Projektiranje Sudić d.o.o.
za projektiranje, nadzor i savjetovanje
www.projektiranje-sudic.com

Adresa | Ćirilometodska 19c, 10430 Samobor
Kontakt | +385(0)1/888-9621
OIB | 95112538705

Investitor	**Fakultet za dentalnu medicinu i zdravstvo**
Adresa	**Crkvena ulica br. 21, 31000 Osijek**
OIB	**83830458507**

OVAJ GLAVNI PROJEKT - IZMJENE I DOPUNE SASTAVNI JE DIO RJEŠENJA O IZMJENI I DOPUNI GRAĐEVINSKE DOZVOLE

KLASA: UP/I-361-03/20-01/000100
URBROJ: 2189/1-08/19-20-0020
od 26.10.2020. godine

o v j e r a v a

Digitalno potpisao: Marin Jurlina
Datum: 2020.10.26 10:42:50 +01'00'

Građevina	**REKONSTRUKCIJA I DOGRADNJA građevine FDMZ** **Centar za prevenciju, dijagnostiku, liječenje i rehabilitaciju kardiovaskularnih bolesnika**
Lokacija	**Trg pl. Mihalovića br. 1; k.č.br. 691, k.o. Orahovica**

Razina	**GLAVNI PROJEKT – IZMJENA I DOPUNA**
Mapa 2	**GRAĐEVINSKI PROJEKT KONSTRUKCIJE**
T.D.	**607-1/2019**
Z.O.P.	**FDMZ – 001/06/2020**

Projektant konstrukcije	**Ozren Sudić, dipl.ing.građ.** ovlašteni inženjer građevinarstva
Suradnik	**Borna Doračić, mag.ing.aedif.**
Glavni projektant	**Anton Majnarić, dipl.ing.građ.** ovlašteni inženjer građevinarstva

OZREN SUDIĆ
Digitally signed by OZREN SUDIĆ
Date: 2020.06.29 15:16:16 +02'00'

Anton Majnarić
Digitally signed by Anton Majnarić
Date: 2020.07.01 17:47:27 +02'00'

Samobor, lipanj 2020.

Projektiranje Sudić d.o.o.

Ozren Sudić, dipl.ing.građ.

STRANICA ZA OVJERU REVIDENTA

SADRŽAJ

1. OPĆI DIO 4
1.1. Popis mapa i elaborata 4
1.2. Preslik rješenja o registraciji poduzeća 6
1.3. Rješenje o imenovanju projektanta 9
1.4. Rješenje u upisu u imenik ovlaštenih inženjera 10
1.5. Rješenje o imenovanju projektanta 12
2. TEHNIČKI DIO 13
2.1. Tehnički opis 13
2.2. Analiza opterećenja 16
2.2.1. Stalno opterećenje 16
2.2.2. Uporabno opterećenje 17
2.2.3. Djelovanje snijega 18
2.2.4. Djelovanje vjetra 19
2.2.5. Djelovanje potresa 22
2.3. Proračun konstrukcije 23
2.3.1. Proračun spregnute ploče 23
2.3.2. Proračun čelične konstrukcije 32
2.3.3. Proračun stubišta 101
2.4. Procjena troškova gradnje 119
2.5. Program kontrole i osiguranja kvalitete 120

1. OPĆI DIO

1.1. Popis mapa i elaborata

MAPA 1

Glavni projekt – arhitektonski dio
Izrađivač: Raster d.o.o., Valpovo ; Vijenac Hrvatske republike 13/III
Projektant: Emilija Papić, dipl. ing.arh.
Zajednička oznaka projekta / broj projekta:
FDMZ – 001 / 06 / 2020 / AP - 001 / 06 / 2020
Datum: lipanj , 2020.g.

MAPA 2

Glavni projekt – građevinski dio - konstrukcija
Izrađivač:Projektiranje Sudić d.o.o., Samobor, Ćirilometodska 19c
Projektant građ. djela: Ozren Sudić, dipl.ing.građ.
Zajednička oznaka projekta / broj projekta :
FDMZ – 001 / 06 / 2020 / 607-1 / 2019
Datum: lipanj , 2020.g.

MAPA 3

Glavni projekt – građevinski dio - VK
Izrađivač:TEB. d.o.o., Osijek, Vij.I.Meštrovića 1C
Projektant građ. djela: Anton Majnarić, dipl. ing. građ.
Zajednička oznaka projekta / broj projekta :
FDMZ – 001 / 06 / 2020 / GP - 001 / 06 / 2020
Datum: lipanj , 2020.g.

MAPA 4

Glavni projekt – PROJEKT GRIJANJA I KLIMATIZACIJE
Izrađivač:TERMO TIM PROJEKT d.o.o., Zagreb, Vojnovićeva 22
Projektant str. djela: Milivoj Sremac, dipl. ing. str.
Zajednička oznaka projekta / broj projekta :
FDMZ – 001 / 06 / 2020 / TD 90 / 19
Datum: lipanj , 2020.g.

MAPA 5

Glavni projekt – PROJEKT ELEKTRIČNIH INSTALACIJA JAKE I SLABE STRUJE
Izrađivač:NOVA LUX d.o.o., Osijek, Ulica I.Gundulića 36 b
Projektant el.. djela: Zlatko Galić, dipl. ing. el.
Zajednička oznaka projekta / broj projekta :
FDMZ – 001 / 06 / 2020 / 073 / 19
Datum: lipanj , 2020.g.

Elaborati koji prethode izradi glavnog projekta:

ELABORAT ZAŠTITE OD POŽARA
Izrađivač: TEB. d.o.o., Osijek, Vij.I.Meštrovića 1C
Projektant: Antun Mileta, dipl. ing. građ.
Vrsta projekta: elaborat zaštite od požara
br.projekta : FDMZ – 001 / 06 / 2020 / EZP – 001 / 06 / 2020

ELABORAT ZAŠTITE NA RADU
Izrađivač: TEB. d.o.o., Osijek, Vij.I.Meštrovića 1C
Projektant: Zijad Hadžić, dipl. ing. stroj.
Vrsta projekta: elaborat zaštite na radu
br.projekta : FDMZ – 001 / 06 / 2020 / EZR – 001 / 06 / 2020

ELABORAT ALTERNATIVNIH SUSTAVA OPSKRBE ENERGIJOM
Izrađivač: TEB. d.o.o., Osijek, Vij.I.Meštrovića 1C
Projektant: Anton Majnarić, dipl. ing. građ.
Vrsta projekta: glavni građevinski projekt
br.projekta : FDMZ – 001 / 06 / 2020 / EASOE - 001 /

1.2. Preslik rješenja o registraciji poduzeća

REPUBLIKA HRVATSKA
TRGOVAČKI SUD U ZAGREBU

IZVADAK IZ SUDSKOG REGISTRA

SUBJEKT UPISA

MBS:
080714866

OIB:
95112538705

TVRTKA:
1 PROJEKTIRANJE SUDIĆ d.o.o. za projektiranje, nadzor i savjetovanje

1 PROJEKTIRANJE SUDIĆ d.o.o.

SJEDIŠTE/ADRESA:
2 Samobor (Grad Samobor)
Ćirilometodska 19 C

PRAVNI OBLIK:
1 društvo s ograničenom odgovornošću

PREDMET POSLOVANJA:
1 * - Kupnja i prodaja robe
1 * - Obavljane trgovačkog posredovanja na domaćem i inozemnom tržištu
1 * - Djelatnost javnog cestovnog prijevoza putnika i tereta u domaćem i međunarodnom prometu
1 * - Poslovanje nekretninama
1 * - Poslovi upravljanja nekretninom i održavanje nekretnina
1 * - Posredovanje u prometu nekretninama
1 * - Zastupanje inozemnih tvrtki
1 * - Promičžba (reklama i propaganda)
1 * - Projektiranje, građenje, uporaba i uklanjanje građevina
1 * - Nadzor nad gradnjom
1 * - Upravljanje i održavanje zgrada
1 * - Stručni poslovi prostornog uređenja
1 * - Savjetovanje u vezi sa poslovanjem i upravljanjem
1 * - Tehničko ispitivanje i analiza
1 * - Iznajmljivanje strojeva i opreme, bez rukovatelja i predmeta za osobnu uporabu i kućanstvo
1 * - Turističke usluge u nautičkom turizmu
1 * - Turističke usluge u ostalim oblicima turističke ponude
1 * - Ostale turističke usluge
1 * - Pripremanje hrane i pružanje usluga prehrane
1 * - Pripremanje i usluživanje pića i napitaka
1 * - Pružanje usluga smještaja
1 * - Pripremanje hrane za potrošnju na drugom mjestu sa ili bez usluživanja (u prijevoznom sredstvu,

D004, 2016-04-22 09:11:09 Stranica: 1 od 3

REPUBLIKA HRVATSKA
TRGOVAČKI SUD U ZAGREBU

IZVADAK IZ SUDSKOG REGISTRA

SUBJEKT UPISA

PREDMET POSLOVANJA:

na priredbama i sl.) i opskrba tom hranom (catering)
1 * - Grafički dizajn, industrijski dizajn i dizajn interijera
1 * - Tiskanje časopisa i drugih periodičkih publikacija, knjiga i brošura, glazbenih djela i glazbenih rukopisa, karata i atlasa, plakata, igraćih karata, reklamnih kataloga, prospekata i drugih tiskanih oglasa, djelovodnika, albuma, dnevnika, kalendara, poslovnih obrazaca i drugih tiskanih komercijalnih publikacija, papirne robe za osobne potrebe i drugih tiskanih publikacija, pomoću knjigotiska, ofseta, fotogravure, fleksografije, sitotiska i drugih tiskarskih strojeva, strojeva za umnožavanje, računalnih pisača, fotokopiranja i termokopiranja
1 * - Izrada reklama,natpisa i štambilja
1 * - Izrada i montaža svjetlećih reklama i reklamnih panoa

OSNIVAČI/ČLANOVI DRUŠTVA:

2 Ozren Sudić, OIB: 56484876886
Samobor, Ćirilometodska 19 C
1 - jedini osnivač d.o.o.

OSOBE OVLAŠTENE ZA ZASTUPANJE:

2 Ozren Sudić, OIB: 56484876886
Samobor, Ćirilometodska 19 C
1 - član uprave
1 - zastupa društvo pojedinačno i samostalno

TEMELJNI KAPITAL:
1 20.000,00 kuna

PRAVNI ODNOSI:
Osnivački akt:
1 Izjava o osnivanju od 30.11.2009.

FINANCIJSKA IZVJEŠĆA:

	Predano	God.	Za razdoblje	Vrsta izvještaja
eu	30.03.16	2015	01 01.15 - 31.12.15	GFI-POD izvještaj

Upise u glavnu knjigu proveli su:

RBU	Tt	Datum	Naziv suda

D004, 2016-04-22 09:11:09 Stranica: 2 od 3

REPUBLIKA HRVATSKA
TRGOVAČKI SUD U ZAGREBU

IZVADAK IZ SUDSKOG REGISTRA

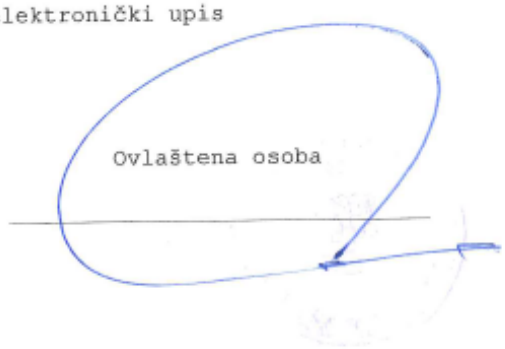
SUBJEKT UPISA

Upise u glavnu knjigu proveli su:

RBU	Tt	Datum	Naziv suda
0001	Tt-09/13485-2	08.12.2009	Trgovački sud u Zagrebu
0002	Tt-09/13485-6	01.02.2010	Trgovački sud u Zagrebu
eu	/	15.10.2010	elektronički upis
eu	/	07.04.2011	elektronički upis
eu	/	16.05.2012	elektronički upis
eu	/	27.03.2013	elektronički upis
eu	/	23.05.2014	elektronički upis
eu	/	31.03.2015	elektronički upis
eu	/	30.03.2016	elektronički upis

U Zagrebu, 22. travnja 2016.

Ovlaštena osoba



D004, 2016-04-22 09:11:09 Stranica: 3 od 3

1.3. Rješenje o imenovanju projektanta

Na temelju članka 51. Zakona o gradnji (NN 153/13, 20/17) izdaje se

RJEŠENJE O IMENOVANJU PROJEKTANTA br. 607-1/2019

Projektant:	**OZREN SUDIĆ, dipl.ing.građ.** **ovlašteni inženjer građevinarstva** Projektiranje Sudić d.o.o., Samobor
Oznaka rješenja:	klasa: UP/I-360-01/05-01/3576 ur.broj: 314-02-05-1 datum upisa: 28.06.2005.
za projektanta:	GRAĐEVINSKOG PROJEKTA KONSTRUKCIJE
za građevinu:	**REKONSTRUKCIJA I DOGRADNJA građevine FMDZ** Centar za prevenciju, dijagnostiku, liječenje i rehabilitaciju kardiovaskularnih bolesnika
investitora:	**FAKULTET ZA DENTALNU MEDICINU I ZDRAVSTVO OSIJEK** Crkvena ulica br. 21, 31000 Osijek OIB: 83830458507
na lokaciji:	Trg pl. Mihalovića br. 1, Orahovica k.č.br. 691, k.o. Orahovica
T.D.:	607-1/2019
Z.O.P.:	FDMZ – 001/06/2020

Imenovani zadovoljava odredbe čl. 51. Zakona o gradnji (NN 153/13, 20/17).

U Samoboru, 06.2020.

Projektiranje Sudić d.o.o.

Ozren Sudić, dipl.ing.građ.

1.4. Rješenje u upisu u imenik ovlaštenih inženjera

REPUBLIKA HRVATSKA
HRVATSKA KOMORA ARHITEKATA
I INŽENJERA U GRADITELJSTVU

Klasa: UP/I-360-01/05-01/ 3576
Urbroj: 314-02-05-1
Zagreb, 30. lipnja 2005.

Na temelju članka 24. i članka 26. stavka 2. Zakona o Hrvatskoj komori arhitekata i inženjera u graditeljstvu ("Narodne novine", br. 47/98), Statuta Hrvatske komore arhitekata i inženjera u graditeljstvu ("Narodne novine", br. 40/99 i 112/99), Pravilnika o upisima u strukovne razrede Hrvatske komore arhitekata i inženjera u graditeljstvu, te na temelju Odluke Odbora za upis u Imenik ovlaštenih inženjera građevinarstva od 28.06.2005. godine, koji je rješavao po Zahtjevu za upis SUDIĆ OZRENA, dipl.ing.građ., SAMOBOR, ĆIRILOMETODSKA 19c, Odbor za upis donosi, a predsjednik Hrvatske komore arhitekata i inženjera u graditeljstvu potpisuje

RJEŠENJE

1. U **Imenik ovlaštenih inženjera građevinarstva** upisuje se **SUDIĆ OZREN**, dipl.ing.građ., SAMCBOR, pod rednim brojem **3576**, s danom upisa **28.06.2005**. godine.

2. Upisom u **Imenik ovlaštenih inženjera građevinarstva**, SUDIĆ OZREN, dipl.ing.građ., stječe pravo na uporabu strukovnog naziva **"ovlašteni inženjer građevinarstva"** i pravo na obavljanje poslova temeljem članka 25. Zakona o Hrvatskoj komori arhitekata i inženjera u graditeljstvu, a u svezi s člankom 4. stavkom 1. Statuta Hrvatske komore arhitekata i inženjera u graditeljstvu, te ostala prava i dužnosti sukladno posebnim propisima.

3. Ovlašteni inženjer građevinarstva stječe pravo na **"inženjersku iskaznicu"** i **"pečat"**, koje izdaje Hrvatska komora arhitekata i inženjera u graditeljstvu.

4. Ovlašteni inženjer građevinarstva poslove iz točke 2. ovoga Rješenja dužan je obavljati stvarno i stalno, te sukladno temeljnim načelima i pravilima struke koje treba poštivati ovlašteni inženjer građevinarstva.

5. Ovlašteni inženjer građevinarstva dužan je plaćati Hrvatskoj komori arhitekata i inženjera u graditeljstvu članarinu i ostala davanja koja utvrde tijela Komore i Razreda.

Obrazloženje

SUDIĆ OZREN, dipl.ing.građ., podnio je Zahtjev za upis u Imenik ovlaštenih inženjera građevinarstva.

Odbor za upise razreda inženjera građevinarstva proveo je na sjednici održanoj 28.06.2005. godine postupak u povodu dostavljenog Zahtjeva, te je temeljem članka 24. stavka 2. i članka 26. stavka 2. Zakona o Hrvatskoj komori arhitekata i inženjera u graditeljstvu ("Narodne novine", br. 47/98), a u svezi s člankom 5. stavkom 4. i člankom 20. Statuta Hrvatske komore arhitekata i inženjera u graditeljstvu ("Narodne novine", br. 40/99 i 112/99), donio Odluku o upisu imenovanog u Imenik ovlaštenih inženjera građevinarstva. Predmetna Odluka dostavljena je stručnoj službi Komore na dovršetak postupka i na potpis predsjedniku Komore.

Ovlašteni inženjer građevinarstva stekao je pravo na obavljanje poslova projektiranja i/ili stručnog nadzora građenja prema članku 49. Zakona o gradnji ("Narodne novine", br. 175/03 i 100/04), u svojstvu odgovorne osobe upisom u Imenik ovlaštenih inženjera građevinarstva Hrvatske komore arhitekata i inženjera u graditeljstvu.

Ovlašteni inženjer građevinarstva može poslove projektiranja i/ili stučnog nadzora građenja obavljati samostalno u vlastitom uredu, zajedničkom uredu, projektantskom društvu, odnosno u drugoj pravnoj osobi registriranoj za tu djelatnost.

Ovlašteni inženjer građevinarstva dužan je u obavljanju poslova projektiranja i/ili stručnog nadzora građenja poštivati odredbe Zakona o gradnji i posebnih zakona, te osigurati da obavljanje poslova projektiranja i/ili stručnog nadzora bude u skladu s načelima i pravilima struke, koja treba poštivati ovlašteni inženjer građevinarstva.

Upisom u Imenik ovlaštenih inženjera građevinarstva imenovani je stekao pravo na "pečat" i "inženjersku iskaznicu" koje mu izdaje Hrvatska komora arhitekata i inženjera u graditeljstvu.

Na temelju svega prethodno navedenog, riješeno je kao u dispozitivu ovoga Rješenja.

Pouka o pravnom lijeku

Protiv ovog Rješenja žalba nije dopuštena, ali se može pokrenuti upravni spor podnošenjem tužbe Upravnom sudu Republike Hrvatske, u roku od 30 dana od primitka ovog Rješenja.

PREDSJEDNIK KOMORE

dr.sc. Petar Đukan, dipl.ing.građ.

Dostaviti:

1. OZREN SUDIĆ, 10430 SAMOBOR, ĆIRILOMETODSKA 19c
2. U Zbirku isprava Komore
3. Pismohrana Komore

1.5. Rješenje o imenovanju projektanta

Na temelju čl. 51. Zakona o gradnji (NN 153/13, 20/17) daje se ova

IZJAVA PROJEKTANTA br. 607-1/2019

o usklađenosti projekta

Projektant:	**OZREN SUDIĆ, dipl.ing.građ.** **ovlašteni inženjer građevinarstva** Projektiranje Sudić d.o.o., Samobor
Oznaka rješenja:	klasa: UP/I-360-01/05-01/3576 ur.broj: 314-02-05-1 datum upisa: 28.06.2005.
Vrsta projekta:	GRAĐEVINSKI PROJEKT KONSTRUKCIJE
građevina:	**REKONSTRUKCIJA I DOGRADNJA građevine FMDZ** Centar za prevenciju, dijagnostiku, liječenje i rehabilitaciju kardiovaskularnih bolesnika
investitor:	**FAKULTET ZA DENTALNU MEDICINU I ZDRAVSTVO OSIJEK** Crkvena ulica br. 21, 31000 Osijek OIB: 83830458507
na lokaciji:	Trg pl. Mihalovića br. 1, Orahovica k.č.br. 691, k.o. Orahovica
T.D.:	607/2019
Z.O.P.:	FDMZ – 001/06/2020

Ovaj projekt je usklađen sa slijedećim posebnim zakonima, drugim propisima i posebnim uvjetima:

1. Zakon o gradnji (NN br. 153/13, 20/17)
2. Zakon o normizaciji (NN br. 163/03)
3. Zakon o zaštiti na radu (NN br. 71/14, 118/14)
4. Tehnički propis za građevinske konstrukcije (NN 17/17)

U Samoboru, 06.2020.

Projektant:

Ozren Sudić, dipl.ing.građ.

2. TEHNIČKI DIO

2.1. Tehnički opis

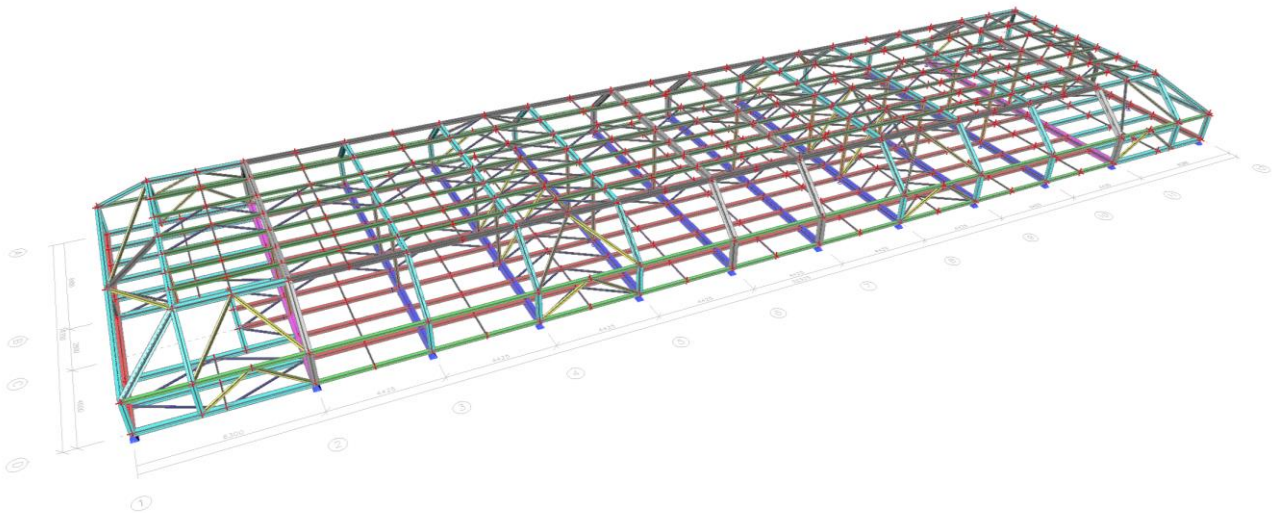
Općenito

Predmet ovog projekta je proračun osnovne nosive čelične konstrukcije krovišta građevine FDMZ. Postojeću konstrukciju potrebno je ojačati kako bi mogla preuzeti reakcije definirane ovim projektom. Na čeličnu konstrukciju oslanja se drveno krovište, čiji je utjecaj uzet u obzir prilikom definiranja djelovanja na čeličnu konstrukciju.

Opis konstrukcije

Osnovna nosiva konstrukcija sastoji se od okvira na rasteru 4,42 m (izuzev rubnih okvira, koji se postavljaju tako da uhvate četverostrešnu geometriju drvenog krovišta iznad). Okviri su međusobno povezani sekudarnim nosačima, te skupa tvore roštiljni nosivi sustav. Čelična konstrukcija sastoji se od sljedećih poprečnih presjeka:

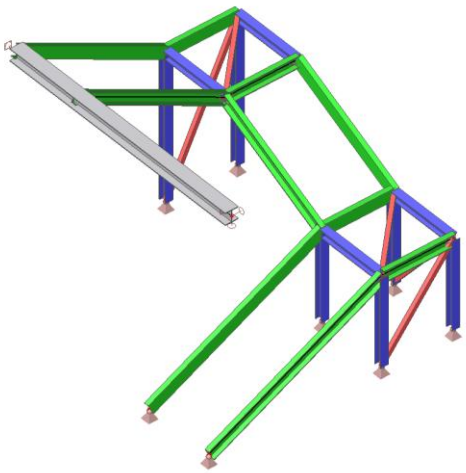
- grede POZ 100 u osima 1 i 12 od valjanih I profila HEA 220,
- grede POZ 100 u osima 2 i 11 od valjanih i profila HEA 280,
- grede POZ 100 u osima 3 – 10 od valjanih I profila HEA 260,
- okviri u osima 1, 3-5, 8-10, 12 od valjanih I profila HEA 200,
- okviri u osima 2, 6, 7, 11 od valjanih I profila HEA 240,
- sekundarni nosači POZ 100 od valjanih I profila HEA 160 (rubni HEA 140),
- sekundarni nosači POZ 200 od hladnooblikovanih cijevnih profila RRK 140/80/4 mm
- rubni sekundarni nosači POZ 200 od valjanih I profila HEA 180.



Globalni sustav stabiliziran je u uzdužnom i poprečnom smjeru vertikalnom stabilizacijom od cijevnih profila RRK 100/100/4 mm. Podne ravnine stabilizirane su u horizontalnom smjeru spregnutom pločom na trapenom limu Cofra T40/0,88 mm te uzdužnom i poprečnom stabilizacijom od RRK 60/60/4 mm cijevnog profila. U polovici raspona sekundaraca izvode se zatezaljke od RRK 50/50/3 cijevnog profila.

Detaljan prikaz nosive čelične konstrukcije dan je u poglavlju 2.3.2.

Vertikalna komunikacija između etaža odvija se trokrakim slobodnostojećim čeličnim stubištem izrađenim od UNP 180 tetiva, okvira i poluokvira od valjanih I profila HEA 120 te stabilizacije od hladnooblikovanih kvadratih cijevi RRK60/60/4. Detaljan prikaz konstrukcije stubišta dan je u poglavlju 2.3.3.



Utjecaj na postojeću konstrukciju

Obzirom da je postojeća konstrukcija izvedena kao klasična zidana konstrukcija temeljena na zidanim temeljima, potrebno ju je dodatno ojačavati. **Proračun (i eventualno ojačanje) postojeće konstrukcije te proračun drvenog krovišta nisu predmet ovog projekta.**

Djelovanja na konstrukciju

Proračun konstrukcije provodi se za sljedeća opterećenja:

- stalni teret; prema dimenzijama i vrstama materijala i zapreminskim težinama,
- uporabno opterećenje,
- djelovanje snijega,
- djelovanje vjetra,
- djelovanje potresa.

Detaljan pregled i vrijednosti opterećenja dani su u poglavlju 2.2. Analiza opterećenja.

Materijali u konstrukciji

Svi širokopojasni profili čelične nosive konstrukcija te sekundarni nosači POZ 200 (RRK 140/80/4) izrađuju se čelika S355J2 sa normativnom granicom 355 N/mm^2 sukladno normi HRN EN 10025, a ostali hladnooblikovani cijevni profili od čelika S235JR sa normativnom granicom 235 N/mm^2 sukladno normi HRN EN 10219. Vijčani montažni spojevi izvode se vijcima kvalitete 8.8 (HRN EN 15048) i 10.9 (HRN EN 14399). Spojna sredstva kao EJOT SBR-14 za lim spregnute ploče.

Izvedba konstrukcije

Čelična nosiva konstrukcija izvodi se prema izvedbenim i radioničkim nacrtima usklađenim s glavnim projektom čelične konstrukcije (izvedbenu dokumentaciju ovjerenu od strane ovlaštenog projektanta potrebno je dostaviti na pregled i ovjeru glavnom projektantu konstrukcije, prije početka izrade konstrukcije). Izvođač čelične konstrukcije treba prije radioničke izrade napraviti tehnološki plan zavarivanja, plan kontrole kvalitete zavarenih spojeva, te provoditi kontrolu zavarivanja. Također, izvođač čelične konstrukcije treba napraviti plan i redoslijed montiranja čelične konstrukcije na gradilištu, te

provoditi kontrolu montaže. Radionička izrada i montaža čelične konstrukcije treba biti u skladu s EN 1090-1; EN 1090-2. Odabrana klasa izvođenja je EXC2. U skladu s odabranom klasom izvođenja potrebno je provoditi sve radnje kod radioničke izrade i montaže čelične konstrukcije te kontrolu izrade i montaže čelične konstrukcije. Zavarivanje se izvodi prema: EN 1993-1-1; EN 1993-1-8; EN 12345:1999; EN 288-2:1992; EN 288-3:1999. Dopuštena razina greške (kvalitete vara) određuje se prema HRN EN 25817:1992 (ISO 5817:1992) za grupu B.

Za sve betonske elemente temeljna i nadtemeljnih zidova odabran je razred agresivnog djelovanja okoliša za koroziju armature od djelovanja karbonatizacije XC2 (minimalni zaštitni sloj betona: c = 40 mm), dok se nadzemni elementi izvode u razredu XC1 (minimalni zaštitni sloj betona: c = 20 mm) . Svi betonski elementi se izvode u drvenoj ili metalnoj oplati. Za ostvarivanje minimalnog zaštitnog sloja koriste se plastični distanceri pričvršćeni na oplatu. Prstenasti distanceri pričvršćeni za armaturu primjenjuju se u vertikalnim armiranobetonskim elementima. Za osiguranje razmaka između dviju zona armature koriste se distanceri od armaturnog čelika koji se pričvršćuju na armaturu. Potreban broj distancera armature je $n=4/m^2$. Distanceri zona armature se trebaju nalaziti iznad distancera oplate da se prilikom betoniranja zadrži položaj gornje zone armature.

Antikorozivna zaštita konstrukcije

Predviđena je antikorozivna zaštita premazima.

Čelična konstrukcija unutrašnjih prostora svrstana je u okolinu C3 (HRN EN ISO 12944-2), te se izvodi premazima u debljini minimalno 180μm. Završni premazi su u boji po izboru investitora. Nakon montaže potrebno je izvršiti popravke premaza montirane konstrukcije.

Projektirani vijek uporabe građevine i uvjeti za održavanje

Suglasno HRN EN 1991-1 ovisno o vrsti konstrukcije razlikuju se četiri razreda sa različitim proračunskim uporabnim vijekom prema slijedećoj tablici:

Tablica 1. Razredba proračunskoga uporabnog vijeka (prema HRN EN 1991-1)

Razred	Proračunski vijek (godine)	Primjer konstrukcije
1	1-5	Privremene konstrukcije
2	25	Zamjenjivi dijelovi konstrukcije, npr. grede pokretnih kranova, ležajevi
3	50	Konstrukcije zgrada ili druge uobičajene konstrukcije
4	100	Monumentalne građevine, mostovi i druge inženjerske konstrukcije

Suglasno ovoj normi konstrukciju građevine koja je predmet projektiranja ovim projektom treba svrstati u treći razred što znači da je zahtijevani proračunski uporabni vijek ove građevine 50 godina.

Investitor ili korisnik građevine dužan je voditi brigu o stabilnosti konstrukcije za vrijeme korištenja građevine i provoditi sljedeće:

- izraditi program održavanja čelične konstrukcije,
- voditi evidenciju o čeličnoj konstrukciji putem knjige (servisne knjige) čelične konstrukcije,
- svake godine obaviti redovni pregled,
- svakih deset godina obaviti glavni pregled,
- provoditi radove obnove ili sanacije čelične konstrukcije utvrđene pregledima, a prema zakonima i propisima.

Projektant konstrukcije:

Ozren Sudić, dipl.ing.građ.

2.2. Analiza opterećenja

Osnovni podaci o građevini

Vanjski gabariti (širina x dužina x visina)	52,5 m x 14,5 m x 5,0 m
Nagib krovne konstrukcije	40º
Nadmorska visina	180 m.n.m.

2.2.1. Stalno opterećenje

Opterećenje sukladno normi HRN EN 1991-1-1:2012/NA:2012.

*Vlastita težina definirana je automatski unutar programskog paketa Scia Engineer v19.1.

Poz 300 - krov

Utoreni crijep	g = 0,80 kN/m^2
Letve za pokrov 3 x 5 cm	g = 0,02 kN/m^2
Letve 5 x 3 cm (okomito na strehu)	g = 0,03 kN/m^2
Paronepropusna folija	
OSB ploče, d=2,5 cm	g = 0,15 kN/m^2
Rogovi b/h = 14/16 cm**	g = 0,15 kN/m^2
Termoizolacija, d=20 cm	g = 0,20 kN/m^2
Vlastita težina konstrukcije*	
Gipskartonske ploče (2 sloja)	g = 0,25 kN/m^2
Stalno opterećenje na drvenu konstrukciju	**g_{300} = 1,60 kN/m^2**

** Dimenzija rogova je pretpostavljena. Konačnu dimenziju potrebno je utvrditi statičkim proračunom, te po potrebi obavjestiti projektanta konstrukcije o povećanju stalnog opterećenja.

Poz 200 - strop kata

OSB ploče, d=2,5 cm	g = 0,15 kN/m^2
Termoizolacija, d=20 cm	g = 0,20 kN/m^2
Vlastita težina čelične konstrukcije*	
Spušteni strop (gipskartonske ploče)	g = 0,50 kN/m^2
Instalacije	g = 0,15 kN/m^2
Stalno opterećenje kata	**g_{200} = 1,00 kN/m^2**

Poz 100 - strop kata

Monolitno elastični pod	g = 0,10 kN/m^2
Cementni estrih 6 cm	g = 1,25 kN/m^2
PE folija	
EPS	g = 0,15 kN/m^2
Armiranobetonska tlačna ploča sa limom	g = 2,50 kN/m^2
Vlastita težina čelične konstrukcije*	
Spušteni strop (GK ploče)	g = 0,50 kN/m^2
Stalno opterećenje kata	**g_{100} = 4,50 kN/m^2**

Poz 100 - čelično stubište

Hodni lim stubišta i podesta	g = 0,50 kN/m^2
Vlastita težina konstrukcije*	
Stalno opterećenje konstrukcije	**$g_{stubiste}$ = 0,50 kN/m^2**

2.2.2. Uporabno opterećenje

Opterećenje sukladno normi HRN EN 1991-1-1:2012.

Uporabno opterećenje definirano je namjenom prostora i kao takvo prikazano u nastavku. Obzirom da zgrada po namjeni spada u kategoriju C, odnosno u prostore gdje se može okupljati veći broj ljudi, vrijede sljedeće vrijednosti opterećenja:

Unutarnji prostor	**q_1 = 3,00 kN/m^2**
Stubišni prostor	**q_2 = 5,00 kN/m^2**

Prema Nacionalnom dodatku, HRN EN 1991-1-1:2012/NA:2012, za kategorije namjene prostora C smije se upotrijebiti faktor smanjenja α_A prema izrazu:

$\alpha_A = 0,7 + 10/A$ → **$q_1 = 0,75 \cdot 3,00 = 2,25$ kN/m^2**

2.2.3. Djelovanje snijega

Opterećenje sukladno normi EN 1991-1-3.

U nastavku je prikazana karta karakterističnog opterećenja snijegom.

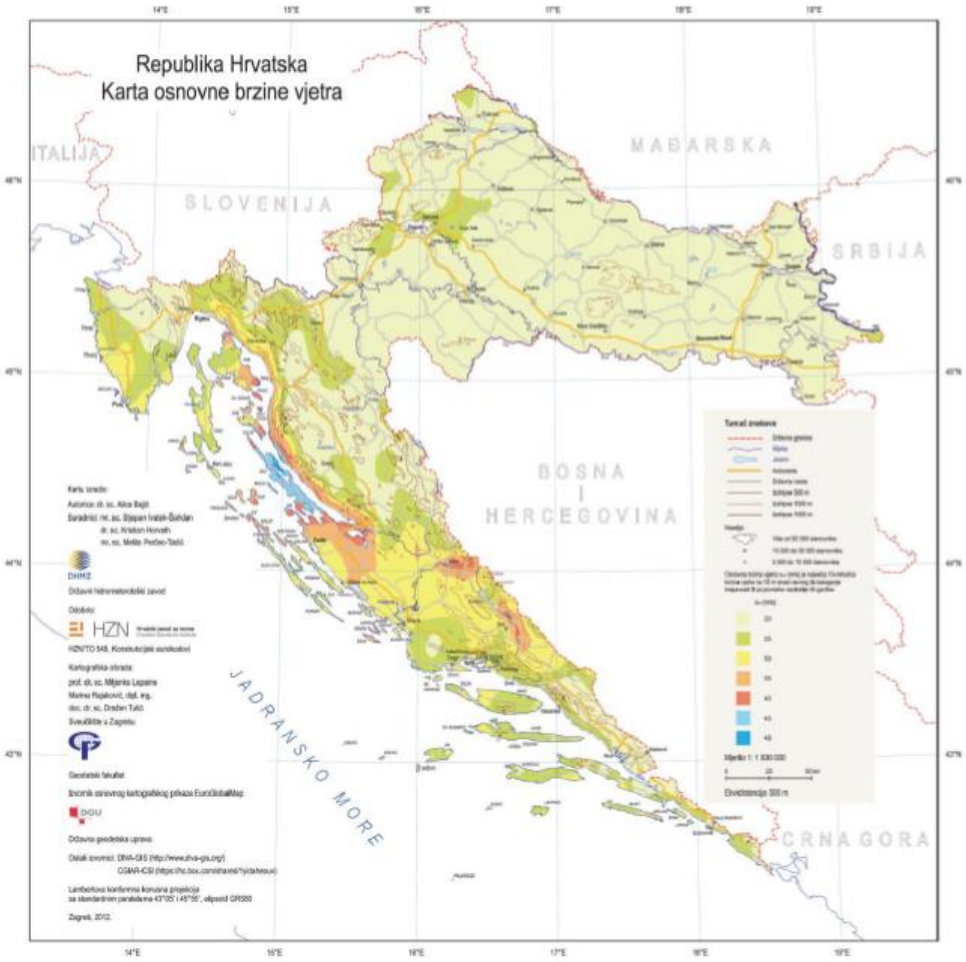
Za predmetnu lokaciju (<150 m.n.m.) vrijede sljedeće vrijednosti opterećenja:

Karakteristično opterećenje snijegom na tlu	s_k = 1,25 kN/m^2
Koeficijent umanjenja za nagib 30° < α < 60°	$u_i = 0,8 \cdot (60 - \alpha)/30 = 0,53$
Opterećenje snijegom na konstrukciju	**$s = s_k \cdot u_i$ = 0,66 kN/m^2**

2.2.4. Djelovanje vjetra

Opterećenje sukladno normi EN 1991-1-4.

U nastavku je prikazana karta karakterističnog opterećenja vjetrom.



Za navedenu lokaciju vrijede sljedeće vrijednosti opterećenja:

Srednja brzina vjetra (okomito na plohu)	$v_{b,0}$ = 20,00 m/s
Kategorija terena: II (strana parka)	Ce(z) = 2,40
Referentni pritisak srednje brzine vjetra	**q_b = 0,25 kN/m²**

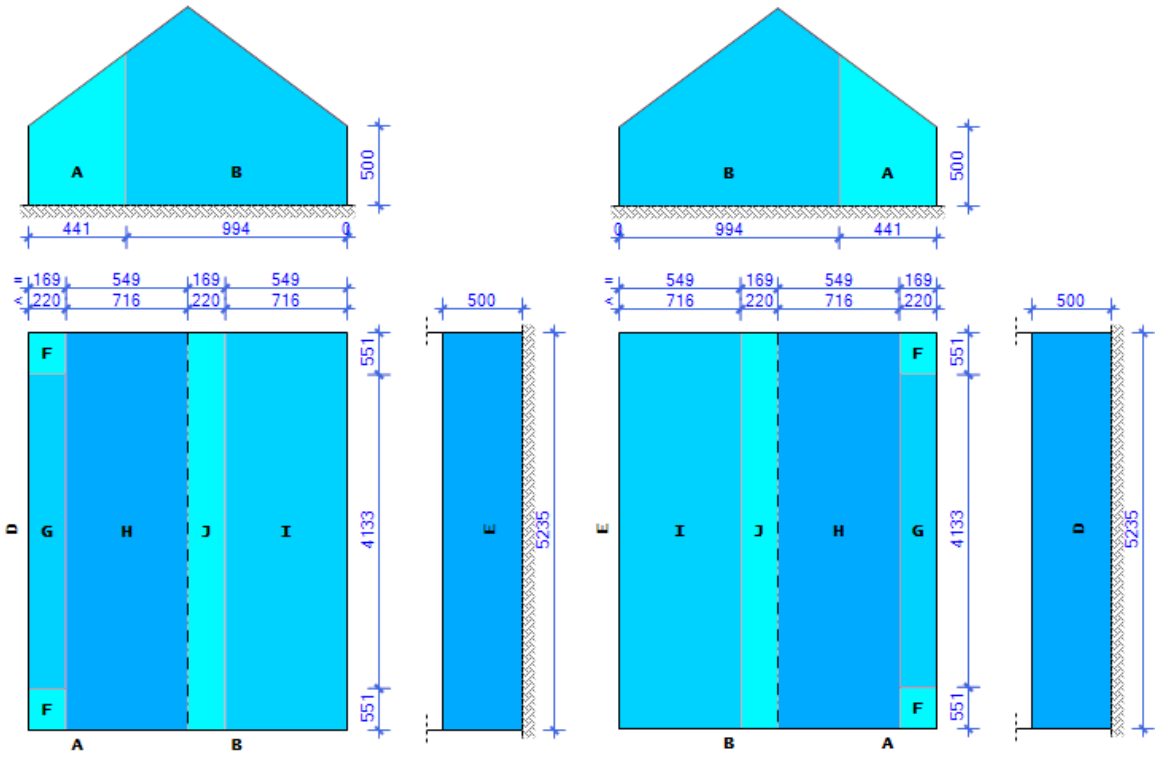
Vjetar puše s lijeve strane (slika lijevo):

$W_{LJ\ MAX}$	A	B	C	D	E	F	G	H	I	J
$C_{e(5,00)}$	-0,43	-0,24	-	0,49	-0,05	$C_{e(11,02)}$0,60	0,60	0,54	0,02	-0,04
$W_{LJ\ MIN}$										
$C_{e(5,00)}$	-0,68	-0,48	-	0,25	-0,29	$C_{e(11,02)}$0,30	0,30	0,24	-0,28	-0,34

Vjetar puše s desne strane (slika desno):

$W_{DE\ MAX}$	A	B	C	D	E	F	G	H	I	J
$C_{e(5,00)}$	-0,43	-0,24	-	0,49	-0,05	$C_{e(11,02)}$0,60	0,60	0,54	0,02	-0,04
$W_{DE\ MIN}$										
$C_{e(5,00)}$	-0,68	-0,48	-	0,25	-0,29	$C_{e(11,02)}$0,30	0,30	0,24	-0,28	-0,34

Shematski prikaz ploha vjetra; smjer vjetra lijevo i desno:



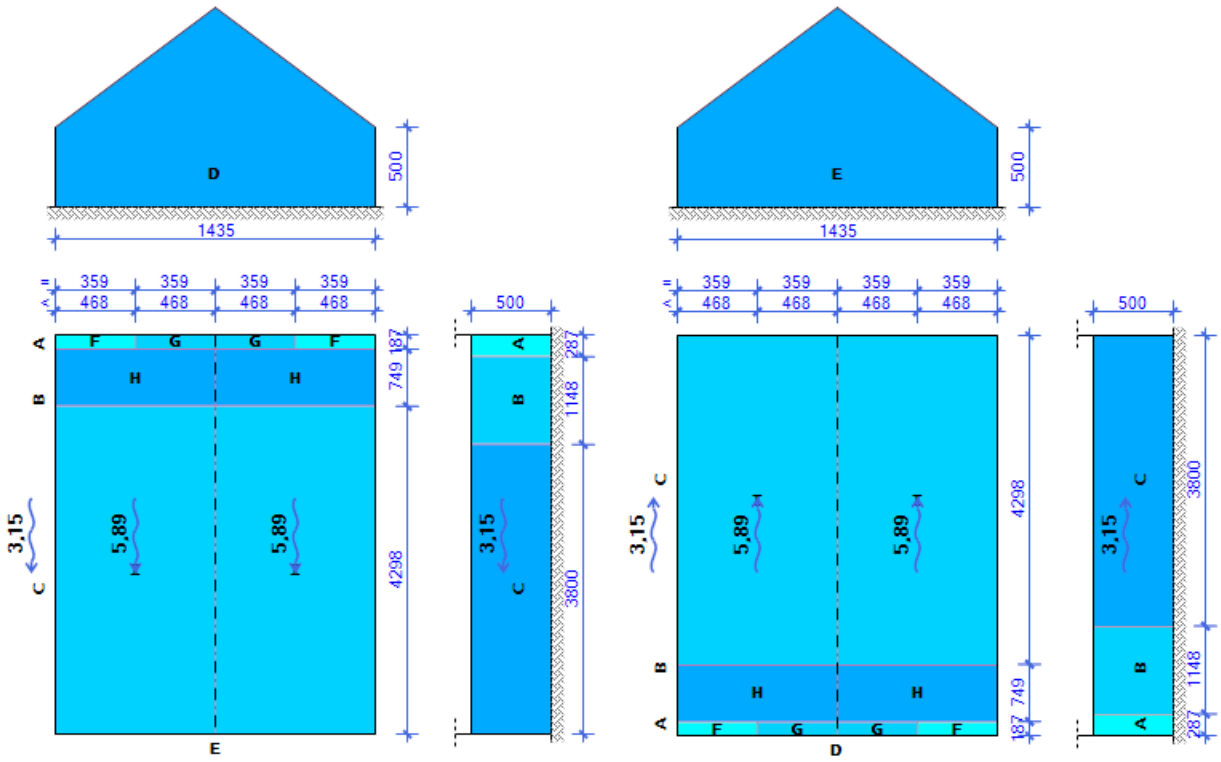
Vjetar puše sa gornje strane (slika dolje):

$W_{GO\,MAX}$	A	B	C	D	E	F_{LJ}	F_{DE}	G_{LJ}	G_{DE}	H_{LJ}	H_{DE}	I_{LJ}	I_{DE}
$C_{e(11,02)}$	-0,54	-0,30	-0,12	0,60	0,00	$C_{e(11,02)}$	-0,49	-0,49	-0,68	-0,68	-0,34	-0,34	-0,12	-0,12
$W_{GO\,MIN}$														
$C_{e(11,02)}$	-0,84	-0,60	-0,42	0,30	-0,30	$C_{e(11,02)}$	-0,79	-0,79	-0,98	-0,98	-0,64	-0,64	-0,42	-0,42

Vjetar puše sa donje strane (slika dolje):

$W_{DO\,MAX}$	A	B	C	D	E	F_{LJ}	F_{DE}	G_{LJ}	G_{DE}	H_{LJ}	H_{DE}	I_{LJ}	I_{DE}
$C_{e(11,02)}$	-0,54	-0,30	-0,12	0,60	0,00	$C_{e(11,02)}$	-0,49	-0,49	-0,68	-0,68	-0,34	-0,34	-0,12	-0,12
$W_{DO\,MIN}$														
$C_{e(11,02)}$	-0,84	-0,60	-0,42	0,30	-0,30	$C_{e(11,02)}$	-0,79	-0,79	-0,98	-0,98	-0,64	-0,64	-0,42	-0,42

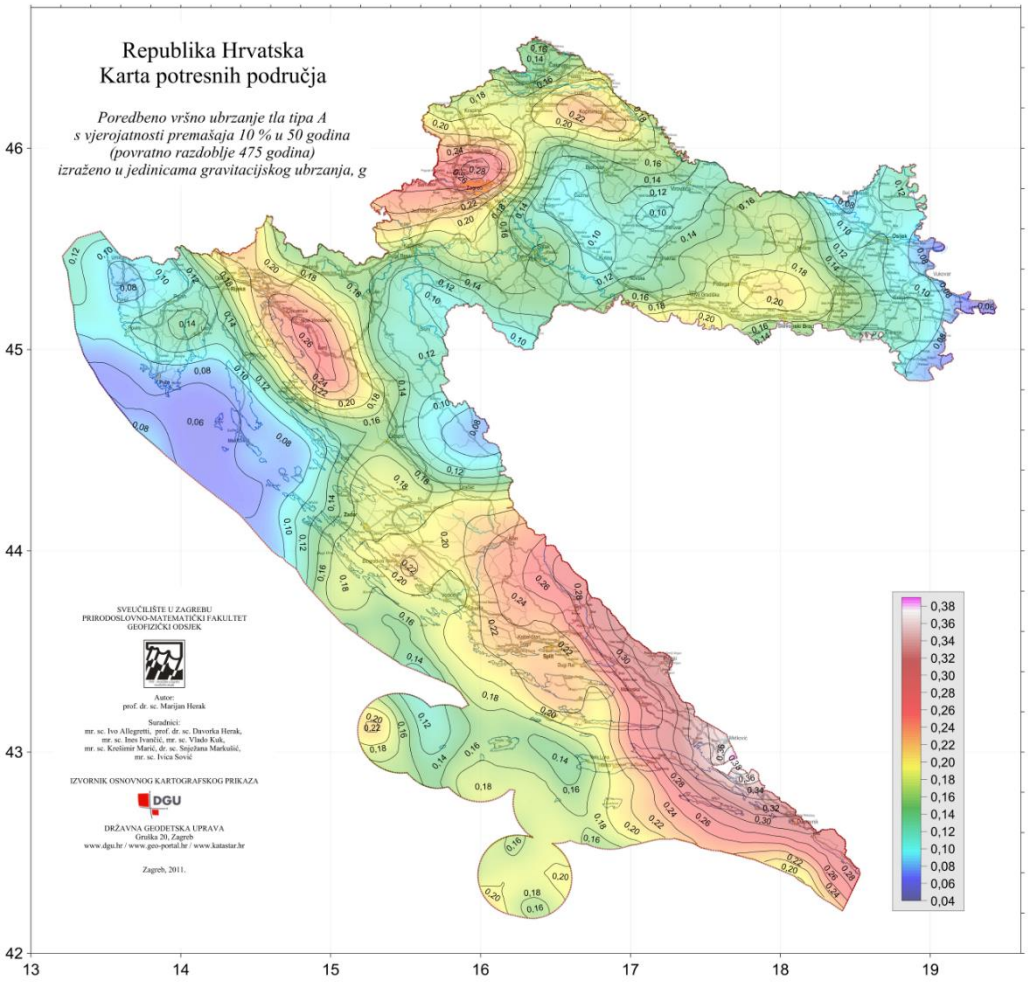
Shematski prikaz ploha vjetra; smjer vjetra gore i dolje:



Zbog jednostavnosti proračuna rubne zone F i G vjetra dobivene sukladno normi HRN EN 1991-1-4:2012/NA:2012 neće se uzimati u obzir u proračunu konstrukcije.

2.2.5. Djelovanje potresa

Opterećenje sukladno normi HRN EN 1998-1:2011. U nastavku je prikazana karta potresnih područja Republike Hrvatske.



Sukladno gore navedenom, za predmetnu lokaciju i zgradu vrijede slijedeće vrijednosti:

- računsko ubrzanje tla (T_p = 475 godina) **a_g = 0,11g**
- kategorija tla B
- kategorija značaja II
- faktor ponašanja (najnepovoljniji) q = 2,0

Obzirom na prirodnu dispoziciju konstrukcije, geometrijsku pravilnost te prirodnu duktilnost osnovne konstrukcije, potresno djelovanje nije mjerodavno za proračun nosivosti konstrukcije.

Projektant konstrukcije:

Ozren Sudić, dipl.ing.građ.

2.3. Proračun konstrukcije

2.3.1. Proračun spregnute ploče

U nastavku je dan proračun spregnute ploče konzolnog dijela objekta na trapeznom limu Cofrastra T40, t = 0.88 mm. Zbog jednostavnosti prikaza u nastavku je dan proračun maksimalnog raspona **bez podupiranja**.

FULL OUTPUT

Note: Section designed according to EN1994-1

Construction stage

$\Gamma\delta$	=	0.75	<= 1.00	Deflection
$\Gamma_{M,+}$	=	0.55	<= 1.00	Sagging bending moment
$\Gamma_{R,Ex}$	=	0.17	<= 1.00	Reaction at end support
$\Gamma_{M,-}$	=	-1	<= 1.00	Hogging bending moment
$\Gamma_{R,C}$	=	-1	<= 1.00	Reaction at internal support
Γ_{RM}	=	-1	<= 1.00	Combined bending moment and support reaction

Composite slab

Γ_{M+}	=	0.12	<= 1.00	Sagging bending moment
Γ_{M-}	=	0.54	<= 1.00	Hogging bending moment
$\Gamma_{M-(L/3)}$	=	0.08	<= 1.00	Hogging bending moment at L/3 from internal support
Γ_{LR1}	=	0.19	<= 1.00	Longitudinal shear by partial connexion method
Γ_{VR1}	=	0.4	<= 1.00	Vertical shear - End support
Γ_{VR2}	=	0.45	<= 1.00	Vertical shear - internal support
Γ_{FL}	=	0.1	<= 1.00	Deflection control
Γ_{Vi}	=	0.13	<= 1.00	Vibration control
Γ_{VP}	=	-1	<= 1.00	Punching
Γ_{Fs}	=	-1	<= 1.00	Cracking control

Fire resistance

Γ_{IST}	=	0.9	<= 1.00	Thermal insulation
Γ_{RF}	=	0.03	<= 1.00	Load bearing criterion
$\Gamma_{RF(L/3)}$	=	0.08	<= 1.00	Load bearing criterion at L/3 from internal support
$\Gamma_{RF_recommended}$	=	0.12	<= 1.00	Free span moment - recommended checking

Note: Check imperatively whether the assumptions comply with project specifications and project plan.

1. Project Data

a. Profile Data: cofrastra40 / 0.88mm / noperce

Characteristics	Values	Unit
Thickness of profiled steel sheeting	0.88	mm
Self-weight of profiled steel sheeting	11.69	kg/m²
Height of profile	40	mm
Effective width of profile	750	mm
Cross-sectional area of profile	1099	mm²/m
Second moment of area of the profile	22.23	cm4/m
Position of neutral axis of profile	10.61	mm
Reduction of concrete	10	mm
Sagging resistance moment of profile	4.44	kNm/m
End support reaction resistance of profile	31.26	kN/m
Internal support widths	60, 160	kN/m
Maximum hogging resistance moment of profile	3.96, 4.82	kNm/m
Maximum internal reaction resistance of profile	23.79, 34.1	kN/m
Empirical factor for design shear resistance (m)	149	N/mm²
Empirical factor for design shear resistance (k)	N/A	
Longitudinal shear strength of a composite slab $\tau_{u,Rk}$	0.29	N/mm²

b. Composite slab

Spans:

Span →	1	2	3	4	5
Span (m)	1.85	1.85	1.85	1.85	0

Static system:	hyperstatique	
Overall slab depth:	100	(mm)
Screed:	0	(mm)

c. Construction stage

Number of spans / steel sheet:

Steel sheet	1	2	3	4	5
Number spans	1	1	1	1	0

Number of props/span:

Span →	1	2	3	4	5
Number props	0	0	0	0	0

Note: for N>0, prop must be placed at 1/(N+1) of span

Prop width:		(mm)
End support width:	50	(mm)
Internal support width:	100	(mm)

d. Reinforcement data

Yield strength:	500	
Ductility class:	B	
Exposure class:	XC1	
Structural class:	S4	
Minimum cover:	25	(mm)

Overall mesh:	2.83 cm²	Cover:	25	(mm)
Reinforcement on support:		Cover:		(mm)
Repartition mesh:		Cover:	10	(mm)
Reinforcement in the rib:		Cover:		(mm)

Note: overall mesh shall be continuous on support

e. Concrete data: normal / NC25/30

Concrete wet self weight	25	kN/m³
Concrete dry self weight	24	kN/m³
F_{ck}	25	N/mm²
F_{ctm}	2.6	N/mm²
E_{cm}	31000	N/mm²

f. Project requirements

Shear bond method		partielle
Deflection limit during construction	L /	180
Deflection limit in service	L /	300
Crack control	W_{max}	
Coefficient of moment redistribution		0
Coefficient mass related to live load (frequency)		0.5
Minimum frequency		3
Fire resistance period	REI	60
Fire factor	$\Psi_{1,1} =$	0.5

g. Loads acting on slab

- Uniformly distributed load

Span →	1	2	3	4	5
Permanent loads g_{per} (kN/m²)	2	2	2	2	
Live load q (kN/m²)	4	4	4	4	

- Line loads perpendicular to deck span

Note: Any line load is considered

- Punctual loads

Note: Any concentrated load is considered

- Mobile axle load

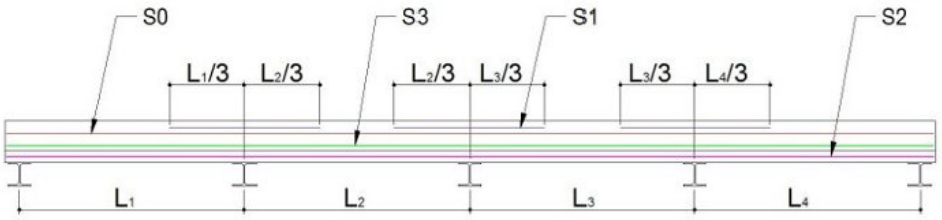
Note: Any mobile load is considered

h. Partial safety factor

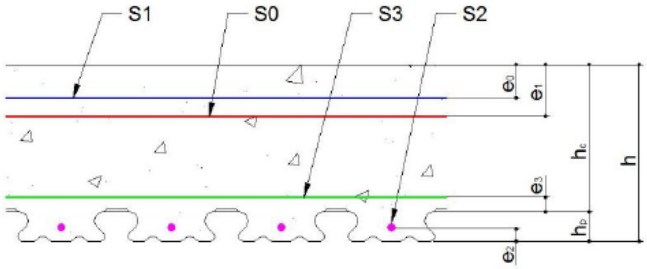
Material			Actions		
Steel sheet	γ_M	1.1	Perm. load	γ_0	1.2
Rebars	γ_{sb}	1.2	Live load	γ_q	1.5
Concrete	γ_c	1.45			
Shearing	γ_{vs}	1.25			

2. Longitudinal section and cross-section

Longitudinal section



Cross section



Profile: **cofrastra40 / 0.88mm / noperce**

L1 (m)	L2 (m)	L3 (m)	L4 (m)	L5 (m)
1.85	1.85	1.85	1.85	0

Anti-cracking mesh	S_0	2.83 cm²
Reinforcement on support	S_1	
Reinforcement in the rib	S_2	
Repartition mesh	S_3	

Slab depth	h_t	100	mm
Profile height	h_p	40	mm
Cover anti-cracking mesh	e_0	25	mm
Cover reinforcement on support	e_1		mm
Cover reinforcement in the rib	e_2		mm
Cover repartition mesh	e_3	10	mm

3. Details EN

IMPLEMENTATION OF THE COMPOSITE DECK: Supports, props, fasteners, openings, etc. ... shall comply with the rules of Art, the guidance in "Prescription of technical requirements - CPT" and in various documents of ArcelorMittal Construction

CONCRETE: The implementation of concrete by pump is recommended. Otherwise, the concrete must be poured on the bearing elements without excessive accumulation, and immediately leveled to the depth planned.

Consumption of concrete	90	Litres/m²
Total weight of the slab	236.69	Kg/m²
Overall mesh	0	Kg/m²
Reinforcement on support	0	Kg/m²
Repartition mesh	0	Kg/m²
Reinforcement in the rib	0	Kg/m²

Note: The quantity above are given for information, more accurate values can be calculated taking into account real conditions of the implementation on site.

4. Construction stage

a. Loadings

	Unfactored (Kn/m²)
Self weight of decking	0.12
Self weight of concrete slab	2.25
Construction load (working area 3mx3m)	1.5
Construction load (outside working area)	0.75

b. Deflection checking

- Maximum deflection under self weight of decking and wet concrete slab:

Steel sheet	1	2	3	4	5
f_0 (mm) (without PEF)	7.73	7.73	7.73	7.73	
Additional weight (kN/m²)	0	0	0	0	
Selfweight of slab (kN/m²)	2.37	2.37	2.37	2.37	
f_{alw} (mm) (allowed)	10.28	10.28	10.28	10.28	
f_{max} (mm) (with PEF, if any)	7.73	7.73	7.73	7.73	
$f_{max\,/\,falw}$	0.75	0.75	0.75	0.75	

Unity factor: $\frac{f_{max}}{f_{allowed}} =$ 0.75 <= 1.00 Pass

c. Sagging bending resistance check

Steel sheet	1	2	3	4	5
Max applied moment: M_{Edp}	2.46	2.46	2.46	2.46	
Moment resistance: M_{Rdp}	4.44	4.44	4.44	4.44	
M_{Edp} / M_{Rdp}	0.55	0.55	0.55	0.55	

Unity factor: $\frac{M_{Edp}}{M_{Rdp}} =$ 0.55 <= 1.00 Pass

d. End support reaction

Steel sheet	1	2	3	4	5
Max applied reaction: $R_{Ed, En}$	5.31	5.31	5.31	5.31	
Web crippling resistance: $R_{Rd, En}$	31.26	31.26	31.26	31.26	
$R_{Ed, En} / E_{Rd, En}$	0.17	0.17	0.17	0.17	

Unity factor: $\frac{R_{Ed,En}}{R_{Rd,En}} =$ 0.17 <= 1.00 Pass

e. Hogging bending resistance check

Steel sheet	1	2	3	4	5
Max applied reaction: $R_{Ed, En}$	-0	-0	-0	-0	
Moment resistance: M_{Rdn}	-0	-0	-0	-0	
$R_{Ed, En} / E_{Rd, En}$	-1	-1	-1	-1	

Unity factor: $\frac{M_{Edn}}{M_{Rdn}} =$ -1 <= 1.00 Pass

f. Internal support reaction

Steel sheet	1	2	3	4	5
Max applied reaction: $R_{Ed, In}$	-0.01	-0.01	-0.01	-0.01	
Web crippling resistance: $R_{Rd, In}$	-0.01	-0.01	-0.01	-0.01	
$R_{Ed, In} / R_{Rd, In}$	-1	-1	-1	-1	

Unity factor: $\frac{R_{Ed,In}}{R_{Rd,In}} =$ -1 <= 1.00 Pass

g. Interaction bending moment - reaction

Steel sheet	1	2	3	4	5
Max applied reaction: $R_{Ed, In}$	-0.01	-0.01	-0.01	-0.01	
Web crippling resistance: R_0	-0.01	-0.01	-0.01	-0.01	
Max applied moment: M_{Edn}	-0	-0	-0	-0	
Moment resistance: M_0	0	0	0	0	
$M_{Edn} / M_0 + R_{Ed, In} / R_0$	-1	-1	-1	-1	

Unity factor: $\frac{M_{Edn}}{M_0} + \frac{R_{Ed,In}}{R_0} =$ -1 <= 1.00 Pass

5. Normal stage

a. Loadings

- Uniformly distributed loads

	Unfactored (kN/m²)				
Span →	1	2	3	4	5
Self weight of composite slab	2.28	2.28	2.28	2.28	
Additional permanent loads (kN/m²)	2	2	2	2	
Live loads (kN/m²)	4	4	4	4	

b. Sagging bending moment

- Surface and constant line load

Span →	1	2	3	4	5
Applied moment (kNm/m)	3.56	2.37	2.37	3.56	
Moment resistance (kNm/m)	29.16	29.16	29.16	29.16	

Unity factor: $\frac{M_{Edp}}{M_{Rdp}} =$ 0.12 <= 1.00 Pass

c. Hogging bending moment

- Surface and constant line load

Support →	1	2	3	4
Applied moment (kNm/m)	4.59	4.59	4.59	
Moment resistance (kNm/m)				

Unity factor: $\frac{M_{Edn}}{M_{Rdn}} =$ <= 1.00 null

d. Hogging bending moment at L/3 from internal

- Surface and constant line load

Support →	1	2	3	4
Applied moment (kNm/m)	-0.05	0.67	0.67	-0.05
Moment resistance (kNm/m)	8.57	8.57	8.57	8.57

Unity factor: $\frac{M_{Edn}}{M_{Rdn}} =$ 0.08 <= 1.00 Pass

e. Longitudinal shear

Partial connexion method:

- Surface and constant line load

Span →	1	2	3	4	5
Applied moment (kNm/m)	2.98	2.26	2.26	2.98	
Partial resistance moment	15.69	20.79	20.79	15.69	
Position (m)	0.46	0.74	0.74	0.46	
Max unity factor M_{Ed} / M_{Rd}	0.19	0.11	0.11	0.19	

Unity factor: $\frac{M_{Ed}}{M_{Rd}} =$ 0.19 <= 1.00 Pass

f. Vertical shear

- Surface and constant line load

Max applied vertical shear

End support : $V_{Ed,\,En}$	9.15	kN/m
Internal support : $V_{Ed,\,In}$	13.37	kN/m

Vertical shear resistance:

End support : $V_{Rd,\,En}$	22.77	kN/m
Internal support : $V_{Rd,\,In}$	29.7	kN/m

Unity factor: $\frac{V_{Ed,En}}{V_{Rd,En}} =$ 0.4 <= 1.00 Pass

Unity factor: $\frac{V_{Ed,In}}{V_{Rd,In}} =$ 0.45 <= 1.00 Pass

h. Deflection checking

- Inertia´s moment of the cross-section:

Homogeneous section:	737.13	cm4/m
Cracked section:	456.41	cm4/m
Mean value:	596.77	cm4/m

- Surface and constant line load

Span →	1	2	3	4	5
Deflection under total loads (mm)	0.61	0.35	0.35	0.61	
Allowable deflection (mm)	6.17	6.17	6.17	6.17	

Unity factor: $\frac{f_{max}}{f_{allowed}} =$ 0.1 <= 1.00 Pass

j. Vibration control

Coefficient mass related to live load	0.5	
Minimum required frequency: f_{min}	3	Hz
Estimated first frequency of the floor	22.58	Hz

Unity factor: $\frac{f_{min}}{f_0} =$ 0.13 <= 1.00 Pass

6. Fire resistance

Required fire resistance: **60**

a. Loadings

- Uniformly distributed loads:

Factor $\Psi_{1,1} =$ 0.5

Span →	1	2	3	4	5
Self weight of composite slab	2.28	2.28	2.28	2.28	
Supplementary permanent loads	2	2	2	2	
Live load	4	4	4	4	

b. Thermal insulation checking

Min required slab depth: 90 mm

Unity factor: $\frac{h_{min}}{h_t + h_{screed}} =$ 0.9 <= 1.00 Pass

c. Integrity criterion

For composite slabs the integrity criterion "E" is assumed to be satisfied (according to EN 1994-1-2).

d. Fire resistance checking

Moment resistance - 7.54 kNm/m

Span →	1	2	3	4	5
Span moment (kNm/m)	0.24	-4.85	-4.85	0.24	
Span moment resistance	7.95	7.95	7.95	7.95	

Unity factor: $\frac{M_{Ed,fi}}{M_{Rd,fi}} =$ 0.03 <= 1.00 Pass

Recommended complementary checking: 0.35 free span moment

Span →	1	2	3	4	5
0.35 free span moment	0.94	0.94	0.94	0.94	

Unity factor: $\frac{0.35M_{Ed,fi}}{M_{Rdp,fi}} =$ 0.12 <= 1.00 Pass

Hogging moment at L/3 from internal support

Moment resistance - hogging at L/3 from support: 7.54 kNm/m

Span →	1	2	3	4	5
Hogging moment at L/3 from	-2.64	-5.15	-5.15	-2.64	

Unity factor: $\frac{M_{Ed,fi}}{M_{Rd,fi}} =$ 0.08 <= 1.00 Pass

2.3.2. Proračun čelične konstrukcije

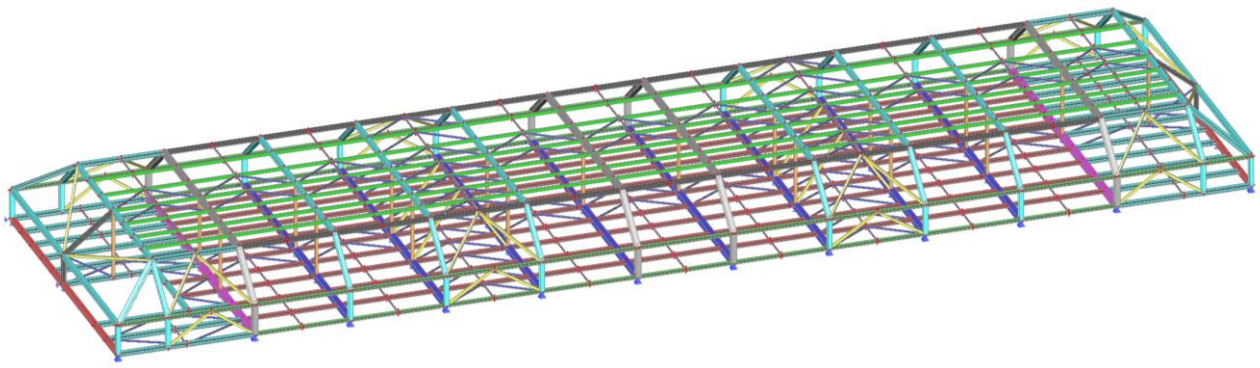
Materijali u konstrukciji

Svi širokopojasni profili čelične nosive konstrukcija te sekundarni nosači POZ 200 (RRK 140/80/4) izrađuju se čelika S355J2 sa normativnom granicom 355 N/mm^2 sukladno normi HRN EN 10025 (sekudarci prema normi HRN EN 10219), a ostali hladnooblikovani cijevni profili od čelika S235JR sa normativno granicom 235 N/mm^2 sukladno normi HRN EN 10219. Vijčani montažni spojevi izvode se vijcima kvalitete 8.8 (HRN EN 15048) i 10.9 (HRN EN 14399).

Name	ρ [kg/m^3]	E_{mod} [MPa]	μ	Lower limit [mm]	Upper limit [mm]	F_y [MPa]	F_u [MPa]
		G_{mod} [MPa]	α [m/mK]				
S 235	7850,0	2,1000e+05	0.3	0	40	235,0	360,0
		8,0769e+04	0,00	40	80	215,0	360,0
S 355	7850,0	2,1000e+05	0.3	0	40	355,0	490,0
		8,0769e+04	0,00	40	80	335,0	470,0

Poprečni presjeci u konstrukciji

Name	Type	Item material	Fabrication	A [m^2]	A_y [m^2]	I_y [m^4]	$W_{el.y}$ [m^3]	$W_{pl.y}$ [m^3]	Colour
	Detailed				A_z [m^2]	I_z [m^4]	$W_{el.z}$ [m^3]	$W_{pl.z}$ [m^3]	
CS1	RRK60/60/4	S 235	cold formed	8,5500e-04	4,6442e-04	4,3600e-07	1,4500e-05	1,7600e-05	
					4,6442e-04	4,3600e-07	1,4500e-05	1,7600e-05	
CS2	HEA280	S 355	rolled	9,7300e-03	6,9388e-03	1,3700e-04	1,0100e-03	1,1125e-03	
					2,2952e-03	4,7600e-05	3,4000e-04	5,1667e-04	
CS3	HEA200	S 355	rolled	5,3800e-03	3,8609e-03	3,6900e-05	3,8900e-04	4,2917e-04	
					1,3156e-03	1,3400e-05	1,3400e-04	2,0375e-04	
CS4	HEA160	S 355	rolled	3,8800e-03	2,8173e-03	1,6700e-05	2,2000e-04	2,4500e-04	
					9,7756e-04	6,1600e-06	7,7000e-05	1,1750e-04	
CS5	RRK50/50/3	S 235	cold formed	5,4100e-04	2,9087e-04	1,9500e-07	7,7900e-06	9,3900e-06	
					2,9087e-04	1,9500e-07	7,7900e-06	9,3900e-06	
CS6	HEA260	S 355	rolled	8,6800e-03	6,3187e-03	1,0500e-04	8,3600e-04	9,2083e-04	
					2,0148e-03	3,6700e-05	2,8200e-04	4,2917e-04	
CS7	RRK100/100/4	S 235	cold formed	1,4950e-03	7,8127e-04	2,2600e-06	4,5300e-05	5,3300e-05	
					7,8127e-04	2,2600e-06	4,5300e-05	5,3300e-05	
CS8	HEA140	S 355	rolled	3,1400e-03	2,3063e-03	1,0300e-05	1,5500e-04	1,7333e-04	
					7,7401e-04	3,8900e-06	5,5600e-05	8,5000e-05	
CS9	RRK120/120/4	S 235	cold formed	1,8150e-03	9,3922e-04	4,0200e-06	6,7000e-05	7,8300e-05	
					9,3922e-04	4,0200e-06	6,7000e-05	7,8300e-05	
CS10	RRK140/80/4	S 355	cold formed	1,6550e-03	6,3631e-04	4,3000e-06	6,1400e-05	7,5500e-05	
					1,0710e-03	1,8000e-06	4,5100e-05	5,1300e-05	
CS11	HEA240	S 355	rolled	7,6800e-03	5,6329e-03	7,7600e-05	6,7500e-04	7,4583e-04	
					1,8411e-03	2,7700e-05	2,3100e-04	3,5167e-04	
CS12	HEA220	S 355	rolled	6,4300e-03	4,6326e-03	5,4100e-05	5,1500e-04	5,6667e-04	
					1,5689e-03	1,9600e-05	1,7800e-04	2,7042e-04	
CS13	HEA180	S 355	rolled	4,5300e-03	3,2772e-03	2,5100e-05	2,9400e-04	3,2500e-04	
					1,0992e-03	9,2500e-06	1,0300e-04	1,5667e-04	



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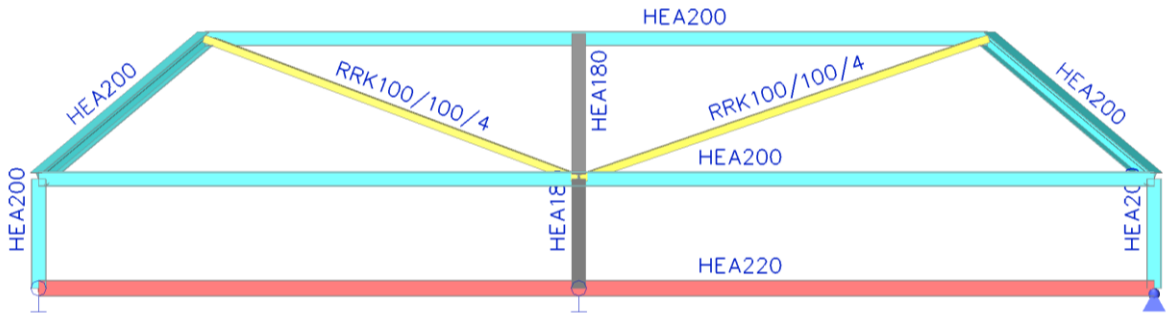

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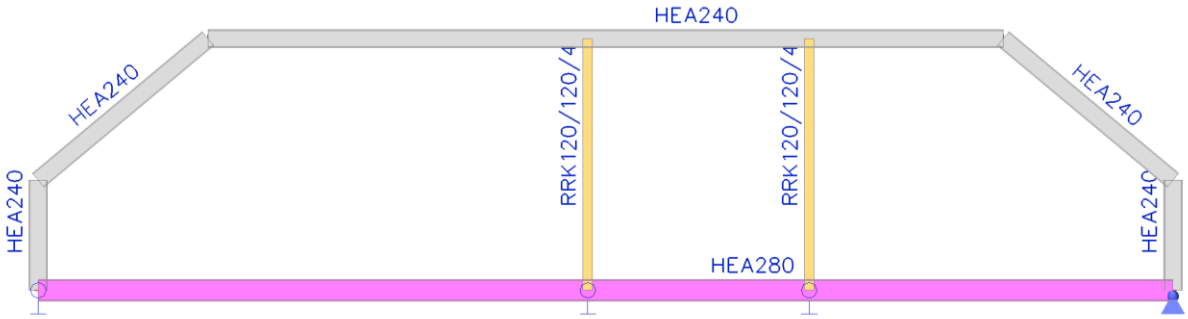

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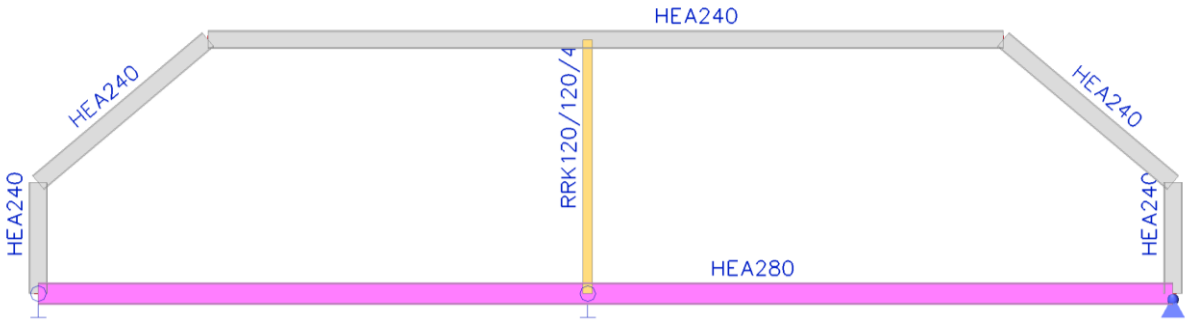

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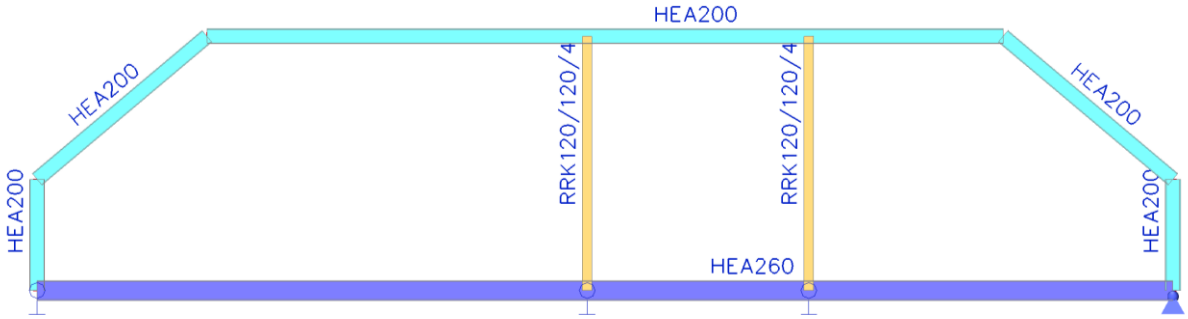

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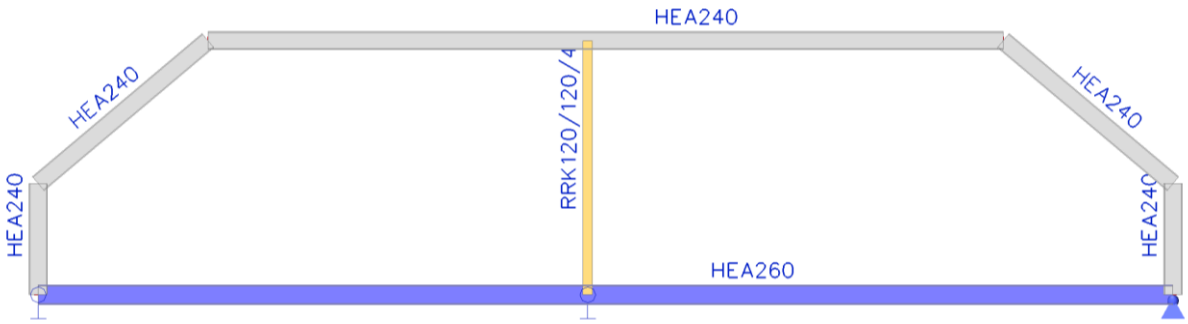
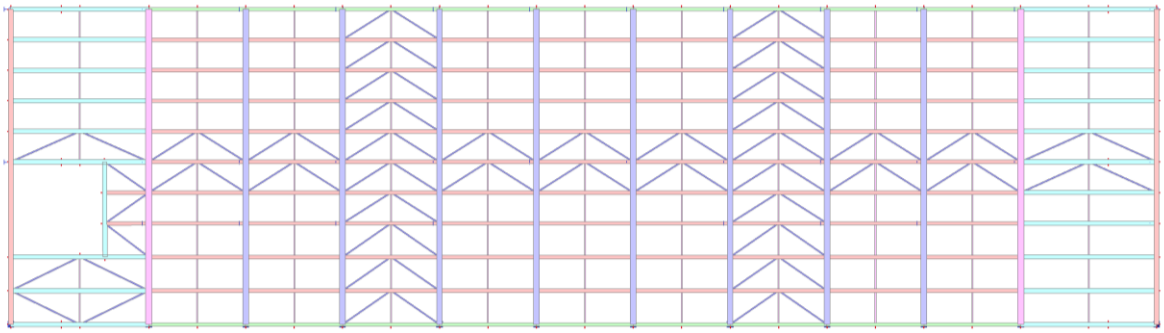


Tlocrt POZ 100



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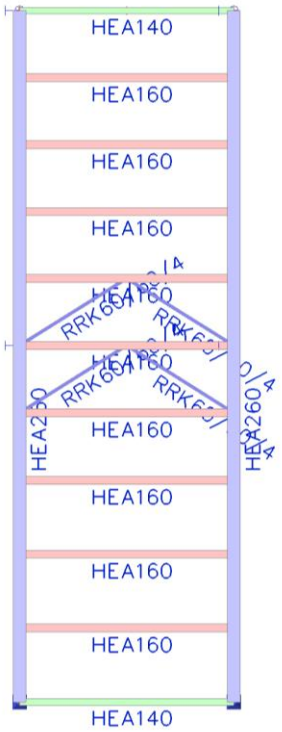

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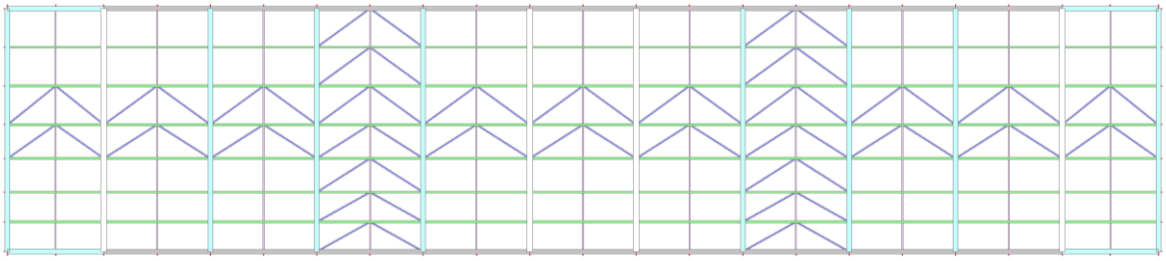

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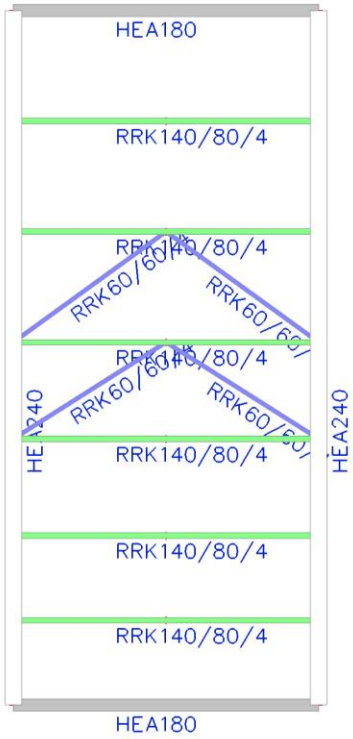
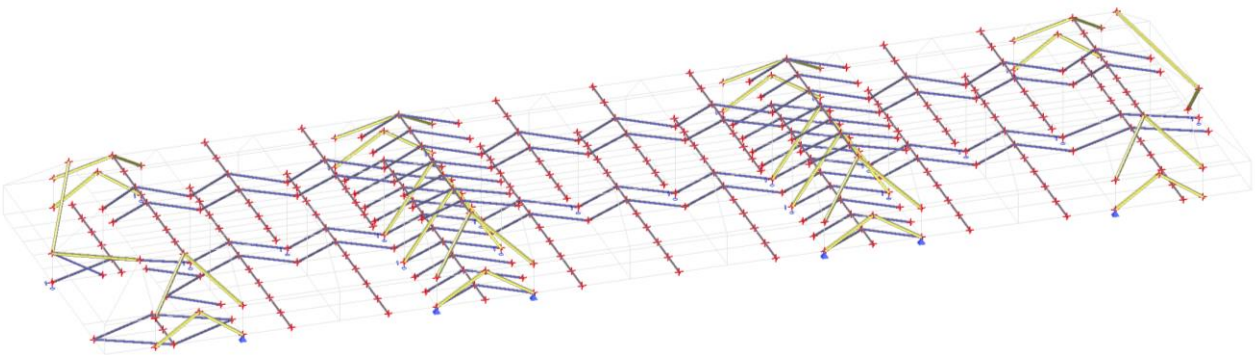


Stabilizacija čelične konstrukcije

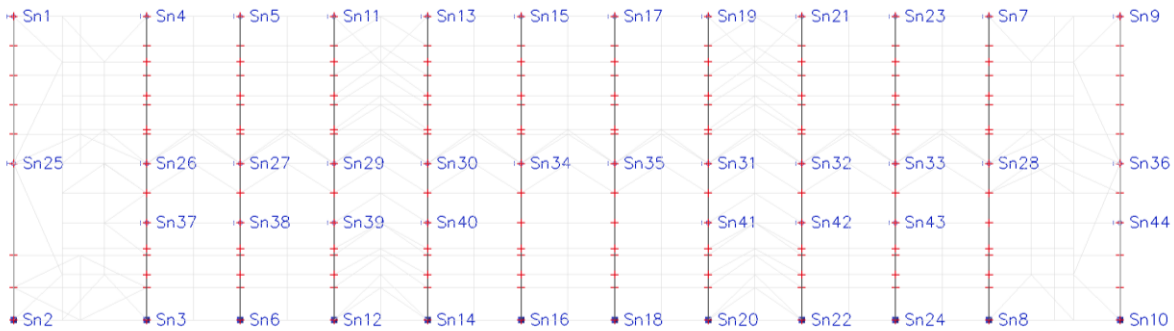
Horizontalna stabilizacija izvodi se od hladnooblikovanih kvadratnih cijevi RHS 60/60/4 te zatezaljki RHS 50/50/3. Vertikalna stabilizacija izvodi se od hladnooblikovanih kvadratnih cijevi RHS 100/100/4.



Oslonci konstrukcije

Oslonci konstrukcije projektirani su kao zglobni (ne prenose savijanje).

Name	Node	System	Type	X	Y	Z	Rx	Ry	Rz
Sn1	N1	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn2	N3	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn3	N8	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn4	N6	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn5	N14	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn6	N16	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn7	N21	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn8	N23	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn9	N27	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn10	N29	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn11	N33	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn12	N35	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn13	N40	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn14	N42	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn15	N47	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn16	N49	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn17	N54	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn18	N56	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn19	N61	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn20	N63	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn21	N68	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn22	N70	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn23	N75	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn24	N77	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn25	N5	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn26	N94	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn27	N96	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn28	N98	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn29	N100	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn30	N102	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn31	N104	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn32	N106	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn33	N108	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn34	N120	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn35	N122	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn36	N31	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn37	N110	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn38	N112	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn39	N116	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn40	N118	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn41	N124	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn42	N126	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn43	N128	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free
Sn44	N114	GCS	Standard	Free	Rigid	Rigid	Free	Free	Free

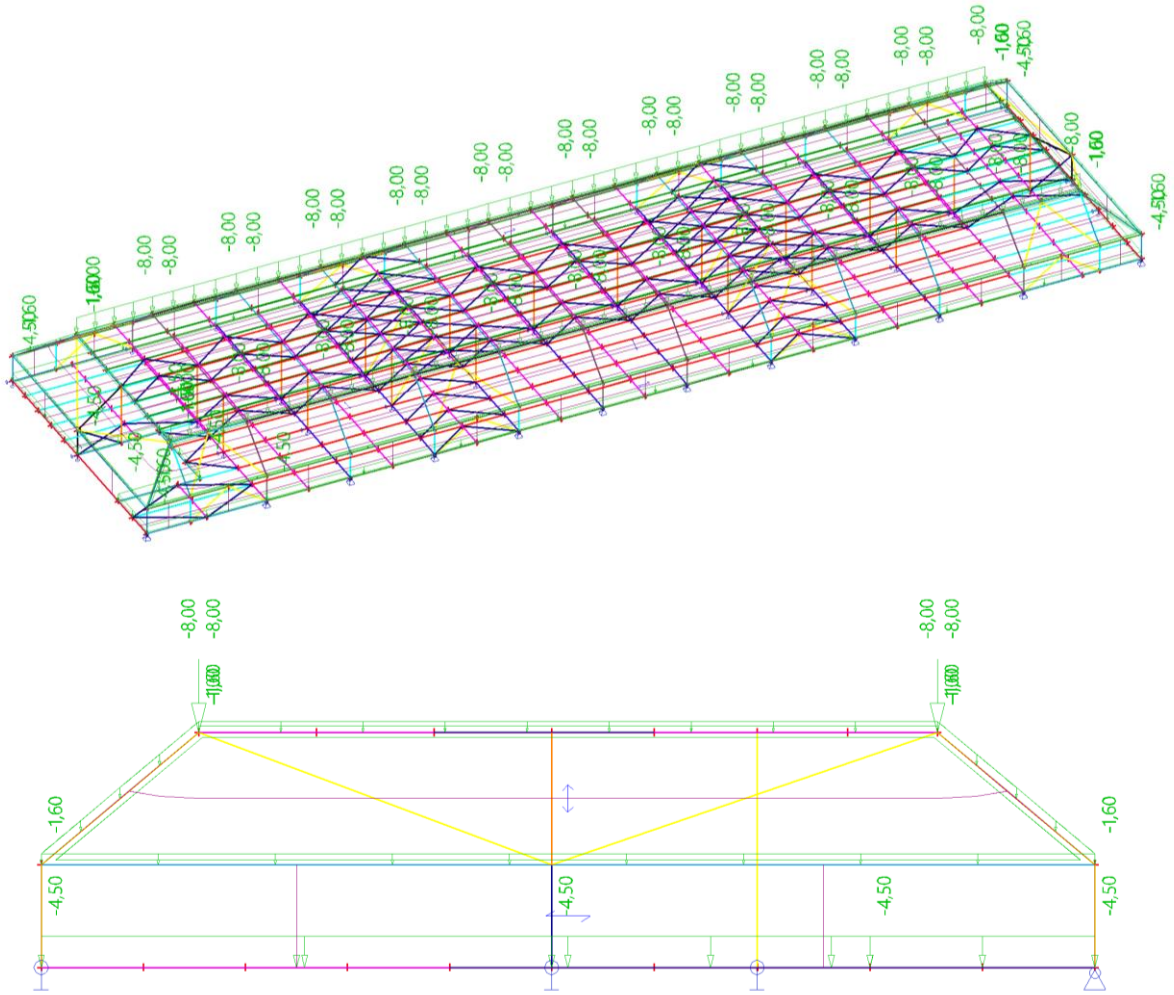


Djelovanja na konstrukciju

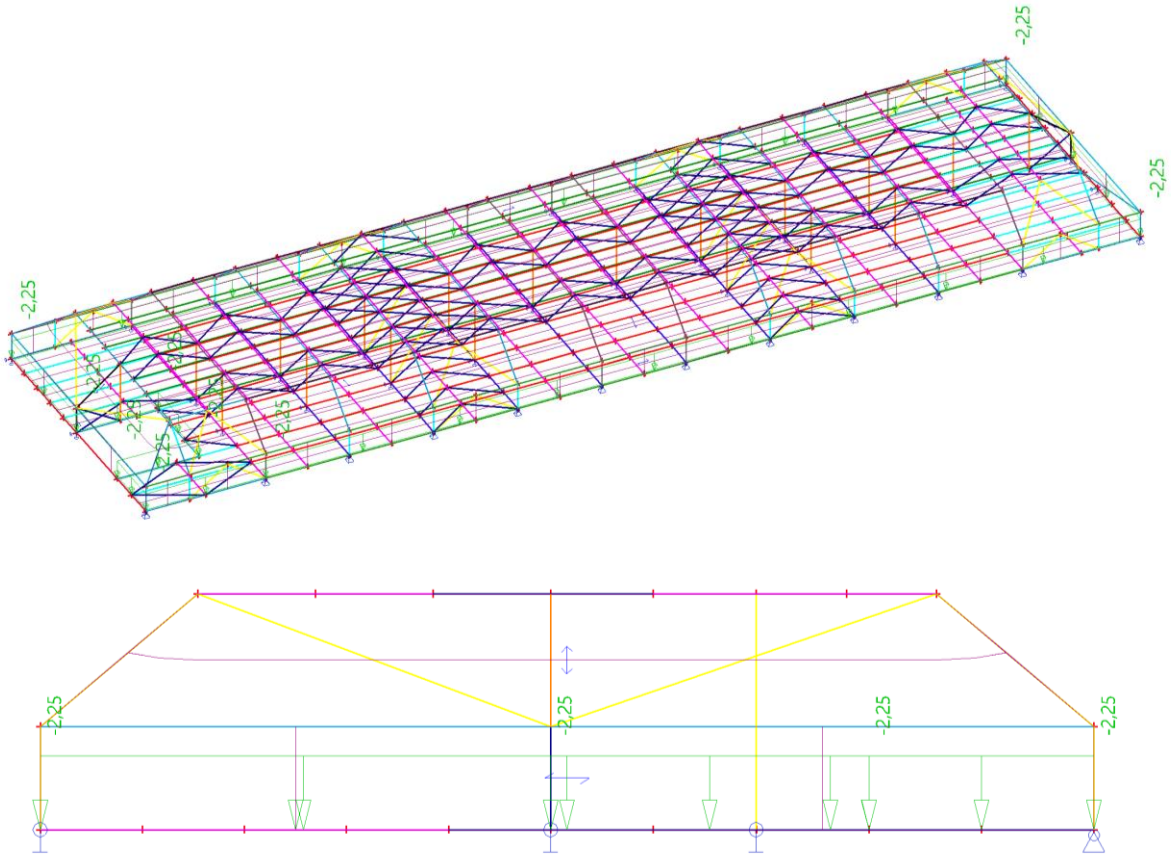
Name	Description	Load group	Load type	Action type	Spec	Direction	Duration
LC1	Vlastita tezina	LG1	Self weight	Permanent		-Z	
LC2	Stalno	LG1	Standard	Permanent			
LC3	Uporabno	LG2	Static	Variable	Standard		Short
LC4	Snijeg [n]	LG3	Static	Variable	Standard		Short
LC5	Snijeg [s]	LG3	Static	Variable	Standard		Short
LC6	Vjetar pritisak X	LG4	Static	Variable	Static wind		
LC7	Vjetar odizanje X	LG4	Static	Variable	Static wind		
LC8	Vjetar pritisak Y	LG4	Static	Variable	Static wind		
LC9	Vjetar odizanje Y	LG4	Static	Variable	Static wind		

Shematski prikaz djelovanja na konstrukciju:

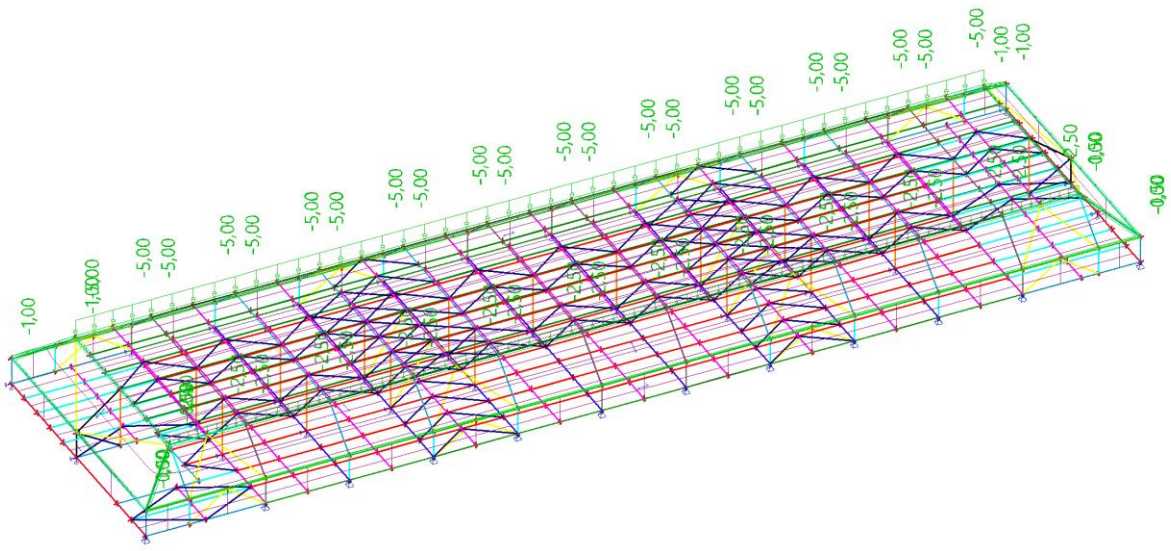
Name	Description	Load group	Load type	Action type
LC2	Stalno	LG1	Standard	Permanent

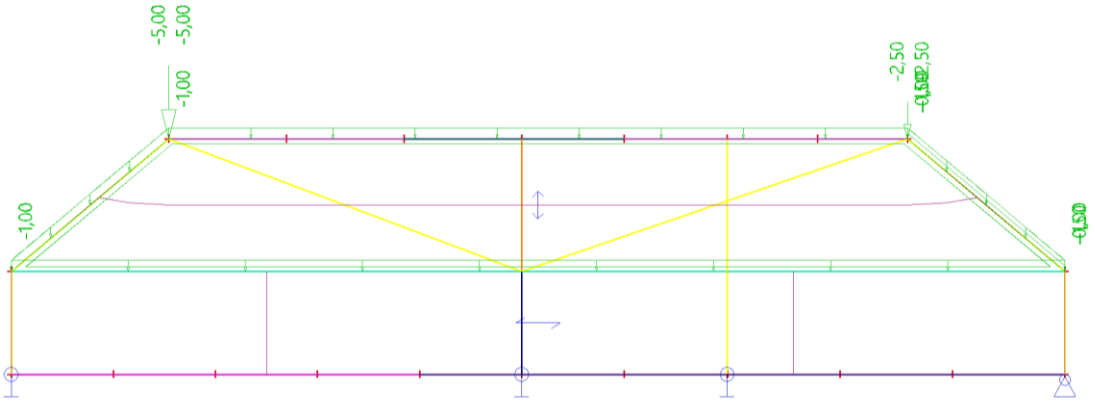


Name	Description	Load group	Load type	Action type	Spec	Duration
LC3	Uporabno	LG2	Static	Variable	Standard	Short

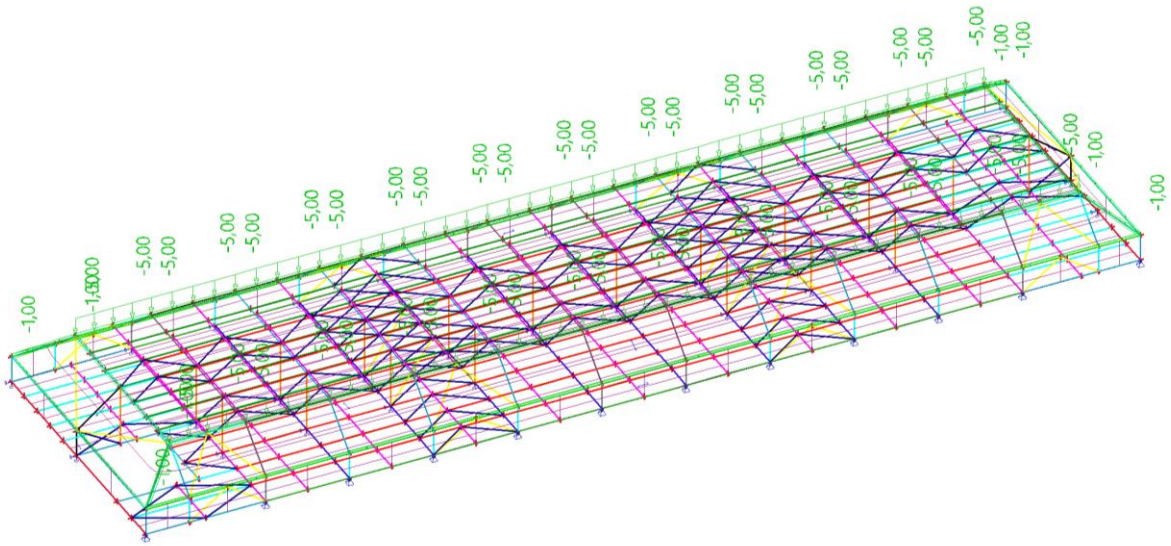


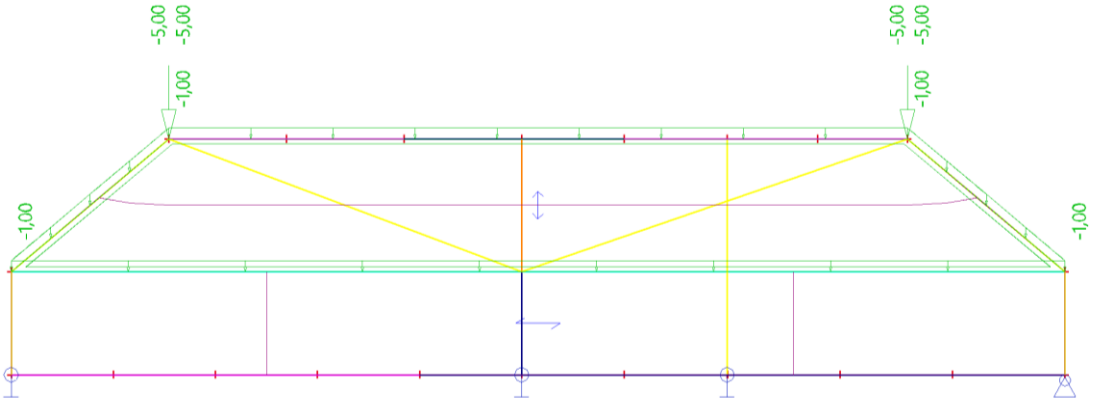
Name	Description	Load group	Load type	Action type	Spec	Duration
LC4	Snijeg [n]	LG3	Static	Variable	Standard	Short



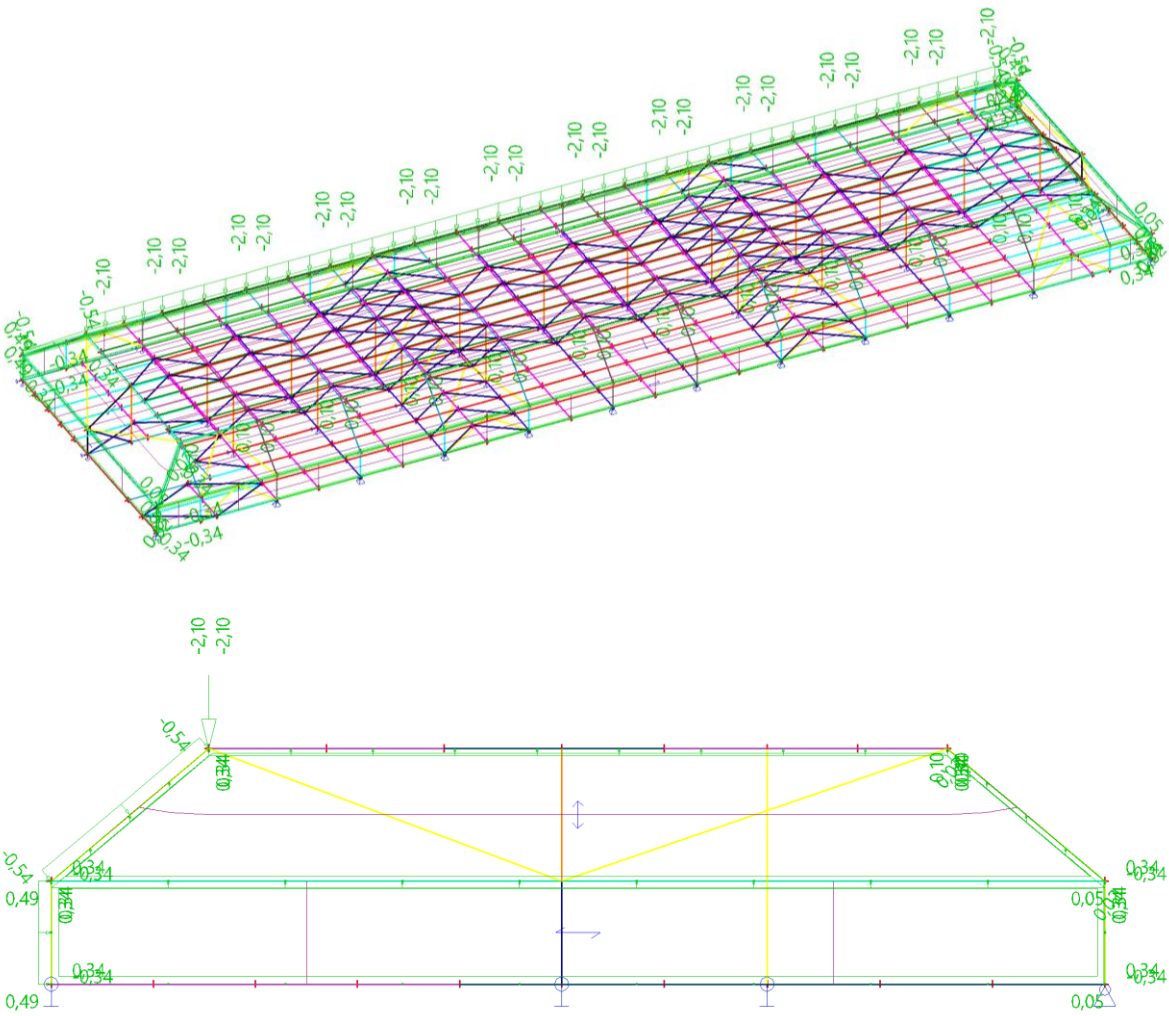


Name	Description	Load group	Load type	Action type	Spec	Duration
LC5	Snijeg [s]	LG3	Static	Variable	Standard	Short

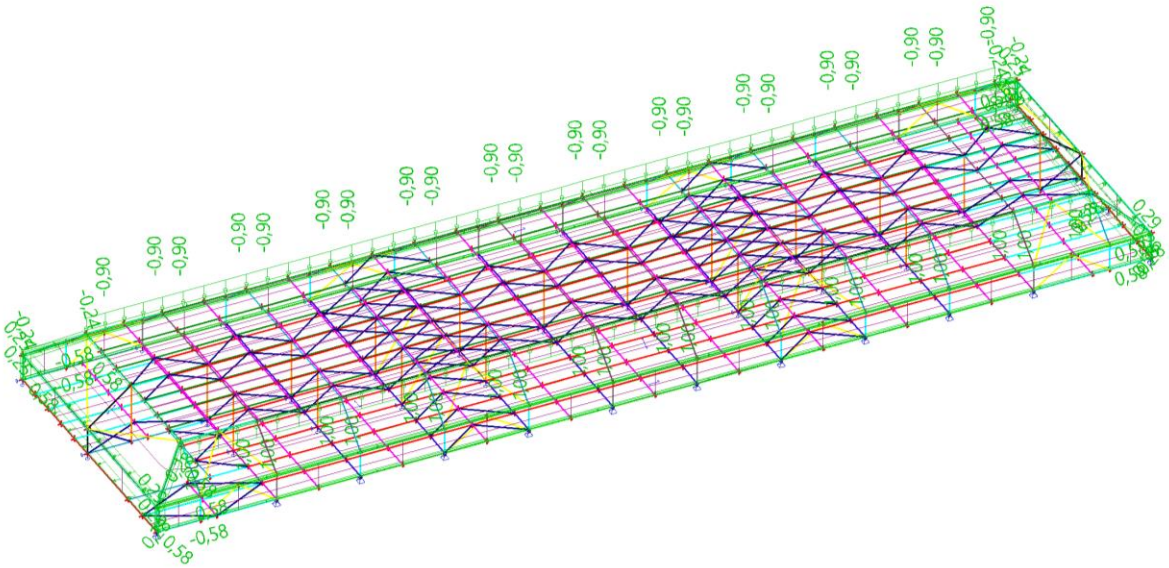


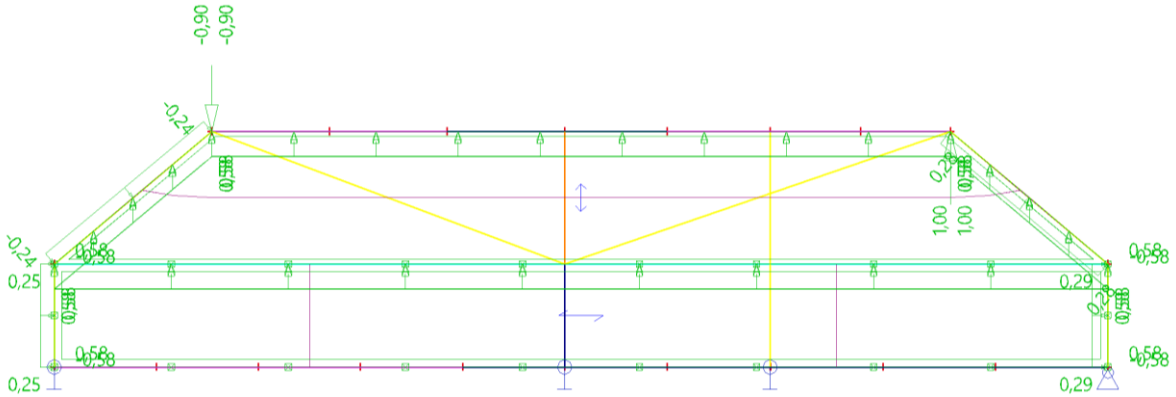


Name	Description	Load group	Load type	Action type	Spec
LC6	Vjetar pritisak X	LG4	Static	Variable	Static wind

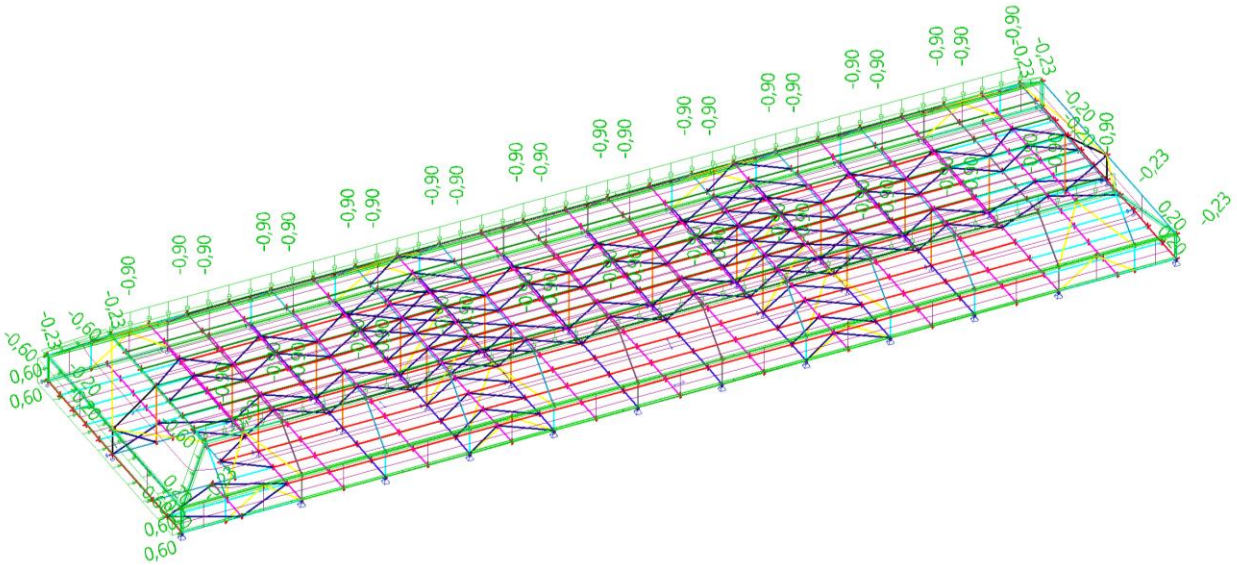


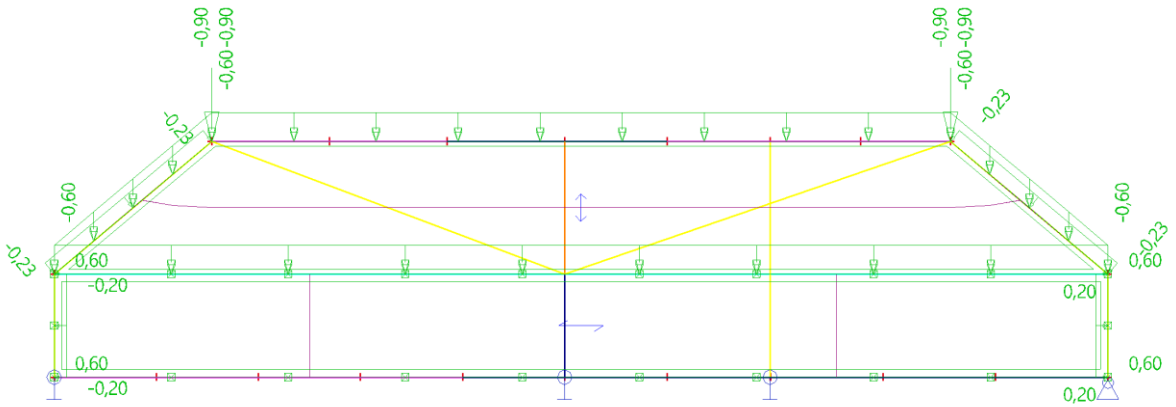
Name	Description	Load group	Load type	Action type	Spec
LC7	Vjetar odizanje X	LG4	Static	Variable	Static wind



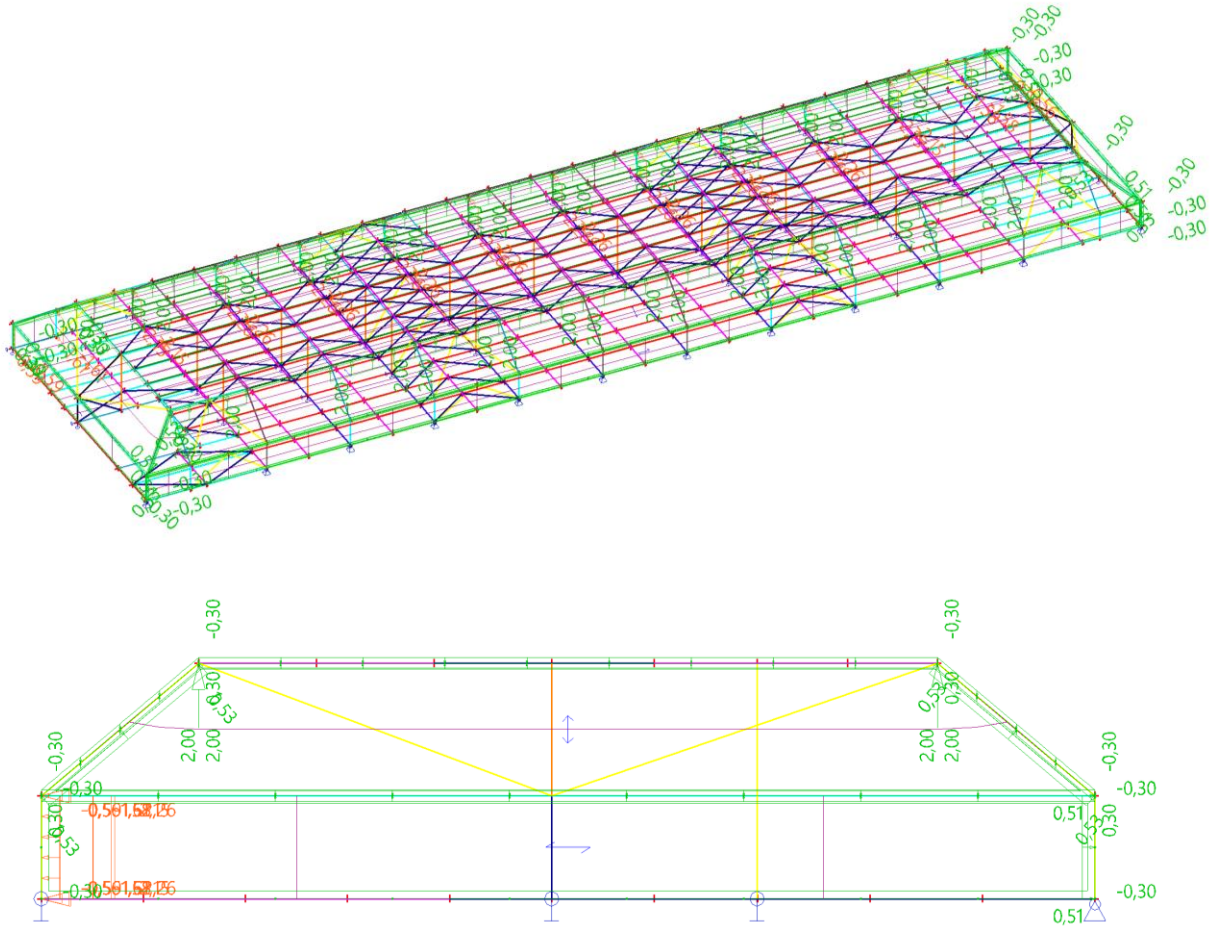


Name	Description	Load group	Load type	Action type	Spec
LC8	Vjetar pritisak Y	LG4	Static	Variable	Static wind





Name	Description	Load group	Load type	Action type	Spec
LC9	Vjetar odizanje Y	LG4	Static	Variable	Static wind



Kombinacije djelovanja na konstrukciju

Kombinacije za granično stanje nosivosti:

Name	Description	Type	Load cases	Coeff. [-]
GSN1		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC3 - Uporabno	1,50
GSN2		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC4 - Snijeg [n]	1,50
GSN3		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC5 - Snijeg [s]	1,50
GSN4		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC6 - Vjetar pritisak X	1,50
GSN5		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC8 - Vjetar pritisak Y	1,50
GSN6		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC4 - Snijeg [n]	1,50
			LC6 - Vjetar pritisak X	0,90
GSN7		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC4 - Snijeg [n]	1,50
			LC8 - Vjetar pritisak Y	0,90

Name	Description	Type	Load cases	Coeff. [-]
GSN8		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC5 - Snijeg [s]	1,50
			LC6 - Vjetar pritisak X	0,90
GSN9		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC5 - Snijeg [s]	1,50
			LC8 - Vjetar pritisak Y	0,90
GSN10		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC4 - Snijeg [n]	0,75
			LC6 - Vjetar pritisak X	1,50
GSN11		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC4 - Snijeg [n]	0,75
			LC8 - Vjetar pritisak Y	1,50
GSN12		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC5 - Snijeg [s]	0,75
			LC6 - Vjetar pritisak X	1,50
GSN13		Envelope - ultimate	LC1 - Vlastita tezina	1,35
			LC2 - Stalno	1,35
			LC5 - Snijeg [s]	0,75
			LC8 - Vjetar pritisak Y	1,50
GSN14		Envelope - ultimate	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC7 - Vjetar odizanje X	1,50
GSN15		Envelope - ultimate	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC9 - Vjetar odizanje Y	1,50

Kombinacije za granično stanje uporabivosti:

Name	Description	Type	Load cases	Coeff. [-]
GSU1		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC3 - Uporabno	1,00
GSU2		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC4 - Snijeg [n]	1,00
GSU3		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC5 - Snijeg [s]	1,00
GSU4		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC6 - Vjetar pritisak X	1,00
GSU5		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC8 - Vjetar pritisak Y	1,00
GSU6		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC4 - Snijeg [n]	1,00
			LC6 - Vjetar pritisak X	0,60
GSU7		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC4 - Snijeg [n]	1,00
			LC8 - Vjetar pritisak Y	0,60
GSU8		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC5 - Snijeg [s]	1,00
			LC6 - Vjetar pritisak X	0,60
GSU9		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC5 - Snijeg [s]	1,00
			LC8 - Vjetar pritisak Y	0,60
GSU10		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC4 - Snijeg [n]	0,50
			LC6 - Vjetar pritisak X	1,00

Name	Description	Type	Load cases	Coeff. [-]
GSU11		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC4 - Snijeg [n]	0,50
			LC8 - Vjetar pritisak Y	1,00
GSU12		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC5 - Snijeg [s]	0,50
			LC6 - Vjetar pritisak X	1,00
GSU13		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC5 - Snijeg [s]	0,50
			LC8 - Vjetar pritisak Y	1,00
GSU14		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC7 - Vjetar odizanje X	1,00
GSU15		Envelope - serviceability	LC1 - Vlastita tezina	1,00
			LC2 - Stalno	1,00
			LC9 - Vjetar odizanje Y	1,00

Anvelope djelovanja na konstrukciju

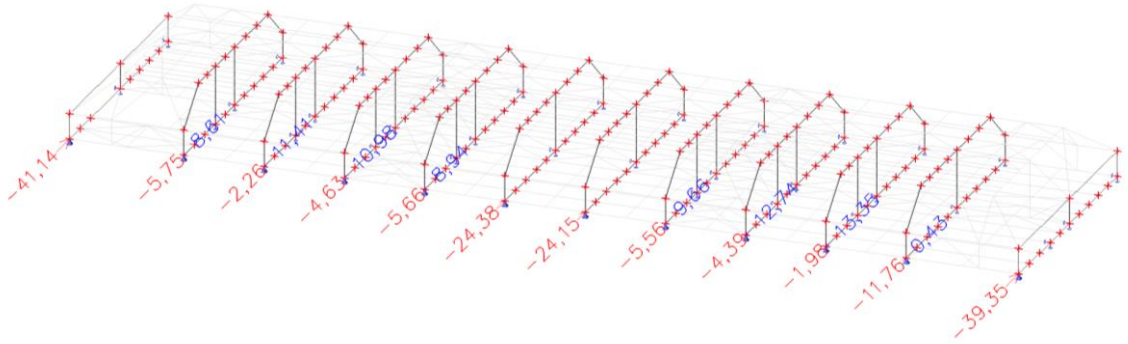
Name	List
Anvelopa GSN	GSN1 - Envelope - ultimate
	GSN2 - Envelope - ultimate
	GSN3 - Envelope - ultimate
	GSN4 - Envelope - ultimate
	GSN5 - Envelope - ultimate
	GSN6 - Envelope - ultimate
	GSN7 - Envelope - ultimate
	GSN8 - Envelope - ultimate
	GSN9 - Envelope - ultimate
	GSN10 - Envelope - ultimate
	GSN11 - Envelope - ultimate
	GSN12 - Envelope - ultimate
	GSN13 - Envelope - ultimate
	GSN14 - Envelope - ultimate
	GSN15 - Envelope - ultimate
Anvelopa GSU	GSU1 - Envelope - serviceability
	GSU2 - Envelope - serviceability
	GSU3 - Envelope - serviceability
	GSU4 - Envelope - serviceability
	GSU5 - Envelope - serviceability
	GSU6 - Envelope - serviceability
	GSU7 - Envelope - serviceability
	GSU8 - Envelope - serviceability
	GSU9 - Envelope - serviceability
	GSU10 - Envelope - serviceability
	GSU11 - Envelope - serviceability
	GSU12 - Envelope - serviceability
	GSU13 - Envelope - serviceability
	GSU14 - Envelope - serviceability
	GSU15 - Envelope - serviceability

Reakcije oslonaca konstrukcije

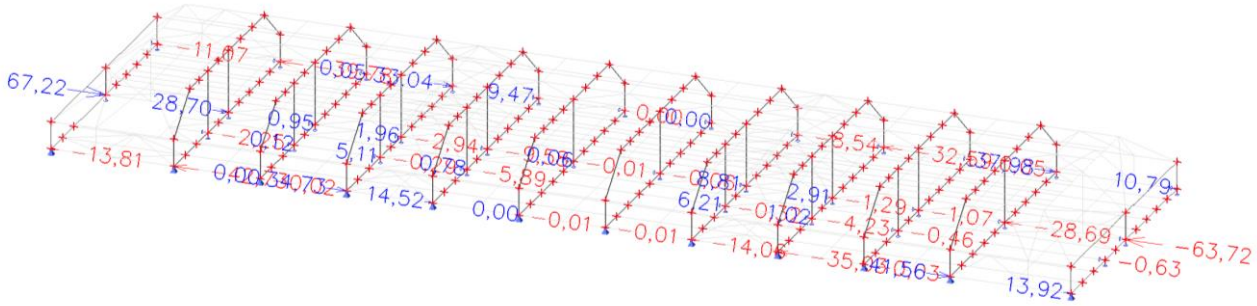
U nastavku su dani tablični i grafički prikaz reakcija oslonaca za proračunsku anvelopu nosivosti GSN.

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn2/N3	GSN10/1	**-41,14**	-9,38	113,55	0,00	0,00	0,00	0,0	0,0
Sn24/N77	GSN9/2	**13,35**	-0,03	188,96	**0,00**	**0,00**	**0,00**	0,0	0,0
Sn36/N31	GSN8/3	0,00	**-63,72**	267,09	0,00	0,00	0,00	0,0	0,0
Sn25/N5	GSN8/3	0,00	**67,22**	248,94	0,00	0,00	0,00	0,0	0,0
Sn44/N114	GSN14/4	0,00	-0,29	**44,84**	0,00	0,00	0,00	0,0	0,0
Sn28/N98	GSN1/5	0,00	-23,70	**521,14**	0,00	0,00	0,00	0,0	0,0

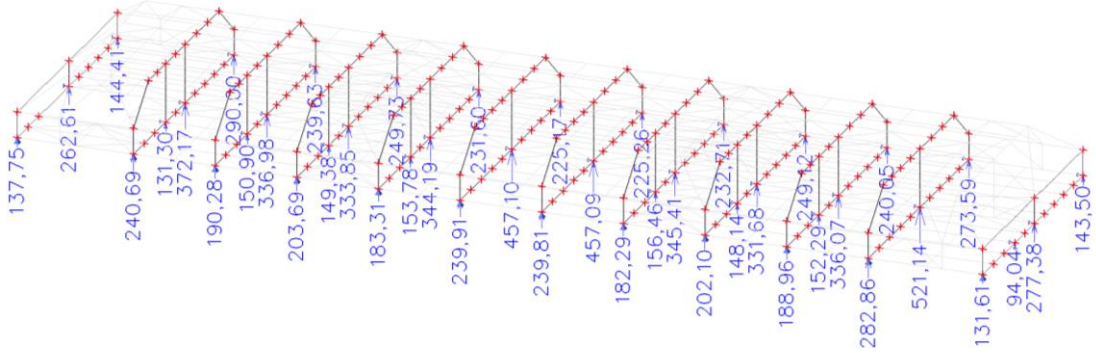
Values: R_x
Class: Anvelopa GSN



Values: R_y
Class: Anvelopa GSN



Values: R_z
Class: Anvelopa GSN

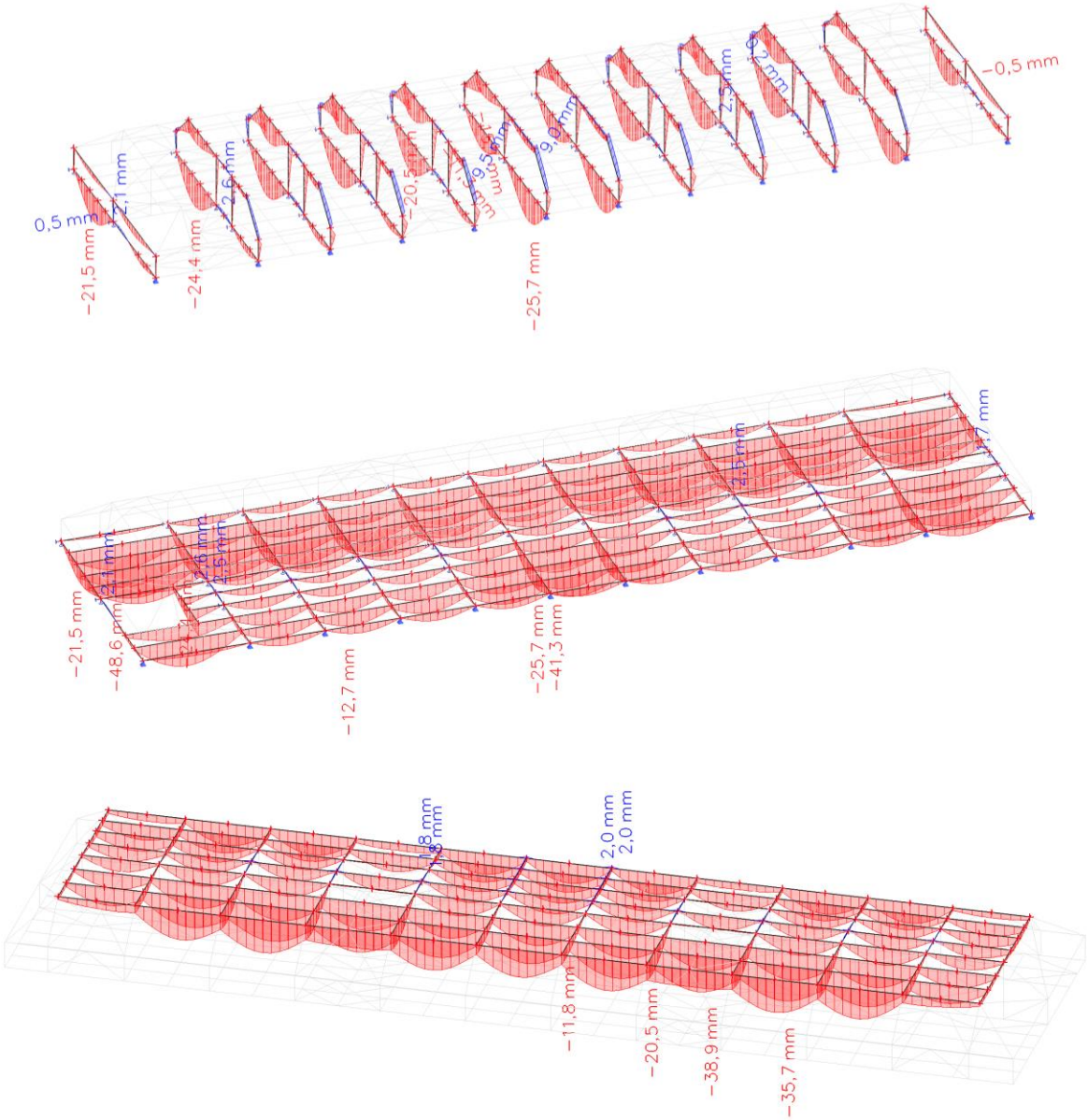


Pomaci i deformacije elemenata konstrukcije

U nastavku su dani tablični i grafički prikaz deformacija po poprečnim presjecima za anvelopu uporabivosti GSU.

Name	dx [m]	Case	u_x [mm]	u_y [mm]	u_z [mm]	φ_x [mrad]	φ_y [mrad]	φ_z [mrad]	U_{total} [mm]
B82	1,400	GSU9/1	**-6,6**	0,6	-0,1	-0,5	0,1	-0,8	6,6
B619	1,867	GSU6/2	**13,2**	-0,1	1,4	0,0	0,1	0,0	13,3
B4	2,878	GSU14/3	1,4	**-3,6**	-2,0	0,5	-0,9	0,0	4,4
B39	2,878	GSU14/3	1,4	**3,6**	-2,0	-0,5	-0,8	0,0	4,3
B285	3,150-	GSU1/4	0,2	0,0	**-48,6**	-0,6	2,8	0,0	**48,6**
B11	6,000-	GSU1/4	-0,1	0,0	**2,6**	-0,2	0,3	0,0	2,6
B198	0,000	GSU1/4	0,0	0,0	-4,2	**-18,8**	-1,9	0,0	4,2
B198	6,300	GSU1/4	0,0	0,0	-5,4	**17,6**	-1,8	0,0	5,4
B669	1,390	GSU1/4	0,1	-0,1	-3,3	-1,9	**-24,9**	0,0	3,3
B665	0,000	GSU1/4	0,3	0,0	-4,1	-0,6	**25,9**	0,0	4,1
B106	0,000	GSU12/5	-2,0	0,0	-0,1	-6,3	2,4	**-3,1**	2,0
B122	4,425	GSU12/5	-2,2	0,0	-0,1	6,3	2,3	**3,1**	2,2

Deformacije glavnih okvira, POZ 100 i 200



Maks. relativni progib GN: u_z = 25,7 mm < u_{dop} = L/250 = 7400/250 = 29,6 mm

Maks. relativni progib SN POZ 100 u 1. i 11. polju: u_z = 48,6-20,3 = 28,3 mm < u_{dop} = L/200 = 6300/200 = 31,5 mm
Maks.relativni progib SN POZ 100 u ostalim poljima: u_z = 41,3-25,7 = 15,6 mm < u_{dop} = L/200 = 4425/200 = 22,1 mm

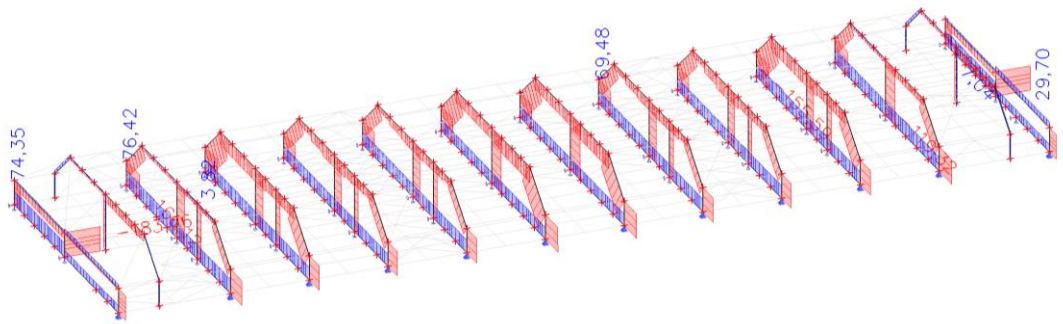
Maks. relativni progib SN POZ 200: u_z = 38,9-19,7 = 19,2 mm < u_{dop} = L/200 = 4425/200 = 22,1 mm

Rezne sile u konstrukciji

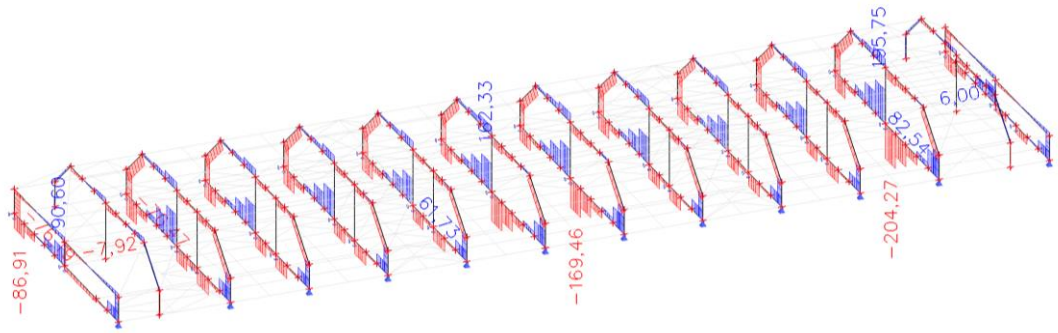
U nastavku je dan tablični i grafički prikaz maksimalnih reznih sila po tipu poprečnog presjeka za anvelopu graničnog stanja nosivosti GSN. Radi preglednosti, grafički prikaz podijeljen je na glavne okvire, podne ravnine te stabilizaciju.

Name	dx [m]	Case	N [kN]	V_y [kN]	V_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
B3	0,000	GSN9/1	**-183,26**	25,78	-1,18	0,00	-0,01	-25,38
B642	2,000+	GSN8/2	**123,72**	0,00	6,69	0,00	-2,51	0,03
B10	6,856+	GSN6/3	-8,84	**-8,92**	24,76	0,00	9,34	9,77
B35	7,400-	GSN1/4	42,27	-0,40	**-204,27**	0,01	-326,78	-0,16
B219	0,000	GSN9/1	-31,50	-0,01	10,00	**-0,40**	0,00	0,00
B216	2,212+	GSN9/1	-21,54	0,01	-0,16	**0,36**	11,25	-0,02
B35	7,400+	GSN1/4	43,15	0,12	**195,75**	0,00	**-326,78**	-0,22
B11	11,570-	GSN1/4	45,21	0,00	30,55	0,00	**224,09**	-0,01
B3	0,000	GSN1/4	-132,17	**34,10**	-2,83	0,00	0,00	**-34,51**
B3	1,400	GSN10/5	-128,07	34,04	-0,17	0,00	-3,82	**16,51**

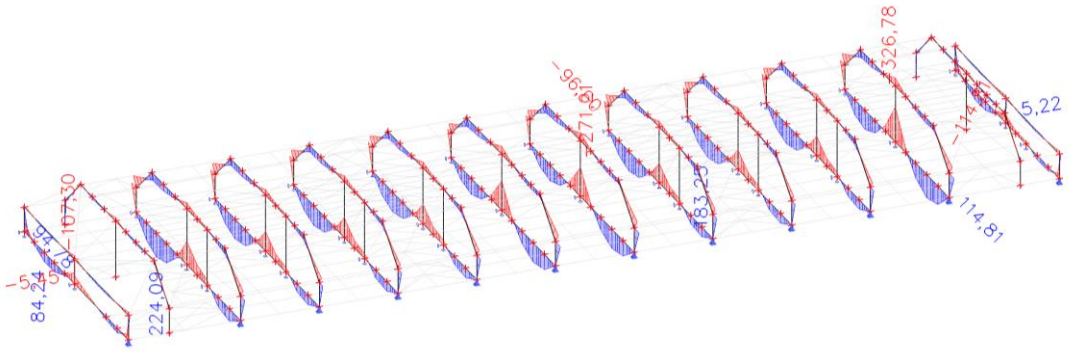
Values: **N**
Class: Anvelopa GSN, glavni okviri
Extreme 1D: Cross-section



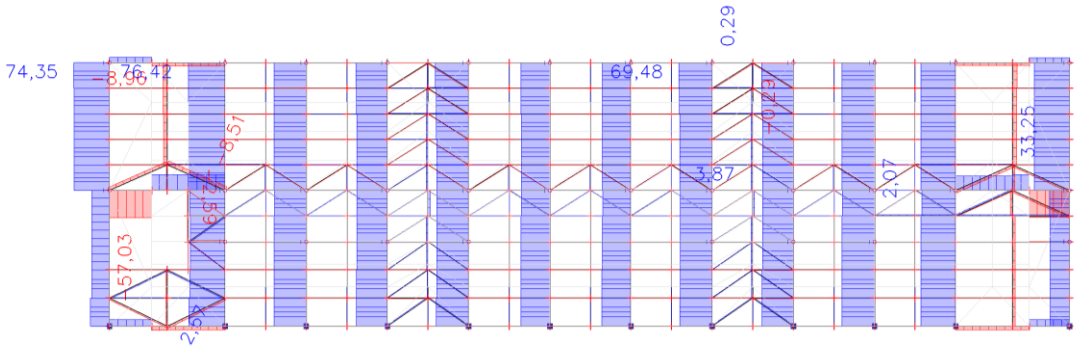
Values: **V_z**
Class: Anvelopa GSN, glavni okviri
Extreme 1D: Cross-section



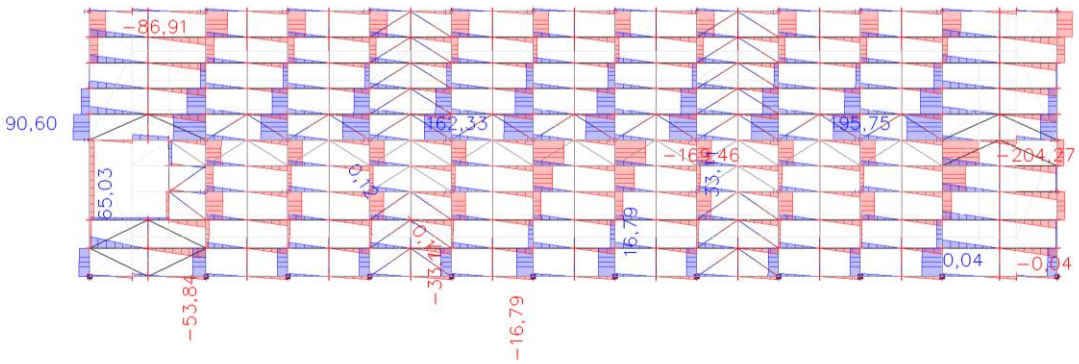
Values: **M_y**
Class: Anvelopa GSN, glavni okviri
Extreme 1D: Cross-section



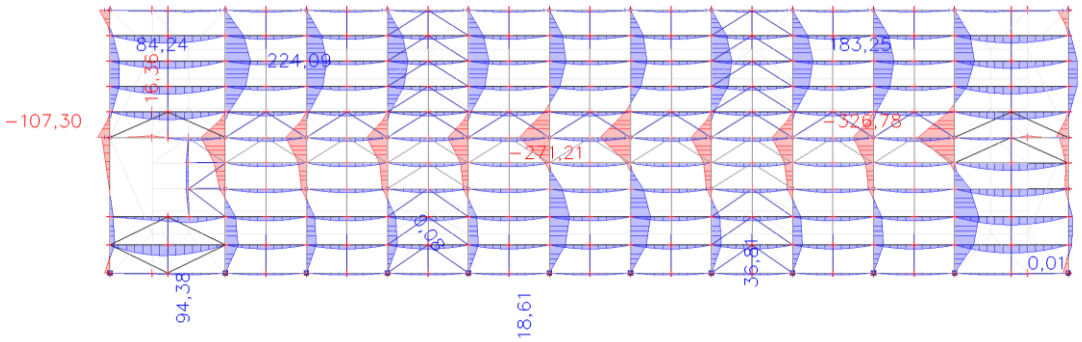
Values: **N**
Class: Anvelopa GSN, poz 100
Extreme 1D: Cross-section



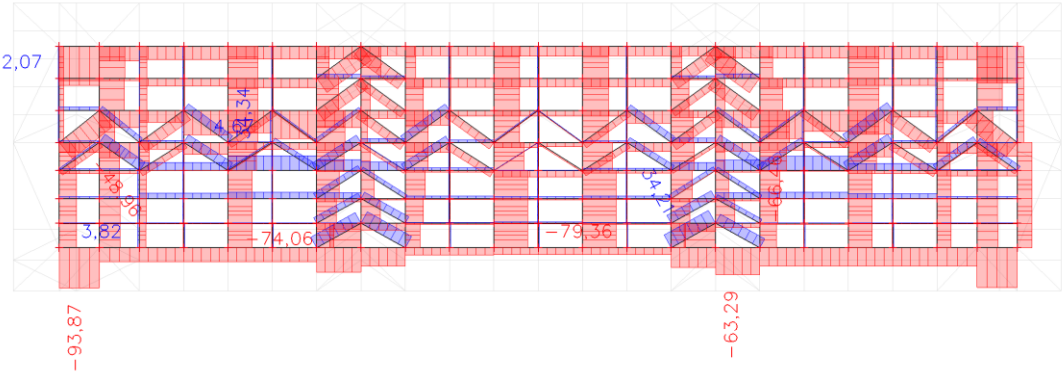
Values: **V_z**
Class: Anvelopa GSN, poz 100
Extreme 1D: Cross-section



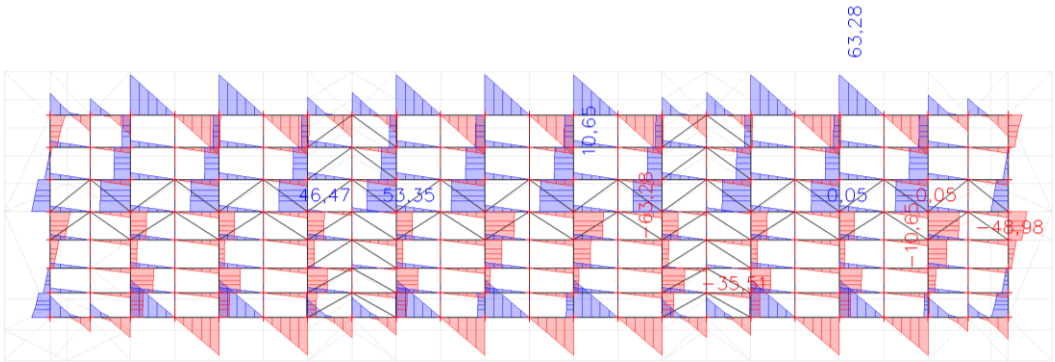
Values: **M_y**
Class: Anvelopa GSN, poz 100
Extreme 1D: Cross-section



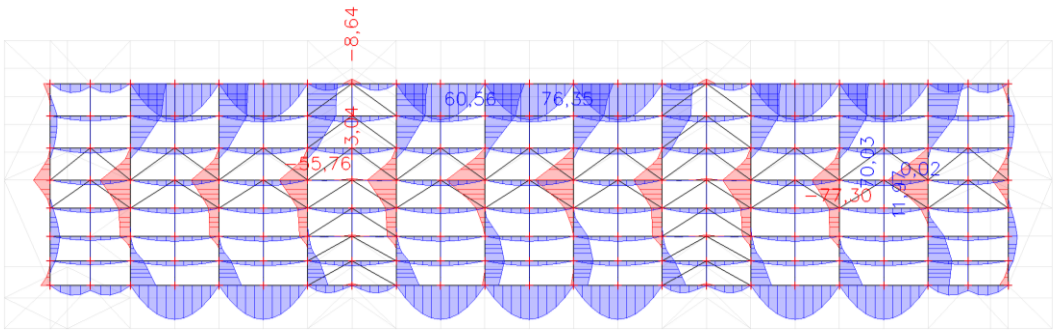
Values: **N**
Class: Anvelopa GSN, poz 200
Extreme 1D: Cross-section



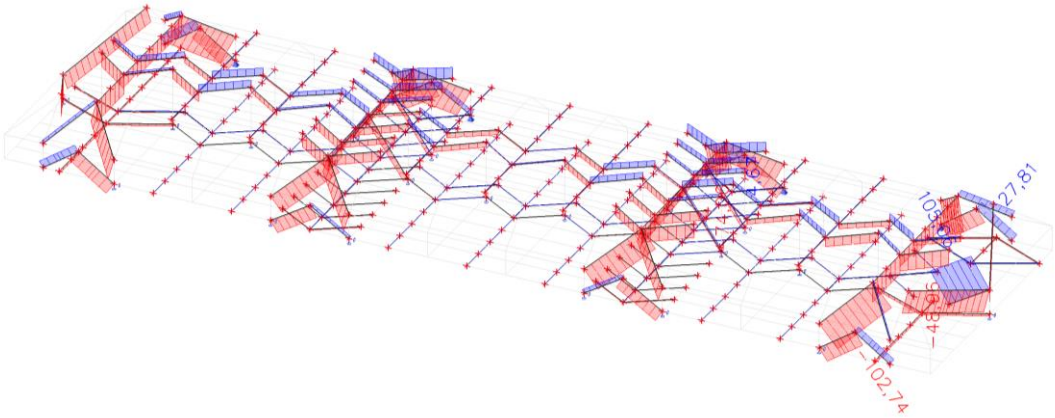
Values: **V_z**
Class: Anvelopa GSN, poz 200
Extreme 1D: Cross-section



Values: M_y
Class: Anvelopa GSN, poz 200
Extreme 1D: Cross-section



Values: **N**
Class: Anvelopa GSN, stabilizacija
Extreme 1D: Cross-section



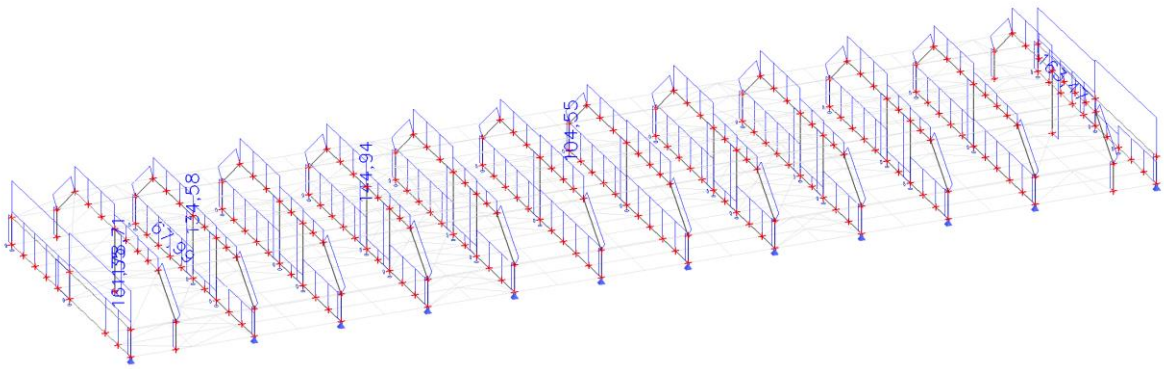
Analiza vitkosti glavnih nosivih okvira konstrukcije

U nastavku su dani rekapitualcija faktora izvijanja po tipu poprečnog presjeka te grafički prikaz vitkosti za elemente glavnih okvira čelične konstrukcije.

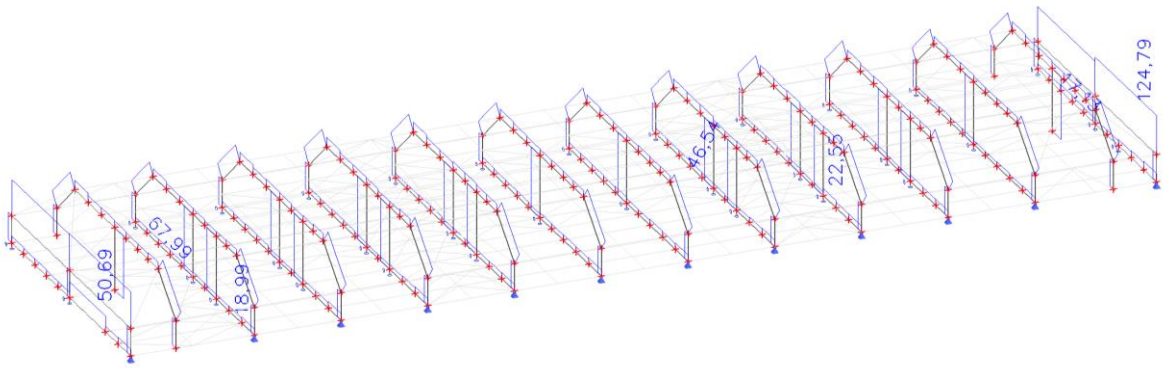
Member	CS Name	Part	Sway y	Ly [m]	ky [-]	Iy [m]	Lam y [-]	Iyz [m]	I LTB [m]
			Sway z	Lz [m]	kz [-]	Iz [m]	Lam z [-]		
B4	CS3	1	Yes	7,400	2,00	14,800	178,71	7,400	7,400
			No	7,400	0,79	5,843	117,08		
B1	CS3	1	Yes	1,400	2,00	2,800	33,81	1,400	1,400
			No	1,400	1,00	1,400	28,05		
B48	CS3	1	Yes	1,400	2,00	2,800	33,81	1,400	1,400
			No	1,400	1,00	1,400	28,05		
B39	CS3	1	Yes	7,400	2,00	14,800	178,71	7,400	7,400
			No	7,400	0,84	6,228	124,79		
B3	CS13	1	Yes	1,400	8,15	11,406	153,24	1,400	1,400
			No	1,400	0,54	0,760	16,83		
B38	CS13	1	Yes	1,400	8,69	12,169	163,47	1,400	1,400
			No	1,400	0,55	0,774	17,13		
B5	CS12	1	Yes	7,400	2,00	14,800	161,35	1,533	1,533
			No	1,533	0,76	1,169	21,17		
B5	CS12	3	Yes	7,400	2,00	14,800	161,35	4,333	4,333
			No	4,333	0,65	2,799	50,69		
B40	CS12	1	Yes	4,600	2,00	9,200	100,30	1,533	1,533
			No	1,533	0,97	1,483	26,86		

Member	CS Name	Part	Sway y Sway z	Ly [m] Lz [m]	ky [-] kz [-]	Iy [m] Iz [m]	Lam y [-] Lam z [-]	Iyz [m]	I LTB [m]
B63	CS11	1	Yes	5,255	2,00	10,510	104,55	1,227	1,227
			No	1,227	0,97	1,190	19,82		
B6	CS11	1	Yes	1,400	2,00	2,800	27,86	1,400	1,400
			No	1,400	1,00	1,396	23,25		
B615	CS11	1	Yes	2,800	2,00	5,601	55,72	2,800	2,800
			No	2,800	0,99	2,782	46,32		
B60	CS11	1	Yes	1,400	2,00	2,800	27,86	1,400	1,400
			No	1,400	1,00	1,400	23,31		
B621	CS11	1	Yes	2,800	2,00	5,601	55,72	2,800	2,800
			No	2,800	1,00	2,795	46,54		
B8	CS9	1	Yes	3,200	1,00	3,200	67,99	3,200	3,200
			No	3,200	1,00	3,200	67,99		
B35	CS2	1	Yes	7,400	2,03	14,995	126,37	1,533	1,533
			No	1,533	0,70	1,076	15,39		
B11	CS2	1	Yes	4,600	2,74	12,617	106,33	1,533	1,533
			No	1,533	0,87	1,328	18,99		
B11	CS2	6	Yes	6,950	2,30	15,969	134,58	1,390	1,390
			No	1,390	0,60	0,836	11,95		
B64	CS6	1	Yes	7,400	2,03	15,047	136,81	1,533	1,533
			No	1,533	0,84	1,296	19,92		
B53	CS6	1	Yes	4,600	2,89	13,279	120,73	1,533	1,533
			No	1,533	0,90	1,377	21,18		
B53	CS6	6	Yes	6,950	2,29	15,941	144,94	1,390	1,390
			No	1,390	0,63	0,869	13,37		
B30	CS6	1	Yes	4,600	2,86	13,133	119,41	1,533	1,533
			No	1,533	0,90	1,374	21,14		
B81	CS6	3	Yes	4,600	2,89	13,279	120,73	1,533	1,533
			No	1,533	0,96	1,466	22,55		

Values: **Lam,y**
Extreme 1D: Cross-section



Values: **Lam,z**
Extreme 1D: Cross-section



Dimenzioniranje elemenata konstrukcije

U nastavku su dani grafički i tablični prikaz iskoristivosti poprečnog presjeka za anvelopu graničnog stanja nosivosti GSN te detaljan prikaz dimenzioniranja za kritični element po tipu poprečnog presjeka. Radi preglednosti, grafički prikaz podijeljen je na glavne okvire, podne ravnine te stabilizaciju.

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B1	0,000	GSN1/1	CS3 - HEA200	S 355	**0,69**	0,62	0,69
B2	0,000	GSN1/1	CS3 - HEA200	S 355	**0,36**	0,32	0,36
B3	0,000	GSN9/2	CS13 - HEA180	S 355	**0,82**	0,46	0,82
B4	7,400+	GSN11/3	CS3 - HEA200	S 355	**0,30**	0,20	0,30
B5	7,400+	GSN1/1	CS12 - HEA220	S 355	**0,53**	0,53	0,00
B6	0,000	GSN9/2	CS11 - HEA240	S 355	**0,48**	0,15	0,48
B7	0,000	GSN8/4	CS11 - HEA240	S 355	**0,43**	0,13	0,43
B8	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,34**	0,22	0,34
B9	0,000	GSN9/2	CS9 - RRK120/120/4	S 235	**0,19**	0,12	0,19
B10	5,255+	GSN6/5	CS11 - HEA240	S 355	**0,34**	0,18	0,34
B11	11,570-	GSN1/1	CS2 - HEA280	S 355	**0,58**	0,58	0,00
B12	0,000	GSN8/4	CS8 - HEA140	S 355	**0,07**	0,07	0,00
B13	0,000	GSN8/4	CS8 - HEA140	S 355	**0,06**	0,06	0,00
B14	2,212-	GSN9/2	CS13 - HEA180	S 355	**0,66**	0,57	0,66
B15	2,212	GSN9/2	CS8 - HEA140	S 355	**0,34**	0,23	0,34
B16	2,212	GSN6/5	CS8 - HEA140	S 355	**0,36**	0,24	0,36
B17	2,212+	GSN8/4	CS13 - HEA180	S 355	**0,70**	0,61	0,70
B18	3,150-	GSN1/1	CS3 - HEA200	S 355	**0,16**	0,07	0,16
B19	3,150-	GSN1/1	CS3 - HEA200	S 355	**0,16**	0,08	0,16
B20	2,212+	GSN1/1	CS8 - HEA140	S 355	**0,30**	0,27	0,30
B21	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,43**	0,39	0,43
B22	2,212+	GSN1/1	CS8 - HEA140	S 355	**0,33**	0,30	0,33
B23	3,150-	GSN1/1	CS3 - HEA200	S 355	**0,50**	0,45	0,50
B24	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B25	0,000	GSN9/2	CS3 - HEA200	S 355	**0,73**	0,18	0,73
B26	0,000	GSN8/4	CS3 - HEA200	S 355	**0,62**	0,16	0,62
B27	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,33**	0,21	0,33
B28	0,000	GSN9/2	CS9 - RRK120/120/4	S 235	**0,18**	0,12	0,18
B29	5,255+	GSN8/4	CS3 - HEA200	S 355	**0,58**	0,35	0,58
B30	11,570+	GSN1/1	CS6 - HEA260	S 355	**0,56**	0,56	0,00
B31	0,000	GSN8/4	CS11 - HEA240	S 355	**0,46**	0,14	0,46
B32	0,000	GSN9/2	CS11 - HEA240	S 355	**0,52**	0,16	0,52
B33	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,43**	0,28	0,43
B34	5,255+	GSN8/4	CS11 - HEA240	S 355	**0,37**	0,29	0,37
B35	7,400+	GSN1/1	CS2 - HEA280	S 355	**0,84**	0,84	0,00
B36	0,000	GSN1/1	CS3 - HEA200	S 355	**0,68**	0,61	0,68
B37	0,000	GSN1/1	CS3 - HEA200	S 355	**0,33**	0,29	0,33
B38	0,000	GSN8/4	CS13 - HEA180	S 355	**0,85**	0,46	0,85
B39	7,400+	GSN1/1	CS3 - HEA200	S 355	**0,26**	0,13	0,26
B40	7,400+	GSN1/1	CS12 - HEA220	S 355	**0,53**	0,53	0,00
B41	3,000	GSN9/2	CS3 - HEA200	S 355	**0,31**	0,12	0,31
B42	0,000	GSN8/4	CS8 - HEA140	S 355	**0,11**	0,11	0,00
B43	0,000	GSN8/4	CS8 - HEA140	S 355	**0,10**	0,10	0,00
B44	3,100+	GSN1/1	CS3 - HEA200	S 355	**0,16**	0,07	0,16
B45	1,771	GSN1/1	CS3 - HEA200	S 355	**0,14**	0,14	0,00
B46	3,100+	GSN1/1	CS3 - HEA200	S 355	**0,16**	0,08	0,16
B47	3,100+	GSN1/1	CS3 - HEA200	S 355	**0,48**	0,43	0,48
B48	0,000	GSN9/2	CS3 - HEA200	S 355	**0,70**	0,18	0,70
B49	0,000	GSN8/4	CS3 - HEA200	S 355	**0,62**	0,16	0,62
B50	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,31**	0,20	0,31
B51	0,000	GSN9/2	CS9 - RRK120/120/4	S 235	**0,15**	0,10	0,15
B52	5,255+	GSN6/5	CS3 - HEA200	S 355	**0,56**	0,29	0,56
B53	11,570+	GSN1/1	CS6 - HEA260	S 355	**0,56**	0,56	0,00
B54	0,000	GSN9/2	CS3 - HEA200	S 355	**0,74**	0,19	0,74
B55	0,000	GSN8/4	CS3 - HEA200	S 355	**0,67**	0,17	0,67
B56	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,32**	0,20	0,32
B57	0,000	GSN9/2	CS9 - RRK120/120/4	S 235	**0,16**	0,11	0,16
B58	5,255+	GSN8/4	CS3 - HEA200	S 355	**0,53**	0,37	0,53
B59	11,570+	GSN1/1	CS6 - HEA260	S 355	**0,56**	0,56	0,00
B60	0,000	GSN8/4	CS11 - HEA240	S 355	**0,39**	0,11	0,39
B61	0,000	GSN8/4	CS11 - HEA240	S 355	**0,50**	0,16	0,50
B62	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,43**	0,28	0,43
B63	1,227+	GSN9/2	CS11 - HEA240	S 355	**0,40**	0,14	0,40
B64	7,400-	GSN1/1	CS6 - HEA260	S 355	**0,83**	0,83	0,00
B65	0,000	GSN8/4	CS11 - HEA240	S 355	**0,39**	0,11	0,39

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B66	0,000	GSN8/4	CS11 - HEA240	S 355	**0,50**	0,15	0,50
B67	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,43**	0,28	0,43
B68	1,227+	GSN9/2	CS11 - HEA240	S 355	**0,40**	0,14	0,40
B69	7,400-	GSN1/1	CS6 - HEA260	S 355	**0,83**	0,83	0,00
B70	0,000	GSN9/2	CS3 - HEA200	S 355	**0,75**	0,19	0,75
B71	0,000	GSN8/4	CS3 - HEA200	S 355	**0,67**	0,17	0,67
B72	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,31**	0,20	0,31
B73	0,000	GSN9/2	CS9 - RRK120/120/4	S 235	**0,17**	0,11	0,17
B74	5,255+	GSN8/4	CS3 - HEA200	S 355	**0,52**	0,36	0,52
B75	11,570+	GSN1/1	CS6 - HEA260	S 355	**0,56**	0,56	0,00
B76	0,000	GSN9/2	CS3 - HEA200	S 355	**0,71**	0,18	0,71
B77	0,000	GSN8/4	CS3 - HEA200	S 355	**0,61**	0,15	0,61
B78	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,31**	0,20	0,31
B79	0,000	GSN9/2	CS9 - RRK120/120/4	S 235	**0,15**	0,10	0,15
B80	5,255+	GSN6/5	CS3 - HEA200	S 355	**0,56**	0,29	0,56
B81	11,570+	GSN1/1	CS6 - HEA260	S 355	**0,56**	0,56	0,00
B82	0,000	GSN9/2	CS3 - HEA200	S 355	**0,74**	0,18	0,74
B83	0,000	GSN8/4	CS3 - HEA200	S 355	**0,61**	0,15	0,61
B84	0,000	GSN8/4	CS9 - RRK120/120/4	S 235	**0,33**	0,21	0,33
B85	0,000	GSN9/2	CS9 - RRK120/120/4	S 235	**0,19**	0,12	0,19
B86	5,255+	GSN8/4	CS3 - HEA200	S 355	**0,57**	0,35	0,57
B87	11,570+	GSN1/1	CS6 - HEA260	S 355	**0,56**	0,56	0,00
B88	2,213+	GSN9/2	CS13 - HEA180	S 355	**0,66**	0,57	0,66
B89	2,213	GSN9/2	CS8 - HEA140	S 355	**0,34**	0,23	0,34
B90	2,213	GSN6/5	CS8 - HEA140	S 355	**0,36**	0,24	0,36
B91	2,213+	GSN8/4	CS13 - HEA180	S 355	**0,70**	0,61	0,70
B92	2,213+	GSN1/1	CS8 - HEA140	S 355	**0,30**	0,27	0,30
B93	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,43**	0,39	0,43
B94	2,213+	GSN1/1	CS8 - HEA140	S 355	**0,33**	0,30	0,33
B95	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B96	0,885	GSN9/2	CS13 - HEA180	S 355	**0,45**	0,12	0,45
B97	0,000	GSN8/4	CS8 - HEA140	S 355	**0,09**	0,09	0,00
B98	0,000	GSN8/4	CS8 - HEA140	S 355	**0,08**	0,08	0,00
B99	2,213-	GSN9/2	CS13 - HEA180	S 355	**0,16**	0,11	0,16
B100	2,213-	GSN1/1	CS8 - HEA140	S 355	**0,31**	0,28	0,31
B101	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,43**	0,39	0,43
B102	2,213+	GSN1/1	CS8 - HEA140	S 355	**0,33**	0,30	0,33
B103	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B104	2,213+	GSN9/2	CS13 - HEA180	S 355	**0,64**	0,57	0,64
B105	2,213	GSN9/2	CS8 - HEA140	S 355	**0,35**	0,23	0,35
B106	2,213	GSN6/5	CS8 - HEA140	S 355	**0,39**	0,24	0,39
B107	2,213-	GSN8/4	CS13 - HEA180	S 355	**0,70**	0,61	0,70
B108	2,213-	GSN1/1	CS8 - HEA140	S 355	**0,30**	0,28	0,30
B109	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,43**	0,39	0,43
B110	2,213+	GSN1/1	CS8 - HEA140	S 355	**0,33**	0,30	0,33
B111	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B112	2,212+	GSN9/2	CS13 - HEA180	S 355	**0,64**	0,57	0,64
B113	2,213	GSN9/2	CS8 - HEA140	S 355	**0,35**	0,23	0,35
B114	2,213	GSN6/5	CS8 - HEA140	S 355	**0,39**	0,24	0,39
B115	2,212+	GSN8/4	CS13 - HEA180	S 355	**0,70**	0,61	0,70
B116	2,212-	GSN1/1	CS8 - HEA140	S 355	**0,30**	0,27	0,30
B117	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,43**	0,39	0,43
B118	2,212-	GSN1/1	CS8 - HEA140	S 355	**0,33**	0,30	0,33
B119	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B120	2,212-	GSN9/2	CS13 - HEA180	S 355	**0,64**	0,57	0,64
B121	2,213	GSN9/2	CS8 - HEA140	S 355	**0,35**	0,23	0,35
B122	2,213	GSN6/5	CS8 - HEA140	S 355	**0,39**	0,24	0,39
B123	2,212+	GSN8/4	CS13 - HEA180	S 355	**0,70**	0,61	0,70
B124	2,212+	GSN1/1	CS8 - HEA140	S 355	**0,30**	0,28	0,30
B125	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,43**	0,39	0,43
B126	2,212-	GSN1/1	CS8 - HEA140	S 355	**0,33**	0,30	0,33
B127	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B128	3,540	GSN9/2	CS13 - HEA180	S 355	**0,33**	0,12	0,33
B129	2,212+	GSN8/4	CS8 - HEA140	S 355	**0,09**	0,09	0,00
B130	2,212+	GSN9/2	CS8 - HEA140	S 355	**0,08**	0,08	0,00
B131	2,212+	GSN9/2	CS13 - HEA180	S 355	**0,22**	0,11	0,22
B132	2,212+	GSN1/1	CS8 - HEA140	S 355	**0,31**	0,28	0,31
B133	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,43**	0,39	0,43
B134	2,212-	GSN1/1	CS8 - HEA140	S 355	**0,33**	0,30	0,33
B135	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B136	2,212-	GSN9/2	CS13 - HEA180	S 355	**0,67**	0,57	0,67
B137	2,213	GSN9/2	CS8 - HEA140	S 355	**0,34**	0,23	0,34

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B138	2,213	GSN6/5	CS8 - HEA140	S 355	**0,36**	0,24	0,36
B139	2,212+	GSN8/4	CS13 - HEA180	S 355	**0,70**	0,61	0,70
B140	2,212-	GSN1/1	CS8 - HEA140	S 355	**0,30**	0,27	0,30
B141	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,43**	0,39	0,43
B142	2,212-	GSN1/1	CS8 - HEA140	S 355	**0,33**	0,30	0,33
B143	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B144	2,212+	GSN9/2	CS13 - HEA180	S 355	**0,67**	0,57	0,67
B145	2,212	GSN9/2	CS8 - HEA140	S 355	**0,34**	0,23	0,34
B146	2,212	GSN6/5	CS8 - HEA140	S 355	**0,36**	0,24	0,36
B147	2,212-	GSN8/4	CS13 - HEA180	S 355	**0,70**	0,61	0,70
B148	2,212-	GSN1/1	CS8 - HEA140	S 355	**0,30**	0,28	0,30
B149	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,43**	0,39	0,43
B150	2,212+	GSN1/1	CS8 - HEA140	S 355	**0,33**	0,30	0,33
B151	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B152	0,000	GSN9/2	CS7 - RRK100/100/4	S 235	**0,29**	0,15	0,29
B153	3,569	GSN9/2	CS7 - RRK100/100/4	S 235	**0,42**	0,21	0,42
B154	0,000	GSN8/4	CS7 - RRK100/100/4	S 235	**0,19**	0,12	0,19
B155	0,000	GSN10/6	CS7 - RRK100/100/4	S 235	**0,05**	0,05	0,00
B156	0,000	GSN8/4	CS7 - RRK100/100/4	S 235	**0,36**	0,18	0,36
B157	3,569	GSN8/4	CS7 - RRK100/100/4	S 235	**0,45**	0,22	0,45
B158	0,000	GSN8/4	CS7 - RRK100/100/4	S 235	**0,17**	0,11	0,17
B159	0,000	GSN1/1	CS7 - RRK100/100/4	S 235	**0,03**	0,03	0,00
B160	0,000	GSN9/2	CS7 - RRK100/100/4	S 235	**0,43**	0,22	0,43
B161	3,569	GSN9/2	CS7 - RRK100/100/4	S 235	**0,28**	0,14	0,28
B162	3,569	GSN8/4	CS7 - RRK100/100/4	S 235	**0,36**	0,18	0,36
B163	0,000	GSN8/4	CS7 - RRK100/100/4	S 235	**0,45**	0,23	0,45
B164	2,618	GSN10/6	CS7 - RRK100/100/4	S 235	**0,04**	0,04	0,00
B165	2,618	GSN8/4	CS7 - RRK100/100/4	S 235	**0,19**	0,12	0,19
B166	2,618	GSN1/1	CS7 - RRK100/100/4	S 235	**0,03**	0,03	0,00
B167	2,618	GSN9/2	CS7 - RRK100/100/4	S 235	**0,17**	0,11	0,17
B168	3,890	GSN5/7	CS7 - RRK100/100/4	S 235	**0,01**	0,01	0,00
B169	3,890	GSN9/2	CS7 - RRK100/100/4	S 235	**0,11**	0,05	0,11
B170	0,000	GSN12/8	CS7 - RRK100/100/4	S 235	**0,03**	0,03	0,00
B171	3,890	GSN9/2	CS7 - RRK100/100/4	S 235	**0,03**	0,03	0,00
B172	0,000	GSN3/9	CS7 - RRK100/100/4	S 235	**0,03**	0,03	0,00
B173	3,890	GSN10/6	CS7 - RRK100/100/4	S 235	**0,02**	0,02	0,00
B174	0,000	GSN3/9	CS7 - RRK100/100/4	S 235	**0,10**	0,05	0,10
B175	0,000	GSN15/10	CS7 - RRK100/100/4	S 235	**0,02**	0,02	0,00
B176	2,810-	GSN1/1	CS3 - HEA200	S 355	**0,16**	0,15	0,16
B177	3,100-	GSN1/1	CS3 - HEA200	S 355	**0,44**	0,44	0,00
B178	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B179	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B180	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,39**	0,39	0,00
B181	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B182	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B183	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B184	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B185	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,39**	0,39	0,00
B186	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B187	4,300+	GSN1/1	CS3 - HEA200	S 355	**0,38**	0,34	0,38
B188	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B189	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B190	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,47**	0,42	0,47
B191	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B192	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B193	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B194	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,47**	0,42	0,47
B195	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B196	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B197	3,100-	GSN1/1	CS3 - HEA200	S 355	**0,54**	0,48	0,54
B198	3,150-	GSN1/1	CS3 - HEA200	S 355	**0,71**	0,62	0,71
B199	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B200	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B201	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,47**	0,42	0,47
B202	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B203	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B204	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B205	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,47**	0,42	0,47
B206	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B207	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,46**	0,42	0,46
B208	3,100+	GSN1/1	CS3 - HEA200	S 355	**0,54**	0,48	0,54
B209	4,279-	GSN1/1	CS3 - HEA200	S 355	**0,19**	0,19	0,00

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B210	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,70**	0,42	0,70
B211	2,000+	GSN3/9	CS10 - RRK140/80/4	S 355	**0,59**	0,34	0,59
B212	2,213-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,62**	0,42	0,62
B213	2,213-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,23**	0,11	0,23
B214	2,213-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,68**	0,42	0,68
B215	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,61**	0,42	0,61
B216	2,212+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,67**	0,42	0,67
B217	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,24**	0,11	0,24
B218	2,212-	GSN3/9	CS10 - RRK140/80/4	S 355	**0,63**	0,42	0,63
B219	2,212-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,73**	0,42	0,73
B220	2,000+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,51**	0,36	0,51
B221	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,64**	0,44	0,64
B222	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,69**	0,44	0,69
B223	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,45**	0,45	0,00
B224	2,212-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,69**	0,44	0,69
B225	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,68**	0,44	0,68
B226	2,213-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,45**	0,45	0,00
B227	2,213+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,69**	0,44	0,69
B228	2,213-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,69**	0,44	0,69
B229	2,212-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,65**	0,44	0,65
B230	2,000-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,52**	0,36	0,52
B231	2,000-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,47**	0,31	0,47
B232	2,212-	GSN3/9	CS10 - RRK140/80/4	S 355	**0,53**	0,38	0,53
B233	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,38**	0,38	0,00
B234	2,212-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,39**	0,39	0,00
B235	2,212+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,54**	0,38	0,54
B236	2,213-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,53**	0,38	0,53
B237	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,57**	0,38	0,57
B238	2,213-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,38**	0,38	0,00
B239	2,213+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,39**	0,39	0,00
B240	2,212+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,38**	0,38	0,00
B241	2,000+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,62**	0,34	0,62
B242	2,212+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,36**	0,36	0,00
B243	2,213-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,36**	0,36	0,00
B244	2,213-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,15**	0,09	0,15
B245	2,213-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,49**	0,36	0,49
B246	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,50**	0,36	0,50
B247	2,212+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,49**	0,36	0,49
B248	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,15**	0,09	0,15
B249	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,36**	0,36	0,00
B250	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,36**	0,36	0,00
B251	2,000-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,30**	0,30	0,00
B252	2,000+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,66**	0,37	0,66
B253	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,88**	0,45	0,88
B254	2,213+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,89**	0,45	0,89
B255	2,213-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,78**	0,45	0,78
B256	2,213-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,77**	0,45	0,77
B257	2,212-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,63**	0,45	0,63
B258	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,75**	0,45	0,75
B259	2,212-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,90**	0,45	0,90
B260	2,212+	GSN8/4	CS10 - RRK140/80/4	S 355	**0,78**	0,45	0,78
B261	2,212-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,86**	0,45	0,86
B262	2,000-	GSN8/4	CS10 - RRK140/80/4	S 355	**0,60**	0,37	0,60
B263	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,44**	0,40	0,44
B264	3,100+	GSN1/1	CS3 - HEA200	S 355	**0,50**	0,46	0,50
B265	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,44**	0,40	0,44
B266	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,45**	0,41	0,45
B267	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,40**	0,40	0,00
B268	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,40**	0,40	0,00
B269	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,44**	0,40	0,44
B270	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,45**	0,41	0,45
B271	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,44**	0,40	0,44
B272	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,40**	0,40	0,00
B273	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,46**	0,34	0,46
B274	2,213+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,46**	0,34	0,46
B275	2,213+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,53**	0,35	0,53
B276	2,213+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,47**	0,34	0,47
B277	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,46**	0,34	0,46
B278	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,47**	0,34	0,47
B279	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,58**	0,35	0,58
B280	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,47**	0,34	0,47
B281	2,212-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,46**	0,34	0,46

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B282	2,000+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,41**	0,28	0,41
B283	1,007	GSN1/1	CS4 - HEA160	S 355	**0,08**	0,08	0,00
B284	1,004	GSN1/1	CS4 - HEA160	S 355	**0,09**	0,08	0,09
B285	3,150-	GSN1/1	CS3 - HEA200	S 355	**0,45**	0,45	0,00
B286	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B287	3,100-	GSN1/1	CS3 - HEA200	S 355	**0,43**	0,43	0,00
B288	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B289	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B290	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B291	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B292	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B293	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B294	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B295	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B296	3,150+	GSN1/1	CS3 - HEA200	S 355	**0,50**	0,45	0,50
B297	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B298	3,100-	GSN1/1	CS3 - HEA200	S 355	**0,48**	0,43	0,48
B299	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B300	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B301	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B302	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B303	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B304	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,38**	0,38	0,00
B305	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B306	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B307	3,150+	GSN1/1	CS3 - HEA200	S 355	**0,50**	0,45	0,50
B308	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B309	3,100-	GSN1/1	CS3 - HEA200	S 355	**0,48**	0,44	0,48
B310	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B311	2,213-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B312	2,213+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B313	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B314	2,212-	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B315	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B316	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,38	0,42
B317	2,212+	GSN1/1	CS4 - HEA160	S 355	**0,42**	0,39	0,42
B318	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B319	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B320	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B321	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B322	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B323	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B324	1,306	GSN3/9	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B325	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B326	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,00
B327	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B328	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B329	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B330	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,00
B331	1,309	GSN8/4	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,00
B332	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B333	1,346	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B334	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B335	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B336	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B337	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B338	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B339	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B340	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B341	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B342	1,306	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B343	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B344	1,306	GSN3/9	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B345	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B346	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B347	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B348	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B349	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B350	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,00
B351	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B352	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B353	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B354	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B355	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B356	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B357	1,346	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B358	0,000	GSN1/1	CS5 - RRK50/50/3	S 235	**0,05**	0,04	0,05
B359	0,000	GSN1/1	CS5 - RRK50/50/3	S 235	**0,05**	0,04	0,05
B360	0,000	GSN1/1	CS5 - RRK50/50/3	S 235	**0,05**	0,04	0,05
B361	0,000	GSN1/1	CS5 - RRK50/50/3	S 235	**0,05**	0,04	0,05
B362	0,000	GSN1/1	CS5 - RRK50/50/3	S 235	**0,05**	0,04	0,05
B363	0,000	GSN1/1	CS5 - RRK50/50/3	S 235	**0,05**	0,04	0,05
B364	0,000	GSN10/6	CS5 - RRK50/50/3	S 235	**0,08**	0,06	0,08
B365	0,000	GSN10/6	CS5 - RRK50/50/3	S 235	**0,08**	0,06	0,08
B366	0,000	GSN10/6	CS5 - RRK50/50/3	S 235	**0,12**	0,07	0,12
B367	0,000	GSN10/6	CS5 - RRK50/50/3	S 235	**0,12**	0,07	0,12
B368	1,306	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B369	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B370	1,306	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B371	1,306	GSN9/2	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B372	1,306	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B373	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B374	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B375	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B376	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B377	1,306	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B378	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,02
B379	1,306	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,03
B380	1,306	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B381	1,306	GSN6/5	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,02
B382	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,11**	0,03	0,11
B383	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,07**	0,02	0,07
B384	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,14**	0,14	0,00
B385	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,15**	0,15	0,00
B386	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,07**	0,07	0,00
B387	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,09**	0,09	0,00
B388	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,07**	0,07	0,00
B389	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,05**	0,05	0,00
B390	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,10**	0,10	0,00
B391	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,10**	0,04	0,10
B392	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,04**	0,04	0,00
B393	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,29**	0,10	0,29
B394	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,40**	0,14	0,40
B395	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,26**	0,09	0,26
B396	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,57**	0,21	0,57
B397	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,42**	0,15	0,42
B398	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,17**	0,17	0,00
B399	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,12**	0,12	0,00
B400	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,10**	0,10	0,00
B401	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,05**	0,05	0,00
B402	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,05**	0,05	0,00
B403	0,000	GSN3/9	CS1 - RRK60/60/4	S 235	**0,05**	0,05	0,00
B404	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,10**	0,04	0,10
B405	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,10**	0,10	0,00
B406	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,30**	0,11	0,30
B407	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,05**	0,05	0,00
B408	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,23**	0,08	0,23
B409	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,40**	0,14	0,40
B410	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,40**	0,14	0,40
B411	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,58**	0,21	0,58
B412	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,38**	0,14	0,38
B413	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,09**	0,09	0,00
B414	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,20**	0,07	0,20
B415	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,00
B416	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,09**	0,09	0,00
B417	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,26**	0,09	0,26
B418	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,01**	0,01	0,00
B419	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,01**	0,01	0,00
B420	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,22**	0,08	0,22
B421	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,08**	0,08	0,00
B422	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B423	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,22**	0,08	0,22
B424	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,11**	0,11	0,00
B425	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,40**	0,14	0,40

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B426	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B427	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B428	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B429	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B430	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B431	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B432	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B433	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B434	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B435	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B436	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B437	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B438	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B439	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B440	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B441	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B442	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B443	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B444	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B445	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B446	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B447	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B448	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B449	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B450	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B451	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B452	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B453	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B454	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B455	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B456	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B457	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B458	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B459	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B460	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B461	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B462	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B463	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B464	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B465	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B466	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B467	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B468	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B469	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B470	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B471	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B472	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B473	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B474	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B475	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B476	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B477	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B478	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B479	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B480	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B481	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B482	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B483	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B484	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B485	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B486	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B487	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B488	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B489	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B490	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B491	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B492	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B493	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B494	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B495	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B496	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B497	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00

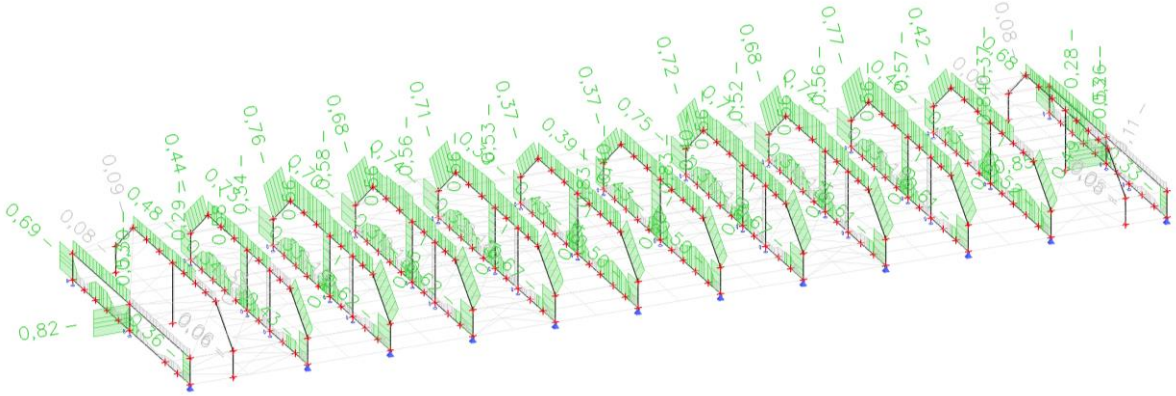
Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B498	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B499	0,463	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B500	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B501	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B502	0,467	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B503	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B504	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B505	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B506	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B507	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B508	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B509	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B510	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B511	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B512	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B513	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B514	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B515	0,511	GSN9/2	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B516	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B517	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B518	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B519	0,000	GSN6/5	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B520	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B521	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B522	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,02**	0,02	0,00
B523	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B524	0,000	GSN11/3	CS5 - RRK50/50/3	S 235	**0,02**	0,01	0,02
B525	0,000	GSN11/3	CS5 - RRK50/50/3	S 235	**0,02**	0,01	0,02
B526	0,000	GSN6/5	CS5 - RRK50/50/3	S 235	**0,04**	0,04	0,00
B527	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B528	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B529	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B530	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,54**	0,36	0,54
B531	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,40**	0,24	0,40
B532	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,28**	0,17	0,28
B533	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,24**	0,12	0,24
B534	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,33**	0,17	0,33
B535	0,000	GSN8/4	CS5 - RRK50/50/3	S 235	**0,68**	0,37	0,68
B536	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,88**	0,58	0,88
B537	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B538	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B539	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B540	0,000	GSN13/11	CS5 - RRK50/50/3	S 235	**0,02**	0,01	0,02
B541	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B542	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B543	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B544	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B545	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B546	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B547	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B548	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B549	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B550	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B551	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B552	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B553	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B554	0,534	GSN13/11	CS5 - RRK50/50/3	S 235	**0,02**	0,01	0,02
B555	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B556	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B557	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B558	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B559	0,000	GSN11/3	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,01
B560	0,000	GSN11/3	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,01
B561	0,000	GSN6/5	CS5 - RRK50/50/3	S 235	**0,04**	0,04	0,00
B562	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B563	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B564	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B565	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,54**	0,36	0,54
B566	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,40**	0,24	0,40
B567	0,000	GSN8/4	CS5 - RRK50/50/3	S 235	**0,28**	0,17	0,28
B568	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,23**	0,12	0,23
B569	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,32**	0,17	0,32

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B570	0,000	GSN8/4	CS5 - RRK50/50/3	S 235	**0,68**	0,37	0,68
B571	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,88**	0,58	0,88
B572	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B573	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B574	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B575	0,000	GSN6/5	CS5 - RRK50/50/3	S 235	**0,03**	0,03	0,00
B576	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B577	0,000	GSN12/8	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B578	0,000	GSN15/10	CS5 - RRK50/50/3	S 235	**0,01**	0,01	0,00
B579	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,19**	0,07	0,19
B580	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,11**	0,11	0,00
B581	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,00
B582	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,06**	0,06	0,00
B583	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,09**	0,09	0,00
B584	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,23**	0,09	0,23
B585	0,000	GSN15/10	CS1 - RRK60/60/4	S 235	**0,00**	0,00	0,00
B586	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,00
B587	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,19**	0,07	0,19
B588	0,000	GSN9/2	CS1 - RRK60/60/4	S 235	**0,07**	0,07	0,00
B589	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,07**	0,07	0,00
B590	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,00
B591	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,11**	0,11	0,00
B592	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,22**	0,09	0,22
B593	1,229	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B594	1,226	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B595	1,260	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B596	1,309	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B597	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B598	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B599	1,309	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B600	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B601	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,04**	0,04	0,00
B602	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B603	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B604	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,04**	0,04	0,00
B605	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B606	1,309	GSN8/4	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B607	1,309	GSN1/1	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B608	1,309	GSN6/5	CS1 - RRK60/60/4	S 235	**0,02**	0,02	0,00
B609	1,309	GSN9/2	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B610	0,000	GSN1/1	CS1 - RRK60/60/4	S 235	**0,01**	0,01	0,00
B611	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,07**	0,02	0,07
B612	2,000+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,45**	0,31	0,45
B613	2,000+	GSN9/2	CS10 - RRK140/80/4	S 355	**0,30**	0,30	0,00
B614	2,000-	GSN9/2	CS10 - RRK140/80/4	S 355	**0,41**	0,28	0,41
B615	2,800	GSN8/4	CS11 - HEA240	S 355	**0,40**	0,36	0,40
B616	2,800	GSN8/4	CS3 - HEA200	S 355	**0,65**	0,53	0,65
B617	2,800	GSN9/2	CS11 - HEA240	S 355	**0,49**	0,43	0,49
B618	2,800	GSN8/4	CS3 - HEA200	S 355	**0,61**	0,53	0,61
B619	2,800	GSN8/4	CS3 - HEA200	S 355	**0,64**	0,57	0,64
B620	2,800	GSN8/4	CS11 - HEA240	S 355	**0,50**	0,42	0,50
B621	2,800	GSN8/4	CS11 - HEA240	S 355	**0,50**	0,42	0,50
B622	2,800	GSN8/4	CS3 - HEA200	S 355	**0,64**	0,57	0,64
B623	2,800	GSN8/4	CS3 - HEA200	S 355	**0,59**	0,52	0,59
B624	2,800	GSN8/4	CS3 - HEA200	S 355	**0,63**	0,52	0,63
B625	2,800	GSN9/2	CS11 - HEA240	S 355	**0,44**	0,40	0,44
B626	2,800	GSN9/2	CS3 - HEA200	S 355	**0,76**	0,61	0,76
B627	2,800	GSN9/2	CS3 - HEA200	S 355	**0,68**	0,60	0,68
B628	2,800	GSN9/2	CS3 - HEA200	S 355	**0,71**	0,63	0,71
B629	2,800	GSN9/2	CS11 - HEA240	S 355	**0,37**	0,31	0,37
B630	2,800	GSN9/2	CS11 - HEA240	S 355	**0,37**	0,32	0,37
B631	2,800	GSN9/2	CS3 - HEA200	S 355	**0,72**	0,63	0,72
B632	2,800	GSN9/2	CS3 - HEA200	S 355	**0,68**	0,60	0,68
B633	2,800	GSN9/2	CS3 - HEA200	S 355	**0,77**	0,62	0,77
B634	2,800	GSN8/4	CS11 - HEA240	S 355	**0,42**	0,38	0,42
B635	1,000	GSN9/2	CS3 - HEA200	S 355	**0,78**	0,11	0,78
B636	1,000	GSN9/2	CS3 - HEA200	S 355	**0,83**	0,12	0,83
B637	1,400	GSN1/1	CS3 - HEA200	S 355	**0,06**	0,06	0,00
B638	0,000	GSN9/2	CS3 - HEA200	S 355	**0,12**	0,12	0,00
B639	5,255-	GSN9/2	CS3 - HEA200	S 355	**0,29**	0,21	0,29
B640	0,000	GSN9/2	CS3 - HEA200	S 355	**0,09**	0,09	0,00
B641	1,400	GSN10/6	CS3 - HEA200	S 355	**0,08**	0,08	0,00

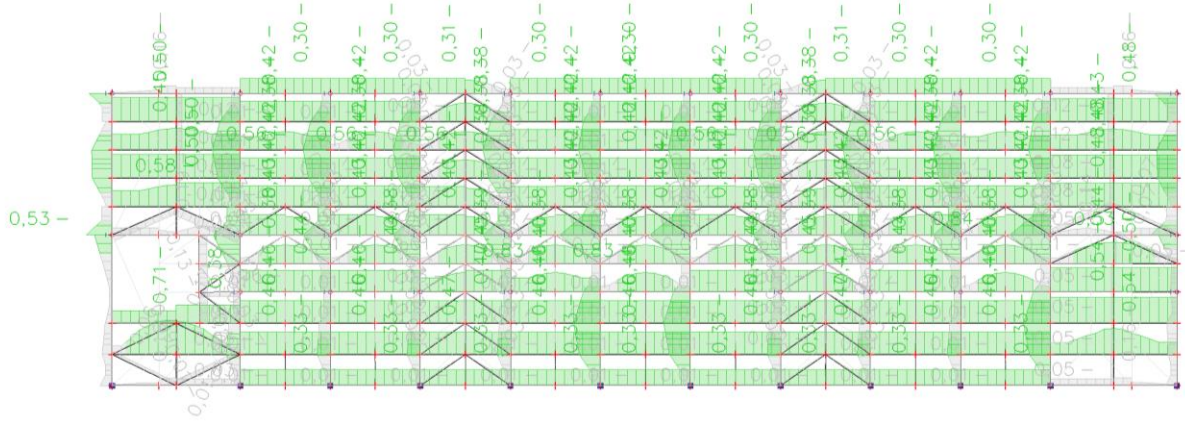
Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B642	2,000+	GSN8/4	CS8 - HEA140	S 355	**0,11**	0,11	0,00
B643	2,000+	GSN8/4	CS8 - HEA140	S 355	**0,10**	0,10	0,00
B644	3,624	GSN9/2	CS3 - HEA200	S 355	**0,13**	0,06	0,13
B645	3,624	GSN9/2	CS3 - HEA200	S 355	**0,11**	0,06	0,11
B646	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,58**	0,38	0,58
B647	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,57**	0,38	0,57
B648	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,62**	0,38	0,62
B649	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,62**	0,37	0,62
B650	0,000	GSN8/4	CS5 - RRK50/50/3	S 235	**0,53**	0,28	0,53
B651	0,000	GSN8/4	CS5 - RRK50/50/3	S 235	**0,86**	0,46	0,86
B652	0,000	GSN8/4	CS5 - RRK50/50/3	S 235	**0,87**	0,47	0,87
B653	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,62**	0,24	0,62
B654	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,06**	0,06	0,00
B655	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,16**	0,06	0,16
B656	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,12**	0,12	0,00
B657	3,441	GSN1/1	CS7 - RRK100/100/4	S 235	**0,05**	0,05	0,00
B658	3,441	GSN9/2	CS7 - RRK100/100/4	S 235	**0,52**	0,27	0,52
B659	2,441	GSN1/1	CS7 - RRK100/100/4	S 235	**0,08**	0,08	0,00
B660	2,441	GSN9/2	CS7 - RRK100/100/4	S 235	**0,19**	0,13	0,19
B661	0,000	GSN8/4	CS7 - RRK100/100/4	S 235	**0,56**	0,29	0,56
B662	0,000	GSN1/1	CS7 - RRK100/100/4	S 235	**0,03**	0,03	0,00
B663	0,000	GSN6/5	CS7 - RRK100/100/4	S 235	**0,18**	0,12	0,18
B664	0,000	GSN1/1	CS7 - RRK100/100/4	S 235	**0,06**	0,06	0,00
B665	0,000	GSN10/6	CS5 - RRK50/50/3	S 235	**0,12**	0,07	0,12
B666	0,000	GSN10/6	CS5 - RRK50/50/3	S 235	**0,12**	0,07	0,12
B667	0,000	GSN10/6	CS5 - RRK50/50/3	S 235	**0,08**	0,06	0,08
B668	0,000	GSN10/6	CS5 - RRK50/50/3	S 235	**0,07**	0,06	0,07
B669	0,000	GSN10/6	CS5 - RRK50/50/3	S 235	**0,02**	0,01	0,02
B670	0,000	GSN1/1	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B671	0,000	GSN1/1	CS5 - RRK50/50/3	S 235	**0,03**	0,02	0,03
B672	0,000	GSN1/1	CS1 - RRK60/60/4	S 235	**0,06**	0,02	0,06
B673	0,000	GSN1/1	CS1 - RRK60/60/4	S 235	**0,09**	0,02	0,09
B674	0,000	GSN1/1	CS1 - RRK60/60/4	S 235	**0,01**	0,01	0,00
B675	0,000	GSN1/1	CS1 - RRK60/60/4	S 235	**0,01**	0,01	0,00
B676	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,17**	0,04	0,17
B677	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,13**	0,03	0,13
B678	3,000	GSN8/4	CS3 - HEA200	S 355	**0,75**	0,11	0,75
B679	1,400	GSN10/6	CS3 - HEA200	S 355	**0,08**	0,08	0,00
B680	0,000	GSN3/9	CS3 - HEA200	S 355	**0,08**	0,08	0,00
B681	5,255-	GSN8/4	CS3 - HEA200	S 355	**0,28**	0,20	0,27
B682	0,000	GSN3/9	CS3 - HEA200	S 355	**0,11**	0,11	0,00
B683	1,400	GSN1/1	CS3 - HEA200	S 355	**0,06**	0,06	0,00
B684	3,561	GSN9/2	CS3 - HEA200	S 355	**0,11**	0,06	0,11
B685	3,561	GSN9/2	CS3 - HEA200	S 355	**0,12**	0,06	0,12
B686	3,441	GSN1/1	CS7 - RRK100/100/4	S 235	**0,03**	0,03	0,00
B687	3,441	GSN8/4	CS7 - RRK100/100/4	S 235	**0,55**	0,29	0,55
B688	0,000	GSN9/2	CS8 - HEA140	S 355	**0,06**	0,06	0,00
B689	2,441	GSN1/1	CS7 - RRK100/100/4	S 235	**0,06**	0,06	0,00
B690	2,441	GSN6/5	CS7 - RRK100/100/4	S 235	**0,17**	0,12	0,17
B691	0,000	GSN8/4	CS8 - HEA140	S 355	**0,07**	0,07	0,00
B692	0,000	GSN9/2	CS7 - RRK100/100/4	S 235	**0,47**	0,24	0,47
B693	0,000	GSN1/1	CS7 - RRK100/100/4	S 235	**0,04**	0,04	0,00
B694	0,000	GSN1/1	CS7 - RRK100/100/4	S 235	**0,17**	0,12	0,17
B695	0,000	GSN1/1	CS7 - RRK100/100/4	S 235	**0,08**	0,08	0,00
B696	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,58**	0,38	0,58
B697	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,57**	0,38	0,57
B698	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,62**	0,37	0,62
B699	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,62**	0,37	0,62
B700	0,000	GSN9/2	CS5 - RRK50/50/3	S 235	**0,54**	0,29	0,54
B701	0,000	GSN8/4	CS5 - RRK50/50/3	S 235	**0,86**	0,47	0,86
B702	0,000	GSN8/4	CS5 - RRK50/50/3	S 235	**0,87**	0,47	0,87
B703	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,03**	0,03	0,00
B704	0,000	GSN6/5	CS1 - RRK60/60/4	S 235	**0,55**	0,22	0,55
B705	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,08**	0,08	0,00
B706	0,000	GSN10/6	CS1 - RRK60/60/4	S 235	**0,12**	0,05	0,12
B707	0,000	GSN3/9	CS13 - HEA180	S 355	**0,54**	0,04	0,54
B708	0,000	GSN9/2	CS13 - HEA180	S 355	**0,56**	0,05	0,56
B709	3,200	GSN8/4	CS9 - RRK120/120/4	S 235	**0,06**	0,06	0,00
B710	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,52**	0,52	0,00
B711	3,200	GSN8/4	CS9 - RRK120/120/4	S 235	**0,05**	0,05	0,00
B712	0,000	GSN8/4	CS1 - RRK60/60/4	S 235	**0,52**	0,52	0,00
B713	5,623	GSN8/4	CS7 - RRK100/100/4	S 235	**0,67**	0,18	0,67

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B714	0,000	GSN9/2	CS7 - RRK100/100/4	S 235	**0,53**	0,13	0,53
B715	5,974	GSN9/2	CS7 - RRK100/100/4	S 235	**0,59**	0,15	0,59
B716	0,000	GSN6/5	CS7 - RRK100/100/4	S 235	**0,62**	0,17	0,62

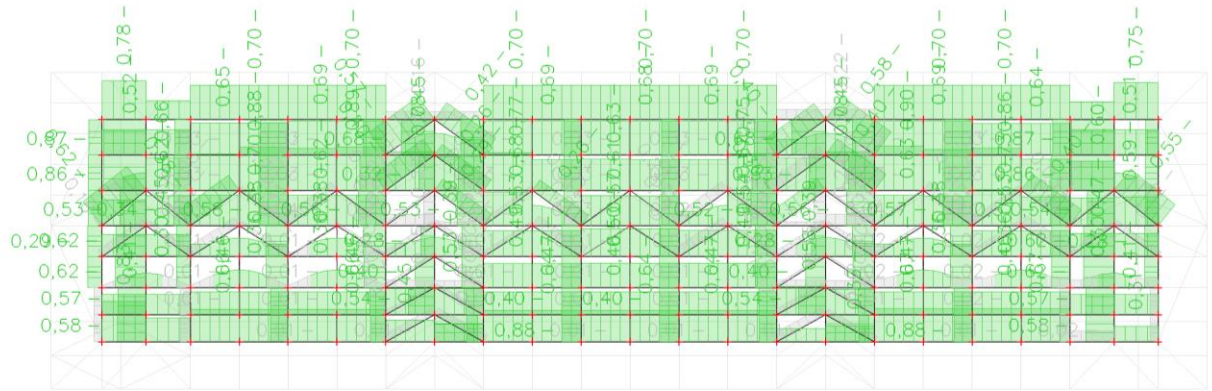
Glavni okviri



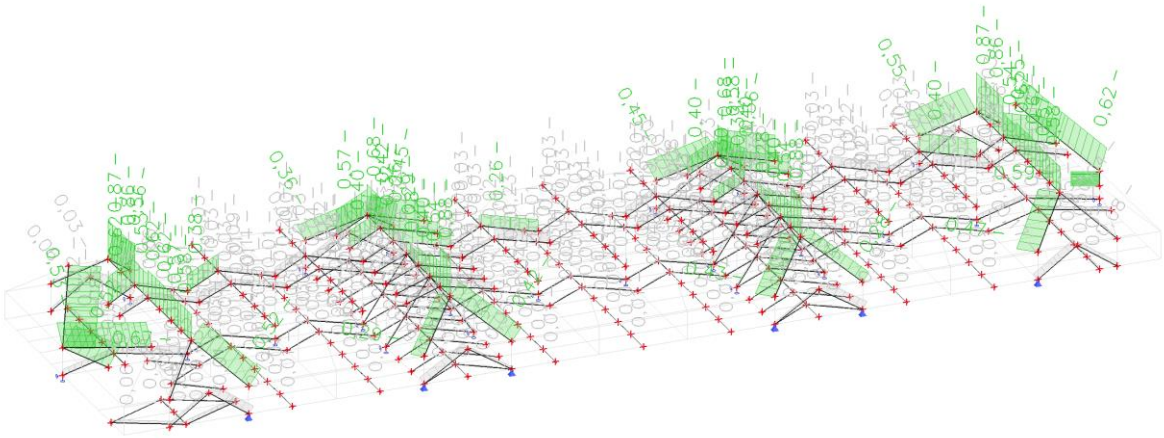
Pozicija 100



Pozicija 200



Stabilizacija



Dimenzioniranje poprečnog presjeka HEA 200

EN 1993-1-1 Code Check
National annex: Standard EN

Member B636	**1,000 / 4,000 m**	**HEA200**	**S 355**	**Anvelopa GSN**	**0,83 -**

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC5 + 0.90*LC8

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	355,0	MPa
Ultimate strength	f_u	490,0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 1,000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-93,87	kN
Shear force	$V_{y,Ed}$	-2,50	kN
Shear force	$V_{z,Ed}$	4,61	kN
Torsion	T_{Ed}	0,00	kNm
Bending moment	$M_{y,Ed}$	18,34	kNm
Bending moment	$M_{z,Ed}$	-2,61	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	79	10	-2,312e+04	-7,747e+03								
3	SO	79	10	-3,142e+04	-4,680e+04								
4	I	134	7	-1,585e+04	5,071e+04	-0,31		0,65	20,62	39,66	46,98	56,77	1
5	SO	79	10	5,799e+04	4,261e+04	0,73	0,54	1,00	7,88	7,32	8,14	12,53	2
7	SO	79	10	6,629e+04	8,166e+04	0,81	0,45	1,00	7,88	7,32	8,14	11,41	2

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 2

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	5,3800e-03	m^2
Compression resistance	$N_{c,Rd}$	1909,90	kN
Unity check		0,05	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	4,2917e-04	m^3
Plastic bending moment	$M_{pl,y,Rd}$	152,35	kNm
Unity check		0,12	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	2,0375e-04	m^3
Plastic bending moment	$M_{pl,z,Rd}$	72,33	kNm
Unity check		0,04	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	4,1592e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	852,48	kN
Unity check		0,00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	1,8050e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	369,95	kN
Unity check		0,01	-

Combined Shear and Torsion check for V_y and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_y and T_{Ed}	$V_{pl,T,y,Rd}$	852,33	kN
Unity check		0,00	-

Combined Shear and Torsion check for V_z and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_z and T_{Ed}	$V_{pl,T,z,Rd}$	369,89	kN
Unity check		0,01	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Plastic bending moment	$M_{pl,y,Rd}$	152,35	kNm
Exponent of bending ratio y	α	2,00	
Plastic bending moment	$M_{pl,z,Rd}$	72,33	kNm
Exponent of bending ratio z	β	1,00	

Unity check (6.41) = 0,01 + 0,04 = 0,05 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.
Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 1,500 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	79	10	-1,863e+04	3,982e+03	-4,68	1,83	0,18	7,88	41,59	46,21	23,11	1
3	SO	79	10	-3,084e+04	-5,346e+04								
4	I	134	7	-1,396e+04	4,883e+04	-0,29		0,65	20,62	39,66	46,98	55,83	1
5	SO	79	10	5,350e+04	3,088e+04	0,58	0,63	1,00	7,88	7,32	8,14	13,56	2
7	SO	79	10	6,571e+04	8,832e+04	0,74	0,45	1,00	7,88	7,32	8,14	11,49	2

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 2

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	2,000	2,000	m
Buckling factor	k	10,00	1,00	
Buckling length	l_{cr}	20,000	1,998	m
Critical Euler load	N_{cr}	191,20	6959,74	kN
Slenderness	λ	241,49	40,03	
Relative slenderness	λ_{rel}	3,16	0,52	
Limit slenderness	$\lambda_{rel,0}$	0,20	0,20	
Buckling curve		b	c	
Imperfection	α	0,34	0,49	
Reduction factor	χ	0,09	0,83	
Buckling resistance	$N_{b,Rd}$	156,49	1440,34	kN

Flexural Buckling verification			
Cross-section area	A	5,3800e-03	m²
Buckling resistance	$N_{b,Rd}$	156,49	kN
Unity check		0,60	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	4,2917e-04	m³
Elastic critical moment	M_{cr}	776,46	kNm
Relative slenderness	$\lambda_{rel,LT}$	0,44	
Limit slenderness	$\lambda_{rel,LT,0}$	0,40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	2,000	m
Influence of load position		no influence	
Correction factor	k	1,00	
Correction factor	k_w	1,00	
LTB moment factor	C_1	1,11	
LTB moment factor	C_2	0,32	
LTB moment factor	C_3	0,53	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 1	
Cross-section area	A	5,3800e-03	m^2
Plastic section modulus	$W_{pl,y}$	4,2917e-04	m^3
Plastic section modulus	$W_{pl,z}$	2,0375e-04	m^3
Design compression force	N_{Ed}	93,87	kN
Design bending moment (maximum)	$M_{y,Ed}$	18,34	kNm
Design bending moment (maximum)	$M_{z,Ed}$	-5,02	kNm
Characteristic compression resistance	N_{Rk}	1909,90	kN
Characteristic moment resistance	$M_{y,Rk}$	152,35	kNm
Characteristic moment resistance	$M_{z,Rk}$	72,33	kNm
Reduction factor	χ_y	0,09	
Reduction factor	χ_z	0,83	
Modified reduction factor	$\chi_{LT,mod}$	1,00	
Interaction factor	k_{yy}	1,31	
Interaction factor	k_{yz}	0,70	
Interaction factor	k_{zy}	2,34	
Interaction factor	k_{zz}	1,51	

Maximum moment $M_{y,Ed}$ is derived from beam B636 position 1,000 m.
Maximum moment $M_{z,Ed}$ is derived from beam B636 position 2,000 m.

Interaction method 1 parameters			
Critical Euler load	$N_{cr,y}$	191,20	kN
Critical Euler load	$N_{cr,z}$	6959,74	kN
Elastic critical load	$N_{cr,T}$	7537,79	kN
Plastic section modulus	$W_{pl,y}$	4,2917e-04	m^3
Elastic section modulus	$W_{el,y}$	3,8900e-04	m^3
Plastic section modulus	$W_{pl,z}$	2,0375e-04	m^3
Elastic section modulus	$W_{el,z}$	1,3400e-04	m^3
Second moment of area	I_y	3,6900e-05	m^4
Second moment of area	I_z	1,3400e-05	m^4
Torsional constant	I_t	1,9610e-07	m^4
Method for equivalent moment factor $C_{my,0}$		Table A.2 Line 2 (General)	
Design bending moment (maximum)	$M_{y,Ed}$	18,34	kNm
Maximum relative deflection	δ_z	-1,2	mm
Equivalent moment factor	$C_{my,0}$	1,11	
Method for equivalent moment factor $C_{mz,0}$		Table A.2 Line 2 (General)	
Design bending moment (maximum)	$M_{z,Ed}$	-5,02	kNm
Maximum relative deflection	δ_y	0,5	mm
Equivalent moment factor	$C_{mz,0}$	1,00	
Factor	μ_y	0,53	
Factor	μ_z	1,00	
Factor	ε_y	2,70	
Factor	a_{LT}	0,99	
Critical moment for uniform bending	$M_{cr,0}$	699,51	kNm
Relative slenderness	$\lambda_{rel,0}$	0,47	
Limit relative slenderness	$\lambda_{rel,0,lim}$	0,21	
Equivalent moment factor	C_{my}	1,04	
Equivalent moment factor	C_{mz}	1,00	
Equivalent moment factor	C_{mLT}	1,09	
Factor	b_{LT}	0,00	
Factor	c_{LT}	0,05	
Factor	d_{LT}	0,04	
Factor	e_{LT}	0,52	
Factor	w_y	1,10	
Factor	w_z	1,50	
Factor	n_{pl}	0,05	
Maximum relative slenderness	$\lambda_{rel,max}$	3,16	
Factor	C_{yy}	0,91	
Factor	C_{yz}	0,54	
Factor	C_{zy}	0,49	
Factor	C_{zz}	0,66	

Unity check (6.61) = 0,60 + 0,17 + 0,05 = 0,83 -
Unity check (6.62) = 0,07 + 0,31 + 0,12 = 0,49 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	4,000	m
Web		unstiffened	
Web height	h_w	170	mm
Web thickness	t	7	mm
Material coefficient	ε	0,81	
Shear correction factor	η	1,20	

Shear Buckling verification		
Web slenderness	h_w/t	26,15
Web slenderness limit		48,82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka HEA 180

EN 1993-1-1 Code Check
National annex: Standard EN

Member B38	0,000 / 1,400 m	HEA180	S 355	Anvelopa GSN	0,85 -

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC5 + 0.90*LC6

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	355,0	MPa
Ultimate strength	f_u	490,0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0,000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-173,22	kN
Shear force	$V_{y,Ed}$	26,78	kN
Shear force	$V_{z,Ed}$	5,18	kN
Torsion	T_{Ed}	0,00	kNm
Bending moment	$M_{y,Ed}$	0,01	kNm
Bending moment	$M_{z,Ed}$	-25,44	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	72	10	8,778e+04	2,859e+05	0,31	0,51	1,00	7,58	7,32	8,14	12,23	2
3	SO	72	10	-1,128e+04	-2,094e+05								
4	I	122	6	3,826e+04	3,829e+04	1,00		1,00	20,33	22,78	27,66	30,93	1
5	SO	72	10	-1,124e+04	-2,094e+05								
7	SO	72	10	8,782e+04	2,859e+05	0,31	0,51	1,00	7,58	7,32	8,14	12,23	2

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 2

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	4,5300e-03	m^2
Compression resistance	$N_{c,Rd}$	1608,15	kN
Unity check		0,11	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	3,2500e-04	m^3
Plastic bending moment	$M_{pl,y,Rd}$	115,38	kNm
Unity check		0,00	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	1,5667e-04	m^3
Plastic bending moment	$M_{pl,z,Rd}$	55,62	kNm
Unity check		0,46	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	3,5460e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	726,79	kN
Unity check		0,04	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	1,4520e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	297,60	kN
Unity check		0,02	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	0,1	MPa
Elastic shear resistance	τ_{Rd}	205,0	MPa
Unity check		0,00	-

Note: The unity check for torsion is lower than the limit value of 0,05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Design plastic moment resistance reduced due to N_{Ed}	$M_{N,y,Rd}$	115,38	kNm
Exponent of bending ratio y	α	2,00	
Plastic bending moment	$M_{pl,z,Rd}$	55,62	kNm
Exponent of bending ratio z	β	1,00	

Unity check (6.41) = 0,00 + 0,46 = 0,46 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0,000 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	72	10	8,778e+04	2,859e+05	0,31	0,51	1,00	7,58	7,32	8,14	12,23	2
3	SO	72	10	-1,128e+04	-2,094e+05								
4	I	122	6	3,826e+04	3,829e+04	1,00		1,00	20,33	22,78	27,66	30,93	1
5	SO	72	10	-1,124e+04	-2,094e+05								
7	SO	72	10	8,782e+04	2,859e+05	0,31	0,51	1,00	7,58	7,32	8,14	12,23	2

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 2

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	1,400	1,400	m
Buckling factor	k	8,69	0,55	
Buckling length	l_{cr}	12,169	0,774	m
Critical Euler load	N_{cr}	351,33	31997,05	kN
Slenderness	λ	163,47	17,13	
Relative slenderness	λ_{rel}	2,14	0,22	
Limit slenderness	$\lambda_{rel,0}$	0,20	0,20	
Buckling curve		b	c	
Imperfection	α	0,34	0,49	
Reduction factor	χ	0,19	0,99	
Buckling resistance	$N_{b,Rd}$	271,38	1443,95	kN

Flexural Buckling verification			
Cross-section area	A	4,5300e-03	m²
Buckling resistance	$N_{b,Rd}$	271,38	kN
Unity check		0,64	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	3,2500e-04	m³
Elastic critical moment	M_{cr}	1331,03	kNm
Relative slenderness	$\lambda_{rel,LT}$	0,29	
Limit slenderness	$\lambda_{rel,LT,0}$	0,40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	1,400	m
Influence of load position		no influence	
Correction factor	k	1,00	
Correction factor	k_w	1,00	
LTB moment factor	C_1	1,55	
LTB moment factor	C_2	0,06	
LTB moment factor	C_3	1,00	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 1	
Cross-section area	A	4,5300e-03	m^2
Plastic section modulus	$W_{pl,y}$	3,2500e-04	m^3
Plastic section modulus	$W_{pl,z}$	1,5667e-04	m^3
Design compression force	N_{Ed}	173,22	kN
Design bending moment (maximum)	$M_{y,Ed}$	5,10	kNm
Design bending moment (maximum)	$M_{z,Ed}$	-25,44	kNm
Characteristic compression resistance	N_{Rk}	1608,15	kN
Characteristic moment resistance	$M_{y,Rk}$	115,38	kNm
Characteristic moment resistance	$M_{z,Rk}$	55,62	kNm
Reduction factor	χ_y	0,19	
Reduction factor	χ_z	0,99	
Modified reduction factor	$\chi_{LT,mod}$	1,00	
Interaction factor	k_{yy}	1,11	
Interaction factor	k_{yz}	0,31	
Interaction factor	k_{zy}	1,62	
Interaction factor	k_{zz}	0,77	

Maximum moment $M_{y,Ed}$ is derived from beam B38 position 1,400 m.
Maximum moment $M_{z,Ed}$ is derived from beam B38 position 0,000 m.

Interaction method 1 parameters			
Critical Euler load	$N_{cr,y}$	351,33	kN
Critical Euler load	$N_{cr,z}$	31997,05	kN
Elastic critical load	$N_{cr,T}$	9973,16	kN
Plastic section modulus	$W_{pl,y}$	3,2500e-04	m^3
Elastic section modulus	$W_{el,y}$	2,9400e-04	m^3
Plastic section modulus	$W_{pl,z}$	1,5667e-04	m^3
Elastic section modulus	$W_{el,z}$	1,0300e-04	m^3
Second moment of area	I_y	2,5100e-05	m^4
Second moment of area	I_z	9,2500e-06	m^4
Torsional constant	I_t	1,4800e-07	m^4
Method for equivalent moment factor $C_{my,0}$		Table A.2 Line 2 (General)	
Design bending moment (maximum)	$M_{y,Ed}$	5,10	kNm
Maximum relative deflection	δ_z	-0,1	mm
Equivalent moment factor	$C_{my,0}$	0,88	
Method for equivalent moment factor $C_{mz,0}$		Table A.2 Line 1 (Linear)	
Ratio of end moments	ψ_z	-0,47	
Equivalent moment factor	$C_{mz,0}$	0,69	
Factor	μ_y	0,56	
Factor	μ_z	1,00	
Factor	ε_y	0,45	
Factor	a_{LT}	0,99	
Critical moment for uniform bending	$M_{cr,0}$	860,07	kNm
Relative slenderness	$\lambda_{rel,0}$	0,37	
Limit relative slenderness	$\lambda_{rel,0,lim}$	0,25	
Equivalent moment factor	C_{my}	0,93	
Equivalent moment factor	C_{mz}	0,69	
Equivalent moment factor	C_{mLT}	1,00	
Factor	b_{LT}	0,00	
Factor	c_{LT}	0,01	
Factor	d_{LT}	0,22	
Factor	e_{LT}	0,29	
Factor	w_y	1,11	
Factor	w_z	1,50	
Factor	n_{pl}	0,12	
Maximum relative slenderness	$\lambda_{rel,max}$	2,14	
Factor	C_{yy}	0,92	
Factor	C_{yz}	0,87	
Factor	C_{zy}	0,58	
Factor	C_{zz}	0,90	

Unity check (6.61) = 0,64 + 0,05 + 0,16 = 0,85 -
Unity check (6.62) = 0,12 + 0,08 + 0,39 = 0,59 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	1,400	m
Web		unstiffened	
Web height	h_w	152	mm
Web thickness	t	6	mm
Material coefficient	ε	0,81	
Shear correction factor	η	1,20	

Shear Buckling verification		
Web slenderness	h_w/t	25,33
Web slenderness limit		48,82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka HEA 220

EN 1993-1-1 Code Check
National annex: Standard EN

Member B5	7,400 / 14,350 m	HEA220	S 355	Anvelopa GSN	0,53 -

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC3

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	355,0	MPa
Ultimate strength	f_u	490,0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 7,400 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	73,76	kN
Shear force	$V_{y,Ed}$	0,04	kN
Shear force	$V_{z,Ed}$	90,60	kN
Torsion	T_{Ed}	0,00	kNm
Bending moment	$M_{y,Ed}$	-107,30	kNm
Bending moment	$M_{z,Ed}$	-0,02	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	89	11	1,859e+05	1,860e+05	1,00	0,43	1,00	8,05	7,32	8,14	11,20	2
3	SO	89	11	1,858e+05	1,857e+05	1,00	0,43	1,00	8,05	7,32	8,14	11,22	2
4	I	152	7	1,393e+05	-1,622e+05	-1,16		0,40	21,71	72,79	83,92	117,84	1
5	SO	89	11	-2,088e+05	-2,089e+05								
7	SO	89	11	-2,088e+05	-2,087e+05								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 2

Tension check
According to EN 1993-1-1 article 6.2.3 and formula (6.5)

Cross-section area	A	6,4300e-03	m^2
Plastic tension resistance	$N_{pl,Rd}$	2282,65	kN
Ultimate tension resistance	$N_{u,Rd}$	2268,50	kN
Tension resistance	$N_{t,Rd}$	2268,50	kN
Unity check		0,03	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	5,6667e-04	m^3
Plastic bending moment	$M_{pl,y,Rd}$	201,17	kNm
Unity check		0,53	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	2,7042e-04	m^3
Plastic bending moment	$M_{pl,z,Rd}$	96,00	kNm
Unity check		0,00	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	5,0150e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	1027,87	kN
Unity check		0,00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	2,0630e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	422,83	kN
Unity check		0,21	-

Torsion check
According to EN 1993-1-1 article 6.2.7 and formula (6.23)

Index of fibre	Fibre	2	
Total torsional moment	τ_{Ed}	0,1	MPa
Elastic shear resistance	τ_{Rd}	205,0	MPa
Unity check		0,00	-

Note: The unity check for torsion is lower than the limit value of 0,05. Therefore torsion is considered as insignificant and is ignored in the combined checks.

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Plastic bending moment	$M_{pl,y,Rd}$	201,17	kNm
Exponent of bending ratio y	α	2,00	
Plastic bending moment	$M_{pl,z,Rd}$	96,00	kNm
Exponent of bending ratio z	β	1,00	

Unity check (6.41) = 0,28 + 0,00 = 0,28 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.
Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 7,400 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	89	11	1,859e+05	1,860e+05	1,00	0,43	1,00	8,05	7,32	8,14	11,20	2
3	SO	89	11	1,858e+05	1,857e+05	1,00	0,43	1,00	8,05	7,32	8,14	11,22	2
4	I	152	7	1,393e+05	-1,622e+05	-1,16		0,40	21,71	72,79	83,92	117,84	1
5	SO	89	11	-2,088e+05	-2,089e+05								
7	SO	89	11	-2,088e+05	-2,087e+05								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 2

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	5,6667e-04	m^3
Elastic critical moment	M_{cr}	4295,57	kNm
Relative slenderness	$\lambda_{rel,LT}$	0,22	
Limit slenderness	$\lambda_{rel,LT,0}$	0,40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	1,390	m
Influence of load position		no influence	
Correction factor	k	1,00	
Correction factor	k_w	1,00	
LTB moment factor	C_1	1,95	
LTB moment factor	C_2	0,00	
LTB moment factor	C_3	1,00	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.
Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	14,350	m
Web		unstiffened	
Web height	h_w	188	mm
Web thickness	t	7	mm
Material coefficient	ε	0,81	
Shear correction factor	η	1,20	

Shear Buckling verification		
Web slenderness	h_w/t	26,86
Web slenderness limit		48,82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka HEA 240

EN 1993-1-1 Code Check
National annex: Standard EN

Member B32	**0,000 / 1,400 m**	**HEA240**	**S 355**	**Anvelopa GSN**	**0,52 -**

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC5 + 0.90*LC8

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	355,0	MPa
Ultimate strength	f_u	490,0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 0,000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-160,84	kN
Shear force	$V_{y,Ed}$	-0,07	kN
Shear force	$V_{z,Ed}$	82,54	kN
Torsion	T_{Ed}	-0,05	kNm
Bending moment	$M_{y,Ed}$	0,00	kNm
Bending moment	$M_{z,Ed}$	0,00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	95	12	2,093e+04	2,093e+04	1,00	0,43	1,00	7,94	7,32	8,14	11,39	2
3	SO	95	12	2,093e+04	2,093e+04	1,00	0,43	1,00	7,94	7,32	8,14	11,39	2
4	I	164	8	2,093e+04	2,093e+04	1,00		1,00	21,87	22,78	27,66	30,92	1
5	SO	95	12	2,093e+04	2,093e+04	1,00	0,43	1,00	7,94	7,32	8,14	11,39	2
7	SO	95	12	2,093e+04	2,093e+04	1,00	0,43	1,00	7,94	7,32	8,14	11,39	2

Note: The Classification limits have been set according to Semi-Comp+.The cross-section is classified as Class 2

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	7,6800e-03	m²
Compression resistance	$N_{c,Rd}$	2726,40	kN
Unity check		0,06	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	5,9737e-03	m²
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	1224,38	kN
Unity check		0,00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	2,5140e-03	m²
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	515,27	kN
Unity check		0,16	-

Combined Shear and Torsion check for V_y and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_y and T_{Ed}	$V_{pl,T,y,Rd}$	1219,00	kN
Unity check		0,00	-

Combined Shear and Torsion check for V_z and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_z and T_{Ed}	$V_{pl,T,z,Rd}$	513,01	kN
Unity check		0,16	-

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 1,400 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	95	12	-1,403e+05	-1,400e+05								
3	SO	95	12	-1,405e+05	-1,408e+05								
4	I	164	8	-1,005e+05	1,420e+05	-0,71		0,68	21,87	37,20	44,22	75,86	1
5	SO	95	12	1,819e+05	1,815e+05	1,00	0,43	1,00	7,94	7,32	8,14	11,23	2
7	SO	95	12	1,820e+05	1,824e+05	1,00	0,43	1,00	7,94	7,32	8,14	11,21	2

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 2

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	1,400	1,400	m
Buckling factor	k	2,00	1,00	
Buckling length	l_{cr}	2,800	1,397	m
Critical Euler load	N_{cr}	20514,68	29420,83	kN
Slenderness	λ	27,86	23,26	
Relative slenderness	λ_{rel}	0,36	0,30	
Limit slenderness	$\lambda_{rel,0}$	0,20	0,20	

Note: The slenderness or compression force is such that Flexural Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Torsional buckling length	l_{cr}	1,400	m
Elastic critical load	$N_{cr,T}$	27100,11	kN
Relative slenderness	$\lambda_{rel,T}$	0,32	
Limit slenderness	$\lambda_{rel,0}$	0,20	

Note: The slenderness or compression force is such that Torsional(-Flexural) Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 1	
Cross-section area	A	7,6800e-03	m^2
Plastic section modulus	$W_{pl,y}$	7,4583e-04	m^3
Plastic section modulus	$W_{pl,z}$	3,5167e-04	m^3

Bending and axial compression check parameters			
Design compression force	N_{Ed}	160,84	kN
Design bending moment (maximum)	$M_{y,Ed}$	114,81	kNm
Design bending moment (maximum)	$M_{z,Ed}$	-0,10	kNm
Characteristic compression resistance	N_{Rk}	2726,40	kN
Characteristic moment resistance	$M_{y,Rk}$	264,77	kNm
Characteristic moment resistance	$M_{z,Rk}$	124,84	kNm
Reduction factor	χ_y	1,00	
Reduction factor	χ_z	1,00	
Modified reduction factor	$\chi_{LT,mod}$	1,00	
Interaction factor	k_{yy}	0,94	
Interaction factor	k_{yz}	0,54	
Interaction factor	k_{zy}	0,49	
Interaction factor	k_{zz}	0,80	

Maximum moment $M_{y,Ed}$ is derived from beam B32 position 1,400 m.
Maximum moment $M_{z,Ed}$ is derived from beam B32 position 1,400 m.

Interaction method 1 parameters			
Critical Euler load	$N_{cr,y}$	20514,68	kN
Critical Euler load	$N_{cr,z}$	29420,83	kN
Elastic critical load	$N_{cr,T}$	27100,11	kN
Plastic section modulus	$W_{pl,y}$	7,4583e-04	m^3
Elastic section modulus	$W_{el,y}$	6,7500e-04	m^3
Plastic section modulus	$W_{pl,z}$	3,5167e-04	m^3
Elastic section modulus	$W_{el,z}$	2,3100e-04	m^3
Second moment of area	I_y	7,7600e-05	m^4
Second moment of area	I_z	2,7700e-05	m^4
Torsional constant	I_t	3,9611e-07	m^4
Method for equivalent moment factor $C_{my,0}$		Table A.2 Line 1 (Linear)	
Ratio of end moments	ψ_y	0,00	
Equivalent moment factor	$C_{my,0}$	0,79	
Method for equivalent moment factor $C_{mz,0}$		Table A.2 Line 1 (Linear)	
Ratio of end moments	ψ_z	0,00	
Equivalent moment factor	$C_{mz,0}$	0,79	
Factor	μ_y	1,00	
Factor	μ_z	1,00	
Factor	ε_y	8,12	
Factor	a_{LT}	0,99	
Critical moment for uniform bending	$M_{cr,0}$	3299,06	kNm
Relative slenderness	$\lambda_{rel,0}$	0,28	
Limit relative slenderness	$\lambda_{rel,0,lim}$	0,27	
Equivalent moment factor	C_{my}	0,95	
Equivalent moment factor	C_{mz}	0,79	
Equivalent moment factor	C_{mLT}	1,00	
Factor	b_{LT}	0,00	
Factor	c_{LT}	0,07	
Factor	d_{LT}	0,00	
Factor	e_{LT}	2,02	
Factor	w_y	1,10	
Factor	w_z	1,50	
Factor	n_{pl}	0,06	
Maximum relative slenderness	$\lambda_{rel,max}$	0,36	
Factor	C_{yy}	1,01	
Factor	C_{yz}	1,02	
Factor	C_{zy}	1,01	
Factor	C_{zz}	0,99	

Unity check (6.61) = 0,06 + 0,45 + 0,00 = 0,52 -
Unity check (6.62) = 0,06 + 0,23 + 0,00 = 0,30 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	1,400	m
Web		unstiffened	
Web height	h_w	206	mm
Web thickness	t	8	mm
Material coefficient	ε	0,81	
Shear correction factor	η	1,20	

Shear Buckling verification		
Web slenderness	h_w/t	27,47
Web slenderness limit		48,82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka RRK120/120/4

EN 1993-1-1 Code Check
National annex: Standard EN

Member B33	0,000 / 3,200 m	RRK120/120/4	S 235	Anvelopa GSN	0,43 -

Note: EN 1993-1-3 article 1.1(3) specifies that this part does not apply to cold formed CHS and RHS sections.
The default EN 1993-1-1 code check is executed instead of the EN 1993-1-3 code check.

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC5 + 0.90*LC6

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	235,0	MPa
Ultimate strength	f_u	360,0	MPa
Fabrication		Cold formed	

...::SECTION CHECK::...

The critical check is on position 0,000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-119,32	kN
Shear force	$V_{y,Ed}$	0,00	kN
Shear force	$V_{z,Ed}$	0,00	kN
Torsion	T_{Ed}	-0,17	kNm
Bending moment	$M_{y,Ed}$	0,00	kNm
Bending moment	$M_{z,Ed}$	0,00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	108	4	6,576e+04	6,576e+04	1,00		1,00	27,00	28,00	34,00	38,00	1
3	I	108	4	6,576e+04	6,576e+04	1,00		1,00	27,00	28,00	34,00	38,00	1
5	I	108	4	6,576e+04	6,576e+04	1,00		1,00	27,00	28,00	34,00	38,00	1
7	I	108	4	6,576e+04	6,576e+04	1,00		1,00	27,00	28,00	34,00	38,00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	1,8150e-03	m^2
Compression resistance	$N_{c,Rd}$	426,52	kN
Unity check		0,28	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.1(5) and formula (6.1)

Elastic verification			
Fibre		10	
Normal stress due to the normal force N	$\sigma_{N,Ed}$	65,7	MPa
Normal stress due to the bending moment M_y	$\sigma_{My,Ed}$	0,0	MPa
Normal stress due to the bending moment M_z	$\sigma_{Mz,Ed}$	0,0	MPa
Total longitudinal stress	$\sigma_{tot,Ed}$	65,7	MPa
Shear stress due to the transverse shear force V_y	$\tau_{Vy,Ed}$	0,0	MPa
Shear stress due to the transverse shear force V_z	$\tau_{Vz,Ed}$	0,0	MPa
Shear stress due to uniform (St. Venant) torsion	$\tau_{t,Ed}$	1,6	MPa
Total shear stress	$\tau_{tot,Ed}$	1,6	MPa
Summation of von Mises stress	$\sigma_{von\ Mises,Ed}$	65,8	MPa
Unity check		0,28	-

Note: Since there is no shear force, the effect of the torsional moment cannot be accounted for in the plastic interaction. Therefore the elastic yield criterion according to EN 1993-1-1 article 6.2.1(5) is verified.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0,000 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	108	4	6,576e+04	6,576e+04	1,00		1,00	27,00	28,00	34,00	38,00	1
3	I	108	4	6,576e+04	6,576e+04	1,00		1,00	27,00	28,00	34,00	38,00	1
5	I	108	4	6,576e+04	6,576e+04	1,00		1,00	27,00	28,00	34,00	38,00	1
7	I	108	4	6,576e+04	6,576e+04	1,00		1,00	27,00	28,00	34,00	38,00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	3,200	3,200	m
Buckling factor	k	1,00	1,00	
Buckling length	l_{cr}	3,200	3,200	m
Critical Euler load	N_{cr}	813,66	813,70	kN
Slenderness	λ	67,99	67,99	
Relative slenderness	λ_{rel}	0,72	0,72	
Limit slenderness	$\lambda_{rel,0}$	0,20	0,20	
Buckling curve		c	c	
Imperfection	α	0,49	0,49	
Reduction factor	χ	0,71	0,71	
Buckling resistance	$N_{b,Rd}$	275,21	275,22	kN

Flexural Buckling verification			
Cross-section area	A	1,8150e-03	m^2
Buckling resistance	$N_{b,Rd}$	275,21	kN
Unity check		0,43	-

Torsional(-Flexural) Buckling check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: The cross-section concerns a RHS section which is not susceptible to Torsional(-Flexural) Buckling.

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka HEA 280

EN 1993-1-1 Code Check
National annex: Standard EN

Member B35	7,400 / 14,350 m	HEA280	S 355	Anvelopa GSN	0,84 -

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC3

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	355,0	MPa
Ultimate strength	f_u	490,0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 7,400 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	43,15	kN
Shear force	$V_{y,Ed}$	0,12	kN
Shear force	$V_{z,Ed}$	195,75	kN
Torsion	T_{Ed}	0,00	kNm
Bending moment	$M_{y,Ed}$	-326,78	kNm
Bending moment	$M_{z,Ed}$	-0,22	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	112	13	3,027e+05	3,032e+05	1,00	0,43	1,00	8,62	7,32	8,14	11,21	3
3	SO	112	13	3,025e+05	3,020e+05	1,00	0,43	1,00	8,62	7,32	8,14	11,23	3
4	I	196	8	2,297e+05	-2,386e+05	-1,04		0,46	24,50	63,50	73,21	104,80	1
5	SO	112	13	-3,116e+05	-3,121e+05								
7	SO	112	13	-3,113e+05	-3,108e+05								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 3

Semi-Comp+ properties			
Material coefficient	ε	0,81	
Flange class 2 slenderness limit	$\beta_{2,y,f}$	8,14	
Flange class 3 slenderness limit	$\beta_{3,y,f}$	11,39	
Web class 2 slenderness limit	$\beta_{2,y,w}$	67,53	
Web class 3 slenderness limit	$\beta_{3,y,w}$	100,89	
Flange class 2 slenderness limit	$\beta_{2,z,f}$	8,14	
Flange class 3 slenderness limit	$\beta_{3,z,f}$	13,02	
Web slenderness ratio	c/t_w	24,50	
Flange slenderness ratio	c/t_f	8,62	
Reference slenderness ratio	$c/t_{ref,y}$	0,15	
Reference slenderness ratio	$c/t_{ref,z}$	0,10	
Interpolated section modulus	$W_{3,y}$	1,0974e-03	m^3
Interpolated section modulus	$W_{3,z}$	4,9932e-04	m^3

Note: The resistance for this semi-compact section has been calculated according to Semi-Comp+.

Tension check
According to EN 1993-1-1 article 6.2.3 and formula (6.5)

Cross-section area	A	9,7300e-03	m^2
Plastic tension resistance	$N_{pl,Rd}$	3454,15	kN
Ultimate tension resistance	$N_{u,Rd}$	3432,74	kN
Tension resistance	$N_{t,Rd}$	3432,74	kN
Unity check		0,01	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Interpolated section modulus	$W_{3,y}$	1,0974e-03	m^3
Interpolated bending resistance	$M_{3,y,Rd}$	389,58	kNm
Unity check		0,84	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Interpolated section modulus	$W_{3,z}$	4,9932e-04	m^3
Interpolated bending resistance	$M_{3,z,Rd}$	177,26	kNm
Unity check		0,00	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	7,5360e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	1544,57	kN
Unity check		0,00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	3,1780e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	651,36	kN
Unity check		0,30	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Interpolated moment resistance reduced due to N_{Ed}	$M_{N,3,y,Rd}$	384,71	kNm
Exponent of bending ratio y	α	2,00	
Interpolated moment resistance reduced due to N_{Ed}	$M_{N,3,z,Rd}$	177,23	kNm
Exponent of bending ratio z	β	1,00	

Unity check (6.41) = 0,72 + 0,00 = 0,72 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 7,400 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	112	13	3,027e+05	3,032e+05	1,00	0,43	1,00	8,62	7,32	8,14	11,21	3
3	SO	112	13	3,025e+05	3,020e+05	1,00	0,43	1,00	8,62	7,32	8,14	11,23	3
4	I	196	8	2,297e+05	-2,386e+05	-1,04		0,46	24,50	63,50	73,21	104,80	1
5	SO	112	13	-3,116e+05	-3,121e+05								
7	SO	112	13	-3,113e+05	-3,108e+05								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 3

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Interpolated section modulus	$W_{3,y}$	1,0974e-03	m^3
Elastic critical moment	M_{cr}	10684,33	kNm
Relative slenderness	$\lambda_{rel,LT}$	0,19	
Limit slenderness	$\lambda_{rel,LT,0}$	0,40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	1,390	m
Influence of load position		no influence	
Correction factor	k	1,00	
Correction factor	k_w	1,00	
LTB moment factor	C_1	1,60	
LTB moment factor	C_2	0,00	
LTB moment factor	C_3	1,00	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	14,350	m
Web		unstiffened	
Web height	h_w	244	mm
Web thickness	t	8	mm
Material coefficient	ε	0,81	
Shear correction factor	η	1,20	

Shear Buckling verification		
Web slenderness	h_w/t	30,50
Web slenderness limit		48,82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka HEA 140

EN 1993-1-1 Code Check
National annex: Standard EN

Member B106	2,213 / 4,425 m	HEA140	S 355	Anvelopa GSN	0,39 -

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC4 + 0.90*LC6

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	355,0	MPa
Ultimate strength	f_u	490,0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 2,213 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	2,88	kN
Shear force	$V_{y,Ed}$	0,00	kN
Shear force	$V_{z,Ed}$	0,00	kN
Torsion	T_{Ed}	0,00	kNm
Bending moment	$M_{y,Ed}$	14,62	kNm
Bending moment	$M_{z,Ed}$	1,07	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	55	9	-9,304e+04	-1,082e+05								
3	SO	55	9	-8,492e+04	-6,973e+04								
4	I	92	6	-6,599e+04	6,416e+04	-1,03		0,49	16,73	59,54	68,63	103,78	1
5	SO	55	9	9,120e+04	1,064e+05	0,86	0,44	1,00	6,50	7,32	8,14	11,35	1
7	SO	55	9	8,309e+04	6,790e+04	0,82	0,50	1,00	6,50	7,32	8,14	12,08	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Tension check
According to EN 1993-1-1 article 6.2.3 and formula (6.5)

Cross-section area	A	3,1400e-03	m^2
Plastic tension resistance	$N_{pl,Rd}$	1114,70	kN
Ultimate tension resistance	$N_{u,Rd}$	1107,79	kN
Tension resistance	$N_{t,Rd}$	1107,79	kN
Unity check		0,00	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	1,7333e-04	m^3
Plastic bending moment	$M_{pl,y,Rd}$	61,53	kNm
Unity check		0,24	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	8,5000e-05	m^3
Plastic bending moment	$M_{pl,z,Rd}$	30,18	kNm
Unity check		0,04	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Plastic bending moment	$M_{pl,y,Rd}$	61,53	kNm
Exponent of bending ratio y	α	2,00	
Plastic bending moment	$M_{pl,z,Rd}$	30,18	kNm
Exponent of bending ratio z	β	1,00	

Unity check (6.41) = 0,06 + 0,04 = 0,09 -

Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 2,213 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	55	9	-9,304e+04	-1,082e+05								
3	SO	55	9	-8,492e+04	-6,973e+04								
4	I	92	6	-6,599e+04	6,416e+04	-1,03		0,49	16,73	59,54	68,63	103,78	1
5	SO	55	9	9,120e+04	1,064e+05	0,86	0,44	1,00	6,50	7,32	8,14	11,35	1
7	SO	55	9	8,309e+04	6,790e+04	0,82	0,50	1,00	6,50	7,32	8,14	12,08	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	1,7333e-04	m^3
Elastic critical moment	M_{cr}	63,91	kNm
Relative slenderness	$\lambda_{rel,LT}$	0,98	
Limit slenderness	$\lambda_{rel,LT,0}$	0,40	
LTB curve		b	
Imperfection	α_{LT}	0,34	
LTB factor	β	0,75	
Reduction factor	χ_{LT}	0,71	
Correction factor	k_c	0,94	
Correction factor	f	0,97	
Modified reduction factor	$\chi_{LT,mod}$	0,73	
Design buckling resistance	$M_{b,Rd}$	40,89	kNm
Unity check		0,36	-

Mcr parameters			
LTB length	l_{LT}	4,425	m
Influence of load position		no influence	
Correction factor	k	1,00	
Correction factor	k_w	1,00	
LTB moment factor	C_1	1,13	
LTB moment factor	C_2	0,45	
LTB moment factor	C_3	0,53	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.
Note: The correction factor k_c is determined from C_1.

Bending and axial tension check
According to EN 1993-1-3 article 6.3

Normal force	N_{Ed}	2,88	kN
Bending moment	$M_{y,Ed}$	14,62	kNm
Bending moment	$M_{z,Ed}$	1,07	kNm
Tension resistance	$N_{t,Rd}$	1107,79	kN
Bending resistance	$M_{b,y,Rd}$	40,89	kNm
Bending resistance	$M_{c,z,Rd,com}$	30,18	kNm

Unity check = 0,36 + 0,04 - 0,00 = 0,39 -

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka HEA 160

EN 1993-1-1 Code Check
National annex: Standard EN

Member B201	**2,213 / 4,425 m**	**HEA160**	**S 355**	**Anvelopa GSN**	**0,47 -**

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC3

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	355,0	MPa
Ultimate strength	f_u	490,0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 2,213 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-0,85	kN
Shear force	$V_{y,Ed}$	0,00	kN
Shear force	$V_{z,Ed}$	0,16	kN
Torsion	T_{Ed}	0,00	kNm
Bending moment	$M_{y,Ed}$	36,81	kNm
Bending moment	$M_{z,Ed}$	0,00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	62	9	-1,571e+05	-1,571e+05								
3	SO	62	9	-1,571e+05	-1,571e+05								
4	I	104	6	-1,142e+05	1,146e+05	-1,00		0,50	17,33	58,23	67,16	100,60	1
5	SO	62	9	1,575e+05	1,575e+05	1,00	0,43	1,00	6,89	7,32	8,14	11,20	1
7	SO	62	9	1,575e+05	1,575e+05	1,00	0,43	1,00	6,89	7,32	8,14	11,22	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	3,8800e-03	m^2
Compression resistance	$N_{c,Rd}$	1377,40	kN
Unity check		0,00	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	2,4500e-04	m^3
Plastic bending moment	$M_{pl,y,Rd}$	86,98	kNm
Unity check		0,42	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	1,1750e-04	m^3
Plastic bending moment	$M_{pl,z,Rd}$	41,71	kNm
Unity check		0,00	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	3,0060e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	616,11	kN
Unity check		0,00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	1,3240e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	271,37	kN
Unity check		0,00	-

Combined Shear and Torsion check for V_y and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_y and T_{Ed}	$V_{pl,T,y,Rd}$	615,49	kN
Unity check		0,00	-

Combined Shear and Torsion check for V_z and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_z and T_{Ed}	$V_{pl,T,z,Rd}$	271,09	kN
Unity check		0,00	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Plastic bending moment	$M_{pl,y,Rd}$	86,98	kNm
Exponent of bending ratio y	α	2,00	
Plastic bending moment	$M_{pl,z,Rd}$	41,71	kNm
Exponent of bending ratio z	β	1,00	

Unity check (6.41) = 0,18 + 0,00 = 0,18 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.
Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 2,213 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	62	9	-1,571e+05	-1,571e+05								
3	SO	62	9	-1,571e+05	-1,571e+05								
4	I	104	6	-1,142e+05	1,146e+05	-1,00		0,50	17,33	58,23	67,16	100,60	1
5	SO	62	9	1,575e+05	1,575e+05	1,00	0,43	1,00	6,89	7,32	8,14	11,20	1
7	SO	62	9	1,575e+05	1,575e+05	1,00	0,43	1,00	6,89	7,32	8,14	11,22	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	4,425	2,213	m
Buckling factor	k	1,00	0,76	
Buckling length	l_{cr}	4,425	1,678	m
Critical Euler load	N_{cr}	1767,70	4536,53	kN
Slenderness	λ	67,45	42,10	
Relative slenderness	λ_{rel}	0,88	0,55	
Limit slenderness	$\lambda_{rel,0}$	0,20	0,20	

Note: The slenderness or compression force is such that Flexural Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: For this I-section the Torsional(-Flexural) buckling resistance is higher than the resistance for Flexural buckling. Therefore Torsional(-Flexural) buckling is not printed on the output.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Plastic section modulus	$W_{pl,y}$	2,4500e-04	m^3
Elastic critical moment	M_{cr}	320,87	kNm
Relative slenderness	$\lambda_{rel,LT}$	0,52	
Limit slenderness	$\lambda_{rel,LT,0}$	0,40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	2,213	m
Influence of load position		no influence	
Correction factor	k	1,00	
Correction factor	k_w	1,00	
LTB moment factor	C_1	1,34	
LTB moment factor	C_2	0,12	
LTB moment factor	C_3	1,00	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 1	
Cross-section area	A	3,8800e-03	m^2
Plastic section modulus	$W_{pl,y}$	2,4500e-04	m^3
Plastic section modulus	$W_{pl,z}$	1,1750e-04	m^3
Design compression force	N_{Ed}	0,85	kN
Design bending moment (maximum)	$M_{y,Ed}$	36,81	kNm
Design bending moment (maximum)	$M_{z,Ed}$	0,00	kNm
Characteristic compression resistance	N_{Rk}	1377,40	kN
Characteristic moment resistance	$M_{y,Rk}$	86,98	kNm
Characteristic moment resistance	$M_{z,Rk}$	41,71	kNm
Reduction factor	χ_y	1,00	
Reduction factor	χ_z	1,00	
Modified reduction factor	$\chi_{LT,mod}$	1,00	
Interaction factor	k_{yy}	1,00	
Interaction factor	k_{yz}	0,65	
Interaction factor	k_{zy}	0,52	
Interaction factor	k_{zz}	0,79	

Maximum moment $M_{y,Ed}$ is derived from beam B201 position 2,213 m.
Maximum moment $M_{z,Ed}$ is derived from beam B201 position 2,213 m.

Interaction method 1 parameters			
Critical Euler load	$N_{cr,y}$	1767,70	kN
Critical Euler load	$N_{cr,z}$	4536,53	kN
Elastic critical load	$N_{cr,T}$	3755,58	kN
Plastic section modulus	$W_{pl,y}$	2,4500e-04	m^3
Elastic section modulus	$W_{el,y}$	2,2000e-04	m^3
Plastic section modulus	$W_{pl,z}$	1,1750e-04	m^3
Elastic section modulus	$W_{el,z}$	7,7000e-05	m^3
Second moment of area	I_y	1,6700e-05	m^4
Second moment of area	I_z	6,1600e-06	m^4
Torsional constant	I_t	1,1372e-07	m^4
Method for equivalent moment factor $C_{my,0}$		Table A.2 Line 4 (Line load)	
Equivalent moment factor	$C_{my,0}$	1,00	
Method for equivalent moment factor $C_{mz,0}$		Table A.2 Line 1 (Linear)	
Ratio of end moments	ψ_z	0,00	
Equivalent moment factor	$C_{mz,0}$	0,79	
Factor	μ_y	1,00	
Factor	μ_z	1,00	
Factor	ε_y	760,72	
Factor	a_{LT}	0,99	
Critical moment for uniform bending	$M_{cr,0}$	240,23	kNm
Relative slenderness	$\lambda_{rel,0}$	0,60	
Limit relative slenderness	$\lambda_{rel,0,lim}$	0,23	
Equivalent moment factor	C_{my}	1,00	
Equivalent moment factor	C_{mz}	0,79	
Equivalent moment factor	C_{mLT}	1,00	
Factor	b_{LT}	0,00	
Factor	c_{LT}	0,30	
Factor	d_{LT}	0,00	
Factor	e_{LT}	2,24	
Factor	w_y	1,11	
Factor	w_z	1,50	
Factor	n_{pl}	0,00	
Maximum relative slenderness	$\lambda_{rel,max}$	0,88	
Factor	C_{yy}	1,00	
Factor	C_{yz}	0,85	
Factor	C_{zy}	1,00	
Factor	C_{zz}	1,00	

Unity check (6.61) = 0,00 + 0,47 + 0,00 = 0,47 -
Unity check (6.62) = 0,00 + 0,24 + 0,00 = 0,24 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	4,425	m
Web		unstiffened	
Web height	h_w	134	mm
Web thickness	t	6	mm
Material coefficient	ε	0,81	
Shear correction factor	η	1,20	

Shear Buckling verification		
Web slenderness	h_w/t	22,33
Web slenderness limit		48,82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka HEA 260

EN 1993-1-1 Code Check
National annex: Standard EN

Member B69	7,400 / 14,350 m	HEA260	S 355	Anvelopa GSN	0,83 -

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC3

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	355,0	MPa
Ultimate strength	f_u	490,0	MPa
Fabrication		Rolled	

...::SECTION CHECK::...

The critical check is on position 7,400 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	33,27	kN
Shear force	$V_{y,Ed}$	-0,01	kN
Shear force	$V_{z,Ed}$	-169,46	kN
Torsion	T_{Ed}	-0,01	kNm
Bending moment	$M_{y,Ed}$	-271,21	kNm
Bending moment	$M_{z,Ed}$	0,00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	102	13	3,041e+05	3,041e+05	1,00	0,43	1,00	8,18	7,32	8,14	11,22	3
3	SO	102	13	3,041e+05	3,041e+05	1,00	0,43	1,00	8,18	7,32	8,14	11,20	3
4	I	177	8	2,257e+05	-2,334e+05	-1,03		0,46	23,60	63,03	72,66	104,33	1
5	SO	102	13	-3,118e+05	-3,118e+05								
7	SO	102	13	-3,118e+05	-3,118e+05								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 3

Semi-Comp+ properties			
Material coefficient	ε	0,81	
Flange class 2 slenderness limit	$\beta_{2,y,f}$	8,14	
Flange class 3 slenderness limit	$\beta_{3,y,f}$	11,39	
Web class 2 slenderness limit	$\beta_{2,y,w}$	67,53	
Web class 3 slenderness limit	$\beta_{3,y,w}$	100,89	
Flange class 2 slenderness limit	$\beta_{2,z,f}$	8,14	
Flange class 3 slenderness limit	$\beta_{3,z,f}$	13,02	
Web slenderness ratio	c/t_w	23,60	
Flange slenderness ratio	c/t_f	8,18	
Reference slenderness ratio	$c/t_{ref,y}$	0,01	
Reference slenderness ratio	$c/t_{ref,z}$	0,01	
Interpolated section modulus	$W_{3,y}$	9,1969e-04	m^3
Interpolated section modulus	$W_{3,z}$	4,2785e-04	m^3

Note: The resistance for this semi-compact section has been calculated according to Semi-Comp+.

Tension check
According to EN 1993-1-1 article 6.2.3 and formula (6.5)

Cross-section area	A	8,6800e-03	m^2
Plastic tension resistance	$N_{pl,Rd}$	3081,40	kN
Ultimate tension resistance	$N_{u,Rd}$	3062,30	kN
Tension resistance	$N_{t,Rd}$	3062,30	kN
Unity check		0,01	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Interpolated section modulus	$W_{3,y}$	9,1969e-04	m^3
Interpolated bending resistance	$M_{3,y,Rd}$	326,49	kNm
Unity check		0,83	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Interpolated section modulus	$W_{3,z}$	4,2785e-04	m^3
Interpolated bending resistance	$M_{3,z,Rd}$	151,89	kNm
Unity check		0,00	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	6,7363e-03	m^2
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	1380,66	kN
Unity check		0,00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	2,8737e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	589,00	kN
Unity check		0,29	-

Combined Shear and Torsion check for V_y and $T_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_y and T_{Ed}	$V_{pl,T,y,Rd}$	1379,54	kN
Unity check		0,00	-

Combined Shear and Torsion check for V_z and $T_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.26)

Plastic shear resistance for V_z and T_{Ed}	$V_{pl,T,z,Rd}$	588,53	kN
Unity check		0,29	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Interpolated moment resistance reduced due to N_{Ed}	$M_{N,3,y,Rd}$	322,96	kNm
Exponent of bending ratio y	α	2,00	
Interpolated moment resistance reduced due to N_{Ed}	$M_{N,3,z,Rd}$	151,87	kNm
Exponent of bending ratio z	β	1,00	

Unity check (6.41) = 0,71 + 0,00 = 0,71 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 7,400 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	102	13	3,041e+05	3,041e+05	1,00	0,43	1,00	8,18	7,32	8,14	11,22	3
3	SO	102	13	3,041e+05	3,041e+05	1,00	0,43	1,00	8,18	7,32	8,14	11,20	3
4	I	177	8	2,257e+05	-2,334e+05	-1,03		0,46	23,60	63,03	72,66	104,33	1
5	SO	102	13	-3,118e+05	-3,118e+05								
7	SO	102	13	-3,118e+05	-3,118e+05								

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 3

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.3 and formula (6.54)

LTB parameters			
Method for LTB curve		Alternative case	
Interpolated section modulus	$W_{3,y}$	9,1969e-04	m^3
Elastic critical moment	M_{cr}	7741,57	kNm
Relative slenderness	$\lambda_{rel,LT}$	0,21	
Limit slenderness	$\lambda_{rel,LT,0}$	0,40	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters			
LTB length	l_{LT}	1,400	m
Influence of load position		no influence	
Correction factor	k	1,00	
Correction factor	k_w	1,00	
LTB moment factor	C_1	1,64	
LTB moment factor	C_2	0,00	
LTB moment factor	C_3	1,00	
Shear centre distance	d_z	0	mm
Distance of load application	z_g	0	mm
Mono-symmetry constant	β_y	0	mm
Mono-symmetry constant	z_j	0	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters			
Buckling field length	a	14,350	m
Web		unstiffened	
Web height	h_w	225	mm
Web thickness	t	8	mm
Material coefficient	ε	0,81	
Shear correction factor	η	1,20	

Shear Buckling verification		
Web slenderness	h_w/t	30,00
Web slenderness limit		48,82

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka RRK100/100/4

EN 1993-1-1 Code Check
National annex: Standard EN

Member B713	5,623 / 5,623 m	RRK100/100/4	S 235	Anvelopa GSN	0,67 -

Note: EN 1993-1-3 article 1.1(3) specifies that this part does not apply to cold formed CHS and RHS sections.
The default EN 1993-1-1 code check is executed instead of the EN 1993-1-3 code check.

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC5 + 0.90*LC6

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	235,0	MPa
Ultimate strength	f_u	360,0	MPa
Fabrication		Cold formed	

...::SECTION CHECK::...

The critical check is on position 5,623 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-64,15	kN
Shear force	$V_{y,Ed}$	0,00	kN
Shear force	$V_{z,Ed}$	0,00	kN
Torsion	T_{Ed}	0,00	kNm
Bending moment	$M_{y,Ed}$	0,00	kNm
Bending moment	$M_{z,Ed}$	0,00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	88	4	4,292e+04	4,292e+04	1,00		1,00	22,00	28,00	34,00	38,00	1
3	I	88	4	4,292e+04	4,292e+04	1,00		1,00	22,00	28,00	34,00	38,00	1
5	I	88	4	4,292e+04	4,292e+04	1,00		1,00	22,00	28,00	34,00	38,00	1
7	I	88	4	4,292e+04	4,292e+04	1,00		1,00	22,00	28,00	34,00	38,00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	1,4950e-03	m^2
Compression resistance	$N_{c,Rd}$	351,32	kN
Unity check		0,18	-

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 5,623 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	88	4	4,292e+04	4,292e+04	1,00		1,00	22,00	28,00	34,00	38,00	1
3	I	88	4	4,292e+04	4,292e+04	1,00		1,00	22,00	28,00	34,00	38,00	1
5	I	88	4	4,292e+04	4,292e+04	1,00		1,00	22,00	28,00	34,00	38,00	1
7	I	88	4	4,292e+04	4,292e+04	1,00		1,00	22,00	28,00	34,00	38,00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	5,623	5,623	m
Buckling factor	k	1,00	1,00	
Buckling length	l_{cr}	5,623	5,623	m
Critical Euler load	N_{cr}	148,15	148,16	kN
Slenderness	λ	144,62	144,61	
Relative slenderness	λ_{rel}	1,54	1,54	
Limit slenderness	$\lambda_{rel,0}$	0,20	0,20	
Buckling curve		c	c	
Imperfection	α	0,49	0,49	
Reduction factor	χ	0,30	0,30	
Buckling resistance	$N_{b,Rd}$	96,44	96,44	kN

Flexural Buckling verification			
Cross-section area	A	1,4950e-03	m^2
Buckling resistance	$N_{b,Rd}$	96,44	kN
Unity check		0,67	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: The cross-section concerns a RHS section which is not susceptible to Torsional(-Flexural) Buckling.

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka RRK140/80/4

EN 1993-1-1 Code Check
National annex: Standard EN

Member B259	**2,212 / 4,425 m**	**RRK140/80/4**	**S 355**	**Anvelopa GSN**	**0,90 -**

Note: EN 1993-1-3 article 1.1(3) specifies that this part does not apply to cold formed CHS and RHS sections.
The default EN 1993-1-1 code check is executed instead of the EN 1993-1-3 code check.

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC5 + 0.90*LC6

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	355,0	MPa
Ultimate strength	f_u	490,0	MPa
Fabrication		Cold formed	

...::SECTION CHECK::...

The critical check is on position 2,212 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-61,82	kN
Shear force	$V_{y,Ed}$	-0,01	kN
Shear force	$V_{z,Ed}$	0,17	kN
Torsion	T_{Ed}	-0,02	kNm
Bending moment	$M_{y,Ed}$	11,96	kNm
Bending moment	$M_{z,Ed}$	-0,02	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	68	4	-1,516e+05	-1,524e+05								
3	I	128	4	-1,413e+05	2,152e+05	-0,66		0,60	32,00	44,19	52,00	72,72	1
5	I	68	4	2,264e+05	2,271e+05	1,00		1,00	17,00	22,78	27,66	30,95	1
7	I	128	4	2,160e+05	-1,405e+05	-0,65		0,61	32,00	43,94	51,72	72,34	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	1,6550e-03	m²
Compression resistance	$N_{c,Rd}$	587,52	kN
Unity check		0,11	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,y}$	7,5500e-05	m³
Plastic bending moment	$M_{pl,y,Rd}$	26,80	kNm
Unity check		0,45	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Plastic section modulus	$W_{pl,z}$	5,1300e-05	m³
Plastic bending moment	$M_{pl,z,Rd}$	18,21	kNm
Unity check		0,00	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	6,0182e-04	m²
Plastic shear resistance for V_y	$V_{pl,y,Rd}$	123,35	kN
Unity check		0,00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	1,0532e-03	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	215,86	kN
Unity check		0,00	-

Combined Shear and Torsion check for V_y and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.28)

Plastic shear resistance for V_y and T_{Ed}	$V_{pl,T,y,Rd}$	123,23	kN
Unity check		0,00	-

Combined Shear and Torsion check for V_z and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.28)

Plastic shear resistance for V_z and T_{Ed}	$V_{pl,T,z,Rd}$	215,65	kN
Unity check		0,00	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Design plastic moment resistance reduced due to N_{Ed}	$M_{N,y,Rd}$	26,80	kNm
Exponent of bending ratio y	α	1,68	
Design plastic moment resistance reduced due to N_{Ed}	$M_{N,z,Rd}$	18,21	kNm
Exponent of bending ratio z	β	1,68	

Unity check (6.41) = 0,26 + 0,00 = 0,26 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0,000 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	68	4	3,736e+04	3,736e+04	1,00		1,00	17,00	22,78	27,66	30,92	1
3	I	128	4	3,736e+04	3,736e+04	1,00		1,00	32,00	22,78	27,66	30,92	4
5	I	68	4	3,736e+04	3,736e+04	1,00		1,00	17,00	22,78	27,66	30,92	1
7	I	128	4	3,736e+04	3,736e+04	1,00		1,00	32,00	22,78	27,66	30,92	4

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 4

Effective section N-
Effective width calculation
According to EN 1993-1-5 article 4.4

Id	Type	b_p [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	λ_p [-]	ρ [-]	b_e [mm]	b_{e1} [mm]	b_{e2} [mm]
1	I	68	3,550e+05	3,550e+05	1,00	4,00	0,37	1,00	68	34	34
3	I	128	3,550e+05	3,550e+05	1,00	4,00	0,69	0,99	126	63	63
5	I	68	3,550e+05	3,550e+05	1,00	4,00	0,37	1,00	68	34	34
7	I	128	3,550e+05	3,550e+05	1,00	4,00	0,69	0,99	126	63	63

Effective section My+
Effective width calculation
According to EN 1993-1-5 article 4.4

Id	Type	b_p [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	λ_p [-]	ρ [-]	b_e [mm]	b_{e1} [mm]	b_{e2} [mm]
1	I	68	-3,550e+05	-3,550e+05							
3	I	128	3,341e+05	-3,341e+05	-1,00	23,90	0,28	1,00	64	26	38
5	I	68	3,550e+05	3,550e+05	1,00	4,00	0,37	1,00	68	34	34
7	I	128	3,341e+05	-3,341e+05	-1,00	23,90	0,28	1,00	64	26	38

Effective section Mz-
Effective width calculation
According to EN 1993-1-5 article 4.4

Id	Type	b_p [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	ψ [-]	k_σ [-]	λ_p [-]	ρ [-]	b_e [mm]	b_{e1} [mm]	b_{e2} [mm]
1	I	68	3,178e+05	-3,146e+05	-0,99	23,62	0,15	1,00	34	14	21
3	I	128	-3,518e+05	-3,518e+05							
5	I	68	3,178e+05	-3,146e+05	-0,99	23,62	0,15	1,00	34	14	21
7	I	128	3,550e+05	3,550e+05	1,00	4,00	0,69	0,99	126	63	63

Effective properties						
Effective area	A_{eff}	1,6396e-03	m²			
Effective second moment of area	$I_{eff,y}$	4,2951e-06	m⁴	$I_{eff,z}$	1,7930e-06	m⁴
Effective section modulus	$W_{eff,y}$	6,1359e-05	m³	$W_{eff,z}$	4,4632e-05	m³
Shift of the centroid	$e_{N,y}$	0	mm	$e_{N,z}$	0	mm

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	4,425	2,212	m
Buckling factor	k	1,00	0,94	
Buckling length	l_{cr}	4,425	2,082	m
Critical Euler load	N_{cr}	455,16	861,03	kN
Slenderness	λ	86,81	63,12	
Relative slenderness	λ_{rel}	1,13	0,82	
Limit slenderness	$\lambda_{rel,0}$	0,20	0,20	
Buckling curve		c	c	
Imperfection	α	0,49	0,49	
Reduction factor	χ	0,47	0,65	
Buckling resistance	$N_{b,Rd}$	247,69	343,00	kN

Flexural Buckling verification			
Cross-section effective area	A_{eff}	1,6396e-03	m²
Buckling resistance	$N_{b,Rd}$	247,69	kN
Unity check		0,25	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: The cross-section concerns a RHS section which is not susceptible to Torsional(-Flexural) Buckling.

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1
Note: The cross-section concerns an RHS section with 'h / b < 10 / $\lambda_{rel,z}$'.
This section is thus not susceptible to Lateral Torsional Buckling.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 1	
Cross-section effective area	A_{eff}	1,6396e-03	m²
Effective section modulus	$W_{eff,y}$	6,1359e-05	m³
Effective section modulus	$W_{eff,z}$	4,4632e-05	m³
Design compression force	N_{Ed}	61,82	kN
Design bending moment (maximum)	$M_{y,Ed}$	11,96	kNm
Design bending moment (maximum)	$M_{z,Ed}$	-0,02	kNm
Additional moment	$\Delta M_{y,Ed}$	0,00	kNm
Additional moment	$\Delta M_{z,Ed}$	0,00	kNm

Bending and axial compression check parameters			
Characteristic compression resistance	N_{Rk}	582,05	kN
Characteristic moment resistance	$M_{y,Rk}$	21,78	kNm
Characteristic moment resistance	$M_{z,Rk}$	15,84	kNm
Reduction factor	χ_y	0,47	
Reduction factor	χ_z	0,65	
Reduction factor	χ_{LT}	1,00	
Interaction factor	k_{yy}	1,07	
Interaction factor	k_{yz}	0,78	
Interaction factor	k_{zy}	1,13	
Interaction factor	k_{zz}	0,82	

Maximum moment $M_{y,Ed}$ is derived from beam B259 position 2,212 m.
Maximum moment $M_{z,Ed}$ is derived from beam B259 position 2,212 m.

Interaction method 1 parameters			
Critical Euler load	$N_{cr,y}$	455,16	kN
Critical Euler load	$N_{cr,z}$	861,03	kN
Elastic critical load	$N_{cr,T}$	87031,82	kN
Effective section modulus	$W_{eff,y}$	6,1359e-05	m^3
Second moment of area	I_y	4,3000e-06	m^4
Second moment of area	I_z	1,8000e-06	m^4
Torsional constant	I_t	3,9699e-06	m^4
Method for equivalent moment factor $C_{my,0}$		Table A.2 Line 4 (Line load)	
Equivalent moment factor	$C_{my,0}$	1,00	
Method for equivalent moment factor $C_{mz,0}$		Table A.2 Line 1 (Linear)	
Ratio of end moments	ψ_z	0,00	
Equivalent moment factor	$C_{mz,0}$	0,78	
Factor	μ_y	0,92	
Factor	μ_z	0,97	
Factor	ε_y	5,17	
Factor	a_{LT}	0,08	
Critical moment for uniform bending	$M_{cr,0}$	494,44	kNm
Relative slenderness	$\lambda_{rel,0}$	0,21	
Limit relative slenderness	$\lambda_{rel,0,lim}$	0,23	
Equivalent moment factor	C_{my}	1,00	
Equivalent moment factor	C_{mz}	0,78	
Equivalent moment factor	C_{mLT}	1,00	

Unity check (6.61) = 0,25 + 0,65 + 0,00 = 0,90 -
Unity check (6.62) = 0,18 + 0,68 + 0,00 = 0,86 -

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka RRK60/60/4

EN 1993-1-1 Code Check
National annex: Standard EN

Member B653	0,000 / 2,562 m	RRK60/60/4	S 235	Anvelopa GSN	0,62 -

Note: EN 1993-1-3 article 1.1(3) specifies that this part does not apply to cold formed CHS and RHS sections.
The default EN 1993-1-1 code check is executed instead of the EN 1993-1-3 code check.

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC5 + 0.90*LC6

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	235,0	MPa
Ultimate strength	f_u	360,0	MPa
Fabrication		Cold formed	

...::SECTION CHECK::...

The critical check is on position 0,000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-48,96	kN
Shear force	$V_{y,Ed}$	0,00	kN
Shear force	$V_{z,Ed}$	0,00	kN
Torsion	T_{Ed}	0,00	kNm
Bending moment	$M_{y,Ed}$	0,00	kNm
Bending moment	$M_{z,Ed}$	0,00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	48	4	5,729e+04	5,729e+04	1,00		1,00	12,00	28,00	34,00	38,00	1
3	I	48	4	5,729e+04	5,729e+04	1,00		1,00	12,00	28,00	34,00	38,00	1
5	I	48	4	5,729e+04	5,729e+04	1,00		1,00	12,00	28,00	34,00	38,00	1
7	I	48	4	5,729e+04	5,729e+04	1,00		1,00	12,00	28,00	34,00	38,00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	8,5500e-04	m^2
Compression resistance	$N_{c,Rd}$	200,93	kN
Unity check		0,24	-

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0,000 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	48	4	5,729e+04	5,729e+04	1,00		1,00	12,00	28,00	34,00	38,00	1
3	I	48	4	5,729e+04	5,729e+04	1,00		1,00	12,00	28,00	34,00	38,00	1
5	I	48	4	5,729e+04	5,729e+04	1,00		1,00	12,00	28,00	34,00	38,00	1
7	I	48	4	5,729e+04	5,729e+04	1,00		1,00	12,00	28,00	34,00	38,00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	2,562	2,562	m
Buckling factor	k	1,00	1,00	
Buckling length	l_{cr}	2,562	2,562	m
Critical Euler load	N_{cr}	137,64	137,65	kN
Slenderness	λ	113,47	113,46	
Relative slenderness	λ_{rel}	1,21	1,21	
Limit slenderness	$\lambda_{rel,0}$	0,20	0,20	
Buckling curve		c	c	
Imperfection	α	0,49	0,49	
Reduction factor	χ	0,43	0,43	
Buckling resistance	$N_{b,Rd}$	78,52	78,52	kN

Flexural Buckling verification			
Cross-section area	A	8,5500e-04	m^2
Buckling resistance	$N_{b,Rd}$	78,52	kN
Unity check		0,62	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: The cross-section concerns a RHS section which is not susceptible to Torsional(-Flexural) Buckling.

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka RRK50/50/3

EN 1993-1-1 Code Check
National annex: Standard EN

Member B571	0,000 / 1,227 m	RRK50/50/3	S 235	Anvelopa GSN	0,88 -

Note: EN 1993-1-3 article 1.1(3) specifies that this part does not apply to cold formed CHS and RHS sections.
The default EN 1993-1-1 code check is executed instead of the EN 1993-1-3 code check.

Combination key
Anvelopa GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC5 + 0.90*LC8

Partial safety factors	
γ_{M0} for resistance of cross-sections	1,00
γ_{M1} for resistance to instability	1,10
γ_{M2} for resistance of net sections	1,25

Material			
Yield strength	f_y	235,0	MPa
Ultimate strength	f_u	360,0	MPa
Fabrication		Cold formed	

...::SECTION CHECK::...

The critical check is on position 0,000 m

Internal forces		Calculated	Unit
Normal force	N_{Ed}	-74,06	kN
Shear force	$V_{y,Ed}$	0,00	kN
Shear force	$V_{z,Ed}$	0,03	kN
Torsion	T_{Ed}	0,00	kNm
Bending moment	$M_{y,Ed}$	0,00	kNm
Bending moment	$M_{z,Ed}$	0,00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	41	3	1,370e+05	1,370e+05	1,00		1,00	13,67	28,00	34,00	38,00	1
3	I	41	3	1,370e+05	1,370e+05	1,00		1,00	13,67	28,00	34,00	38,00	1
5	I	41	3	1,370e+05	1,370e+05	1,00		1,00	13,67	28,00	34,00	38,00	1
7	I	41	3	1,370e+05	1,370e+05	1,00		1,00	13,67	28,00	34,00	38,00	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

Cross-section area	A	5,4100e-04	m^2
Compression resistance	$N_{c,Rd}$	127,14	kN
Unity check		0,58	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Shear correction factor	η	1,20	
Shear area	A_v	2,7050e-04	m^2
Plastic shear resistance for V_z	$V_{pl,z,Rd}$	36,70	kN
Unity check		0,00	-

Combined Shear and Torsion check for V_z and $\tau_{t,Ed}$
According to EN 1993-1-1 article 6.2.6 & 6.2.7 and formula (6.25),(6.28)

Plastic shear resistance for V_z and T_{Ed}	$V_{pl,T,z,Rd}$	36,67	kN
Unity check		0,00	-

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0,409 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	I	41	3	1,358e+05	1,358e+05	1,00		1,00	13,67	28,00	34,00	38,00	1
3	I	41	3	1,360e+05	1,380e+05	0,99		1,00	13,67	28,00	34,00	38,19	1
5	I	41	3	1,381e+05	1,381e+05	1,00		1,00	13,67	28,00	34,00	38,00	1
7	I	41	3	1,380e+05	1,360e+05	0,99		1,00	13,67	28,00	34,00	38,19	1

Note: The Classification limits have been set according to Semi-Comp+.
The cross-section is classified as Class 1

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters		yy	zz	
Sway type		sway	non-sway	
System length	L	1,227	1,227	m
Buckling factor	k	1,00	1,00	
Buckling length	l_{cr}	1,227	1,227	m
Critical Euler load	N_{cr}	268,27	268,28	kN
Slenderness	λ	64,65	64,65	
Relative slenderness	λ_{rel}	0,69	0,69	
Limit slenderness	$\lambda_{rel,0}$	0,20	0,20	
Buckling curve		c	c	
Imperfection	α	0,49	0,49	
Reduction factor	χ	0,73	0,73	
Buckling resistance	$N_{b,Rd}$	84,59	84,59	kN

Flexural Buckling verification			
Cross-section area	A	5,4100e-04	m^2
Buckling resistance	$N_{b,Rd}$	84,59	kN
Unity check		0,88	-

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)
Note: The cross-section concerns a RHS section which is not susceptible to Torsional(-Flexural) Buckling.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters			
Interaction method		alternative method 1	
Cross-section area	A	5,4100e-04	m^2
Plastic section modulus	$W_{pl,y}$	9,3900e-06	m^3
Design compression force	N_{Ed}	74,06	kN
Design bending moment (maximum)	$M_{y,Ed}$	0,01	kNm
Design bending moment (maximum)	$M_{z,Ed}$	0,00	kNm
Characteristic compression resistance	N_{Rk}	127,14	kN
Characteristic moment resistance	$M_{y,Rk}$	2,21	kNm
Reduction factor	χ_y	0,73	
Reduction factor	χ_z	0,73	
Reduction factor	χ_{LT}	1,00	
Interaction factor	k_{yy}	1,20	
Interaction factor	k_{zy}	0,83	

Maximum moment $M_{y,Ed}$ is derived from beam B571 position 0,409 m.
Maximum moment $M_{z,Ed}$ is derived from beam B571 position 0,000 m.

Interaction method 1 parameters			
Critical Euler load	$N_{cr,y}$	268,27	kN
Critical Euler load	$N_{cr,z}$	268,28	kN
Elastic critical load	$N_{cr,T}$	34802,79	kN
Plastic section modulus	$W_{pl,y}$	9,3900e-06	m^3
Elastic section modulus	$W_{el,y}$	7,7900e-06	m^3
Plastic section modulus	$W_{pl,z}$	9,3900e-06	m^3
Elastic section modulus	$W_{el,z}$	7,7900e-06	m^3
Second moment of area	I_y	1,9500e-07	m^4
Second moment of area	I_z	1,9500e-07	m^4
Torsional constant	I_t	3,1062e-07	m^4
Method for equivalent moment factor $C_{my,0}$		Table A.2 Line 4 (Line load)	
Equivalent moment factor	$C_{my,0}$	1,01	
Factor	μ_y	0,91	
Factor	μ_z	0,91	
Factor	ε_y	0,01	
Factor	a_{LT}	0,00	
Critical moment for uniform bending	$M_{cr,0}$	82,04	kNm
Relative slenderness	$\lambda_{rel,0}$	0,16	
Limit relative slenderness	$\lambda_{rel,0,lim}$	0,20	
Equivalent moment factor	C_{my}	1,01	
Equivalent moment factor	C_{mLT}	1,00	
Factor	b_{LT}	0,00	
Factor	d_{LT}	0,00	
Factor	w_y	1,21	
Factor	w_z	1,21	
Factor	n_{pl}	0,64	
Maximum relative slenderness	$\lambda_{rel,max}$	0,69	
Factor	C_{yy}	1,06	
Factor	C_{zy}	0,91	

Unity check (6.61) = 0,88 + 0,01 + 0,00 = 0,88 -
Unity check (6.62) = 0,88 + 0,00 + 0,00 = 0,88 -

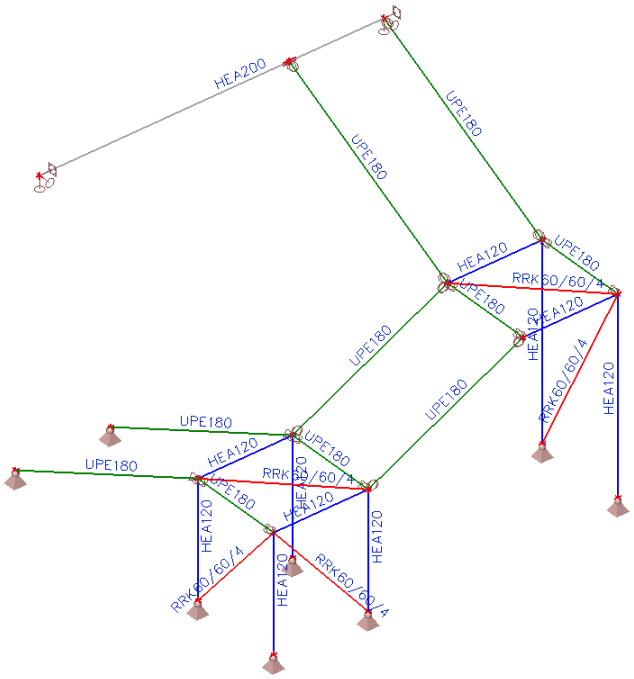
The member satisfies the stability check.

2.3.3. Proračun stubišta

U nastavku je proveden proračun trokrakog unutarnjeg stubišta. Globalni sustav stabiliziran je vertikalnom stabilizacijom u tri nosive ravnine hladnooblikovanim cijevnim spregom od cijevi 60/60/4 mm (sukladno HRN EN 10219). Horizontalna ravnina stabilizirana je hodnim rešetkastim limom, osim na nosačima konzola koje se sprežu analogno vertikalnim ravninama, obzirom da dolaze ispod UNP nosača. Svi elementi stubišta izvode se od čelika S235JR sa normativnom granicom popuštanja 235 N/mm^2.

Poprečni presjeci u konstrukciji

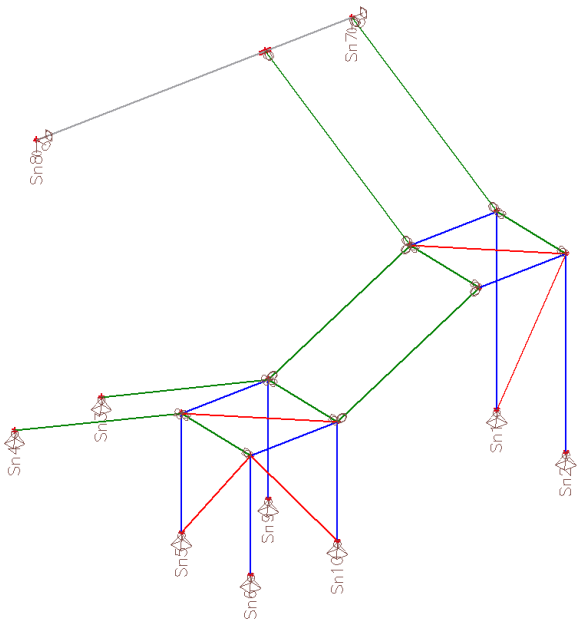
Name	Type	Item material	Fabrication	A [m²]	A_y [m²]	I_y [m⁴]	$W_{el.y}$ [m³]	$W_{pl.y}$ [m³]	Colour
	Detailed				A_z [m²]	I_z [m⁴]	$W_{el.z}$ [m³]	$W_{pl.z}$ [m³]	
CS1	HEA120	S 235	rolled	2.5300e-03	1.8765e-03	6.0600e-06	1.0600e-04	1.1958e-04	
					6.1150e-04	2.3100e-06	3.8500e-05	5.8750e-05	
CS2	UPE180	S 235	rolled	2.5100e-03	1.4774e-03	1.3530e-05	1.5000e-04	1.7300e-04	
					9.9741e-04	1.4400e-06	2.8600e-05	5.1300e-05	
CS3	RRK60/60/4	S 235	cold formed	8.5500e-04	4.6442e-04	4.3600e-07	1.4500e-05	1.7600e-05	
					4.6442e-04	4.3600e-07	1.4500e-05	1.7600e-05	
CS4	HEA200	S 235	rolled	5.3800e-03	3.8609e-03	3.6900e-05	3.8900e-04	4.2917e-04	
					1.3156e-03	1.3400e-05	1.3400e-04	2.0375e-04	



Oslonci konstrukcije

Svi oslonci konstrukcije stubišta modelirani su kao zglobni.

Name	Node	System	Type	X	Y	Z	Rx	Ry	Rz
Sn1	N14	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn2	N13	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn3	N1	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn4	N2	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn5	N5	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn6	N4	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn7	N15	GCS	Standard	Rigid	Rigid	Rigid	Free	Rigid	Free
Sn8	N17	GCS	Standard	Rigid	Rigid	Rigid	Free	Rigid	Free
Sn9	N19	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn10	N18	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free

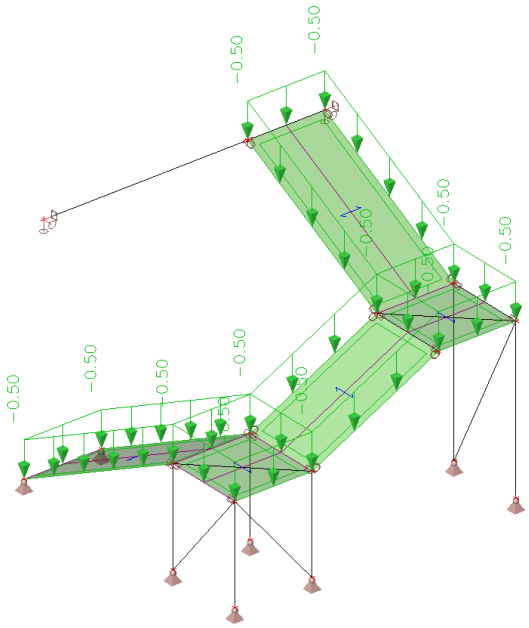


Djelovanja na konstrukciju

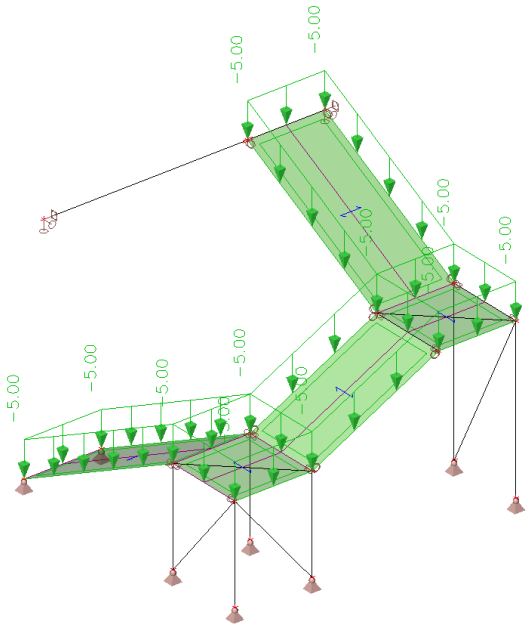
Name	Description	Action type	Load group	Load type	Spec	Direction	Duration
LC1	Vlastita tezina	Permanent	LG1	Self weight		-Z	
LC2	Stalno	Permanent	LG1	Standard			
LC3	Uporabno	Variable	LG2	Static	Standard		Short

Shematski prikaz djelovanja na konstrukciju:

Name	Description	Action type	Load group	Load type
LC2	Stalno	Permanent	LG1	Standard



Name	Description	Action type	Load group	Load type	Spec	Duration
LC3	Uporabno	Variable	LG2	Static	Standard	Short



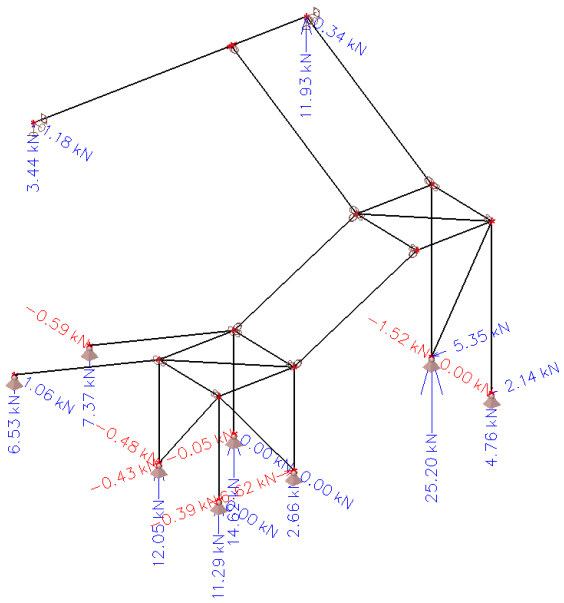
Kombinacije djelovanja na konstrukciju

Name	Description	Type	Load cases	Coeff. [-]
GSN		Envelope - ultimate	LC1 - Vlastita tezina	1.35
			LC2 - Stalno	1.35
			LC3 - Uporabno	1.50
GSU		Envelope - serviceability	LC1 - Vlastita tezina	1.00
			LC2 - Stalno	1.00
			LC3 - Uporabno	1.00

Reakcije oslonaca konstrukcije

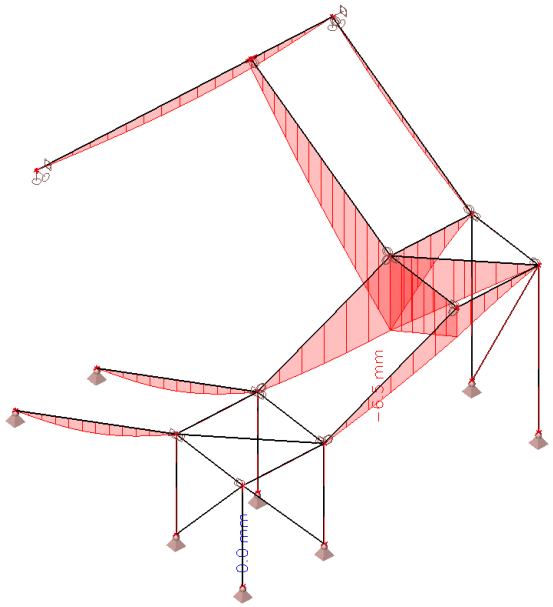
U nastavku su dani tablični i grafički prikaz reakcija za granično stanje nosivosti GSN.

Name	Case	R_x [kN]	R_y [kN]	R_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]	e_x [mm]	e_y [mm]
Sn1/N14	GSN/1	**-0.27**	**0.78**	**4.30**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn1/N14	GSN/2	**-1.52**	**5.35**	**25.20**	0.00	0.00	**0.00**	0.0	0.0
Sn2/N13	GSN/1	**0.00**	**0.35**	**1.42**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn2/N13	GSN/2	**0.00**	**2.14**	**4.76**	0.00	0.00	**0.00**	0.0	0.0
Sn3/N1	GSN/1	**-0.20**	**0.00**	**1.04**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn3/N1	GSN/2	**-0.59**	0.00	**7.37**	0.00	0.00	**0.00**	0.0	0.0
Sn4/N2	GSN/2	**1.06**	**0.00**	**6.53**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn4/N2	GSN/1	**0.27**	0.00	**0.80**	0.00	0.00	**0.00**	0.0	0.0
Sn5/N5	GSN/1	**-0.07**	**-0.07**	**2.26**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn5/N5	GSN/2	**-0.48**	**-0.43**	**12.05**	0.00	0.00	**0.00**	0.0	0.0
Sn6/N4	GSN/2	**0.00**	**-0.39**	**11.29**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn6/N4	GSN/1	**0.00**	**-0.06**	**2.20**	0.00	0.00	**0.00**	0.0	0.0
Sn7/N15	GSN/2	**0.34**	**0.00**	**11.93**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn7/N15	GSN/1	**0.13**	0.00	**2.60**	0.00	0.00	**0.00**	0.0	0.0
Sn8/N17	GSN/2	**1.18**	**0.00**	**3.44**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn8/N17	GSN/1	**0.14**	0.00	**1.42**	0.00	0.00	**0.00**	0.0	0.0
Sn9/N19	GSN/2	**0.00**	**-0.05**	**14.62**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn9/N19	GSN/1	**0.00**	**-0.01**	**2.36**	0.00	0.00	**0.00**	0.0	0.0
Sn10/N18	GSN/2	**0.00**	**-6.62**	**2.66**	**0.00**	**0.00**	**0.00**	0.0	0.0
Sn10/N18	GSN/1	**0.00**	**-0.99**	**0.77**	0.00	0.00	**0.00**	0.0	0.0



Pomaci i deformacije konstrukcije

U nastavku su dani tablični i grafički prikaz pomaka za granično stanje nosivosti GSU.



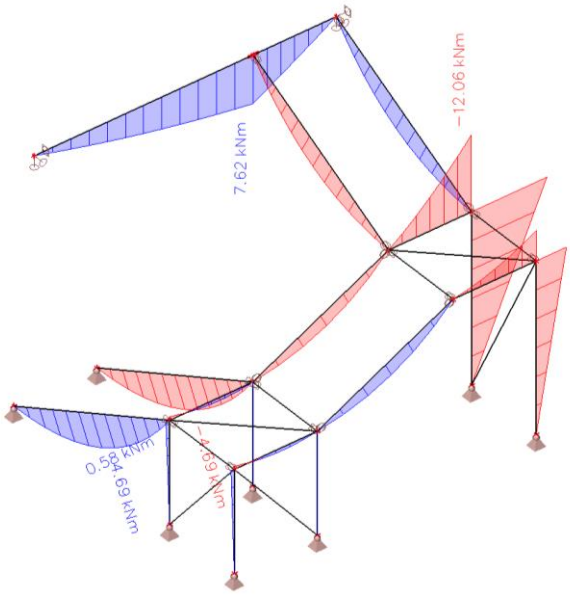
Maks. relativni progib GN: u_z = 6,5 mm < u_{dop} = L/150 = 1100/150 = 7,3 mm

Rezne sile u konstrukciji

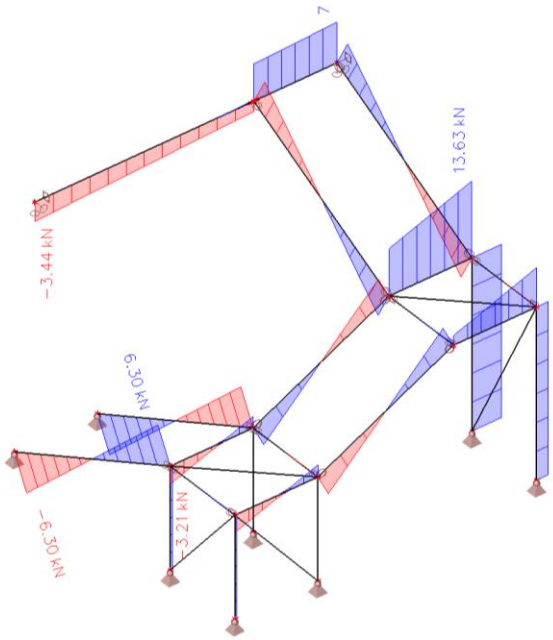
U nastavku su dani tablični i grafički prikaz maks. reznih sila po tipu poprečnog presjeka za granično stanje nosivosti.

Name	dx [m]	Case	N [kN]	V_y [kN]	V_z [kN]	M_x [kNm]	M_y [kNm]	M_z [kNm]
B16	2.250	GSN/1	**-21.98**	0.00	5.35	0.00	0.00	0.00
B25	0.000	GSN/1	**10.52**	0.00	0.00	0.00	0.00	0.00
B4	2.974	GSN/1	-2.02	0.00	**-6.30**	0.00	0.00	0.00
B18	0.000	GSN/1	7.70	0.00	-5.47	**-0.02**	0.00	0.00
B10	0.000	GSN/1	0.00	0.00	0.14	**0.03**	0.00	0.00
B9	0.000	GSN/1	-5.35	0.01	**13.63**	0.00	**-12.06**	-0.01
B19	1.100+	GSN/1	0.00	**1.18**	-1.82	0.00	**7.62**	-3.42
B19	1.100-	GSN/1	0.00	**-3.12**	6.60	0.00	7.60	**-3.43**
B9	1.100	GSN/1	-5.35	0.01	8.39	0.00	0.05	**0.01**

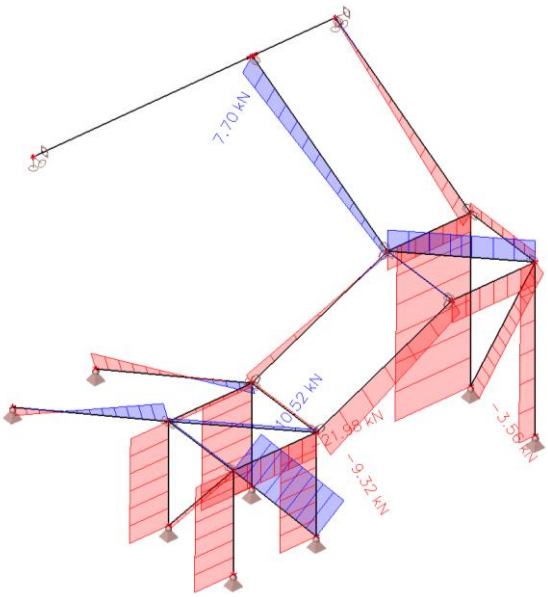
Values: $\mathbf{M_y}$
Combination: GSN
Extreme 1D: Cross-section



Values: $\mathbf{V_z}$
Combination: GSN
Extreme 1D: Cross-section



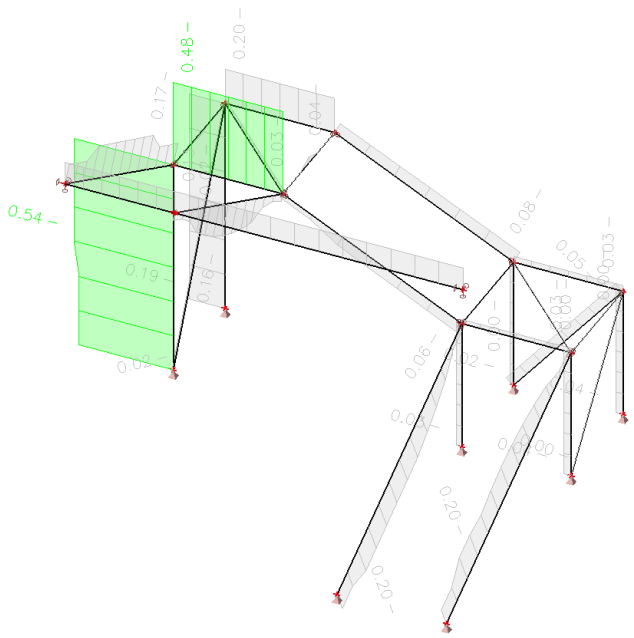
Values: **N**
Combination: GSN
Extreme 1D: Cross-section



Dimenzioniranje elemenata konstrukcije

U nastavku su dani grafički i tablični prikaz iskoristivosti poprečnog presjeka za granično stanje nosivosti GSN te detaljan prikaz dimenzioniranja za kritični element po tipu poprečnog presjeka.

Name	dx [m]	Case	Cross-section	Material	$UC_{Overall}$ [-]	UC_{Sec} [-]	UC_{Stab} [-]
B1	1.100	GSN/1	CS1 - HEA120	S 235	**0.03**	0.03	0.02
B2	0.000	GSN/1	CS1 - HEA120	S 235	**0.04**	0.02	0.04
B3	0.000	GSN/1	CS1 - HEA120	S 235	**0.04**	0.02	0.04
B4	2.478-	GSN/1	CS2 - UPE180	S 235	**0.20**	0.07	0.20
B5	2.478-	GSN/1	CS2 - UPE180	S 235	**0.20**	0.07	0.20
B6	0.550-	GSN/1	CS2 - UPE180	S 235	**0.00**	0.00	0.00
B7	0.550-	GSN/1	CS2 - UPE180	S 235	**0.00**	0.00	0.00
B8	1.100	GSN/1	CS1 - HEA120	S 235	**0.03**	0.03	0.03
B9	0.000	GSN/1	CS1 - HEA120	S 235	**0.48**	0.43	0.48
B10	0.550-	GSN/1	CS2 - UPE180	S 235	**0.04**	0.04	0.00
B11	0.550-	GSN/1	CS2 - UPE180	S 235	**0.02**	0.02	0.01
B12	0.000	GSN/1	CS1 - HEA120	S 235	**0.20**	0.17	0.20
B13	2.012	GSN/1	CS2 - UPE180	S 235	**0.08**	0.03	0.08
B14	2.012	GSN/1	CS2 - UPE180	S 235	**0.06**	0.03	0.06
B15	2.250	GSN/1	CS1 - HEA120	S 235	**0.19**	0.02	0.19
B16	1.125-	GSN/1	CS1 - HEA120	S 235	**0.54**	0.21	0.54
B17	1.946	GSN/1	CS2 - UPE180	S 235	**0.17**	0.07	0.17
B18	1.297-	GSN/1	CS2 - UPE180	S 235	**0.16**	0.11	0.16
B19	1.100+	GSN/1	CS4 - HEA200	S 235	**0.13**	0.08	0.13
B20	1.741	GSN/1	CS3 - RRK60/60/4	S 235	**0.00**	0.00	0.00
B21	0.000	GSN/1	CS3 - RRK60/60/4	S 235	**0.03**	0.03	0.00
B22	2.504	GSN/1	CS3 - RRK60/60/4	S 235	**0.02**	0.02	0.00
B23	0.000	GSN/1	CS1 - HEA120	S 235	**0.02**	0.02	0.02
B24	0.000	GSN/1	CS1 - HEA120	S 235	**0.03**	0.02	0.03
B25	0.000	GSN/1	CS3 - RRK60/60/4	S 235	**0.05**	0.05	0.00
B26	0.000	GSN/1	CS3 - RRK60/60/4	S 235	**0.00**	0.00	0.00



Dimenzioniranje poprečnog presjeka HEA 120

EN 1993-1-1 Code Check
National annex: Standard EN

Member B16	**1.125 / 2.250 m**	**HEA120**	**S 235**	**GSN**	**0.54 -**

Combination key
GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC3

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.10
γ_{M2} for resistance of net sections	1.25

Material		
Yield strength f_y	235.0	MPa
Ultimate strength f_u	360.0	MPa
Fabrication	Rolled	

...::SECTION CHECK::...

The critical check is on position 1.125 m

Internal forces	Calculated	Unit
N_{Ed}	-21.69	kN
$V_{y,Ed}$	0.00	kN
$V_{z,Ed}$	5.35	kN
T_{Ed}	0.00	kNm
$M_{y,Ed}$	-6.02	kNm
$M_{z,Ed}$	0.00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	5e+01	8e+00	6.118e+04	6.120e+04	1.0	0.4	1.0	5.7	9.0	10.0	13.8	1
3	SO	5e+01	8e+00	6.117e+04	6.115e+04	1.0	0.4	1.0	5.7	9.0	10.0	13.8	1

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
4	I	7e+01	5e+00	4.529e+04	-2.817e+04	-0.6		0.6	14.8	55.6	64.0	90.4	1
5	SO	5e+01	8e+00	-4.406e+04	-4.408e+04								
7	SO	5e+01	8e+00	-4.405e+04	-4.403e+04								

The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	2.5300e-03	m²
$N_{c,Rd}$	594.55	kN
Unity check	0.04	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

$W_{pl,y}$	1.1958e-04	m³
$M_{pl,y,Rd}$	28.10	kNm
Unity check	0.21	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

$W_{pl,z}$	5.8750e-05	m³
$M_{pl,z,Rd}$	13.81	kNm
Unity check	0.00	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

η	1.20	
A_v	2.0050e-03	m²
$V_{pl,y,Rd}$	272.03	kN
Unity check	0.00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

η	1.20	
A_v	8.4200e-04	m²
$V_{pl,z,Rd}$	114.24	kN
Unity check	0.05	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

$M_{pl,y,Rd}$	28.10	kNm
α	2.00	
$M_{pl,z,Rd}$	13.81	kNm
β	1.00	

Unity check (6.41) = 0.05 + 0.00 = 0.05 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.
Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.
Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 0.000 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	5e+01	8e+00	1.137e+05	1.137e+05	1.0	0.4	1.0	5.7	9.0	10.0	13.8	1
3	SO	5e+01	8e+00	1.137e+05	1.136e+05	1.0	0.4	1.0	5.7	9.0	10.0	13.8	1
4	I	7e+01	5e+00	8.191e+04	-6.502e+04	-0.8		0.6	14.8	55.8	64.2	102.9	1
5	SO	5e+01	8e+00	-9.680e+04	-9.684e+04								
7	SO	5e+01	8e+00	-9.678e+04	-9.674e+04								

The cross-section is classified as Class 1

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	2.250	2.250	m
Buckling factor k	2.00	1.00	
Buckling length l_{cr}	4.500	2.248	m
Critical Euler load N_{cr}	620.25	947.12	kN
Slenderness λ	91.95	74.41	
Relative slenderness λ_{rel}	0.98	0.79	
Limit slenderness $\lambda_{rel,0}$	0.20	0.20	

Note: The slenderness or compression force is such that Flexural Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Torsional buckling length l_{cr}	2.250	m
Elastic critical load $N_{cr,T}$	2196.89	kN
Relative slenderness $\lambda_{rel,T}$	0.52	
Limit slenderness $\lambda_{rel,0}$	0.20	

Note: The slenderness or compression force is such that Torsional(-Flexural) Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.2 and formula (6.54)

LTB parameters		
Method for LTB curve	General case	
Plastic section modulus $W_{pl,y}$	1.1958e-04	m^3
Elastic critical moment M_{cr}	146.74	kNm
Relative slenderness $\lambda_{rel,LT}$	0.44	
Limit slenderness $\lambda_{rel,LT,0}$	0.20	
LTB curve	a	
Imperfection α_{LT}	0.21	
Reduction factor χ_{LT}	0.94	
Design buckling resistance $M_{b,Rd}$	24.08	kNm
Unity check	0.25	-

Mcr parameters		
LTB length l_{LT}	2.250	m
Influence of load position	no influence	
Correction factor k	1.00	
Correction factor k_w	1.00	
LTB moment factor C_1	1.77	
LTB moment factor C_2	0.00	
LTB moment factor C_3	1.00	
Shear center distance d_z	-6e-10	mm
Distance of load application z_g	0e+00	mm
Mono-symmetry constant β_y	1e-09	mm
Mono-symmetry constant z_j	6e-10	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters		
Interaction method	alternative method 1	
Cross-section area A	2.5300e-03	m^2
Plastic section modulus $W_{pl,y}$	1.1958e-04	m^3
Plastic section modulus $W_{pl,z}$	5.8750e-05	m^3
Design compression force N_{Ed}	21.69	kN
Design bending moment (maximum) $M_{y,Ed}$	-12.04	kNm
Design bending moment (maximum) $M_{z,Ed}$	0.00	kNm
Characteristic compression resistance N_{Rk}	594.55	kN
Characteristic moment resistance $M_{y,Rk}$	28.10	kNm
Characteristic moment resistance $M_{z,Rk}$	13.81	kNm
Reduction factor χ_y	1.00	
Reduction factor χ_z	1.00	
Reduction factor χ_{LT}	0.94	
Interaction factor k_{yy}	0.99	
Interaction factor k_{yz}	0.64	
Interaction factor k_{zy}	0.53	
Interaction factor k_{zz}	0.81	

Maximum moment $M_{y,Ed}$ is derived from beam B16 position 0.000 m.
Maximum moment $M_{z,Ed}$ is derived from beam B16 position 0.000 m.

Interaction method 1 parameters		
Critical Euler load $N_{cr,y}$	620.25	kN
Critical Euler load $N_{cr,z}$	947.12	kN
Elastic critical load $N_{cr,T}$	2196.89	kN
Plastic section modulus $W_{pl,y}$	1.1958e-04	m^3
Elastic section modulus $W_{el,y}$	1.0600e-04	m^3
Plastic section modulus $W_{pl,z}$	5.8750e-05	m^3
Elastic section modulus $W_{el,z}$	3.8500e-05	m^3
Second moment of area I_y	6.0600e-06	m^4
Second moment of area I_z	2.3100e-06	m^4
Torsional constant I_t	5.8186e-08	m^4
Method for equivalent moment factor $C_{my,0}$	Table A.2 Line 1 (Linear)	
Ratio of end moments ψ_y	0.00	
Equivalent moment factor $C_{my,0}$	0.79	
Method for equivalent moment factor $C_{mz,0}$	Table A.2 Line 1 (Linear)	
Ratio of end moments ψ_z	0.00	
Equivalent moment factor $C_{mz,0}$	0.79	
Factor μ_y	1.00	
Factor μ_z	1.00	
Factor ε_y	13.25	
Factor a_{LT}	0.99	
Critical moment for uniform bending $M_{cr,0}$	82.91	kNm
Relative slenderness $\lambda_{rel,0}$	0.58	
Limit relative slenderness $\lambda_{rel,0,lim}$	0.26	
Equivalent moment factor C_{my}	0.95	
Equivalent moment factor C_{mz}	0.79	
Equivalent moment factor C_{mLT}	1.00	
Factor b_{LT}	0.00	
Factor c_{LT}	0.30	
Factor d_{LT}	0.00	
Factor e_{LT}	0.95	
Factor w_y	1.13	
Factor w_z	1.50	
Factor n_{pl}	0.04	
Maximum relative slenderness $\lambda_{rel,max}$	0.98	
Factor C_{yy}	1.00	
Factor C_{yz}	0.87	
Factor C_{zy}	0.98	
Factor C_{zz}	1.00	

Unity check (6.61) = 0.04 + 0.50 + 0.00 = 0.54 -
Unity check (6.62) = 0.04 + 0.26 + 0.00 = 0.30 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters		
Buckling field length a	2.250	m
Web	unstiffened	
Web height h_w	1e+02	mm
Web thickness t	5e+00	mm
Material coefficient ε	1.00	
Shear correction factor η	1.20	

Shear Buckling verification	
Web slenderness h_w/t	19.60
Web slenderness limit	60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka UPE180

EN 1993-1-1 Code Check
National annex: Standard EN

Member B5	2.478 / 2.974 m	UPE180	S 235	GSN	0.20 -

Combination key
GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC3

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.10
γ_{M2} for resistance of net sections	1.25

Material		
Yield strength f_y	235.0	MPa
Ultimate strength f_u	360.0	MPa
Fabrication	Rolled	

...::SECTION CHECK::...

The critical check is on position 2.478 m

Internal forces	Calculated	Unit
N_{Ed}	-2.80	kN
$V_{y,Ed}$	0.00	kN
$V_{z,Ed}$	4.20	kN
T_{Ed}	0.00	kNm
$M_{y,Ed}$	-2.60	kNm
$M_{z,Ed}$	0.00	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	UO	6e+01	1e+01	1.742e+04	1.742e+04	1.0	0.4	1.0	5.5	9.0	10.0	14.0	1
3	I	1e+02	6e+00	1.410e+04	-1.187e+04	-0.8		0.5	24.5	65.4	75.3	107.1	1
5	UO	6e+01	1e+01	-1.519e+04	-1.519e+04								

The cross-section is classified as Class 1

Compression check
According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	2.5100e-03	m^2
$N_{c,Rd}$	589.85	kN
Unity check	0.00	-

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

$W_{pl,y}$	1.7300e-04	m^3
$M_{pl,y,Rd}$	40.66	kNm
Unity check	0.06	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

η	1.20	
A_v	1.1188e-03	m^2
$V_{pl,z,Rd}$	151.79	kN
Unity check	0.03	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.1 and formula (6.2)

$N_{pl,Rd}$	589.85	kN
$M_{pl,y,Rd}$	40.66	kNm
$M_{pl,z,Rd}$	12.06	kNm

Unity check (6.2) = 0.00 + 0.06 + 0.00 = 0.07 -

Note: No specific interaction formulae according to EN 1993-1-1 article 6.2.9.1 apply.
Therefore the plastic linear summation according to EN 1993-1-1 article 6.2.1(7) is verified.
Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 1.487 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	UO	6e+01	1e+01	2.961e+04	2.961e+04	1.0	0.4	1.0	5.5	9.0	10.0	14.0	1
3	I	1e+02	6e+00	2.363e+04	-2.311e+04	-1.0		0.5	24.5	71.1	81.8	120.9	1
5	UO	6e+01	1e+01	-2.908e+04	-2.908e+04								

The cross-section is classified as Class 1

Flexural Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	2.974	2.974	m
Buckling factor k	1.00	1.00	
Buckling length l_{cr}	2.974	2.974	m
Critical Euler load N_{cr}	3170.44	337.45	kN
Slenderness λ	40.51	124.16	
Relative slenderness λ_{rel}	0.43	1.32	
Limit slenderness $\lambda_{rel,0}$	0.20	0.20	

Note: The slenderness or compression force is such that Flexural Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Torsional(-Flexural) Buckling check
According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Torsional buckling length l_{cr}	2.974	m
Elastic critical load $N_{cr,T}$	855.36	kN
Elastic critical load $N_{cr,TF}$	337.45	kN
Relative slenderness $\lambda_{rel,T}$	1.32	
Limit slenderness $\lambda_{rel,0}$	0.20	

Note: The slenderness or compression force is such that Torsional(-Flexural) Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.2 and formula (6.54)

LTB parameters		
Method for LTB curve	General case	
Plastic section modulus $W_{pl,y}$	1.7300e-04	m^3
Elastic critical moment M_{cr}	55.82	kNm
Relative slenderness $\lambda_{rel,LT}$	0.85	
Relative slenderness $\lambda_{rel,T}$	0.18	
Relative slenderness $\lambda_{rel,EXTRA}$	1.04	
Limit slenderness $\lambda_{rel,LT,0}$	0.20	
LTB curve	a	
Imperfection α_{LT}	0.21	
Reduction factor χ_{LT}	0.64	
Design buckling resistance $M_{b,Rd}$	23.67	kNm
Unity check	0.11	-

Note: $\lambda_{rel,EXTRA}$ is determined according to "Design rule for lateral torsional buckling of channel sections, 2007".

Mcr parameters		
LTB length l_{LT}	2.974	m
Influence of load position	no influence	
Correction factor k	1.00	
Correction factor k_w	1.00	
LTB moment factor C_1	1.13	
LTB moment factor C_2	0.45	
LTB moment factor C_3	0.53	
Shear center distance d_z	-4e-05	mm
Distance of load application z_g	0e+00	mm
Mono-symmetry constant β_y	7e-05	mm
Mono-symmetry constant z_j	4e-05	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters		
Interaction method	alternative method 1	
Cross-section area A	2.5100e-03	m^2
Plastic section modulus $W_{pl,y}$	1.7300e-04	m^3
Design compression force N_{Ed}	2.80	kN
Design bending moment (maximum) $M_{y,Ed}$	-4.69	kNm
Design bending moment (maximum) $M_{z,Ed}$	0.00	kNm
Characteristic compression resistance N_{Rk}	589.85	kN
Characteristic moment resistance $M_{y,Rk}$	40.66	kNm
Reduction factor χ_y	1.00	
Reduction factor χ_z	1.00	
Reduction factor χ_{LT}	0.64	
Interaction factor k_{yy}	1.00	
Interaction factor k_{zy}	0.53	

Maximum moment $M_{y,Ed}$ is derived from beam B5 position 1.487 m.
Maximum moment $M_{z,Ed}$ is derived from beam B5 position 0.000 m.

Interaction method 1 parameters		
Critical Euler load $N_{cr,y}$	3170.44	kN
Critical Euler load $N_{cr,z}$	337.45	kN
Elastic critical load $N_{cr,T}$	855.36	kN
Plastic section modulus $W_{pl,y}$	1.7300e-04	m^3
Elastic section modulus $W_{el,y}$	1.5000e-04	m^3
Plastic section modulus $W_{pl,z}$	5.1300e-05	m^3
Elastic section modulus $W_{el,z}$	2.8600e-05	m^3
Second moment of area I_y	1.3530e-05	m^4
Second moment of area I_z	1.4400e-06	m^4
Torsional constant I_t	6.8662e-08	m^4
Method for equivalent moment factor $C_{my,0}$	Table A.2 Line 4 (Line load)	
Equivalent moment factor $C_{my,0}$	1.00	
Factor μ_y	1.00	
Factor μ_z	1.00	
Factor ε_y	28.00	
Factor a_{LT}	0.99	
Critical moment for uniform bending $M_{cr,0}$	49.53	kNm
Relative slenderness $\lambda_{rel,0}$	0.91	
Limit relative slenderness $\lambda_{rel,0,lim}$	0.21	
Equivalent moment factor C_{my}	1.00	
Equivalent moment factor C_{mLT}	1.00	
Factor b_{LT}	0.00	
Factor d_{LT}	0.00	
Factor w_y	1.15	
Factor w_z	1.50	
Factor n_{pl}	0.01	
Maximum relative slenderness $\lambda_{rel,max}$	1.32	
Factor C_{yy}	1.00	
Factor C_{zy}	0.99	

Unity check (6.61) = 0.01 + 0.20 + 0.00 = 0.20 -
Unity check (6.62) = 0.01 + 0.11 + 0.00 = 0.11 -

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka HEA 200

EN 1993-1-1 Code Check
National annex: Standard EN

Member B19	1.100 / 4.000 m	HEA200	S 235	GSN	0.13 -

Combination key
GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC3

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.10
γ_{M2} for resistance of net sections	1.25

Material		
Yield strength f_y	235.0	MPa
Ultimate strength f_u	360.0	MPa
Fabrication	Rolled	

...::SECTION CHECK::...

The critical check is on position 1.100 m

Internal forces	Calculated	Unit
N_{Ed}	0.00	kN
$V_{y,Ed}$	1.18	kN
$V_{z,Ed}$	-1.82	kN
T_{Ed}	0.00	kNm
$M_{y,Ed}$	7.62	kNm
$M_{z,Ed}$	-3.42	kNm

Classification for cross-section design
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	8e+01	1e+01	-1.314e+04	7.012e+03	-1.9	1.2	0.3	7.9	25.9	28.7	23.1	1
3	SO	8e+01	1e+01	-2.402e+04	-4.417e+04								
4	I	1e+02	7e+00	-1.383e+04	1.383e+04	-1.0		0.5	20.6	72.0	83.0	124.0	1
5	SO	8e+01	1e+01	1.314e+04	-7.012e+03	-0.5	9.2	0.7	7.9	17.1	19.0	63.8	1
7	SO	8e+01	1e+01	2.402e+04	4.417e+04	0.5	0.5	1.0	7.9	9.0	10.0	14.5	1

The cross-section is classified as Class 1

Bending moment check for M_y
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

$W_{pl,y}$	4.2917e-04	m³
$M_{pl,y,Rd}$	100.85	kNm
Unity check	0.08	-

Bending moment check for M_z
According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

$W_{pl,z}$	2.0375e-04	m³
$M_{pl,z,Rd}$	47.88	kNm
Unity check	0.07	-

Shear check for V_y
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

η	1.20	
A_v	4.1592e-03	m²
$V_{pl,y,Rd}$	564.32	kN
Unity check	0.00	-

Shear check for V_z
According to EN 1993-1-1 article 6.2.6 and formula (6.17)

η	1.20	
A_v	1.8050e-03	m²
$V_{pl,z,Rd}$	244.90	kN
Unity check	0.01	-

Combined bending, axial force and shear force check
According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

$M_{pl,y,Rd}$	100.85	kNm
α	2.00	
$M_{pl,z,Rd}$	47.88	kNm
β	1.00	

Unity check (6.41) = 0.01 + 0.07 = 0.08 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

The member satisfies the section check.

...::STABILITY CHECK::...

Classification for member buckling design
Decisive position for stability classification: 1.100 m
Classification according to EN 1993-1-1 article 5.5.2
Classification of Internal and Outstand parts according to EN 1993-1-1 Table 5.2 Sheet 1 & 2

Id	Type	c [mm]	t [mm]	σ_1 [kN/m²]	σ_2 [kN/m²]	Ψ [-]	k_σ [-]	α [-]	c/t [-]	Class 1 Limit [-]	Class 2 Limit [-]	Class 3 Limit [-]	Class
1	SO	8e+01	1e+01	-1.308e+04	7.130e+03	-1.8	1.2	0.4	7.9	25.5	28.3	22.9	1
3	SO	8e+01	1e+01	-2.399e+04	-4.420e+04								
4	I	1e+02	7e+00	-1.380e+04	1.380e+04	-1.0		0.5	20.6	72.0	83.0	124.0	1
5	SO	8e+01	1e+01	1.308e+04	-7.130e+03	-0.5	9.5	0.6	7.9	17.3	19.2	64.8	1
7	SO	8e+01	1e+01	2.399e+04	4.420e+04	0.5	0.5	1.0	7.9	9.0	10.0	14.5	1

The cross-section is classified as Class 1

Lateral Torsional Buckling check
According to EN 1993-1-1 article 6.3.2.1 & 6.3.2.2 and formula (6.54)

LTB parameters		
Method for LTB curve	General case	
Plastic section modulus $W_{pl,y}$	4.2917e-04	m^3
Elastic critical moment M_{cr}	597.04	kNm
Relative slenderness $\lambda_{rel,LT}$	0.41	
Limit slenderness $\lambda_{rel,LT,0}$	0.20	

Note: The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4).

Mcr parameters		
LTB length l_{LT}	2.900	m
Influence of load position	no influence	
Correction factor k	1.00	
Correction factor k_w	1.00	
LTB moment factor C_1	1.61	
LTB moment factor C_2	0.04	
LTB moment factor C_3	1.00	
Shear center distance d_z	-3e-10	mm
Distance of load application z_g	0e+00	mm
Mono-symmetry constant β_y	5e-10	mm
Mono-symmetry constant z_j	-3e-10	mm

Note: C parameters are determined according to ECCS 119 2006 / Galea 2002.

Bending and axial compression check
According to EN 1993-1-1 article 6.3.3 and formula (6.61),(6.62)

Bending and axial compression check parameters		
Interaction method	alternative method 1	
Cross-section area A	5.3800e-03	m^2
Plastic section modulus $W_{pl,y}$	4.2917e-04	m^3
Plastic section modulus $W_{pl,z}$	2.0375e-04	m^3
Design compression force N_{Ed}	0.00	kN
Design bending moment (maximum) $M_{y,Ed}$	7.61	kNm
Design bending moment (maximum) $M_{z,Ed}$	-3.42	kNm
Characteristic compression resistance N_{Rk}	1264.30	kN
Characteristic moment resistance $M_{y,Rk}$	100.85	kNm
Characteristic moment resistance $M_{z,Rk}$	47.88	kNm
Reduction factor χ_y	1.00	
Reduction factor χ_z	1.00	
Reduction factor χ_{LT}	1.00	
Interaction factor k_{yy}	1.00	
Interaction factor k_{yz}	0.56	
Interaction factor k_{zy}	0.52	
Interaction factor k_{zz}	0.79	

Maximum moment $M_{y,Ed}$ is derived from beam B19 position 1.100 m.
Maximum moment $M_{z,Ed}$ is derived from beam B19 position 1.100 m.

Interaction method 1 parameters		
Critical Euler load $N_{cr,y}$	47.80	kN
Critical Euler load $N_{cr,z}$	5007.90	kN
Elastic critical load $N_{cr,T}$	4473.52	kN
Plastic section modulus $W_{pl,y}$	4.2917e-04	m^3
Elastic section modulus $W_{el,y}$	3.8900e-04	m^3
Plastic section modulus $W_{pl,z}$	2.0375e-04	m^3

Interaction method 1 parameters		
Elastic section modulus $W_{el,z}$	1.3400e-04	m^3
Second moment of area I_y	3.6900e-05	m^4
Second moment of area I_z	1.3400e-05	m^4
Torsional constant I_t	1.9610e-07	m^4
Method for equivalent moment factor $C_{my,0}$	Table A.2 Line 2 (General)	
Design bending moment (maximum) $M_{y,Ed}$	7.61	kNm
Maximum relative deflection δ_z	-1.4	mm
Equivalent moment factor $C_{my,0}$	1.00	
Method for equivalent moment factor $C_{mz,0}$	Table A.2 Line 1 (Linear)	
Ratio of end moments ψ_z	0.00	
Equivalent moment factor $C_{mz,0}$	0.79	
Factor μ_y	1.00	
Factor μ_z	1.00	
Factor a_{LT}	0.99	
Critical moment for uniform bending $M_{cr,0}$	371.65	kNm
Relative slenderness $\lambda_{rel,0}$	0.52	
Limit relative slenderness $\lambda_{rel,0,lim}$	0.25	
Equivalent moment factor C_{my}	1.00	
Equivalent moment factor C_{mz}	0.79	
Equivalent moment factor C_{mLT}	1.00	
Factor b_{LT}	0.00	
Factor c_{LT}	0.04	
Factor d_{LT}	0.04	
Factor e_{LT}	0.41	
Factor w_y	1.10	
Factor w_z	1.50	
Factor n_{pl}	0.00	
Maximum relative slenderness $\lambda_{rel,max}$	5.14	
Factor C_{yy}	1.00	
Factor C_{yz}	0.98	
Factor C_{zy}	1.00	
Factor C_{zz}	1.00	

Unity check (6.61) = 0.00 + 0.08 + 0.04 = 0.13 -
Unity check (6.62) = 0.00 + 0.04 + 0.06 = 0.10 -

Shear Buckling check
According to EN 1993-1-5 article 5 & 7.1 and formula (5.10) & (7.1)

Shear Buckling parameters		
Buckling field length a	4.000	m
Web	unstiffened	
Web height h_w	2e+02	mm
Web thickness t	7e+00	mm
Material coefficient ε	1.00	
Shear correction factor η	1.20	

Shear Buckling verification	
Web slenderness h_w/t	26.15
Web slenderness limit	60.00

Note: The web slenderness is such that Shear Buckling effects may be ignored according to EN 1993-1-5 article 5.1(2).

The member satisfies the stability check.

Dimenzioniranje poprečnog presjeka RRK60/60/4

EN 1993-1-1 Code Check
National annex: Standard EN

Member B25	0.000 / 1.741 m	RRK60/60/4	S 235	GSN	0.05 -

Note: EN 1993-1-3 article 1.1(3) specifies that this part does not apply to cold formed CHS and RHS sections.
The default EN 1993-1-1 code check is executed instead of the EN 1993-1-3 code check.

Combination key
GSN / 1.35*LC1 + 1.35*LC2 + 1.50*LC3

Partial safety factors	
γ_{M0} for resistance of cross-sections	1.00
γ_{M1} for resistance to instability	1.10
γ_{M2} for resistance of net sections	1.25

Material		
Yield strength f_y	235.0	MPa
Ultimate strength f_u	360.0	MPa
Fabrication	Cold formed	

...::SECTION CHECK::...

The critical check is on position 0.000 m

Internal forces	Calculated	Unit
N_{Ed}	10.52	kN
$V_{y,Ed}$	0.00	kN
$V_{z,Ed}$	0.00	kN
T_{Ed}	0.00	kNm
$M_{y,Ed}$	0.00	kNm
$M_{z,Ed}$	0.00	kNm

Tension check
According to EN 1993-1-1 article 6.2.3 and formula (6.5)

A	8.5500e-04	m^2
$N_{pl,Rd}$	200.93	kN
$N_{u,Rd}$	221.62	kN
$N_{t,Rd}$	200.93	kN
Unity check	0.05	-

The member satisfies the section check.

2.4. Procjena troškova gradnje

Vrsta projekta:	Građevinski projekt konstrukcije
građevina:	Rekonstrukcija i dogradnja građevine FDMZ
investitor:	Fakultet za dentalnu medicine i zdravstvo Osijek Crkvena ulica br. 21, 31000 Osijek OIB: 83830458507
na lokaciji:	k.č.br. 691, k.o.Orahovica
T.D.: Z.O.P.:	607-1/2019 FDMZ – 001/06/2020

Temeljem Zakona o gradnji (N.N. br.153/13, 20/17), obzirom na veličinu i namjenu predmetne građevine, te vezano za norme i propise pod kojima je napravljen Glavni projekt, kao i uvažavajući zahtjeve investitora u tom pogledu, visina troškova gradnje vezano za izvedbu radova na nosivoj konstrukciji procjenjuje se na:

1.200.000,00 HRK (slovima: milijun i dvjesto tisuća kuna)

Procijenjeni troškovi gradnje dani su bez PDV-a. Procjena troškova gradnje daje se isključivo u svrhe procjene gradnje građevine, odnosno kao orijentacijski iznos vrijednosti radova. Navedeno se odnosi isključivo na osnovnu nosivu čeličnu konstrukciju,

Projektant konstrukcije:

Ozren Sudić, dipl.ing.građ.

2.5. Program kontrole i osiguranja kvalitete

Opći uvjeti za izradu i montažu čelične konstrukcije

Konstrukcija obrađena ovim rješenjima podliježe primjeni tehničkih propisa za nosive konstrukcije.

U tehničkoj dokumentaciji predviđena je vrsta i kvaliteta materijala od kojeg konstrukciju treba izraditi. Materijal druge vrste i kvalitete ne može se upotrijebiti bez suglasnosti i odobrenja projektanta. U istoj tehničkoj dokumentaciji definiran je oblik, kvaliteta i pozicije. Za svaku promjenu potrebno je prethodno ishoditi odobrenje projektanta.

Osnovni dokument za izvođenje

Potrebno je sve radove izvoditi prema:

- glavnom projektu (građevna dozvola)
- izvedbenom projektu (usklađenom s glavnim projektom)
- tehnološkom projektu (prema Pravilniku o montaži čeličnih nosivih konstrukcija), koji u pravilu sadrži tehnologiju izvođenja zavarenih spojeva i planove montaže čelične konstrukcije s redoslijedom montaže i podacima o skelama, opremom za dizanje i mjerama zaštite na radu.

Podloge za izradu tehnologije zavarivanja i dokaze kvalitete

Tehnologiju zavarivanja potrebno je uskladiti sa slijedećim zahtjevima:

Potrebno je izvršiti kontrolu varova nerazornim metodama i to:
- Dimenzionalna i vizualna kontrola 100% prema EN 970.
- Ostale kontrole sukladno klasi izvođenja EXC2
- Dopuštena razina grešaka (kvaliteta vara) određuje se prema HRN EN ISO 5817 za grupu B.
- Prigodom nabave materijala obavezno je tražiti odgovarajuće ateste za osnovni i dodatni materijal. Kvaliteta elekrode definirana je prema EN 499 i usvaja se u ovisnosti o odabranoj kvaliteti čelika.
- Kod zavarivačkih radova potrebno je osigurati stalnu kontrolu prije, u toku i nakon izvedenih radova. Površine za zavarivanje moraju biti kvalitetno pripremljene, bez masnoća, hrđe i drugih prljavština. Prije izvedenih zavarivačkih radova potrebno je obaviti dimenzionalnu i vizualnu kotrolu te ostale kontrole predviđene u točki 1. ovog programa. Prilikom izvođenja zavarivačkih radova potrebno je voditi računa da elementi konstrukcije nakon hlađenja ne poprime neželjeni deformirani oblik. Ne dopušta se zavrivanje na temperaturi nižoj od 0°C. Za radove koji nakon potpunog sklapanja konstrukcije neće biti vidljivi, potrebno je napisati zapisnik o preuzimanju u trenutku dostupnosti pregledanju svih dijelova konstrukcije (posebna pozornost na ležajeve).

Dokazi kvalitete prije početka izrade čelične konstrukcije

Prije početka izrade čelične konstrukcije potrebno je posjedovati sljedeće:

- rješenja za voditelja izrade i montaže čelične nosive konstukcije
- atesti materijala od kojih će biti izrađena čelična konstrukcija,
- atesti za spojni materijal (vijci, elektrode),
- svjedodžbe tehnologa zavarivanja i zavarivača koji će raditi na ovoj konstrukciji,
- tehnologija izrade (tehnologija zavarivanja),

- tehnologija montaže,
- plan kontrole.

Ova dokumentacija ovjerena po nadzornom inženjeru odnosno projektantu sastavni je dio dokumenata za tehnički pregled konstrukcije. Ukoliko se materijal nabavlja tijekom rada, potrebno je ateste materijala prije početka izrade dostaviti nadzornom inženjeru na ovjeru.

Kontrola u toku izrade, transporta i montaže

Tijekom izrade kontrukcije u radionici i montaže izvoditelj je dužan voditi zakonom propisane dnevnike i provoditi svoju kontrolu u skladu s planom kontrole. Dužnost je nadzornog inžnjera kontrolirati izvedbu u svim fazama izrade i montaže, tj. usklađenost s tehničkom dokumentacijom i važećim tehničkim normama i pravilima, ovjeravati navedene dokumente i ateste, te zapisnik o preuzimanju elemenata u radionici prije isporuke na montažu. Sve izmjene u dimenzijama ili načinu spajanja elemenata moraju biti ovjerene od projektanata konstrukcije.

Fazne kontrole (fazni tehnički pregledi) koji se provide u toku izvedbe čelične konstrukcije

Izvedba čelične konstrukcije ima sljedeće faze:

- izrada elemenata u radionici,
- transport od radionice na gradilište,
- montaža čelične konstr. na gradilištu na prethodno pripremljenu sidrenu konstrukciju (temelje ili dijelove zgrade).

U pravilu se svaka faza mora pregledati i utvrditi da je izvedena prema tehničkoj dokumentaciji i prema važećim tehničkim propisima. Izvršenje fazne kontrole potvrđuju putem zapisnika odgovorne osobe projektanta, stručnog nadzora i izvoditelja. dok se ne uklone nedostaci utvrđeni u nekoj fazi, u pravilu ne može započeti iduća faza.

Fazni pregledi sa zapisnicima potpisanim od strane odgovornih imenovanih osoba su:

- kontrola dokaza kvalitete prije početka izrade konstrukcije,
- prijem čelične konstrukcije po izradi u radionici,
- prijem čelične konstrukcije po transportu na gradilištu,
- geodetska kontrola izvedene sidrene konstrukcije ili drugih dijelova konstrukcije na koju se montira čelična konstrukcija,
- geodetska kontrola montirane čelične konstrukcije,
- završni pregled čelične konstrukcije prije početka drugih radova na čeličnoj konstrukciji (pokrivanje, oblaganje, montaža instalacija ili opreme i drugo).

Prijem elemenata obavlja se na temelju radioničkih crteža i specifikacija.

Kontrola i prijem čelične konstrukcije vrši se prema Pravilniku o tehničkim mjerama i uvjetima za montažu čeličnih kostrukcija. Sve daljnje aktivnosti prigodom transporta, skladištenja i montažnih radova moraju biti u skladu s navedenim Pravilnikom. Posebno se naglašava potreba pažljivog postupanja prigodom utovara, istovara i transporta dijelova konstrukcije.

Dijelovi konstrukcije ne smiju se odlagati neposredno na zemlju nego na drvene grede i sl.
Dijelovi konstrukcije se slažu tako da se omogući lagano pronalaženje pozicija i pristup zbog dizanja i transporta.

Prigodom prijema u radionici izvoditelj radova na izradi čelične konstrukcije dužan je staviti na uvid potrebnu tehničku dokumentaciju:

- radioničke nacrte sa specifikacijama,
- ateste osnovnog materijala,
- ateste dodatnog materijala,
- ateste zavarivača,
- ateste priključnih elemenata,
- dnevnik izrade elemenata,
- dnevnik zavarivanja,
- podatke o tehnologiji zavarivanja,
- izvješće interne tehničke kontrole,
- uvjerenja o kvalifikacijama stručnih osoba koje sudjeluju u izradi konstrukcije.

Završnom pregledu po montaži u pravilu sudjeluje i rukovoditelj ili koordinator izgradnje cjelokupne građevine.

Antikorozivna zaštita

Antikorozivna zaštita u svemu se provodi prema uvjetima u projektnoj dokumentaciji i u skladu s važećom normom. Izvođenje radova zahtijeva isti postupak kao i sama čelična konstrukcija; kontrola i dokazi kvalitete predmet su istih faznih pregleda.

Tehnički pregled konstrukcije u sklopu pregleda građevine

Nakon izvedbe građevine prema Zakonu o gradnji provodi se postupak Tehničkog pregleda. Stručnoj komisiji za tehnički pregled izvedene građevine predočuje se sva projektna dokumentacija i dokumentacija praćenja izvedbe sa svim elaboriranim dokazima kvlaitete i izvještajima o izvršenim ispitivanjima i pregledima.

Održavanje i praćenje čelične nosive konstrukcije za vrijeme korištenja građevine

Investitor ili korisnik građevine dužan je voditi brigu o stabilnosti konstrukcije za vrijeme korištenja građevine provoditi slijedeće:

- izraditi program održavanja čelične konstrukcije,
- voditi evidenciju o čeličnoj konstrukciji putem knjige (servisne knjige) čelične konstrukcije,
- svake godine obaviti redoviti pregled,
- svakih deset godina obaviti glavni pregled,
- provoditi radove obnove ili sanacije čelične konstrukcije utvrđene pregledima, a prema zakonima i propisima.

Projektant konstrukcije:

Ozren Sudić, dipl.ing.građ.