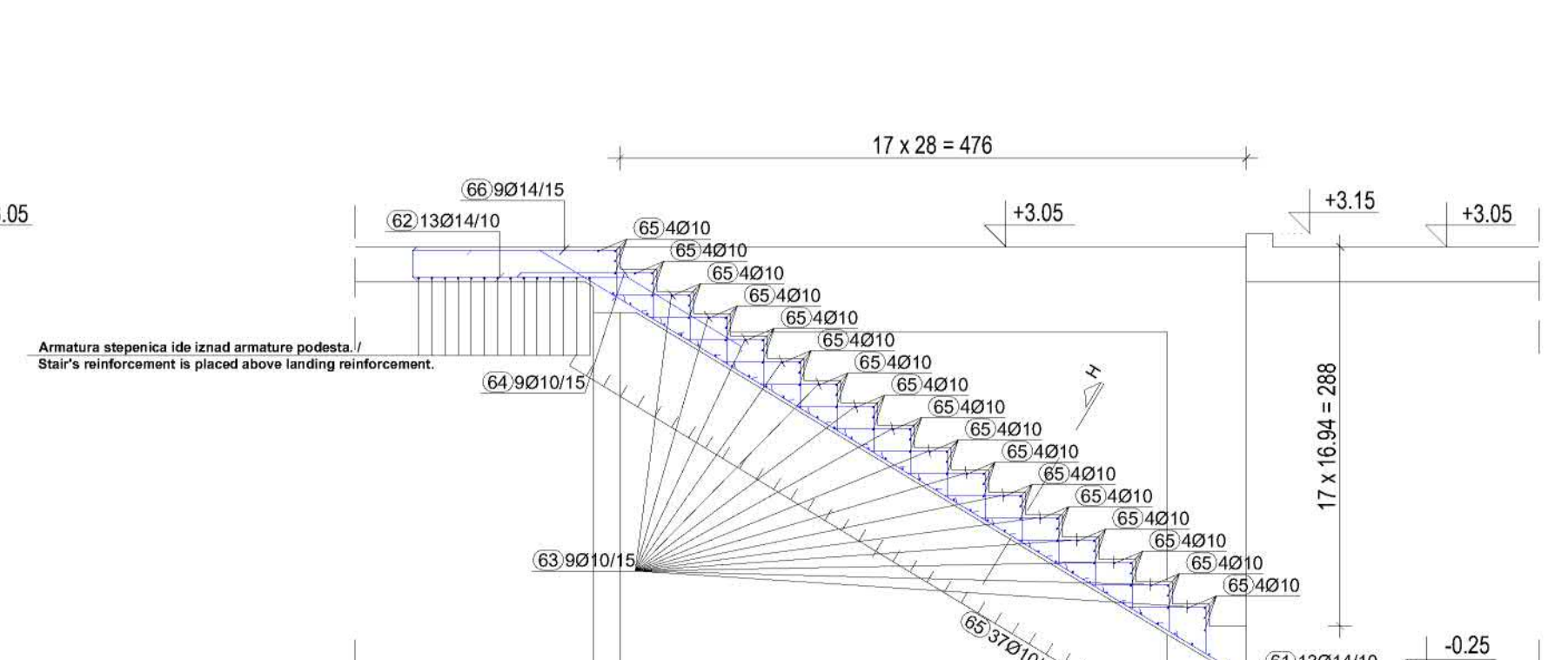
pos ST-01
n = 1 kom.



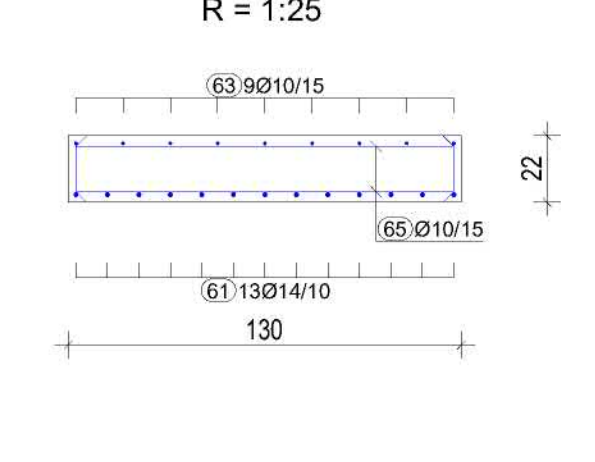
PRESEK I-I / SECTION I-I
R = 1:25



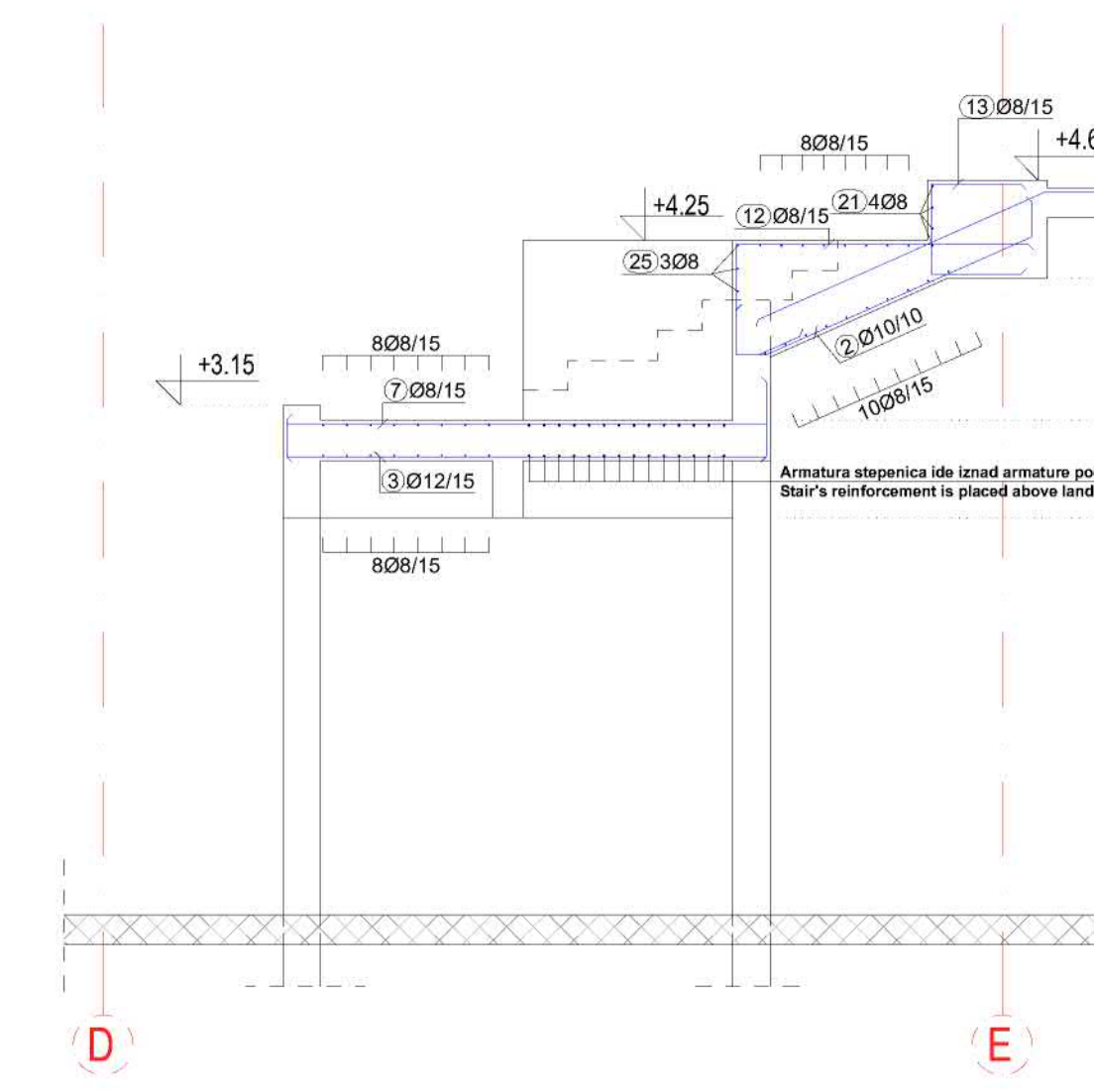
pos ST-02
n = 2 kom.



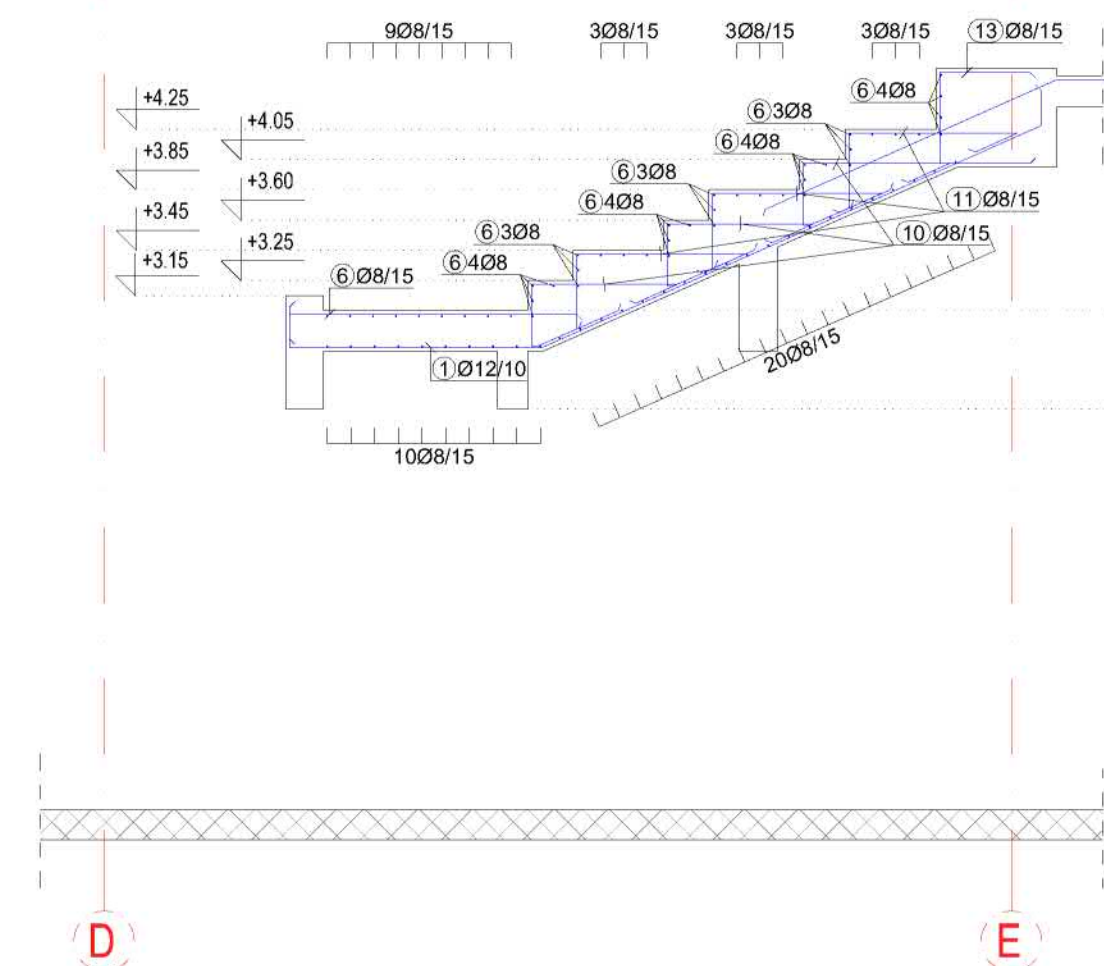
PRESEK H-H / SECTION H-H
R = 1:25



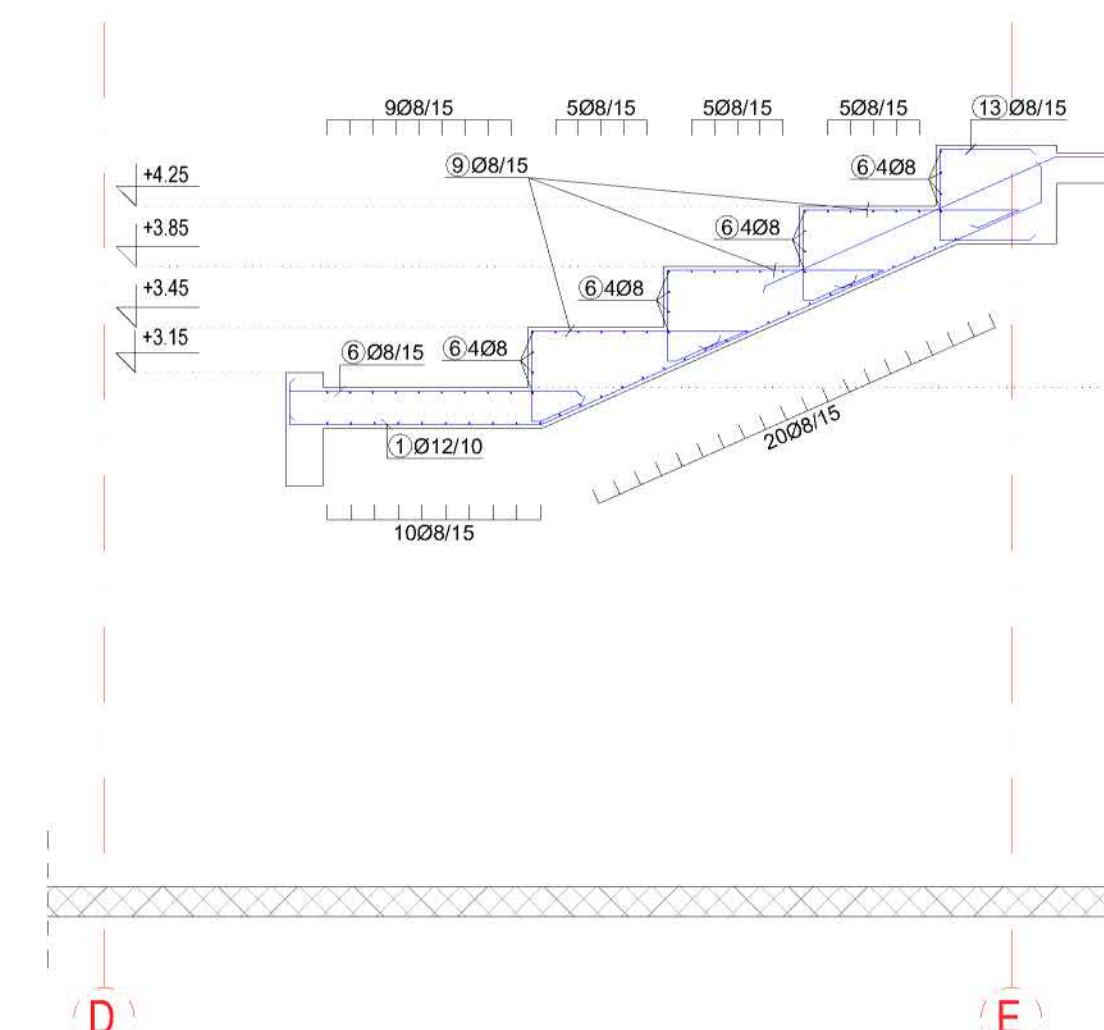
PRESEK a-a / SECTION a-a



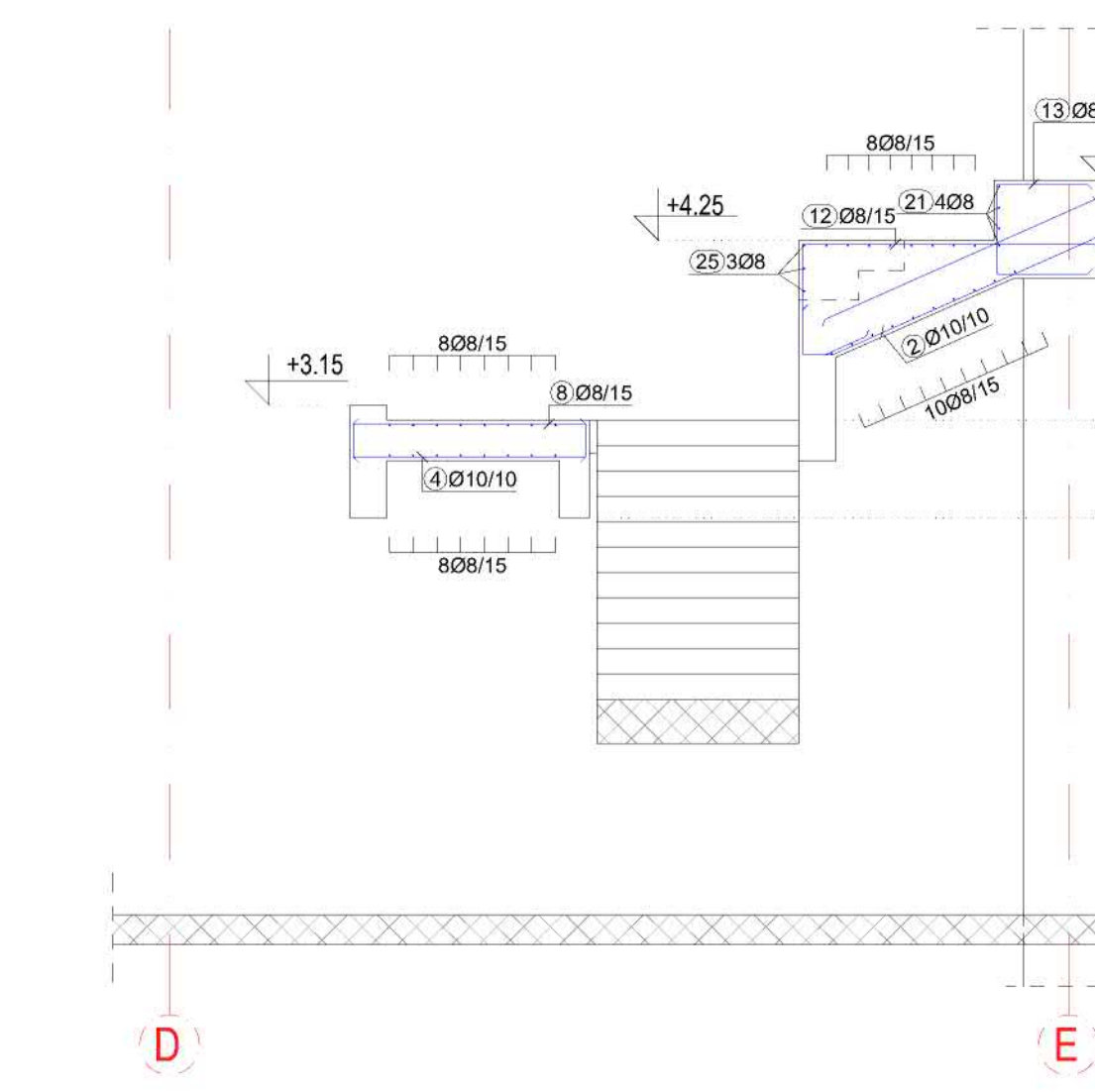
PRESEK b-b / SECTION b-b



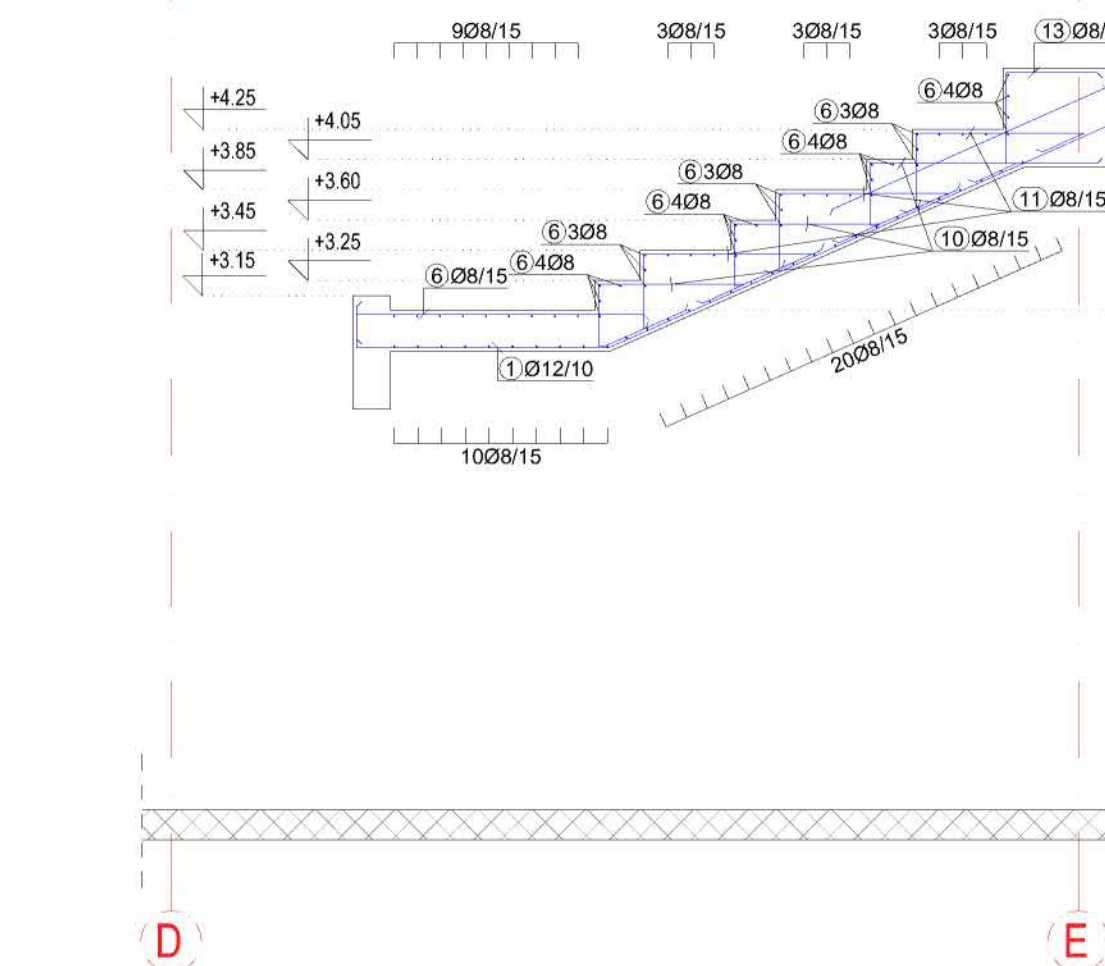
PRESEK d-d / SECTION d-d



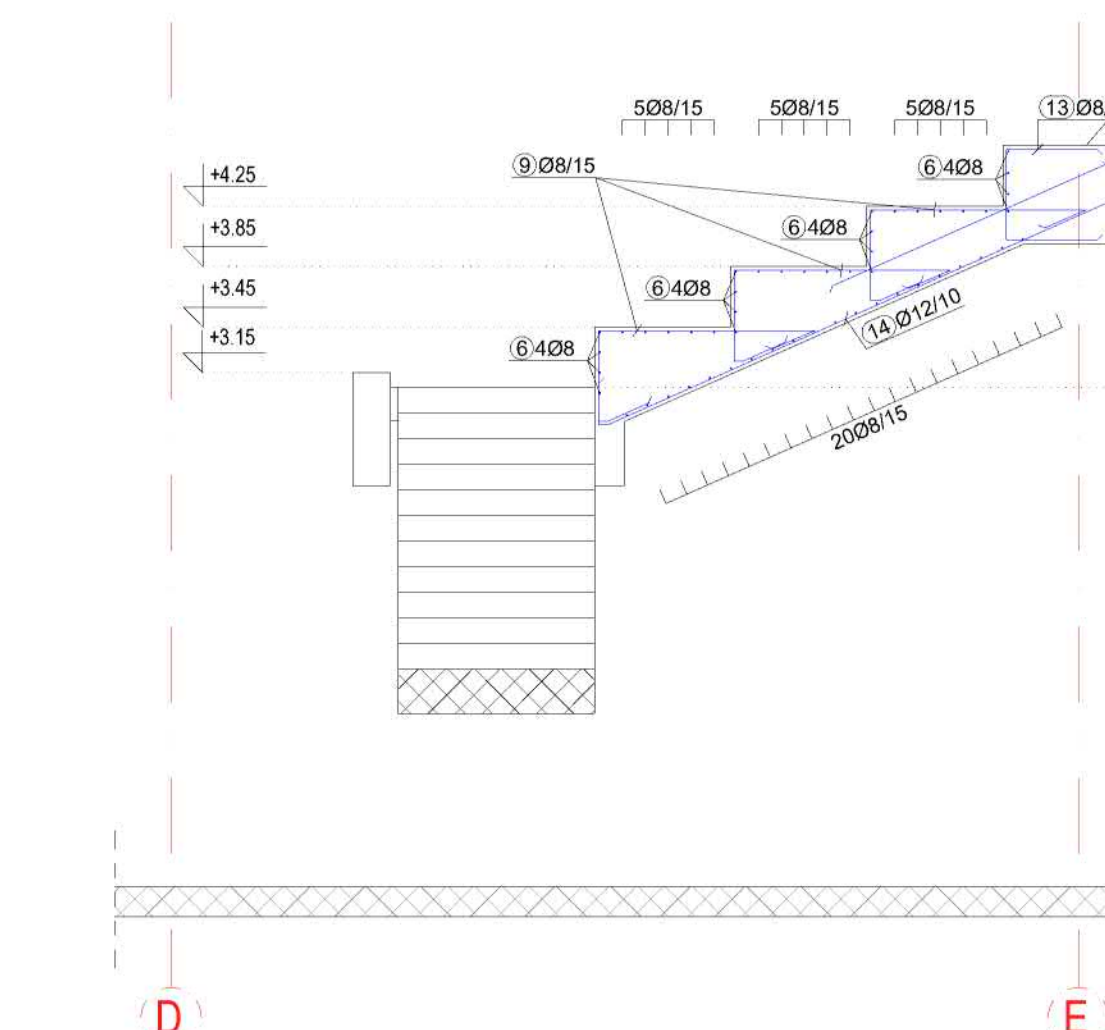
PRESEK a1-a1 / SECTION a1-a1



PRESEK b1-b1 / SECTION b1-b1



PRESEK e-e / SECTION e-e



OPŠTE NAPOMENE

1. Pre izvođenja radova sve mere proveriti na licu mesta.
2. Nausaglašenosti i odstupanja u očitima ili tekstu iz projekta, obavezno razrešiti sa autorom i odgovornim projektantom.
3. Izmena u delu projekta za vreme gradnje, vrši samo uz saglasnost autora i odgovornog projektanta.
4. Ne dozvoljavati se izmene na gradilištu za vreme izvođenja radova, bez saglasnosti autora, odgovornog projektanta i nadležnog nadzora.
5. Odgovornost za izmene snosi lic koje ih je izvelo uoči.
6. Ne premeravati crteže, koje u projektu su menodani.
7. Sve instalacione delove obavezno proveriti u projektnim instalacijama.

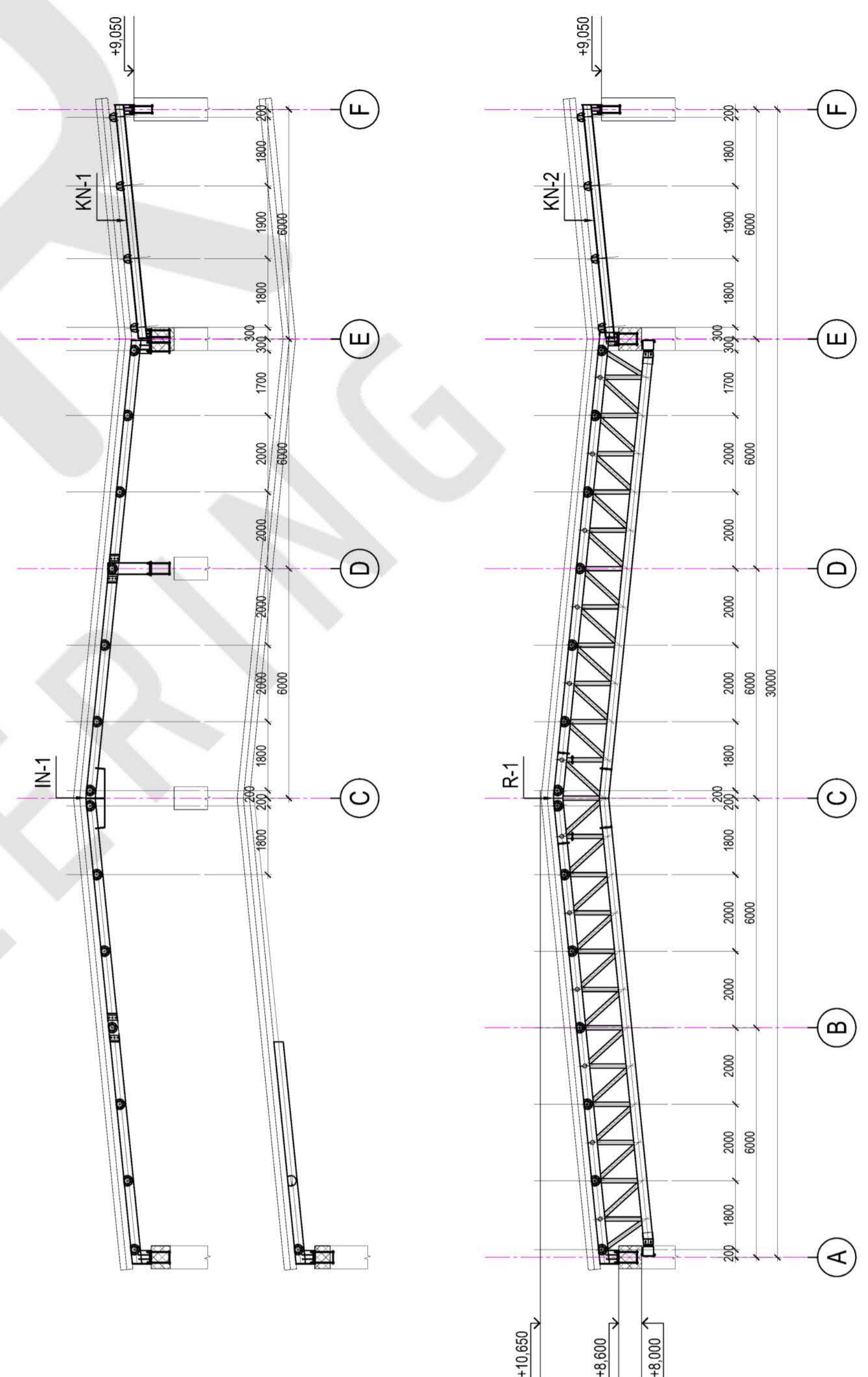
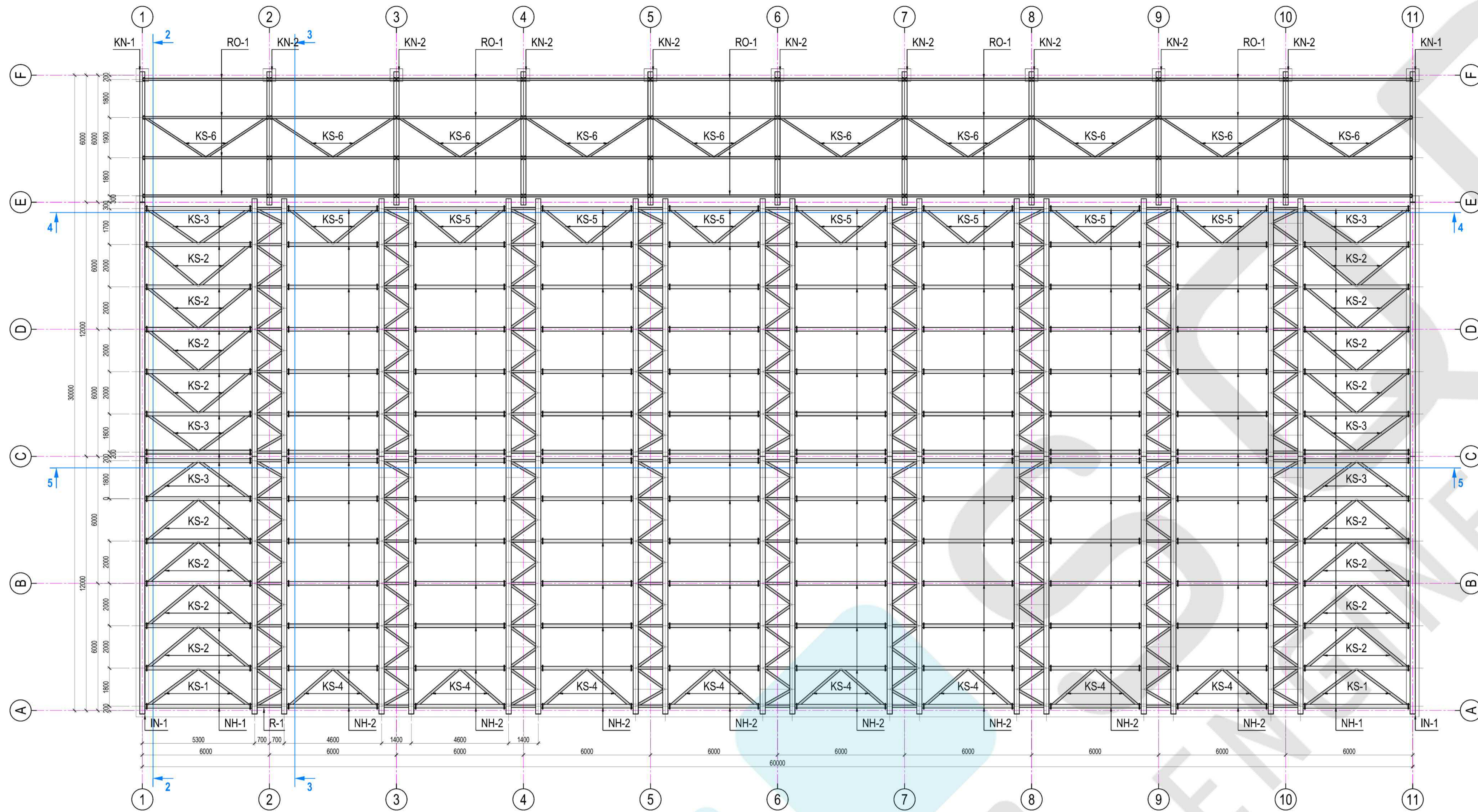
GENERAL NOTES

1. All measurements will be checked prior to commencement of works on site.
2. Inconformities in other drawings and/or textual appendices will have to be resolved with both an Author and a Professional Engineer (PE).
3. Variations, which may emerge in the design during the construction, are only to be made if the prior approval by both the Author and a Professional Engineer (PE) has been obtained.
4. No variations will be allowed in the course of work performed on site without approval by an Author, PE or a Technical Supervisor has been given.
5. Responsibility will be assumed by a person who authorized variations in the first place.
6. Drawings will not be checked for accuracy as design levels are correct.
7. All notes to be checked in the designs of installations.

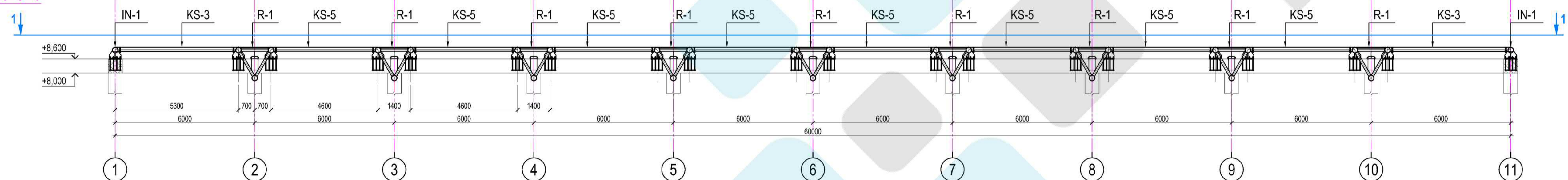
NAPOMENE:
- Površine betona ugraditi do mraznog stana.
- Sve konstrukivne šipke obilim prilagođeni oštali betonu, tako da se pokriva površina šipke pr u koraku sa vazduhom, odnosno površina šipke pr vidljiva.
- Merka betona je postavljena na tribinu u oštali na ostali konstrukivni - C30/37.

NOTES:
- Concrete surface needs to have published fresh.
- All non-structural reinforcement bars obilim adjust on site in accordance to formwork, with the intent to cover all the concrete surface that is in direct contact with air that is to cover all the surfaces that are visible.
- Concrete class for grandstand is higher than the rest of the building - C30/37.

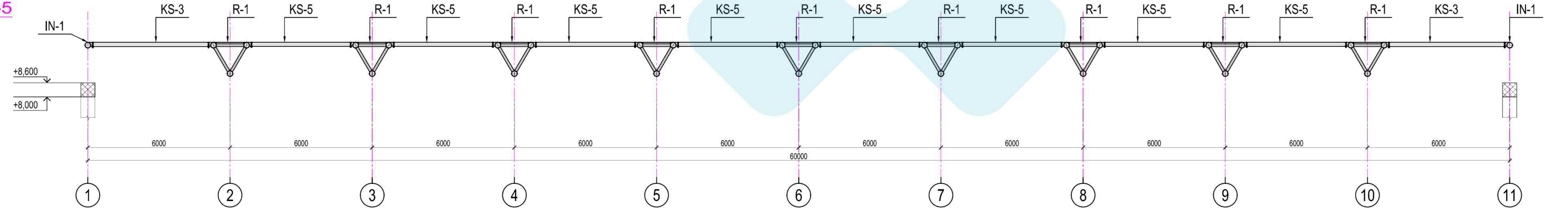
ZASTITNI SLOJ
BETON
B 5003
C 3037



Presek / Section 4-4
R=1:100



Presek / Section 5-5
R=1:100



NAPOMENE / REMARKS

- Osnovni materijal za sve elemente čelične konstr. je S235JRG2.
Basic material for all elements of the steel construction is S235JRG2.
- Svi savovi su "C" kvaliteta.
All welds are of "C" quality.
- Svi ugonsi savovi koji nisu označeni debljine su 0,71 min, ali ne manje od 3 mm.
All fillet welds which are not marked are of thickness 0,71 min, but are not smaller than 3mm, except for the hollow profiles where they are same as the wall of the profile.
- Svi kontakti čeličnih elemenata, osim veza sa zavrtanjima, zavareni su su odgovarajućim ugonsim ili subovnim savovima!
All contacts of steel elements, other than embroidery with screws, connect with appropriate fillet or butt weld!
- Sve šuplje profile zatvoreni 5mm debljinom pločom.
All hollow profiles closed with 5mm steel plate.
- Osnovni materijal za ankerne je S.8.
Basic material for all anchors is S.8.
- Visinske kote preuzete iz projekta arhitekture ili armirano-betonske konstrukcije.
Elevation dim. are taken from the architectural design or concrete structure design.
- SVE DIMENZIJE PROVERITI NA LICU MESTAJ!
ALL DIMENSIONS NEED TO BE CHECKED ON THE SPOT!

OZNAKA ELEMENTA / ELEMENT MARK	OBLIK / SHAPE	PRESEK / SECTION
R-1		1-Ø 244.5x8 2-Ø 108x4 3-# 10 4-# 10
IN-1		1-Ø 244.5x8
NH-1		1-Ø 177.8x5
NH-2		1-Ø 168.3x4
KS-1; KS-2; KS-3; KS-4; KS-5		1-Ø 114.3x4
KN-1		1-IPB1 240 (hea)
RO-1		1-□ 160x100x5
KS-6		1-□ 90x90x4

