ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΙΟΝΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ

ΔΙΕΥΘΥΝΣΗ ΤΕΧΝΙΚΩΝ ΥΠΗΡΕΣΙΩΝ

ΕΡΓΟ :

ΚΤΙΡΙΟ ΤΜΗΜΑΤΟΣ ΜΟΥΣΙΚΩΝ ΣΠΟΥΔΩΝ ΣΤΟ ΟΙΚΟΠΕΔΟ Ε.Α.Σ.Κ.

ΘΕΣΗ ΕΡΓΟΥ :

9η ΠΑΡΟΔΟΣ Δ. ΘΕΟΤΟΚΗ ,
ΠΕΡΙΟΧΗ ΠΑΛΛΑΔΑ - Ο.Τ. 379 , ΚΕΡΚΥΡΑ

ΣΤΑΔΙΟ ΜΕΛΕΤΗΣ :	**ΣΤΑΤΙΚΗ ΜΕΛΕΤΗ ΕΦΑΡΜΟΓΗΣ**	ΣΤΑ.
ΘΕΜΑ ΤΕΥΧΟΥΣ :	ΤΕΥΧΟΣ ΣΤΑΤΙΚΩΝ ΥΠΟΛΟΓΙΣΜΩΝ ΜΕΤΑΛΛΙΚΩΝ ΔΑΠΕΔΩΝ - ΚΤΙΡΙΑ Β ΚΑΙ Ε	Τ.10

ΑΡΧΙΤΕΚΤΟΝΙΚΗ ΜΕΛΕΤΗ	ΣΤΑΤΙΚΗ ΜΕΛΕΤΗ	ΜΕΛΕΤΗ Η/Μ ΕΓΚΑΤΑΣΤΑΣΕΩΝ	ΗΜΕΡΟΜΗΝΙΑ
Δ. ΒΑΣΙΛΟΠΟΥΛΟΣ & ΣΥΝΕΡΓΑΤΕΣ Ε.Ε. ΣΥΝΕΡΓΑΤΕΣ ΑΡΧΙΤΕΚΤΟΝΕΣ : Σ.ΚΟΛΟΒΟΥ, Ε. ΝΤΟΥΡΜΑ, Χ. ΣΟΥΛΙΩΤΗ, Φ. ΓΕΡΟΝΤΑΚΗΣ.	ΑΡΤΕΜΙΣ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ Ε.Π.Ε.	Η-Μ ΣΧΕΔΙΑΣΜΟΣ Κ. ΓΕΩΡΓΑΚΟΠΟΥΛΟΣ- Σ. ΤΣΑΝΤΕΣ & ΣΙΑ Ε.Ε.	ΣΕΠΤΕΜΒΡΙΟΣ 2019
ΣΥΜΒΟΥΛΟΣ ΑΚΟΥΣΤΙΚΗΣ ΜΕΛΕΤΗΣ: Ι. ΜΑΡΙΝΟΣ	ΓΕΩΤΕΧΝΙΚΗ ΜΕΛΕΤΗ: Ν. ΔΕΡΕΚΑΣ		

ΣΦΡΑΓΙΔΕΣ - ΥΠΟΓΡΑΦΕΣ

ΑΡΤΕΜΙΣ ΣΥΜΒΟΥΛΟΙ ΜΗΧΑΝΙΚΟΙ ΕΠΕ
ΕΤΑΙΡΕΙΑ ΣΤΑΤΙΚΩΝ ΜΕΛΕΤΩΝ
ΛΟΥΚΑΡΕΩΣ 57-59 114 75 ΑΘΗΝΑ
ΤΗΛ.: 210 6450349, ΦΑΞ: 210 6450745
ΑΦΜ: 099841348, ΔΟΥ: ΙΘ' ΑΘΗΝΩΝ

Περιεχόμενα

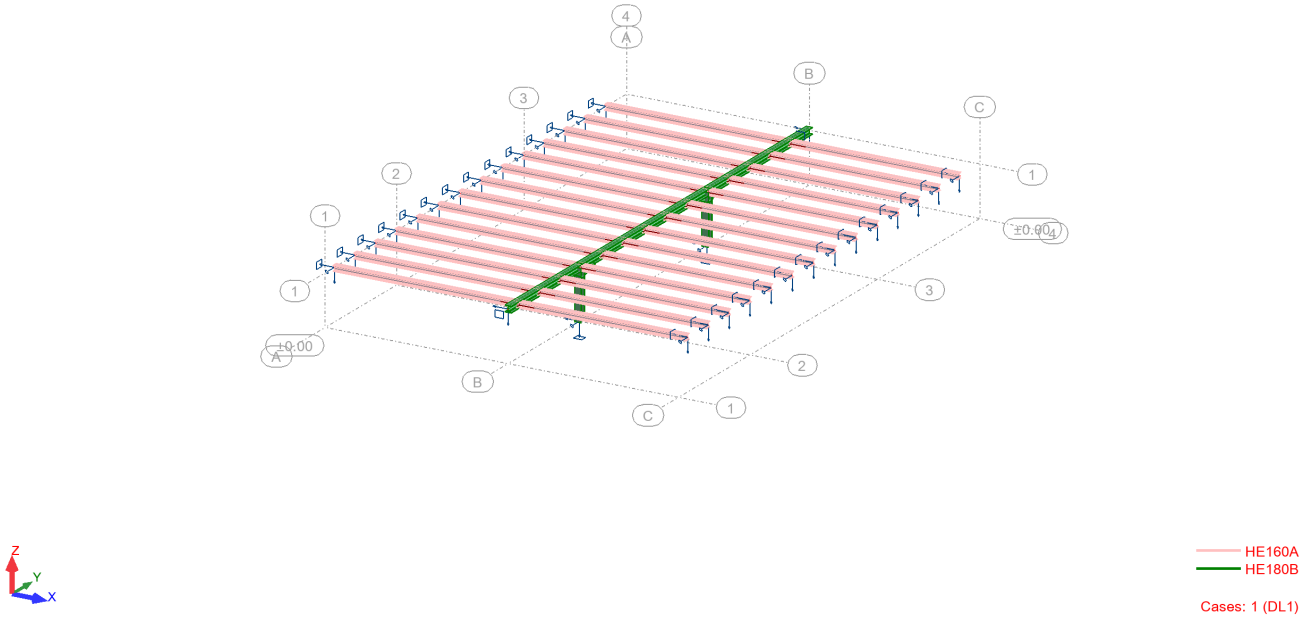
1 ΤΕΧΝΙΚΗ ΠΕΡΙΓΡΑΦΗ 1
2 ΘΕΜΑΤΑ ΠΡΟΣΟΜΟΙΩΣΗΣ, ΑΝΑΛΥΣΗΣ & ΔΙΑΣΤΑΣΙΟΛΟΓΗΣΗΣ 3
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3.1 ΥΛΙΚΑ 3
3.2 ΦΟΡΤΙΣΕΙΣ 3
3.3 ΚΑΝΟΝΙΣΜΟΙ 3
4 ΚΥΡΙΟΣ ΦΟΡΕΑΣ – ΤΜΗΜΑ Ε 4
4.1 ΔΕΔΟΜΕΝΑ ΠΡΟΣΟΜΟΙΩΜΑΤΟΣ 4
4.2 ΦΟΡΤΙΣΕΙΣ 6
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5.1 ΦΟΡΤΙΣΕΙΣ 42
5.2 ΑΠΟΤΕΛΕΣΜΑΤΑ 43

1 ΤΕΧΝΙΚΗ ΠΕΡΙΓΡΑΦΗ

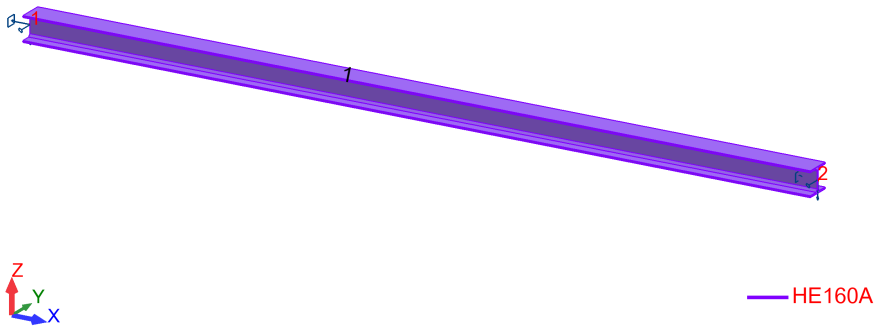
Η παρούσα Τεχνική Έκθεση και τα σχέδια που τη συνοδεύουν, αποτελούν στοιχεία της στατικής μελέτης, στα πλαίσια του έργου «**Κτίριο του Τμήματος Μουσικών Σπουδών στο Οικόπεδο Ε.Α.Σ.Κ.**» στο Ιόνιο Πανεπιστήμιο. Η μελέτη περιλαμβάνει την διαμόρφωση νέων πατωμάτων, τα οποία στηρίζονται σε νέα μεταλλικά στοιχεία που καταλήγουν και εδράζονται σε υφιστάμενα στοιχεία ωπλισμένου σκυροδέματος.

Στο τμήμα Ε, το νέο μεταλλικό δάπεδο ορθογωνικής κάτοψης έχει διαστάσεις 9.85m x 14.25m. Ο μεταλλικός φορέας αποτελείται από ένα πλαίσιο δοκών και υποστυλωμάτων διατομής HEB180 στην διαμήκη διεύθυνση, και αμφιέρειστες δευτερεύουσες δοκούς διατομής HEA160 στην εγκάρσια διεύθυνση.

Στο τμήμα Β, διαμορφώνονται τρία νέα ξύλινα δάπεδα τραπεζοειδούς κάτοψης, τα οποία εδράζονται σε αμφιέρειστες μεταλλικές δοκούς διατομής HEA160.



Εικόνα 1: Τριδιάστατη απεικόνιση μεταλλικού φορέα – Τμήμα Ε



Εικόνα 2: Τυπική αμφιέρειστη δοκός – Τμήμα Β

2 ΘΕΜΑΤΑ ΠΡΟΣΟΜΟΙΩΣΗΣ, ΑΝΑΛΥΣΗΣ & ΔΙΑΣΤΑΣΙΟΛΟΓΗΣΗΣ

Η μελέτη του φορέα έγινε με το Autodesk Robot Structural Analysis 2019. Το Autodesk Robot Structural Analysis Professional είναι ένα γενικό πρόγραμμα ανάλυσης και διαστασιολόγησης οποιασδήποτε κατασκευής (κτίρια, γέφυρες, ειδικές κατασκευές) από οπλισμένο σκυρόδεμα, χάλυβα, αλουμίνιο, ξύλο κλπ.

3 ΠΑΡΑΔΟΧΕΣ ΜΕΛΕΤΗΣ

3.1 ΥΛΙΚΑ

Για την μεταλλική κατασκευή θα γίνει χρήση χάλυβα ποιότητας S275 γενικά. Οι κοχλίες είναι κατηγορίας 8.8 γενικά.

3.2 ΦΟΡΤΙΣΕΙΣ

Οι φορτίσεις που έχουν ληφθεί υπόψη για την επίλυση του φορέα έχουν ως εξής:

Μόνιμα Φορτία:

- Ίδιο Βάρος Χάλυβα: 78.50 kN/m^3
- Ίδιο Βάρος Μεταλλικού δαπέδου: 0.80 kN/m^2
- Ίδιο Βάρος Ξύλινου δαπέδου: 2.00 kN/m^2
- Κινητό φορτίο δαπέδων: 5.00 kN/m^2

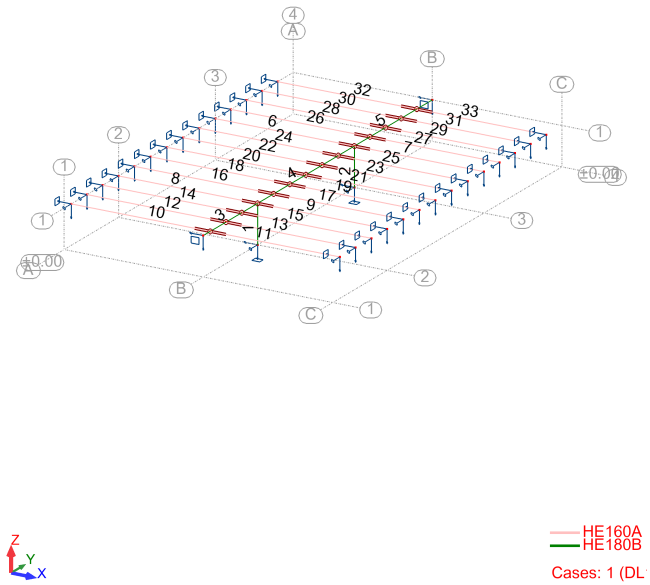
3.3 ΚΑΝΟΝΙΣΜΟΙ

Οι κανονισμοί, βάση των οποίων μελετάται συνολικά το έργο, είναι οι ακόλουθοι.

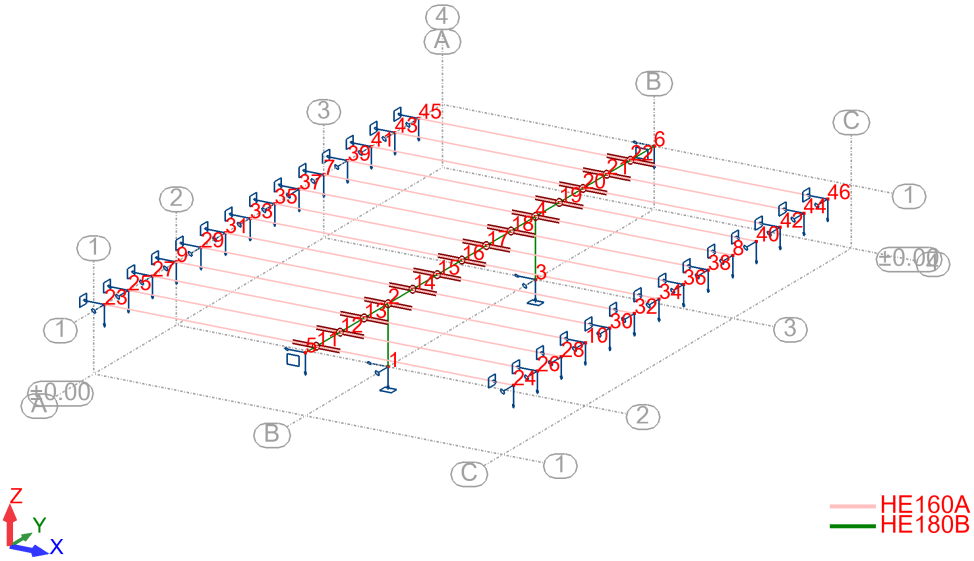
- EN 1993-1-1: 2005 (Ευρωκώδικας 3) Εθνικό κείμενο εφαρμογής
- Φορτίσεων ΕΝ1991 (ΕΥΡΩΚΩΔΙΚΑΣ 1)

4 ΚΥΡΙΟΣ ΦΟΡΕΑΣ – ΤΜΗΜΑ Ε

4.1 ΔΕΔΟΜΕΝΑ ΠΡΟΣΟΜΟΙΩΜΑΤΟΣ



Εικόνα 3: Αρίθμηση μεταλλικών στοιχείων



Εικόνα 4: Αρίθμηση κόμβων

Data - Bars

Bar	Node 1	Node 2	Section	Material	Length (m)	Gamma (Deg)	Type
1	1	2	HE180B	S 275	1.40	90.0	_COL_nonsway
2	3	4	HE180B	S 275	1.40	90.0	_COL_nonsway
3	5	2	HE180B	S 275	3.45	0.0	_BM_main_outer
4	2	4	HE180B	S 275	6.15	0.0	_BM_main_inner
5	4	6	HE180B	S 275	4.95	0.0	_BM_main_outer
6	7	4	HE160A	S 275	5.10	0.0	_BM_sec
7	4	8	HE160A	S 275	4.75	0.0	_BM_sec
8	9	2	HE160A	S 275	5.10	0.0	_BM_sec
9	2	10	HE160A	S 275	4.75	0.0	_BM_sec
10	11	23	HE160A	S 275	5.10	0.0	_BM_sec
11	11	24	HE160A	S 275	4.75	0.0	_BM_sec
12	12	25	HE160A	S 275	5.10	0.0	_BM_sec
13	12	26	HE160A	S 275	4.75	0.0	_BM_sec
14	13	27	HE160A	S 275	5.10	0.0	_BM_sec
15	13	28	HE160A	S 275	4.75	0.0	_BM_sec
16	14	29	HE160A	S 275	5.10	0.0	_BM_sec
17	14	30	HE160A	S 275	4.75	0.0	_BM_sec
18	15	31	HE160A	S 275	5.10	0.0	_BM_sec
19	15	32	HE160A	S 275	4.75	0.0	_BM_sec
20	16	33	HE160A	S 275	5.10	0.0	_BM_sec
21	16	34	HE160A	S 275	4.75	0.0	_BM_sec
22	17	35	HE160A	S 275	5.10	0.0	_BM_sec
23	17	36	HE160A	S 275	4.75	0.0	_BM_sec
24	18	37	HE160A	S 275	5.10	0.0	_BM_sec
25	18	38	HE160A	S 275	4.75	0.0	_BM_sec
26	19	39	HE160A	S 275	5.10	0.0	_BM_sec
27	19	40	HE160A	S 275	4.75	0.0	_BM_sec
28	20	41	HE160A	S 275	5.10	0.0	_BM_sec
29	20	42	HE160A	S 275	4.75	0.0	_BM_sec
30	21	43	HE160A	S 275	5.10	0.0	_BM_sec
31	21	44	HE160A	S 275	4.75	0.0	_BM_sec
32	22	45	HE160A	S 275	5.10	0.0	_BM_sec
33	22	46	HE160A	S 275	4.75	0.0	_BM_sec

Data – Sections

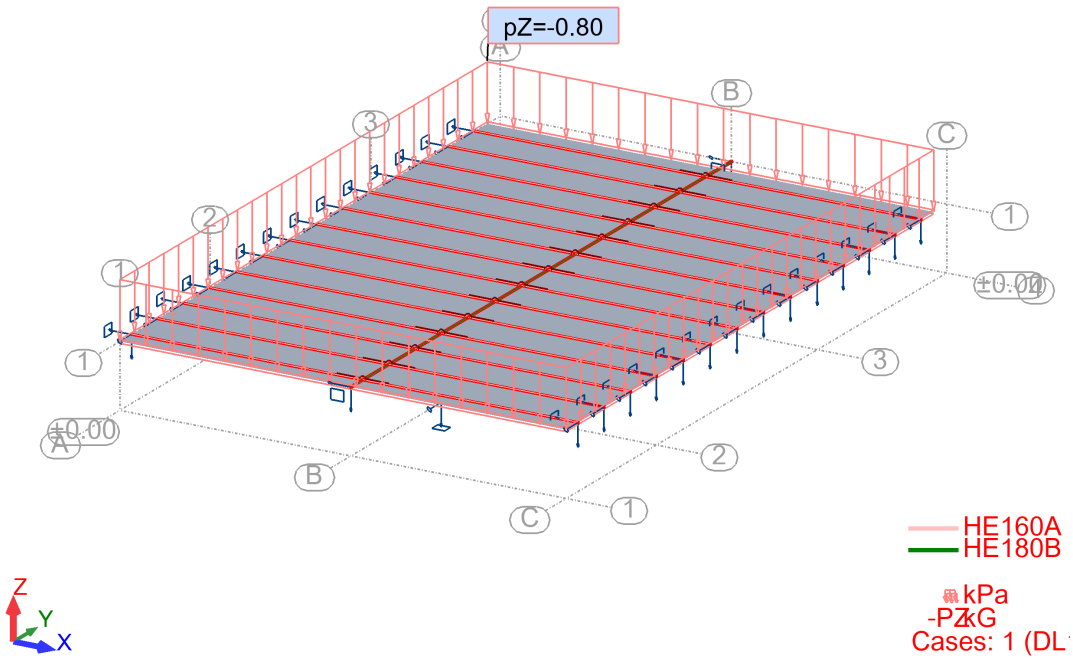
Section name	Bar list	AX (cm2)	AY (cm2)	AZ (cm2)	IX (cm4)	IY (cm4)	IZ (cm4)
HE160A	6to33	38.77	27.96	9.75	10.90	1672.98	615.57
HE180B	1to5	65.25	47.86	15.99	45.10	3831.13	1362.85

Data – Supports

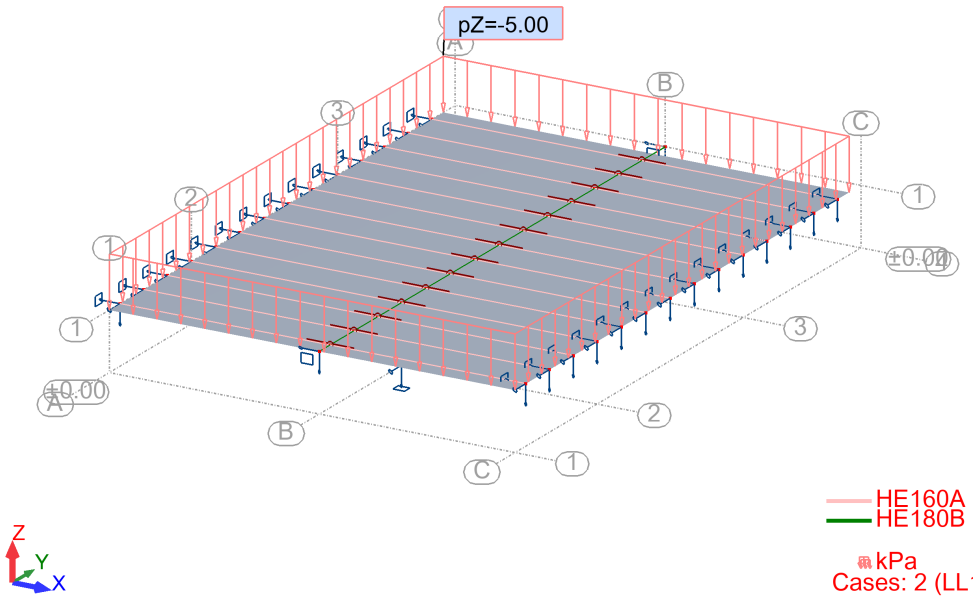
Support name	List of nodes	List of edges	List of objects	Support conditions
Pinned_RX	7to10 23to46			UX UY UZ RX
Pinned_RY	5 6			UX UZ RY
Pinned_RZ	1 3			UX UY UZ RZ

4.2 ΦΟΡΤΙΣΕΙΣ

Μόνιμο φορτίο (1:DL1)



Κινητό φορτίο (2:LL1)



Loads – Cases

Case	Label	Case name	Nature	Analysis type
1	DL1	DL1	Structural	Static - Linear
2	LL1	LL1	Category C	Static - Linear
3		ULS		Static - Linear
4		ULS+		Static - Linear
5		ULS-		Static - Linear
6		SLS		Static - Linear
7		SLS+		Static - Linear
8		SLS-		Static - Linear
9		SLS:CHR		Static - Linear
10		SLS:CHR+		Static - Linear
11		SLS:CHR-		Static - Linear
12		SLS:FRE		Static - Linear
13		SLS:FRE+		Static - Linear
14		SLS:FRE-		Static - Linear
15		SLS:QPR		Static - Linear
16		SLS:QPR+		Static - Linear
17		SLS:QPR-		Static - Linear

Loads – Values

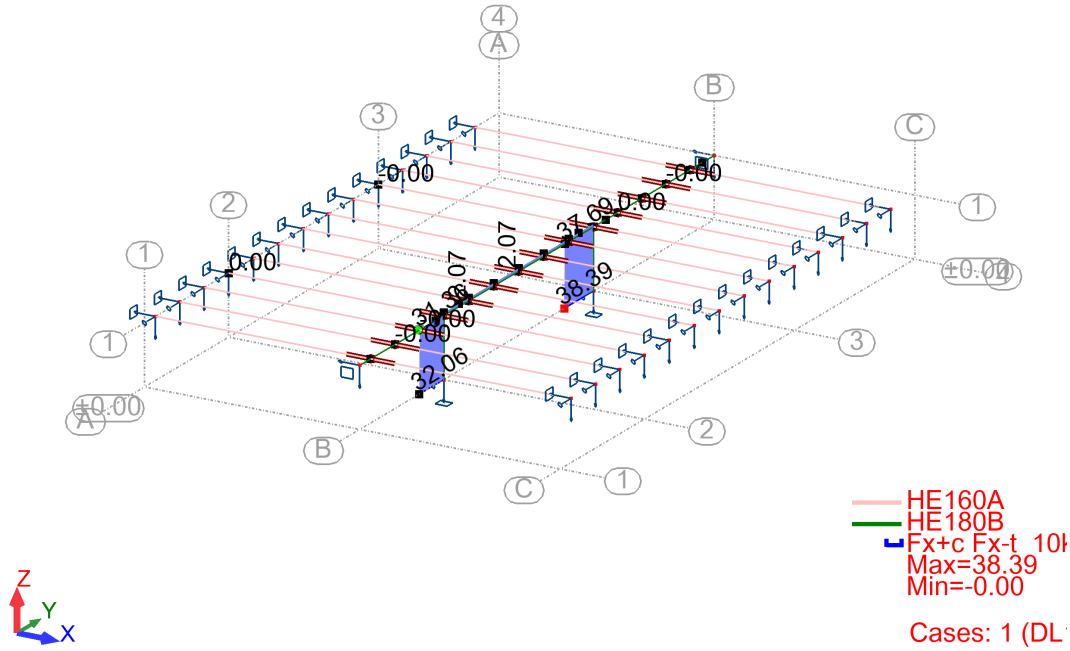
Case	Load type	List	Load values
1	self-weight	1to34	PZ Negative Factor=1.00
1	(FE) uniform	34	PZ=-0.80(kN/m2)
2	(FE) uniform	34	PZ=-5.00(kN/m2)

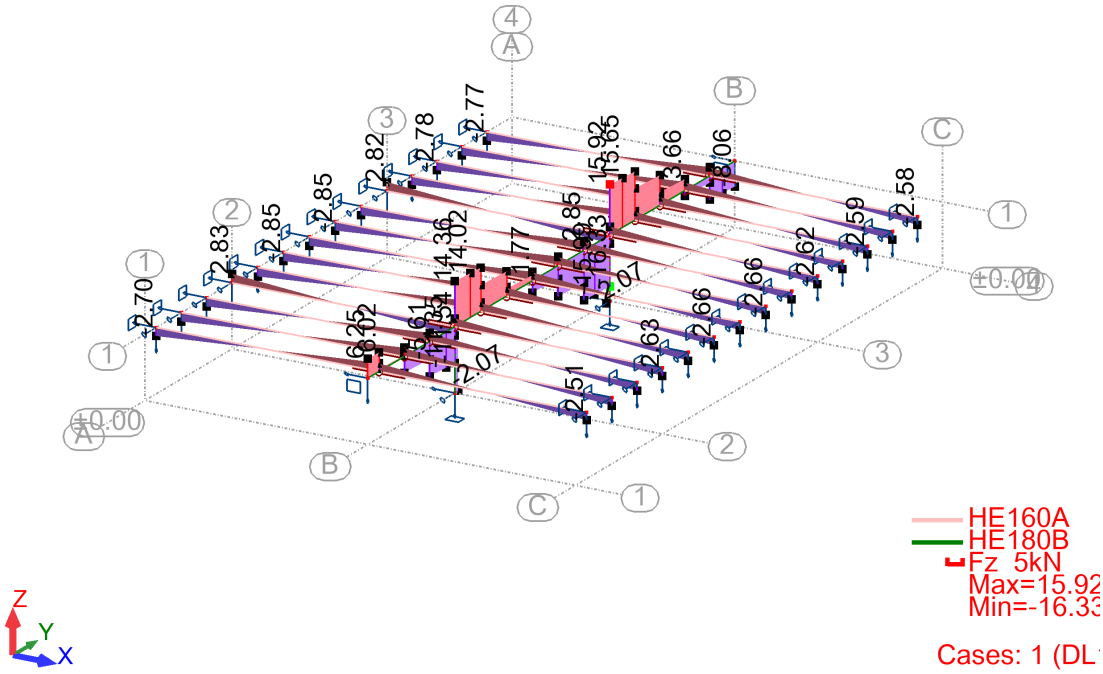
Combinations

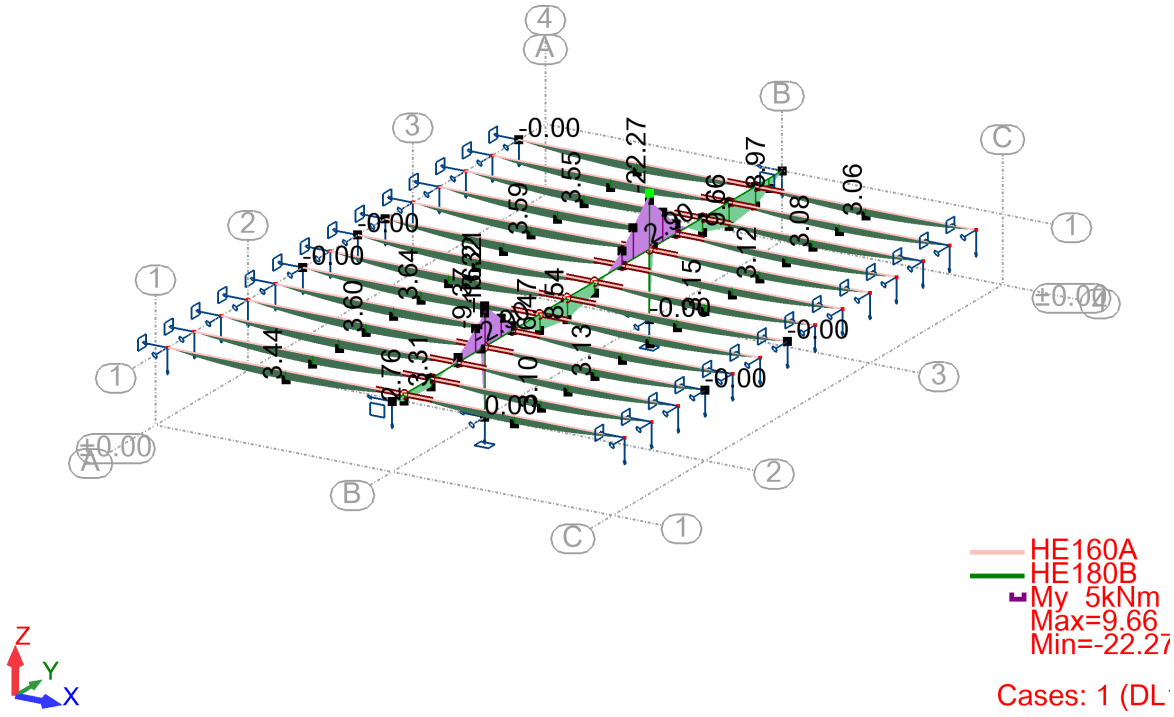
Combinations/Comp.	Definition
ULS/\t1	1*1.35 + 2*1.50
ULS/\t2	1*1.35
ULS/\t3	1*1.00 + 2*1.50
ULS/\t4	1*1.00
SLS:CHR/\t1	1*1.00 + 2*1.00
SLS:CHR/\t2	1*1.00
SLS:FRE/\t3	1*1.00 + 2*0.70
SLS:FRE/\t4	1*1.00
SLS:QPR/\t5	1*1.00 + 2*0.60
SLS:QPR/\t6	1*1.00
SLS:CHR/\t1	1*1.00 + 2*1.00
SLS:CHR/\t2	1*1.00
SLS:FRE/\t1	1*1.00 + 2*0.70
SLS:FRE/\t2	1*1.00
SLS:QPR/\t1	1*1.00 + 2*0.60
SLS:QPR/\t2	1*1.00

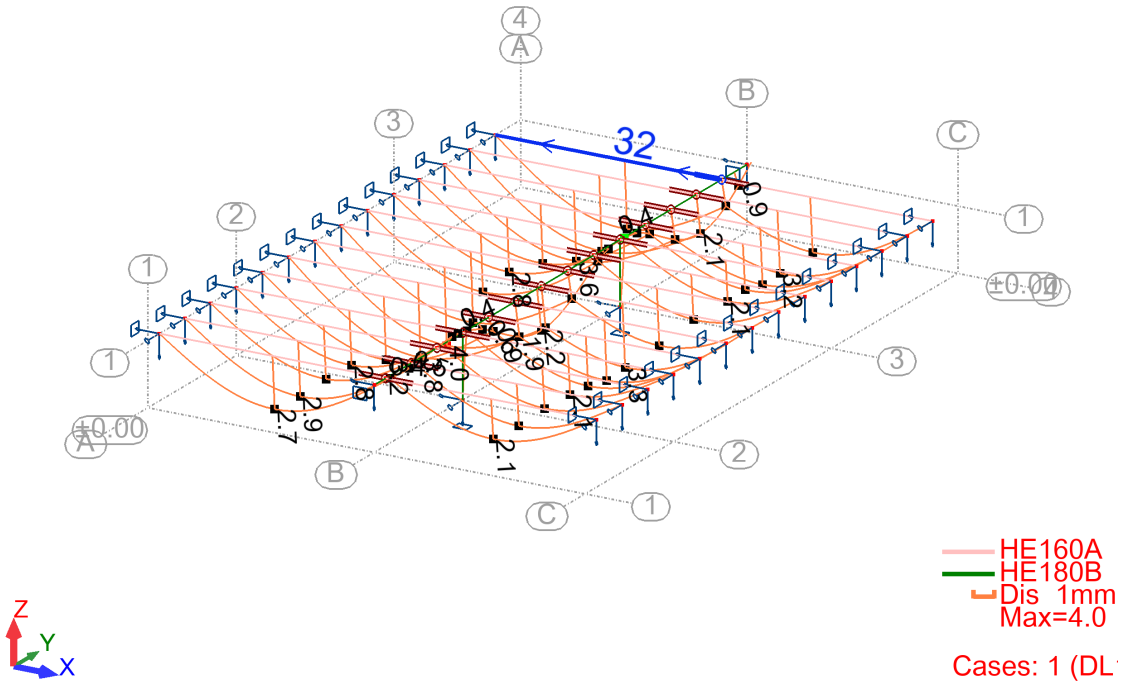
4.3 ΑΠΟΤΕΛΕΣΜΑΤΑ

ΜΟΝΙΜΟ ΦΟΡΤΙΟ (1:DL1)

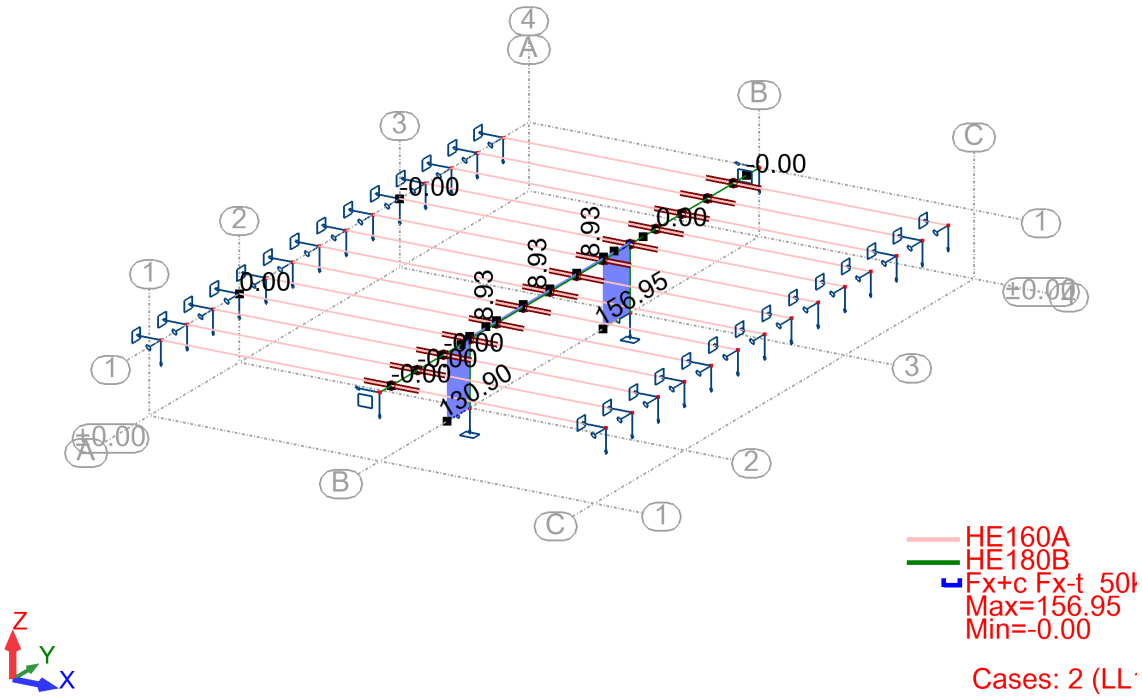


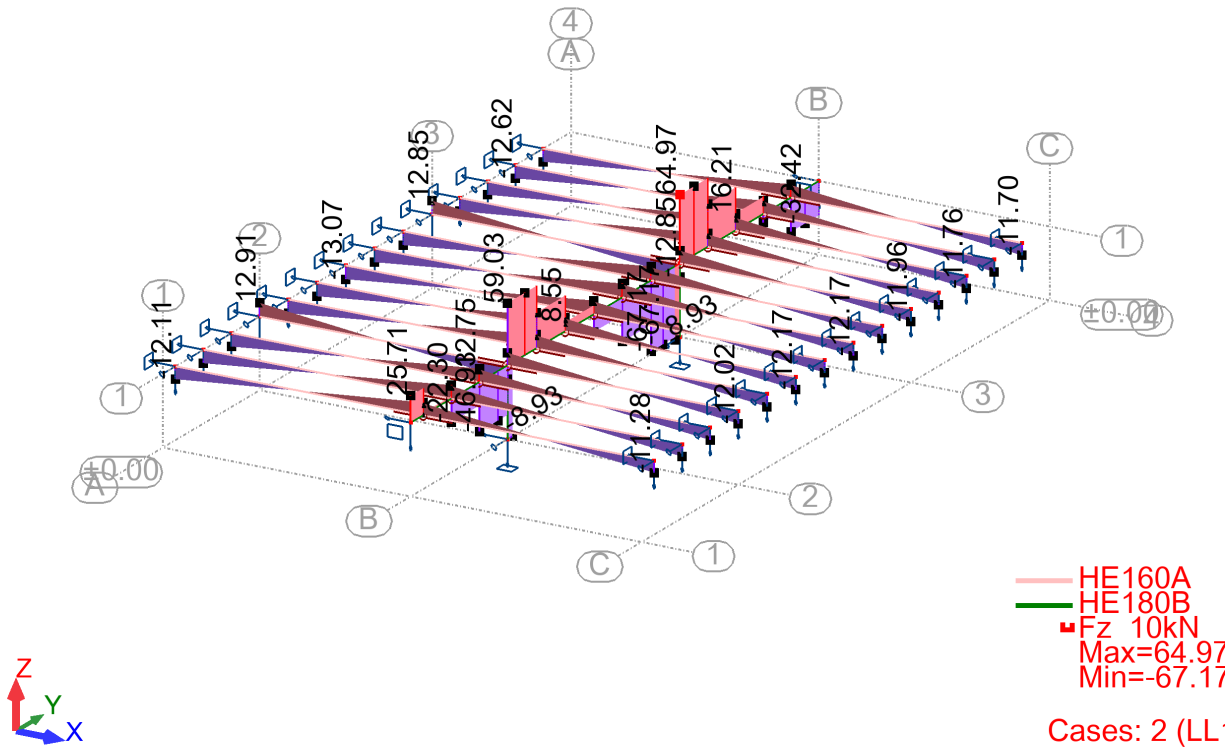


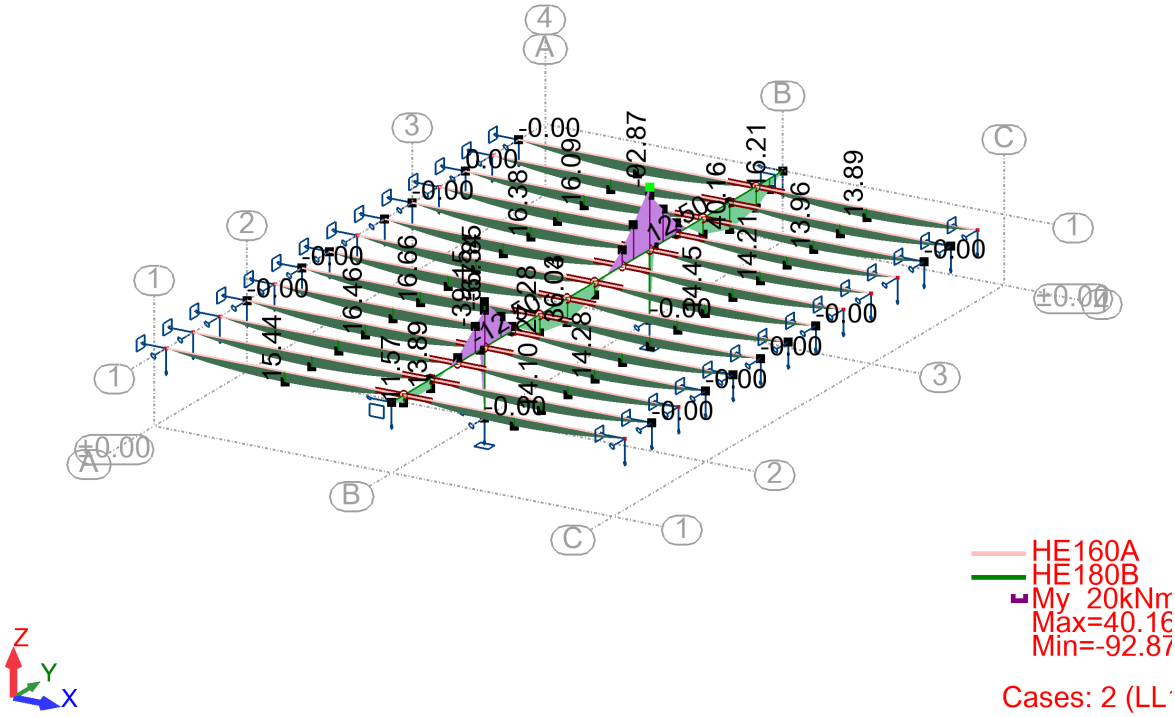

HE160A
HE180B
My 5kNm
Max=9.66
Min=-22.27
Cases: 1 (DL

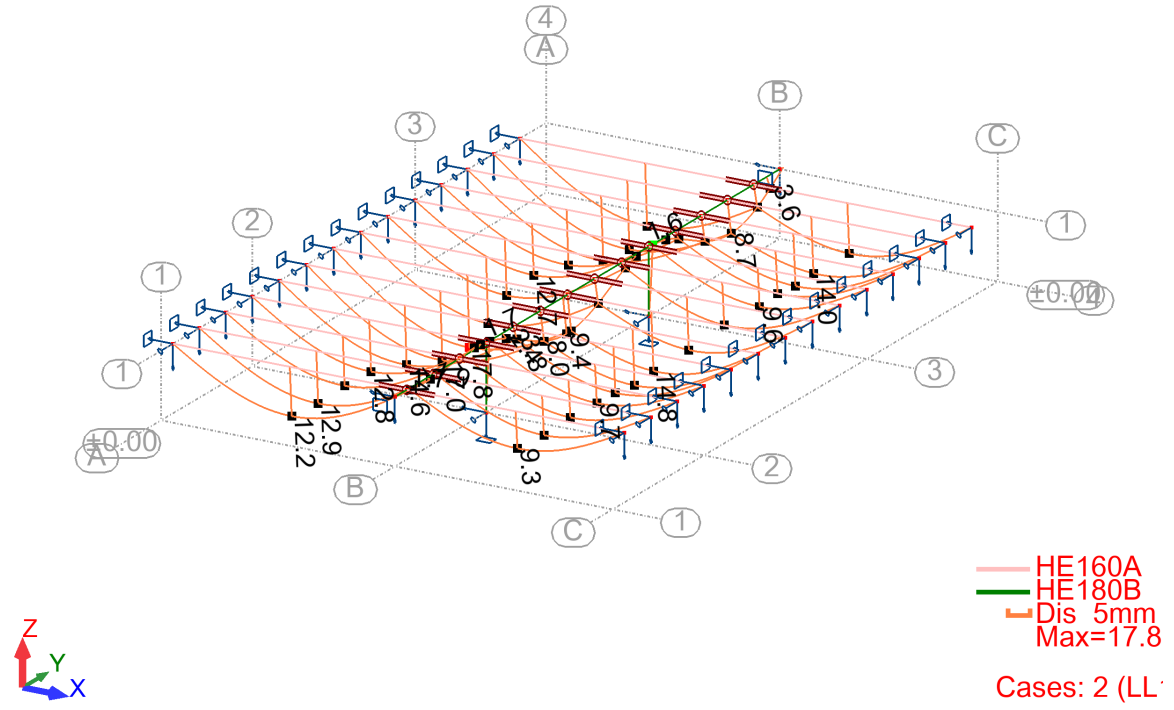

32
HE160A
HE180B
Dis 1mm
Max=4.0
Cases: 1 (DL

ΚΙΝΗΤΟ ΦΟΡΤΙΟ (2:LL1)






HE160A
HE180B
My 20kNm
Max=40.16
Min=-92.87
Cases: 2 (LL
Z
Y
X


HE160A
HE180B
Dis 5mm
Max=17.8
Cases: 2 (LL
Z
Y
X

Reactions – Values

Node/Case	FX (kN)	FY (kN)	FZ (kN)	MX (kNm)	MY (kNm)	MZ (kNm)
1/1	-0.00	2.07	32.06	-0.00	-0.00	-0.00
1/2	-0.00	8.93	130.90	0.00	-0.00	-0.00
1/ULS+	-0.00	16.19	239.63	0.00	-0.00	-0.00
1/ULS-	-0.00	2.07	32.06	-0.00	-0.00	-0.00
1/SLS+	-0.00	11.00	162.96	0.00	-0.00	-0.00
1/SLS-	-0.00	2.07	32.06	-0.00	-0.00	-0.00
1/SLS:CHR+	-0.00	11.00	162.96	0.00	-0.00	-0.00
1/SLS:CHR-	-0.00	2.07	32.06	-0.00	-0.00	-0.00
1/SLS:FRE+	-0.00	8.32	123.69	0.00	-0.00	-0.00
1/SLS:FRE-	-0.00	2.07	32.06	-0.00	-0.00	-0.00
1/SLS:QPR+	-0.00	7.43	110.60	0.00	-0.00	-0.00
1/SLS:QPR-	-0.00	2.07	32.06	-0.00	-0.00	-0.00
3/1	0.00	-2.07	38.39	0.00	0.00	-0.00
3/2	0.00	-8.93	156.95	0.00	0.00	-0.00
3/ULS+	0.00	-2.07	287.25	0.00	0.00	-0.00
3/ULS-	0.00	-16.19	38.39	0.00	0.00	-0.00
3/SLS+	0.00	-2.07	195.34	0.00	0.00	-0.00
3/SLS-	0.00	-11.00	38.39	0.00	0.00	-0.00
3/SLS:CHR+	0.00	-2.07	195.34	0.00	0.00	-0.00
3/SLS:CHR-	0.00	-11.00	38.39	0.00	0.00	-0.00
3/SLS:FRE+	0.00	-2.07	148.26	0.00	0.00	-0.00
3/SLS:FRE-	0.00	-8.32	38.39	0.00	0.00	-0.00
3/SLS:QPR+	0.00	-2.07	132.56	0.00	0.00	-0.00
3/SLS:QPR-	0.00	-7.43	38.39	0.00	0.00	-0.00
5/1	-0.00	0.0	6.25	-0.00	-0.00	-0.00
5/2	-0.00	0.0	25.71	0.00	-0.00	0.0
5/ULS+	-0.00	0.0	47.00	0.00	-0.00	-0.00
5/ULS-	-0.00	0.0	6.25	-0.00	-0.00	-0.00
5/SLS+	-0.00	0.0	31.96	0.00	-0.00	-0.00
5/SLS-	-0.00	0.0	6.25	-0.00	-0.00	-0.00
5/SLS:CHR+	-0.00	0.0	31.96	0.00	-0.00	-0.00
5/SLS:CHR-	-0.00	0.0	6.25	-0.00	-0.00	-0.00
5/SLS:FRE+	-0.00	0.0	24.25	0.00	-0.00	-0.00
5/SLS:FRE-	-0.00	0.0	6.25	-0.00	-0.00	-0.00
5/SLS:QPR+	-0.00	0.0	21.67	0.00	-0.00	-0.00
5/SLS:QPR-	-0.00	0.0	6.25	-0.00	-0.00	-0.00
6/1	-0.00	0.00	8.06	-0.00	0.00	0.0
6/2	-0.00	0.00	32.42	-0.00	0.00	0.00
6/ULS+	-0.00	0.00	59.51	-0.00	0.00	0.00
6/ULS-	-0.00	0.00	8.06	-0.00	0.00	0.0
6/SLS+	-0.00	0.00	40.48	-0.00	0.00	0.00

6/SLS-	-0.00	0.00	8.06	-0.00	0.00	0.0
6/SLS:CHR+	-0.00	0.00	40.48	-0.00	0.00	0.00
6/SLS:CHR-	-0.00	0.00	8.06	-0.00	0.00	0.0
6/SLS:FRE+	-0.00	0.00	30.75	-0.00	0.00	0.00
6/SLS:FRE-	-0.00	0.00	8.06	-0.00	0.00	0.0
6/SLS:QPR+	-0.00	0.00	27.51	-0.00	0.00	0.00
6/SLS:QPR-	-0.00	0.00	8.06	-0.00	0.00	0.0
7/1	-0.00	-0.00	2.82	0.00	0.0	-0.00
7/2	-0.00	-0.00	12.85	0.00	-0.00	-0.00
7/ULS+	-0.00	-0.00	23.07	0.00	0.0	-0.00
7/ULS-	-0.00	-0.00	2.82	0.00	-0.00	-0.00
7/SLS+	-0.00	-0.00	15.66	0.00	0.0	-0.00
7/SLS-	-0.00	-0.00	2.82	0.00	-0.00	-0.00
7/SLS:CHR+	-0.00	-0.00	15.66	0.00	0.0	-0.00
7/SLS:CHR-	-0.00	-0.00	2.82	0.00	-0.00	-0.00
7/SLS:FRE+	-0.00	-0.00	11.81	0.00	0.0	-0.00
7/SLS:FRE-	-0.00	-0.00	2.82	0.00	-0.00	-0.00
7/SLS:QPR+	-0.00	-0.00	10.52	0.00	0.0	-0.00
7/SLS:QPR-	-0.00	-0.00	2.82	0.00	-0.00	-0.00
8/1	0.00	0.00	2.62	0.00	0.0	-0.00
8/2	0.00	0.00	11.96	0.00	0.0	-0.00
8/ULS+	0.00	0.00	21.49	0.00	0.0	-0.00
8/ULS-	0.00	0.00	2.62	0.00	0.0	-0.00
8/SLS+	0.00	0.00	14.59	0.00	0.0	-0.00
8/SLS-	0.00	0.00	2.62	0.00	0.0	-0.00
8/SLS:CHR+	0.00	0.00	14.59	0.00	0.0	-0.00
8/SLS:CHR-	0.00	0.00	2.62	0.00	0.0	-0.00
8/SLS:FRE+	0.00	0.00	11.00	0.00	0.0	-0.00
8/SLS:FRE-	0.00	0.00	2.62	0.00	0.0	-0.00
8/SLS:QPR+	0.00	0.00	9.80	0.00	0.0	-0.00
8/SLS:QPR-	0.00	0.00	2.62	0.00	0.0	-0.00
9/1	0.00	-0.00	2.83	0.00	0.00	-0.00
9/2	0.00	-0.00	12.91	0.00	-0.00	-0.00
9/ULS+	0.00	-0.00	23.18	0.01	0.00	-0.00
9/ULS-	0.00	-0.00	2.83	0.00	-0.00	-0.00
9/SLS+	0.00	-0.00	15.74	0.00	0.00	-0.00
9/SLS-	0.00	-0.00	2.83	0.00	-0.00	-0.00
9/SLS:CHR+	0.00	-0.00	15.74	0.00	0.00	-0.00
9/SLS:CHR-	0.00	-0.00	2.83	0.00	-0.00	-0.00
9/SLS:FRE+	0.00	-0.00	11.86	0.00	0.00	-0.00
9/SLS:FRE-	0.00	-0.00	2.83	0.00	-0.00	-0.00
9/SLS:QPR+	0.00	-0.00	10.57	0.00	0.00	-0.00
9/SLS:QPR-	0.00	-0.00	2.83	0.00	-0.00	-0.00
10/1	0.00	0.00	2.63	0.00	0.00	-0.00

10/2	0.00	0.00	12.02	0.00	0.00	-0.00
10/ULS+	0.00	0.00	21.59	0.01	0.00	-0.00
10/ULS-	0.00	0.00	2.63	0.00	0.00	-0.00
10/SLS+	0.00	0.00	14.66	0.00	0.00	-0.00
10/SLS-	0.00	0.00	2.63	0.00	0.00	-0.00
10/SLS:CHR+	0.00	0.00	14.66	0.00	0.00	-0.00
10/SLS:CHR-	0.00	0.00	2.63	0.00	0.00	-0.00
10/SLS:FRE+	0.00	0.00	11.05	0.00	0.00	-0.00
10/SLS:FRE-	0.00	0.00	2.63	0.00	0.00	-0.00
10/SLS:QPR+	0.00	0.00	9.85	0.00	0.00	-0.00
10/SLS:QPR-	0.00	0.00	2.63	0.00	0.00	-0.00
23/1	0.00	-0.00	2.70	0.00	0.0	-0.00
23/2	0.00	-0.00	12.11	0.00	0.00	-0.00
23/ULS+	0.00	-0.00	21.81	0.00	0.00	-0.00
23/ULS-	0.00	-0.00	2.70	0.00	0.0	-0.00
23/SLS+	0.00	-0.00	14.81	0.00	0.00	-0.00
23/SLS-	0.00	-0.00	2.70	0.00	0.0	-0.00
23/SLS:CHR+	0.00	-0.00	14.81	0.00	0.00	-0.00
23/SLS:CHR-	0.00	-0.00	2.70	0.00	0.0	-0.00
23/SLS:FRE+	0.00	-0.00	11.18	0.00	0.00	-0.00
23/SLS:FRE-	0.00	-0.00	2.70	0.00	0.0	-0.00
23/SLS:QPR+	0.00	-0.00	9.97	0.00	0.00	-0.00
23/SLS:QPR-	0.00	-0.00	2.70	0.00	0.0	-0.00
24/1	0.00	0.0	2.51	0.00	-0.00	-0.00
24/2	0.00	0.00	11.28	0.00	0.00	-0.00
24/ULS+	0.00	0.00	20.32	0.00	0.00	-0.00
24/ULS-	0.00	0.0	2.51	0.00	-0.00	-0.00
24/SLS+	0.00	0.00	13.80	0.00	0.00	-0.00
24/SLS-	0.00	0.0	2.51	0.00	-0.00	-0.00
24/SLS:CHR+	0.00	0.00	13.80	0.00	0.00	-0.00
24/SLS:CHR-	0.00	0.0	2.51	0.00	-0.00	-0.00
24/SLS:FRE+	0.00	0.00	10.41	0.00	-0.00	-0.00
24/SLS:FRE-	0.00	0.0	2.51	0.00	-0.00	-0.00
24/SLS:QPR+	0.00	0.00	9.28	0.00	-0.00	-0.00
24/SLS:QPR-	0.00	0.0	2.51	0.00	-0.00	-0.00
25/1	-0.00	0.0	2.80	-0.00	-0.00	-0.00
25/2	-0.00	-0.00	12.75	-0.00	0.0	-0.00
25/ULS+	-0.00	0.0	22.91	-0.00	-0.00	-0.00
25/ULS-	-0.00	-0.00	2.80	-0.00	-0.00	-0.00
25/SLS+	-0.00	0.0	15.55	-0.00	-0.00	-0.00
25/SLS-	-0.00	-0.00	2.80	-0.00	-0.00	-0.00
25/SLS:CHR+	-0.00	0.0	15.55	-0.00	-0.00	-0.00
25/SLS:CHR-	-0.00	-0.00	2.80	-0.00	-0.00	-0.00
25/SLS:FRE+	-0.00	0.0	11.73	-0.00	-0.00	-0.00

25/SLS:FRE-	-0.00	-0.00	2.80	-0.00	-0.00	-0.00
25/SLS:QPR+	-0.00	0.0	10.45	-0.00	-0.00	-0.00
25/SLS:QPR-	-0.00	-0.00	2.80	-0.00	-0.00	-0.00
26/1	-0.00	-0.00	2.61	-0.00	0.0	-0.00
26/2	-0.00	0.00	11.88	-0.00	0.00	-0.00
26/ULS+	-0.00	0.00	21.33	-0.00	0.00	-0.00
26/ULS-	-0.00	-0.00	2.61	-0.00	0.0	-0.00
26/SLS+	-0.00	0.00	14.48	-0.00	0.00	-0.00
26/SLS-	-0.00	-0.00	2.61	-0.00	0.0	-0.00
26/SLS:CHR+	-0.00	0.00	14.48	-0.00	0.00	-0.00
26/SLS:CHR-	-0.00	-0.00	2.61	-0.00	0.0	-0.00
26/SLS:FRE+	-0.00	0.00	10.92	-0.00	0.00	-0.00
26/SLS:FRE-	-0.00	-0.00	2.61	-0.00	0.0	-0.00
26/SLS:QPR+	-0.00	0.00	9.73	-0.00	0.00	-0.00
26/SLS:QPR-	-0.00	-0.00	2.61	-0.00	0.0	-0.00
27/1	0.00	-0.00	2.80	-0.00	0.00	-0.00
27/2	0.00	-0.00	12.75	-0.00	0.00	-0.00
27/ULS+	0.00	-0.00	22.91	-0.00	0.00	-0.00
27/ULS-	0.00	-0.00	2.80	-0.00	0.00	-0.00
27/SLS+	0.00	-0.00	15.55	-0.00	0.00	-0.00
27/SLS-	0.00	-0.00	2.80	-0.00	0.00	-0.00
27/SLS:CHR+	0.00	-0.00	15.55	-0.00	0.00	-0.00
27/SLS:CHR-	0.00	-0.00	2.80	-0.00	0.00	-0.00
27/SLS:FRE+	0.00	-0.00	11.73	-0.00	0.00	-0.00
27/SLS:FRE-	0.00	-0.00	2.80	-0.00	0.00	-0.00
27/SLS:QPR+	0.00	-0.00	10.45	-0.00	0.00	-0.00
27/SLS:QPR-	0.00	-0.00	2.80	-0.00	0.00	-0.00
28/1	0.00	0.00	2.61	-0.00	-0.00	0.00
28/2	0.00	-0.00	11.88	-0.00	-0.00	0.00
28/ULS+	0.00	0.00	21.33	-0.00	-0.00	0.00
28/ULS-	0.00	-0.00	2.61	-0.00	-0.00	0.00
28/SLS+	0.00	0.00	14.48	-0.00	-0.00	0.00
28/SLS-	0.00	-0.00	2.61	-0.00	-0.00	0.00
28/SLS:CHR+	0.00	0.00	14.48	-0.00	-0.00	0.00
28/SLS:CHR-	0.00	-0.00	2.61	-0.00	-0.00	0.00
28/SLS:FRE+	0.00	0.00	10.92	-0.00	-0.00	0.00
28/SLS:FRE-	0.00	-0.00	2.61	-0.00	-0.00	0.00
28/SLS:QPR+	0.00	0.00	9.73	-0.00	-0.00	0.00
28/SLS:QPR-	0.00	-0.00	2.61	-0.00	-0.00	0.00
29/1	-0.00	-0.00	2.85	0.00	0.00	-0.00
29/2	-0.00	0.00	13.07	0.01	-0.00	-0.00
29/ULS+	-0.00	0.00	23.45	0.01	0.00	-0.00
29/ULS-	-0.00	-0.00	2.85	0.00	-0.00	-0.00
29/SLS+	-0.00	-0.00	15.92	0.01	0.00	-0.00

29/SLS-	-0.00	-0.00	2.85	0.00	-0.00	-0.00
29/SLS:CHR+	-0.00	-0.00	15.92	0.01	0.00	-0.00
29/SLS:CHR-	-0.00	-0.00	2.85	0.00	-0.00	-0.00
29/SLS:FRE+	-0.00	-0.00	12.00	0.01	0.00	-0.00
29/SLS:FRE-	-0.00	-0.00	2.85	0.00	0.00	-0.00
29/SLS:QPR+	-0.00	-0.00	10.69	0.01	0.00	-0.00
29/SLS:QPR-	-0.00	-0.00	2.85	0.00	0.00	-0.00
30/1	-0.00	-0.00	2.66	0.00	0.00	0.00
30/2	-0.00	0.00	12.17	0.01	0.00	-0.00
30/ULS+	-0.00	0.00	21.84	0.02	0.00	0.00
30/ULS-	-0.00	-0.00	2.66	0.00	0.00	-0.00
30/SLS+	-0.00	0.00	14.83	0.01	0.00	0.00
30/SLS-	-0.00	-0.00	2.66	0.00	0.00	-0.00
30/SLS:CHR+	-0.00	0.00	14.83	0.01	0.00	0.00
30/SLS:CHR-	-0.00	-0.00	2.66	0.00	0.00	-0.00
30/SLS:FRE+	-0.00	0.00	11.18	0.01	0.00	0.00
30/SLS:FRE-	-0.00	-0.00	2.66	0.00	0.00	-0.00
30/SLS:QPR+	-0.00	0.00	9.96	0.01	0.00	0.00
30/SLS:QPR-	-0.00	-0.00	2.66	0.00	0.00	-0.00
31/1	0.00	-0.00	2.85	0.00	-0.00	-0.00
31/2	0.00	0.0	13.07	0.01	-0.00	-0.00
31/ULS+	0.00	-0.00	23.45	0.01	-0.00	-0.00
31/ULS-	0.00	-0.00	2.85	0.00	-0.00	-0.00
31/SLS+	0.00	-0.00	15.92	0.01	-0.00	-0.00
31/SLS-	0.00	-0.00	2.85	0.00	-0.00	-0.00
31/SLS:CHR+	0.00	-0.00	15.92	0.01	-0.00	-0.00
31/SLS:CHR-	0.00	-0.00	2.85	0.00	-0.00	-0.00
31/SLS:FRE+	0.00	-0.00	12.00	0.01	-0.00	-0.00
31/SLS:FRE-	0.00	-0.00	2.85	0.00	-0.00	-0.00
31/SLS:QPR+	0.00	-0.00	10.69	0.00	-0.00	-0.00
31/SLS:QPR-	0.00	-0.00	2.85	0.00	-0.00	-0.00
32/1	0.00	-0.00	2.66	0.00	0.00	0.00
32/2	0.00	-0.00	12.17	0.01	0.00	-0.00
32/ULS+	0.00	-0.00	21.84	0.01	0.00	0.00
32/ULS-	0.00	-0.00	2.66	0.00	0.00	-0.00
32/SLS+	0.00	-0.00	14.83	0.01	0.00	0.00
32/SLS-	0.00	-0.00	2.66	0.00	0.00	-0.00
32/SLS:CHR+	0.00	-0.00	14.83	0.01	0.00	0.00
32/SLS:CHR-	0.00	-0.00	2.66	0.00	0.00	-0.00
32/SLS:FRE+	0.00	-0.00	11.18	0.01	0.00	0.00
32/SLS:FRE-	0.00	-0.00	2.66	0.00	0.00	-0.00
32/SLS:QPR+	0.00	-0.00	9.96	0.01	0.00	0.00
32/SLS:QPR-	0.00	-0.00	2.66	0.00	0.00	-0.00
33/1	-0.00	0.00	2.85	-0.00	-0.00	0.00

33/2	-0.00	0.00	13.07	-0.00	-0.00	-0.00
33/ULS+	-0.00	0.00	23.45	-0.00	-0.00	0.00
33/ULS-	-0.00	0.00	2.85	-0.00	-0.00	-0.00
33/SLS+	-0.00	0.00	15.92	-0.00	-0.00	0.00
33/SLS-	-0.00	0.00	2.85	-0.00	-0.00	-0.00
33/SLS:CHR+	-0.00	0.00	15.92	-0.00	-0.00	0.00
33/SLS:CHR-	-0.00	0.00	2.85	-0.00	-0.00	-0.00
33/SLS:FRE+	-0.00	0.00	12.00	-0.00	-0.00	0.00
33/SLS:FRE-	-0.00	0.00	2.85	-0.00	-0.00	-0.00
33/SLS:QPR+	-0.00	0.00	10.69	-0.00	-0.00	0.00
33/SLS:QPR-	-0.00	0.00	2.85	-0.00	-0.00	-0.00
34/1	-0.00	0.00	2.66	-0.00	0.0	-0.00
34/2	-0.00	-0.00	12.17	-0.00	0.00	0.00
34/ULS+	-0.00	0.00	21.84	-0.00	0.00	0.00
34/ULS-	-0.00	-0.00	2.66	-0.00	0.0	-0.00
34/SLS+	-0.00	0.00	14.83	-0.00	0.00	0.00
34/SLS-	-0.00	-0.00	2.66	-0.00	0.0	-0.00
34/SLS:CHR+	-0.00	0.00	14.83	-0.00	0.00	0.00
34/SLS:CHR-	-0.00	-0.00	2.66	-0.00	0.0	-0.00
34/SLS:FRE+	-0.00	0.00	11.18	-0.00	0.00	0.00
34/SLS:FRE-	-0.00	-0.00	2.66	-0.00	0.0	-0.00
34/SLS:QPR+	-0.00	0.00	9.96	-0.00	0.00	0.00
34/SLS:QPR-	-0.00	-0.00	2.66	-0.00	0.0	-0.00
35/1	0.00	-0.00	2.85	-0.00	-0.00	-0.00
35/2	0.00	0.00	13.07	-0.01	-0.00	-0.00
35/ULS+	0.00	0.00	23.45	-0.00	-0.00	-0.00
35/ULS-	0.00	-0.00	2.85	-0.01	-0.00	-0.00
35/SLS+	0.00	0.00	15.92	-0.00	-0.00	-0.00
35/SLS-	0.00	-0.00	2.85	-0.01	-0.00	-0.00
35/SLS:CHR+	0.00	0.00	15.92	-0.00	-0.00	-0.00
35/SLS:CHR-	0.00	-0.00	2.85	-0.01	-0.00	-0.00
35/SLS:FRE+	0.00	0.00	12.00	-0.00	-0.00	-0.00
35/SLS:FRE-	0.00	-0.00	2.85	-0.01	-0.00	-0.00
35/SLS:QPR+	0.00	0.00	10.69	-0.00	-0.00	-0.00
35/SLS:QPR-	0.00	-0.00	2.85	-0.01	-0.00	-0.00
36/1	0.00	0.0	2.66	-0.00	0.00	0.00
36/2	0.00	-0.00	12.17	-0.01	0.00	0.00
36/ULS+	0.00	0.0	21.84	-0.00	0.00	0.00
36/ULS-	0.00	-0.00	2.66	-0.01	0.00	0.00
36/SLS+	0.00	0.0	14.83	-0.00	0.00	0.00
36/SLS-	0.00	-0.00	2.66	-0.01	0.00	0.00
36/SLS:CHR+	0.00	0.0	14.83	-0.00	0.00	0.00
36/SLS:CHR-	0.00	-0.00	2.66	-0.01	0.00	0.00
36/SLS:FRE+	0.00	0.0	11.18	-0.00	0.00	0.00

36/SLS:FRE-	0.00	-0.00	2.66	-0.01	0.00	0.00
36/SLS:QPR+	0.00	0.0	9.96	-0.00	0.00	0.00
36/SLS:QPR-	0.00	-0.00	2.66	-0.01	0.00	0.00
37/1	-0.00	-0.00	2.85	-0.00	-0.00	-0.00
37/2	-0.00	-0.00	13.07	-0.01	-0.00	-0.00
37/ULS+	-0.00	-0.00	23.45	-0.00	-0.00	-0.00
37/ULS-	-0.00	-0.00	2.85	-0.01	-0.00	-0.00
37/SLS+	-0.00	-0.00	15.92	-0.00	-0.00	-0.00
37/SLS-	-0.00	-0.00	2.85	-0.01	-0.00	-0.00
37/SLS:CHR+	-0.00	-0.00	15.92	-0.00	-0.00	-0.00
37/SLS:CHR-	-0.00	-0.00	2.85	-0.01	-0.00	-0.00
37/SLS:FRE+	-0.00	-0.00	12.00	-0.00	-0.00	-0.00
37/SLS:FRE-	-0.00	-0.00	2.85	-0.01	-0.00	-0.00
37/SLS:QPR+	-0.00	-0.00	10.69	-0.00	-0.00	-0.00
37/SLS:QPR-	-0.00	-0.00	2.85	-0.01	-0.00	-0.00
38/1	-0.00	-0.00	2.66	-0.00	0.00	0.00
38/2	-0.00	-0.00	12.17	-0.01	0.0	0.00
38/ULS+	-0.00	-0.00	21.84	-0.00	0.00	0.00
38/ULS-	-0.00	-0.00	2.66	-0.01	0.00	0.00
38/SLS+	-0.00	-0.00	14.83	-0.00	0.00	0.00
38/SLS-	-0.00	-0.00	2.66	-0.01	0.00	0.00
38/SLS:CHR+	-0.00	-0.00	14.83	-0.00	0.00	0.00
38/SLS:CHR-	-0.00	-0.00	2.66	-0.01	0.00	0.00
38/SLS:FRE+	-0.00	-0.00	11.18	-0.00	0.00	0.00
38/SLS:FRE-	-0.00	-0.00	2.66	-0.01	0.00	0.00
38/SLS:QPR+	-0.00	-0.00	9.96	-0.00	0.00	0.00
38/SLS:QPR-	-0.00	-0.00	2.66	-0.01	0.00	0.00
39/1	-0.00	-0.00	2.78	0.00	0.00	-0.00
39/2	-0.00	-0.00	12.62	0.01	-0.00	-0.00
39/ULS+	-0.00	-0.00	22.69	0.01	0.00	-0.00
39/ULS-	-0.00	-0.00	2.78	0.00	-0.00	-0.00
39/SLS+	-0.00	-0.00	15.40	0.01	0.00	-0.00
39/SLS-	-0.00	-0.00	2.78	0.00	-0.00	-0.00
39/SLS:CHR+	-0.00	-0.00	15.40	0.01	0.00	-0.00
39/SLS:CHR-	-0.00	-0.00	2.78	0.00	-0.00	-0.00
39/SLS:FRE+	-0.00	-0.00	11.62	0.01	0.00	-0.00
39/SLS:FRE-	-0.00	-0.00	2.78	0.00	-0.00	-0.00
39/SLS:QPR+	-0.00	-0.00	10.35	0.01	0.00	-0.00
39/SLS:QPR-	-0.00	-0.00	2.78	0.00	-0.00	-0.00
40/1	-0.00	-0.00	2.59	0.00	0.00	-0.00
40/2	-0.00	-0.00	11.76	0.01	-0.00	-0.00
40/ULS+	-0.00	-0.00	21.13	0.01	0.00	-0.00
40/ULS-	-0.00	-0.00	2.59	0.00	-0.00	-0.00
40/SLS+	-0.00	-0.00	14.35	0.01	0.00	-0.00

40/SLS-	-0.00	-0.00	2.59	0.00	-0.00	-0.00
40/SLS:CHR+	-0.00	-0.00	14.35	0.01	0.00	-0.00
40/SLS:CHR-	-0.00	-0.00	2.59	0.00	-0.00	-0.00
40/SLS:FRE+	-0.00	-0.00	10.82	0.01	0.00	-0.00
40/SLS:FRE-	-0.00	-0.00	2.59	0.00	-0.00	-0.00
40/SLS:QPR+	-0.00	-0.00	9.64	0.01	0.00	-0.00
40/SLS:QPR-	-0.00	-0.00	2.59	0.00	-0.00	-0.00
41/1	0.00	-0.00	2.78	0.00	0.00	-0.00
41/2	0.00	-0.00	12.62	0.01	0.00	-0.00
41/ULS+	0.00	-0.00	22.69	0.01	0.00	-0.00
41/ULS-	0.00	-0.00	2.78	0.00	0.00	-0.00
41/SLS+	0.00	-0.00	15.40	0.01	0.00	-0.00
41/SLS-	0.00	-0.00	2.78	0.00	0.00	-0.00
41/SLS:CHR+	0.00	-0.00	15.40	0.01	0.00	-0.00
41/SLS:CHR-	0.00	-0.00	2.78	0.00	0.00	-0.00
41/SLS:FRE+	0.00	-0.00	11.62	0.01	0.00	-0.00
41/SLS:FRE-	0.00	-0.00	2.78	0.00	0.00	-0.00
41/SLS:QPR+	0.00	-0.00	10.35	0.01	0.00	-0.00
41/SLS:QPR-	0.00	-0.00	2.78	0.00	0.00	-0.00
42/1	0.00	-0.00	2.59	0.00	0.0	0.00
42/2	0.00	-0.00	11.76	0.01	0.0	0.00
42/ULS+	0.00	-0.00	21.13	0.01	0.0	0.00
42/ULS-	0.00	-0.00	2.59	0.00	0.0	0.00
42/SLS+	0.00	-0.00	14.35	0.01	0.0	0.00
42/SLS-	0.00	-0.00	2.59	0.00	0.0	0.00
42/SLS:CHR+	0.00	-0.00	14.35	0.01	0.0	0.00
42/SLS:CHR-	0.00	-0.00	2.59	0.00	0.0	0.00
42/SLS:FRE+	0.00	-0.00	10.82	0.01	0.0	0.00
42/SLS:FRE-	0.00	-0.00	2.59	0.00	0.0	0.00
42/SLS:QPR+	0.00	-0.00	9.64	0.01	0.0	0.00
42/SLS:QPR-	0.00	-0.00	2.59	0.00	0.0	0.00
43/1	-0.00	-0.00	2.78	-0.00	-0.00	-0.00
43/2	-0.00	-0.00	12.62	-0.00	-0.00	-0.00
43/ULS+	-0.00	-0.00	22.69	-0.00	-0.00	-0.00
43/ULS-	-0.00	-0.00	2.78	-0.00	-0.00	-0.00
43/SLS+	-0.00	-0.00	15.40	-0.00	-0.00	-0.00
43/SLS-	-0.00	-0.00	2.78	-0.00	-0.00	-0.00
43/SLS:CHR+	-0.00	-0.00	15.40	-0.00	-0.00	-0.00
43/SLS:CHR-	-0.00	-0.00	2.78	-0.00	-0.00	-0.00
43/SLS:FRE+	-0.00	-0.00	11.62	-0.00	-0.00	-0.00
43/SLS:FRE-	-0.00	-0.00	2.78	-0.00	-0.00	-0.00
43/SLS:QPR+	-0.00	-0.00	10.35	-0.00	-0.00	-0.00
43/SLS:QPR-	-0.00	-0.00	2.78	-0.00	-0.00	-0.00
44/1	-0.00	-0.00	2.59	-0.00	0.0	0.00

44/2	-0.00	0.00	11.76	-0.00	0.00	-0.00
44/ULS+	-0.00	0.00	21.13	-0.00	0.00	0.00
44/ULS-	-0.00	-0.00	2.59	-0.00	0.0	-0.00
44/SLS+	-0.00	0.00	14.35	-0.00	0.00	0.00
44/SLS-	-0.00	-0.00	2.59	-0.00	0.0	-0.00
44/SLS:CHR+	-0.00	0.00	14.35	-0.00	0.00	0.00
44/SLS:CHR-	-0.00	-0.00	2.59	-0.00	0.0	-0.00
44/SLS:FRE+	-0.00	0.00	10.82	-0.00	0.00	0.00
44/SLS:FRE-	-0.00	-0.00	2.59	-0.00	0.0	-0.00
44/SLS:QPR+	-0.00	0.00	9.64	-0.00	0.00	0.00
44/SLS:QPR-	-0.00	-0.00	2.59	-0.00	0.0	-0.00
45/1	0.00	-0.00	2.77	-0.00	-0.00	-0.00
45/2	0.00	-0.00	12.56	-0.01	-0.00	-0.00
45/ULS+	0.00	-0.00	22.58	-0.00	-0.00	-0.00
45/ULS-	0.00	-0.00	2.77	-0.01	-0.00	-0.00
45/SLS+	0.00	-0.00	15.33	-0.00	-0.00	-0.00
45/SLS-	0.00	-0.00	2.77	-0.01	-0.00	-0.00
45/SLS:CHR+	0.00	-0.00	15.33	-0.00	-0.00	-0.00
45/SLS:CHR-	0.00	-0.00	2.77	-0.01	-0.00	-0.00
45/SLS:FRE+	0.00	-0.00	11.56	-0.00	-0.00	-0.00
45/SLS:FRE-	0.00	-0.00	2.77	-0.01	-0.00	-0.00
45/SLS:QPR+	0.00	-0.00	10.31	-0.00	-0.00	-0.00
45/SLS:QPR-	0.00	-0.00	2.77	-0.01	-0.00	-0.00
46/1	0.00	-0.00	2.58	-0.00	0.00	-0.00
46/2	0.00	0.00	11.70	-0.01	0.00	-0.00
46/ULS+	0.00	0.00	21.03	-0.00	0.00	-0.00
46/ULS-	0.00	-0.00	2.58	-0.02	0.00	-0.00
46/SLS+	0.00	0.00	14.28	-0.00	0.00	-0.00
46/SLS-	0.00	-0.00	2.58	-0.01	0.00	-0.00
46/SLS:CHR+	0.00	0.00	14.28	-0.00	0.00	-0.00
46/SLS:CHR-	0.00	-0.00	2.58	-0.01	0.00	-0.00
46/SLS:FRE+	0.00	0.00	10.77	-0.00	0.00	-0.00
46/SLS:FRE-	0.00	-0.00	2.58	-0.01	0.00	-0.00
46/SLS:QPR+	0.00	0.00	9.60	-0.00	0.00	-0.00
46/SLS:QPR-	0.00	-0.00	2.58	-0.01	0.00	-0.00
Case 1	DL1					
Sum of val.	0.00	0.00	160.70	0.00	-0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case 2	LL1					

Sum of val.	0.00	0.00	691.96	0.01	0.00	-0.00
Sum of reac.	0.00	0.00	691.96	4860.11	-3407.92	0.00
Sum of forc.	0.0	0.0	-691.96	-4860.11	3407.92	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	6.90622e-14	2.35275e-27				
Case ULS+	ULS+					
Sum of val.	0.00	14.12	1254.89	0.11	0.00	0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case ULS-	ULS-					
Sum of val.	-0.00	-14.12	160.70	-0.08	-0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case SLS+	SLS+					
Sum of val.	0.00	8.93	852.66	0.07	0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case SLS-	SLS-					
Sum of val.	-0.00	-8.93	160.70	-0.05	-0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case SLS:CHR+	SLS:CHR+					
Sum of val.	0.00	8.93	852.66	0.07	0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case SLS:CHR-	SLS:CHR-					
Sum of val.	-0.00	-8.93	160.70	-0.05	-0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00

Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case SLS:FRE+	SLS:FRE+					
Sum of val.	0.00	6.25	645.07	0.05	0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case SLS:FRE-	SLS:FRE-					
Sum of val.	-0.00	-6.25	160.70	-0.04	-0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case SLS:QPR+	SLS:QPR+					
Sum of val.	0.00	5.36	575.88	0.04	0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				
Case SLS:QPR-	SLS:QPR-					
Sum of val.	-0.00	-5.36	160.70	-0.03	-0.00	-0.00
Sum of reac.	0.00	0.00	160.70	1129.78	-792.98	0.00
Sum of forc.	0.0	0.0	-160.70	-1129.78	792.98	0.0
Check val.	0.00	0.00	-0.00	-0.00	0.00	0.00
Precision	7.29429e-14	2.62432e-27				

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Member	Section	Material	Lay	Laz	Ratio	Case	Ratio(uy)	Case (uy)	Ratio(uz)	Case (uz)
1	HE180B	S 275	15.50	30.63	0.31	3 ULS /1/	-	-	-	-
2	HE180B	S 275	15.75	30.63	0.34	3 ULS /1/	-	-	-	-
3	HE180B	S 275	42.94	21.87	0.56	3 ULS /1/	0.00	6 SLS /1/	0.07	6 SLS /1/
4	HE180B	S 275	73.56	22.40	0.73	3 ULS /1/	0.00	6 SLS /1/	0.46	6 SLS /1/
5	HE180B	S 275	61.61	21.65	0.69	3 ULS /1/	0.00	6 SLS /1/	0.53	6 SLS /1/
6	HE160A	S 275	77.64	127.99	0.66	3 ULS /1/	0.00	6 SLS /1/	0.75	6 SLS /1/
7	HE160A	S 275	72.31	119.21	0.55	3 ULS /1/	0.00	6 SLS /1/	0.61	6 SLS /1/
8	HE160A	S 275	77.64	127.99	0.66	3 ULS /1/	0.00	6 SLS /1/	0.76	6 SLS /1/
9	HE160A	S 275	72.31	119.21	0.55	3 ULS /1/	0.00	1*2	0.61	6 SLS /1/
10	HE160A	S 275	77.64	127.99	0.62	3 ULS /1/	0.00	6 SLS /1/	0.71	6 SLS /1/
11	HE160A	S 275	72.31	119.21	0.52	3 ULS /1/	0.00	6 SLS /1/	0.58	6 SLS /1/
12	HE160A	S 275	77.64	127.99	0.65	3 ULS /1/	0.00	6 SLS /1/	0.75	6 SLS /1/
13	HE160A	S 275	72.31	119.21	0.54	3 ULS /1/	0.00	6 SLS /1/	0.61	6 SLS /1/
14	HE160A	S 275	77.64	127.99	0.65	3 ULS /1/	0.00	2 LL1	0.75	6 SLS /1/
15	HE160A	S 275	72.31	119.21	0.54	3 ULS /1/	0.00	6 SLS /1/	0.61	6 SLS /1/
16	HE160A	S 275	77.64	127.99	0.67	3 ULS /1/	0.00	1*2	0.77	6 SLS /1/
17	HE160A	S 275	72.31	119.21	0.56	3 ULS /1/	0.00	6 SLS /1/	0.62	6 SLS /1/
18	HE160A	S 275	77.64	127.99	0.67	3 ULS /1/	0.00	1*2	0.77	6 SLS /1/
19	HE160A	S 275	72.31	119.21	0.56	3 ULS /1/	0.00	6 SLS /1/	0.62	6 SLS /1/
20	HE160A	S 275	77.64	127.99	0.67	3 ULS /1/	0.00	6 SLS /1/	0.77	6 SLS /1/
21	HE160A	S 275	72.31	119.21	0.56	3 ULS /1/	0.00	6 SLS /1/	0.62	6 SLS /1/
22	HE160A	S 275	77.64	127.99	0.67	3 ULS /1/	0.00	6 SLS /1/	0.77	6 SLS /1/
23	HE160A	S 275	72.31	119.21	0.56	3 ULS /1/	0.00	1*2	0.62	6 SLS /1/
24	HE160A	S 275	77.64	127.99	0.67	3 ULS /1/	0.00	1*2	0.77	6 SLS /1/
25	HE160A	S 275	72.31	119.21	0.56	3 ULS /1/	0.00	6 SLS /1/	0.62	6 SLS /1/
26	HE160A	S 275	77.64	127.99	0.65	3 ULS /1/	0.00	6 SLS /1/	0.74	6 SLS /1/
27	HE160A	S 275	72.31	119.21	0.54	3 ULS /1/	0.00	6 SLS /1/	0.60	6 SLS /1/
28	HE160A	S 275	77.64	127.99	0.65	3 ULS /1/	0.00	1*2	0.74	6 SLS /1/
29	HE160A	S 275	72.31	119.21	0.54	3 ULS /1/	0.00	6 SLS /1/	0.60	6 SLS /1/
30	HE160A	S 275	77.64	127.99	0.65	3 ULS /1/	0.00	6 SLS /1/	0.74	6 SLS /1/
31	HE160A	S 275	72.31	119.21	0.54	3 ULS /1/	0.00	6 SLS /1/	0.60	6 SLS /1/
32	HE160A	S 275	77.64	127.99	0.64	3 ULS /1/	0.00	6 SLS /1/	0.74	6 SLS /1/
33	HE160A	S 275	72.31	119.21	0.54	3 ULS /1/	0.00	6 SLS /1/	0.60	6 SLS /1/

ΣΥΝΔΕΣΗ ΥΠΟΣΤΥΛΩΜΑΤΩΝ ΣΕ ΥΦΙΣΤΑΜΕΝΟ ΣΤΟΙΧΕΙΟ Ω/Σ

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Profis Anchor 2.8.4

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Specifier's comments:

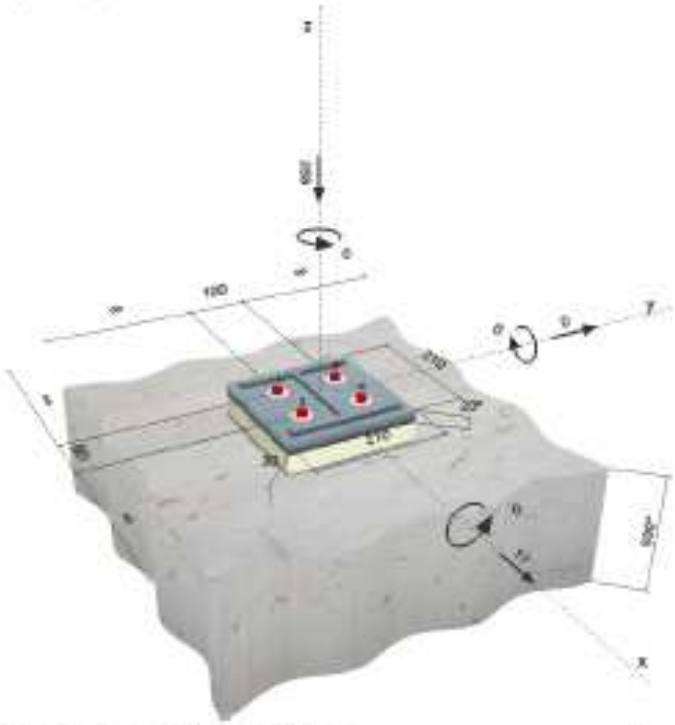
1 Input data



Anchor type and diameter:	**HIT-HY 200 + HIT-V (8.8) M16**
Seismic/Filling set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 150 mm ($h_{ef,limit}$ = - mm)
Material:	8.8
Evaluation Service Report:	ETA 11/0493
Issued / Valid:	7/28/2017 / -
Proof:	SOFA design method + fib (07/2011) - after ETAG BOND testing
Stand-off installation:	without clamping (anchor); restraint level (anchor plate): 2.00; e_b = 30 mm; t = 20 mm
	Hilti Grout: , multipurpose, $f_{c,Grout}$ = 30.00 N/mm²
Anchor plate:	l_x x l_y x t = 210 mm x 210 mm x 20 mm; (Recommended plate thickness: not calculated
Profile:	IPB/HEB, IPB 180 / HE 180 B; (L x W x T x FT) = 180 mm x 180 mm x 9 mm x 14 mm
Base material:	cracked concrete, C25/30, $f_{c,cyl}$ = 25.00 N/mm², h = 500 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 Reinforcement to control splitting according to: fib (07/2011), 16.1.5 present

* - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [mm] & Loading [kN, kNm]



Input data and results must be checked for agreement with the existing conditions and for plausibility!
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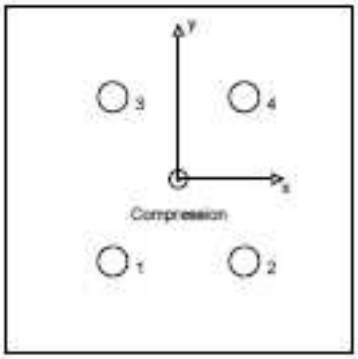
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2 Load case/Resulting anchor forces

Load case: Design loads

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

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0.000	4.250	4.250	0.000
2	0.000	4.250	4.250	0.000
3	0.000	4.250	4.250	0.000
4	0.000	4.250	4.250	0.000



max. concrete compressive strain: 0.22 [‰]
max. concrete compressive stress: 6.53 [N/mm²]
resulting tension force in (x/y)=(0/0): 0.000 [kN]
resulting compression force in (x/y)=(0/0): 268.000 [kN]

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

3 Tension load SOFA (fib (07/2011), section 16.2.1)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel Strength*	N/A	N/A	N/A	N/A
Combined pullout-concrete cone failure**	N/A	N/A	N/A	N/A
Concrete Breakout Strength**	N/A	N/A	N/A	N/A
Splitting failure**	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (anchors in tension)

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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4 Shear load SOFA (fib (07/2011), section 16.2.2)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel Strength (without lever arm)*	4.250	50.240	9	OK
Steel failure (with lever arm)*	4.250	8.880	48	OK
Pryout Strength**	17.000	133.209	13	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (relevant anchors)

4.1 Steel Strength (without lever arm)

$V_{Rd,s}$ [kN]	$\gamma_{M,s}$	$V_{Rk,s}$ [kN]	V_{Sd} [kN]
62.800	1.250	50.240	4.250

4.2 Steel failure (with lever arm)

l [mm]	α_M
45	2.00

N_{Sd} / $N_{Rd,s}$	1 - N_{Sd} / $N_{Rd,s}$	$M^0_{Rd,s}$ [kNm]	$M_{Rd,s} = M^0_{Rd,s}$ (1 - N_{Sd}/$N_{Rd,s}$) [kNm]
0.000	1.000	0.266	0.266

$V^M_{Rd,s} = \alpha_M * M_{Rd,s} / l$ [kN]	$\gamma_{Ms,V}$	$V^M_{Rd,s}$ [kN]	V_{Rd} [kN]
11.100	1.250	8.880	4.250

4.3 Pryout Strength (Bond Strength controls)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$\psi_{A,N}$	$\tau_{Rk,ucr,25}$ [N/mm²]	$c_{cr,Np}$ [mm]	$s_{cr,Np}$ [mm]	c_{min} [mm]
291.500	202.500	1.440	18.00	225	450	-

ψ_s	$\tau_{Rd,ucr}$ [N/mm²]	max $\tau_{Rd,ucr}$ [N/mm²]	k_τ	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.020	8.67	9.38	2.000	1.111	1.061

$e_{c,V}$ [mm]	$\psi_{ec,Np}$	$e_{c,V}$ [mm]	$\psi_{ec,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0	1.000	0	1.000	1.000	1.000

$N^0_{Rd,p}$ [kN]	$N_{Rd,p}$ [kN]	$\gamma_{M,p}$	$V_{Rd,cp}$ [kN]	V_{Rd} [kN]
65.987	99.907	1.500	133.209	17.000

5 Displacements (highest loaded anchor)

Short term loading:

N_{Sk} = 0.000 [kN] δ_N = 0.000 [mm]
V_{Sk} = 3.148 [kN] δ_V = 0.126 [mm]
δ_{NV} = 0.126 [mm]

Long term loading:

N_{Sk} = 0.000 [kN] δ_N = 0.000 [mm]
V_{Sk} = 3.148 [kN] δ_V = 0.189 [mm]
δ_{NV} = 0.189 [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!

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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6 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (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 Anchor calculates the minimum required anchor plate thickness with FEM 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 Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- 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.
- Please contact Hilti to check feasibility of HIT-V rod supply.
- The design method fib (07/2011) 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 SafeticFilling set) or by other suitable means.
- The compliance with current standards (e.g. EC3) is the responsibility of the user.
- Checking the transfer of loads into the base material is required in accordance with fib (07/2011)!

Fastening meets the design criteria!

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7 Installation data

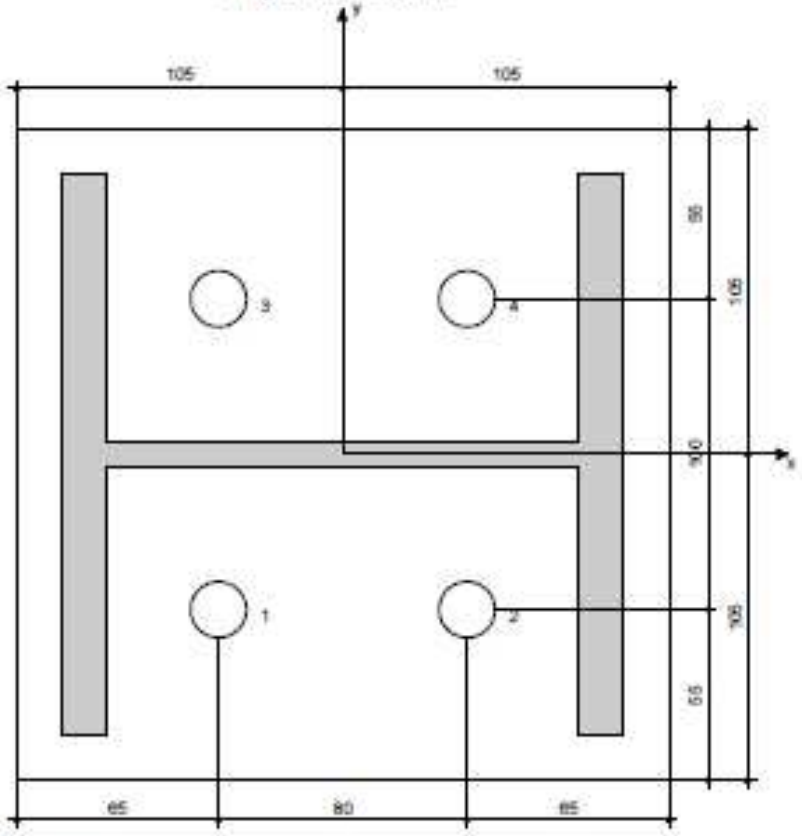
Anchor plate, steel: -
Profile: IPB/HEB, IPB 160 / HE 160 B; (L x W x T x FT) = 160 mm x 160 mm x 9 mm x 14 mm
Hole diameter in the fixture: d_f = 18 mm
Plate thickness (input): 20 mm
Recommended plate thickness: not calculated
Drilling method: Hammer drilled
Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and diameter: HIT-HY 200 + HIT-V (8.8) M16
Installation torque: 0.080 kNm

Hole diameter in the base material: 18 mm
Hole depth in the base material: 150 mm
Minimum thickness of the base material: 188 mm

7.1 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 • Seismic/Filling set • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-40	-50	-	-	-	-
2	40	-50	-	-	-	-
3	-40	50	-	-	-	-
4	40	50	-	-	-	-

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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8 Remarks; Your Cooperation Duties

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Specifier's comments:

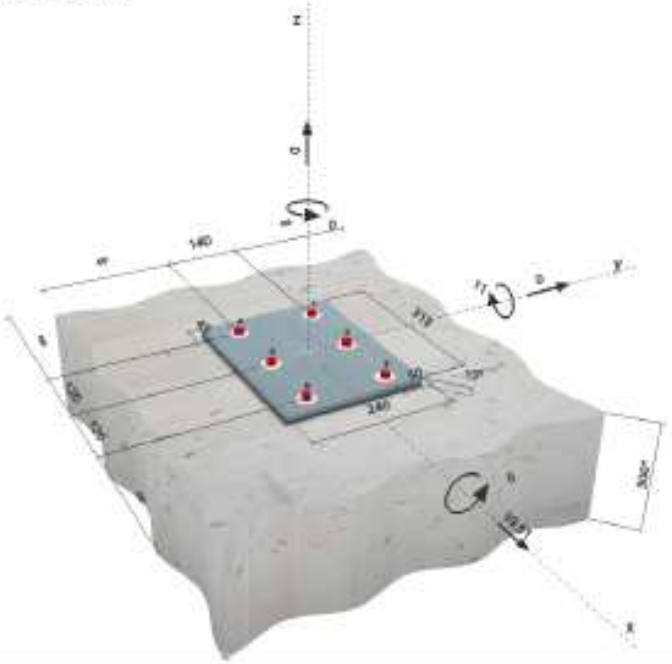
1 Input data



Anchor type and diameter:	**HIT-HY 200 + HIT-V (8.8) M16**
Seismic/Filling set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 150 mm ($h_{ef,red}$ = - mm)
Material:	8.8
Evaluation Service Report:	ETA 11/0493
Issued / Valid:	7/28/2017 / -
Proof:	SOFA design method + fib (07/2011) - **after ETAG BOND testing**
Stand-off installation:	e_b = 0 mm (no stand-off); t = 15 mm
Anchor plate:	l_x x l_y x t = 315 mm x 240 mm x 15 mm; (Recommended plate thickness: not calculated
Profile:	no profile
Base material:	cracked concrete, C25/30, f_{cyl} = 25.00 N/mm²; h = 300 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
	Reinforcement to control splitting according to : fib (07/2011), 16.1.5 **present**

* - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [mm] & Loading [kN, kNm]



Input data and results must be checked for agreement with the existing conditions and for plausibility!
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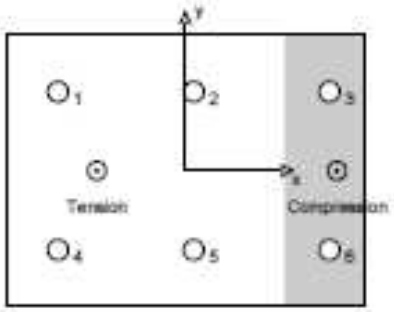
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2 Load case/Resulting anchor forces

Load case: Design loads

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

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	18.493	9.918	9.918	0.000
2	7.402	9.918	9.918	0.000
3	0.000	9.918	9.918	0.000
4	18.493	9.918	9.918	0.000
5	7.402	9.918	9.918	0.000
6	0.000	9.918	9.918	0.000



max. concrete compressive strain: 0.21 [‰]
max. concrete compressive stress: 8.17 [N/mm²]
resulting tension force in (x/y)=(-75/0): 51.791 [kN]
resulting compression force in (x/y)=(1346/0): 51.791 [kN]

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

3 Tension load SOFA (fib (07/2011), section 16.2.1)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel Strength*	18.493	83.733	23	OK
Combined pullout-concrete cone failure**	51.791	68.313	76	OK
Concrete Breakout Strength**	51.791	70.282	74	OK
Splitting failure**	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (anchors in tension)

3.1 Steel Strength

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
125.600	1.500	83.733	18.493

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\psi_{A,N}$	$\tau_{Rk,ucr,25}$ [N/mm²]	$e_{c1,N}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
398,300	202,500	1.661	18.00	450	225	-

ψ_c	$\tau_{Rk,c}$ [N/mm²]	max $\tau_{Rk,c}$ [N/mm²]	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.020	8.67	9.38	1.111	1.051

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
26	0.897	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]
85.387	102.469	1.500	68.313	51.791

3.3 Concrete Breakout Strength

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$\psi_{A,N}$	$c_{c,N}$ [mm]	$s_{cr,N}$ [mm]
398,300	202,500	1.661	225	450

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
26	0.897	0	1.000	1.000	1.000

k_c	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rk,c}$ [kN]	$N_{Rd,c}$ [kN]
7.700	70.729	1.500	70.282	51.791

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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4 Shear load SOFA (fib (07/2011), section 16.2.2)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel Strength (without lever arm)*	9.918	50.240	20	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	59.510	188.327	32	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (relevant anchors)

4.1 Steel Strength (without lever arm)

$V_{sa,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
62.800	1.250	50.240	9.918

4.2 Pryout Strength (Bond Strength controls)

A_{Nc} [mm²]	A^0_{Nc} [mm²]	$\Psi_{A,N}$	$\tau_{Rk,cr,25}$ [N/mm²]	$c_{cr,Np}$ [mm]	$s_{cr,Np}$ [mm]	c_{min} [mm]
407,100	202,500	2.010	16.00	225	450	-
Ψ_1	$\tau_{Rk,cr}$ [N/mm²]	max $\tau_{Rk,cr}$ [N/mm²]	k_{cr}	$\Psi^0_{g,Np}$	$\Psi_{g,Np}$
1.020	8.67	9.38	2.000	1.161	1.075
$e_{c1,V}$ [mm]	$\Psi_{ec1,Np}$	$e_{c2,V}$ [mm]	$\Psi_{ec2,Np}$	$\Psi_{c,Np}$	$\Psi_{cp,Np}$
0	1.000	0	1.000	1.000	1.000
$N^0_{Rk,s}$ [kN]	$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rk,Np}$ [kN]	V_{Sd} [kN]	
85.387	141.245	1.500	188.327	59.510	

5 Combined tension and shear loads SOFA (fib (07/2011), section 10.3)

	β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
steel	0.221	0.197	2.000	9	OK
concrete	0.758	0.319	1.500	84	OK

$\beta_N^{\alpha} + \beta_V^{\alpha} \leq 1$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sd} = 13.898 [kN] δ_N = 0.127 [mm]
V_{Sd} = 7.547 [kN] δ_V = 0.294 [mm]
δ_{NV} = 0.320 [mm]

Long term loading:

N_{Sd} = 13.898 [kN] δ_N = 0.291 [mm]
V_{Sd} = 7.547 [kN] δ_V = 0.441 [mm]
δ_{NV} = 0.528 [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!

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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7 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (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 Anchor calculates the minimum required anchor plate thickness with FEM 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 Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- 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
- Please contact Hilti to check feasibility of HIT-V rod supply.
- The design method fib (07/2011) 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 SafeticFilling set) or by other suitable means
- The compliance with current standards (e.g. EC3) is the responsibility of the user
- Checking the transfer of loads into the base material is required in accordance with fib (07/2011)!

Fastening meets the design criteria!

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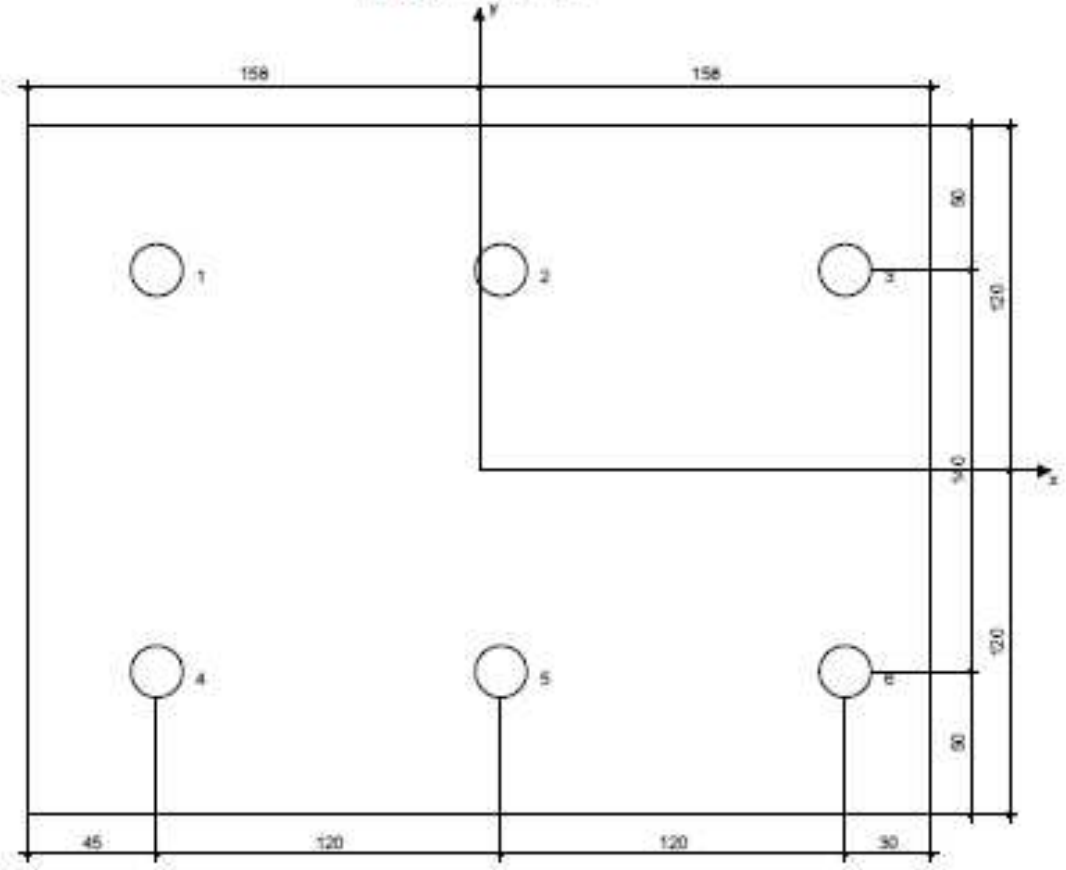
8 Installation data

Anchor plate, steel: -
Profile: no profile
Hole diameter in the fixture: d_f = 18 mm
Plate thickness (input): 15 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 + HIT-V (8.8) M16
Installation torque: 0.080 kNm
Hole diameter in the base material: 18 mm
Hole depth in the base material: 150 mm
Minimum thickness of the base material: 186 mm

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 • SeismicFilling set • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{x1}	c_{x2}	c_{y1}	c_{y2}
1	-113	70	-	-	-	-
2	8	70	-	-	-	-
3	128	70	-	-	-	-

Anchor	x	y	c_{x1}	c_{x2}	c_{y1}	c_{y2}
4	-113	-70	-	-	-	-
5	8	-70	-	-	-	-
6	128	-70	-	-	-	-

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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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 Auto-Update 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:

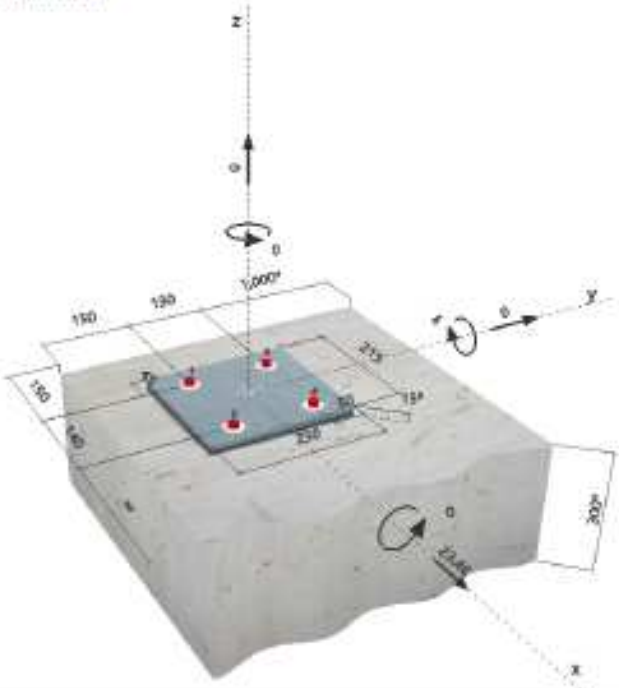
1 Input data



Anchor type and diameter:	**HIT-HY 200 + HIT-V (8.8) M16**
Seismic/Filling set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 150 mm ($h_{ef,red}$ = - mm)
Material:	8.8
Evaluation Service Report:	ETA 11/0493
Issued / Valid:	7/28/2017 / -
Proof:	SOFA design method + fib (07/2011) - after ETAG BOND testing
Stand-off installation:	e_b = 0 mm (no stand-off); t = 15 mm
Anchor plate:	l_x x l_y x t = 215 mm x 230 mm x 15 mm; (Recommended plate thickness: not calculated
Profile:	no profile
Base material:	cracked concrete, C25/30, $f_{c,cyl}$ = 25.00 N/mm²; h = 300 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 Reinforcement to control splitting according to: fib (07/2011), 16.1.5 present

* - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [mm] & Loading [kN, kNm]



Input data and results must be checked for agreement with the existing conditions and for plausibility!
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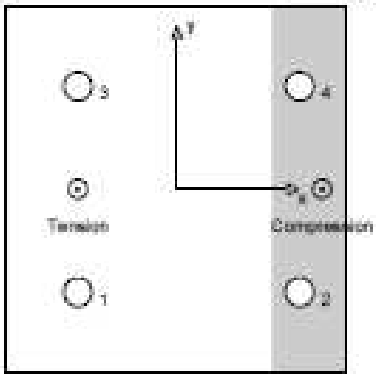
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Phone I Fax: | Date: 15/12/2019
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2 Load case/Resulting anchor forces

Load case: Design loads

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

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	12.967	5.865	5.865	0.000
2	0.000	5.865	5.865	0.000
3	12.967	5.865	5.865	0.000
4	0.000	5.865	5.865	0.000



max. concrete compressive strain: 0.16 [‰]
max. concrete compressive stress: 4.77 [N/mm²]
resulting tension force in (x/y)=(-63/0): 25.933 [kN]
resulting compression force in (x/y)=(63/0): 25.933 [kN]

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

3 Tension load SOFA (fib (07/2011), section 16.2.1)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel Strength*	12.967	83.733	15	OK
Combined pullout-concrete cone failure**	25.933	37.453	70	OK
Concrete Breakout Strength**	25.933	39.887	66	OK
Splitting failure**	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (anchors in tension)

3.1 Steel Strength

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
125.600	1.500	83.733	12.967

3.2 Combined pullout-concrete cone failure

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\psi_{A,N}$	$\tau_{Rk,ucr,25}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
189,375	202,500	0.935	15.00	450	225	150

ψ_{ec}	$\tau_{Rk,ucr}$ [N/mm²]	max $\tau_{Rk,ucr}$ [N/mm²]	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.020	8.67	9.38	1.046	1.021

$e_{c,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0	1.000	0	1.000	0.900	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rk,p}$ [kN]	$N_{Rd,p}$ [kN]
65.587	56.160	1.500	37.453	25.933

3.3 Concrete Breakout Strength

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$\psi_{A,N}$	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]
189,375	202,500	0.935	225	450

$e_{c,N}$ [mm]	$\psi_{ec,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0	1.000	0	1.000	0.900	1.000

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rk,c}$ [kN]	$N_{Rd,c}$ [kN]
7.700	70.729	1.500	39.887	25.933

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4 Shear load SOFA (fib (07/2011), section 16.2.2)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel Strength (without lever arm)*	5.885	50.240	12	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	23.480	105.838	23	OK
Concrete edge failure in direction y-**	11.750	24.879	48	OK

* anchor having the highest loading **anchor group (relevant anchors)

4.1 Steel Strength (without lever arm)

$V_{sa,s}$ [kN]	$\gamma_{M,s}$	$V_{sa,d}$ [kN]	V_{Sd} [kN]
62.800	1.250	50.240	5.885

4.2 Pryout Strength (Bond Strength controls)

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\psi_{A,Np}$	$\tau_{Rk,ucr,25}$ [N/mm²]	$c_{cr,Np}$ [mm]	$s_{cr,Np}$ [mm]	c_{min} [mm]
260,075	202,500	1.284	18.00	225	450	150

$\psi_{s,N}$	$\tau_{Rk,ucr}$ [N/mm²]	max $\tau_{Rk,ucr}$ [N/mm²]	k_{ucr}	$\psi^{c}_{g,Np}$	$\psi_{g,Np}$
1.020	8.67	9.38	2.000	1.111	1.050

$e_{N,V}$ [mm]	$\psi_{ec2,Np}$	$e_{N,z}$ [mm]	$\psi_{ec2,Np}$	$\psi_{A,Np}$	$\psi_{re,Np}$
0	1.000	0	1.000	0.900	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$V_{Rk,p}$ [kN]	V_{Sd} [kN]
65.387	79.379	1.500	105.838	23.480

4.3 Concrete edge failure in direction y-

l_f [mm]	d_{nom} [mm]	k_y	α	β
160	16.0	1.700	0.079	0.058

c_1 [mm]	$A_{c,V}$ [mm²]	$A^0_{c,V}$ [mm²]	$\psi_{A,V}$
280	213,000	352,800	0.604

$\psi_{s,V}$	$\psi_{h,V}$	$\psi_{ec,V}$	$e_{V,z}$ [mm]	$\psi_{ec,z}$	$\psi_{re,V}$	$\psi_{ec2,V}$
0.807	1.183	2.000	0	1.000	1.000	2.000

$V^0_{Rk,c}$ [kN]	n_c	$\gamma_{M,c}$	$V_{Rk,c}$ [kN]	V_{Sd} [kN]
64.722	2	1.500	24.879	11.750

Note: Resistance limit acc. to fib (07/2011) Eq. (16.2-6) is governing

5 Combined tension and shear loads SOFA (fib (07/2011), section 10.3)

	β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
steel	0.155	0.117	2.000	4	OK
concrete	0.692	0.471	1.500	90	OK

$\beta_N^{\alpha} + \beta_V^{\alpha} <= 1$

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6 Displacements (highest loaded anchor)

Short term loading:

N_{ks} = 9.605 [kN] δ_N = 0.089 [mm]

V_{ks} = 4.344 [kN] δ_V = 0.174 [mm]

δ_{NV} = 0.195 [mm]

Long term loading:

N_{ks} = 9.605 [kN] δ_N = 0.204 [mm]

V_{ks} = 4.344 [kN] δ_V = 0.281 [mm]

δ_{NV} = 0.331 [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 Anchor require rigid anchor plates per current regulations (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 Anchor calculates the minimum required anchor plate thickness with FEM 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 Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- 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.
- Please contact Hilti to check feasibility of HIT-V rod supply.
- The design method fib (07/2011) 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 SelamicFilling set) or by other suitable means.
- The compliance with current standards (e.g. EC3) is the responsibility of the user.
- Checking the transfer of loads into the base material is required in accordance with fib (07/2011)!

Fastening meets the design criteria!

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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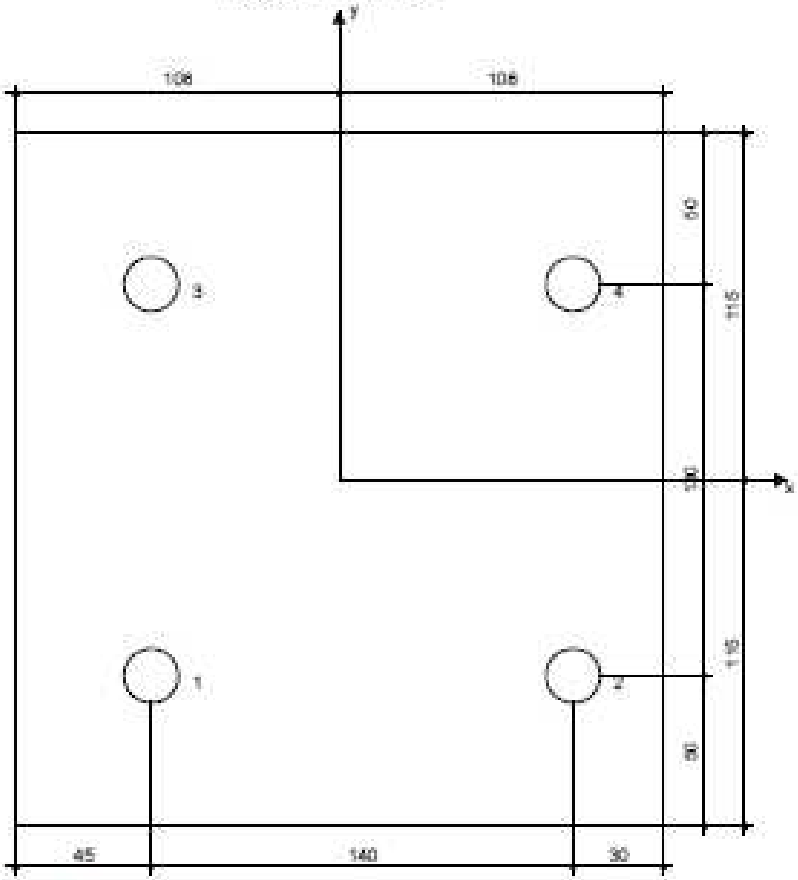
8 Installation data

Anchor plate, steel: -
Profile: no profile
Hole diameter in the fixture: d_f = 18 mm
Plate thickness (input): 15 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 + HIT-V (5.8) M16
Installation torque: 0.080 kNm
Hole diameter in the base material: 18 mm
Hole depth in the base material: 150 mm
Minimum thickness of the base material: 166 mm

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 • Seismic/Filling set • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-83	-65	150	-	150	1,150
2	78	-65	280	-	150	1,150
3	-83	65	150	-	280	1,000
4	78	65	280	-	280	1,000

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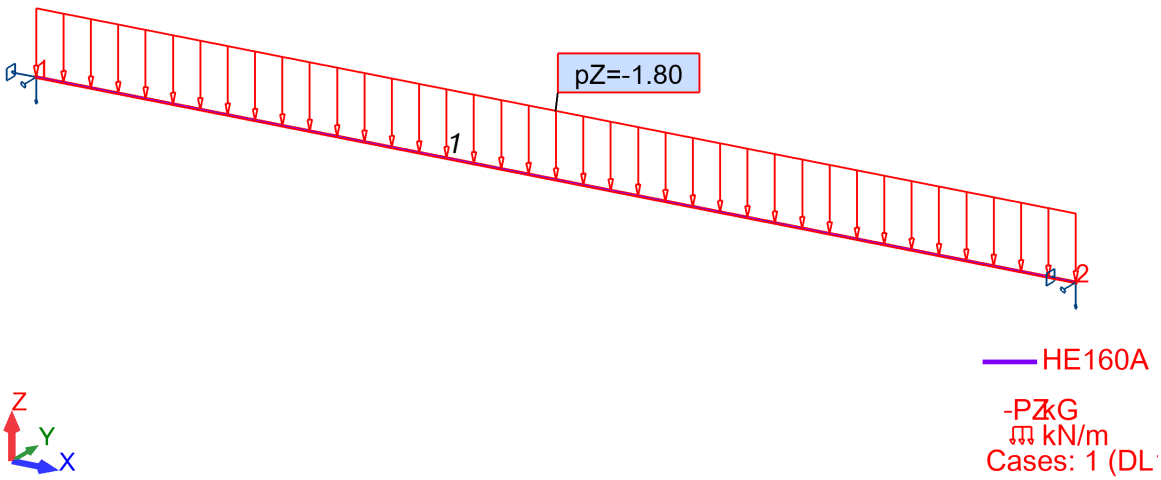
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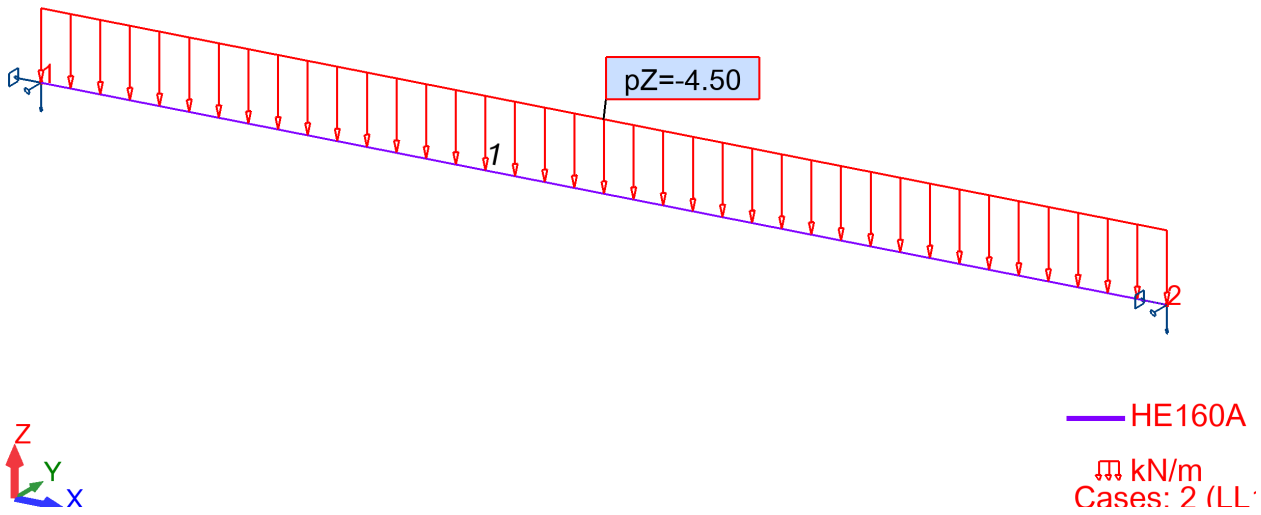
5 ΚΥΡΙΟΣ ΦΟΡΕΑΣ – ΤΜΗΜΑ Β

5.1 ΦΟΡΤΙΣΕΙΣ

Μόνιμο φορτίο (1:DL1)

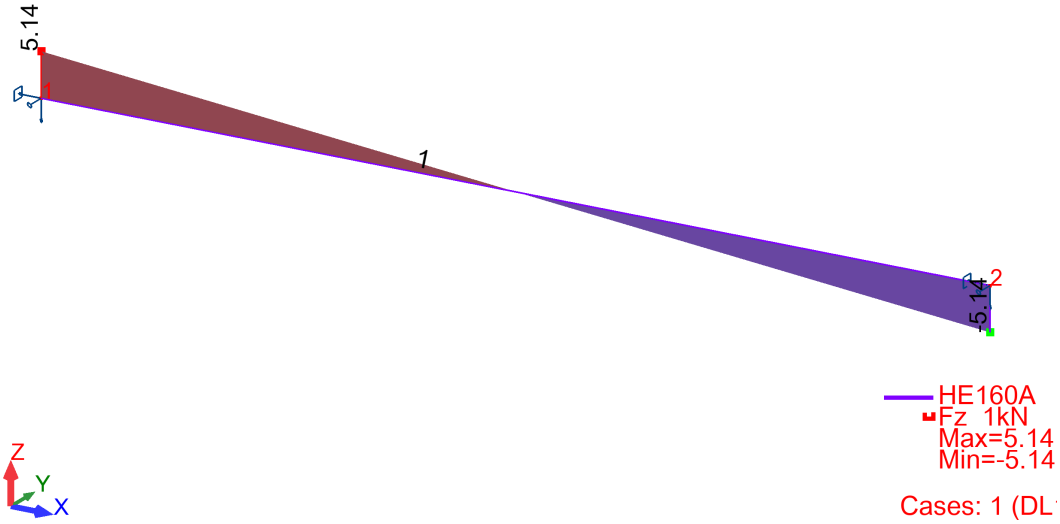


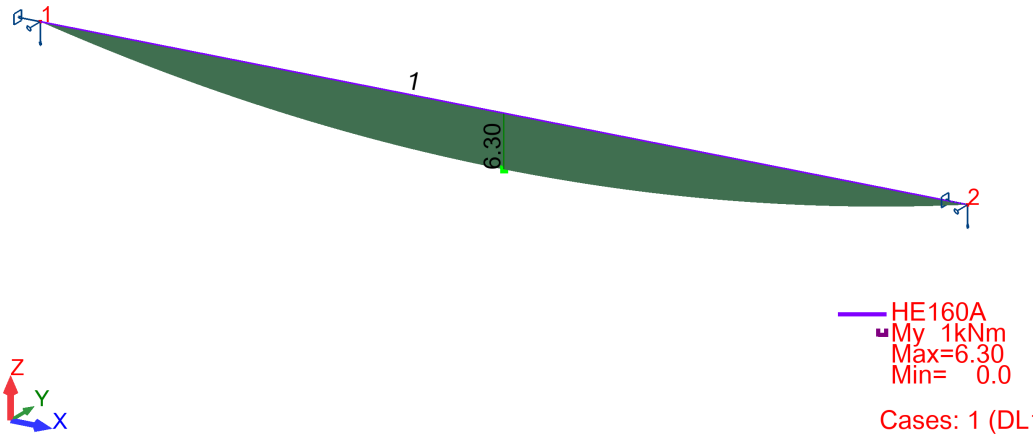
Κινητό φορτίο (2:LL1)

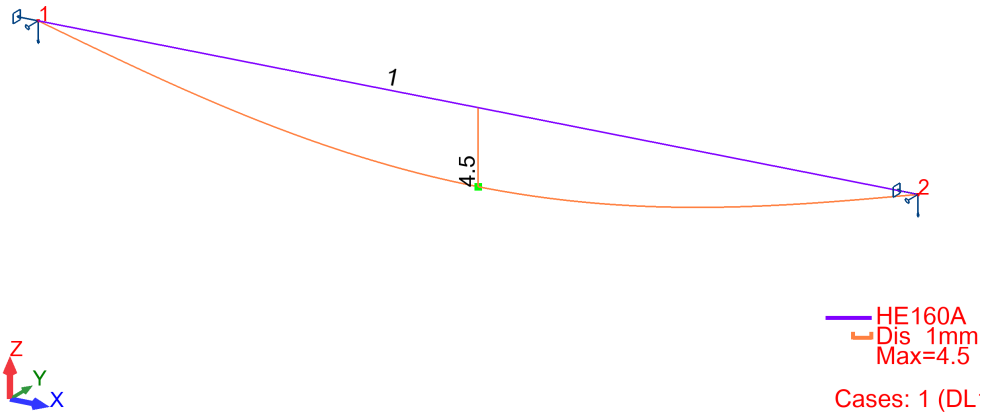


5.2 ΑΠΟΤΕΛΕΣΜΑΤΑ

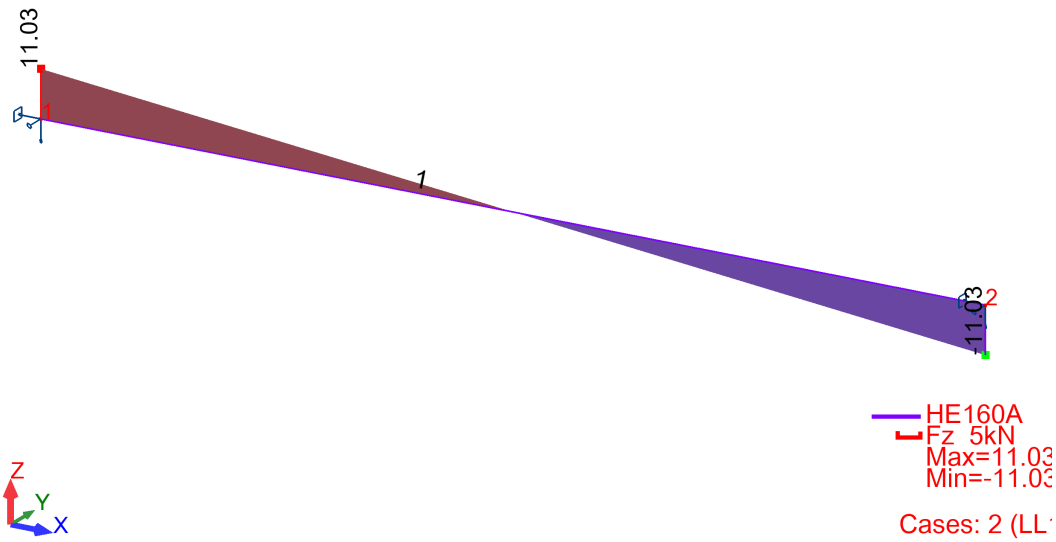
ΜΟΝΙΜΟ ΦΟΡΤΙΟ (1:DL1)

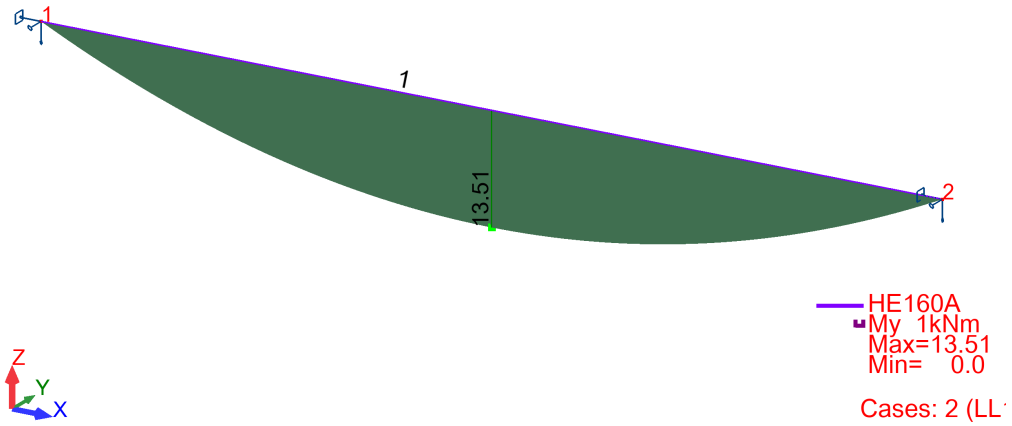


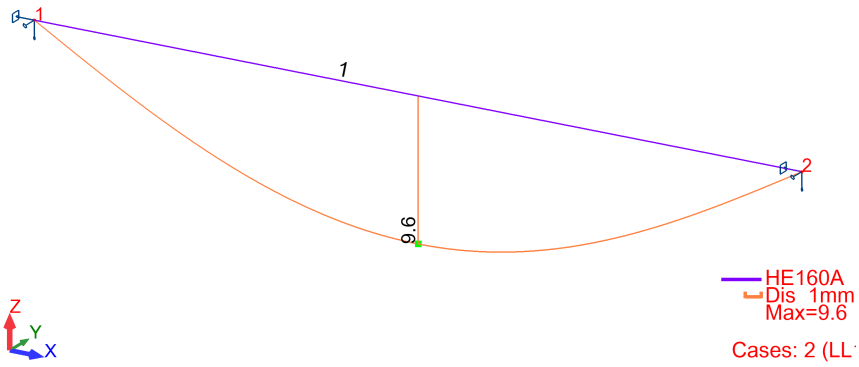




ΚΙΝΗΤΟ ΦΟΡΤΙΟ (2:LL1)







STEEL DESIGN

CODE: *EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 1 MAIN BEAM_1 **POINT:** **COORDINATE:** x = 0.50 L = 2.45 m

---

LOADS:
Governing Load Case: 3 ULS /1/ 1*1.35 + 2*1.50

MATERIAL:
S 275 (S 275) fy = 275.00 MPa



SECTION PARAMETERS: HE160A

h=15.2 cm	gM0=1.00	gM1=1.00	
b=16.0 cm	Ay=32.53 cm2	Az=13.21 cm2	Ax=38.77 cm2
tw=0.6 cm	Iy=1672.98 cm4	Iz=615.57 cm4	Ix=10.90 cm4
tf=0.9 cm	Wply=245.17 cm3	Wplz=117.63 cm3	

INTERNAL FORCES AND CAPACITIES:

My,Ed = 28.76 kN*m
My,pl,Rd = 67.42 kN*m
My,c,Rd = 67.42 kN*m
Mb,Rd = 45.76 kN*m

Class of section = 1




LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 70.04 kN*m	Curve,LT - a	XLT = 0.68
Lcr,upp=4.90 m	Lam_LT = 0.98	fi,LT = 1.06	

BUCKLING PARAMETERS:

 About y axis:

 About z axis:

VERIFICATION FORMULAS:
Section strength check:
My,Ed/My,c,Rd = 0.43 < 1.00 (6.2.5.(1))
Global stability check of member:
My,Ed/Mb,Rd = 0.63 < 1.00 (6.3.2.1.(1))

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

uy = 0.0 mm < uy max = L/250.00 = 19.6 mm Verified
Governing Load Case: 1 DL1
uz = 14.1 mm < uz max = L/250.00 = 19.6 mm Verified
Governing Load Case: 6 SLS /1/ 1*1.00 + 2*1.00
u inst,y = 0.0 mm < u inst,max,y = L/300.00 = 16.3 mm Verified
Governing Load Case:
u inst,z = 9.6 mm < u inst,max,z = L/300.00 = 16.3 mm Verified
Governing Load Case: 1*2



Displacements (GLOBAL SYSTEM): *Not analyzed*

Section OK !!!

ΣΥΝΔΕΣΗ ΚΥΡΙΩΝ ΔΟΚΩΝ ΣΕ ΥΦΙΣΤΑΜΕΝΟ ΣΤΟΙΧΕΙΟ Ω/Σ

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Specifier's comments:

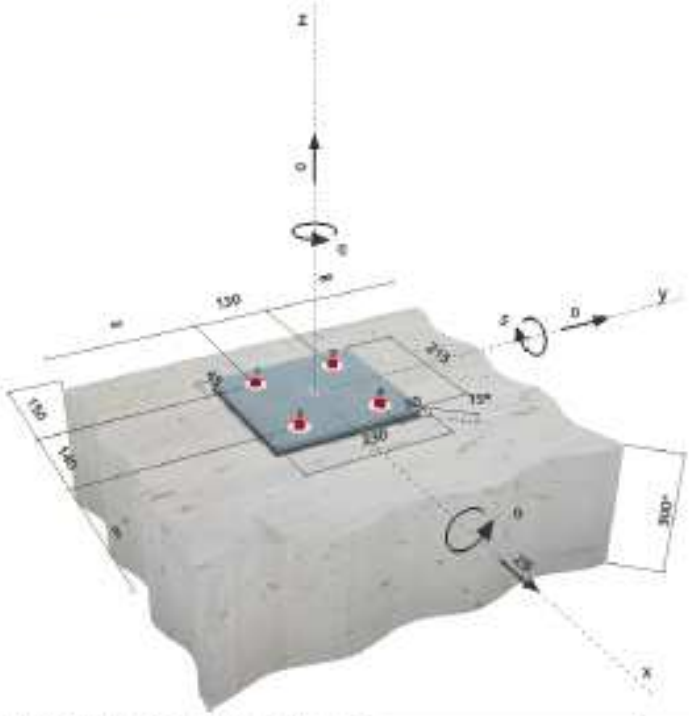
1 Input data



Anchor type and diameter:	**HIT-HY 200 + HIT-V (8.8) M16**
Seismic/Filling set or any suitable annular gap filling solution	
Effective embedment depth:	$h_{ef,act}$ = 150 mm ($h_{ef,limit}$ = - mm)
Material:	8.8
Evaluation Service Report:	ETA 11/0493
Issued / Valid:	7/28/2017 / -
Proof:	SOFA design method + fib (07/2011) - after ETAG BOND testing
Stand-off installation:	e_b = 0 mm (no stand-off); t = 15 mm
Anchor plate:	l_x x l_y x t = 215 mm x 230 mm x 15 mm; (Recommended plate thickness: not calculated
Profile:	no profile
Base material:	cracked concrete, C25/30, f_{cyl} = 25.00 N/mm²; h = 300 mm, Temp. short/long: 40/24 °C
Installation:	**hammer drilled hole, installation condition: Dry**
Reinforcement:	no reinforcement or reinforcement spacing >= 150 mm (any ⌀) or >= 100 mm (⌀ <= 10 mm) no longitudinal edge reinforcement Reinforcement to control splitting according to: fib (07/2011), 16.1.5 present

* - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [mm] & Loading [kN, kNm]



Input data and results must be checked for agreement with the existing conditions and for plausibility!
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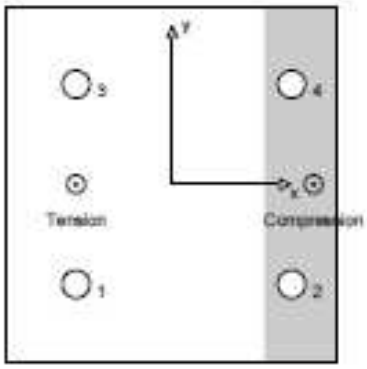
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2 Load case/Resulting anchor forces

Load case: Design loads

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

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	16.208	6.250	6.250	0.000
2	0.000	6.250	6.250	0.000
3	16.208	6.250	6.250	0.000
4	0.000	6.250	6.250	0.000



max. concrete compressive strain: 0.20 [‰]
max. concrete compressive stress: 5.96 [N/mm²]
resulting tension force in (x/y)=(-63/0): 32.416 [kN]
resulting compression force in (x/y)=(92/0): 32.416 [kN]

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

3 Tension load SOFA (fib (07/2011), section 16.2.1)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel Strength*	16.208	83.733	20	OK
Combined pullout-concrete cone failure**	32.416	43.015	76	OK
Concrete Breakout Strength**	32.416	45.581	72	OK
Splitting failure**	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (anchors in tension)

3.1 Steel Strength

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Sd} [kN]
125.600	1.500	83.733	16.208

3.2 Combined pullout-concrete cone failure

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$\psi_{A,N}$	$\tau_{Rk,ucr,25}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]
217,500	202,500	1.074	18.00	450	225	150

ψ_s	$\tau_{Rk,cr}$ [N/mm²]	max $\tau_{Rk,cr}$ [N/mm²]	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.020	8.67	9.38	1.046	1.021

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0	1.000	0	1.000	0.900	1.000

$N^0_{Rk,c}$ [kN]	$N_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Sd} [kN]
85.387	64.523	1.500	43.015	32.416

3.3 Concrete Breakout Strength

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$\psi_{A,N}$	$c_{c,N}$ [mm]	$s_{cr,N}$ [mm]
217,500	202,500	1.074	225	450

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0	1.000	0	1.000	0.900	1.000

k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rk,c}$ [kN]	N_{Sd} [kN]
7.700	70.729	1.500	45.581	32.416

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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4 Shear load SOFA (fib (07/2011), section 16.2.2)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel Strength (without lever arm)*	6.250	50.240	13	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	25.000	121.557	21	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (relevant anchors)

4.1 Steel Strength (without lever arm)

$V_{Ra,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
62.800	1.250	50.240	6.250

4.2 Pryout Strength (Bond Strength controls)

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\psi_{A,N}$	$\tau_{Rk,ucr,20}$ [N/mm²]	$c_{cr,Np}$ [mm]	$s_{cr,Np}$ [mm]	c_{min} [mm]
288,700	202,500	1.475	18.00	225	450	150

ψ_{ec}	$\tau_{Rk,ucr}$ [N/mm²]	max $\tau_{Rk,ucr}$ [N/mm²]	k_{ucr}	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.020	8.67	9.38	2.000	1.111	1.050

$e_{N,V}$ [mm]	$\psi_{ec,Np}$	$e_{N,V}$ [mm]	$\psi_{ec,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0	1.000	0	1.000	0.900	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$V_{Rd,p}$ [kN]	V_{Sd} [kN]
65.587	91.169	1.500	121.557	25.000

5 Combined tension and shear loads SOFA (fib (07/2011), section 10.3)

	β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
steel	0.194	0.124	2.000	8	OK
concrete	0.754	0.206	1.500	75	OK

$\beta_N^\alpha + \beta_V^\alpha <= 1$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sk} = 12.006 [kN] δ_N = 0.111 [mm]
V_{Sk} = 4.690 [kN] δ_V = 0.185 [mm]
δ_{NV} = 0.216 [mm]

Long term loading:

N_{Sk} = 12.006 [kN] δ_N = 0.255 [mm]
V_{Sk} = 4.690 [kN] δ_V = 0.278 [mm]
δ_{NV} = 0.377 [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!

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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7 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (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 Anchor calculates the minimum required anchor plate thickness with FEM 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 Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- 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.
- Please contact Hilti to check feasibility of HIT-V rod supply.
- The design method fib (07/2011) assumes that no bore 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 SafeSet/Filling set) or by other suitable means.
- The compliance with current standards (e.g. EC3) is the responsibility of the user.
- Checking the transfer of loads into the base material is required in accordance with fib (07/2011)!

Fastening meets the design criteria!

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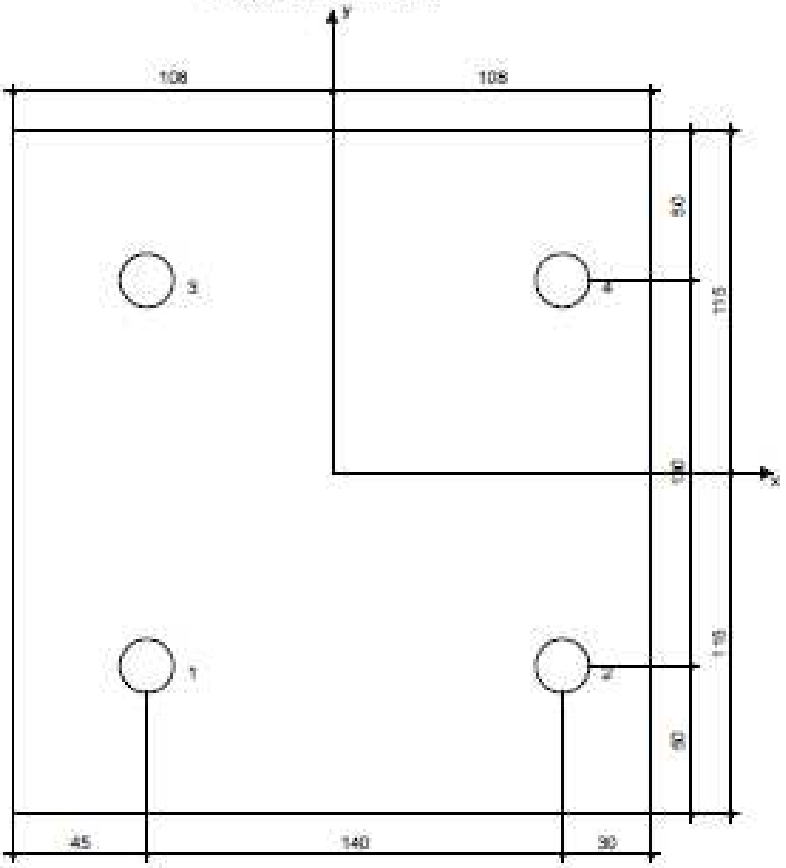
8 Installation data

Anchor plate, steel: -
Profile: no profile
Hole diameter in the fixture: d_f = 18 mm
Plate thickness (input): 15 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 + HIT-V (8.8) M16
Installation torque: 0.080 kNm
Hole diameter in the base material: 18 mm
Hole depth in the base material: 150 mm
Minimum thickness of the base material: 186 mm

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 • Seamic/Filling set • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{x+}	c_{x-}	c_{y+}	c_{y-}
1	-63	-65	150	-	-	-
2	77	-65	200	-	-	-
3	-63	65	150	-	-	-
4	77	65	200	-	-	-

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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9 Remarks; Your Cooperation Duties

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