Pasūtītājs:	**Ventspils brīvostas pārvalde** Reģ. Nr. 90000284085 Adrese: Jāņa iela 19, Ventspils, LV-3601
Izstrādātājs:	**SIA "CHR Design Solutions"** Reģ. Nr. 40203094458 Būvkomersanta apliecība Nr.14083 Adrese: Tvaika iela 27, Rīga, LV-1005
Līguma Nr.:	**2021/50**

Ventspils brīvostas piestātnes Nr.35A kuģu pagaidu tauvošanas risinājums

Amats	Paraksts	Datums	Vārds, Uzvārds
SIA "CHR Design Solutions" valdes loceklis			K. Sirmais
Būvinženieris			E. Ovčiņņikovs
Būvprojekta vadītājs			J. Rāzna

Rīga, 2022. gads

Sējuma satura rādītājs

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IZRAKSTS
Pielikums Nr.1
pie līguma Nr.2021/50 Papildus vienošanās Nr.2

PROJEKTĒŠANAS UZDEVUMS
Papildus projektēšanas darbi
būvprojektam "Ventspils brīvostas piestātnes Nr.35A pārbūve"

1. Pasūtītājs	-	Ventspils brīvostas pārvalde.
2. Objekta nosaukums	-	Ventspils brīvostas piestātnes Nr.35A pārbūve.
3. Objekta atrašanās vieta	-	Ventspils brīvostas piestātne Nr.35A, Dzintaru iela 102C, Ventspils.
4. Projektējamā objekta nozīme	-	Kuģu pagaidu tauvošanas risinājums drošas kuģu tauvošanas un piestātnes ekspluatācijas nodrošināšanai.
5. Projektēšanas darbu apjoms	-	5.1.Cita kuģu pagaidu tauvošanās risinājuma izstrāde. 5.2.Piestātnes tehnoloģiskā laukuma apsekošana minimāli nepieciešamajā apjomā. 5.3.Tehniskā risinājuma detalizācijas pakāpe – tehniskajā risinājumā jāiekļauj visu mezglu risinājumi un pamatmezglu detalizācija. 5.4.Tehniskā risinājuma dokumentācijā jāiekļauj pamatkonstrukciju aprēķina atskaite, kā arī konstrukcijas izgatavošanas darbu apjomi un izmaksu aplēse.
6. Izejas dati projektēšanai	-	6.1.Esošās piestātnes pases aprēķina kuģa (piekrauts ar kravu) izmēri: - garums 195,0 m; - pieļaujamā iegrime mīnus 12,5 m. 6.2.Maksimāli pieļaujamais attālums no piestātnes tehnoloģiskā laukuma līdz pietauvotam kuģim 4,0m.
7. Īpašie noteikumi	-	7.1.Kuģu pagaidu tauvošanas risinājumam jānodrošina kuģu tauvošana līdz atdurpāļu Nr.3 un Nr.4 izbūves realizācijail, kā arī minēto atdurpāļu būvdarbu laikā. 7.2.Kuģu pagaidu tauvošanas konstrukcijas risinājumam jābūt ar aprēķiniem pamatotam. 7.3.Kuģu pagaidu tauvošanas risinājums jāparedz ar iespēju izmantot atvairierīces SCN F1.3 (vai analogs) atkārtoti uz izbūvētajiem atdurpāļiem Nr.3 un Nr.4.
8. Prasības	-	8.1.Projektētājs pilnībā atbild par kuģu pagaidu tauvošanās konstrukcijas tehnisko risinājumu. 8.2.Tehniskais risinājums Pasūtītājam jāiesniedz 3 (trīs) drukas eksemplāros, kā arī 1 (viens) eksemplārs elektroniskā formā: 8.2.1. Teksts un aprēķini – MS Office programmas un ***.pdf failos. 8.2.2. Grafiskie materiāli ***.dwg un ***.pdf failos.
9. Izstrādes termiņi	-	Kuģu pagaidu tauvošanās risinājuma izstrāde 14 (četrpadsmit) kalendārās dienas.

Pasūtītājs

Ventspils brīvostas pārvaldnieks
A.Purmalis

Izpildītājs

SIA "CHR Design Solutions" valdes loceklis
K.Sirmais

DOKUMENTS PARAKSTĪTS AR DROŠU ELEKTRONISKO PARAKSTU UN SATUR LAIKA ZĪMOGU

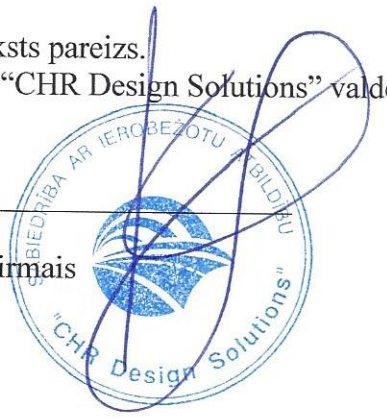
Signature ID: S1
Certificate: KĀRLIS SIRMAIS
Signing time: 2022-02-21 14:16:30 EET
Time stamp: 2022-02-21 14:16:39 EET

Signature profile: QUALIFIED_SIGNATURE
Signature location:
Role (position):

Signature ID: S2
Certificate: ANDRIS PURMALIS
Signing time: 2022-02-21 15:58:48 EET
Time stamp: 2022-02-21 15:55:53 EET

Signature profile: QUALIFIED_SIGNATURE
Signature location:
Role (position):

Izraksts pareizs.
SIA "CHR Design Solutions" valdes loceklis



K. Sirmais

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Ventspils

2021. gada 29.septembrī Nr.21-02/165

Uz Jūsu 2021.g.27.septembra vēstuli Nr.T/TN/DP-8.1/1127

Ventspils brīvostas pārvalde
info@vbp.lv

Par Ventspils brīvostas piestātnes Nr.35A pārbūvi

Atbildot uz Jūsu lūgumu, SIA "VK Terminal Services" saskaņo maksimālā attāluma starp tehnoloģiskā laukuma kordona malu un pietauvoto tankkuģi palielināšanu no 3,5m līdz 4,0m.

Valdes priekšsēdētājs (paraksts*) Arnis Janvars

**Dokuments parakstīts ar drošu elektronisko parakstu un satur laika zīmogu.*

SAŅEMTS
Ventspils brīvostas pārvaldē
Datums: 29.09.2021
Indekss: A/DP- 8/962

V.Verņuks
63660995

Paraksta informācija | Detalizētā pārbaude

PARAKSTA ID	Signature1
SERTIFIKĀTS	ARNIS JANVARS
PARAKSTĪŠANAS LAIKS	29.09.2021 10:32:23 EEST
LAIKA ZĪMOGS	29.09.2021 10:32:32 EEST
PARAKSTA PROFILS	QUALIFIED_SIGNATURE
PARAKSTĪŠANAS VIETA	
PARAKSTĪSANAS IEMESLS	

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APSTIPRINU:
SIA " VK Terminal Services"
2021. gada "22." 03

Tehniskie noteikumi 03/21
"Ventspils brīvostas piestātnes Nr.35A pārbūve"

1. Pasūtītājs — SIA „Ventspils brīvostas pārvalde"
2. Būvniecības vieta — Dzintaru iela 102C, Ventspils
3. Pamats — SIA "CHR Design Solutions" iesniegums un VBP proj. uzd.

4. Plānojot Ventspils brīvostas piestātnes Nr.35A pārbūvi lūdzam ņemt vērā sekojošas prasības izstrādājot projekta dokumentāciju:

4.1. plānot piestātnes pārbūvi neapstādinot kuģu apstrādi minētajā piestātnē (izstrādājot DOP būvprojekta sadaļu sazināties ar SIA "VK Terminal Services" piestātņu dienestu, t.sk. ievērtējot, ka iespējamas ir iekaušanas/izkraušanas operācijas tankkuģim atrodoties 3,5 m attālumā no piestātnes kordona līnijas);

4.2. izstrādājot būvprojektu nav pieļaujama piestātnes Nr.35A galveno raksturlielumu samazināšana (atbilstoši Ventspils brīvostas noteikumi, pielikums Nr.1.);

4.3. paredzēt projekta būvapjomos tehnoloģiskā laukuma un savienojošās daļas ar Ziemeļu molu tērauda pāļu ø820x10/20 un ø1020x13/40 aizsargpārklājuma atjaunošanu;

4.4. izstrādāt un saskaņot projekta dokumentāciju atbilstoši LR spēkā esošajiem normatīvajiem dokumentiem un noteikumiem.

SIA "VK Terminal Services"
Tehniskās daļas vadītājs — M.Janvars

Skaidrojošs apraksts

Kuģu tauvošanas pagaidu risinājums izstrādāts saskaņā ar saskaņoto projektēšanas uzdevumu. Risinājuma mērķis ir nodrošināt lielo kuģu tauvošanas iespēju pie tehnoloģiska laukuma gan pirms būvdarbu uzsākšanas, gan atdurpāļu Nr. 3 un Nr. 4 atjaunošanas būvdarbu laikā.

Pagaidu risinājums paredz 2 fenderu SCN 1600 piestiprināšanu pie tehnoloģiskā laukuma, izmantojot pagaidu konstrukciju komplektu. Pagaidu tauvošanās risinājums paredz iespēju kuģus īslaicīgi (līdz atdurpāļu Nr.3 un Nr.4 būvdarbu pabeigšanai) pietauvot pie tehnoloģiskā laukuma. Pagaidu konstrukcijas projektētas tā, lai tiktu ievērots drošs attālums no atdurpāļiem Nr.3 un Nr.4 to pārbūves laikā kā arī lai maksimālais kuģa izvirzījums no tehnoloģiskā laukuma nepārsniegtu 4.0m – saskaņā ar SIA "VK Terminal Services" tehniskajiem noteikumiem.

Tehniskā risinājuma apraksts.

Paredzēts zem katra no diviem fenderiem SCN 1600 izvietot 2 atsevišķas konstrukcijas – fendera pamatni (rasējumos apzīmēta kā Konstrukcija 3) un siju režģi (rasējumos – Konstrukcija 2). Siju režģi piestiprina pie 2 statņiem, kuri, savukārt, ir piestiprināti pie laukuma malējas plātnes pārkares un atbalstīti uz 2 slīpiem atbalstiem (rasējumos - Konstrukcijas 3). Risinājums izstrādāts un aprēķināts tā, lai visu slodzi no kuģa (200 t uz vienu fenderi) uzņemtu fendera pamatne, siju režģis un statņi ar atbalstiem. Tas pasargā no trieciena tehnoloģiskaā laukuma fasādes dzelzsbetona plātnes ar pārkari, kuru stiegrojums nav pietiekošs šādu slodžu uzņemšanai. Slīpie atbalsti atrodās laukuma pāļiem pretī un pārnes piepūles uz pāļu galvām, caur pēdām, kuras noenkurotas monolīta dzelzsbetona posmos uz pāļiem.

Lai nodrošinātu pietiekošu statņu piestiprināšanas garumu, tehnoloģiskā laukuma fasādes sienu paaugstina atbilstošās vietās. Pārkares apakšējās daļas atbalstam starp pāļiem un malējo fasādes sienas plātņu pārkarēm arī izveido monolīta betona posmus.

Pēc 1. būvdarbu etapa pabeigšanas, kreiso atdurkonstrukciju demontē, atbalstus un siju režģi nojauc un utilizē, bet fendera pamatni ar fenderi pārvieto uz atdurpāli Nr. 4. Tie turpina pildīt savu funkciju kopā ar paliekošo uz tehnoloģiska laukuma labo atdurkonstrukciju, līdz atdurpāļa Nr. 3 izbūves darbu pabeigšanai. Demontāžas un pārvietošanas darbi nav iekļauti tehniskā risinājuma darbu apjomos.

Tā kā Konstrukcijas 1., 2., 3. ir pagaidu, ar kalpošanas laiku aptuveni 0.5 gads, projektētājs neizvirza specialās

prasības betona sastāvam, izņemot tā stiprības radītājus. Bet tas neatbrīvo būvuzņēmēju no pienākuma pielietot ES prasībām atbilstošos materiālus, piestādot visus pavaddokumentus, kur būtu norādīta pilna informācijā par materiālu kvalitāti un īpašībām. Aizsargpārklājums nav paredzēts ne tērauda, ne betona konstrukcijām.

Darba drošība

Par darba drošību ir atbildīgs būvuzņēmējs. Būvuzņēmējam stingri jāievēro visus atbilstošus būvnormatīvus un Pasūtītāja pārstāvju prasības. Būvdarbu zonas uz tehnoloģiska laukuma jānožogo ar 2m augstiem pagaidu žogiem. Pēc visu konstrukciju montāžas un slīpo atbalstu uzstādīšanas, būvbedres piesegt ar pietiekošas nestspējas koka vairogiem. Būvbedru sienām jābūt nostiprinātām. Tad nožogojumu, pēc saskaņošanas ar Pasūtītāju un SIA "VK Terminal Services", var aizvietot ar brīdinājuma zīmēm.

Būvdarbu apjomu noteikšana

Šī sējuma būvdarbu apjomu sarakstā ir iekļauti materiāli un darbi, kas attiecās uz pagaidu atdurkonstrukciju izgatavošanu un montāžu, kā arī federu SCN-1600 montāžu uz pagaidu konstrukcijām pirms 1. kārtas būvdarbu uzsākšanas. Turpmākās montāžas un demontāžas operācijas jāparedz piestātnes pārbūves būvprojekta būvdarbu apjomos.

Fenderus SCN 1600, ar komplektā iekļautiem elementiem, kā arī pagaidu stiprinājumam nepieciešamās ķēdes nodrošina Pasūtītājs. Komplektā iekļautās cilpas, ķēdes un skrūves M42 tiks pielietotas, kad tiks pabeigti piestātnes pārbūves būvdarbi, demontētas pagaidu konstrukcijas un fenderus uzstāda projekta stāvoklī.

BŪVDARBU APJOMU SARAKSTS

Objekta nosaukums: Ventspils brīvostas piestatnes N35A kuģu pagaidu tauvošanas risinājums
Līguma Nr.: 2021/50

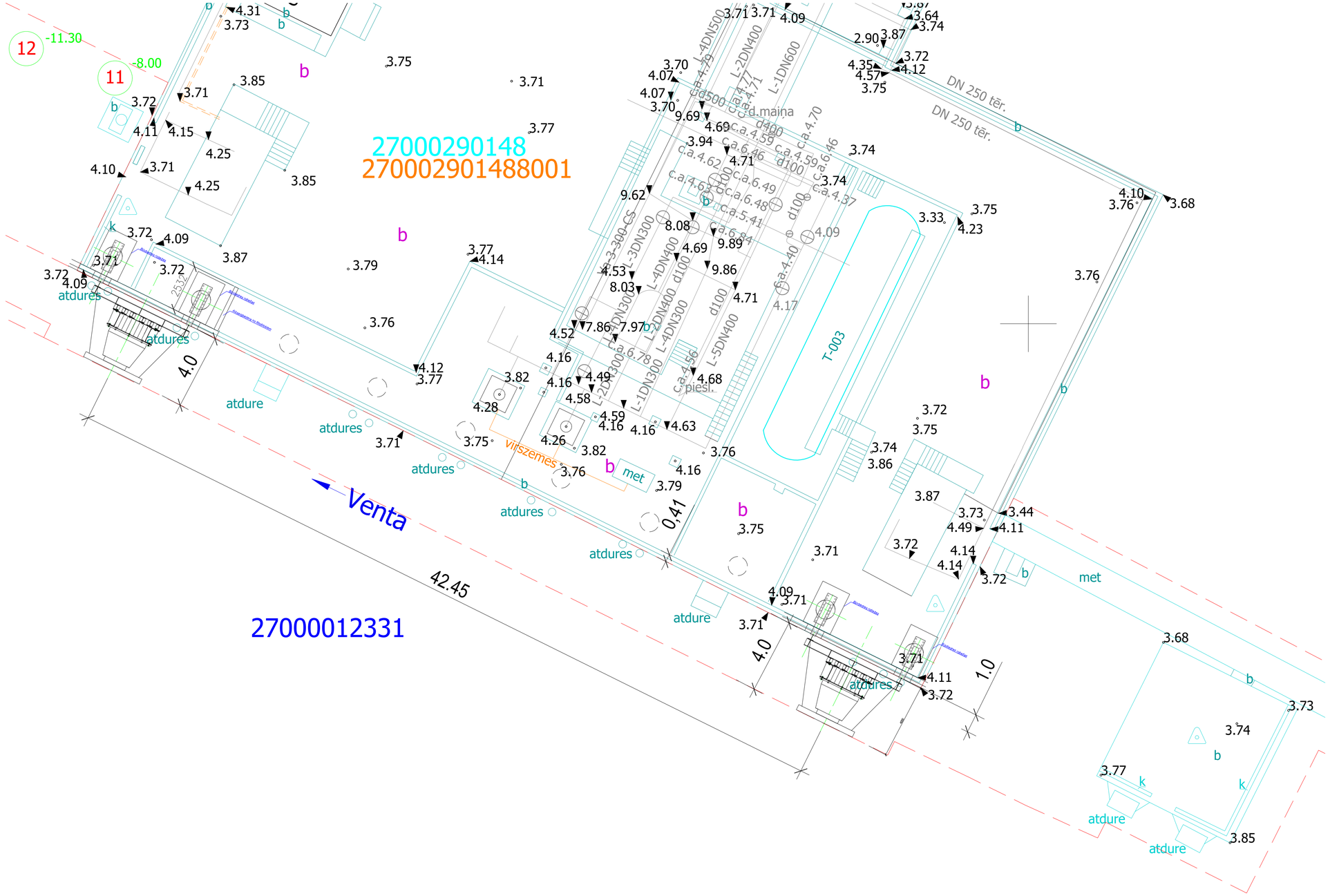
Nr.p.k.	Ras. Nr.	Darba nosaukums	Mērvien.	Daudzums
1		**Sagatavošanas darbi, tai skaitā:**		
2	1; 4	mobilizācija	KS	1
3	1; 4	asu nospraušana un mērniecības darbi	KS	1
4	1; 4	būvlaukuma ierīkošana, nožogošana, apzīmēšana	KS	1
5	1; 4	darbu izpildes programmas sagatavošana	KS	1
6		esošo fenderu demontāža	gab.	8
7	1; 4	seguma nojaukšana	m^2	16.00
8	1; 4	būvbedru rakšana, nostiprināšana, aizsegšana ar vairogu	m^3	18.00
9	1; 4	aizsargborta izbūve no vieglbetona blokiem	m^3	0.15
10		**Monolīta dzelzsbetona posmi, tai skaitā:**		
11	5	betons C35/45	m^3	2.40
12	5	stiegrojums B500B, t.sk. enkuri B500B	t	0.20
13	5	lokšņu tērauds t=10 mm	t	0.48
14	5	ķīmiskie enkuri kl.8.8 Ø16, L=0.4m	gab.	24
15		**Tērauda konstrukciju 1., 2., 3. izgatavošana un montāža, tai skaitā:**		
16	6	profilētas sijas HEB400 S355, L=5650m, 8 gab.	t	7.02
17	5	profilētas sijas HEB300 S355, L=4500m, 4 gab.	t	1.87
18	6	profilētas sijas HEA300 S355, L=2.5-2.9m, 12 gab.	t	2.99
19	6	profilētas sijas UPN280 S355, L=0.7m, 12 gab.	t	0.34
20	5	caurules 350x350x16 S355, L=2.12m, 4 gab.	t	1.49
21	5	lokšņu tērauds t=25mm	t	1.24
22	7	lokšņu tērauds t=20mm	t	2.68
23	6; 7	lokšņu tērauds t=16mm	t	5.03
24	6	lokšņu tērauds t=12mm	t	0.02
25	5	ķīmiskie enkuri kl.8.8 Ø32, L=0.4m	gab.	128
26	5	ķīmiskie enkuri kl.8.8 Ø30, L=0.4m	gab.	100
27	5	pagaidu cilpas, 4 gab.	KS	1
28	5	pagaidu ķēdes, 8 gab.	KS	1
29	4;7	skrūves M42 kl. 8.8 L=120mm ar 2 uzgriežņiem un paplaksnēm	gab.	40
30		**Citi darbi**		
31	1; 4	fenderu SCN-1600 montāža uz pagaidu konstrukcijām*	gab.	2
32	1; 4	būvlaukuma sakārtošana pēc būvdarbiem	KS	1

*Uzstādāmie fenderi SCN-1600 un ķēdes ir Pasūtītāja īpašumā.

Sastādīja: **būvinženiere A. Savenko**

Pārbaudīja: **būvinženieris E. Ovčiņņikovs**

RASĒJUMI



A			
VERSIJA	IZMAIŅAS		DATUMS

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OBJEKTA NOSAUKUMS:
Ventspils brīvostas piestātnes Nr.35A kuģu tauvošanas pagaidu risinājums

PROJEKTA Nr.: 2021/50

STADIJA: Tehniskais risinājums

OBJEKTA ADRESE: Latvija, Ventspils, Dzintaru iela 102C

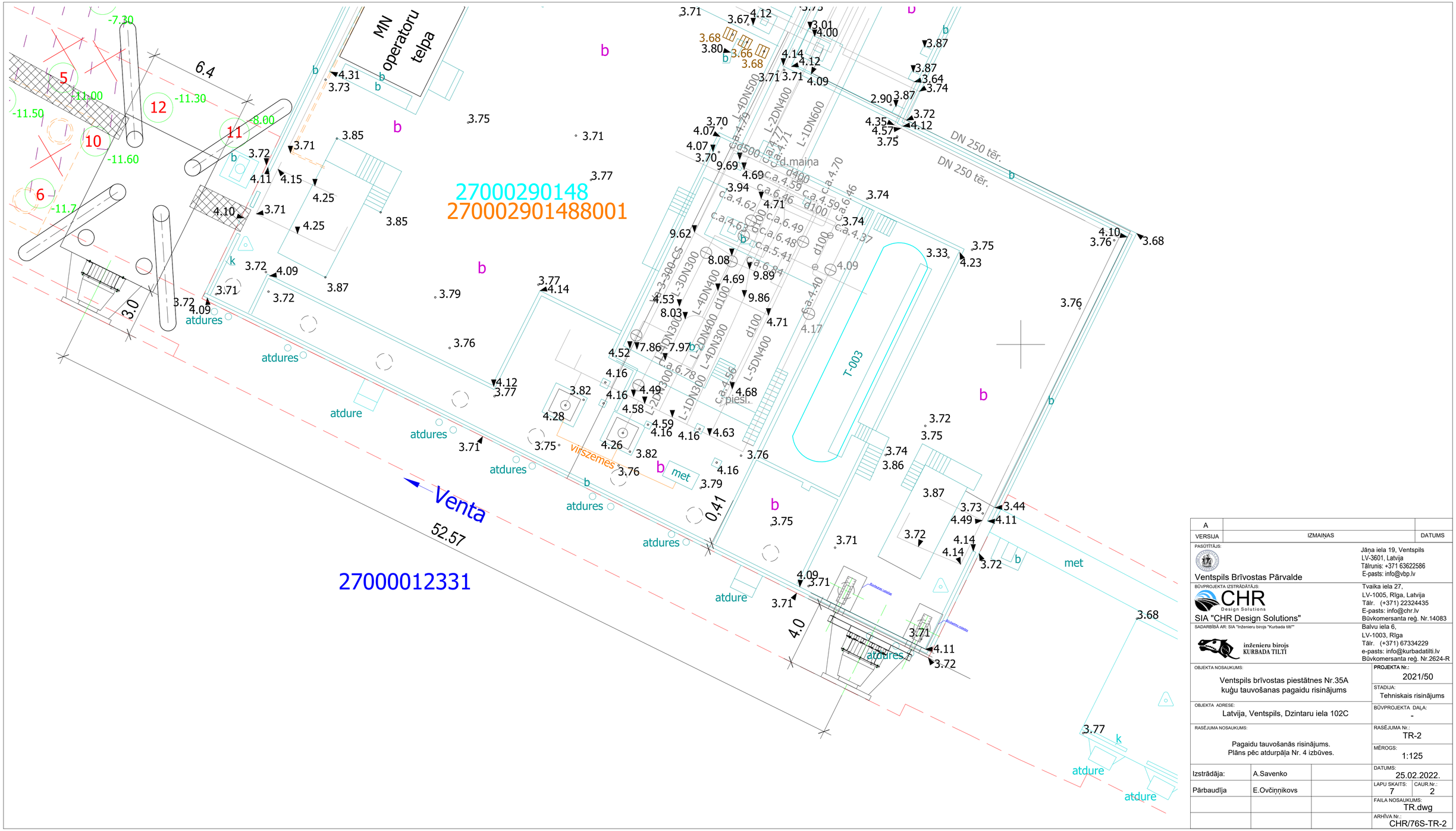
BŪVPROJEKTA DAĻA: -

RASĒJUMA NOSAUKUMS: Pagaidu tauvošanās risinājums. Plāns.

RASĒJUMA Nr.: TR-1

MĒROGS: 1:125

Izstrādāja:	A.Savenko		DATUMS: 25.02.2022.
Pārbaudīja	E.Ovčiņņikovs		LAPU SKAITS: 7 / CAUR.Nr.: 1
			FAILA NOSAUKUMS: TR.dwg
			ARHĪVA Nr.: CHR/76S-TR-1



A			
VERSIJA	IZMAIŅAS		DATUMS

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OBJEKTA NOSAUKUMS:
Ventspils brīvostas piestātnes Nr.35A kuģu tauvošanas pagaidu risinājums

PROJEKTA Nr.: 2021/50

STADIJA: Tehniskais risinājums

OBJEKTA ADRESE: Latvija, Ventspils, Dzintaru iela 102C

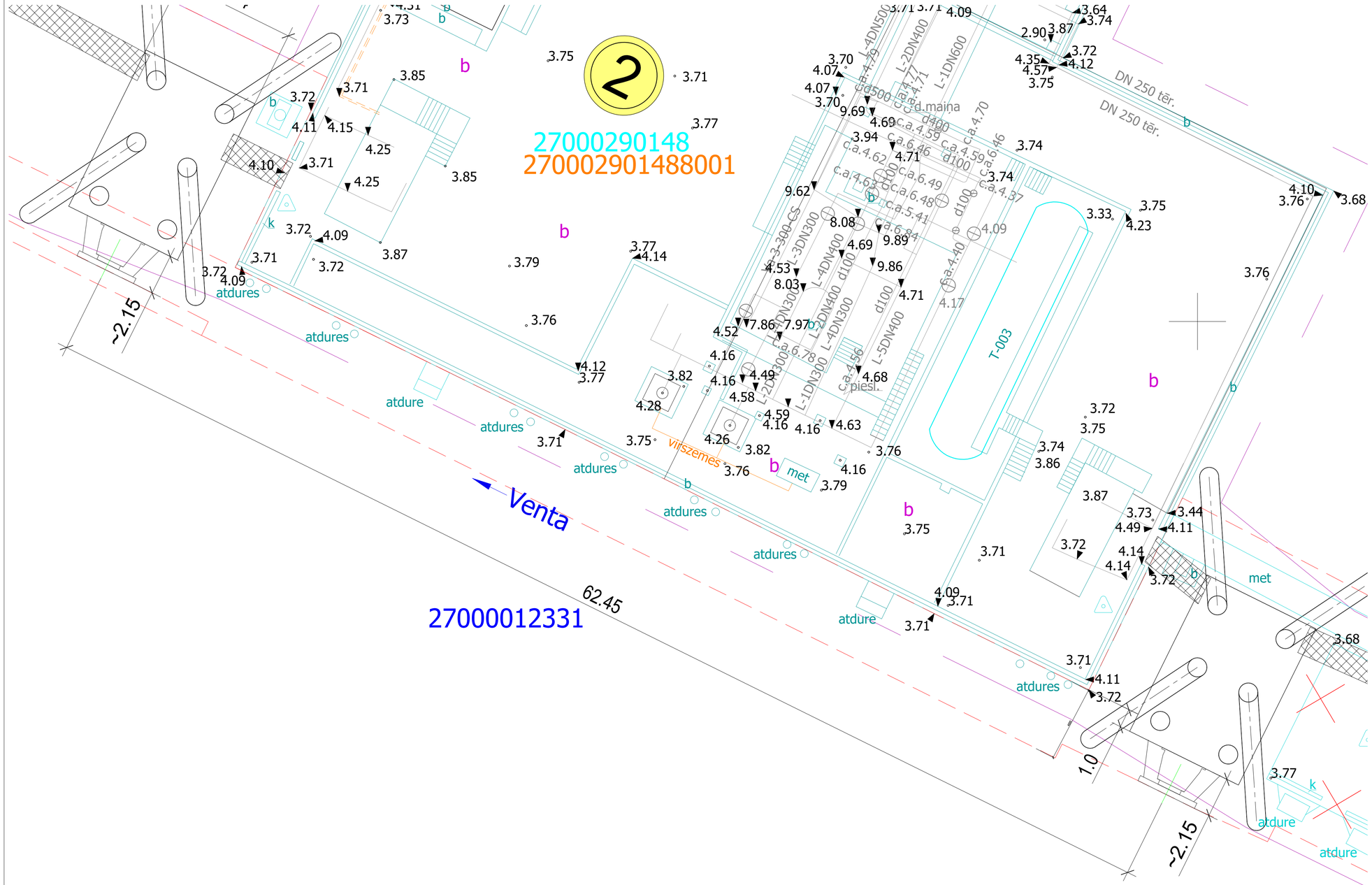
BŪVPROJEKTA DAĻA: -

RASĒJUMA NOSAUKUMS:
Pagaidu tauvošanās risinājums.
Plāns pēc atdurpāļa Nr. 4 izbūves.

RASĒJUMA Nr.: TR-2

MĒROGS: 1:125

Izstrādāja:	A.Savenko		DATUMS: 25.02.2022.
Pārbaudīja	E.Ovčiņnikovs		LAPU SKAITS: 7 / CAUR.Nr.: 2
			FAILA NOSAUKUMS: TR.dwg
			ARHĪVA Nr.: CHR/76S-TR-2



A		
VERSIJA	IZMAIŅAS	DATUMS

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E-pasts: info@chr.lv
Būvkomersanta reģ. Nr.14083

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Būvkomersanta reģ. Nr.2624-R

OBJEKTA NOSAUKUMS:
Ventspils brīvostas piestātnes Nr.35A
kuģu tauvošanas pagaidu risinājums

PROJEKTA Nr.: 2021/50

STADIJA: Tehniskais risinājums

OBJEKTA ADRESE: Latvija, Ventspils, Dzintaru iela 102C

BŪVPROJEKTA DAĻA: -

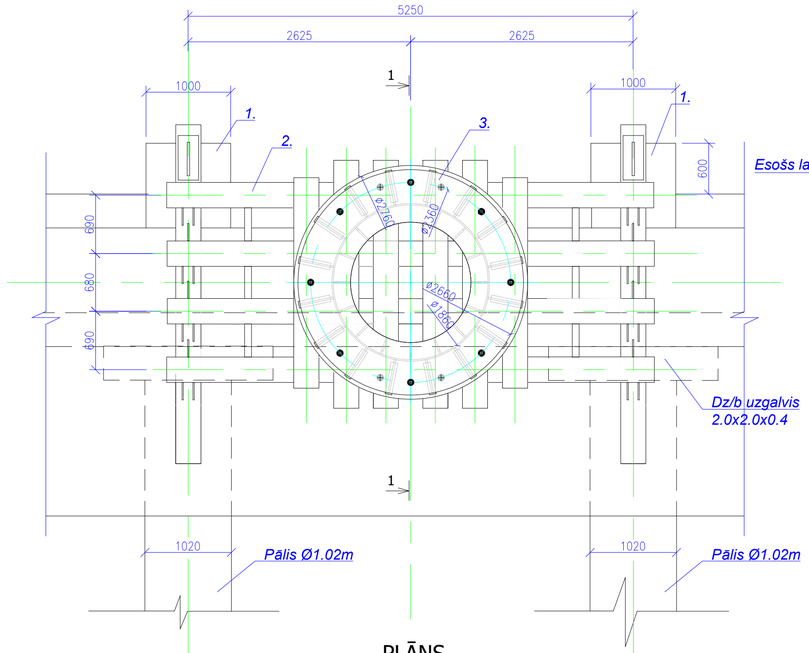
RASĒJUMA NOSAUKUMS:
Pagaidu tauvošanās risinājums.
Plāns pēc atdurpāļa Nr. 3 izbūves.

RASĒJUMA Nr.: TR-3

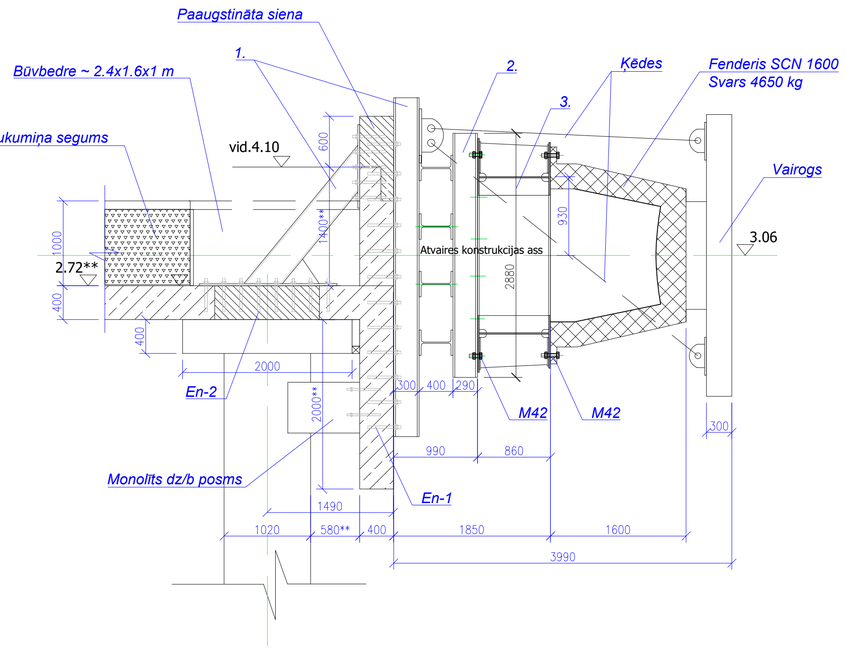
MĒROGS: 1:125

Izstrādāja:	A.Savenko		DATUMS: 25.02.2022.
Pārbaudīja	E.Ovčiņņikovs		LAPU SKAITS: 7 / CAUR.Nr.: 3
			FAILA NOSAUKUMS: TR.dwg
			ARHĪVA Nr.: CHR/76S-TR-3

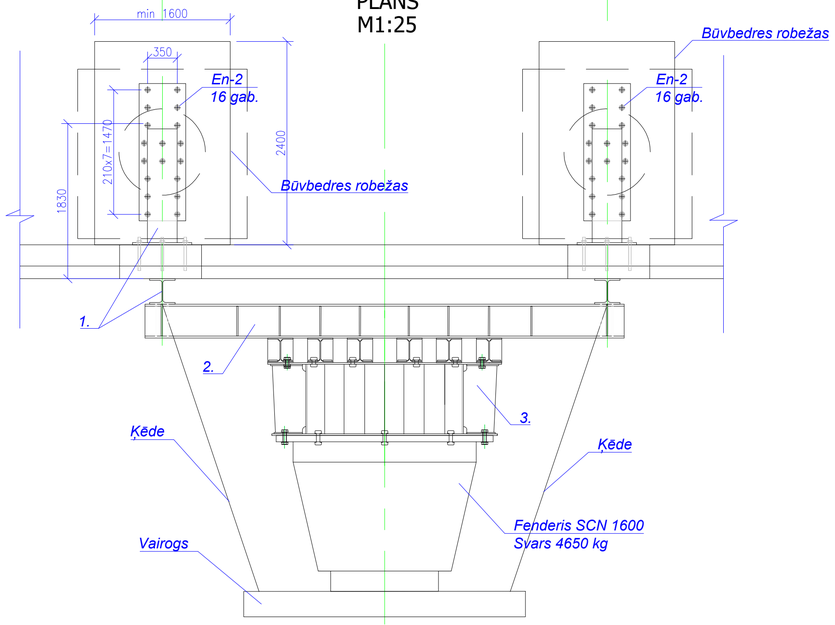
FASĀDE
Fenderis SCN 1600 nav parādīts
M1:25



GRIEZUMS
1-1



PLĀNS
M1:25



SPECIFIKĀCIJA 1 (vienam) PAGAIDU STIPRINAJUMAM

Konstrukijas	Materiāli	Masa/ apjoms kopā	Mērvien.	Piezīme
Monolīta betona posmi	Tērauds S355	0.24	t	Sk. detalrasējumu
	Stiegrojums B500B	0.098	t	
	Betons C30_37	1.200	m³	
	Ķīmiskie enkuri	12	gab.	
1. - statni ar atbalstiem	Tērauds S355	2.322	t	Sk. detalrasējumu
	Ķīmiskie enkuri kl.8.8 Ø30-32	114	gab.	
2. - siju režģis	Tērauds S355	6.019	t	Sk. detalrasējumu
3. - fendera pamatne	Tērauds S355	3.000	t	Sk. detalrasējumu
	Ķēdes fendera pagaidu stiprināšanai, pārraušanas spēkam 25 kN, L=3.2m	2	gab.	
	Ķēdes fendera pagaidu stiprināšanai, pārraušanas spēkam 34 kN, L=4m	2	gab.	
	Skrūves M42 ar paplāksnēm un uzgriežņiem	18	gab.	
Kopā tērauds S355 (bez ķēdēm un cilpām):		11.581	t	

PIEZĪMES

1. Rasējumā parādīts atvairierīču (gumijas fenderu SCN 1600) pagaidu stiprinājums pie tehnoloģiskā laukuma.
2. Pagaidu konstrukcija sastāv no vertikāliem statņiem HEB 300 ar atbalstiem (Konstrukcija 1.), siju režģa HEB400/HEA300 (Konstrukcija 2.) un fendera pamatnes (Konstrukcija 3.).
3. Konstrukcijas 1. vertikālie statņi piestiprināmi pie paaugstinātās betona sienas ar ķīmiskiem enkuriem.
4. Atbalstus piemetina pie vertikālām un horizontālām loksnēm. Loksnes piestiprina pie dzelzsbetona konstrukcijām ar ķīmiskiem enkuriem.
5. Fendera pamatni (Konstrukcija 3.) piestiprina pie Konstrukcijas 2. ar skrūvēm M42.
6. Visām konstrukcijām ir doti detalizācijas rasējumi.
7. Fenderi SCN 1600 piestiprina pie pamatnes ar pagaidu skrūvēm M42, analoģiskām fendera komplektā iekļautām skrūvēm.
8. Būvbedres piesegt ar koka vairogiem, to sienas nostiprināt.
9. Izmēri doti milimetros, augstuma atzīmes - metros, LAS 2000.5.
10. Izmēri ar ** paņemti no tehnoloģiskā laukuma 1993.g. būvprojekta.
11. Fendera ķēdes parādītas nosacīti - kā līnijas.

VERSIJA	IZMAIŅAS	DATUMS
A		

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OBJEKTA NOSAUKUMS:
Ventspils brīvostas piestātnes Nr.35A kuģu tauvošanas pagaidu risinājums

PROJEKTA Nr.: 2021/50

STADIJA: Tehniskais risinājums

OBJEKTA ADRESE: Latvija, Ventspils, Dzintaru iela 102C

BŪVPROJEKTA DAĻA: -

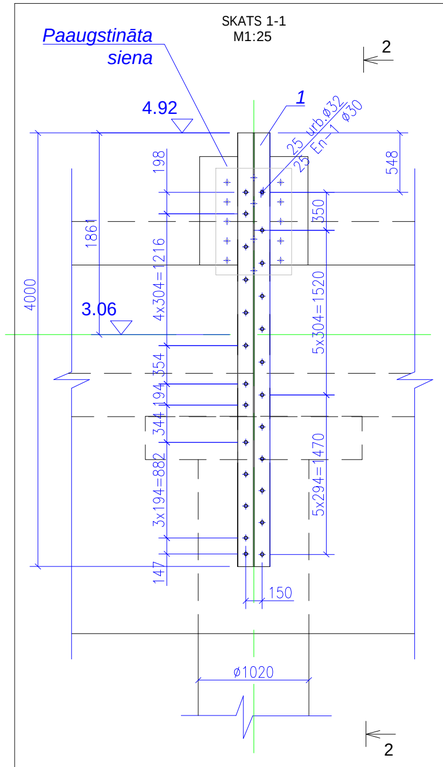
RASĒJUMA NOSAUKUMS: Fendera pagaidu stiprinājums. Kopskats.

RASĒJUMA Nr.: TR-4

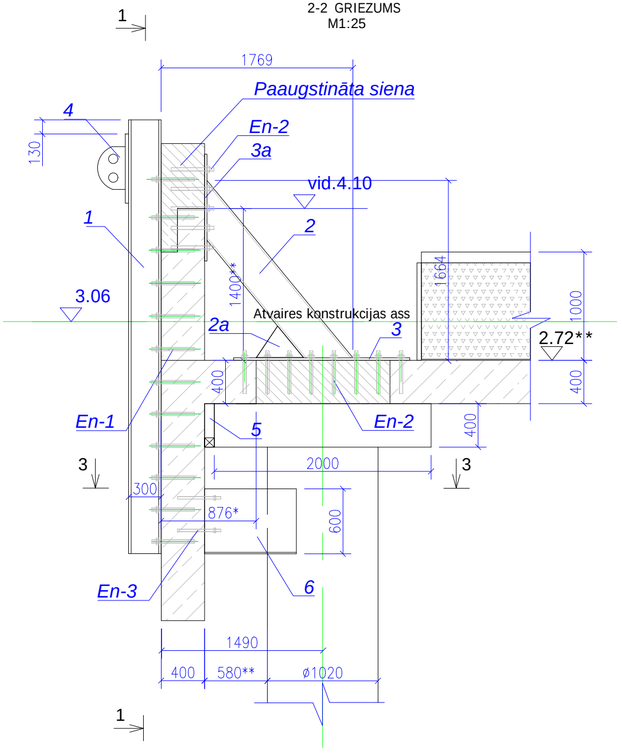
MĒROGS: 1:25

Izstrādāja:	A.Savenko		DATUMS: 25.02.2022.
Pārbaudīja	E.Ovčiņņikovs		LAPU SKAITS: 7 / CAUR.Nr.: 4
			FAILA NOSAUKUMS: TR.dwg
			ARHĪVA Nr.: CHR/76S-TR-4

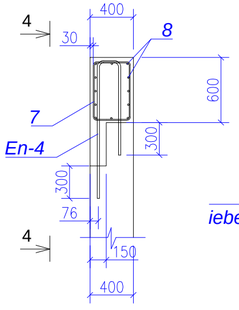
SKATS 1-1
M1:25



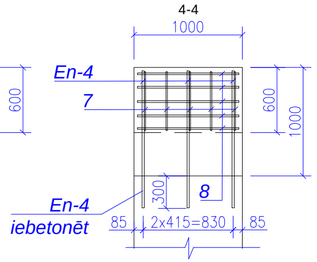
2-2 GRIEZUMS
M1:25



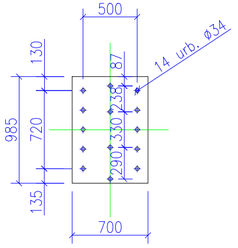
SIENAS PAAUGSTINĀŠANA
M1:25



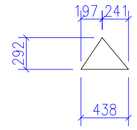
4-4



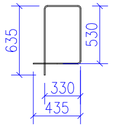
Poz. 3a
M1:25



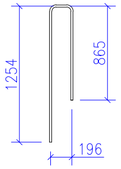
Poz. 2a
M1:25



Poz. 7



En-4

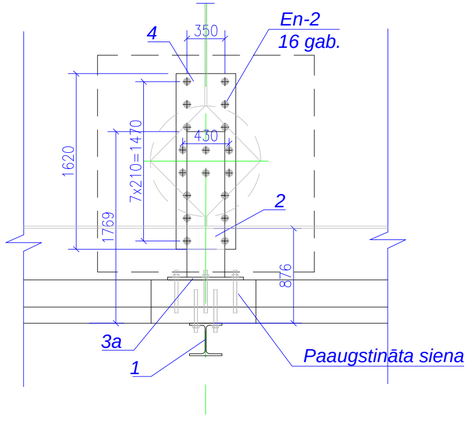


MONOLĪTO DZELZSBETONA POSMU SPECIFIKĀCIJA VIENAM FENDERA STIPRINĀJUMAM

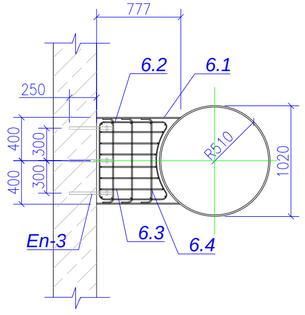
Poz.	Ø, mm	Garums, mm	Materiāls	Skaits	Masa/ apjoms 1 gab	Mērvien.	Masa/ apjoms kopā, kg
5	400x90	L=1500	Bet. C35__45	2	0.1	m³	0.1
6.1	Loksne t=10		S355	6		kg	240
6.2	Ø10	L=2960*	B500B	8	1.79	kg	14.3
6.3	Ø10	L$_{vid.}$ =2320*	B500B	12	1.4	kg	17.3
6.4	Ø12	L=930*	B500B	18	0.8	kg	14.9
6			Bet. C35__45		0.6	m³	0.6
En-3	Ø16	L=400	kl.8.8	12			
7	Ø10	1450	B500B	10	0.9	kg	8.9
8	Ø16	920	B500B	20	1.5	kg	29.0
En-4	Ø20	1880	B500B	3	4.6	kg	13.9
Paaugst. siena			Bet. C35__45			m³	0.4
Kopā Betons C35__45						m³	1.120
Kopa Stiegrojums B500B						kg	98.370

* precizēt darbu veikšanas projektā

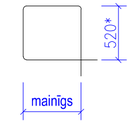
PLĀNS
M1:25



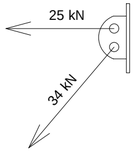
GRIEZUMS 3-3
M1:25



Poz. 6.3 skice



SLODZES CILPAI
M1:25



KONSTRUKCIJAS 1. SPECIFIKĀCIJA

Poz.	Šķērsgriezums	Izmēri, mm	Materiāls	Skaits	Masa/ apjoms 1 gab	Mērvien.	Masa/ apjoms kopā, kg
1	HEB300	L=4500	S355	2	468.0	kg	936.0
2	TUB350x350x16	L=2120	S355	2	372.8	kg	745.6
2a	--438x292x20		S355	2	10.1	kg	20.2
3	--550x25	L=1620	S355	2	174.9	kg	349.8
3a	--700x25	L=985	S355	2	135.3	kg	270.6
4	Sk. det. ras.		S355	2	68.2*	kg	KS
En-1	Ø30	L=400	kl.8.8	50			
En-2	Ø32	L=400	kl.8.8	64			
Kopā terauds S355:							2322.2

PIEZĪMES
1. Rasējumā parādīta konstrukcijas 1. puse. Otrā puse ir simetriska.
2. Skatā 1-1 enkuru uzgriežņi nosacīti nav parādīti.
3. Poz. 5 ir aizbetonēta sprauga L=1.5 m starp sienu un pāļa uzgalvi. No apakšas blīvi iestrādāt koka brusu. Izmērus precizēt uz vietas.
4. Poz. 6 ir betona posms starp sienu un pāli. Betonēt tērauda veidņos, veidus nedemontēt. Veidņu piestiprināšana pie sienas parādīta nosacīti. Pie pāļa veidņus piemetināt ar vertikālām un horizonālām metināšanas šuvēm, šuvju augstums vienāds ar loksnes biezumu.
5. Poz. 2 un 2a piemetināt pie poz. 3 ar stūra šuvēm, šuves augstums vienāds ar plānākas detaļas biezumu.
6. Tērauda veidņu konstrukciju izstrāda būvuzņēmējs.
7. Poz. 4 iegādi un piestiprināšanau nodrošina būvuzņemējs, atbbilstoši norādītām piepulēm.
8. Piepūles ķēdēs norādītas ar drošības koeficientu k=2.
9. Izmēri ir doti milimetros.
10. Izmēri ar ** paņemti no tehnoloģiskā laukuma 1993.g. būvprojekta.

A		
VERSIJA	IZMAIŅAS	DATUMS

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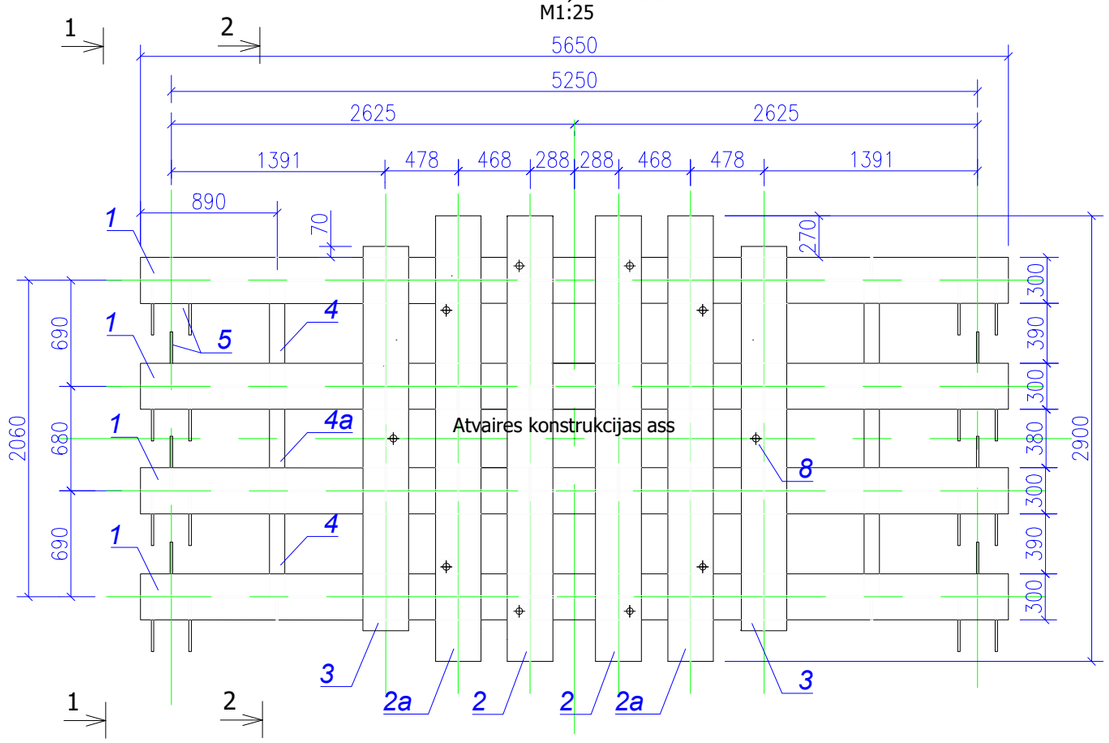
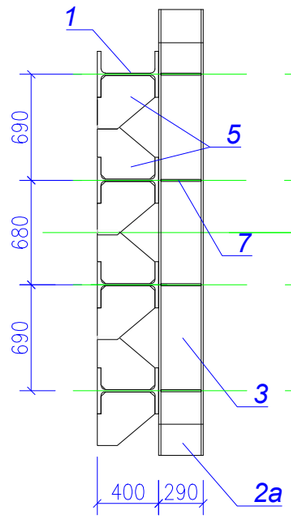
OBJEKTA NOSAUKUMS: Ventspils brīvostas piestātnes Nr.35A kuģu tauvošanas pagaidu risinājums	PROJEKTA Nr.: 2021/50
	STADIJA: Tehniskais risinājums
OBJEKTA ADRESE: Latvija, Ventspils, Dzintaru iela 102C	BŪVPROJEKTA DAĻA: -
RASĒJUMA NOSAUKUMS: Atbalsta konstrukcijas detalizācija. Konstrukcija 1.	RASĒJUMA Nr.: TR-5
	MĒROGS: 1:25
Izstrādāja: A.Savenko	DATUMS: 25.02.2022.
Pārbaudīja: E.Ovčiņņikovs	LAPU SKAITS: 7 / CAUR.Nr.: 5
	FAILA NOSAUKUMS: TR.dwg
	ARHĪVA Nr.: CHR/76S-TR-5

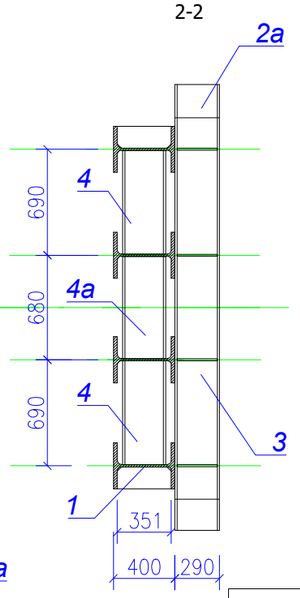
SIJU REŽĢA FASĀDE
M1:25



SKATS
1-1



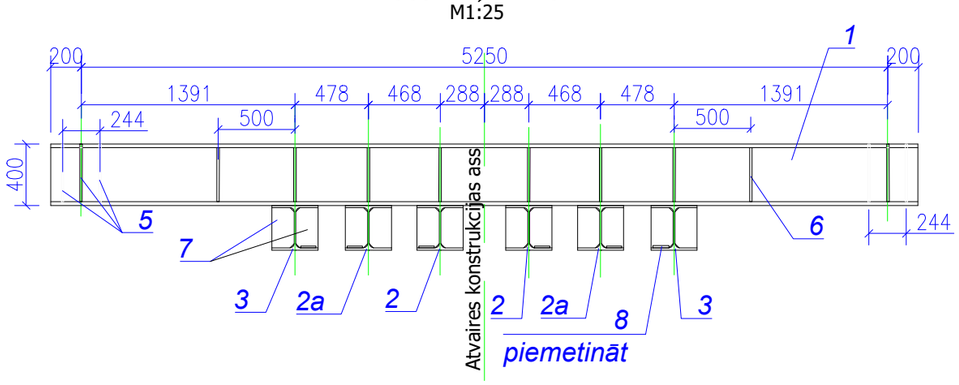
SKATS
2-2



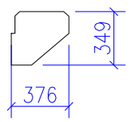
SIJU REŽĢA (Konstrukcijas 2.) SPECIFIKĀCIJA

Poz.	Šķērsgriezums	Izmēri, mm	Materiāls	Skaits	Masa 1 gab, kg	Masa kopā, kg
1	HEB400	L=5650	S355J2	4	877.3	3509.1
2	HEA300	L=2900	S355J2	2	261.0	522.0
2a	HEA300	L=2900	S355J2	2	261.0	522.0
3	HEA300	L=2500	S355J2	2	225.0	450.0
4	UPN280	L=676	S355J2	4	28.3	113.2
4a	UPN280	L=666	S355J2	2	27.9	55.8
5	--349x16	L=376	S355J2	22	12.7	279.4
6	--143x16	L=351	S355J2	52	6.3	327.6
7	--145x16	L=262	S355J2	48	4.8	230.4
8	--100x100x12		S355J2	10	0.9	9.4
			Pavisam kopā:			6018.9

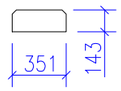
SIJU REŽĢA PLĀNS
M1:25



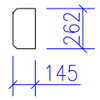
POZ. 5



POZ. 6



POZ. 7



PIEZĪMES

1. Urbumus pozicijās 2, 2a un 3 urbt, izmantojot fendera pamatnes poz. 1 kā šablonu. Savietot fendera pamatnes poz. 1 un siju režģa centrus. Urbumus pozicijā 3 un siju režģa pozicijās 2, 2a un 3 urbt kopā. Nodrošināt precīzu urbumu centru sakrišanu fendera pamatnes pozīcijā 1 un siju režģī.
2. Konstrukcijas izgatavošanu veikt specializētā rūpnīcā, ievērojot attiecīgo standartu prasības.
3. Atsevišķas detaļas sametināt savā starpā ar abpusējām stūra šuvēm, šuves augstums vienāds ar plānākas detaļas biezumu.
4. Izmēri ir doti milimetros.

VERSIJA	IZMAIŅAS	DATUMS
A		

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Būvkomersanta reģ. Nr.2624-R

OBJEKTA NOSAUKUMS:
Ventspils brīvostas piestātnes Nr.35A kuģu tauvošanas pagaidu risinājums

PROJEKTA Nr.: 2021/50

STADIJA: Tehniskais risinājums

OBJEKTA ADRESE: Latvija, Ventspils, Dzintaru iela 102C

BŪVPROJEKTA DAĻA: -

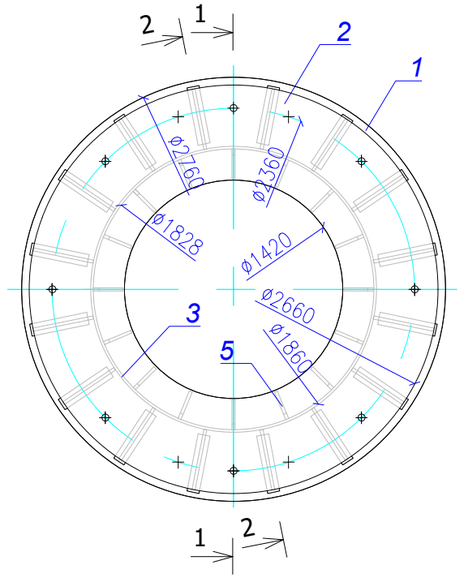
RASĒJUMA NOSAUKUMS:
Siju režģa konstrukcijas detalizācija.
Konstrukcija 2.

RASĒJUMA Nr.: TR-6

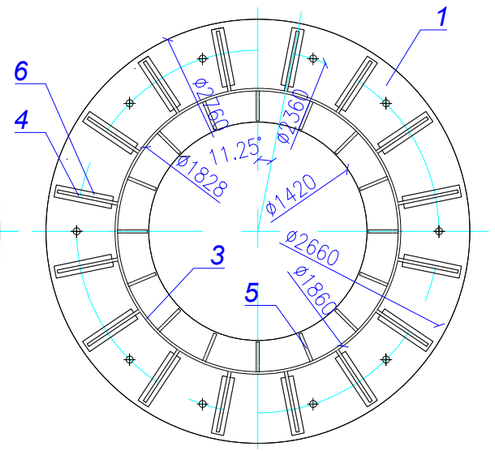
MĒROGS: 1:25

Izstrādāja:	A.Savenko		DATUMS: 25.02.2022.
Pārbaudīja	E.Ovčiņņikovs		LAPU SKAITS: 7 / CAUR.Nr.: 6
			FAILA NOSAUKUMS: TR.dwg
			ARHĪVA Nr.: CHR/76S-TR-6

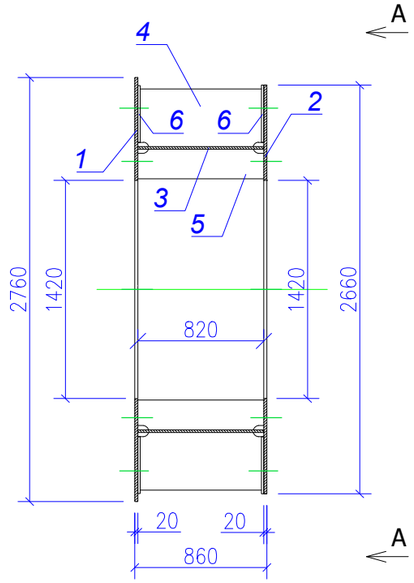
SKATS A-A
M 1:25



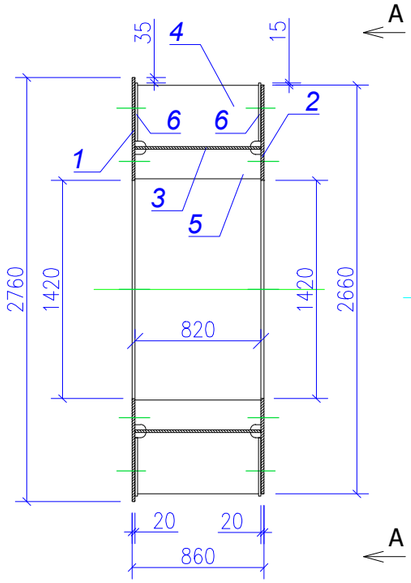
SKATS A-A BEZ POZ.2
M 1:25



GRIEZUMS 1-1
M 1:25

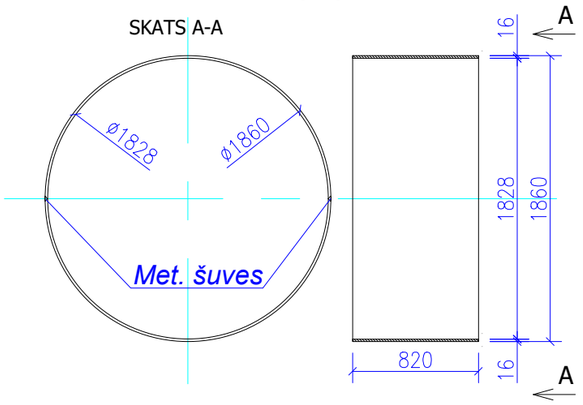


GRIEZUMS 2-2
M 1:25

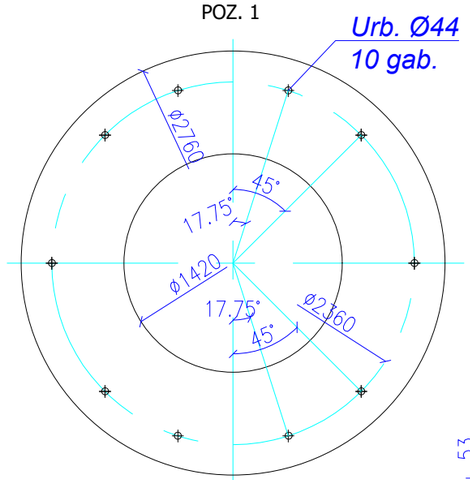


POZ. 3

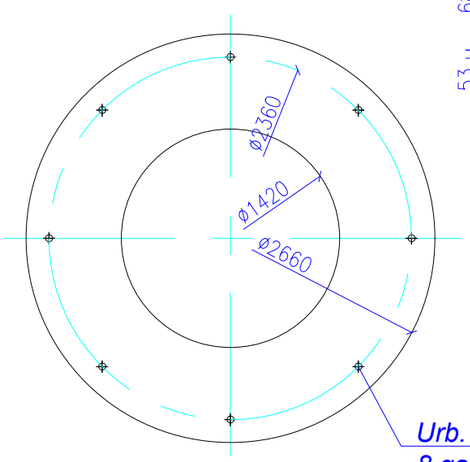
SKATS A-A



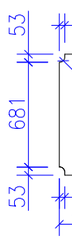
POZ. 1



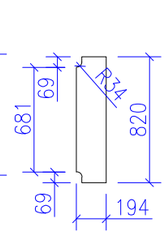
POZ. 2



POZ. 4



POZ. 5



FENDERA PAMATNES (Konstrukcijas 3.) SPECIFIKĀCIJA

Poz.	Šķērsgriezums, Izmēri, mm	Materiāls	Skaits	Masa 1 gab, kg	Masa kopā, kg	Piez.
1	--2760x2760x20	S355	1	703.4	703.36	Norādīts gabarīta izmērs
2	--2660x2660x20	S355	1	624.9	624.90	Norādīts gabarīta izmērs
3	--5790x820x16	S355	1	595.1	595.10	
4	--788x400x16	S355	16	39.6	633.44	
5	--820x194x16	S355	16	20.0	320.00	
6	--380x80x16	S355	32	3.820	122.24	
				Pavisam kopā:	2999.04	

PIEZĪMES

1. Pozīcijas 3 metināšanas šuvju stiprībai jābūt līdzvērtīgai pamatmateriāla stiprībai.
2. Konstrukcijas izgatavošanu veikt speciālizētā rūpnīcā, ievērojot attiecīgo standartu prasības.
3. Detaļas sametināt savā starpā ar stūra šuvēm, šuves augstums vienāds ar plānākas detaļas biezumu.
4. Izmēri ir doti milimetros.

VERSIJA	IZMAIŅAS	DATUMS
A		

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LV-3601, Latvija
Tālrunis: +371 63622586
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BŪVPROJEKTA IZSTRĀDĀTĀJS:
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Tālr. (+371) 22324435
E-pasts: info@chr.lv
Būvkomersanta reģ. Nr.14083

SADARBĪBĀ AR: SIA "Inženieru birojs "Kurbada tilti""
inženieru birojs KURBADA TILTI
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Tālr. (+371) 67334229
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Būvkomersanta reģ. Nr.2624-R

OBJEKTA NOSAUKUMS:
Ventspils brīvostas piestātnes Nr.35A kuģu tauvošanas pagaidu risinājums

OBJEKTA ADRESE:
Latvija, Ventspils, Dzintaru iela 102C

RASĒJUMA NOSAUKUMS:
Fendera pamatnes detalizācija.
Konstrukcija 3.

PROJEKTA Nr.: 2021/50
STADIJA: Tehniskais risinājums
BŪVPROJEKTA DAĻA: -
RASĒJUMA Nr.: TR-7
MĒROGS: 1:25
DATUMS: 25.02.2022.
LAPU SKAITS: 7
CAUR.Nr.: 7
FAILA NOSAUKUMS: TR.dwg
ARHĪVA Nr.: CHR/76S-TR-7

Izstrādāja:	A.Savenko	
Pārbaudīja	E.Ovčiņņikovs	

PIELIKUMI

SATURS

1. Paskaidrojums
2. Aprēķina modelis
3. Aprēķina slodzes un kombinācijas
4. Deformāciju aprēķina rezultāti
5. Spriegumu aprēķina rezultāti
6. Atbalsta reakcijas

IEVADS

Atvaires ierīču pagaidu stiprinājums sastāv no fendera pamatnes, siju režģa un statņiem ar atbalstiem, pie kuriem ir piestiprināts režģis.

Katra no minētām konstrukcijām izskatīta atsevišķi, pēc individuāla modeļa. Aprēķina nav piestādīti visi darba materiāli un izskatītas slodžu kombinācijas, bet vienīgi tās, kas dod nelabvelīgakus rezultātus.

Visas izskatītas konstrukcijas ir pagaidu, paredzēti standarta tauvošanas fendera izvietošanai uz ierobežotu laiku (aptuveni 0,5 gada), tāpēc šķērsgriezumu samazinājums korozijas dēļ nav ieskaitīts.

Aprēķina rezultāti ir piestādīti tabulu un diagrammu veidā. Aprēķins veikts datorpriski pēc MKE metodes.

1. FENDERA PAMATNES APRĒĶINS

Pēc tehniskā risinājuma, fendera pamatne ir izstrādājums no tērauda S355, kas sastāv no caurļveida sienas ar biezumu 16 mm, 2 flančiem ar biezumu 20 mm un pastiprinošām 16 mm biezām ribām.

Fendera pamatnes aprēķina modelis ir plātņu modelis, sastāv no 3072 elementiem. Balstīklas izvietotas vietās, kur fendera apakšējs flancis balstās uz siju režģa siju malām. Plātnēm ir piešķirts biezums, atbilstošs konstrukcijas biezumam atbilstošos elementos.

Aprēķinā modelim ir pieliktas sekojošas slodzes:

a) Pašsvars;

b) Ass spēks no kuģa tauvošanas F=2000 kN;

c) Šķērsspēks no kuģa tauvošanas S=0,1F=200 kN kopa ar standarta fendera pašsvaru;

d) Temperatūras izmaiņas.

Spēks F pielikts , ka vienmērīgi izkliedēta slodze, kas sadalās uz augšēja flanča laukumu:

P=2000kN/3,97 m2 =504 kN/m2

Slodzes P virziens ir pa fendera asi (ass Y modelī).

Spēks S pielikts analoģiski:

S=200 kN/3,97 m2 = 50,4 kN/m2

Slodzes S virziens – perpendikulari slodzes F virzienam (ass Z modelī)

Temperatūras izmaiņas nodotas, ka temperatūru starpība elementos $\delta = +5^{\circ}$, kas var veidot papildus spriegumus materiālā.

Fendera pamatnes darba apstākļi noteic vienīgu nelabvēlīgu situāciju – maksimālās masas kuģa trieciens ar ass spēku 2000 kN, ar šķērssspēku 200 kN, ar vienlaicīgu temperatūras svārstību iedarbību.

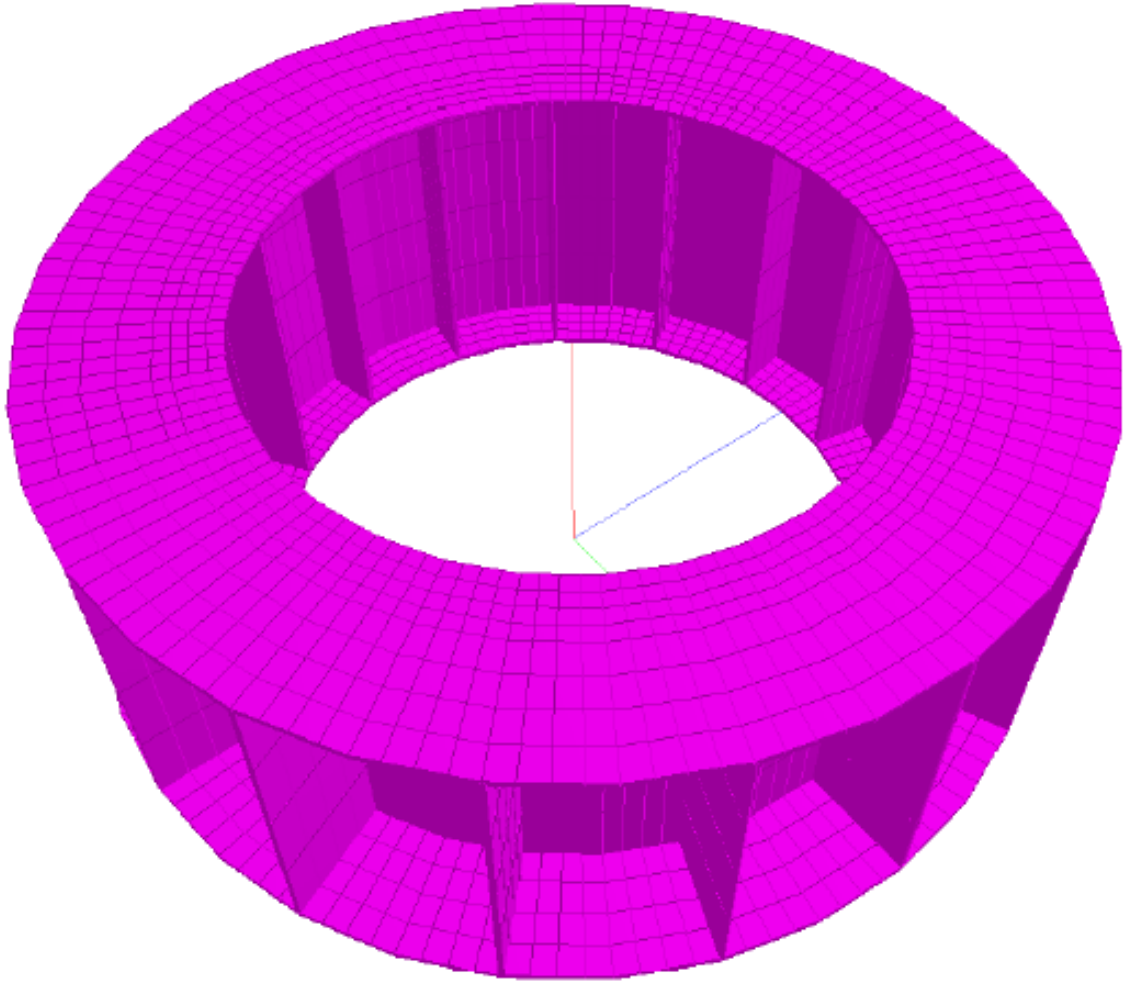
Ņemot vērā dažādu iespējamu faktoru ietekmi, kurus nevar novērtēt matemātiski (piemēram, tauvošanas fendera nevienmērīgu slodzes pārnēsāšanu uz pamatni, temperatūras anomālijas, apledojums un t.l.), projektētājs ir izvelējis sekojošus drošības koeficientus: k=1,35 deformāciju aprēķinam, k=2 stiprības aprēķinam. Aprēķina rezultāti ir piestādīti tabulu un diagrammu veidā.

Aprēķins veikts datorprogramma pēc MKE metodes.

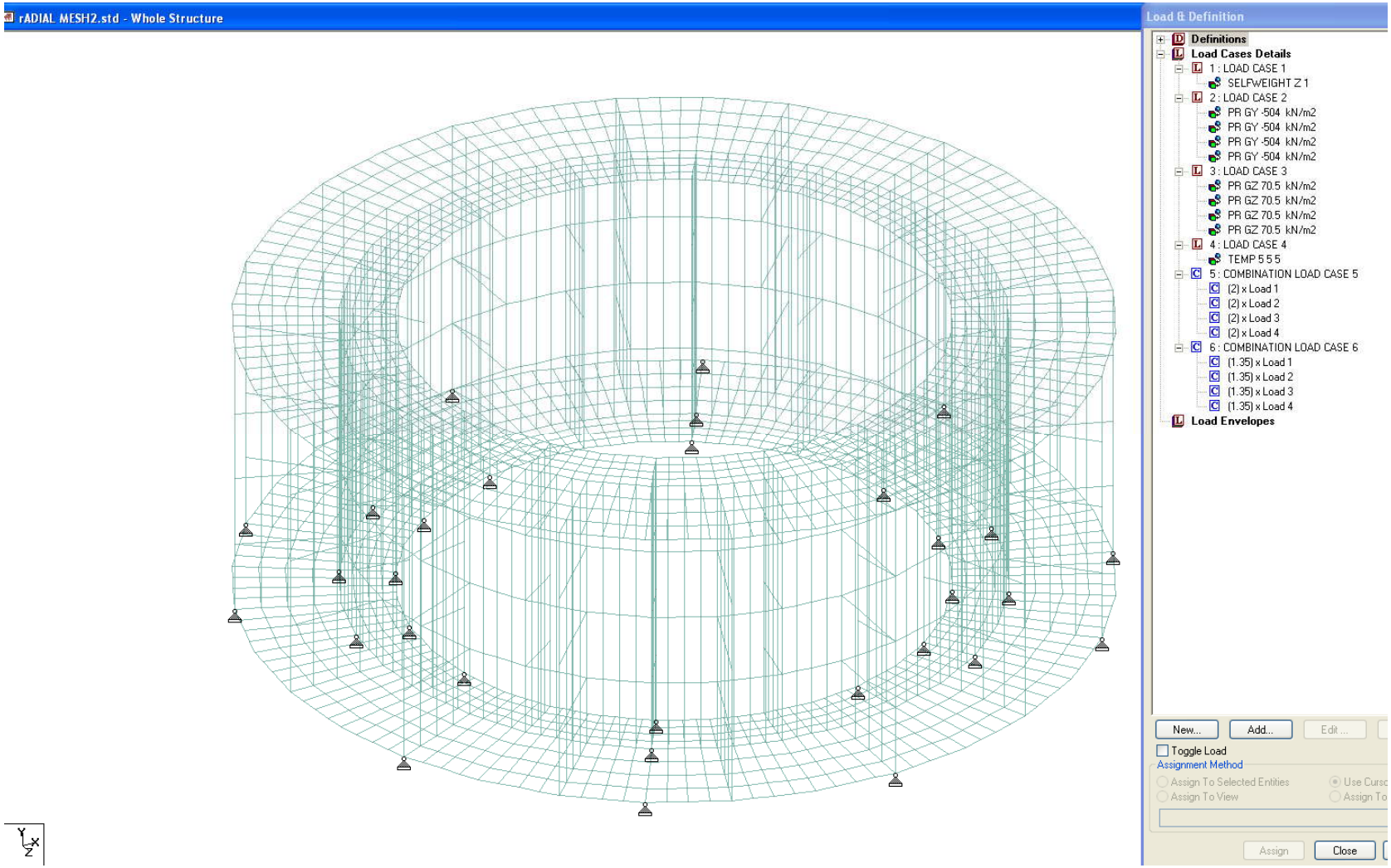
FENDERA PAMATNES APRĒĶINA REZULTĀTI:

Maksimālā deformācija nepārsniedz 1 mm, maksimālais spriegums – 205 MPa, pie pieļaujama sprieguma tēraudā 355 MPa.

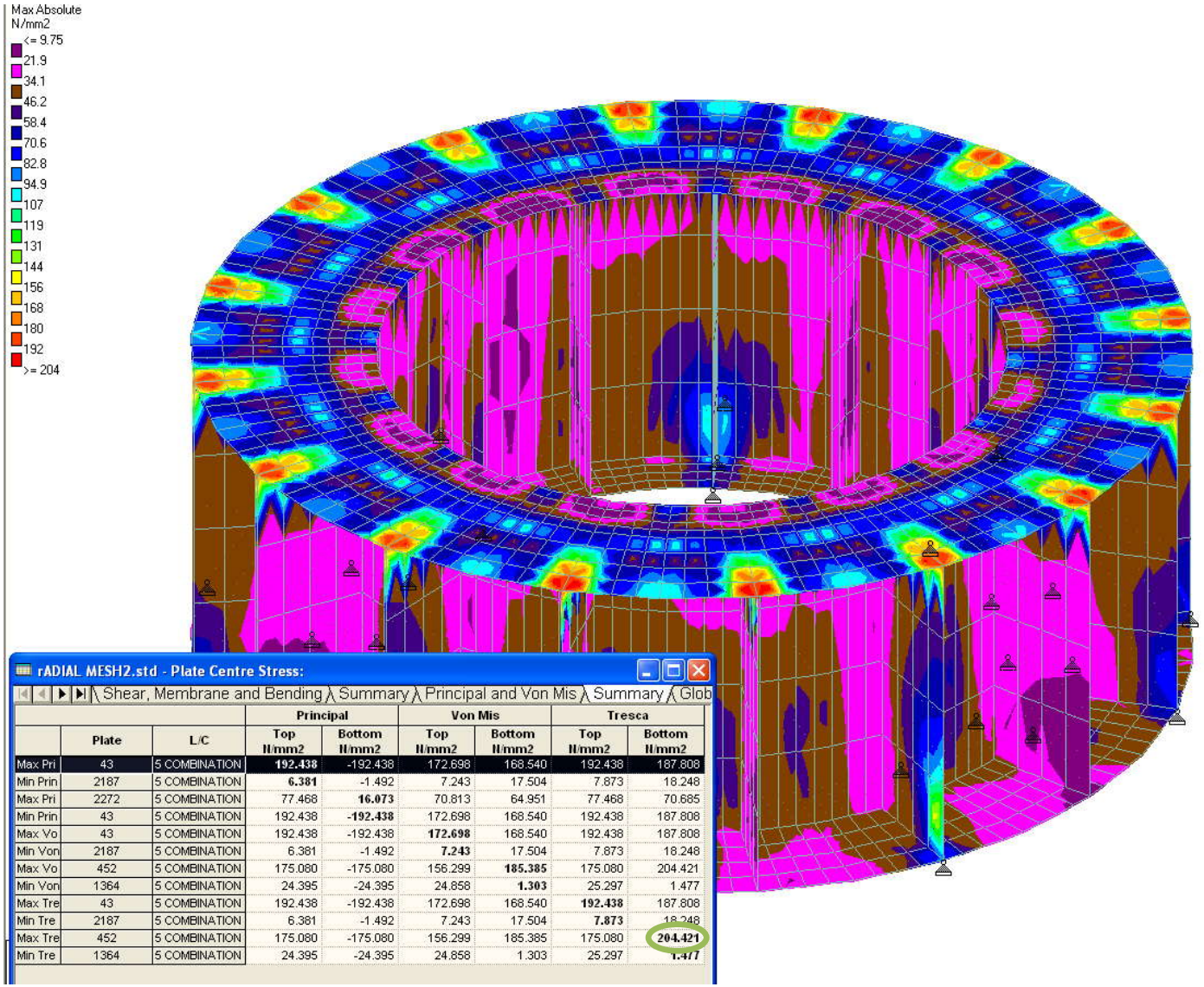
1. Attēls. Fendera pamatnes aprēķina modelis



2. Attēls. Fendera pamatnes slodzes un kombinācijas



3. Attēls. Fendera pamatnes spriegumu aprēķina rezultāti



rADIAL MESH2.std - Plate Centre Stress:

Shear, Membrane and Bending | Summary | Principal and Von Mis | Summary | Glob

			Principal		Von Mis		Tresca	
	Plate	L/C	Top N/mm2	Bottom N/mm2	Top N/mm2	Bottom N/mm2	Top N/mm2	Bottom N/mm2
Max Pri	43	5 COMBINATION	**192.438**	-192.438	172.698	168.540	192.438	187.808
Min Prin	2187	5 COMBINATION	**6.381**	-1.492	7.243	17.504	7.873	18.248
Max Pri	2272	5 COMBINATION	77.468	**16.073**	70.813	64.951	77.468	70.685
Min Prin	43	5 COMBINATION	192.438	**-192.438**	172.698	168.540	192.438	187.808
Max Vo	43	5 COMBINATION	192.438	-192.438	**172.698**	168.540	192.438	187.808
Min Von	2187	5 COMBINATION	6.381	-1.492	**7.243**	17.504	7.873	18.248
Max Vo	452	5 COMBINATION	175.080	-175.080	156.299	**185.385**	175.080	204.421
Min Von	1364	5 COMBINATION	24.395	-24.395	24.858	**1.303**	25.297	1.477
Max Tre	43	5 COMBINATION	192.438	-192.438	172.698	168.540	**192.438**	187.808
Min Tre	2187	5 COMBINATION	6.381	-1.492	7.243	17.504	**7.873**	18.248
Max Tre	452	5 COMBINATION	175.080	-175.080	156.299	185.385	175.080	**204.421**
Min Tre	1364	5 COMBINATION	24.395	-24.395	24.858	1.303	25.297	**1.477**

4. Attēls . Fendera pamatnes deformāciju aprēķina rezultāti (modeļa elementu mezglu pārvietojumi)

rADIAL MESH2.std - Node Displacements:

All \ Summary /

	Node	L/C	Horizontal X mm	Vertical Y mm	Horizontal Z mm	Resultant mm	Rotational rX rad	rY rad	rZ rad
Max X	2049	6 COMBINATI	**0.202**	-0.113	0.057	0.238	0.000	0.002	0.000
Min X	1024	6 COMBINATI	**-0.206**	-0.017	0.046	0.212	0.000	0.002	-0.000
Max Y	132	6 COMBINATI	-0.029	**0.064**	-0.016	0.072	0.000	-0.000	-0.001
Min Y	1281	6 COMBINATI	-0.048	**-0.926**	0.265	0.964	0.003	0.000	0.001
Max Z	355	6 COMBINATI	-0.028	-0.158	**0.277**	0.320	-0.000	0.001	0.000
Min Z	2720	6 COMBINATI	-0.036	-0.085	**-0.151**	0.177	0.000	0.001	-0.000
Max rX	89	6 COMBINATI	-0.141	-0.556	0.172	0.599	**0.004**	-0.000	-0.001
Min rX	2986	6 COMBINATI	0.123	-0.496	0.005	0.511	**-0.004**	-0.000	0.001
Max rY	1024	6 COMBINATI	-0.206	-0.017	0.046	0.212	0.000	**0.002**	-0.000
Min rY	3018	6 COMBINATI	-0.036	-0.032	0.214	0.220	0.000	**-0.001**	0.000
Max rZ	885	6 COMBINATI	-0.104	-0.580	0.267	0.646	-0.000	0.000	**0.004**
Min rZ	2190	6 COMBINATI	0.079	-0.477	-0.064	0.487	0.001	0.000	**-0.004**
Max Rst	1281	6 COMBINATI	-0.048	-0.926	0.265	**0.964**	0.003	0.000	0.001

5. Attēls . Fendera pamatnes atbalsta reākcijas (informatīvi)

rADIAL MESH2.std - Support Reactions:

All \ Summary \ Envelope /

Node	L/C	Horizontal Fx kN	Vertical Fy kN	Horizontal Fz kN	Moment Mx kNm	My kNm	Mz kNm
51	5 COMBINATION	144.365	60.303	53.242	0.000	0.000	0.000
52	5 COMBINATION	208.916	177.551	-101.538	0.000	0.000	0.000
264	5 COMBINATION	114.611	218.733	-40.837	0.000	0.000	0.000
348	5 COMBINATION	109.216	43.798	98.072	0.000	0.000	0.000
540	5 COMBINATION	66.575	141.284	-3.043	0.000	0.000	0.000
594	5 COMBINATION	-55.797	36.108	-34.981	0.000	0.000	0.000
595	5 COMBINATION	-22.463	46.185	1.469	0.000	0.000	0.000
741	5 COMBINATION	63.088	2.721	-110.998	0.000	0.000	0.000
792	5 COMBINATION	-54.800	25.599	-42.771	0.000	0.000	0.000
948	5 COMBINATION	70.880	171.864	77.350	0.000	0.000	0.000
949	5 COMBINATION	37.945	445.768	-119.414	0.000	0.000	0.000
1076	5 COMBINATION	-41.970	30.789	-40.386	0.000	0.000	0.000
1077	5 COMBINATION	-48.758	59.668	58.526	0.000	0.000	0.000
1380	5 COMBINATION	9.948	41.240	-19.288	0.000	0.000	0.000
1504	5 COMBINATION	1.794	99.102	190.499	0.000	0.000	0.000
1565	5 COMBINATION	-0.992	208.040	-249.247	0.000	0.000	0.000
1685	5 COMBINATION	-8.234	44.070	17.337	0.000	0.000	0.000
1988	5 COMBINATION	34.330	54.846	-66.585	0.000	0.000	0.000
1989	5 COMBINATION	50.238	28.551	36.570	0.000	0.000	0.000
2116	5 COMBINATION	-79.596	314.146	55.988	0.000	0.000	0.000
2117	5 COMBINATION	-38.184	260.943	-113.004	0.000	0.000	0.000
2273	5 COMBINATION	59.382	16.078	30.838	0.000	0.000	0.000
2330	5 COMBINATION	-70.752	0.724	90.947	0.000	0.000	0.000
2470	5 COMBINATION	1.612	37.274	-33.792	0.000	0.000	0.000
2471	5 COMBINATION	53.468	27.417	16.569	0.000	0.000	0.000
2525	5 COMBINATION	-28.576	176.354	-64.000	0.000	0.000	0.000
2717	5 COMBINATION	-123.945	102.054	-125.823	0.000	0.000	0.000
2801	5 COMBINATION	-102.101	210.968	-64.898	0.000	0.000	0.000
3013	5 COMBINATION	-198.608	129.947	68.234	0.000	0.000	0.000
3014	5 COMBINATION	-151.591	85.718	-77.580	0.000	0.000	0.000

2. SIJU REŽGA APRĒKINS

Siju režģa apakšēja josla sastāv no 4 horizontālām sijām HEB 400, kuras piemetinātas pie statņiem. Šo siju laidums ir 5.25 m – attalums starp tehnoloģiskā laukuma pāļiem. Dotajā modeļī horizontalo siju piestiprināšana pie statņiem ir modelēta ar balstīklām, fiksējošām siju galu parvietojumus visos virzienos.

Otrajā joslā atrodas sešas vertikālās sijas HEA300, kuras ir cieti savienotas (sametinātas) ar horizontalām sijām HEB 400. Fendera pamatne dotajā modelī nav iekļauta. Aprēķina slodzes F=2000 kN un S=200 kN ir pieliktas tieši pie horizontalām sijām, atbilstoši tās daļas uz katru siju. Slodzei S ir pieskaitītas slodzes no fendera pamatnes P_1 un fendera ar vairogu pašsvara P_2:

$$H= S+P_1+P_2 = 200 \text{ kN} + 30 \text{ kN} + 70\text{kN} = 300 \text{ kN}.$$

$$q = 310 \text{ kN} /4 /2.65 = 28 \text{ kN/m}, \text{ kur } 4 – \text{siju skaits}, 2.65 \text{ m} – \text{slodzes pielikšanas posms}.$$

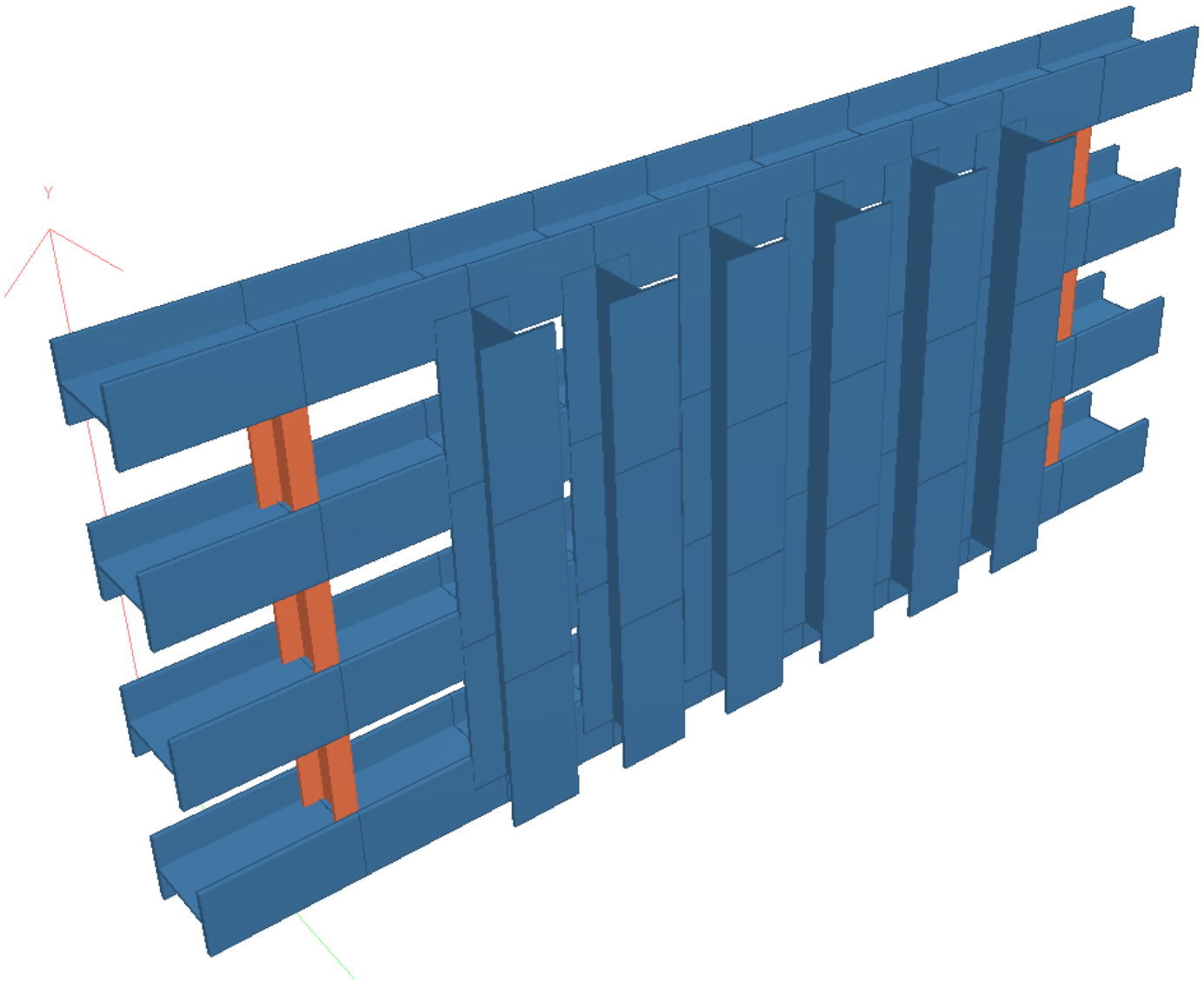
Aprēķina slodzes F=2000 kN pielikšana pie siju režģa ir izskatīta 3-os variantos: 1) pielikta vienmērīgi pēc augstuma (Load Case 2 in Combination 12); 2) pielikta nevienmērīgi, pēc trapēcijas veida epīres, maksimāla spiede uz apakšējo siju (Load Case 3 , Combination 11); 3) pielikta nevienmērīgi, maksimālā spiede uz augšējo siju (Load case 6, Combination 7.). Temperatūras izmaiņas +- 20 grad. bija izskatītas visas kombinācijās, bet tās nepalielina, bet samazina sumārus spriegumus, tāpēc atskaitē nav atspoguļotas.

Drošības koeficients ir pieņemts k=1,5 visām slodzēm.

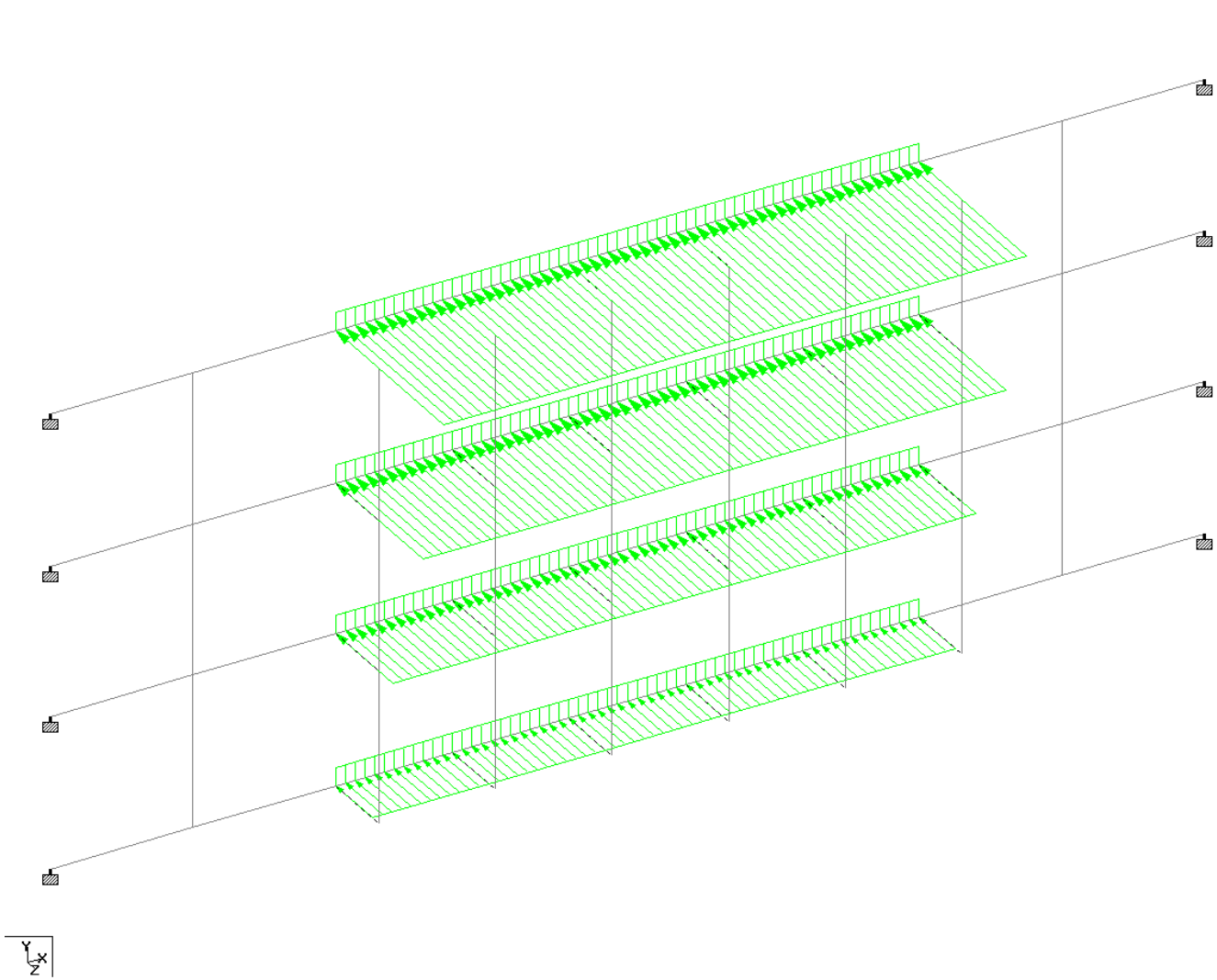
SIJU REŽĢA APRĒĶINA REZULTĀTI

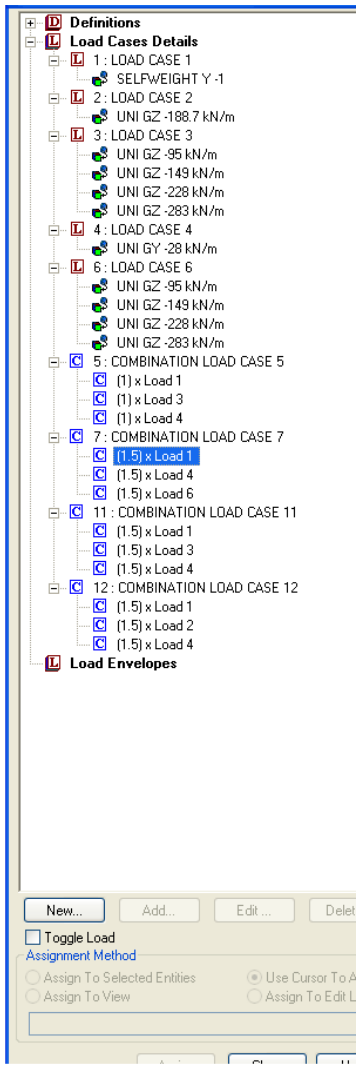
Aprēķini liecina, ka vislielākie spriegumi horizontalās HEB400 sijās nepārsniedz 310 Mpa, pie pieļaijamiem spriegumiem 355 Mpa, bet Ieliekumi nepārsiedz 9 mm.

6. Attēls. Siju režģa aprēķina modelis



7. Attēls. Siju režģa aprēķina modelis ar slodžu kombinācijām





8. Attēls. Siju režģa horizontalo siju HEB 400 aprēķina rezultāti

Ventspils siju rezgis.std - Beam Combined Axial and Bending Stresses: R1: HE400B

All \ Max Stresses \ Profile Stress Points /

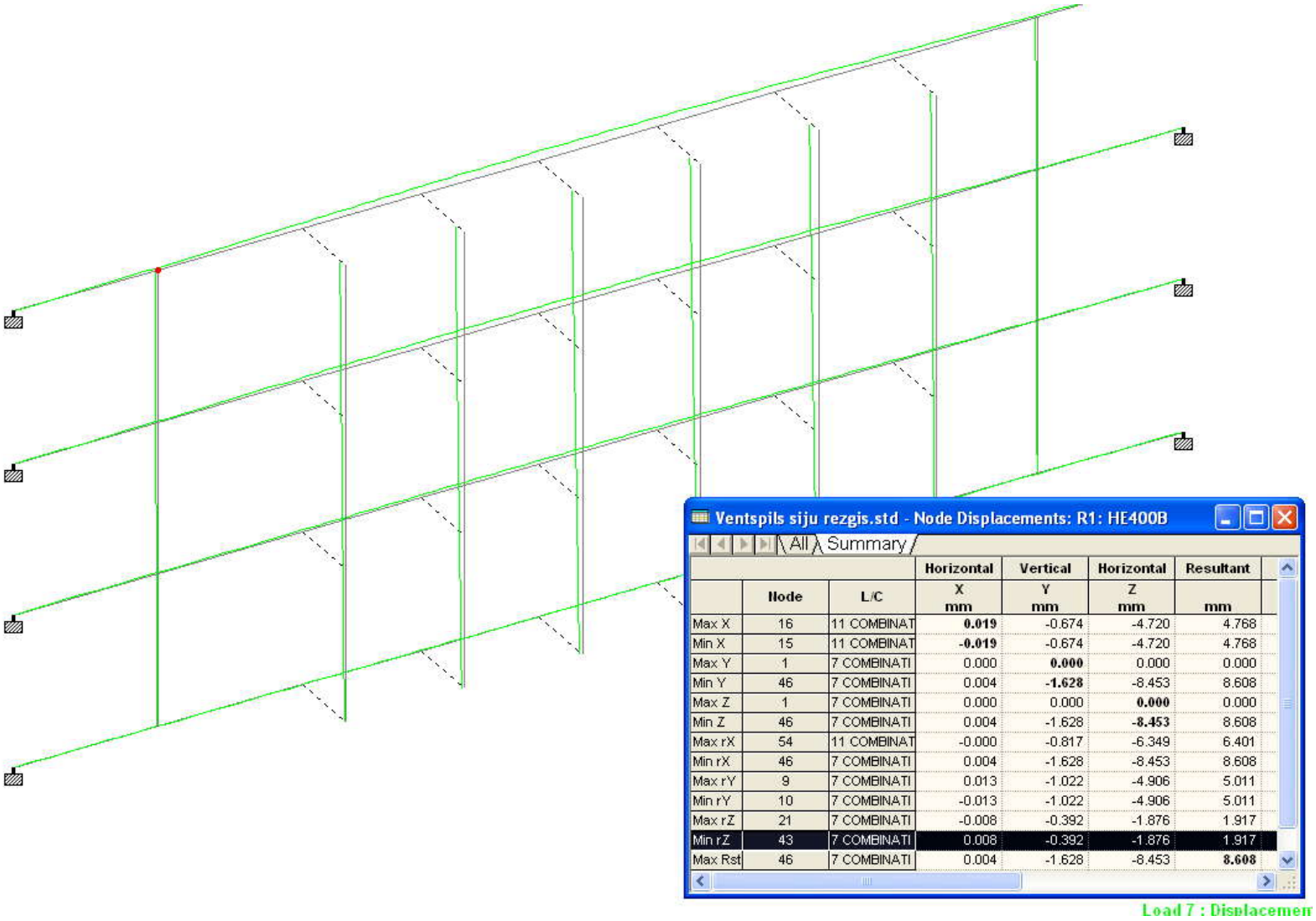
Beam	L/C	Length m	Max Compressive Stress N/mm2	Max Compressive Dist m	Max Compressive Corner	Max Tensile Stress N/mm2	Max Tensile Dist m	Max Tensile Corner
1	7 COMBINATI	0.650	197.976	0.000	3	-197.877	0.000	1
	11 COMBINAT	0.650	238.545	0.000	3	-238.280	0.000	1
2	7 COMBINATI	0.650	253.062	0.000	3	-253.163	0.000	1
	11 COMBINAT	0.650	188.969	0.000	3	-189.234	0.000	1
3	7 COMBINATI	0.650	304.718	0.000	3	-309.607	0.000	1
	11 COMBINAT	0.650	135.067	0.000	3	-141.573	0.000	1
4	7 COMBINATI	0.650	143.567	0.000	3	-138.678	0.000	1
	11 COMBINAT	0.650	289.476	0.000	3	-282.969	0.000	1
5	7 COMBINATI	0.530	132.412	0.530	1	-130.349	0.530	3
	11 COMBINAT	0.530	57.565	0.530	1	-54.674	0.530	3
6	7 COMBINATI	0.650	130.600	0.650	3	-133.961	0.650	1
	11 COMBINAT	0.650	44.222	0.650	3	-49.664	0.650	1
7	7 COMBINATI	0.530	112.629	0.530	1	-112.659	0.530	3
	11 COMBINAT	0.530	85.085	0.530	1	-85.092	0.530	3
9	7 COMBINATI	0.530	88.630	0.530	1	-88.600	0.530	3
	11 COMBINAT	0.530	106.640	0.530	1	-106.633	0.530	3
11	7 COMBINATI	0.530	57.985	0.530	1	-60.048	0.530	3
	11 COMBINAT	0.530	118.744	0.530	1	-121.636	0.530	3
12	7 COMBINATI	0.650	53.265	0.650	3	-49.903	0.650	1
	11 COMBINAT	0.650	110.253	0.650	3	-104.810	0.650	1
26	7 COMBINATI	0.650	304.718	0.650	3	-309.607	0.650	1
	11 COMBINAT	0.650	135.067	0.650	3	-141.573	0.650	1
27	7 COMBINATI	0.650	253.062	0.650	3	-253.163	0.650	1
	11 COMBINAT	0.650	188.969	0.650	3	-189.234	0.650	1
28	7 COMBINATI	0.650	197.976	0.650	3	-197.877	0.650	1
	11 COMBINAT	0.650	238.545	0.650	3	-238.280	0.650	1
29	7 COMBINATI	0.650	143.567	0.650	3	-138.678	0.650	1
	11 COMBINAT	0.650	289.476	0.650	3	-282.969	0.650	1
61	7 COMBINATI	0.650	83.559	0.000	3	-83.506	0.000	1
	11 COMBINAT	0.650	92.188	0.000	3	-91.977	0.000	1
62	7 COMBINATI	0.650	109.442	0.000	3	-109.496	0.000	1
	11 COMBINAT	0.650	69.900	0.000	3	-70.112	0.000	1
63	7 COMBINATI	0.650	130.601	0.000	3	-133.961	0.000	1
	11 COMBINAT	0.650	44.222	0.000	3	-49.664	0.000	1
64	7 COMBINATI	0.650	53.265	0.000	3	-49.903	0.000	1
	11 COMBINAT	0.650	110.254	0.000	3	-104.810	0.000	1
68	7 COMBINATI	0.650	109.442	0.650	3	-109.496	0.650	1
	11 COMBINAT	0.650	69.900	0.650	3	-70.112	0.650	1
69	7 COMBINATI	0.650	83.559	0.650	3	-83.506	0.650	1
	11 COMBINAT	0.650	92.188	0.650	3	-91.977	0.650	1
70	7 COMBINATI	0.530	176.724	0.530	1	-171.676	0.530	3
	11 COMBINAT	0.530	66.046	0.530	1	-58.683	0.530	3
71	7 COMBINATI	0.530	180.649	0.265	1	-174.635	0.265	3
	11 COMBINAT	0.530	64.832	0.265	1	-56.032	0.265	3
72	7 COMBINATI	0.530	176.724	0.000	1	-171.676	0.000	3
	11 COMBINAT	0.530	66.046	0.000	1	-58.683	0.000	3
73	7 COMBINATI	0.530	132.412	0.000	1	-130.349	0.000	3
	11 COMBINAT	0.530	57.565	0.000	1	-54.674	0.000	3

Ventspils siju rezgis.std - Beam Combined Axial and Bending Stresses: R1: HE400B

All \ Max Stresses \ Profile Stress Points /

Beam	L/C	Length m	Max Compressive Stress N/mm2	Max Compressive Dist m	Max Compressive Corner	Max Tensile Stress N/mm2	Max Tensile Dist m	Max Tensile Corner
28	7 COMBINATION	0.650	197.976	0.650	3	-197.877	0.650	1
	11 COMBINATION	0.650	238.545	0.650	3	-238.280	0.650	1
29	7 COMBINATION	0.650	143.567	0.650	3	-138.678	0.650	1
	11 COMBINATION	0.650	289.476	0.650	3	-282.969	0.650	1
61	7 COMBINATION	0.650	83.559	0.000	3	-83.506	0.000	1
	11 COMBINATION	0.650	92.188	0.000	3	-91.977	0.000	1
62	7 COMBINATION	0.650	109.442	0.000	3	-109.496	0.000	1
	11 COMBINATION	0.650	69.900	0.000	3	-70.112	0.000	1
63	7 COMBINATION	0.650	130.601	0.000	3	-133.961	0.000	1
	11 COMBINATION	0.650	44.222	0.000	3	-49.664	0.000	1
64	7 COMBINATION	0.650	53.265	0.000	3	-49.903	0.000	1
	11 COMBINATION	0.650	110.254	0.000	3	-104.810	0.000	1
68	7 COMBINATION	0.650	109.442	0.650	3	-109.496	0.650	1
	11 COMBINATION	0.650	69.900	0.650	3	-70.112	0.650	1
69	7 COMBINATION	0.650	83.559	0.650	3	-83.506	0.650	1
	11 COMBINATION	0.650	92.188	0.650	3	-91.977	0.650	1
70	7 COMBINATION	0.530	176.724	0.530	1	-171.676	0.530	3
	11 COMBINATION	0.530	66.046	0.530	1	-58.683	0.530	3
71	7 COMBINATION	0.530	180.649	0.265	1	-174.635	0.265	3
	11 COMBINATION	0.530	64.832	0.265	1	-56.032	0.265	3
72	7 COMBINATION	0.530	176.724	0.000	1	-171.676	0.000	3
	11 COMBINATION	0.530	66.046	0.000	1	-58.683	0.000	3
73	7 COMBINATION	0.530	132.412	0.000	1	-130.349	0.000	3
	11 COMBINATION	0.530	57.565	0.000	1	-54.674	0.000	3
74	7 COMBINATION	0.530	140.055	0.530	1	-139.935	0.530	3
	11 COMBINATION	0.530	92.002	0.530	1	-91.662	0.530	3
75	7 COMBINATION	0.530	137.473	0.265	1	-137.273	0.265	3
	11 COMBINATION	0.530	84.860	0.265	2	-84.356	0.265	4
76	7 COMBINATION	0.530	140.055	0.000	1	-139.935	0.000	3
	11 COMBINATION	0.530	92.002	0.000	1	-91.662	0.000	3
77	7 COMBINATION	0.530	112.629	0.000	1	-112.659	0.000	3
	11 COMBINATION	0.530	85.085	0.000	1	-85.092	0.000	3
78	7 COMBINATION	0.530	105.611	0.530	1	-105.729	0.530	3
	11 COMBINATION	0.530	120.715	0.530	1	-121.054	0.530	3
79	7 COMBINATION	0.530	101.319	0.265	1	-101.517	0.265	3
	11 COMBINATION	0.530	114.497	0.265	2	-114.999	0.265	4
80	7 COMBINATION	0.530	105.611	0.000	1	-105.729	0.000	3
	11 COMBINATION	0.530	120.715	0.000	1	-121.054	0.000	3
81	7 COMBINATION	0.530	88.630	0.000	1	-88.600	0.000	3
	11 COMBINATION	0.530	106.640	0.000	1	-106.633	0.000	3
82	7 COMBINATION	0.530	64.722	0.530	1	-69.772	0.530	3
	11 COMBINATION	0.530	140.841	0.530	1	-148.206	0.530	3
83	7 COMBINATION	0.530	62.008	0.265	1	-68.024	0.265	3
	11 COMBINATION	0.530	138.257	0.265	1	-147.059	0.265	3
84	7 COMBINATION	0.530	64.722	0.000	1	-69.772	0.000	3
	11 COMBINATION	0.530	140.841	0.000	1	-148.206	0.000	3
85	7 COMBINATION	0.530	57.985	0.000	1	-60.048	0.000	3
	11 COMBINATION	0.530	118.744	0.000	1	-121.636	0.000	3

9. Attēls. Siju režģa horizontalo siju HEB 400 deformāciju aprēķina rezultāti



Ventspils siju rezgis.std - Node Displacements: R1: HE400B

All | Summary

	Node	L/C	Horizontal X mm	Vertical Y mm	Horizontal Z mm	Resultant mm
Max X	16	11 COMBINAT	**0.019**	-0.674	-4.720	4.768
Min X	15	11 COMBINAT	**-0.019**	-0.674	-4.720	4.768
Max Y	1	7 COMBINATI	0.000	**0.000**	0.000	0.000
Min Y	46	7 COMBINATI	0.004	**-1.628**	-8.453	8.608
Max Z	1	7 COMBINATI	0.000	0.000	**0.000**	0.000
Min Z	46	7 COMBINATI	0.004	-1.628	**-8.453**	8.608
Max rX	54	11 COMBINAT	-0.000	-0.817	-6.349	6.401
Min rX	46	7 COMBINATI	0.004	-1.628	-8.453	8.608
Max rY	9	7 COMBINATI	0.013	-1.022	-4.906	5.011
Min rY	10	7 COMBINATI	-0.013	-1.022	-4.906	5.011
Max rZ	21	7 COMBINATI	-0.008	-0.392	-1.876	1.917
Min rZ	43	7 COMBINATI	0.008	-0.392	-1.876	1.917
Max Rst	46	7 COMBINATI	0.004	-1.628	-8.453	**8.608**

Load 7 : Displacemen

10. Attēls. Siju režģa horizontalo siju HEB 400 atbalsta reākcijas

Ventspils siju rezgis flash.std - Support Reactions:

All / Summary / Envelope /

		Horizontal	Vertical	Horizontal	Moment		
Node	L/C	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
1	7 COMBINATION	0.989	66.271	310.153	0.272	-370.912	50.000
	11 COMBINATION	2.618	65.600	435.461	-0.252	-521.597	41.515
	12 COMBINATION	1.807	65.925	372.754	0.010	-446.206	45.759
2	7 COMBINATION	-0.989	66.271	310.153	0.272	370.912	-50.000
	11 COMBINATION	-2.618	65.600	435.461	-0.252	521.597	-41.515
	12 COMBINATION	-1.807	65.925	372.754	0.010	446.206	-45.759
3	7 COMBINATION	-0.996	66.250	440.035	0.272	-530.059	50.003
	11 COMBINATION	-2.625	65.578	314.727	-0.252	-379.374	41.518
	12 COMBINATION	-1.807	65.925	377.328	0.010	-454.667	45.759
4	7 COMBINATION	0.996	66.250	440.035	0.272	530.059	-50.003
	11 COMBINATION	2.625	65.578	314.727	-0.252	379.374	-41.518
	12 COMBINATION	1.807	65.925	377.328	0.010	454.667	-45.759
5	7 COMBINATION	-48.402	61.655	564.637	0.269	-690.041	48.976
	11 COMBINATION	-64.415	62.326	181.539	-0.255	-237.335	40.413
	12 COMBINATION	-56.412	62.009	372.942	0.007	-463.498	44.691
6	7 COMBINATION	48.402	61.655	564.637	0.269	690.040	-48.976
	11 COMBINATION	64.415	62.326	181.539	-0.255	237.335	-40.413
	12 COMBINATION	56.412	62.009	372.942	0.007	463.498	-44.691
7	7 COMBINATION	48.409	61.692	185.737	0.269	-211.212	48.969
	11 COMBINATION	64.422	62.364	568.835	-0.256	-663.917	40.406
	12 COMBINATION	56.412	62.009	377.141	0.007	-437.375	44.691
8	7 COMBINATION	-48.409	61.692	185.737	0.269	211.212	-48.969
	11 COMBINATION	-64.422	62.364	568.835	-0.256	663.917	-40.406
	12 COMBINATION	-56.412	62.009	377.141	0.007	437.375	-44.691

3. STATNU AR ATBALSTIEM APRĒKINS

Aprēķina modelis ir siju modelis, kopā ar siju režģi. Slodzes ir pielikt as pie vertikālām siju režģa sijām HEA300. Slodzu pielikšanas princips ir analogisks siju režģa aprēķinam (vienmērīgs un trapeciāls). Pieņemts, ka visas slodzes ieņem tērauda konstrukcijas.

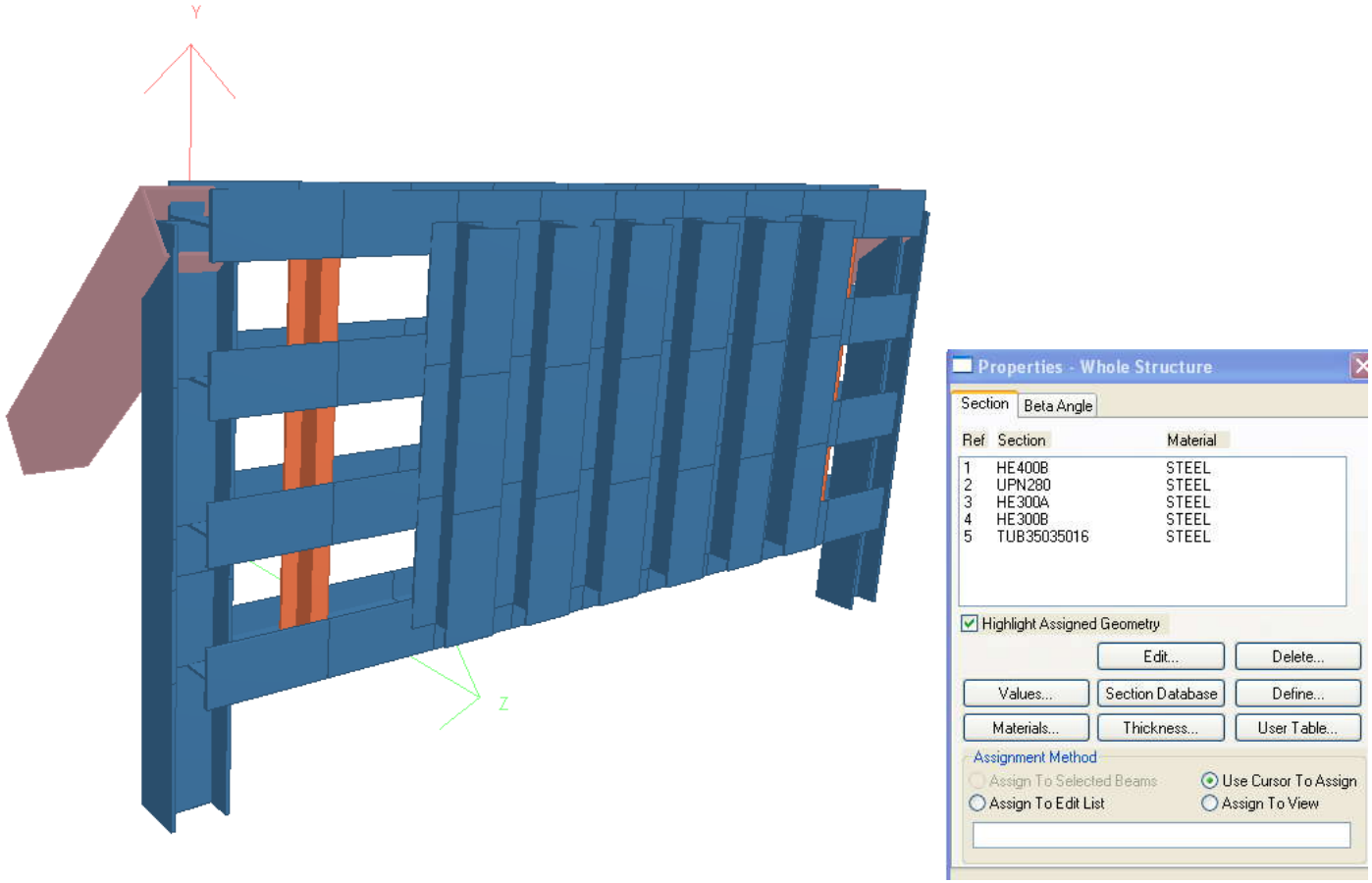
Dzelzsbetona piestātnes konstrukcija modelī ieskaitīta, ka siju balstīklas. Balstīklas ir izvietotas vietās, kur dzelzsbetona konstrukcija ir spējīga uzņemt slodzes un garantēt pārvietojumu aizliegumu – uz malas pārkares, tur, kur pārkare atbalstīta uz pāli caur monolītu konstrukciju, uz piestatnes klāja pālim pretī, un uz monolīta dzelzsbetona posma, kur piestiprināta atbalsta pēda.

Statņu sijas ir HEB300, atbalsti – taisnstūra caurules 350x350x16.

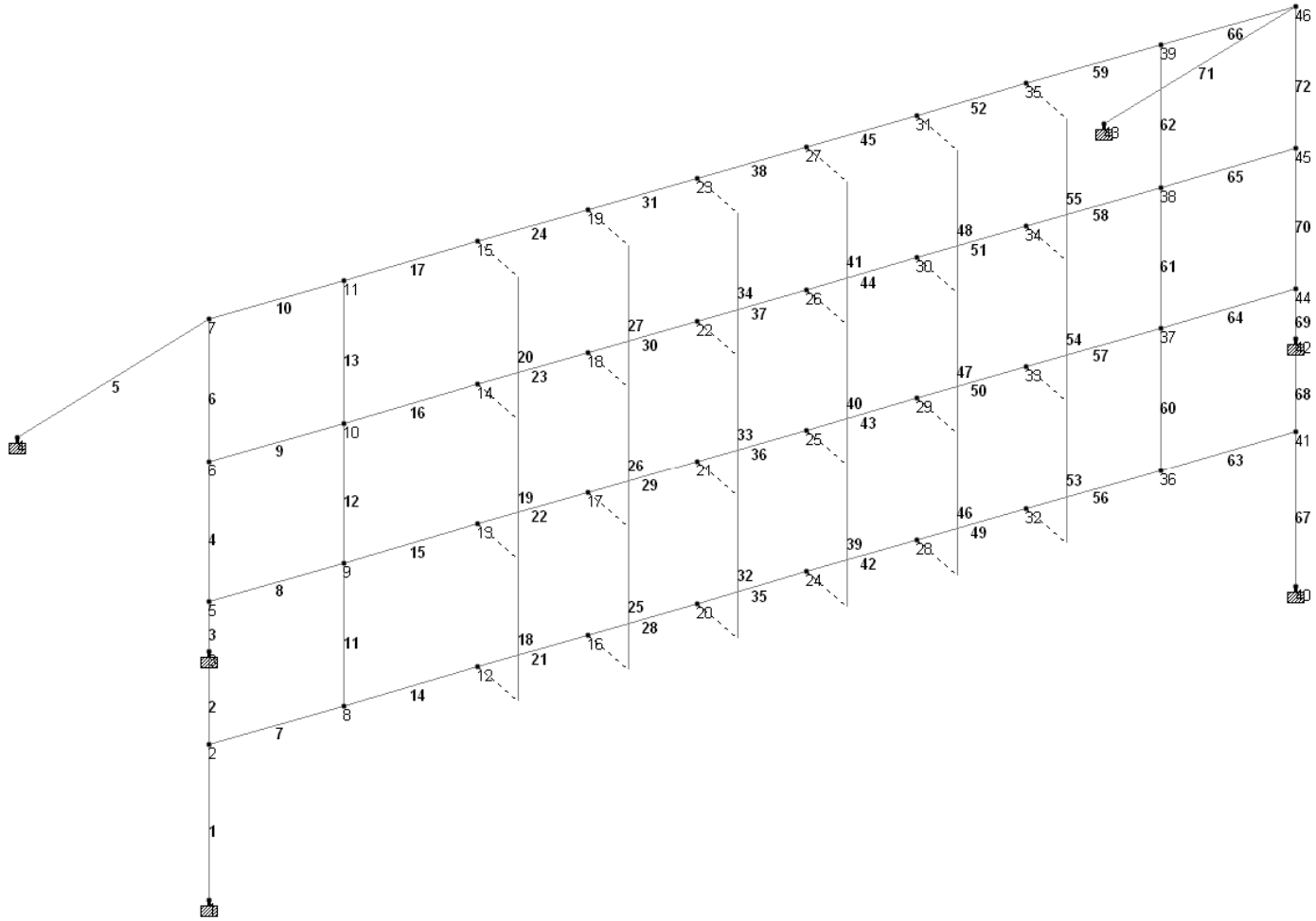
STATŅU AR ATBALSTIEM APRĒĶINA REZULTĀTI

Aprēķini liecina, ka vislielākie spriegumi HEB300 statņos nepārsniedz 247 Mpa, atbalstos – 251 Mpa pie pieļaijamiem spriegumiem 355 Mpa, bet deformācijas nepārsiedz 1 mm.

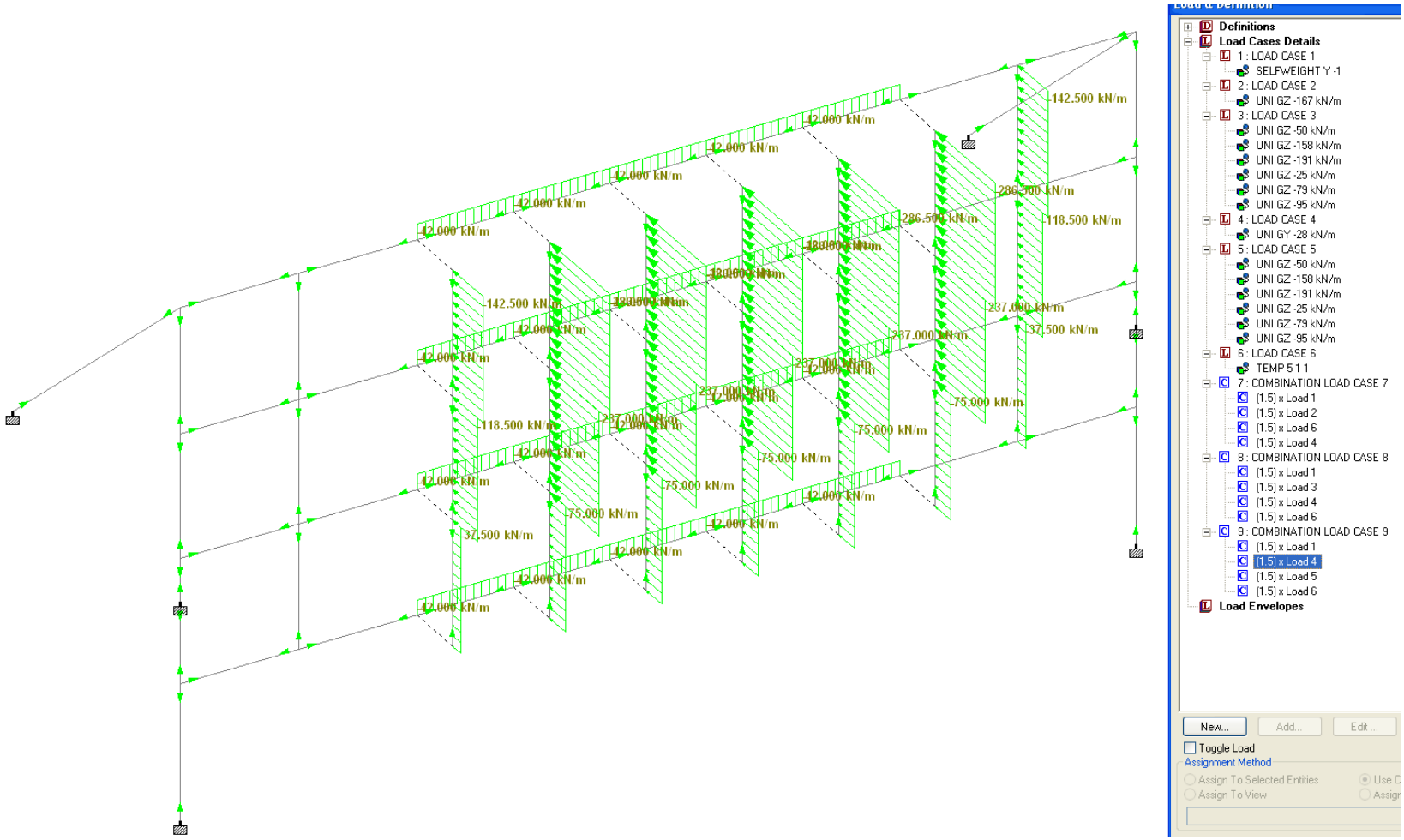
11. Attēls. Statņu un atbalstu ar siju rezģi aprēķina modelis



12. Attēls. Statņu un atbalstu ar siju rezģi aprēķina modelis, elementi



12. Attēls. Statņu un atbalstu ar siju rezģi aprēķina modelis un slodžu kombinācijas



13. Attēls. Statņu un atbalstu spriegumu aprēķina rezultāti

Statni HEB300:

Ventspils atbalsti.std - Beam Combined Axial and Bending Stresses: R4: HE300B

All | Max Stresses | Profile Stress Points

Beam	L/C	Length m	Max Compressive Stress N/mm2	Dist m	Corner	Max Tensile Stress N/mm2	Dist m	Corner
1	7 COMBINATION	0.750	141.786	0.000	2	-103.701	0.000	
	8 COMBINATION	0.750	134.762	0.000	2	-95.431	0.000	
	9 COMBINATION	0.750	90.662	0.000	2	-52.503	0.000	
2	7 COMBINATION	0.450	159.022	0.000	1	-124.293	0.000	
	8 COMBINATION	0.450	147.048	0.000	1	-114.395	0.000	
	9 COMBINATION	0.450	[illegible]	0.000	1	-59.845	0.000	
3	7 COMBINATION	0.240	211.222	0.240	1	-242.768	0.240	
	8 COMBINATION	0.240	147.522	0.240	1	-146.966	0.240	
	9 COMBINATION	0.240	137.269	0.240	1	-166.176	0.240	
4	7 COMBINATION	0.680	86.350	0.000	2	-121.954	0.000	
	8 COMBINATION	0.680	72.281	0.000	2	-79.345	0.000	
	9 COMBINATION	0.680	57.894	0.000	2	-90.938	0.000	
6	7 COMBINATION	0.690	120.308	0.000	1	-161.761	0.000	
	8 COMBINATION	0.690	70.532	0.000	1	-84.914	0.000	
	9 COMBINATION	0.690	93.787	0.000	4	-132.411	0.000	
67	7 COMBINATION	0.750	138.213	0.000	2	-100.136	0.000	
	8 COMBINATION	0.750	131.189	0.000	2	-91.866	0.000	
	9 COMBINATION	0.750	92.655	0.000	2	-54.708	0.000	
68	7 COMBINATION	0.450	162.869	0.000	1	-128.127	0.000	
	8 COMBINATION	0.450	150.894	0.000	1	-118.229	0.000	
	9 COMBINATION	0.450	105.776	0.000	1	[illegible]	0.000	
69	7 COMBINATION	0.240	214.773	0.240	1	-246.476	0.240	
	8 COMBINATION	0.240	151.073	0.240	1	-150.674	0.240	
	9 COMBINATION	0.240	186.854	0.240	1	-228.563	0.240	
70	7 COMBINATION	0.680	82.464	0.000	2	-118.248	0.000	
	8 COMBINATION	0.680	68.395	0.000	2	-75.639	0.000	
	9 COMBINATION	0.680	77.627	0.000	2	-122.628	0.000	
72	7 COMBINATION	0.690	122.874	0.000	1	-164.574	0.000	
	8 COMBINATION	0.690	73.098	0.000	1	-87.727	0.000	
	9 COMBINATION	0.690	119.201	0.000	1	-169.714	0.000	

Atbalsti 350x350x16

Ventspils atbalsti.std - Beam Combined Axial and Bending Stresses: R5: TUB350350...

All | Max Stresses | Profile Stress Points

Beam	L/C	Length m	Max Compressive Stress N/mm2	Dist m	Corner	Max Tensile Stress N/mm2	Dist m	Corner
5	7 COMBINATION	2.106	225.425	2.106	4	-151.970	2.106	2
	8 COMBINATION	2.106	105.082	2.106	4	-71.760	2.106	2
	9 COMBINATION	2.106	225.134	2.106	4	-156.074	2.106	2
71	7 COMBINATION	2.106	228.235	2.106	3	-154.570	2.106	1
	8 COMBINATION	2.106	107.892	2.106	3	-74.360	2.106	1
	9 COMBINATION	2.106	250.472	2.106	3	-165.645	2.106	1

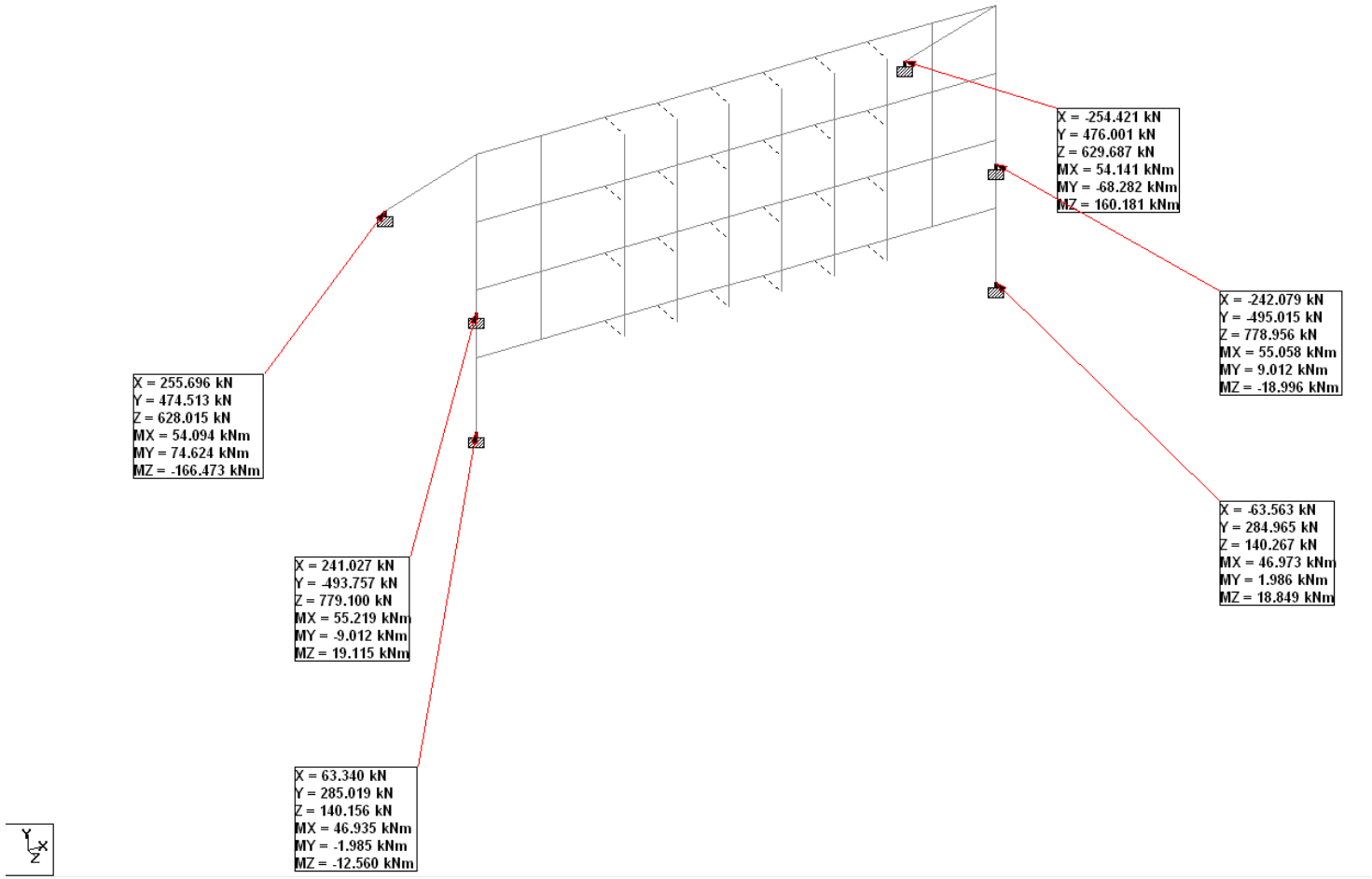
14. Attēls. Atbalstu iekšējas piepūles

Ventspils atbalsti.std - Beam Force Detail: R5: TUB35035016

All | Max Axial Forces | Max Bending Moments | Max Shear Forces

Beam	L/C	Dist m	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
5	7 COMBINATI	0.000	785.659	-48.025	-255.696	-77.916	164.957	-54.094
		0.527	784.818	-49.007	-255.696	-77.916	30.308	-28.546
		1.053	783.977	-49.988	-255.696	-77.916	-104.341	-2.481
		1.580	783.137	-50.970	-255.696	-77.916	-238.990	24.101
		2.106	782.296	-51.952	-255.696	-77.916	-373.639	51.201
	8 COMBINATI	0.000	358.242	-29.493	-115.847	-29.586	80.295	-30.911
		0.527	357.401	-30.475	-115.847	-29.586	19.290	-15.122
		1.053	356.561	-31.456	-115.847	-29.586	-41.715	1.185
		1.580	355.720	-32.438	-115.847	-29.586	-102.720	18.008
		2.106	354.879	-33.420	-115.847	-29.586	-163.725	35.349
	9 COMBINATI	0.000	738.850	-35.448	-271.080	-81.304	175.526	-45.146
		0.527	738.009	-36.430	-271.080	-81.304	32.776	-26.221
		1.053	737.169	-37.412	-271.080	-81.304	-109.974	-6.778
		1.580	736.328	-38.393	-271.080	-81.304	-252.724	13.181
		2.106	735.488	-39.375	-271.080	-81.304	-395.475	33.657
71	7 COMBINATI	0.000	787.896	-47.982	254.421	77.261	-156.048	-54.141
		0.527	787.055	-48.964	254.421	77.261	-22.070	-28.615
		1.053	786.214	-49.946	254.421	77.261	111.908	-2.572
		1.580	785.374	-50.928	254.421	77.261	245.886	23.988
		2.106	784.533	-51.909	254.421	77.261	379.863	51.065
	8 COMBINATI	0.000	360.479	-29.450	114.572	28.931	-71.385	-30.957
		0.527	359.638	-30.432	114.572	28.931	-11.051	-15.190
		1.053	358.798	-31.414	114.572	28.931	49.282	1.094
		1.580	357.957	-32.396	114.572	28.931	109.616	17.895
		2.106	357.116	-33.377	114.572	28.931	169.950	35.213
	9 COMBINATI	0.000	906.770	-48.564	280.398	84.964	-170.620	-58.011
		0.527	905.929	-49.546	280.398	84.964	-22.963	-32.178
		1.053	905.088	-50.528	280.398	84.964	124.694	-5.829
		1.580	904.248	-51.509	280.398	84.964	272.351	21.037
		2.106	903.407	-52.491	280.398	84.964	420.008	48.420

15. Attēls. Reākcijas balstīklās



16. Attēls. Mezglu pārvietojumi (deformācijas)

Ventspils atbalsti.std - Node Displacements: R5: TUB35035016

All | Summary

			Horizontal	Vertical	Horizontal	Resultant	Rotational		
	Node	L/C	X mm	Y mm	Z mm	mm	rX rad	rY rad	rZ rad
Max X	46	8 COMBINATI	**0.139**	0.181	-0.133	0.264	0.000	-0.002	-0.000
Min X	7	8 COMBINATI	**-0.134**	0.180	-0.131	0.260	0.000	0.002	0.000
Max Y	46	9 COMBINATI	0.062	**0.329**	-0.607	0.693	-0.000	-0.005	-0.001
Min Y	4	7 COMBINATI	0.000	**0.000**	0.000	0.000	0.000	0.000	0.000
Max Z	4	7 COMBINATI	0.000	0.000	**0.000**	0.000	0.000	0.000	0.000
Min Z	46	9 COMBINATI	0.062	0.329	**-0.607**	0.693	-0.000	-0.005	-0.001
Max rX	7	8 COMBINATI	-0.134	0.180	-0.131	0.260	**0.000**	0.002	0.000
Min rX	7	9 COMBINATI	-0.126	0.281	-0.460	0.553	**-0.000**	0.005	0.001
Max rY	7	9 COMBINATI	-0.126	0.281	-0.460	0.553	-0.000	**0.005**	0.001
Min rY	46	9 COMBINATI	0.062	0.329	-0.607	0.693	-0.000	**-0.005**	-0.001
Max rZ	7	9 COMBINATI	-0.126	0.281	-0.460	0.553	-0.000	0.005	**0.001**
Min rZ	46	9 COMBINATI	0.062	0.329	-0.607	0.693	-0.000	-0.005	**-0.001**
Max Rst	46	9 COMBINATI	0.062	0.329	-0.607	**0.693**	-0.000	-0.005	-0.001

Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 5, 2022 (1)	Date:	04.03.2022
Fastening point:			

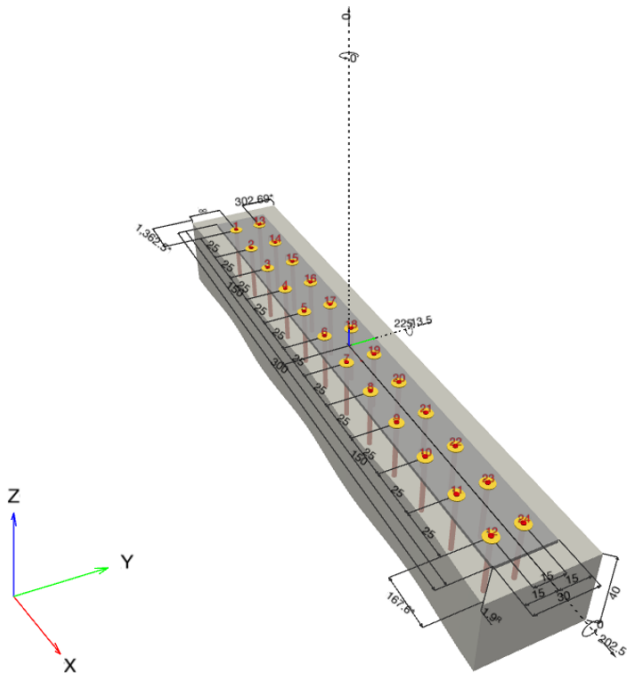
Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-RE 500 V3 100 years + HAS-U 5.8 HDG M24**
Return period (service life in years):	100
Item number:	2223909 HAS-U 5.8 HDG M24x450 (element) / 2123402 HIT-RE 500 V3 (adhesive)
Filling set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 30.00 cm ($h_{ef,limit}$ = - cm)
Material:	5.8
Evaluation Service Report:	ETA 16/0143
Issued I Valid:	14.05.2019 | -
Proof:	Engineering judgement SOFA BOND - based on ETAG BOND testing
Stand-off installation:	e_b = 0.00 cm (no stand-off); t = 1.90 cm
Anchor plate[R]:	l_x x l_y x t = 300.00 cm x 30.00 cm x 1.90 cm; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, C30/37, $f_{c,cube}$ = 37.00 N/mm^2; h = 40.00 cm, Temp. short/long: 40/24 °C
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	no reinforcement or reinforcement spacing >= 150 mm (any Ø) or >= 100 mm (Ø <= 10 mm) no longitudinal edge reinforcement

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [cm] & Loading [kN, kNm]



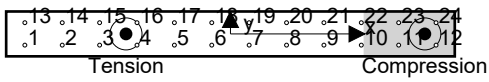
1.1 Load combination

Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	Combination 1	N = 0.000; V_x = 202.500; V_y = 13.500; M_x = 0.000; M_y = 225.000; M_z = 0.000;	no	no	85

2 Load case/Resulting anchor forces

Anchor reactions [kN]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	11.139	8.456	8.438	0.562
2	9.915	8.456	8.438	0.562
3	8.690	8.456	8.438	0.562
4	7.466	8.456	8.438	0.562
5	6.242	8.456	8.438	0.562
6	5.017	8.456	8.438	0.562
7	3.793	8.456	8.438	0.562
8	2.569	8.456	8.438	0.562
9	1.344	8.456	8.438	0.562
10	0.120	8.456	8.438	0.562
11	0.000	8.456	8.438	0.562
12	0.000	8.456	8.438	0.562
13	11.139	8.456	8.438	0.562
14	9.915	8.456	8.438	0.562
15	8.690	8.456	8.438	0.562
16	7.466	8.456	8.438	0.562
17	6.242	8.456	8.438	0.562
18	5.017	8.456	8.438	0.562
19	3.793	8.456	8.438	0.562
20	2.569	8.456	8.438	0.562
21	1.344	8.456	8.438	0.562
22	0.120	8.456	8.438	0.562
23	0.000	8.456	8.438	0.562
24	0.000	8.456	8.438	0.562



max. concrete compressive strain: 0.04 [‰]
max. concrete compressive stress: 1.25 [N/mm^2]
resulting tension force in (x/y)=(-69.86/0.00): 112.590 [kN]
resulting compression force in (x/y)=(129.98/0.00): 112.590 [kN]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load (EOTA TR 029, Section 5.2.2)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel Strength*	11.139	117.667	10	OK
Combined pullout-concrete cone failure**	112.590	387.775	30	OK
Concrete Breakout Failure**	112.590	310.237	37	OK
Splitting failure**	112.590	294.021	39	OK

* highest loaded anchor **anchor group (anchors in tension)

3.1 Steel Strength

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
176.500	1.500	117.667	11.139

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [cm²]	$A^0_{p,N}$ [cm²]	$\tau_{Rk,ucr,25}$ [N/mm²]	$s_{cr,Np}$ [cm]	$c_{cr,Np}$ [cm]	c_{min} [cm]
24,274.74	4,608.00	15.00	67.88	33.94	217.60

ψ_c	$\tau_{Rk,cr}$ [N/mm²]	k	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.040	6.24	2.300	2.785	1.816

$e_{c1,N}$ [cm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [cm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
44.86	0.431	0.00	1.000	1.000	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	N_{Sd} [kN]
141.143	581.662	1.500	387.775	112.590

Group anchor ID
1-10, 13-22

3.3 Concrete Breakout Failure

$A_{c,N}$ [cm²]	$A^0_{c,N}$ [cm²]	$c_{cr,N}$ [cm]	$s_{cr,N}$ [cm]
33,075.00	8,100.00	45.00	90.00

$e_{c1,N}$ [cm]	$\psi_{ec1,N}$	$e_{c2,N}$ [cm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
44.86	0.501	0.00	1.000	1.000	1.000

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Sd} [kN]
7.200	227.570	1.500	310.237	112.590

Group anchor ID
1-10, 13-22

3.4 Splitting failure

$A_{c,N}$ [cm²]	$A^0_{c,N}$ [cm²]	$c_{cr,sp}$ [cm]	$s_{cr,sp}$ [cm]	$\psi_{h,sp}$
52,479.00	17,424.00	66.00	132.00	1.081

$e_{c1,N}$ [cm]	$\psi_{ec1,N}$	$e_{c2,N}$ [cm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	k_1
44.86	0.595	0.00	1.000	1.000	1.000	7.200

$N^0_{Rk,c}$ [kN]	$\gamma_{M,sp}$	$N_{Rd,sp}$ [kN]	N_{Sd} [kN]
227.570	1.500	294.021	112.590

Group anchor ID
1-10, 13-22

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Design:	Concrete - Jan 5, 2022 (1)	Date:	04.03.2022
Fastening point:			

4 Shear load (EOTA TR 029, Section 5.2.3)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel Strength (without lever arm)*	8.456	70.640	12	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	202.950	1,435.658	15	OK
Concrete edge failure in direction x+**	202.503	282.418	72	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength (without lever arm)

$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
88.300	1.250	70.640	8.456

4.2 Pryout Strength (Concrete Breakout Strength controls)

$A_{c,N}$ [cm²]	$A^0_{c,N}$ [cm²]	$c_{cr,N}$ [cm]	$s_{cr,N}$ [cm]	k-factor
38,325.00	8,100.00	45.00	90.00	2.000

$e_{c1,V}$ [cm]	$\Psi_{ec1,N}$	$e_{c2,V}$ [cm]	$\Psi_{ec2,N}$	$\Psi_{s,N}$	$\Psi_{re,N}$
0.00	1.000	0.00	1.000	1.000	1.000

$N^0_{Rk,c}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Sd} [kN]
227.570	1.500	1,435.658	202.950

Group anchor ID
1-24

4.3 Concrete edge failure in direction x+

l_f [cm]	d_{nom} [cm]	k_1	α	β
28.80	2.400	1.700	0.041	0.043

c_1 [cm]	$A_{c,V}$ [cm²]	$A^0_{c,V}$ [cm²]
167.60	20,711.40	126,396.38

$\Psi_{s,V}$	$\Psi_{h,V}$	$\Psi_{\alpha,V}$	$e_{c,V}$ [cm]	$\Psi_{ec,V}$	$\Psi_{re,V}$
1.000	2.507	1.000	0.00	1.000	1.000

$V^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	V_{Sd} [kN]
1,031.234	1.500	282.418	202.503

5 Combined tension and shear loads (EOTA TR 029, Section 5.2.4)

Steel failure

β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
0.383	0.717	1.500	85	OK

$\beta_N^\alpha + \beta_V^\alpha \leq 1.0$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sk}	=	0.000 [kN]	δ_N	=	0.00000 [cm]
V_{Sk}	=	75.001 [kN]	δ_V	=	2.25003 [cm]
			δ_{NV}	=	2.25003 [cm]

Long term loading:

N_{Sk}	=	0.000 [kN]	δ_N	=	0.00000 [cm]
V_{Sk}	=	75.001 [kN]	δ_V	=	3.75006 [cm]
			δ_{NV}	=	3.75006 [cm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the anchor plate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

7 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Checking the transfer of loads into the base material is required in accordance with EOTA TR 029, Section 7!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 4.1 of EOTA TR029! For larger diameters of the clearance hole see Chapter 1.1. of EOTA TR029!
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- Characteristic bond resistances depend on short- and long-term temperatures.
- The design method SOFA assumes that no hole clearance between the anchors and the fixture is present. This can be achieved by filling the gap with mortar of sufficient compressive strength (e.g. by using the Hilti Filling set) or by other suitable means
- The compliance with current standards (e.g. EN 1993, AS 4100:1998, etc.) is the responsibility of the user
- An SLS-check is not performed for SOFA and has to be provided by the user!
- The characteristic bond resistances depend on the return period (service life in years): 100

Fastening meets the design criteria!

Company:		Page:	7
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 5, 2022 (1)	Date:	04.03.2022
Fastening point:			

8 Installation data

Anchor plate, steel: S 355; E = 210,000.00 N/mm^2; f_{yk} = 355.00 N/mm^2

Profile: no profile

Hole diameter in the fixture: d_f = 2.60 cm

Plate thickness (input): 1.90 cm

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and diameter: HIT-RE 500 V3 100 years + HAS-U 5.8 HDG M24

Item number: 2223909 HAS-U 5.8 HDG M24x450 (element) / 2123402 HIT-RE 500 V3 (adhesive)

Maximum installation torque: 200 Nm

Hole diameter in the base material: 2.80 cm

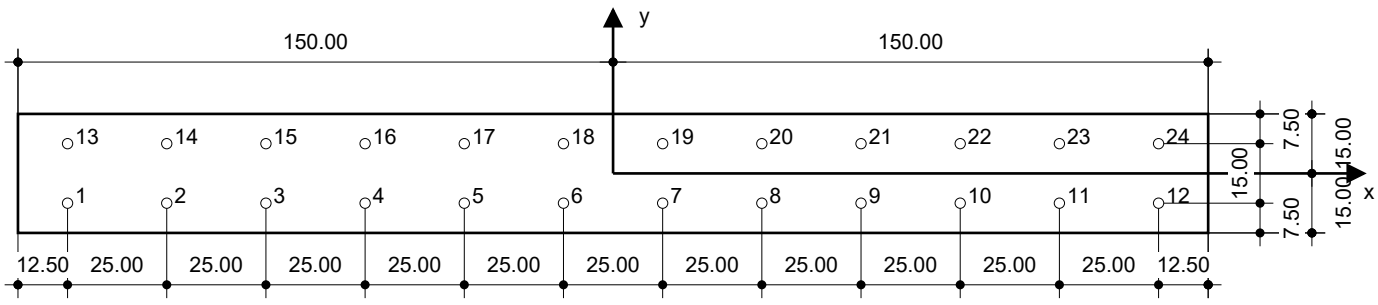
Hole depth in the base material: 30.00 cm

Minimum thickness of the base material: 35.60 cm

Hilti HAS-U threaded rod with HIT-RE 500 V3 injection mortar with 30 cm embedment h_ef, M24, Hot dip galvanized, Hammer drilled installation per ETA 16/0143, with annular gaps filled with Hilti Filling set or any suitable gap solutions

8.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • Filling set • Torque wrench



Coordinates Anchor [cm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-137.50	-7.50	1,362.50	442.60	-	317.69
2	-112.50	-7.50	1,387.50	417.60	-	317.69
3	-87.50	-7.50	1,412.50	392.60	-	317.69
4	-62.50	-7.50	1,437.50	367.60	-	317.69
5	-37.50	-7.50	1,462.50	342.60	-	317.69
6	-12.50	-7.50	1,487.50	317.60	-	317.69
7	12.50	-7.50	1,512.50	292.59	-	317.69
8	37.50	-7.50	1,537.50	267.59	-	317.69
9	62.50	-7.50	1,562.50	242.59	-	317.69
10	87.50	-7.50	1,587.50	217.59	-	317.69
11	112.50	-7.50	1,612.50	192.59	-	317.69
12	137.50	-7.50	1,637.50	167.59	-	317.69

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
13	-137.50	7.50	1,362.50	442.60	-	302.69
14	-112.50	7.50	1,387.50	417.60	-	302.69
15	-87.50	7.50	1,412.50	392.60	-	302.69
16	-62.50	7.50	1,437.50	367.60	-	302.69
17	-37.50	7.50	1,462.50	342.60	-	302.69
18	-12.50	7.50	1,487.50	317.60	-	302.69
19	12.50	7.50	1,512.50	292.59	-	302.69
20	37.50	7.50	1,537.50	267.59	-	302.69
21	62.50	7.50	1,562.50	242.59	-	302.69
22	87.50	7.50	1,587.50	217.59	-	302.69
23	112.50	7.50	1,612.50	192.59	-	302.69
24	137.50	7.50	1,637.50	167.59	-	302.69

9 Remarks; Your Cooperation Duties

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Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Mar 4, 2022	Date:	04.03.2022
Fastening point:			

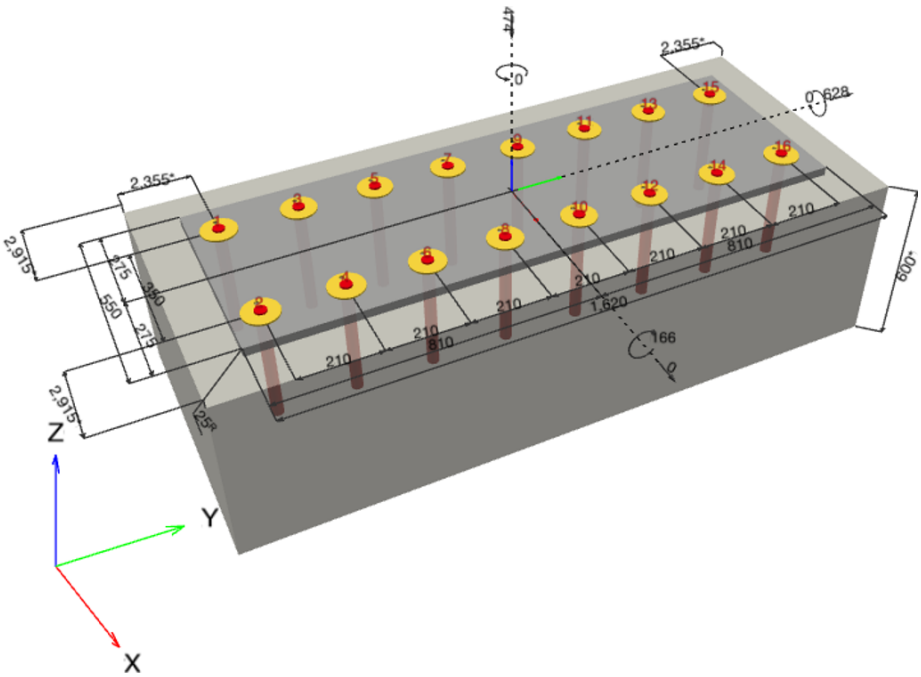
Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-HY 200-R V3 + Rebar 32mm**
Return period (service life in years):	50
Item number:	not available (element) / 2262134 HIT-HY 200-R V3 (adhesive)
Filling set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 300.0 mm ($h_{ef,limit}$ = - mm)
Material:	B500B
Evaluation Service Report:	ETA 19/0601
Issued I Valid:	30.04.2021 | -
Proof:	Engineering judgement SOFA BOND - based on ETAG BOND testing
Stand-off installation:	e_b = 0.0 mm (no stand-off); t = 25.0 mm
Anchor plate[R]:	l_x x l_y x t = 550.0 mm x 1,620.0 mm x 25.0 mm; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	uncracked concrete, C35/45, $f_{c,cube}$ = 45.00 N/mm^2; h = 600.0 mm, Temp. short/long: 40/24 °C
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	no reinforcement or reinforcement spacing >= 150 mm (any Ø) or >= 100 mm (Ø <= 10 mm)
	no longitudinal edge reinforcement

[R] - The anchor calculation is based on a rigid anchor plate assumption.

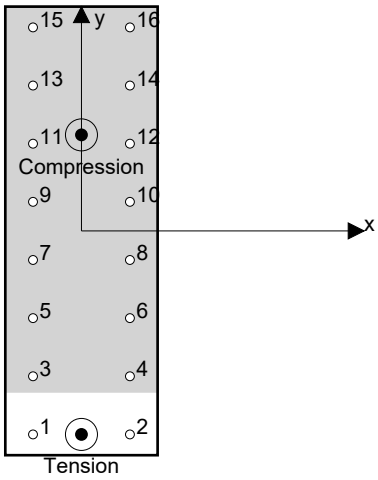
Geometry [mm] & Loading [kN, kNm]



1.1 Load combination

Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	Combination 1	N = -474.000; V_x = 0.000; V_y = 628.000; M_x = -166.000; M_y = 0.000; M_z = 0.000;	no	no	97

2 Load case/Resulting anchor forces



Anchor reactions [kN]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0.746	39.250	0.000	39.250
2	0.746	39.250	0.000	39.250
3	0.000	39.250	0.000	39.250
4	0.000	39.250	0.000	39.250
5	0.000	39.250	0.000	39.250
6	0.000	39.250	0.000	39.250
7	0.000	39.250	0.000	39.250
8	0.000	39.250	0.000	39.250
9	0.000	39.250	0.000	39.250
10	0.000	39.250	0.000	39.250
11	0.000	39.250	0.000	39.250
12	0.000	39.250	0.000	39.250
13	0.000	39.250	0.000	39.250
14	0.000	39.250	0.000	39.250
15	0.000	39.250	0.000	39.250
16	0.000	39.250	0.000	39.250

max. concrete compressive strain: 0.04 [‰]
max. concrete compressive stress: 1.24 [N/mm^2]
resulting tension force in (x/y)=(0.0/-735.0): 1.492 [kN]
resulting compression force in (x/y)=(0.0/346.8): 475.492 [kN]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

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3 Tension load (EOTA TR 029, Section 5.2.2)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel Strength*	0.746	315.714	1	OK
Combined pullout-concrete cone failure**	1.492	368.670	1	OK
Concrete Breakout Failure**	1.492	325.976	1	OK
Splitting failure**	1.492	503.890	1	OK

* highest loaded anchor **anchor group (anchors in tension)

3.1 Steel Strength

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
442.000	1.400	315.714	0.746

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\tau_{Rk,ucr,25}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
938,700	655,360	12.00	809.5	404.8	2,355.0

ψ_c	$\tau_{Rk,ucr}$ [N/mm²]	k	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.067	12.80	3.200	1.000	1.000

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0.0	1.000	0.0	1.000	1.000	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	N_{Sd} [kN]
386.084	553.005	1.500	368.670	1.492

Group anchor ID
1, 2

3.3 Concrete Breakout Failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]
1,125,000	810,000	450.0	900.0

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0.0	1.000	0.0	1.000	1.000	1.000

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Sd} [kN]
10.100	352.054	1.500	325.976	1.492

Group anchor ID
1, 2

3.4 Splitting failure

$A_{c,N}$ [mm^2]	$A^0_{c,N}$ [mm^2]	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	$\psi_{h,sp}$
570,000	360,000	300.0	600.0	1.356

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	k_1
0.0	1.000	0.0	1.000	1.000	1.000	10.100

$N^0_{Rk,c}$ [kN]	$\gamma_{M,sp}$	$N_{Rd,sp}$ [kN]	N_{Sd} [kN]
352.054	1.500	503.890	1.492

Group anchor ID
1, 2

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4 Shear load (EOTA TR 029, Section 5.2.3)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel Strength (without lever arm)*	39.250	147.333	27	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	628.000	1,716.807	37	OK
Concrete edge failure in direction y+**	628.000	651.211	97	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength (without lever arm)

$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
221.000	1.500	147.333	39.250

4.2 Pryout Strength (Concrete Breakout Strength controls)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	k-factor
2,962,500	810,000	450.0	900.0	2.000

$e_{c1,V}$ [mm]	$\Psi_{ec1,N}$	$e_{c2,V}$ [mm]	$\Psi_{ec2,N}$	$\Psi_{s,N}$	$\Psi_{re,N}$
0.0	1.000	0.0	1.000	1.000	1.000

$N^0_{Rk,c}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Sd} [kN]
352.054	1.500	1,716.807	628.000

Group anchor ID
1-16

4.3 Concrete edge failure in direction y+

l_f [mm]	d_{nom} [mm]	k_1	α	β
300.0	32.00	2.400	0.039	0.044

c_1 [mm]	c_1' [mm]	$A_{c,V}$ [mm²]	$A^0_{c,V}$ [mm²]
2,355.0	1,943.3	3,708,000	16,994,450

$\Psi_{s,V}$	$\Psi_{h,V}$	$\Psi_{\alpha,V}$	$e_{c,V}$ [mm]	$\Psi_{ec,V}$	$\Psi_{re,V}$
1.000	2.204	1.000	0.0	1.000	1.000

$V^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	V_{Sd} [kN]
2,031.125	1.500	651.211	628.000

5 Combined tension and shear loads (EOTA TR 029, Section 5.2.4)

Steel failure

β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
0.005	0.964	1.000	81	OK

$(\beta_N + \beta_V) / 1.2 \leq 1.0$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sk} = 0.000 [kN] δ_N = 0.0000 [mm]

V_{Sk} = 232.593 [kN] δ_V = 6.9778 [mm]

δ_{NV} = 6.9778 [mm]

Long term loading:

N_{Sk} = 0.000 [kN] δ_N = 0.0000 [mm]

V_{Sk} = 232.593 [kN] δ_V = 9.3037 [mm]

δ_{NV} = 9.3037 [mm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the anchor plate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

7 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Checking the transfer of loads into the base material is required in accordance with EOTA TR 029, Section 7!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 4.1 of EOTA TR029! For larger diameters of the clearance hole see Chapter 1.1. of EOTA TR029!
- Your design has selected filled holes. Please ensure that there is a proper method to fill the annular gap between the fixture and HIT-HY 200-R V3 + Rebar 32mmand contact Hilti in case of any questions.
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- Bore hole cleaning must be performed according to instructions for use (blow twice with oil-free compressed air (min. 6 bar), brush twice, blow twice with oil-free compressed air (min. 6 bar)).
- Characteristic bond resistances depend on short- and long-term temperatures.
- The design method SOFA assumes that no hole clearance between the anchors and the fixture is present. This can be achieved by filling the gap with mortar of sufficient compressive strength (e.g. by using the Hilti Filling set) or by other suitable means
- The compliance with current standards (e.g. EN 1993, AS 4100:1998, etc.) is the responsibility of the user
- An SLS-check is not performed for SOFA and has to be provided by the user!
- The characteristic bond resistances depend on the return period (service life in years): 50

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Fastening meets the design criteria!

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8 Installation data

Anchor plate, steel: S 235; E = 210,000.00 N/mm^2; f_{yk} = 235.00 N/mm^2

Profile: no profile

Hole diameter in the fixture: d_f = 32.0 mm

Plate thickness (input): 25.0 mm

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and diameter: HIT-HY 200-R V3 + Rebar 32mm

Item number: not available (element) / 2262134 HIT-HY 200-R V3 (adhesive)

Maximum installation torque: -

Hole diameter in the base material: 40.0 mm

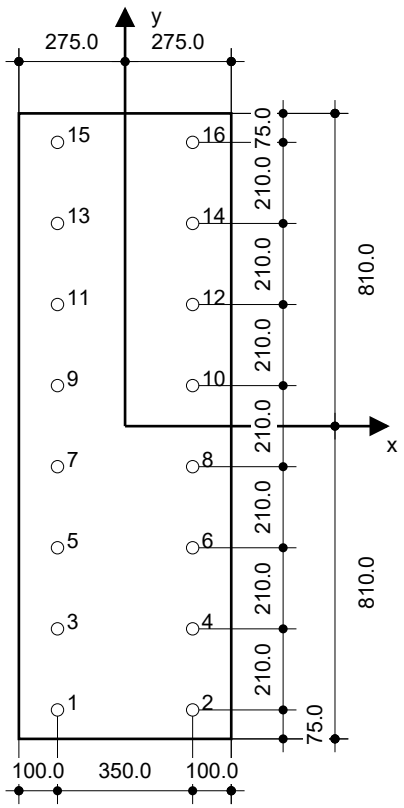
Hole depth in the base material: 300.0 mm

Minimum thickness of the base material: 380.0 mm

Rebar with HIT-HY 200-R V3 injection mortar with 300 mm embedment h_ef, 32mm, Hammer drilled installation per ETA 19/0601, with annular gaps filled with Hilti Filling set or any suitable gap solutions

8.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • For deep installations, a piston plug is necessary • Filling set • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-175.0	-735.0	2,915.0	3,265.0	2,355.0	3,825.0
2	175.0	-735.0	3,265.0	2,915.0	2,355.0	3,825.0
3	-175.0	-525.0	2,915.0	3,265.0	2,565.0	3,615.0
4	175.0	-525.0	3,265.0	2,915.0	2,565.0	3,615.0
5	-175.0	-315.0	2,915.0	3,265.0	2,775.0	3,405.0
6	175.0	-315.0	3,265.0	2,915.0	2,775.0	3,405.0
7	-175.0	-105.0	2,915.0	3,265.0	2,985.0	3,195.0
8	175.0	-105.0	3,265.0	2,915.0	2,985.0	3,195.0

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
9	-175.0	105.0	2,915.0	3,265.0	3,195.0	2,985.0
10	175.0	105.0	3,265.0	2,915.0	3,195.0	2,985.0
11	-175.0	315.0	2,915.0	3,265.0	3,405.0	2,775.0
12	175.0	315.0	3,265.0	2,915.0	3,405.0	2,775.0
13	-175.0	525.0	2,915.0	3,265.0	3,615.0	2,565.0
14	175.0	525.0	3,265.0	2,915.0	3,615.0	2,565.0
15	-175.0	735.0	2,915.0	3,265.0	3,825.0	2,355.0
16	175.0	735.0	3,265.0	2,915.0	3,825.0	2,355.0

9 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

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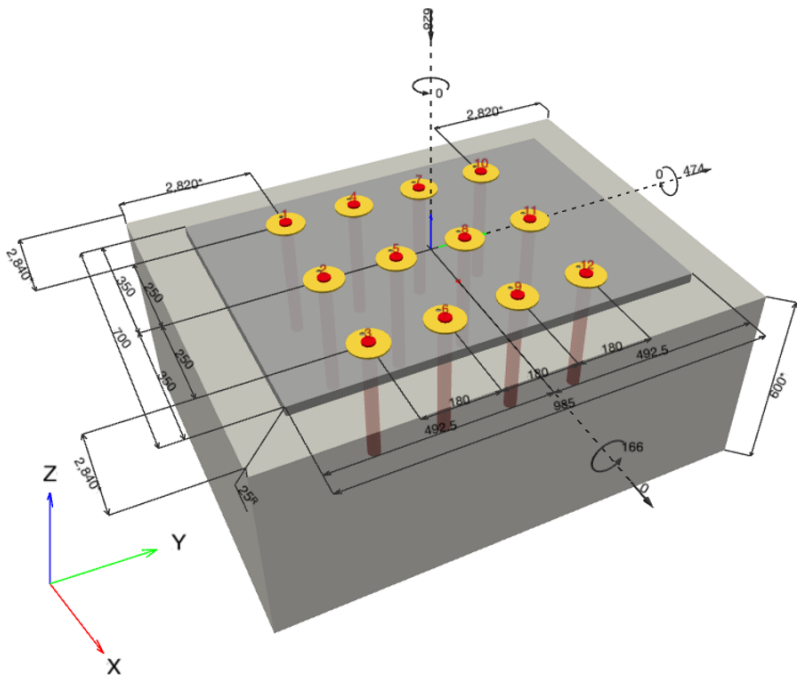
Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-HY 200-R V3 + Rebar 32mm**
Return period (service life in years):	50
Item number:	not available (element) / 2262134 HIT-HY 200-R V3 (adhesive)
Filling set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 300.0 mm ($h_{ef,limit}$ = - mm)
Material:	B500B
Evaluation Service Report:	ETA 19/0601
Issued I Valid:	30.04.2021 | -
Proof:	Engineering judgement SOFA BOND - based on ETAG BOND testing
Stand-off installation:	e_b = 0.0 mm (no stand-off); t = 25.0 mm
Anchor plate[R]:	l_x x l_y x t = 700.0 mm x 985.0 mm x 25.0 mm; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	uncracked concrete, C35/45, $f_{c,cube}$ = 45.00 N/mm²; h = 600.0 mm, Temp. short/long: 40/24 °C
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	no reinforcement or reinforcement spacing >= 150 mm (any Ø) or >= 100 mm (Ø <= 10 mm)
	no longitudinal edge reinforcement

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [mm] & Loading [kN, kNm]



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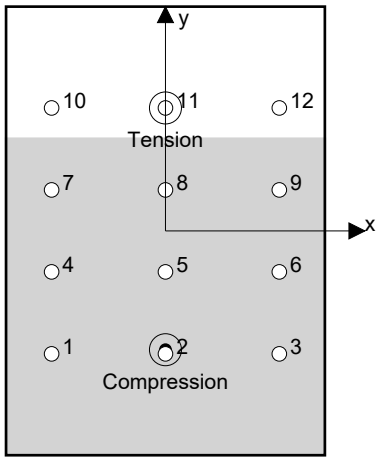
1.1 Load combination

Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	Combination 1	N = -628.000; V_x = 0.000; V_y = 474.000; M_x = 166.000; M_y = 0.000; M_z = 0.000;	no	no	73

2 Load case/Resulting anchor forces



Anchor reactions [kN]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0.000	39.500	0.000	39.500
2	0.000	39.500	0.000	39.500
3	0.000	39.500	0.000	39.500
4	0.000	39.500	0.000	39.500
5	0.000	39.500	0.000	39.500
6	0.000	39.500	0.000	39.500
7	0.000	39.500	0.000	39.500
8	0.000	39.500	0.000	39.500
9	0.000	39.500	0.000	39.500
10	1.357	39.500	0.000	39.500
11	1.357	39.500	0.000	39.500
12	1.357	39.500	0.000	39.500

max. concrete compressive strain: 0.09 [‰]
max. concrete compressive stress: 2.60 [N/mm^2]
resulting tension force in (x/y)=(0.0/270.0): 4.072 [kN]
resulting compression force in (x/y)=(0.0/-260.9): 632.072 [kN]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

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3 Tension load (EOTA TR 029, Section 5.2.2)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel Strength*	1.357	315.714	1	OK
Combined pullout-concrete cone failure**	4.072	416.362	1	OK
Concrete Breakout Failure**	4.072	365.093	2	OK
Splitting failure**	4.072	583.452	1	OK

* highest loaded anchor **anchor group (anchors in tension)

3.1 Steel Strength

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
442.000	1.400	315.714	1.357

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\tau_{Rk,ucr,25}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
1,060,132	655,360	12.00	809.5	404.8	2,820.0

ψ_c	$\tau_{Rk,ucr}$ [N/mm²]	k	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.067	12.80	3.200	1.000	1.000

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0.0	1.000	0.0	1.000	1.000	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	N_{Sd} [kN]
386.084	624.543	1.500	416.362	4.072

Group anchor ID
10-12

3.3 Concrete Breakout Failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]
1,260,000	810,000	450.0	900.0

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0.0	1.000	0.0	1.000	1.000	1.000

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Sd} [kN]
10.100	352.054	1.500	365.093	4.072

Group anchor ID
10-12

3.4 Splitting failure

$A_{c,N}$ [mm^2]	$A^0_{c,N}$ [mm^2]	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	$\psi_{h,sp}$
660,000	360,000	300.0	600.0	1.356

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	k_1
0.0	1.000	0.0	1.000	1.000	1.000	10.100

$N^0_{Rk,c}$ [kN]	$\gamma_{M,sp}$	$N_{Rd,sp}$ [kN]	N_{Sd} [kN]
352.054	1.500	583.452	4.072

Group anchor ID
10-12

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4 Shear load (EOTA TR 029, Section 5.2.3)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel Strength (without lever arm)*	39.500	147.333	27	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	474.000	1,168.298	41	OK
Concrete edge failure in direction y+**	474.000	653.231	73	OK

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength (without lever arm)

$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
221.000	1.500	147.333	39.500

4.2 Pryout Strength (Concrete Breakout Strength controls)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	k-factor
2,016,000	810,000	450.0	900.0	2.000

$e_{c1,V}$ [mm]	$\Psi_{ec1,N}$	$e_{c2,V}$ [mm]	$\Psi_{ec2,N}$	$\Psi_{s,N}$	$\Psi_{re,N}$
0.0	1.000	0.0	1.000	1.000	1.000

$N^0_{Rk,c}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Sd} [kN]
352.054	1.500	1,168.298	474.000

Group anchor ID
1-12

4.3 Concrete edge failure in direction y+

l_f [mm]	d_{nom} [mm]	k_1	α	β
300.0	32.00	2.400	0.040	0.044

c_1 [mm]	c_1' [mm]	$A_{c,V}$ [mm²]	$A^0_{c,V}$ [mm²]
2,820.0	1,893.3	3,708,000	16,131,200

$\Psi_{s,V}$	$\Psi_{h,V}$	$\Psi_{\alpha,V}$	$e_{c,V}$ [mm]	$\Psi_{ec,V}$	$\Psi_{re,V}$
1.000	2.176	1.000	0.0	1.000	1.000

$V^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	V_{Sd} [kN]
1,959.303	1.500	653.231	474.000

5 Combined tension and shear loads (EOTA TR 029, Section 5.2.4)

Steel failure

β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
0.011	0.726	1.000	62	OK

$(\beta_N + \beta_V) / 1.2 \leq 1.0$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sk} = 1.006 [kN] δ_N = 0.0030 [mm]

V_{Sk} = 117.037 [kN] δ_V = 3.5111 [mm]

δ_{NV} = 3.5111 [mm]

Long term loading:

N_{Sk} = 1.006 [kN] δ_N = 0.0057 [mm]

V_{Sk} = 117.037 [kN] δ_V = 4.6815 [mm]

δ_{NV} = 4.6815 [mm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the anchor plate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

7 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Checking the transfer of loads into the base material is required in accordance with EOTA TR 029, Section 7!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 4.1 of EOTA TR029! For larger diameters of the clearance hole see Chapter 1.1. of EOTA TR029!
- Your design has selected filled holes. Please ensure that there is a proper method to fill the annular gap between the fixture and HIT-HY 200-R V3 + Rebar 32mmand contact Hilti in case of any questions.
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- Bore hole cleaning must be performed according to instructions for use (blow twice with oil-free compressed air (min. 6 bar), brush twice, blow twice with oil-free compressed air (min. 6 bar)).
- Characteristic bond resistances depend on short- and long-term temperatures.
- The design method SOFA assumes that no hole clearance between the anchors and the fixture is present. This can be achieved by filling the gap with mortar of sufficient compressive strength (e.g. by using the Hilti Filling set) or by other suitable means
- The compliance with current standards (e.g. EN 1993, AS 4100:1998, etc.) is the responsibility of the user
- An SLS-check is not performed for SOFA and has to be provided by the user!
- The characteristic bond resistances depend on the return period (service life in years): 50

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Fastening meets the design criteria!

8 Installation data

Anchor plate, steel: S 235; E = 210,000.00 N/mm^2; f_{yk} = 235.00 N/mm^2

Profile: no profile

Hole diameter in the fixture: d_f = 32.0 mm

Plate thickness (input): 25.0 mm

Recommended plate thickness: not calculated

Drilling method: Hammer drilled
Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and diameter: HIT-HY 200-R V3 + Rebar 32mm

Item number: not available (element) / 2262134 HIT-HY 200-R V3 (adhesive)

Maximum installation torque: -

Hole diameter in the base material: 40.0 mm

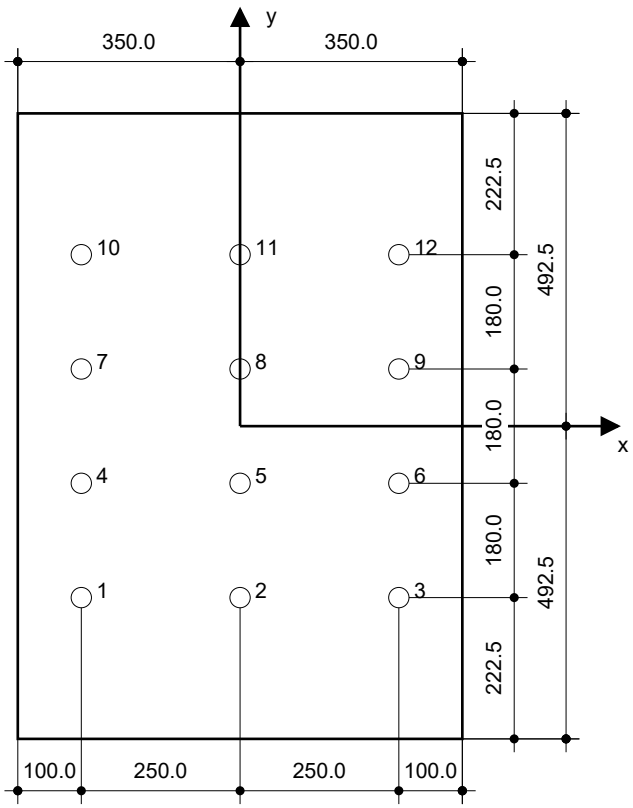
Hole depth in the base material: 300.0 mm

Minimum thickness of the base material: 380.0 mm

Rebar with HIT-HY 200-R V3 injection mortar with 300 mm embedment h_ef, 32mm, Hammer drilled installation per ETA 19/0601, with annular gaps filled with Hilti Filling set or any suitable gap solutions

8.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • For deep installations, a piston plug is necessary • Filling set • Torque wrench



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Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-250.0	-270.0	2,840.0	3,340.0	2,820.0	3,360.0
2	0.0	-270.0	3,090.0	3,090.0	2,820.0	3,360.0
3	250.0	-270.0	3,340.0	2,840.0	2,820.0	3,360.0
4	-250.0	-90.0	2,840.0	3,340.0	3,000.0	3,180.0
5	0.0	-90.0	3,090.0	3,090.0	3,000.0	3,180.0
6	250.0	-90.0	3,340.0	2,840.0	3,000.0	3,180.0

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
7	-250.0	90.0	2,840.0	3,340.0	3,180.0	3,000.0
8	0.0	90.0	3,090.0	3,090.0	3,180.0	3,000.0
9	250.0	90.0	3,340.0	2,840.0	3,180.0	3,000.0
10	-250.0	270.0	2,840.0	3,340.0	3,360.0	2,820.0
11	0.0	270.0	3,090.0	3,090.0	3,360.0	2,820.0
12	250.0	270.0	3,340.0	2,840.0	3,360.0	2,820.0

9 Remarks; Your Cooperation Duties

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