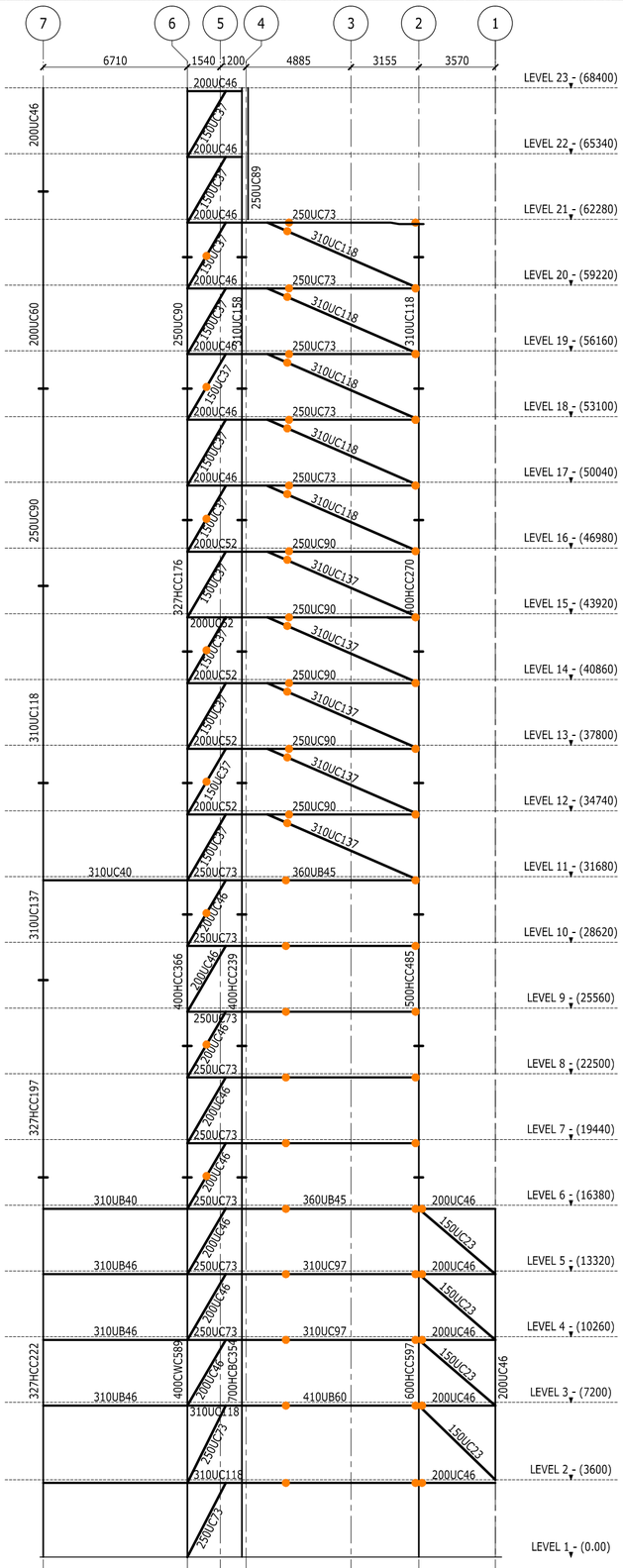
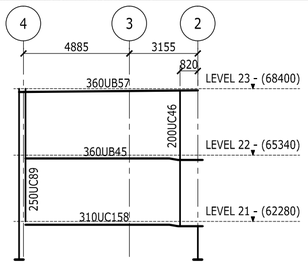
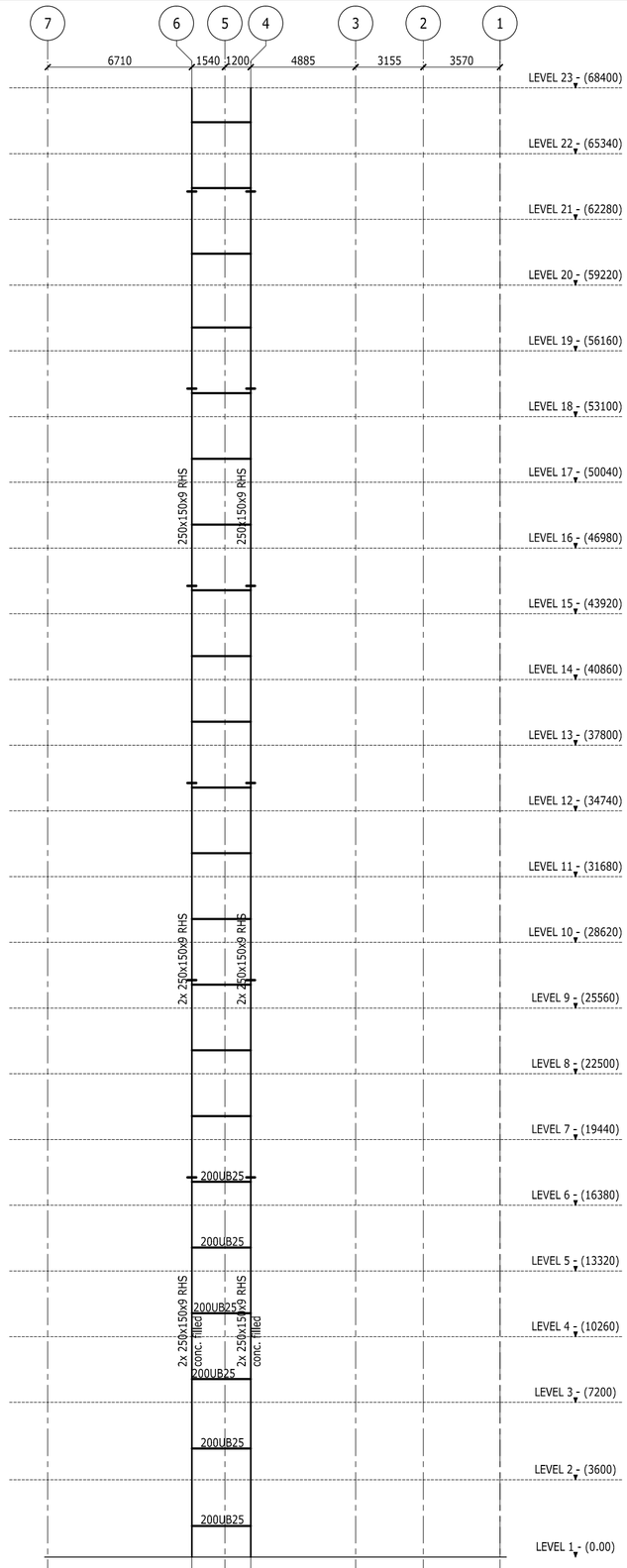
P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



STEELWORK ELEVATION GRID D



STEELWORK ELEVATION GRID D'



STEELWORK ELEVATION GRID Dd

NOTES:

a. Refer to steelwork framing plans for beam sizes

b. Indicates column splice location, location of change in column size

c. Splice location

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
PH	GB		1:200

AMC CONSTRUCTION (client)

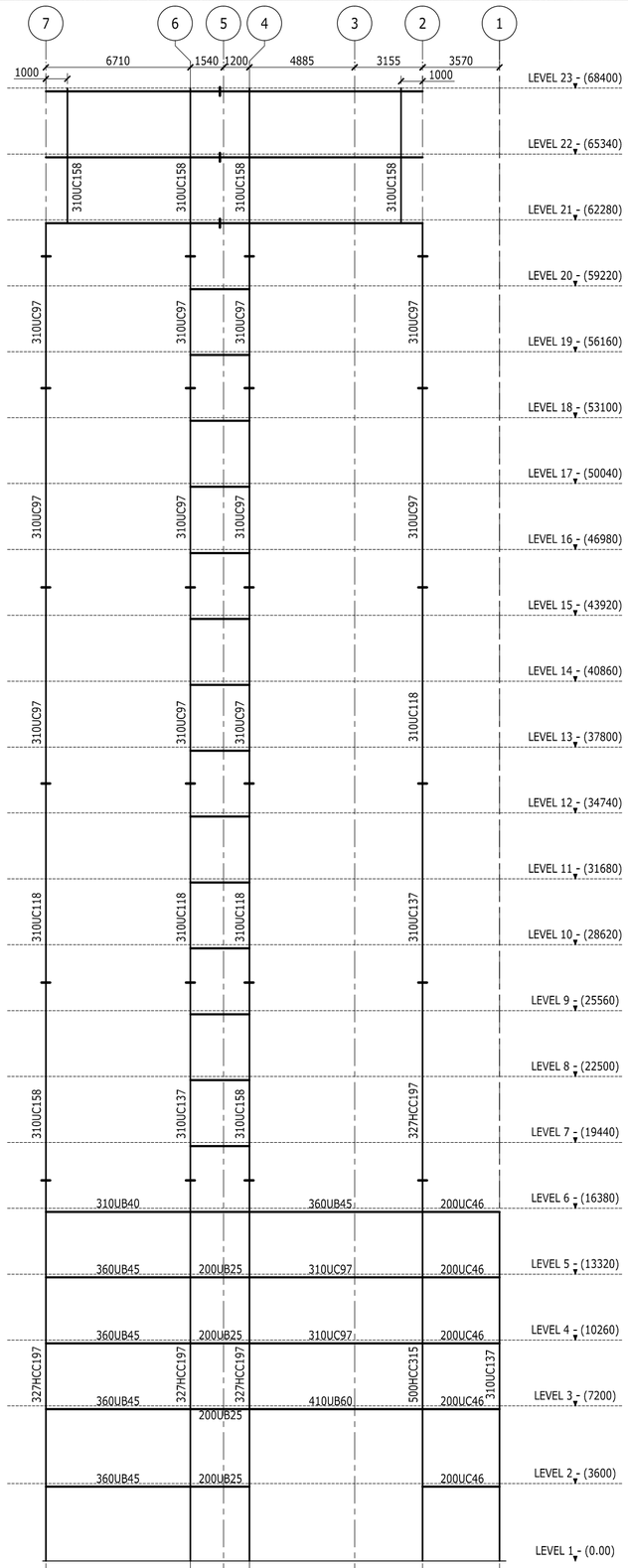
C1 TOWER (project title)

structex "Giving support a whole new meaning" www.structex.co.nz

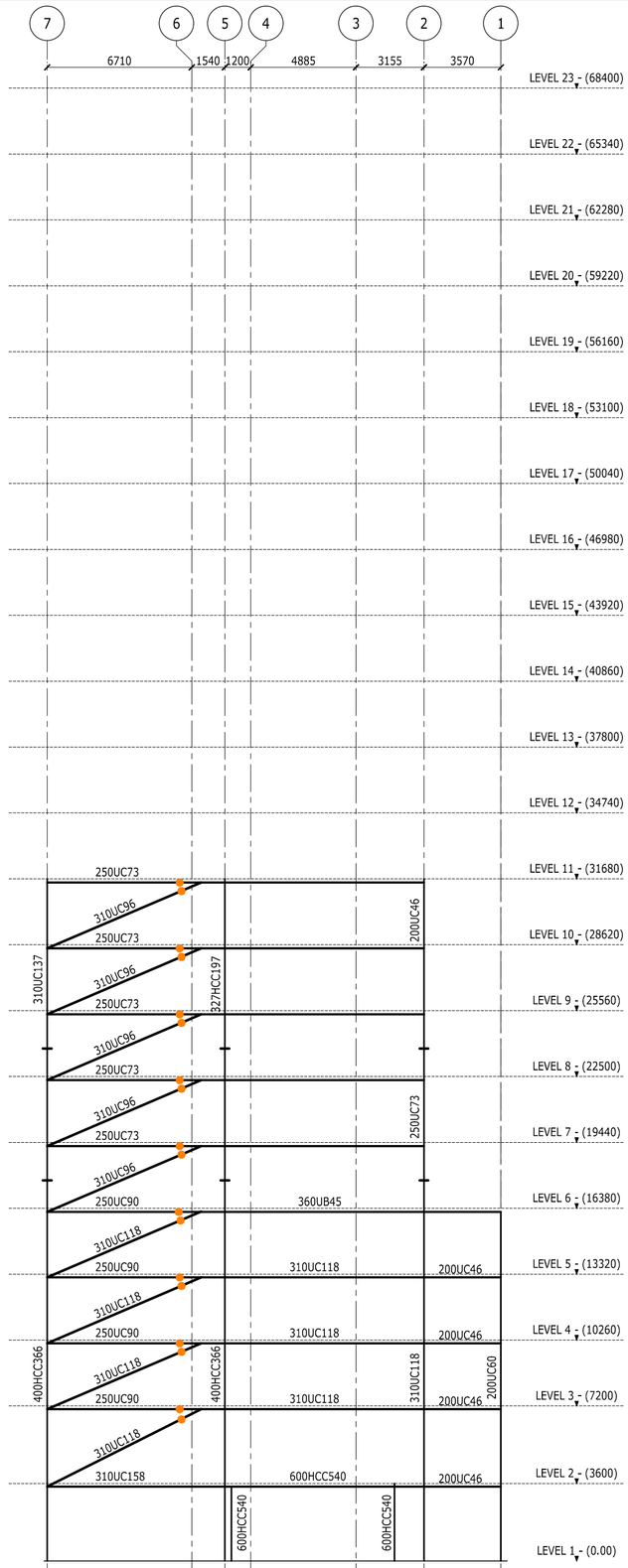
STEELWORK ELEVATION GRIDS D & Dd (drawing title)

S4.32 (drawing no) | project 1770 | 2 (issue)

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



STEELWORK ELEVATION GRID E



STEELWORK ELEVATION GRID F

NOTES:

a. Refer to steelwork framing plans for beam sizes

b. Indicates column splice location, location of change in column size

c. Splice location

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
PH	GB		1:200

client: AMC CONSTRUCTION

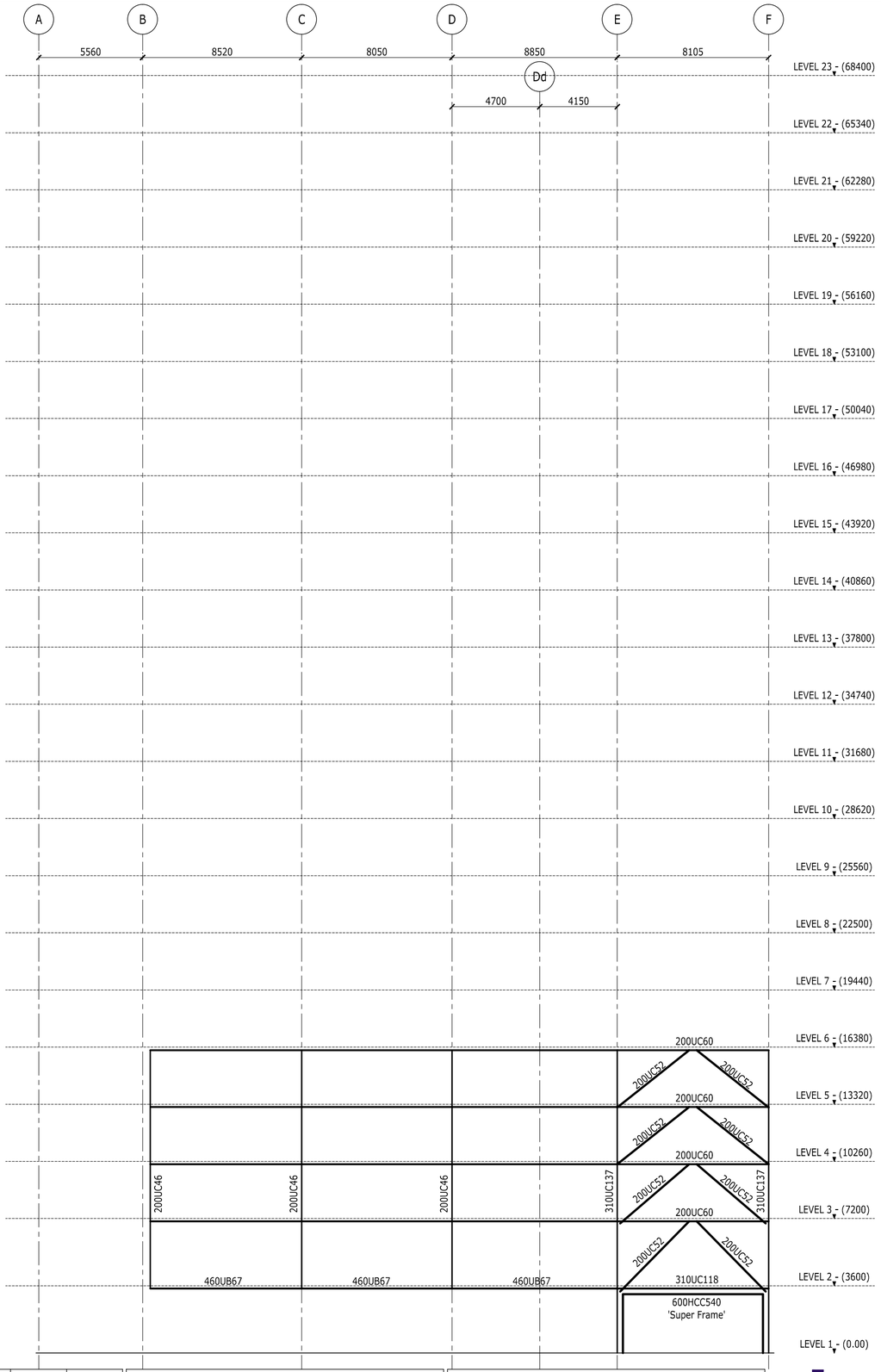
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

drawing title: STEELWORK ELEVATION GRIDS E & F

drawing no	project	issue
S4.33	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



NOTES:

a. Refer to steelwork framing plans for beam sizes

b. ┼ Indicates column splice location, location of change in column size

c. ● Splice location

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
PH	GB		1:200

client: AMC CONSTRUCTION

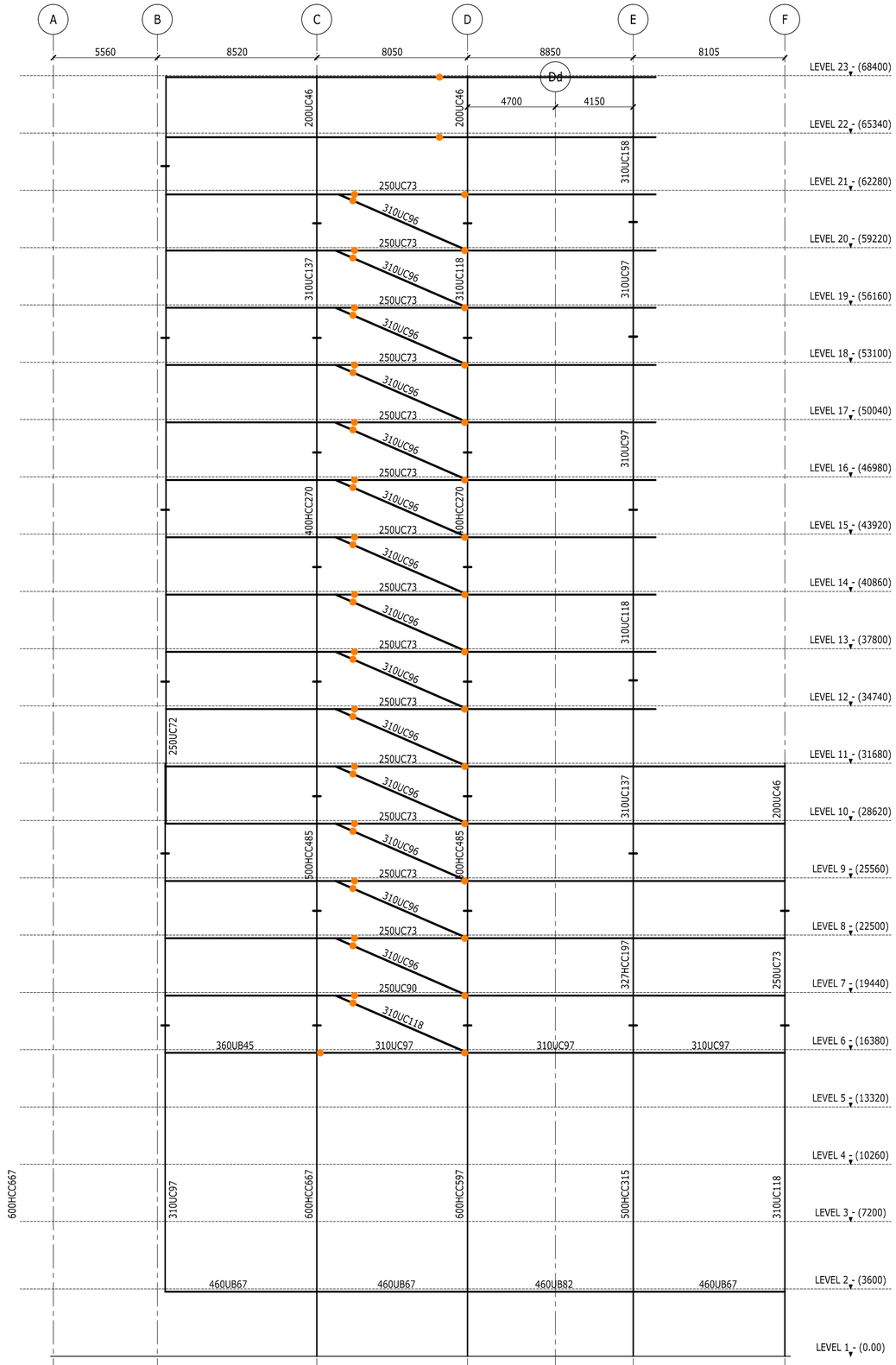
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

drawing title: STEELWORK ELEVATION GRID 1

drawing no	project	issue
S4.34	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



NOTES:

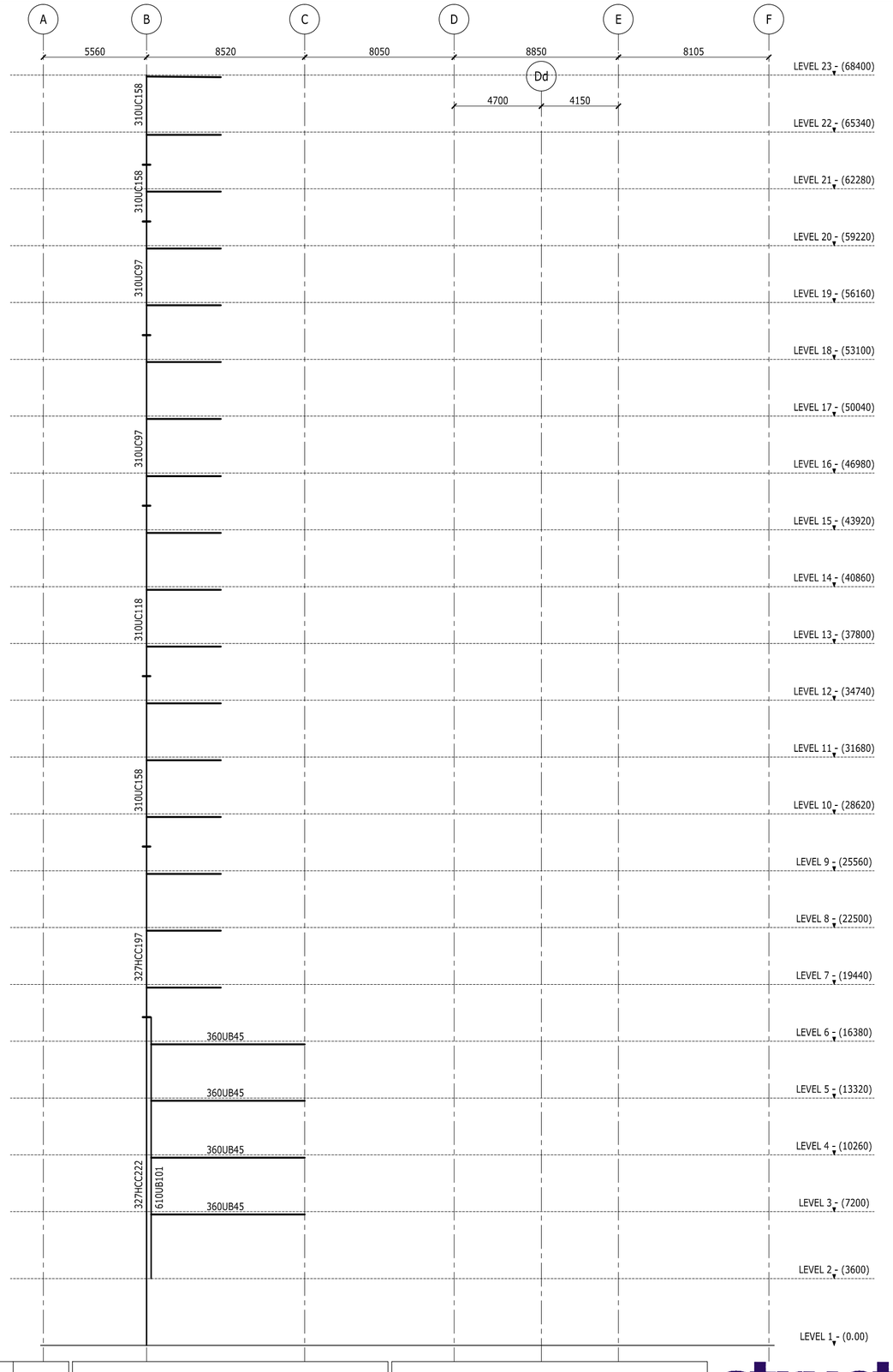
a. Refer to steelwork framing plans for beam sizes

b. Indicates column splice location, location of change in column size

c. Splice location

CONSTRUCTION

2	CONSTRUCTION ISSUE	JL	SG	12-12-07	PH	GB		1:200	AMC CONSTRUCTION	C1 TOWER	structex "Giving support a whole new meaning" www.structex.co.nz	STEELWORK ELEVATION GRID 2	S4.35	project 1770 / issue 2
issue	description	by	appd.	date	drawn	designed	approved	scales	client	project title		drawing title	drawing no	



NOTES:

a. Refer to steelwork framing plans for beam sizes

b. Indicates column splice location, location of change in column size

c. Splice location

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
PH	GB		1:200

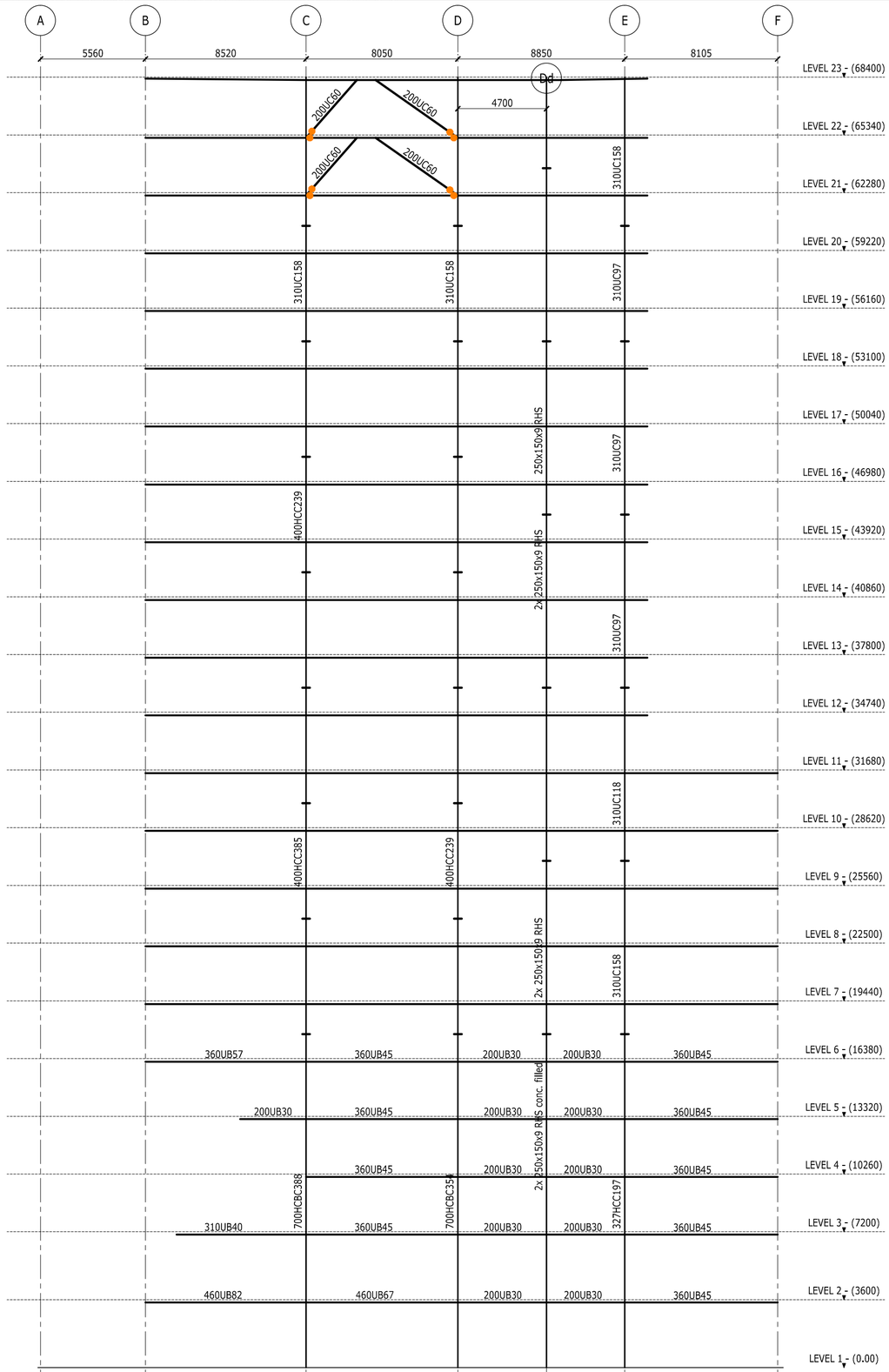
client: AMC CONSTRUCTION

project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

drawing title: STEELWORK ELEVATION GRID 3

drawing no	project	issue
S4.36	1770	2



NOTES:

a. Refer to steelwork framing plans for beam sizes

b. Indicates column splice location, location of change in column size

c. Splice location

CONSTRUCTION

issue	description	by	appd.	date
0F	STEELWORK AMMENDED	JL	GB	10-10-07
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
PH	GB		1:200

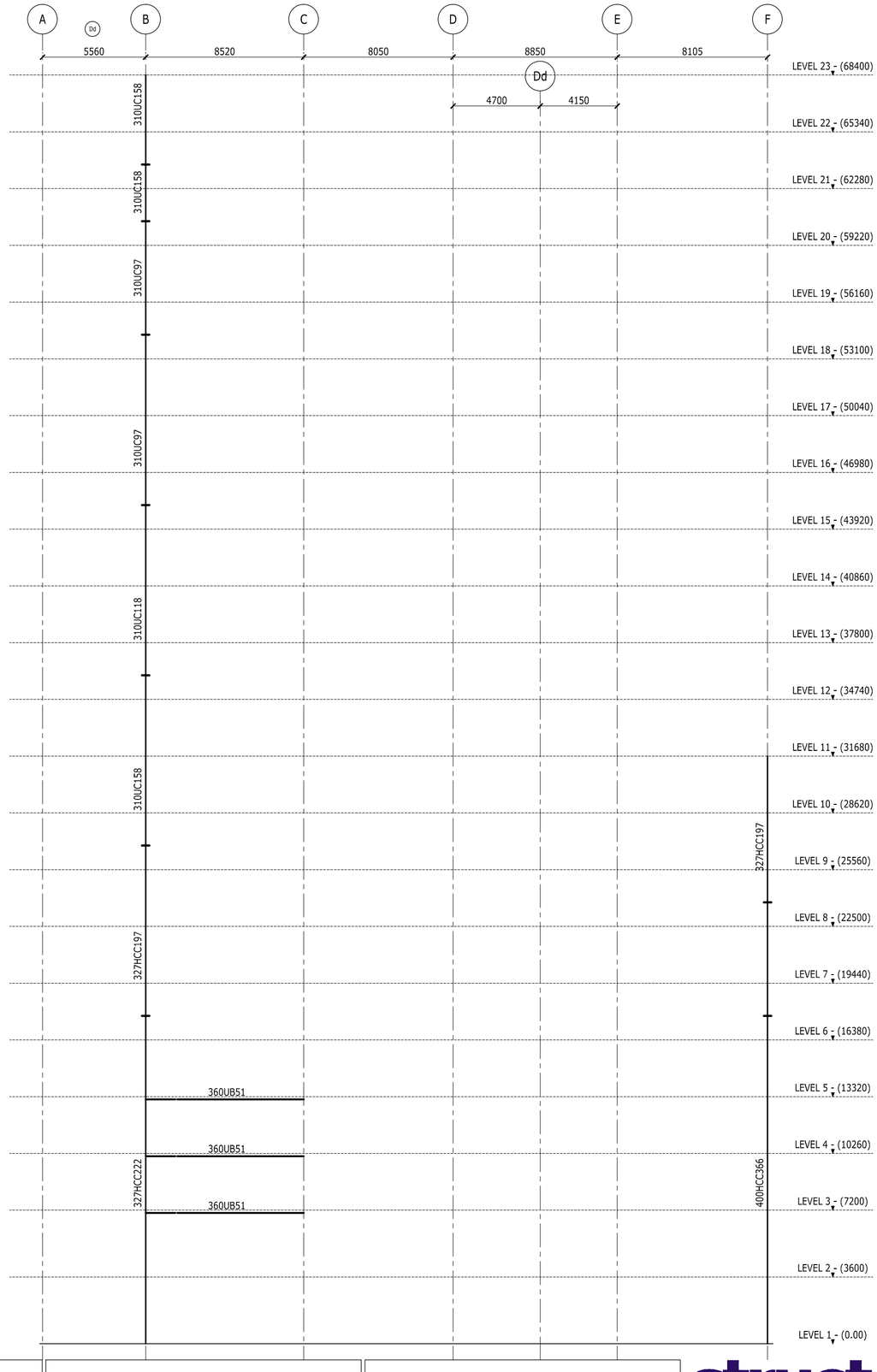
client: AMC CONSTRUCTION

project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

drawing title: STEELWORK ELEVATION GRID 4

drawing no	project	issue
S4.37	1770	2



NOTES:

a. Refer to steelwork framing plans for beam sizes

b. Indicates column splice location, location of change in column size

c. Splice location

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

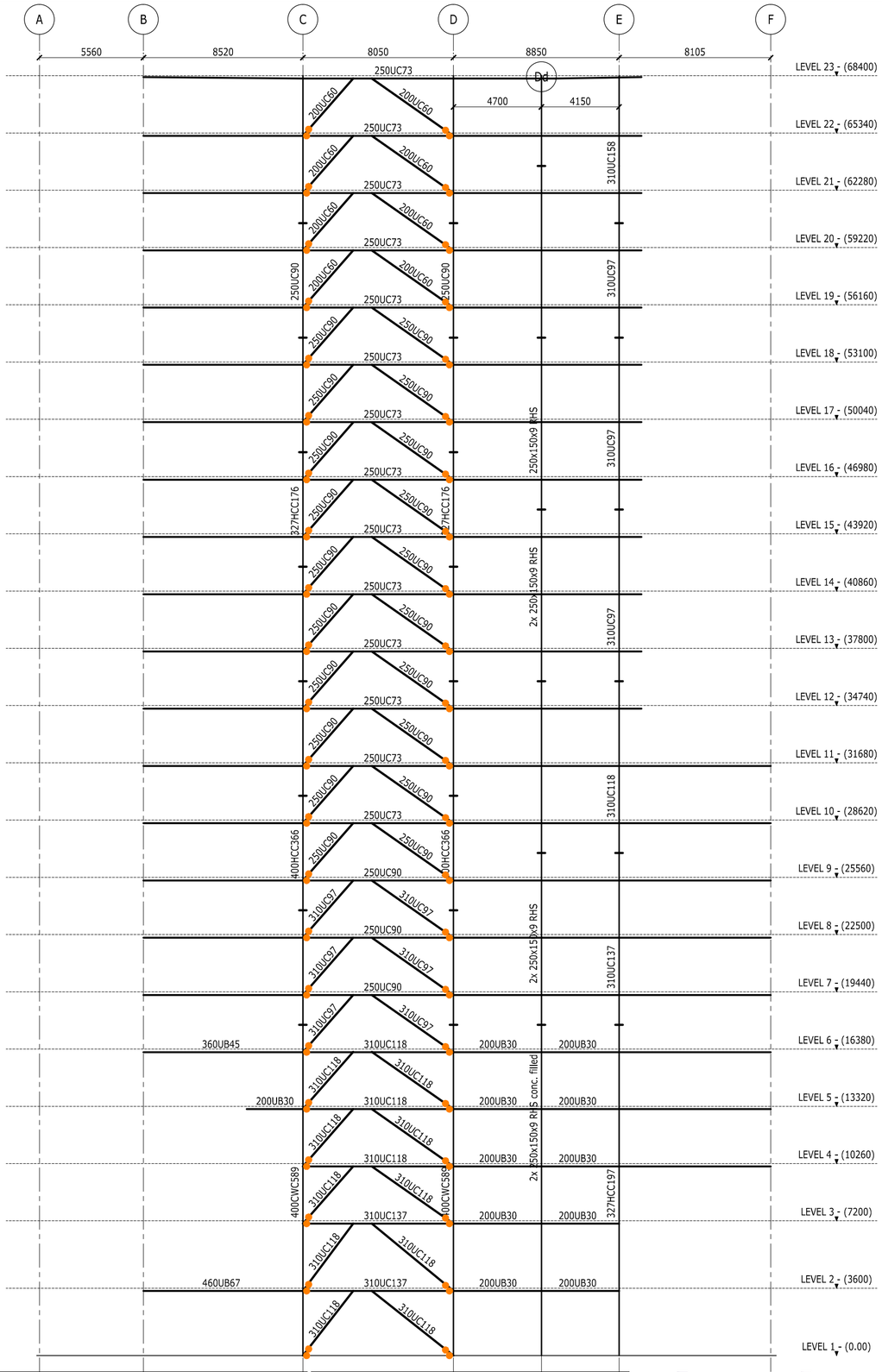
drawn	designed	approved	scales
PH	GB		1:200

client	project title
AMC CONSTRUCTION	C1 TOWER

structex
"Giving support a whole new meaning" www.structex.co.nz

drawing title	drawing no	project	issue
STEELWORK ELEVATION GRID 5	S4.38	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



NOTES:

a. Refer to steelwork framing plans for beam sizes

b. ┼ Indicates column splice location, location of change in column size

c. ● Splice location

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
PH	GB		1:200

client: AMC CONSTRUCTION

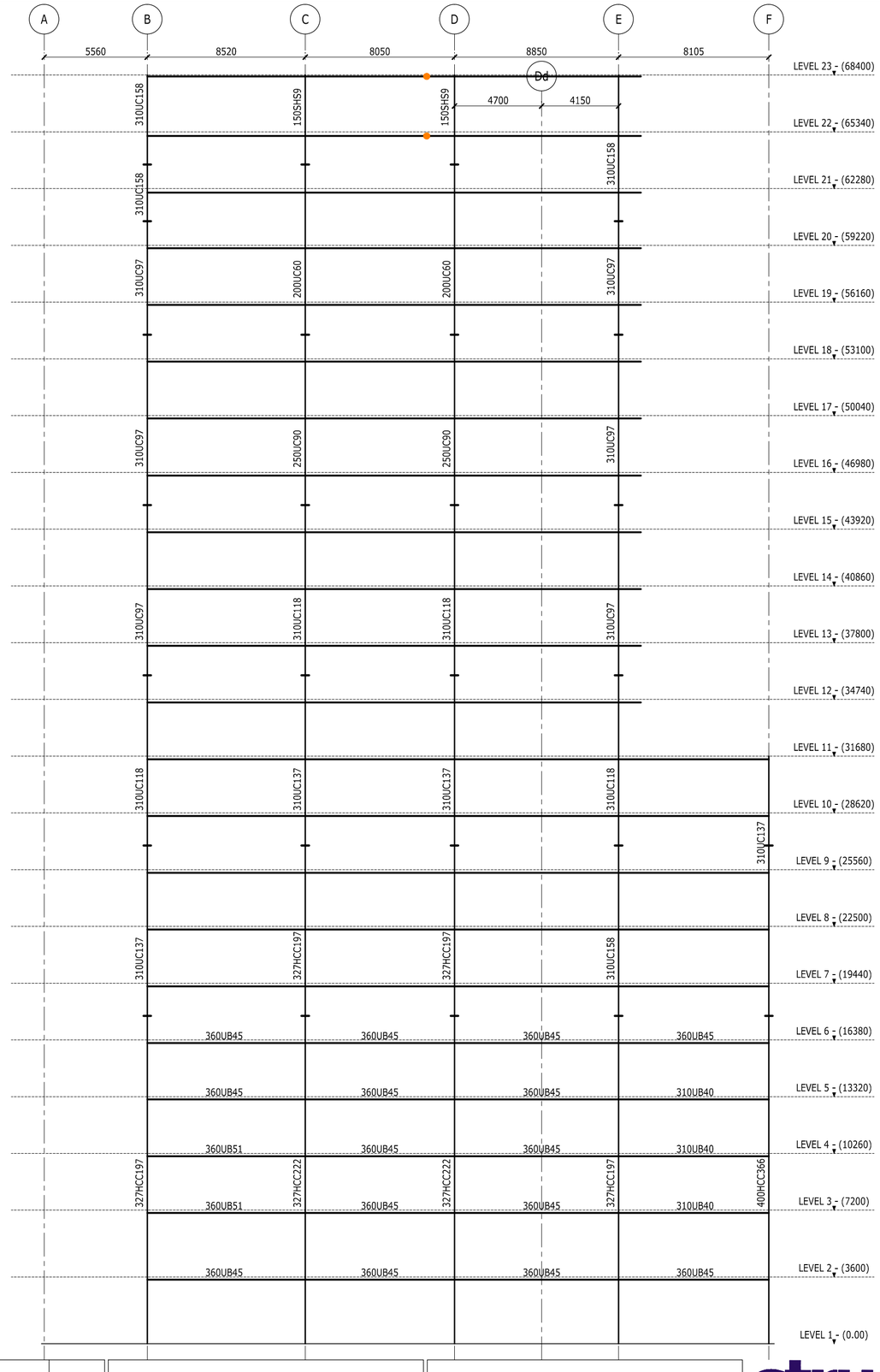
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

drawing title: STEELWORK ELEVATION GRID 6

drawing no	project	issue
S4.39	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



NOTES:

a. Refer to steelwork framing plans for beam sizes

b. Indicates column splice location, location of change in column size

c. Splice location

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
PH	GB		1:200

client: AMC CONSTRUCTION

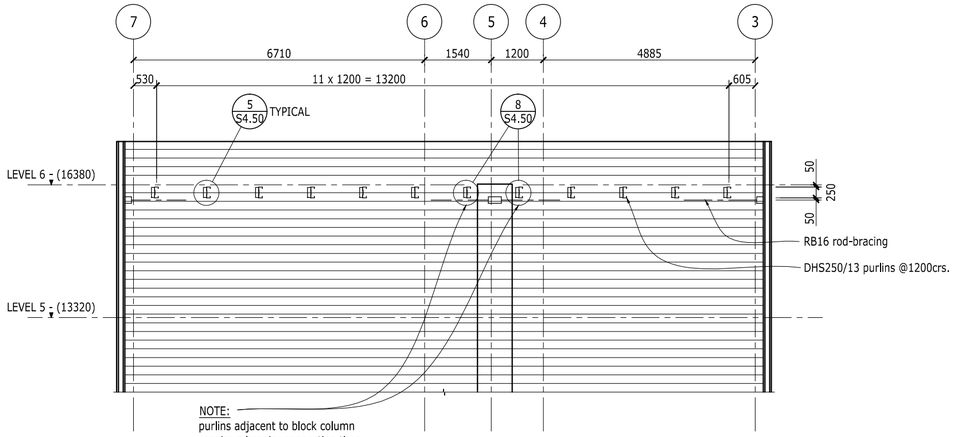
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

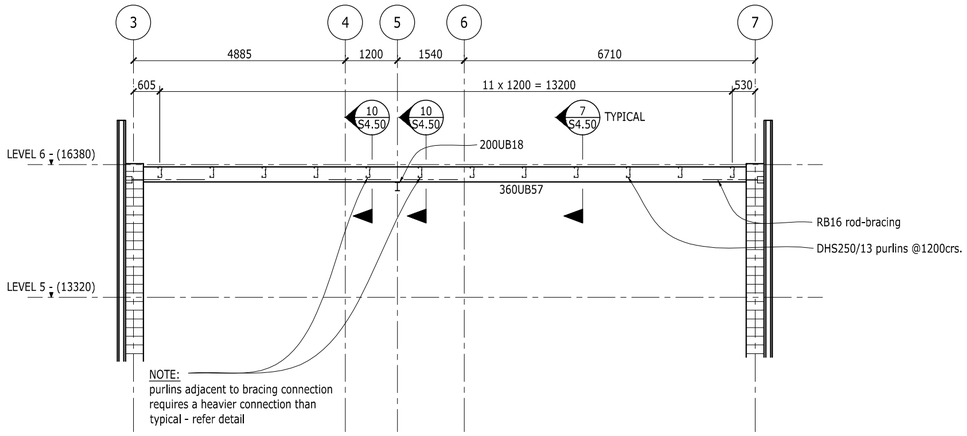
drawing title: STEELWORK ELEVATION GRID 7

drawing no	project	issue
S4.40	1770	2

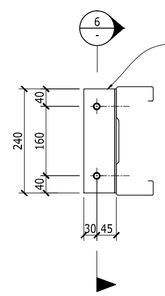
P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



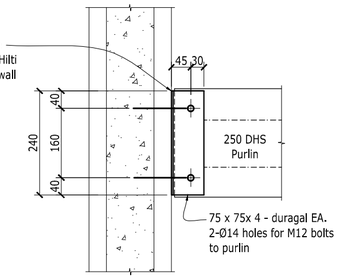
1 S4.06 LEVEL 6 STEELWORK ELEVATION
Scale: 1:100



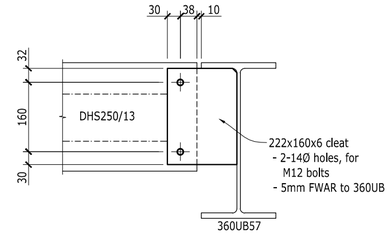
2 S4.06 LEVEL 6 STEELWORK ELEVATION
Scale: 1:100



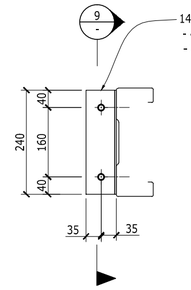
5 - SECTION - TYPICAL PURLIN CONNECTION
Scale: 1:10



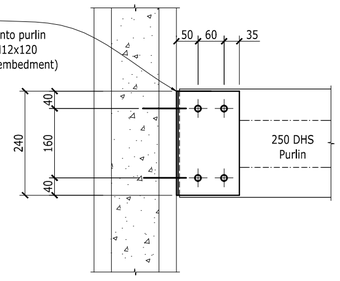
6 - SECTION - TYPICAL PURLIN CONNECTION
Scale: 1:10



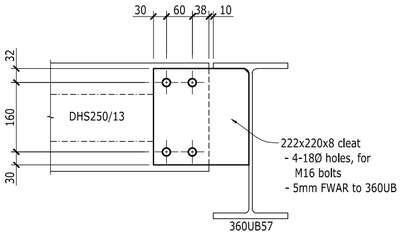
7 - SECTION - TYPICAL PURLIN CONNECTION
Scale: 1:10



8 - SECTION - PURLIN CONNECTION
Scale: 1:10



9 - SECTION - PURLIN CONNECTION
Scale: 1:10



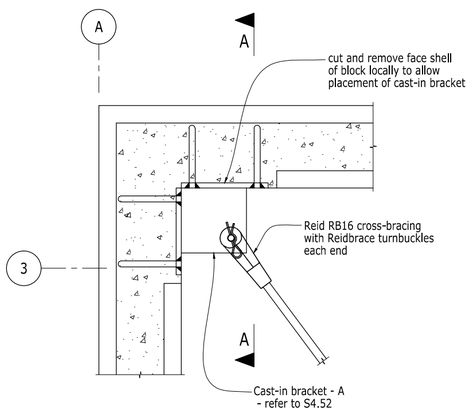
10 - SECTION - PURLIN CONNECTION
Scale: 1:10

CONSTRUCTION

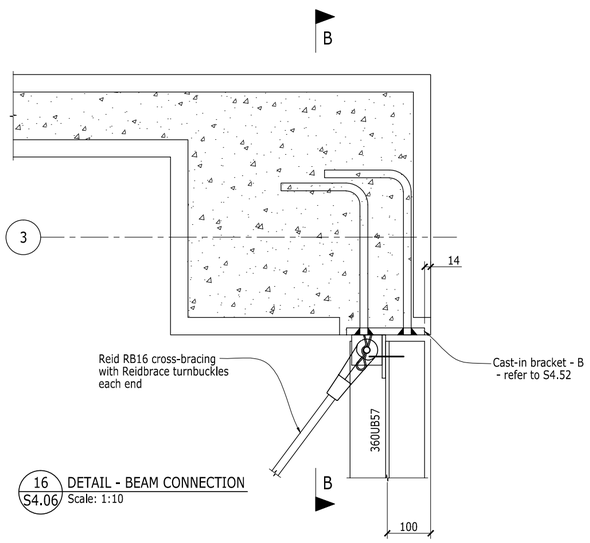
issue	description	by	appd.	date	drawn	designed	approved	scales	client	project title	drawing title	drawing no	issue
2	CONSTRUCTION ISSUE	JL	SG	12-12-07	JM	MG		1:100 1:10	AMC CONSTRUCTION	C1 TOWER	LEVEL 6 ROOF STEELWORK	S4.50	project 1770 2

structex "Giving support a whole new meaning" www.structex.co.nz

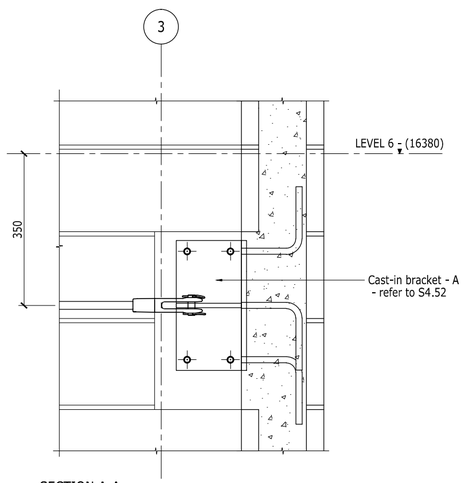
P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



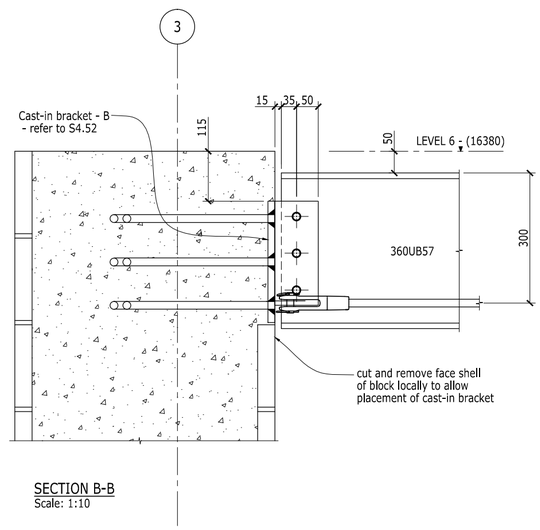
15 S4.06 DETAIL - ROD BRACING CONNECTION
Scale: 1:10



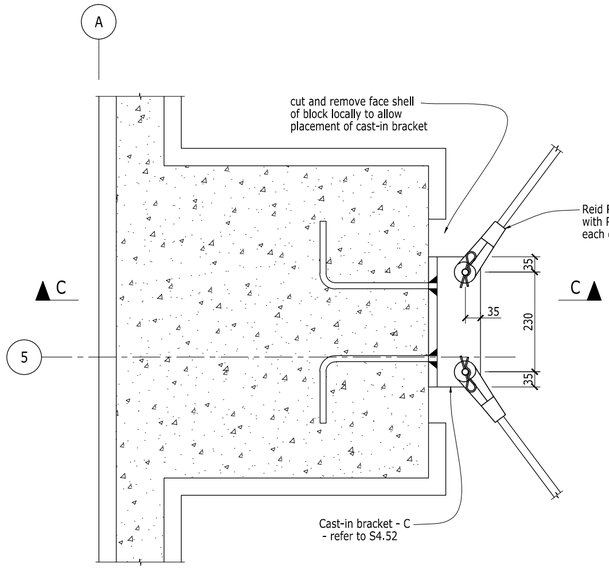
16 S4.06 DETAIL - BEAM CONNECTION
Scale: 1:10



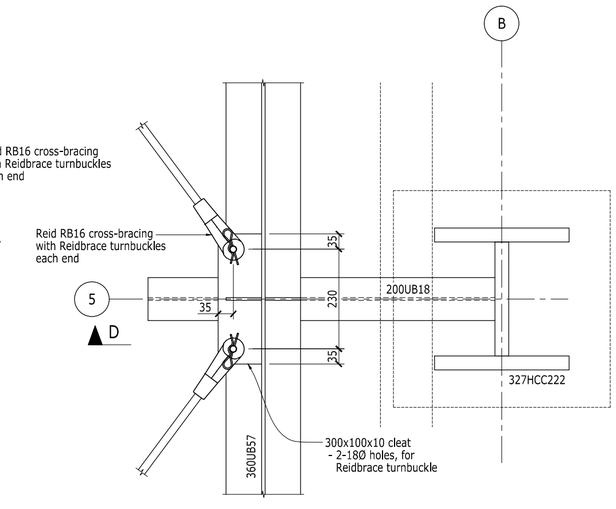
SECTION A-A
Scale: 1:10



SECTION B-B
Scale: 1:10

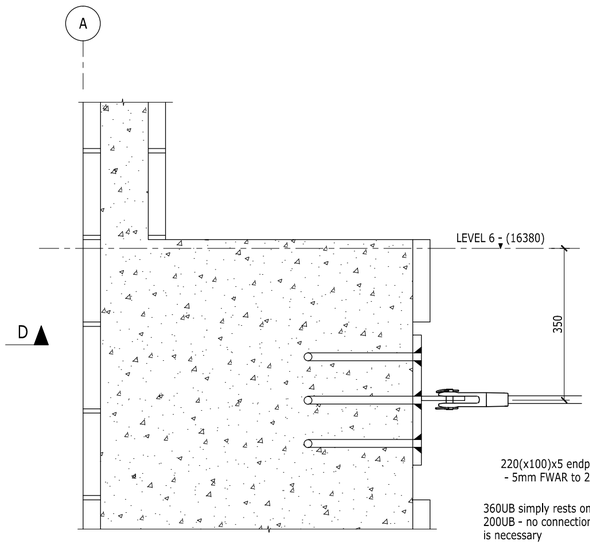


17 S4.06 DETAIL - ROD BRACING CONNECTION
Scale: 1:10

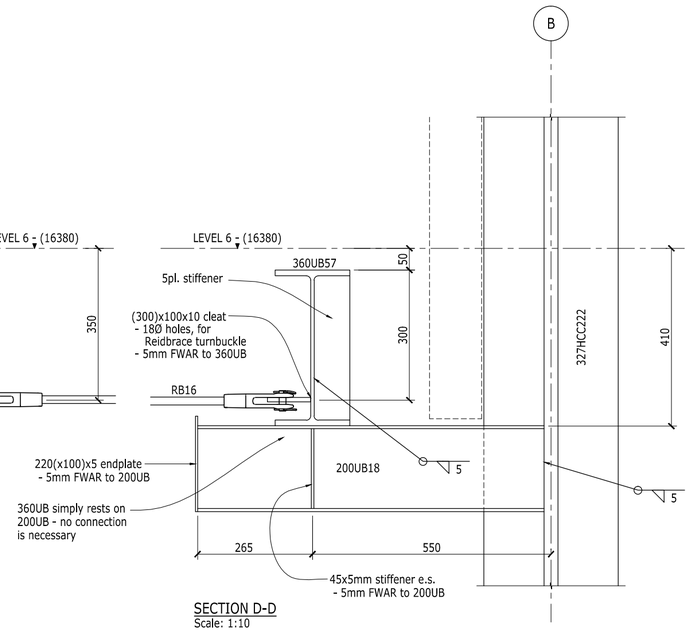


(top flange of 360UB omitted)

18 S4.06 DETAIL - ROD BRACING CONNECTION
Scale: 1:10



SECTION C-C
Scale: 1:10



SECTION D-D
Scale: 1:10

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JM	MG		1:10

client: AMC CONSTRUCTION

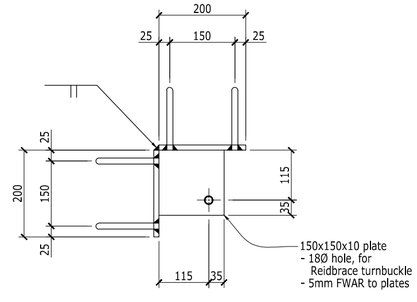
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

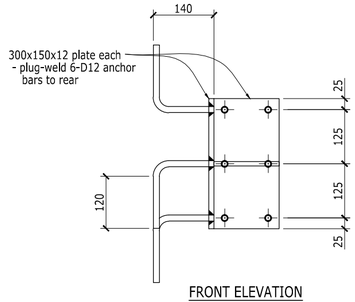
drawing title: LEVEL 6 ROOF STEELWORK

drawing no	project	issue
S4.51	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL

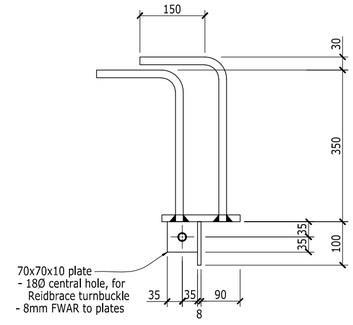


PLAN VIEW

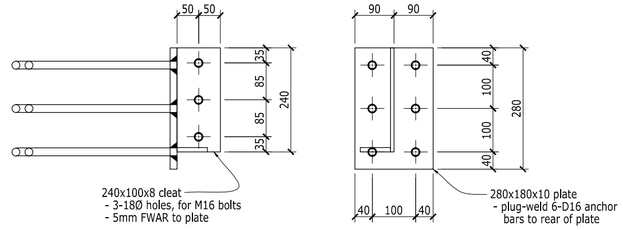


FRONT ELEVATION

CAST-IN BRACKET - A
Scale: 1:10



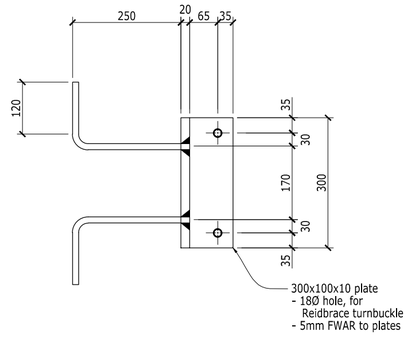
PLAN VIEW



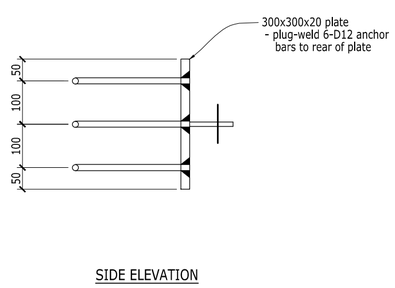
SIDE ELEVATION

FRONT ELEVATION

CAST-IN BRACKET - B
Scale: 1:10



PLAN VIEW



SIDE ELEVATION

CAST-IN BRACKET - C
Scale: 1:10

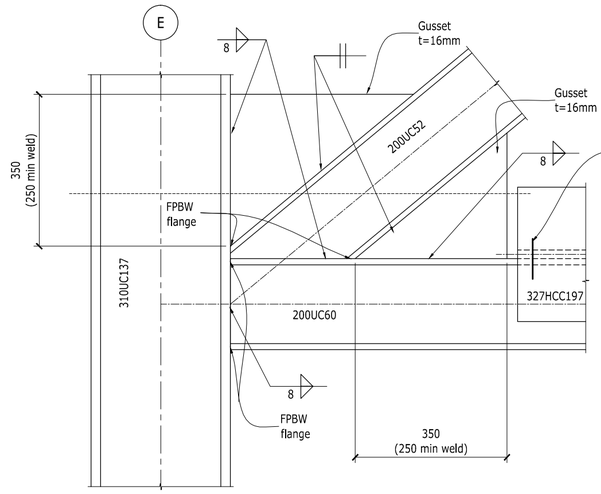
NOTE:
All cleats to be hot dip galvanised
Bend reinforcing after galvanising.

CONSTRUCTION

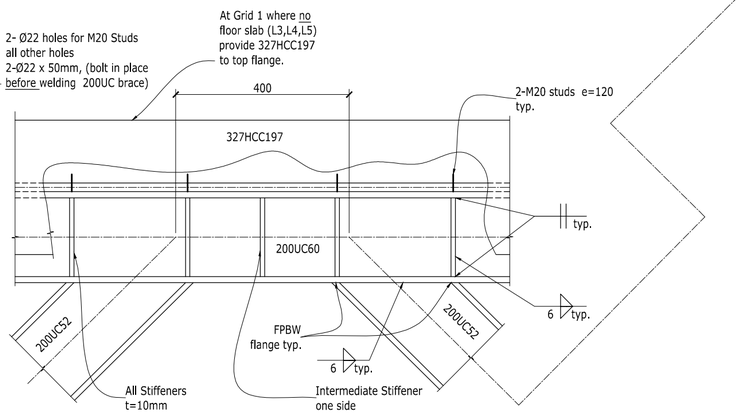
issue	description	by	appd.	date	drawn	designed	approved	scales	client	project title	drawing title	drawing no	project	issue
2	CONSTRUCTION ISSUE	JL	SG	12-12-07	JM	MG		1:10	AMC CONSTRUCTION	C1 TOWER	LEVEL 6 ROOF STEELWORK	S4.52	1770	2

structex "Giving support a whole new meaning" www.structex.co.nz

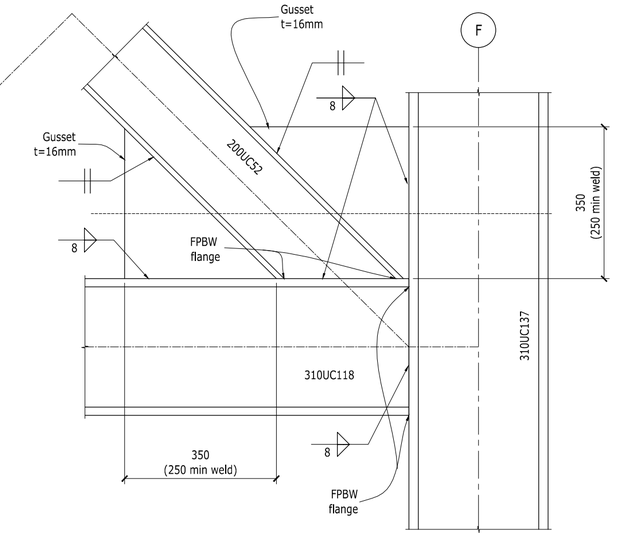
P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



A DETAIL - Level 3, Elev. Grid 1, E
Scale: 1:10



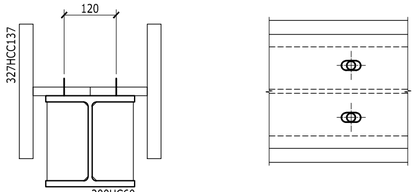
B DETAIL - Level 3, Elev. Grid 1, E-F
Scale: 1:10

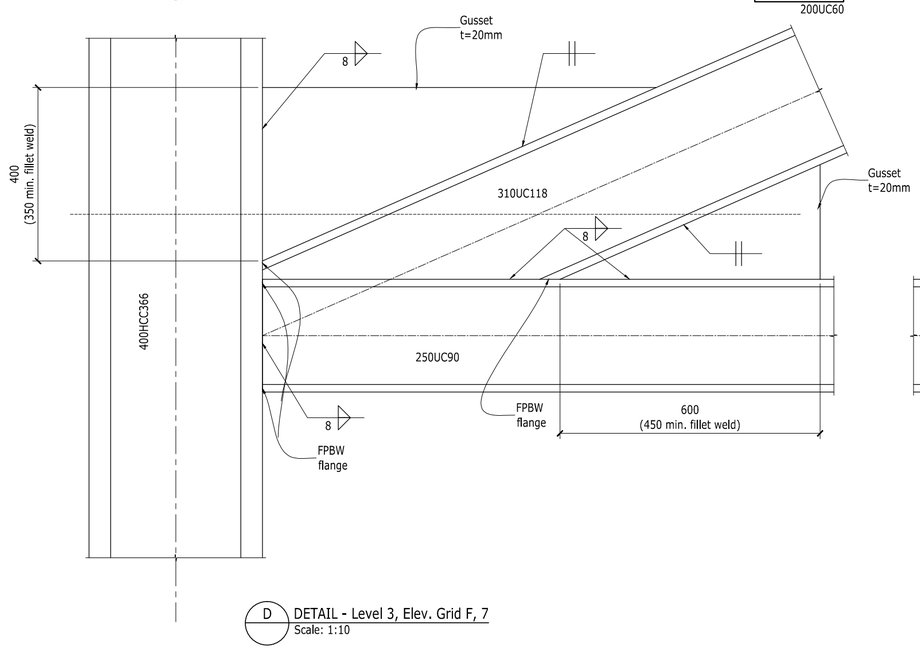


C DETAIL - Level 2, Elev. Grid 1, F
Scale: 1:10

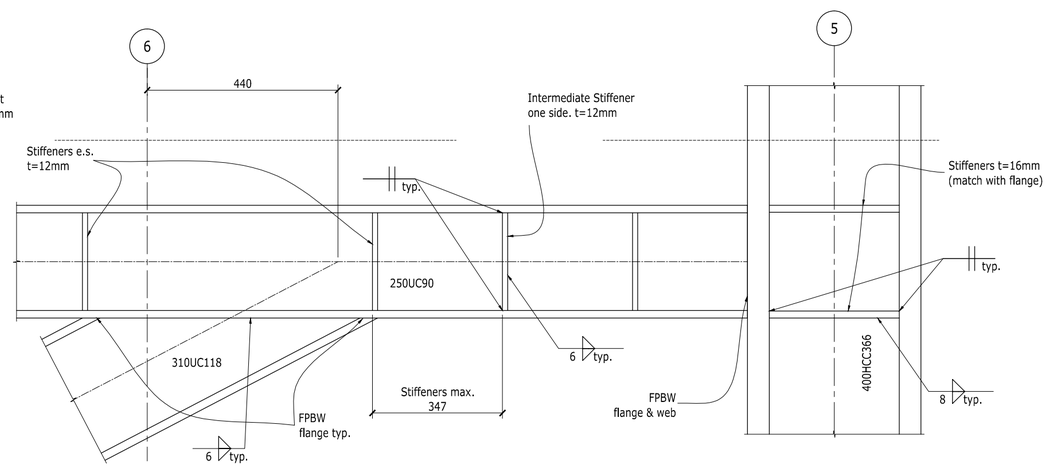
Note:
Beams perpendicular not
shown for clarity

7





D DETAIL - Level 3, Elev. Grid F, 7
Scale: 1:10



E DETAIL - Level 3, Elev. Grid F, 6
Scale: 1:10

F DETAIL - Level 3, Elev. Grid F, 5
Scale: 1:10

Note:
-Material all AS 3679/300 Plus U.N.O.
-Refer S4.70 for ative link stiffener details

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

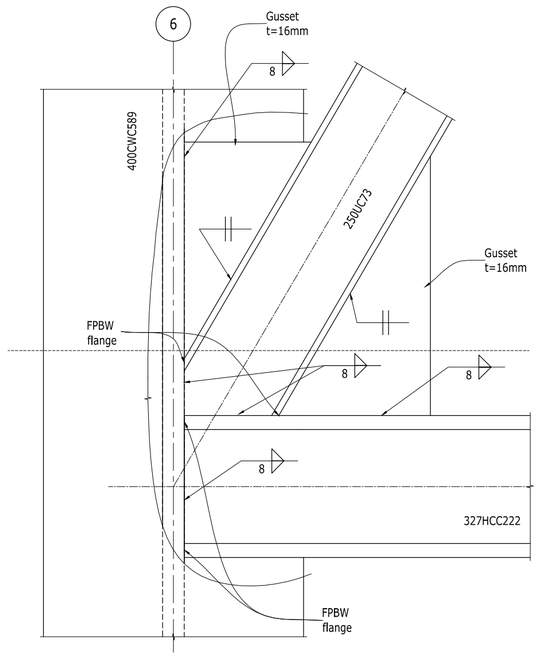
drawn	designed	approved	scales
JL	GB		1:10

client	project title
AMC CONSTRUCTION	C1 TOWER

structex
"Giving support a whole new meaning" www.structex.co.nz

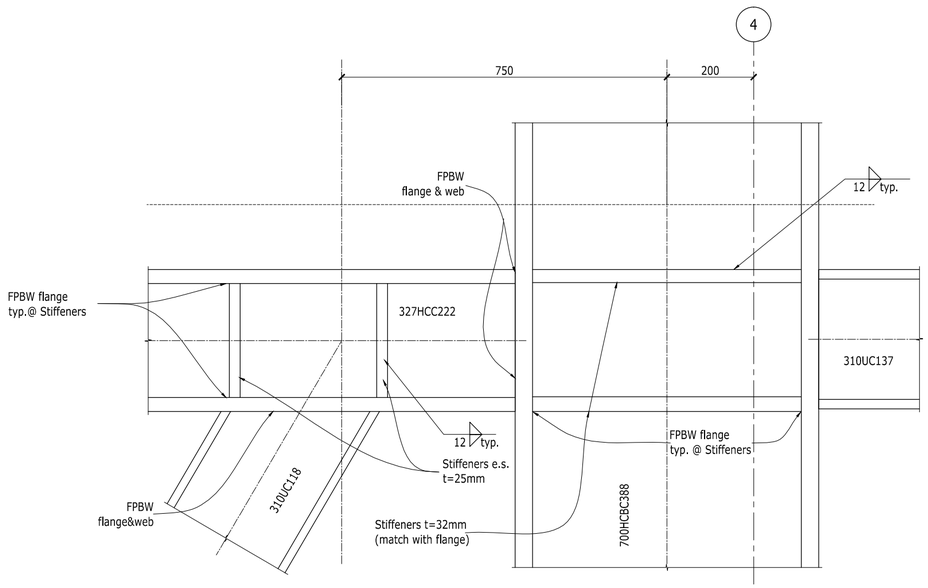
drawing title	drawing no	project	issue
STEELWORK DETAILS SHEET 1	S4.61	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



G DETAIL - Level 3, Elev. Grid C, 6
Scale: 1:10

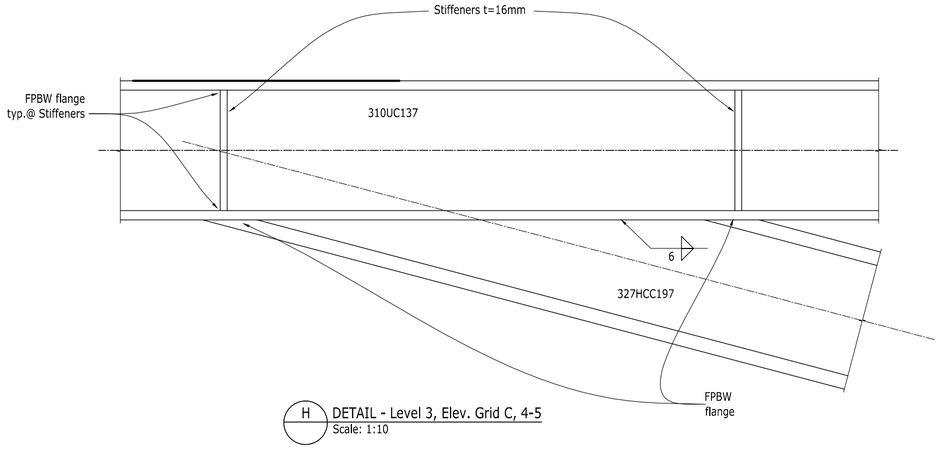
Refer also Detail A/S4.70



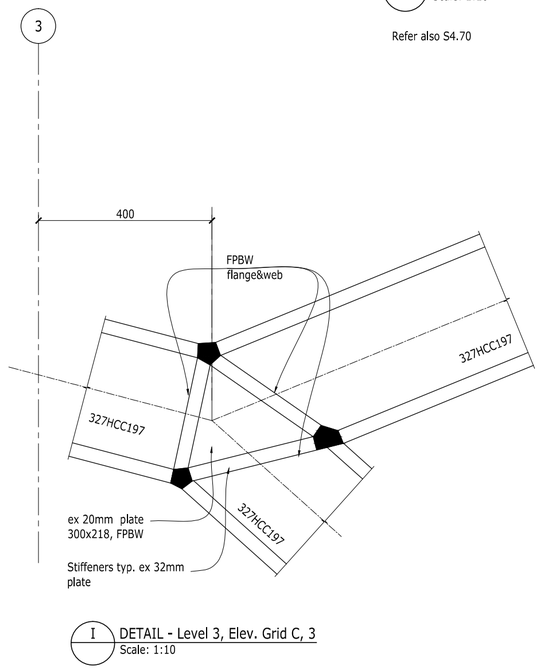
G DETAIL - Level 3, Elev. Grid C, 5
Scale: 1:10

G DETAIL - Level 3, Elev. Grid C, 4
Scale: 1:10

Refer also S4.70



H DETAIL - Level 3, Elev. Grid C, 4-5
Scale: 1:10



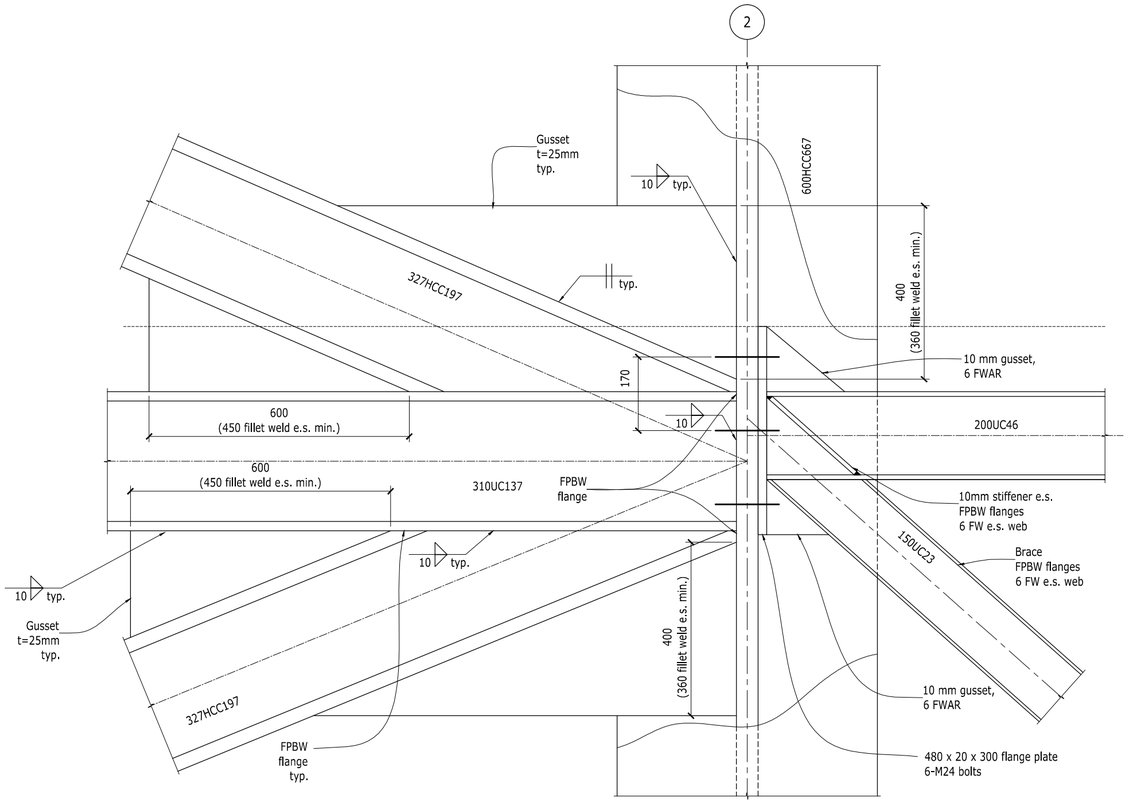
I DETAIL - Level 3, Elev. Grid C, 3
Scale: 1:10

Note:
Material all AS 3679/300 Plus

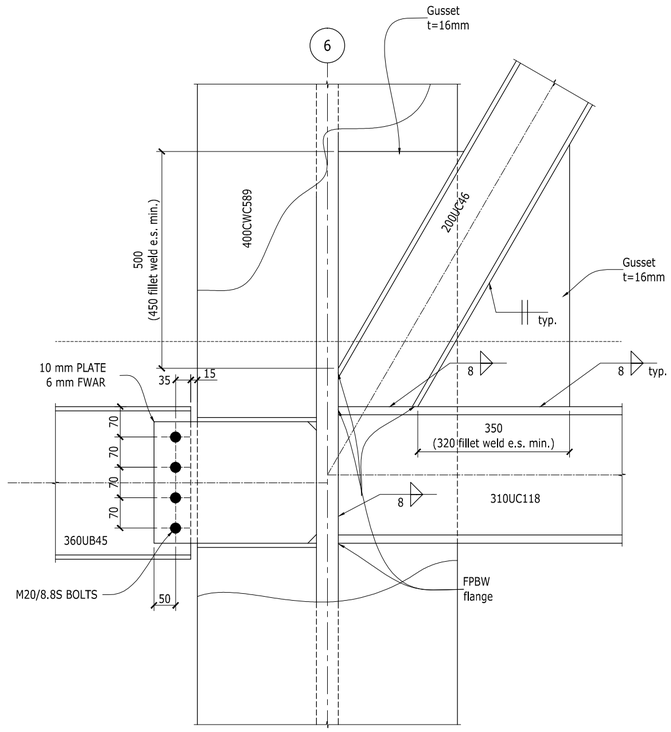
CONSTRUCTION

2 issue	CONSTRUCTION ISSUE description	JL by	SG appd.	12-12-07 date	JL drawn	GB designed	approved	1:10 scales	AMC CONSTRUCTION client	C1 TOWER project title	structex "Giving support a whole new meaning" www.structex.co.nz	STEELWORK DETAILS SHEET 2 drawing title	S4.62 drawing no	project 1770 / 2 issue

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL

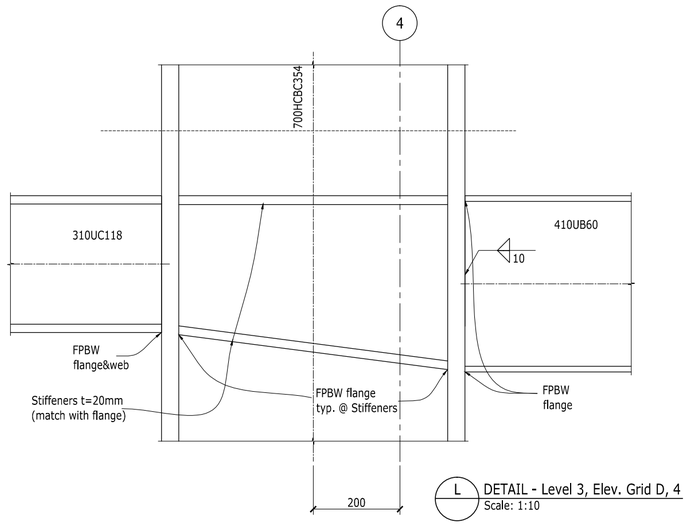


J DETAIL - Level 3, Elev. Grid C, 2
Scale: 1:10



K DETAIL - Level 3, Elev. Grid D, 6
Scale: 1:10

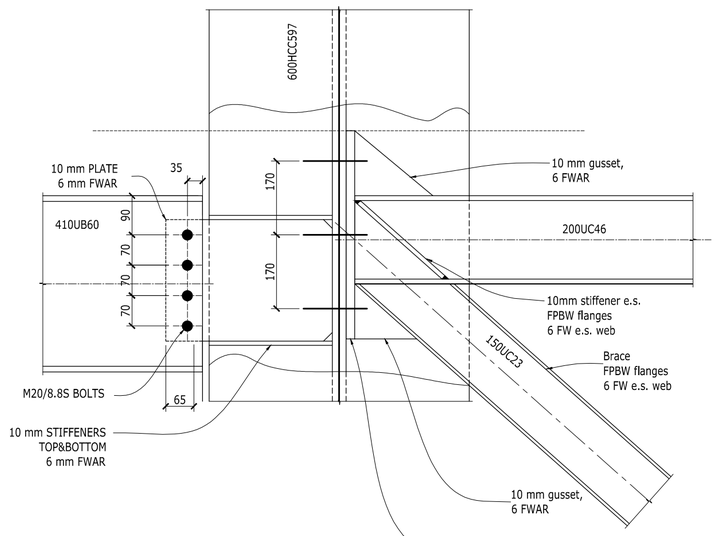
Refer also Detail A / S4.70



L DETAIL - Level 3, Elev. Grid D, 4
Scale: 1:10

Refer also S4.70

Note:
Beams perpendicular not
shown for clarity



M DETAIL - Level 3, Elev. Grid D, 2
Scale: 1:10

Note:
Material all AS 3679/300 Plus

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10

client: AMC CONSTRUCTION

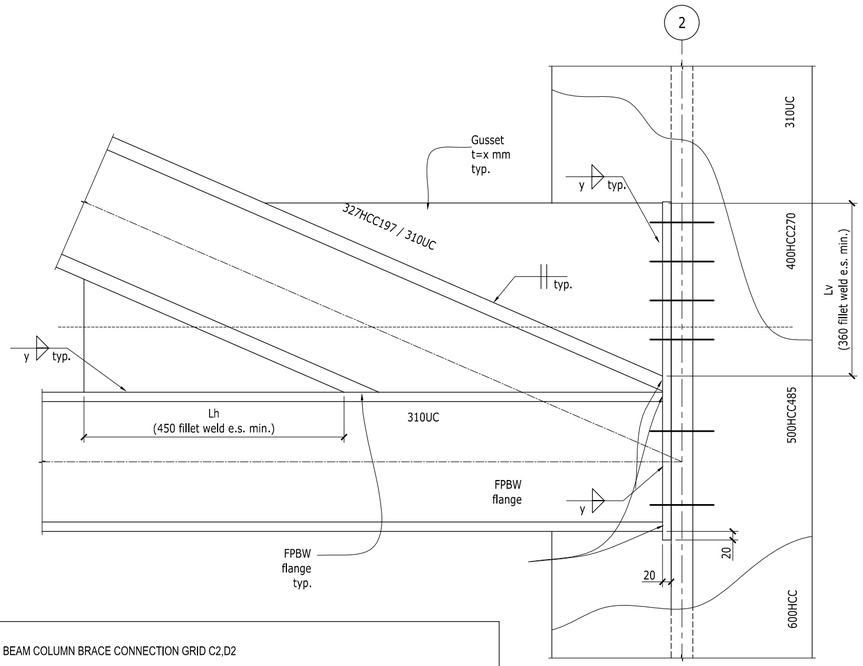
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

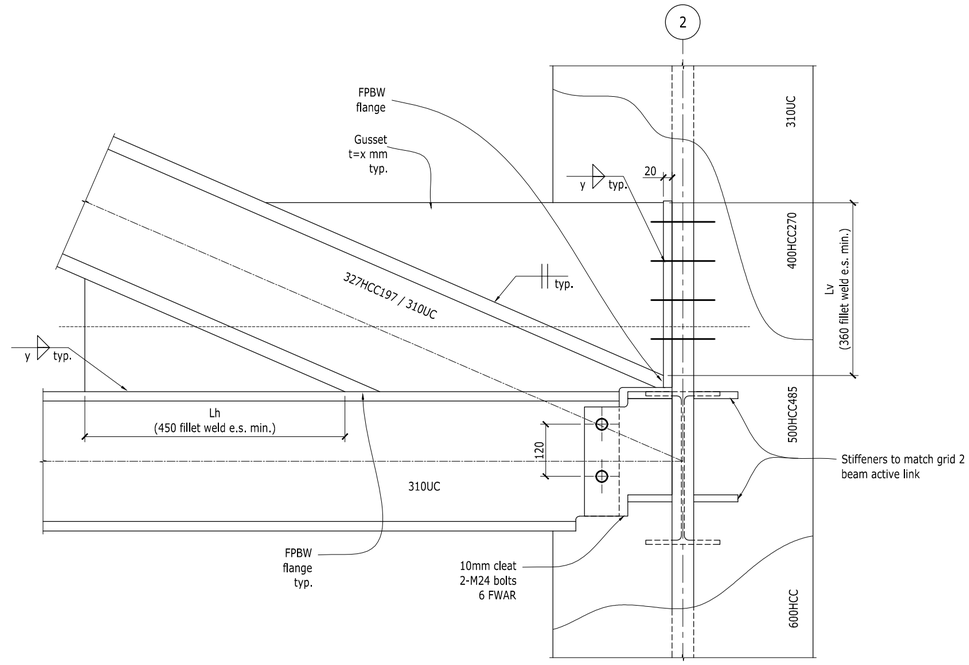
drawing title: STEELWORK DETAILS SHEET 3

drawing no	project	issue
S4.63	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



N DETAIL - Level 3+, Elev. Grid C, 2 ; D, 2
Scale: 1:10



O DETAIL - Level 7-21, Elev. Grid C, 2 (where there are column stiffeners)
Scale: 1:10

Note: Gusset
Material all AS 3679/ G300

BEAM COLUMN BRACE CONNECTION GRID C2,D2

BRACE	GUSSET THICKNESS x	Lv	Lh	FILLET WELD SIZE y	Endplate	Bolts
327HCC197	25	400 (10fw)	600 (10fw)	10	310x20	12-M24
310UC	20	400 (9fw)	600 (9fw)	9	310x20	12-M24

Note:
Material all AS 3679/300 Plus

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10

client: AMC CONSTRUCTION

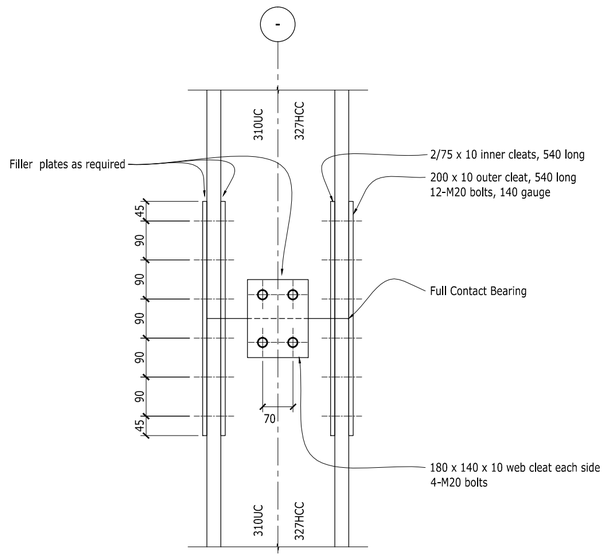
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

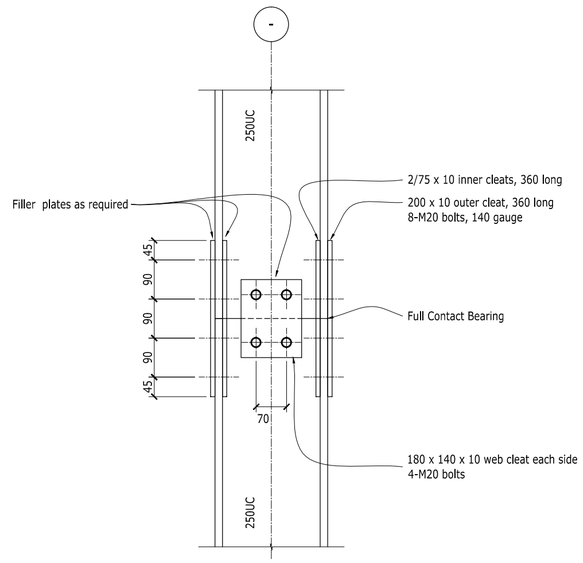
drawing title: STEELWORK DETAILS SHEET 4

drawing no	project	issue
S4.64	1770	2

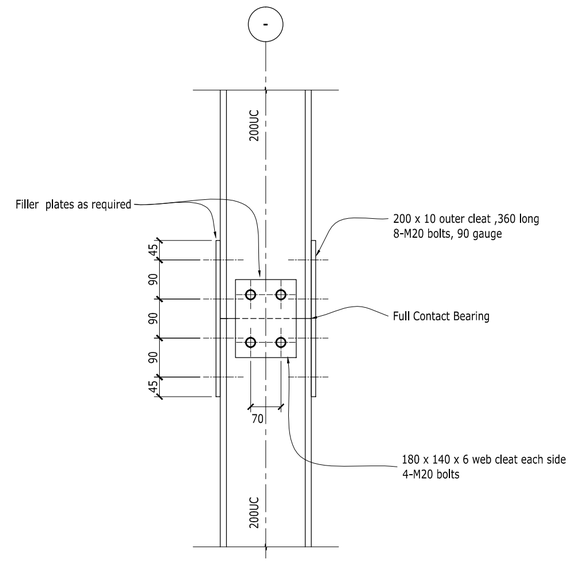
P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



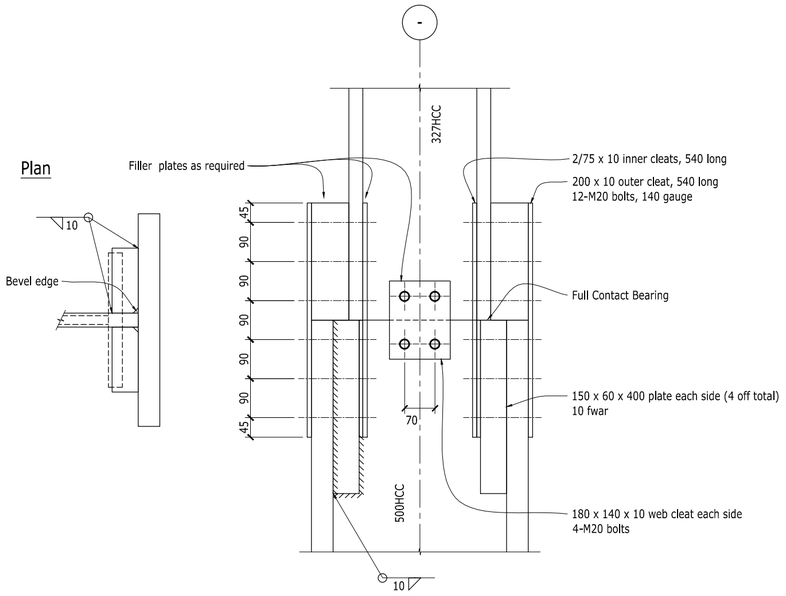
A 327HCC / 310UC Column Splice
Scale: 1:10



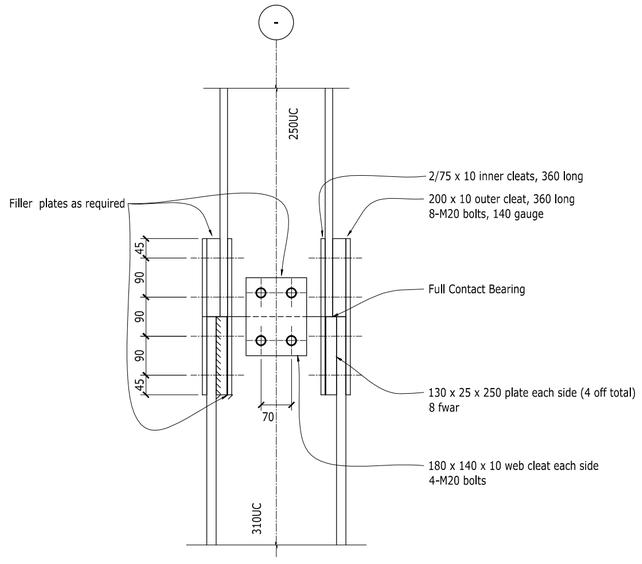
B 250 UC Column Splice
Scale: 1:10



C 200UC Column Splice
Scale: 1:10

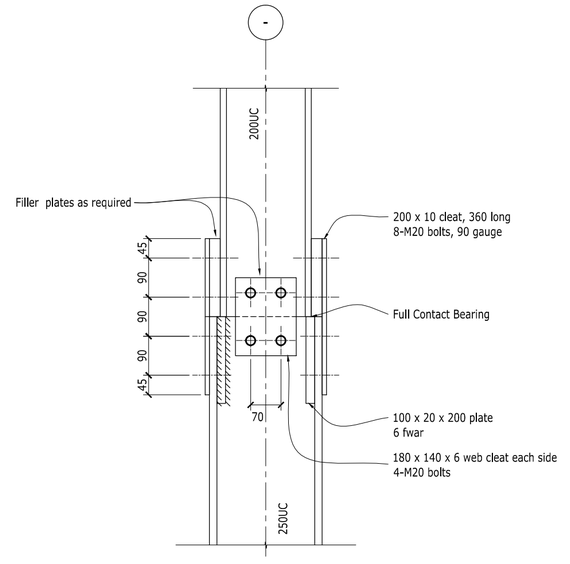


D 500HCC-327HCC Column Splice
Scale: 1:10



E 310UC-250UC Column Splice
Scale: 1:10

Note:
Material all AS 3679/300 Plus



F 250UC-200UC Column Splice
Scale: 1:10

GRAVITY COLUMN SPLICE ONLY

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10

client: AMC CONSTRUCTION

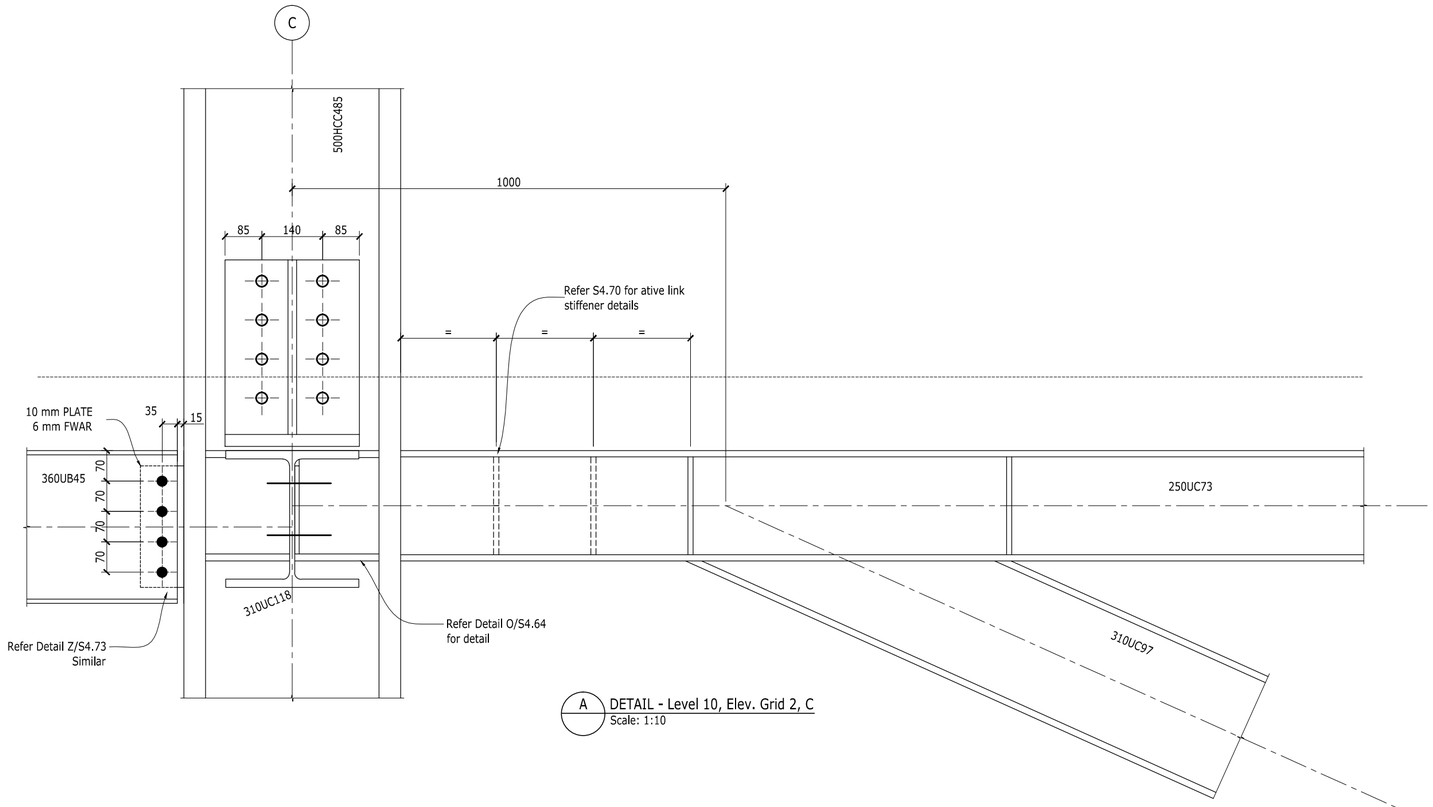
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

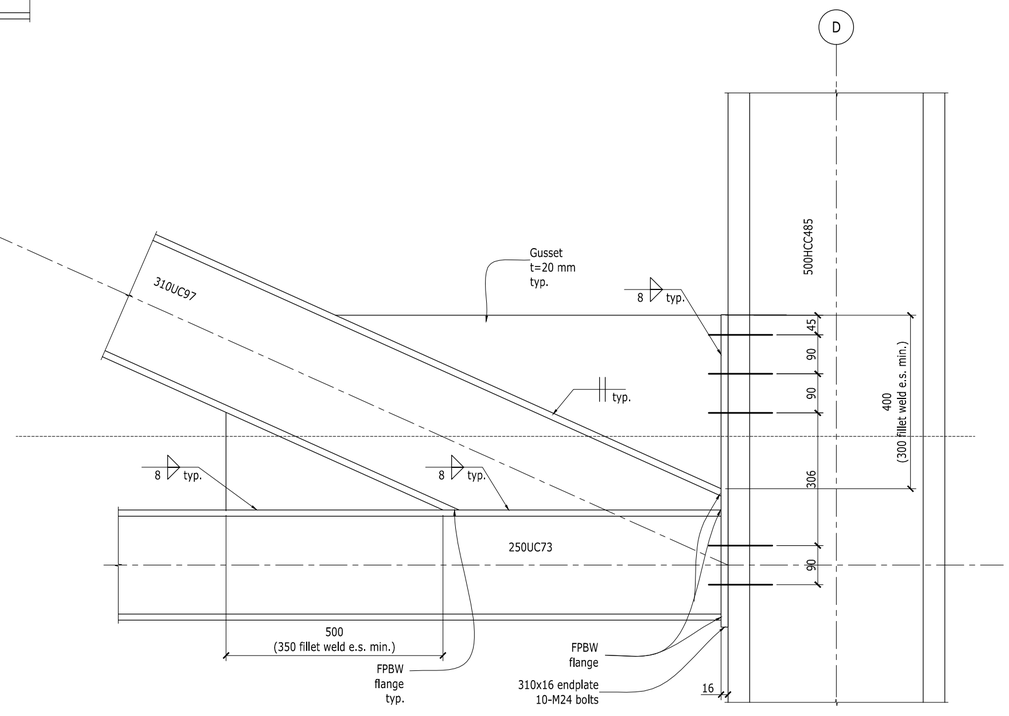
drawing title: STEELWORK DETAILS SHEET 5

drawing no	project	issue
S4.65	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



A DETAIL - Level 10, Elev. Grid 2, C
Scale: 1:10



B DETAIL - Level 9, Elev. Grid 2, D
Scale: 1:10

Note:
Material all AS 3679/300 Plus

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10

client: AMC CONSTRUCTION

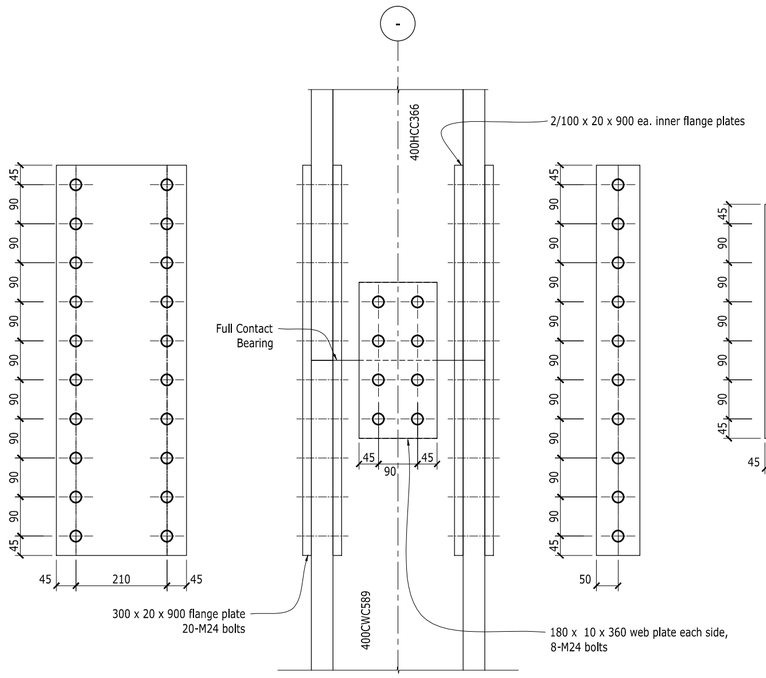
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

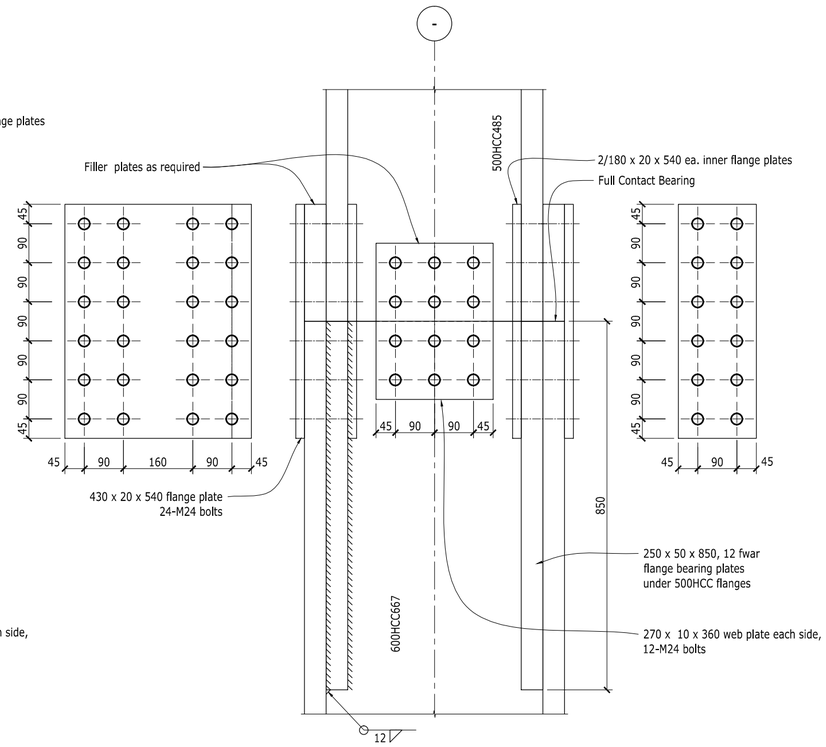
drawing title: STEELWORK DETAILS SHEET 6

drawing no	project	issue
S4.66	1770	2

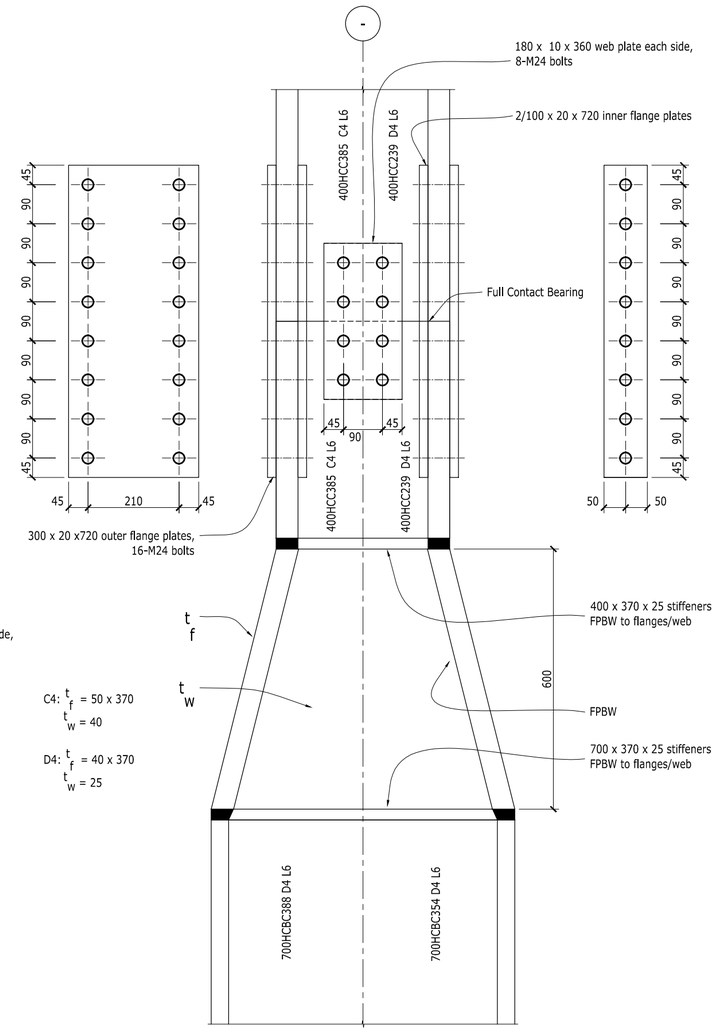
P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



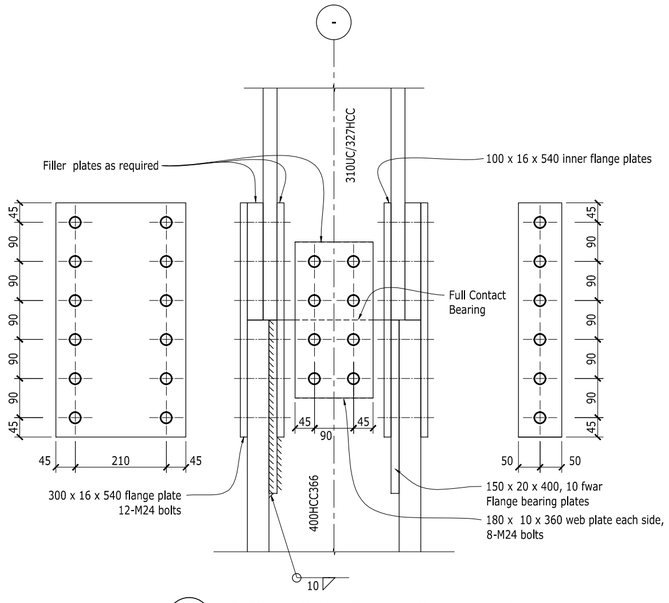
A 400HCC-400CWC Seismic Column Splice Grid Grid C6/D6 @Level 6
Scale: 1:10



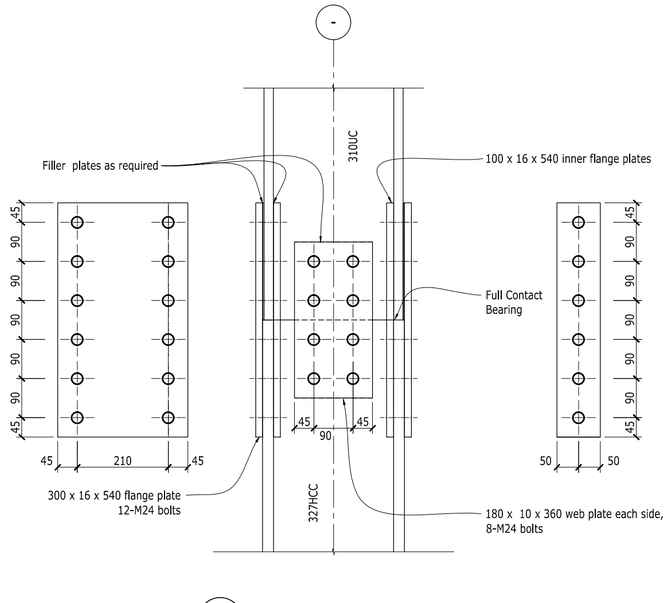
B 600HCC-500HCC Seismic Column Splice Grid C2/D2 @Level 6
Scale: 1:10



E 700HCB-400HCC Seismic Column Splice Grid Grid C4/D4 @Level 6
Scale: 1:10



C 400HCC-310UC/327HCC Seismic Column Splice Grid F
Scale: 1:10



D 310UC-327HCC Seismic Column Splice
Scale: 1:10

Note:
Material all AS 3679/300 Plus

SEISMIC COLUMN SPLICE

CONSTRUCTION

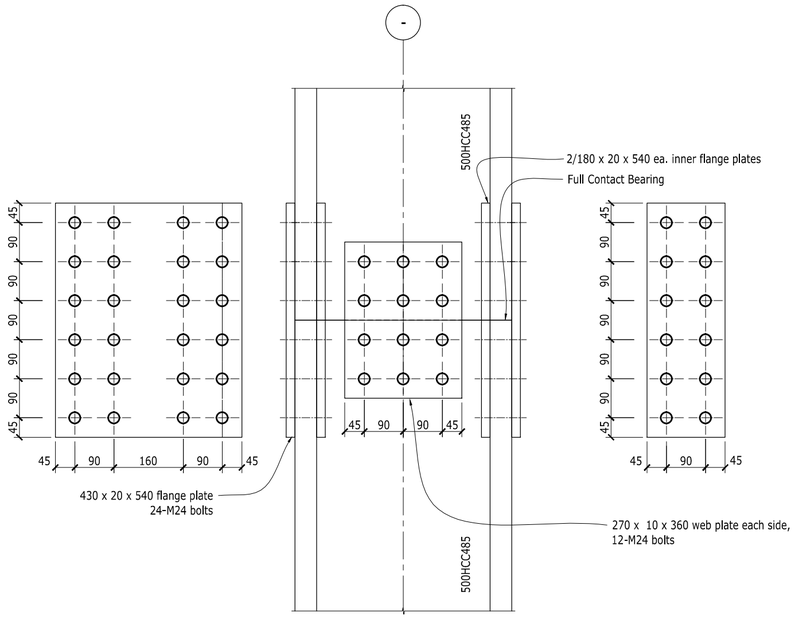
issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10

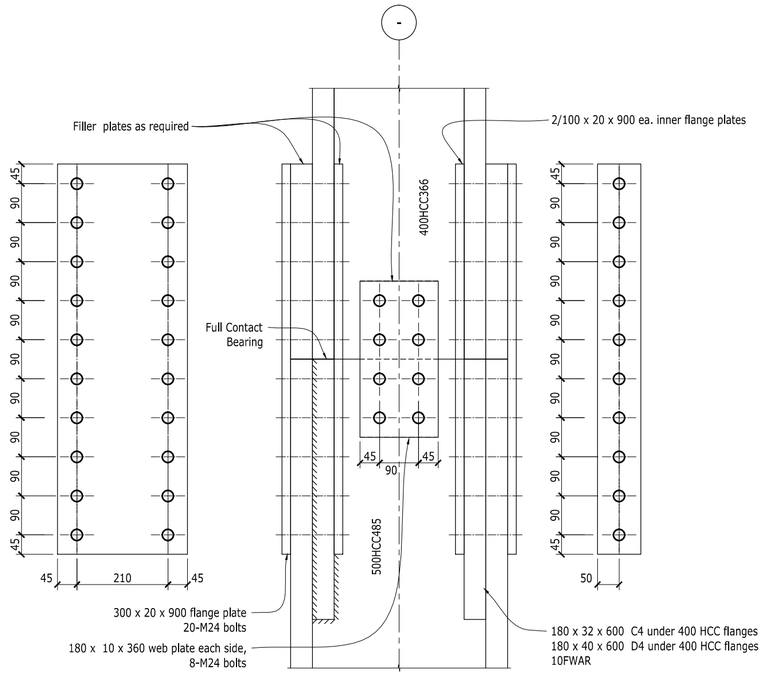
client	project title
AMC CONSTRUCTION	C1 TOWER

structex
"Giving support a whole new meaning" www.structex.co.nz

drawing title	drawing no	project	issue
STEELWORK DETAILS SHEET 7	S4.67	1770	2

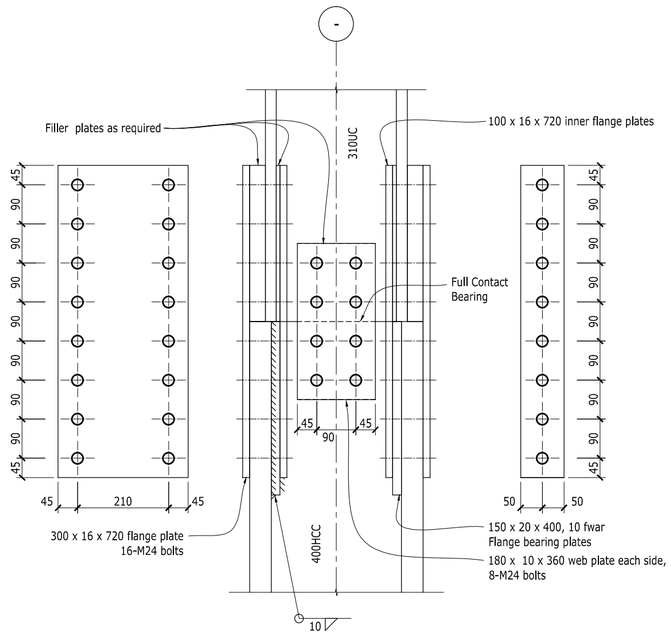


F 500HCC485 Seismic Column Splice Grid C2/D2
Scale: 1:10



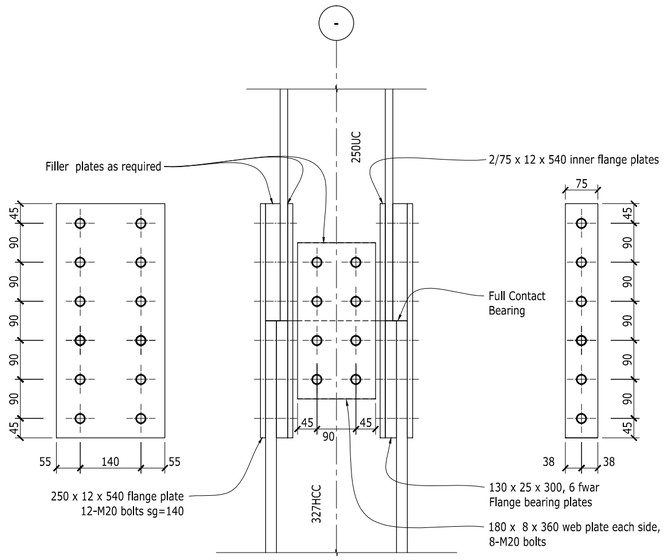
Other 400HCC column splices similar
(no bearing or filler plates)

G 500HCC485-400HCC Seismic Column Splice Grid C2/D2
Scale: 1:10



Other / all 310UC & 327HCC column splices
above similar (no flange bearing plates)

H 400HCC-310UC Seismic Column Splice Grid C/D
Scale: 1:10



250UC column splices similar
(no flange bearing or filler plates)

I 327HCC - 250UC Seismic Column Splice
Scale: 1:10

SEISMIC COLUMN SPLICE

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10

client	project title
AMC CONSTRUCTION	C1 TOWER

structex
"Giving support a whole new meaning" www.structex.co.nz

drawing title	drawing no	project	issue
STEELWORK DETAILS SHEET 8	S4.68	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL

3 3' 2 1

(725)

400

2160

100x100x10 EA fly brace, 2-M20 Bolts each end

100x100x10 EA

FPBW flange&web

327HCC197

10mm stiffeners / cleat to line up with floor beam. 6 fwar

ex 20mm plate 300x218, FPBW

Stiffeners typ. ex 32mm plate

310UB40

Gusset t=25mm

Brace

600

FPBW flange typ.

310UC137

10

170

400

600HCC667

10 mm gusset, 6 FWAR

480 x 20 x 300 flange plate 6-M24 bolts

B DETAIL - Level 3, Elev. Grid C,2
Scale: 1:10

150UC23

200UC46

10mm stiffener e.s. FPBW flanges 6 FW e.s. web

Brace FPBW flanges 6 FW e.s. web

FPBW flange&web

LEVEL 3 - (7200)

C DETAIL - Level 3, Elev. Grid C,1
Scale: 1:10

10 mm PLATE 6 mm FWAR

85 10

35 35

70 70 70

M20/8.8S BOLTS

69 95

10mm stiffeners / cleat 6 fwar

90

45°

100x100x10 EA

A DETAIL-Elev. - Level 2-3&2-1, Elev. Grid 3',C
Scale: 1:10

LEVEL 2 - (3600)

150

460UB67

E DETAIL - Level 2, Elev. Grid C,1
Scale: 1:10

D DETAIL - Level 2, Elev. Grid C,2
Scale: 1:10

Note:
Material all AS 3679/300 Plus

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10

client: AMC CONSTRUCTION

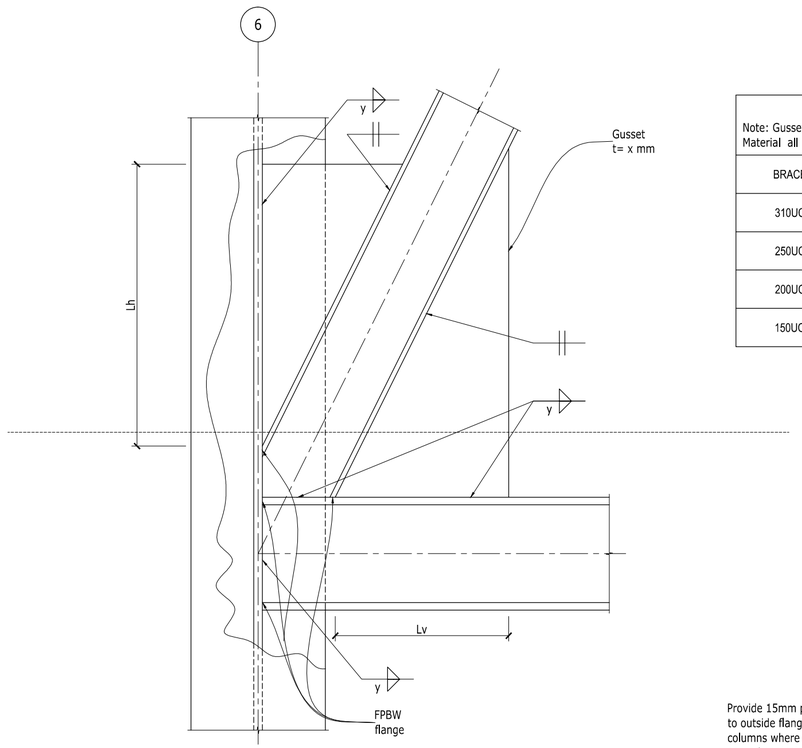
project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

drawing title: STEELWORK DETAILS SHEET 9

drawing no	project	issue
S4.69	1770	2

P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



A DETAIL - Level All, Elev. Grid C,6 & D,6
Scale: 1:10

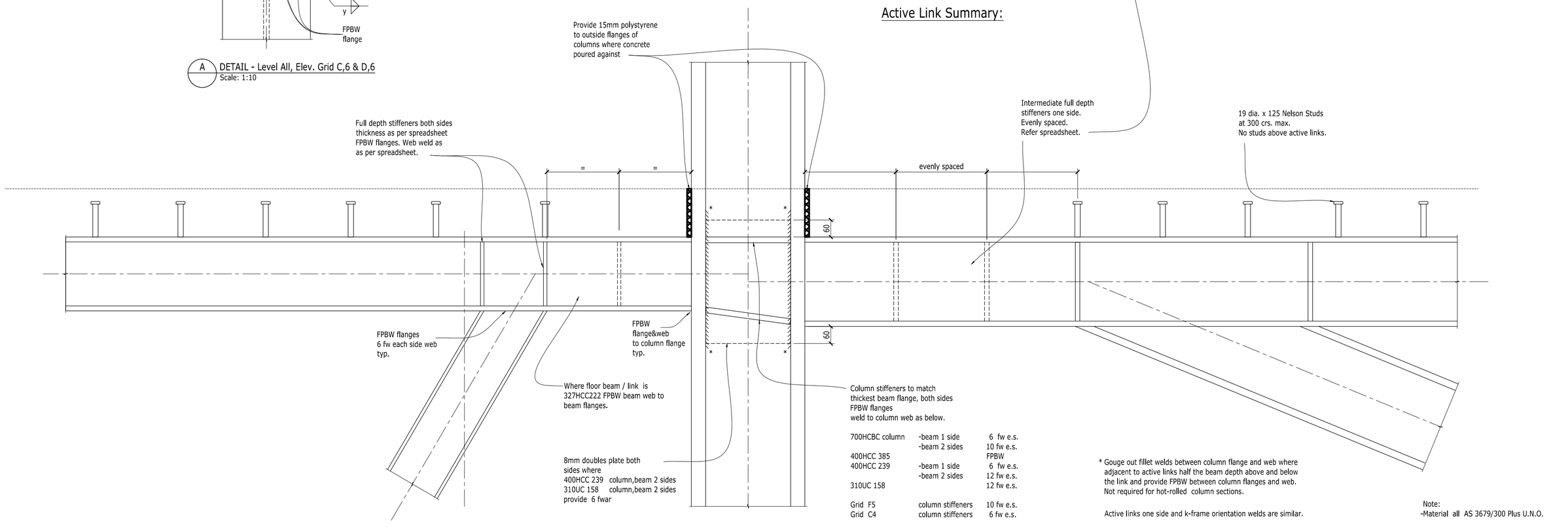
Note: Gusset
Material all AS 3679/ G300

BEAM COLUMN BRACE CONNECTION GRID C6,D6

BRACE	GUSSET THICKNESS x	Lv	Lh	FILLET WELD SIZE y
310UC	20	800	400	9
250UC	16	650	400	8
200UC	16	400	220	8
150UC	12	320	200	6

ACTIVE LINK - INTERMEDIATE STIFFENERS (ONE SIDE)

ACTIVE LINK SIZE	STIFFENER THICKNESS(mm)	FILLET WELD WEB	d(b)	t(wb)	MAX SPACING OF INTERMEDIATE STIFFENERS (mm)
200UC 46	10	6	203	7.3	237
200UC 52	10	6	206	8	263
200UC 60	10	6	210	9.3	311
250UC 73	12	6	254	8.6	276
250UC 89	12	6	260	10.5	347
310UC 118	16	8	315	11.9	389
310UC 137	16	8	321	13.8	460
310UC 158	16	8	327	15.7	531
327HCC 222	25	12	327	32	1151



Active Link Summary:

* Gouge out fillet welds between column flange and web where adjacent to active links half the beam depth above and below the link and provide FPBW between column flanges and web. Not required for hot-rolled column sections.

Active links one side and k-frame orientation welds are similar.

Note:
-Material all AS 3679/300 Plus U.N.O.

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10

client: AMC CONSTRUCTION

project title: C1 TOWER

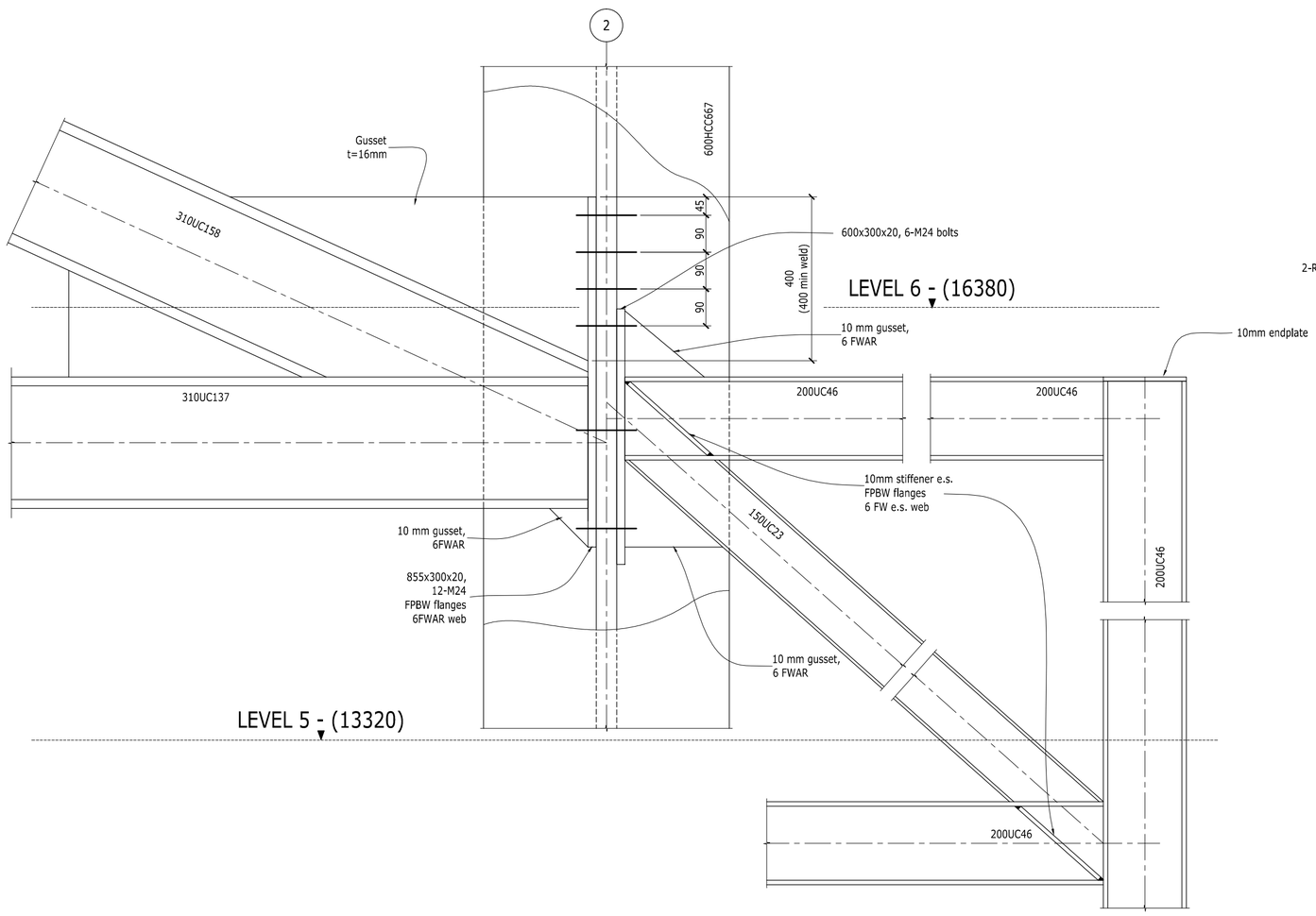
structex
"Giving support a whole new meaning" www.structex.co.nz

drawing title: STEELWORK DETAILS SHEET 10

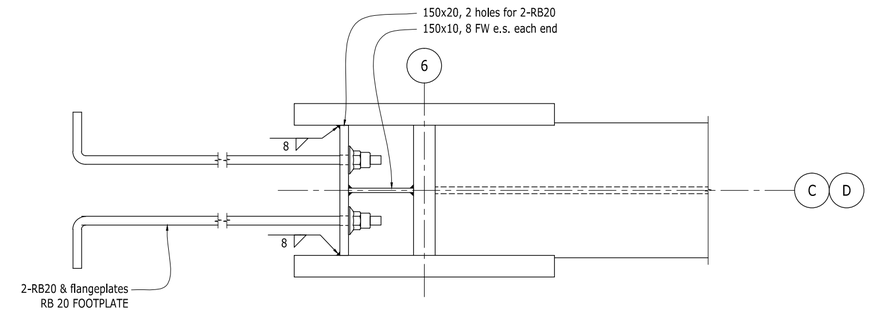
drawing no: S4.70

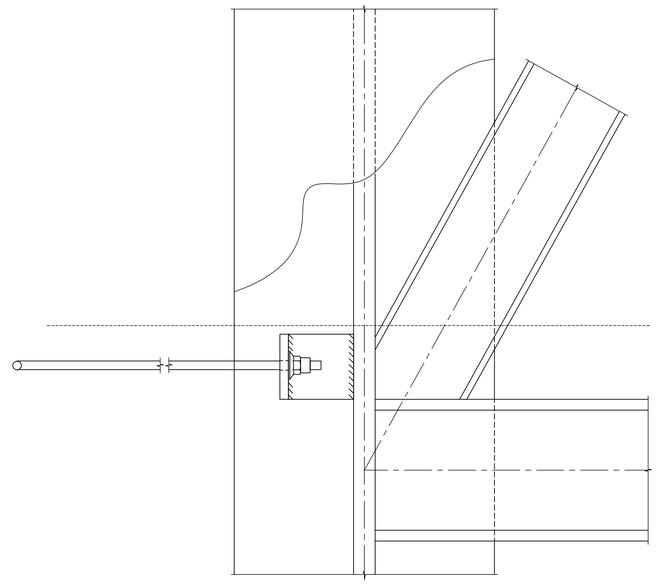
project: 1770

issue: 2



A DETAIL - Level 5-6, Elev. Grid C2/D2
Scale: 1:10





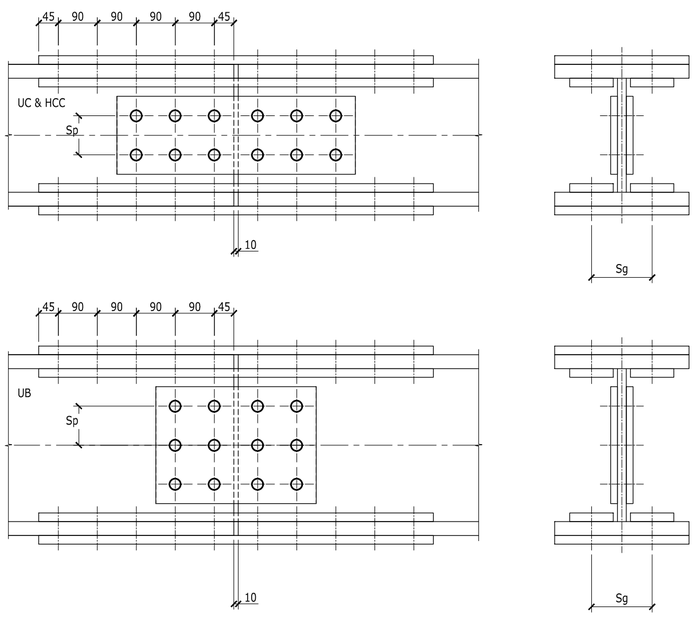
B DETAIL - Level ALL, Elev. Grid C6, D6
Scale: 1:10

Note:
Material all AS 3679/300 Plus

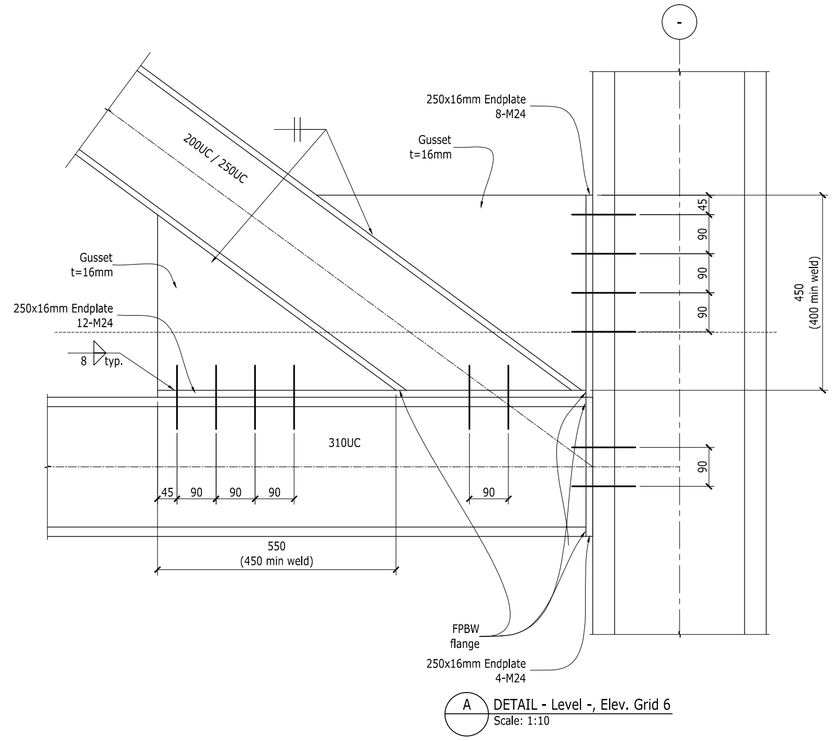
CONSTRUCTION

issue	description	by	appd.	date	drawn	designed	approved	scales	client	project title	drawing title	drawing no	project / issue
2	CONSTRUCTION ISSUE	JL	SG	12-12-07	JL	GB		1:10	AMC CONSTRUCTION	C1 TOWER	STEELWORK DETAILS SHEET 11	S4.71	1770 / 2

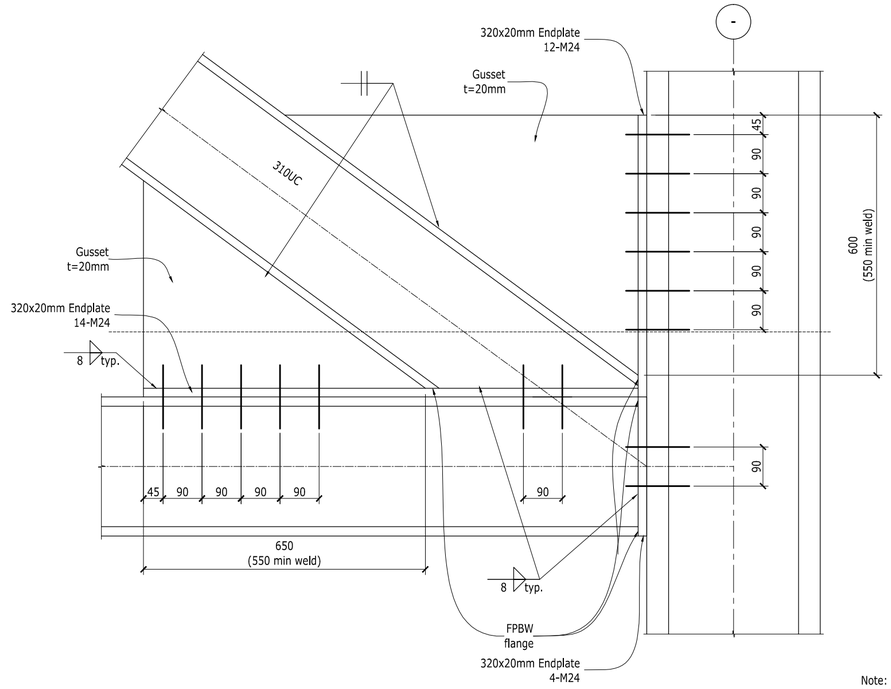
structex "Giving support a whole new meaning" www.structex.co.nz



BEAM / BRACE SPLICE SUMMARY				
Beam/Brace	Flange plates (top+bottom)	Web plates (each side)	Sp	Sg
410UB	180X10,730long,16-M20 2/75 x 10, 730 long	270 x 10, 370 long, 12-M20	90	90
360UB	180X10,730long,16-M20 2/75 x 10, 730 long	270 x 10, 370 long, 12-M20	90	90
327HCC197	300 x 20, 910 long, 20-M24 2/100 x 20, 910 long	200 x 16, 550 long, 12-M24	90	140
310UC158	300 x 16, 730 long, 16-M24 2/100 x 16, 730 long	200 x 12, 370 long, 8-M24	90	140
310UC137	300 x 16, 730 long, 16-M24 2/100 x 16, 730 long	180 x 12, 370 long, 8-M24	90	140
310UC118	300 x 16, 550 long, 12-M24 2/100 x 12, 550 long	180 x 10, 370 long, 8-M24	90	140
310UC96	300 x 12, 550 long, 12-M24 2/100 x 12, 550 long	180 x 10, 370 long, 8-M24	90	140
250UC89	250 x 12, 550 long, 12-M20 2/75 x 12, 550 long	180 x 8, 370 long, 8-M20	90	140
250UC73	250 x 10, 550 long, 12-M20 2/75 x 10, 550 long	180 x 8, 370 long, 8-M20	90	140
200UC60	200 x 10, 550 long, 12-M20 2/75 x 10, 550 long	150 x 8, 370 long, 8-M20	70	110
200UC52	200 x 10, 550 long, 12-M16 2/75 x 10, 550 long	150 x 8, 370 long, 8-M16	70	110
200UC46	200 x 10, 550 long, 12-M16 2/75 x 10, 550 long	150 x 8, 370 long, 8-M16	70	110
150UC37	150 x 12, 730 long, 16-M16 No inner flange plate.	120 x 6, 370 long, 8-M16	60	90



A DETAIL - Level -, Elev. Grid 6
Scale: 1:10



B DETAIL - Level -, Elev. Grid 6
Scale: 1:10

Note:
Material all AS 3679/300 Plus

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10

client: AMC CONSTRUCTION

project title: C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

drawing title: STEELWORK DETAILS SHEET 12

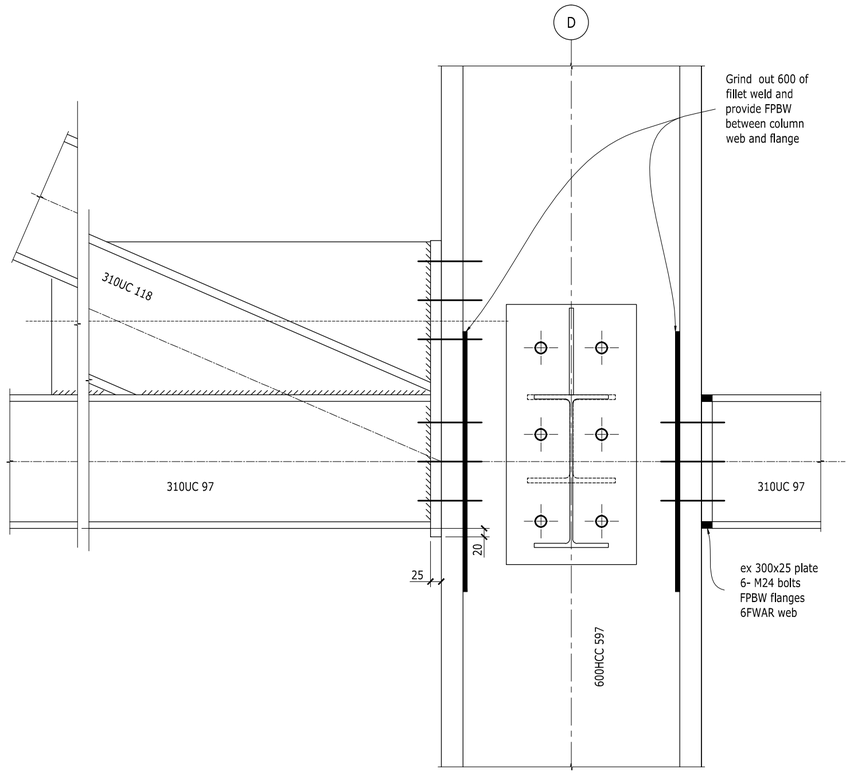
drawing no: S4.72

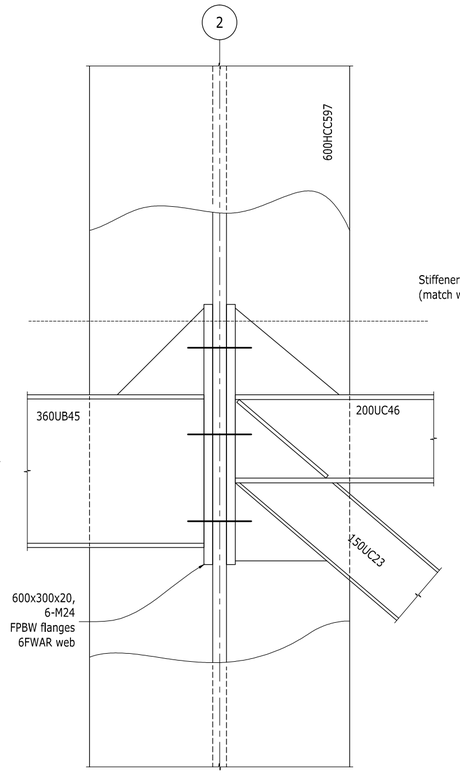
project: 1770

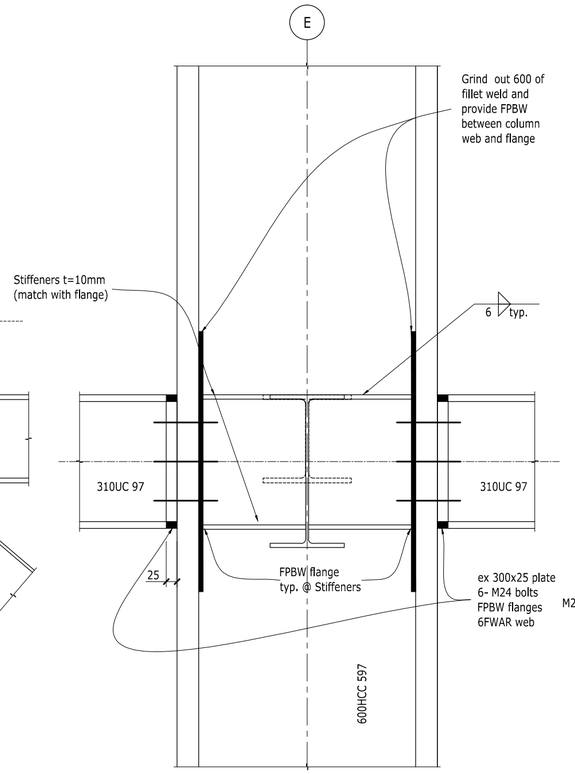
issue: 2

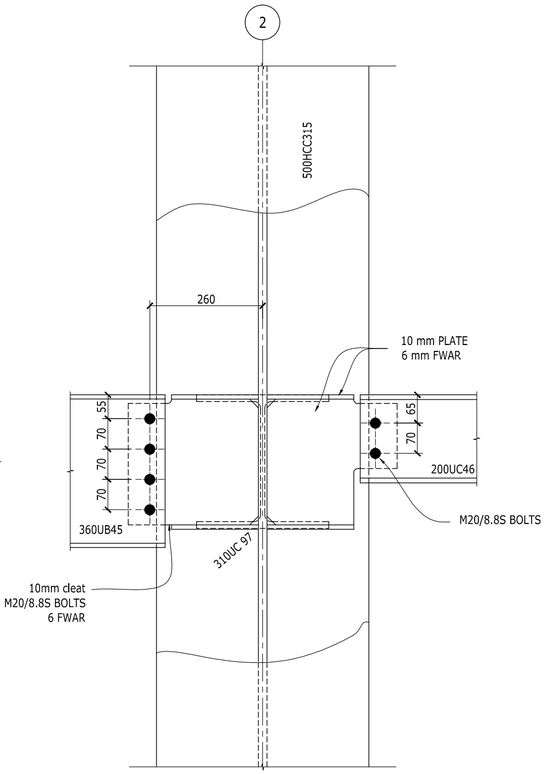
P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL

Note:
Material all AS 3679/300 Plus

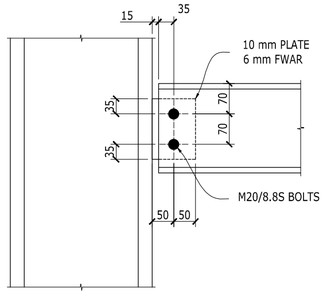






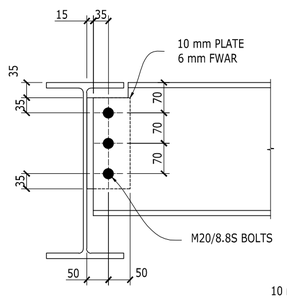


A DETAIL - Level 6, Elev. Grid 2, D
Scale: 1:10

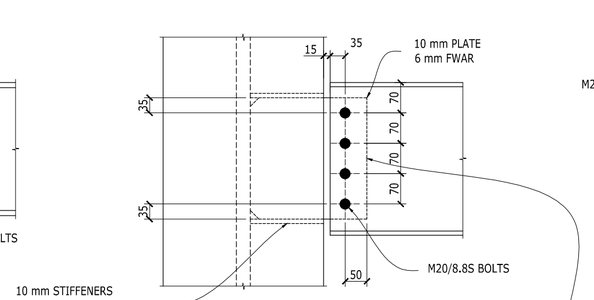


X TYPICAL BEAM-COLUMN FLANGE (200 UB SHOWN)
Scale: 1:10

A' DETAIL - Level 6, Elev. Grid D, 2
Scale: 1:10



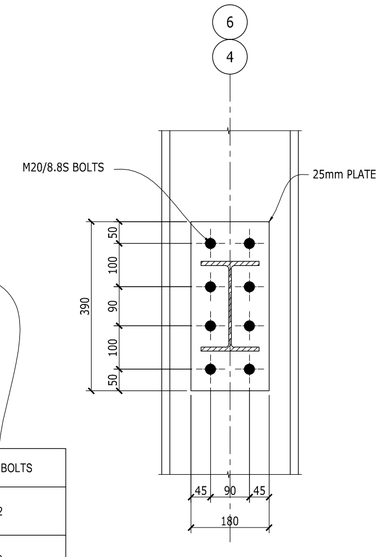
Y TYPICAL BEAM-BEAM (310 UB SHOWN)
Scale: 1:10



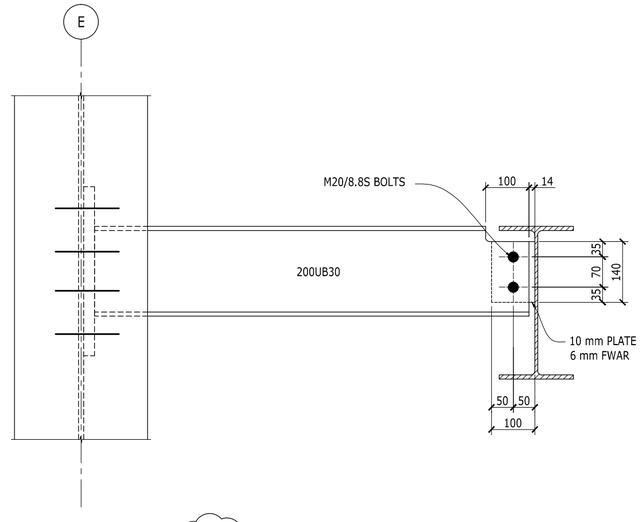
Z TYPICAL BEAM-COLUMN WEB (360 UB SHOWN)
Scale: 1:10

BEAM SIZE	No. OF BOLTS
200UC	2
310UC	3
360UC	4

B DETAIL - Level 6, Elev. Grid 2, E
Scale: 1:10



B' DETAIL - Level 6, Elev. Grid E, 2
Scale: 1:10



C' DETAIL - Levels 12-14 Elev. Grid E, 4 & 6
Scale: 1:10

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

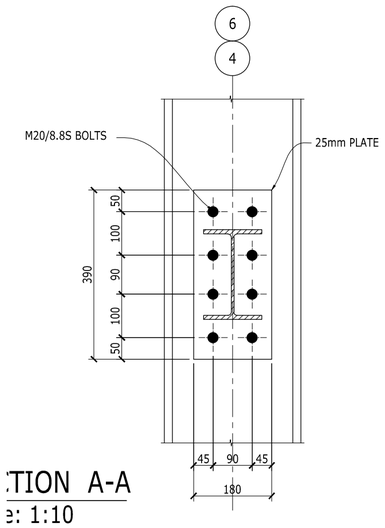
drawn	designed	approved	scales
JL	SG		1:10

client	project title
AMC CONSTRUCTION	C1 TOWER

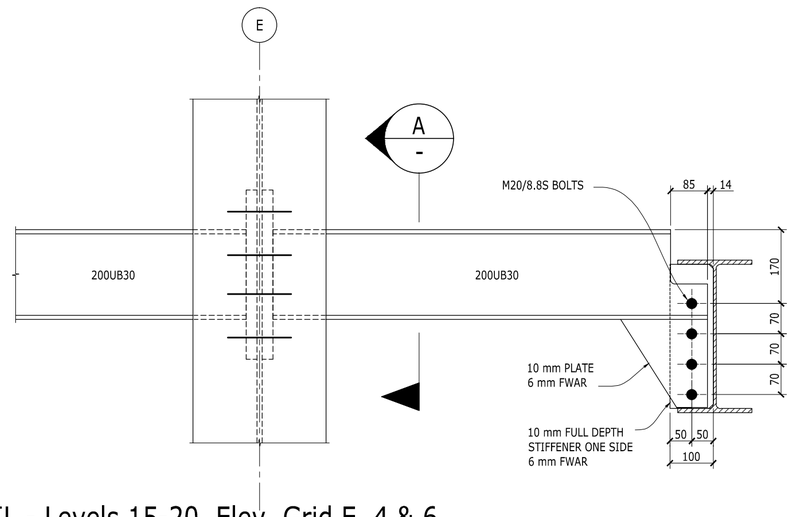
structex
"Giving support a whole new meaning" www.structex.co.nz

drawing title	drawing no	project	issue
STEELWORK DETAILS SHEET 13	S4.73	1770	2

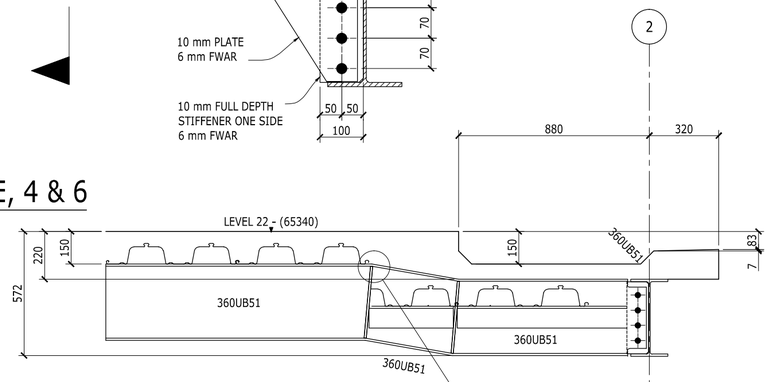
P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



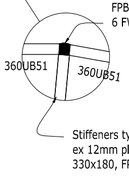
:TION A-A
e: 1:10

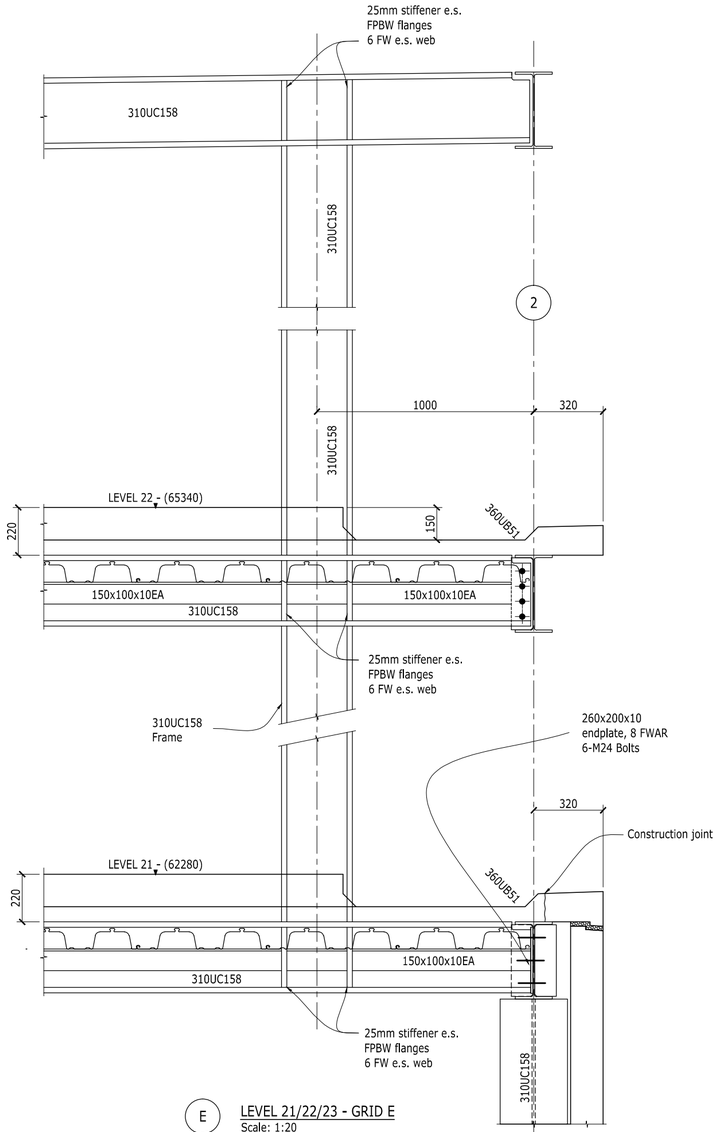


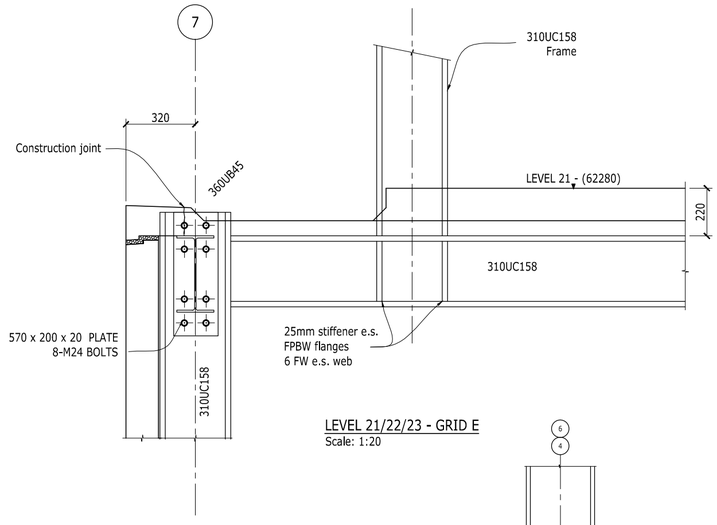
DETAIL - Levels 15-20 Elev. Grid E, 4 & 6
Scale: 1:10



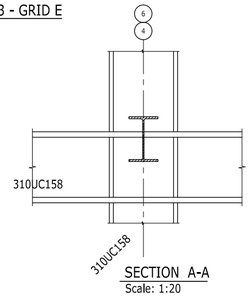
LEVEL 22 - NEAR GRID Dd
Scale: 1:20



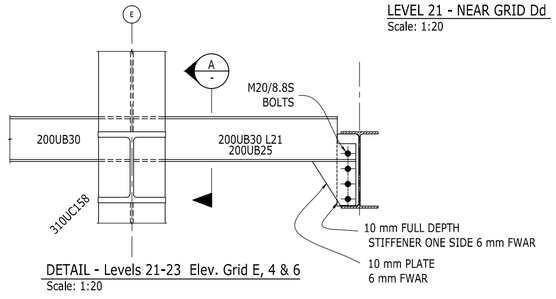




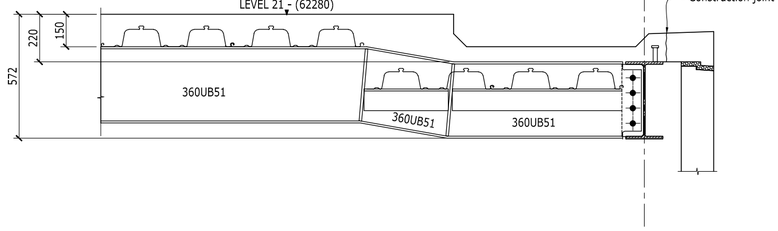
LEVEL 21/22/23 - GRID E
Scale: 1:20



SECTION A-A
Scale: 1:20

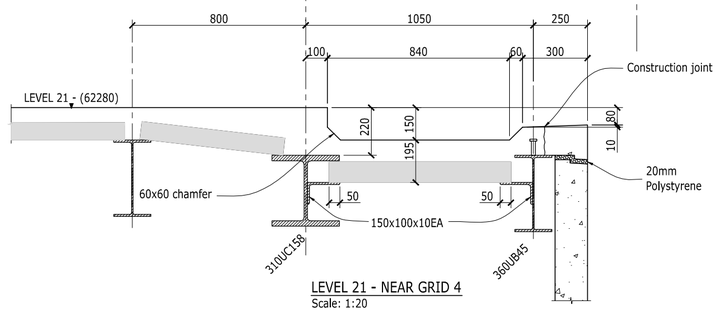


DETAIL - Levels 21-23 Elev. Grid E, 4 & 6
Scale: 1:20



LEVEL 21 - NEAR GRID Dd
Scale: 1:20

LEVEL 21/22/23 - GRID E
Scale: 1:20



LEVEL 21 - NEAR GRID 4
Scale: 1:20

CONSTRUCTION

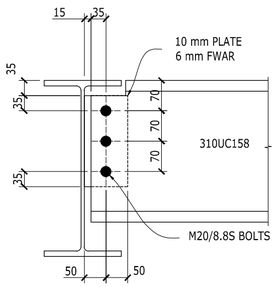
issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	GB		1:10;1:20

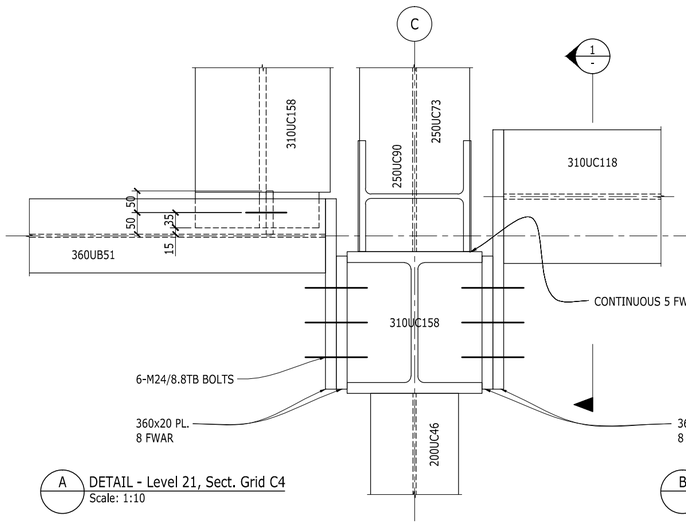
client	project title	drawing title	drawing no	project	issue
AMC CONSTRUCTION	C1 TOWER	STEELWORK DETAILS SHEET 14	S4.74	1770	2

structex
"Giving support a whole new meaning" www.structex.co.nz

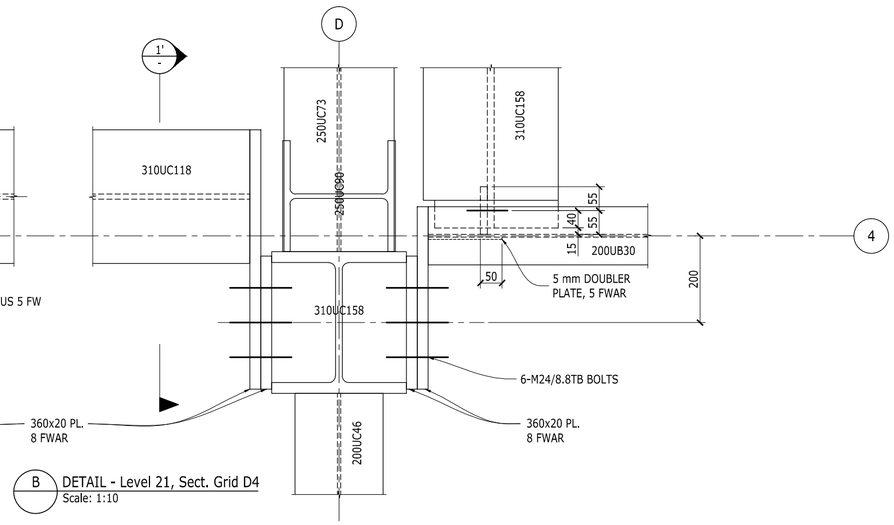
P:\PROJECTS\1770\D\1770S4.0.DWG - 18\10\07 16:18 A2 ORIGINAL



Y TYPICAL BEAM-BEAM (310 UB SHOWN)
Scale: 1:10



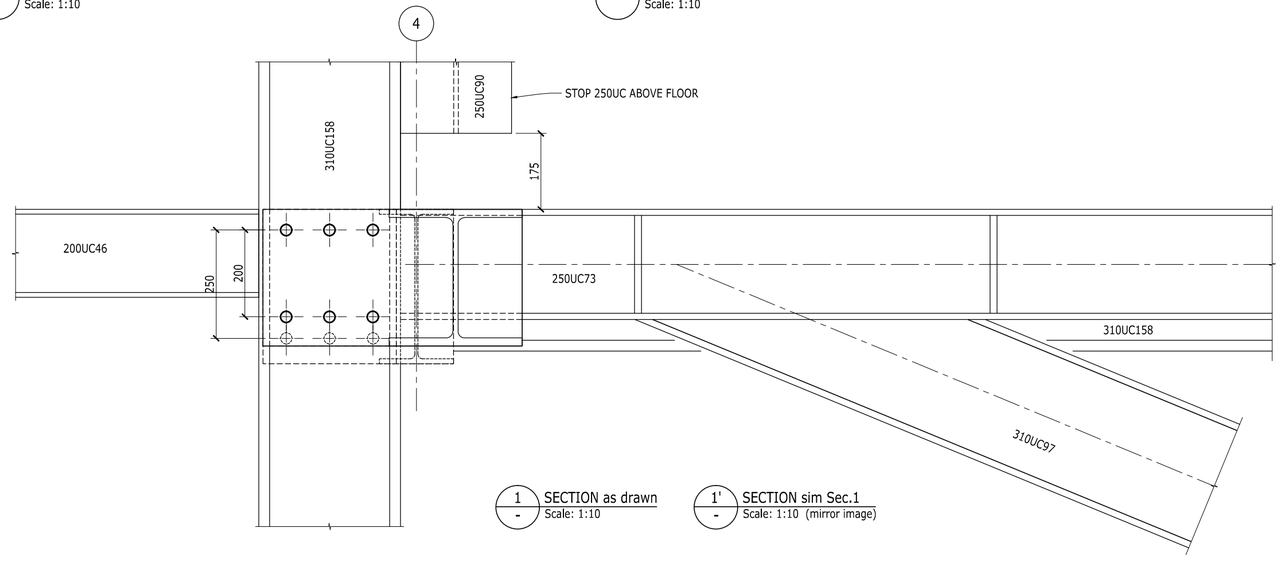
A DETAIL - Level 21, Sect. Grid C4
Scale: 1:10



B DETAIL - Level 21, Sect. Grid D4
Scale: 1:10

A' DETAIL - Level 21, Elev. Grid C4
Scale: 1:10

B' DETAIL - Level 21, Elev. Grid D4
Scale: 1:10



1 / - SECTION as drawn
Scale: 1:10

1' / - SECTION sim Sec.1
Scale: 1:10 (mirror image)

CONSTRUCTION

issue	description	by	appd.	date
2	CONSTRUCTION ISSUE	JL	SG	12-12-07

drawn	designed	approved	scales
JL	SG		1:10

client	project title	drawing title	drawing no	project / issue
AMC CONSTRUCTION	C1 TOWER	STEELWORK DETAILS SHEET 15	S4.75	1770 / 2

structex
"Giving support a whole new meaning" www.structex.co.nz

CPG New Zealand Ltd

Pacific Tower Body Corporate
Post-Earthquake Assessment

Job No. 704785

This report has been prepared for the Pacific Tower Body Corporate by CPG. No liability is accepted by this company or any employee or sub consultant of this company with respect to its use by any other parties.

Quality Statement

Task	Responsibility	Signature
Project Manager	Sean Gardiner	
Prepared by	Sean Gardiner	
Reviewed by	John McCurran	
Approved by	Peter Ollivier	

Revision Schedule

Revision No	Date	Description	Prepared by	Reviewed by	Approved by

Prepared by:
CPG New Zealand Ltd
55 Shands Road, Hornby
P O Box 13-875
Christchurch 8141
New Zealand

Telephone: +64 3 374 6515
Fax: +64 3 374 6516
E-mail: sean.gardiner@nz.cpg-global.com

File No.:
Job No.: 704785
Date: 24 February 2012
Ref: 704785-rpt120224 Pacific Tower Detailed Eng Evaluation-ca.doc

Pacific Tower Body Corporate
Post-Earthquake Assessment

Job No. 704785

TABLE OF CONTENTS

IMPORTANT DISCLAIMER

This Detailed Engineering Evaluation Report (Report) has been prepared in connection with damage suffered by the building at the address shown on the front of this report (Building) resulting from the earthquakes that occurred in the Canterbury region on Saturday 4 September 2010, on Tuesday 22 February 2011, Monday 13 June 2011 and Friday 23 December 2011 (NZDT) and subsequent aftershocks up to the date of inspection by CPG.

This Report has been prepared by CPG for the owner of the building. No liability is accepted by CPG or any employee or sub-consultant of CPG with respect to its use by any other parties other than the parties this Report has been prepared for. This disclaimer shall apply notwithstanding that the Report may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

This Report and assessment herein are based on a visual as well as intrusive (as detailed herein) inspection of the Building. CPG has not carried out a full quantitative assessment (i.e. detailed calculations); the purpose of the report is stated in Section 2 below.

In most cases we have not been able to identify which specific seismic event caused the damage to the Building.

CPG has not attempted to assess the cost of repairs to the Building or the cost of its replacement.

EXECUTIVE SUMMARY

CPG has been engaged to prepare a Detailed Engineering Evaluation and provide recommendations regarding occupancy and repairs.

We have carried out investigations in accordance with the Engineering Advisory Group Guidelines, as required by CERA.

The building has performed very well with generally minor structural and non-structural damage observed throughout. We have instructed repairs to be carried out, but require further testing and continuing minor repairs.

The building has been assessed as having a current strength around 67% NBS and continued occupation is considered appropriate, however we recommend the specified testing and repairs be completed as soon as possible.

The building has been assessed as having a repaired NZSEE seismic grade of A (80 – 100% NBS), based on its detailing and performance. The building is neither earthquake-prone or earthquake risk. There is no regulatory requirement to strengthen the building over and above the restored capacity.

1.0 BACKGROUND

The Pacific Tower Body Corporate via Fortis Construction Ltd engaged CPG to prepare this assessment of damage caused by the 2010/2011 earthquakes and prepare repair specifications as detailed in the CPG proposal dated 7 July 2011.

The Pacific Tower (formally C1 Tower) at 166 Gloucester Street was designed in 2007 by Structex and built shortly after by AMC/SI Construction for C1 Gloucester Ltd.

Following the September 2010 and February 2011 earthquakes Structex completed L2 RAPID Building Safety Evaluations and the building was green placarded INSPECTED each time. Structex completed an Earthquake Damage Report dated 19th May 2011, (Copy in Appendix 3, outlining the damage observed to the date of the report and provided recommendations for further inspections and outline repair specifications. A sample of active links were exposed and inspected (approximately 20%) at critical locations with only minor onset of yielding noted in some locations, and significant permanent offset noted at one active link location on north-western (Grid 1) K-braced frame.

Following the June 2011 earthquakes CPG completed L2 RAPID Building Safety Evaluation (dated 24/06/2011) which recommended the placard remain green INSPECTED and that a structural Detailed Engineering Evaluation be completed.

In a letter dated 12 October 2011, the Canterbury Earthquake Recovery Authority (CERA) issued a Section 51 notice requiring a Detailed Structural Assessment be completed.

Following the 23 December 2011 earthquakes, CPG conducted a further L2 Rapid Building Safety Evaluation inspecting selected areas on 6 January 2012 and concluded that the building has suffered no further significant observed structural damage. Over the following days the contractor reviewed the active links and precast panel fixings and confirmed no further significant damage was observed.

2.0 PURPOSE OF REPORT

This is a detailed engineering evaluation, prepared following the Engineering Advisory Group Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury; July 2011. We have undertaken a thorough visual inspection of the above property inside and out, including removal of linings and prepared this assessment of earthquake damage. With the discovery of a fractured active link in late August 2011, we undertook to inspect all of the active links. As some damaged was observed to the precast panel top fixings and which could not be predicted from external surveys or building deformation, we undertook to inspect all precast panel top fixings. A sample of inspected precast panel lower fixings revealed no movement or damage.

The purpose of this assessment is to:

- Identify damage attributable to recent earthquake activity.
- Assess if any building components pose a hazard to the occupants and the general public.
- Assess if the observed damage has resulted in a significant loss of structural integrity.
- Identify any geotechnical issues.
- Assess if the building, in its current state is suitable for occupation.
- Assess the future seismic capacity and performance of the building.
- Prepare repair specifications to reinstate the building.
- If appropriate recommend further investigation and analysis.

To date, this assessment does not include:

- A quantitative engineering analysis of the building structure, (which we consider is not warranted given its recent construction and noted structural damage).

In the period of June to February 2012 inspections of the building included:

- The exterior from ground Level 6 southern roof and roof level
- The interior including:
- Stairwells
- All steel Eccentrically Braced Frame (EBF) active links.
- All precast panel top fixings.
- Car-stackers and restraints

Relative building vertically was determined from lift shaft measurements provided by the lift technicians (D & M Solutions). Verticality surveys of the exterior and “zip level” surveys of the ground floor and Level 6 were also completed by CPG in February 2012.

This report is based on our assessment of the building at the time stated. Photos that are attached are indicative of the damage. Any subsequent loading by aftershocks, or high winds, may initiate further damage.

3.0 DESCRIPTION OF EXISTING STRUCTURE

Pacific Tower consists of a twenty-two storey, steel framed building with precast concrete cladding panels for most of its height. It has a reinforced masonry block lift machine room centrally on the concrete roof.

The lower portion of the building (to the underside of level 6) is clad on the north and west sides with stone tiles. The south end of the building is constructed from reinforced masonry, seismically separated from the tower above level 2.

The podium level houses seven car-stackers which are supported on the suspended first floor (level 2) deck and laterally via the level 2 deck and braces to the superstructure near the underside of level 6.

Part of the podium level western elevation cantilevers over a Right Of Way access to the basement of Cathedral Junction to the south, via four storey high vertical trusses.

The floors and roof are typically constructed with a 150mm thick composite steel deck (Comflor 80) supported on composite steel beams. The topping is reinforced with H10 at 300 centres each way, supplemented with drag ties as necessary.

The building is supported laterally with a combination of steel Eccentrically Braced Frames (EBF), in both ‘K’ and ‘D’ configurations, and Moment Resisting Frames (MRF). There are transfer diaphragms at levels 2, 6 and 11 to maintain EBF continuity. For much of the height the frames are constructed in an efficient “tube” arrangement which helps control torsional response.

At the ground level (Level 1) the EBF’s on the northern and western elevations (Grids F and 1 respectively) transfer to 600 HCC540 “super” MRFs, to remove the braces from that level.

Reinforced concrete foundation beams are supported on a combination of bored (caisson) concrete piles, and steel screw piles (used primarily for tension loads). The ground floor is reinforced concrete slab on grade.

The stairs and car-stacker level ramp are detailed to slide to prevent overloading due to inter-storey displacements. These appear undamaged and to have performed as expected.

The braced frame lines and locations are summarised in Appendix 2.

During the course of our investigations it has become apparent the 100% active link non-destructive testing (NDT) specified during construction was interpreted as only the “D-braced” active links (refer Appendix 2). The “K-braced” active links received only AS/NZS 1554 testing, understood to be interpreted as 10%. The welds, however, all appear to have performed satisfactorily.

4.0 DESCRIPTION OF DAMAGE OBSERVED AND RECOMMENDED REPAIRS

The building has generally suffered minor structural and non-structural damage with isolated areas of significant damage as noted below. Detailed photographic records of the exterior, the active links and the precast panel brackets have been completed by Fortis Construction and NFM, refer appendices 4, 5 and 6.

4.1 Observed Damage includes:

- Movement of podium level stone cladding to engage veneer ties, though there does not appear to be any connection failures. These should also be inspected and repaired by a stone cladding specialist.

- The concrete panels have suffered further minor cracking and isolated spalling to that noted after the initial earthquakes. The extent of the cracking/spalling has been verified during the external survey. Panels that have "bound" should be sawcut free, so there is no connection between adjacent panels, and the joints resealed. Otherwise, the sliding panel connections appear to have performed well as expected. Refer also to Section 4.4 below regarding panel fixings.

- The soffit linings to some of the balconies on the north face have fallen off, and there have been locations of further damage to the tiled junction between the balcony deck and the precast cladding panels. These should be repaired as previously specified with gaps to allow vertical seismic movements to occur. The junction between the balcony precast units and the cladding panels have impacted and caused spalling to the balcony units. They should be sawcut to provide 20mm clearance and sealed as previously instructed.

- Fire rated Gib linings (non-structural) were noticeably cracked throughout both stairwells for the full height of the building. Subject to a report from the fire engineer these stairwells will require repairs completed to comply with the Building Code requirements for Egress from Fire. The sliding stair details for the building appear to have performed well structurally. Consideration should be given to the installation of "Sliding" Gib details to reduce the extent of future earthquake Gib damage, refer Appendix 10. As an alternative we note the contractor has separated the Gib panel elements and covered joints to allow for future movement. There is minor damage to the stair landings including isolated spalling of floor levelling compound where the central timber framed wall has impacted. These areas should be broken free to allow movement and reconstructed with repair mortars. The gap should be sealed with a fire-rated sealant as previously instructed.

- The cross-bracing in many of the car stackers unhooked at midway along its length. These have been replaced with shackles as previously recommended. Inspection of the car-stacker restraints at the top of the car-stackers by Kiwi Sparky (electrical contractor) identified damaged restraints and some cleat connections pulled out. In addition, the building residual deformations resulted in the car-stacker columns not being vertical. The car-stacker columns have been re-levelled, straightened and are in the process of having the restraints reinstalled and strengthened as previously instructed.

- The seismic flashings between the south reinforced masonry block area and the main tower have been crushed full height and will require replacement. There was also isolated roof damage. Flashings have been dislodged at the junction with the Sampan Noodle House to the east, and may have suffered damage at the corners of the building. These should be

replaced as necessary. Consideration should be given to more permanent fire-rated flexible flashings. Refer www.zonenz.net.nz

- Particularly following the 23 December 2011 earthquakes, exterior masonry block shell damage was observed to both sides of the southern podium likely due to localised pounding. Damaged sections should be broken out (do not damage existing reinforcing) and recast in concrete with an increased gap as previously instructed.

- There is minor damage at the lift landing areas and we have been advised there has been damage to the lift shafts and guide rails rendering the lifts inoperable at full speed. The minor permanent displacement of the building will require the guide rail brackets to be re-aligned and the lift door locations to be adjusted at most levels. We understand a lift technician's report will confirm the full extent of the damage. Racking of the eastern entrance to the lift lobbies has resulted in sloping tiled soffits. These areas should be reconstructed and retiled.

- Most rooms have damage similar in nature to the previous earthquakes including cracked wall and ceiling linings, tiles, glass doors and wardrobes. There is also jamming of several hotel room doors preventing closure or access. This non-structural damage should be repaired by competent trades people.

- The wall at the base of the rooftop mast has suffered cracking around the wall anchor bolts. This section of wall should be rebuilt in concrete (reusing and supplementing the existing reinforcing steel), with larger anchor plates and bolts lower down the wall, as previously instructed.

- The roof cross-bracing (Reid brace) of the underside of the Level 6 in the southern car-stacker extension was inspected and photographed by the contractor and showed no signs of damage.

- There was moderated isolated cracking observed to the ground floor slab under the timber overlay floor which has been repaired with epoxy.

- There is damage to the NE and NW corner panels (spalled concrete). The loose concrete should be broken off and the edge of the panels rebuilt. Corner flashings will likely require replacement.

In addition, the required investigation works to verify the structural condition of the braced frames following the earthquakes have led to damaged wall and ceiling Gib linings and compromised the fire-rating in some locations. Inspection hatches (fire-rated as necessary) should be located to allow re-inspection of the active links following subsequent earthquakes.

We understand the building services are currently operational.

We understand a report on damage to the fire systems has previously been completed by the fire engineer.

4.2 Residual Deformation

The lift technicians (D & M Solutions) have measured the vertical alignment of the lift shafts and have observed the following permanent displacements at 20/04/2011, an intermediate date sometime before 21/07/2011, on 21/07/2011, on 12/12/2011 and 14/01/2011.

The initial measurements were the most accurate as they were measured against the lift brackets (installed vertically). Subsequent measurements are less accurate as they were measured against the lift shaft walls, which were likely not constructed truly vertical. This is also likely explains the apparent "jumps" in inter-storey displacement in later measurements. In addition floor level and exterior verticality surveys were completed by CPG in early February 2012. The graphs are useful to show the relatively minor average residual deformation profile, (<0.3% see Appendix 7).

The levels with identified higher than average inter-storey drift have warranted further investigations of the active links at those levels, however the exterior survey suggests the drifts are smoother and not as high as presented in the lift shaft data.

As the north and south lift shafts are not parallel, the deformations suggest the building has twisted slightly, though mostly at the upper levels. This is confirmed with the exterior survey.

These offsets are not of structural concern as they are within the displacements allowed for during the design of the building and construction tolerances and they are not likely to significantly affect the future performance of the building.

4.3 Detailed Frame Investigations

The linings were removed (where necessary) and the steel frames (EBF active links and MRF Potential Plastic Hinge Regions) were all visually inspected at least one side for yielding and any significant permanent offset or fracture. Refer NFM report in Appendix 5.

Inspections revealed the onset yielding and some minor permanent deformation of the active links of EBF's. One active link has fractured and that has been temporarily cross-braced with 2-75x16 steel flat bars in each direction.

It is anticipated the active links would be relined with access panels (fire rated as necessary) to allow easier future inspection. A number of active links showed evidence of the onset of yielding, with diagonal Lueder's lines and paint flaking being evident in some active link regions.

Interim advice on criteria for actions on EBF in-elastically responding active links from Charles Clifton and others from the University of Auckland suggests "where the maximum applied strain is in the order of +/- 2 to 5% for a small number of load cycles, for example 3, then there is no need for metallurgical treatment of the steel". An upper limit of +/- 5% peak strain has been set to ensure that the toughness requirements of NZS3404 are still able to be met. Charles Clifton advises that this is conservative and peak strains of up to 10% for 2 or 3 cycles will not exhaust the active link capacity. With strains in these regions "...all the indications point to the steel retaining sufficient ability to absorb damage to withstand, at least, another ultimate limit state to maximum considered earthquake."

The 327HCC beams restraining the north-western EBF active links L3, L4, L5 where there is no slab) suffered damage and fracture of the locating bolts. The bolts should be replaced as previously instructed. No damage or sign of any permanent displacement was observed to steel MRFs, columns, braces or welded or bolted connections.

Warped active links flanges were observed at grid 2, levels 8 and 10 due to restraint from panel anchor brackets. As there is no damage to the web or welds, they should be left as they are. Welding/heating is likely to cause more harm than good.

Active links with rotations greater than 5mm over 300mm (moderate) have been inspected by a qualified welding inspector with Magnetic Particle Imaging (MPI). Any indications identified in regions of potential high stress (around active link), have been burr ground to 2mm maximum. If

the indication was removed the ground out portion was feathered. If the indications remained, the full weld width was repaired to NZS 1554.1 SP under the supervision of a qualified welding inspector including 100% NDT. A number of reports have been completed by Southern Quality Assurance (SQA) and are attached in Appendix 8.

The active link on the north-western frame (Grid 1) at the underside of level 6 has fractured. In addition hardness testing of the lower links in this fame (without slabs attached) have indicated strain hardening (and corresponding reduction in ductility capacity), as expected. While this has not been quantified by comparison to destructive testing of outside samples, it is our opinion this testing would result in a requirement to have these links also replaced. The links in this frame should be replaced as per the details and specifications shown in Appendix 9. Repairs have been developed in conjunction with SCNZ, the University of Auckland and the NZ Welding Centre. The removed links must be retained for inspection and testing.

Once the links are removed, they can be subjected to strain-hardness, and Charpy Impact destructive testing to aid in the verification of residual strain capacities of the remaining active links. While we acknowledge hardness testing and its relationship to applied strain may not be conclusive (due to inconsistencies of steel surface finishes and difficulty in accurately correlating hardness into strain, particularly at low levels of strain.), it is a useful tool. It is hoped that while accurate determination of strain and residual capacity may not be possible, identification of when a link needs to be replaced.

At the time of this report the remaining active links in the building (126 total) were also being hardness tested Given the increased length of the remaining links, the reduction in number with significant permanent offset and the fact most have floor slabs attached, it is expected most of the remaining links will not require replacement.

Verification of link residual capacities and repairs if necessary should be completed as soon as possible, but within six months.

4.4 Panel Fixings

Following the identification of damage to some panel inserts all of the precast panel top fixings were exposed for inspection. A limited number of lower fixings were also inspected, but revealed no movement or damage.

The level of damage varied significantly and is well documented in the NFM report attached (refer Appendix 6). In addition it was revealed around six anchors has not been installed at all.

The recommended repairs were as follows:

Steel brackets

- Minor rotation (<5mm off horizontal) – Do nothing.
- Moderate rotation (>5mm off horizontal), gross deformation or weld failure – replace bracket and bolts.

Concrete

- Hairline cracks (no concrete movement) – inject with epoxy.
- Spalling – breakout loose concrete. If anchor is sound reinstate with repair mortars. If not install new anchor, bracket and fly-brace in adjacent undamaged zone of panel (at least 225mm away from original (fixing). Bolt through panel and recess head on outside face of panel. Use galvanised fixings and coat with epoxy for durability.
- Concrete “Cone” failure – install new anchor as above.

- In locations where there is significant concrete damage and where new fixings cannot be anchored, install 100UC mullions to the inside face of the panels.

The agreed repairs are also documented in Appendix 6.

5.0 ASSESSMENT OF DAMAGE OBSERVED

In general the damaged observed has not significantly compromised the strength of the building to the extent where it will fail to meet the Building Code criteria for performance in earthquake or any other specified area of building performance, once the repairs specified in Section 4 have been completed.

The ductility capacity may have been reduced and hardness testing of the active links along with destructive testing of the steel samples should be undertaken as soon as possible, but within six months, to help to verify the active link residual capacities. The fractured link bay has been temporarily braced with a 2-75x16 steel flat cross-brace to reinstate the building to at least 67% of its pre-earthquake strength, prior to the repairs detailed in Appendix 9 being completed.

Following inspections and testing to date (after grinding of identified indications) there have been no signs of significant earthquake induced cracking in the areas of potential inelastic demand. It is believed most, if not all of the steel weld defects identified existed prior to the earthquakes.

An assessment of the damage accumulation in the most heavily deformed links from the Christchurch earthquake series has been undertaken by Charles Clifton, in accordance with a steel damage research paper published in the Journal of Constructional Steel Research by Chris Seal. His assessment was the links had undergone 45% damage (where 100% damage = fracture) from the earthquake series, and that they would have sufficient capacity to resist the earthquake series again or an Alpine fault rupture without failure.

He also had the recommendations:

a) The replacement will be of 4 inelastically responding active links for the NW frame as discussed.

b) These should be replaced one at a time starting with the top (fractured) one.

c) Given that you are replacing them one at a time no temporary cross bracing is necessary. (This is justified on the basis that the performance of the building with the fractured link has been good overall even though this link is in the most critical position. Thus the fractured link can be removed without making the building weaker than it has been throughout the earthquake series once the fracture occurred. Once that is replaced the building will be stronger than it currently is even as one brace at a time on the levels below are taken out and replaced. (If more than one was to be replaced simultaneously, temporary cross bracing would be needed; however this would also have to include a temporary collector beam on the levels where there isn't an existing floor slab).

d) The building can be reoccupied while this work is being done without compromising the life safety of the occupants.

e) However the guests will need to be informed that repairs are being undertaken but that the safety of the building during these repairs is not in question. The reason these are being made is to keep the damage threshold high so that disproportionate building damage does not occur in a future event. The guests will notice the noise of repairs plus smells and some smoke and fumes from welding which would cause undue alarm without them being forewarned.

f) Also the fire safety systems will need to remain fully operational throughout this repair process and any site welding must not compromise the building systems through overheating of the steelwork that is in contact with these systems.

The panels with the most significant insert damage have now been repaired.

Other identified damage will not significantly affect the structural performance of the building.

Building components have been assessed as not posing a significant hazard to the occupants or the general public, and continued occupation is considered appropriate.

6.0 GROUND CONDITIONS

A Post-Earthquake Geotechnical Report has been completed by Geotech Consulting Ltd in February 2012, refer Appendix 12.

They found:

"The building is supported on large diameter bored piles with screw piles to restrain uplift forces. Some piles were tested and the design capacities confirmed during construction. There may have been some settlement of the foundation, but this would be almost expected given the strong shaking (including high vertical accelerations) experienced, the loss of at least some of the side resistance and possible softening of the soils. There is no evidence of liquefaction, but some liquefaction is predicted at the site.

There is no indication that the foundations have not performed adequately and will not continue to carry the structural loads in the future."

The floor level surveys (Ground floor and Level 6) indicate some irregular variations in level, a portion of which are likely to have been pre-existing. There may have been some settlement in the middle of the building. The levels observed are not likely to affect the structural performance of the building.

Given the satisfactory performance of the foundations to date, no further investigations are recommended.

7.0 STRENGTH OF EXISTING BUILDING

The building was designed in 2007 to AS/NZS1170 with a zone factor, Z = 0.22. It was detailed as a limited ductile (μ = 3) structure, however had an actual ductility of closer to μ = 1.5 (due to standardising section sizes and conservatively adding the gravity shear component to the earthquake shear when sizing the active links). The columns, braces and connections were designed for either the overstrength of the active link or the actions generated from elastic or nominally ductile loads, as appropriate and incorporated concurrent actions (100% + 30%) for elements in two-way frames in accordance with AS/NZS 1170.

The building has experienced earthquakes greater than the design level earthquake for the recently revised Z = 0.3. Given the satisfactory performance of the building (by testing) it has met the criterion for 100% NBS (once the structural repairs are complete).

The justification for the actual earthquakes being greater than the design level earthquake for Z = 0.3 is as follows:

- The scale factor determined in accordance with the NZS 1170.5 provisions for Time History Analysis, THA, (with Z = 0.3) is greater than 1.

- Establishing performance in design by THA requires at least 3 earthquakes records from representative events such that for each period point within the period range of interest the spectral value of one of the earthquake records chosen is equal to or greater than the design spectrum. In this case (see spreadsheet attached in Appendix 11) we have more than 3 records but they are of the same event, so a more stringent criterion to apply is that the records meet this criterion across the period range of interest. From the spreadsheet this is the case (Original Design Period, T_1 (N-S) = 3.96 sec, T_1 (E-W) = 3.26 sec).

- The performance of the building in the earthquake series does provide some key information that can be validly used in any assessment. This comes under NZS 3404 Section 17.4 Proof Testing which is what the earthquakes have done. Key findings from this are that:
  - The structure is over 2x as stiff and strong as the models show
  - The capacity design procedure etc is sufficiently robust to concentrate inelastic demand into the active links even with this increased strength and stiffness
  - Heavy bolted connections have performed very well and to expectation
  - The structural system can cope with the loss of one active link without noticeable distress beyond that immediate location (this is referring to the fractured link at level 6 in the NW corner)
  - The structure has been loaded to approx. 2x the previous design level which is still some 1.7 times the current new design level without unexpected performance with the exception of the link fracture. This means it satisfies on the basis of observed whole building performance under load the strength and stiffness requirements of 100% new code level

The building has been subjected to performance by proof test, in accordance with Clause 17.4 of NZS 3404, and, given the intensity of shaking in the 22 February 2011 earthquake, will meet 100% NBS according to the new Z=0.30 zone factor when the scheduled replacement of the northwest frame active links is completed and provided the hardness testing of the remaining active links show that not require replacement.

Thus the repaired building achieves a New Zealand Society for Earthquake Engineering (NZSEE) Grade A seismic rating. A building which achieves grade A or 80% - 100% NBS has a relative risk similar to that of a new building.

The building is neither earthquake-prone or earthquake risk. There is no requirement to strengthen the building.

APPENDIX 1

Site Plan

APPENDIX 2

Braced Frame Line Summary and Construction NDT

APPENDIX 3

Structex Report (19 May 2011)

APPENDIX 4

NFM Exterior Survey
South car-stacker roof bracing, mast pole base

APPENDIX 5

NFM Active Links Survey

APPENDIX 6

NFM Precast Panel Survey and Repair Spec

APPENDIX 7

Residual Deformation Profiles and Verticality and Levels Survey

APPENDIX 8

Southern Quality Assurance Inspection Reports

APPENDIX 9

Active Link Replacement Details

APPENDIX 10

Sliding Gib Details

APPENDIX 11

Canterbury Earthquake Response Spectra 2010/2011

APPENDIX 12

Geotech Consulting Post-Earthquake Geotechnical Report

CPG New Zealand Ltd
cpg-global.com

Water Transport Resources Energy Buildings Urban Development Agribusiness

A INITIAL ISSUE	SG 24.02.12	Client	FORTIS CONSTRUCTION LIMITED	Sheet Title	SITE LOCATION
Revision	App Date	Project Title	PACIFIC TOWER 166 GLOCESTER STREET	Project	704785
Designed NC	24.02.12			Drawing	170
Approved SEAN GARDINER	24.02.12			Revision	A
				Scale 1:	1500

CPG New Zealand Ltd
Level 1, 55 Shands Road
Christchurch 8011
Phone 03 374 6515
Fax 03 374 6516
christchurch@nz.cpg-global.com

L:\7047xx\704785 Fortis Construction - 166 Gloucester St\Cad\704785-000.dwg , Plotted By Neil Cameron at 24/02/2012 10:12:50 a.m. Scale 1:1

earthquake damage report

structex

project	Pacific Tower, 166 Gloucester Street	**project no**	5631
date	19th May 2011	**from**	Sean Gardiner
client	Pacific Tower Body Corporate		

1 Scope of this Report

This report covers our assessment of the structural condition of Pacific Tower located at 166 Gloucester Street, Christchurch on the 31st March 2011 based on a visual inspection inside and out and isolated removal of internal linings to expose the steel superstructure.

Our earlier initial inspection dated 25th February 2011 mainly addresses initial safety matters relating to the building. This subsequent inspection and report describes the damage observed in more detail, and comments on remedial work options for repair of the building as well as further suggested investigations.

This report does not cover a detailed structural strength assessment; which we consider is not warranted given its recent construction and minimal structural damage.

2 Scope of Investigation

On the 31st March 2011, we visually inspected the building including:

- The exterior from ground level
- The interior including:
  - Stairwells
  - Floor levels 1, 2 (including carstackers), 6, 7, 11, 16 and 22
  - Steel frames exposed at the above levels

This report is based on our assessment of the building at the time stated. Photos that are attached are indicative of the damage. Any subsequent loading by aftershocks, or high winds, may initiate further damage.

3 Building Description

Pacific Tower consists of a twenty-two storey, steel framed building with precast concrete cladding panels for most of its height. It has a reinforced masonry block lift machine room centrally on the roof.

The lower portion of the building (to the underside of level 6) is clad on the north and west sides with stone, with the south end of the building constructed from reinforced masonry. Part of the western elevation cantilevers over a Right Of Way access to the basement of Cathedral Junction to the south.

The floors and roof are typically constructed with a 150mm thick reinforced concrete topping on steel Comflor 80 flooring supported on composite steel beams.

The building is supported laterally with a combination of steel Eccentrically Braced Frames (EBF), in both 'K' and 'D' configurations, and Moment Resisting Frames (MRF). There are transfer diaphragms at levels 2, 6 and 11 to maintain EBF continuity.

Reinforced concrete pile caps and foundation beams are supported on a combination of bored (caisson) concrete piles, and steel screw piles (used primarily for tension loads).

4 Damage Description

The building has suffered minor structural and non-structural damage as noted below:

- Onset of yielding and some minor permanent deformation of the active links of EBF's, refer following section on detailed frame investigations. No damage was observed to steel MRFs, columns, braces or welded or bolted connections.

- The lift technicians have measured the vertical alignment of the lift shafts and have observed the following worst case permanent displacements:

    - 66mm to the south relative to the base at around L11/L12, returning to around 38mm offset at L18 and above.
    - 50mm to the east relative to the base at around L11/L12, returning to around 25mm offset at L19 and above.

  These offsets are not of structural concern as they are well within the displacements allowed for during the design of the building.

- Isolated damage to a precast panel connection was noted and while not causing immediate concern, warrants further inspections (by way of exterior survey of the panels, and exposure of a sample of interior connections). Two fly-brace connections at panel fixing locations are missing their anchors to the floor at level 2 (east wall at top of ramp).

- Movement of podium level stone cladding to engage veneer ties, though there does not appear to be any connection failures. These should also be inspected as part of exterior survey.

- The concrete panels will have likely suffered further minor cracking and isolated spalling to that noted after the 4th September 2010 (refer previous exterior survey and subsequent repair specification sent on 7th October 2010). The extent of the cracking/spalling should also be verified during the external survey. Panels that have "bound" should be sawcut free, so there is no connection between adjacent panels, and the joints resealed. Otherwise, the sliding panel connections appear to have performed well as expected.

- The soffit linings to some of the balconies on the north face have fallen off, and there have been locations of further damage to the tiled junction between the balcony deck and the precast cladding panels. These should be repaired as previously specified with gaps to allow vertical seismic movements to occur.

- Fire rated Gib linings (non-structural) are severely cracked throughout both stairwells for the full height of the building. Subject to a report from the fire engineer these stairwells are not likely to comply with the Building Code requirements for Egress from Fire due to the Gib damage. The sliding stair details for the building appear to have performed well structurally. There is minor damage to the stair landings including isolated spalling of floor levelling compound where the central timber framed wall has impacted.

- The cross-bracing in many of the car stackers has unhooked at midway along its length. These will require repair/reinstatement prior to carstacker operation. (We suggest "D" shaped shackles be used to prevent this happening again). Inspection of

the carstacker restraints at the top of the carstackers by Kiwi Sparky (electrical contractor) have identified two fractured SHS restraints and some cleat connections that have pulled out, which will require repair.

- The seismic flashings between the south reinforced masonry block area and the main tower have been crushed full height and will require replacement. It is likely there is isolated roof damage as well. Flashings have also been dislodged at the junction with the Sampan Noodle House to the east, and may have suffered damage at the corners of the building.

- There is minor damage at the lift landing areas and we have been advised there has been damage to the lift shafts and guide rails rendering the lifts partially inoperable. The minor permanent displacement of the building will require the guide rail brackets to be re-aligned and the lift door locations to be adjusted at most levels. We understand a lift technician's report will confirm the full extent of the damage.

- Most rooms have damage similar in nature to the 4th September and Boxing Day quakes including cracked wall and ceiling linings, tiles, glass doors and wardrobes. There is also jamming of several hotel room doors preventing closure or access.

- We understand there is no emergency lighting operating in the building.

In addition, the required investigation works to verify the structural condition of the braced frames following the earthquake have lead to damaged wall and ceiling Gib linings and compromised the fire-rating in some locations.

We understand a report on damage to the fire systems is also being completed by the fire engineer.

5 Detailed frame investigations

The linings were removed (where necessary) and the steel frames (EBF active links and MRF Potential Plastic Hinge Region locations) visually inspected for yielding and any significant permanent offset or fracture at the flowing locations (based on original construction grids):

Level 1: Grid E1(MRF), F2(MRF)
Level 2: Grid E½1, F5, C4(west)
Level 6: Grid C2, C4(west), D4(east), C½6
Level 7: Grid C2, C4(west), D4(east), C½6, F5
Level 11: Grid C2, C4(west), D4(west & east), C½6
Level 16: Grid C4(west), D4(west & east), C½6
Level 22: Grid C½4, C½6, D4(east), E(MRF)

These locations were selected due being at transfer diaphragms levels as well as being at the levels of greatest observed non-structural damage (jamming doors, etc), suggesting greatest movement. Generally all of the readily accessible links at each selected level were inspected. It is anticipated the viewed active links would be relined with (fire rated) access panels to allow easier future inspection.

There was evidence of the onset of yielding, with diagonal Lueder's lines and paint flaking being evident in some active link regions. Only one link had any significant permanent displacement (at L2, grid E½1) and which had paint flaking at the ends of the braces as well as the active link region. This beam, adjacent to a carstacker, has no slab on top and was restrained laterally by a 327 HCC beam on its side (similar to the ones directly above).

Interim advice on criteria for actions on EBF inelastically responding active links from Charles Clifton and others from the University of Auckland suggests "where the maximum applied strain is in the order of +/- 2 TO 5% for a small number of load cycles, for example 3, then there is no need for metallurgical treatment of the steel". An upper limit of +/- 5% peak strain has been set to ensure that the toughness requirements of NZS3404 are still able to be met. With strains in these regions "...all the indications point to the steel retaining sufficient ability to absorb damage to withstand, at least, another ultimate limit state earthquake."

Inter-storey drifts, based on visible "scuff" marks, localised crushing if Gib, etc, appear to be in the order of 15mm. The applied strain, based on the damaged observed, is estimated to be within the range 2-5%. This estimate should also be compared with that calculated by the method noted in section 8.

No damage or sign of any permanent displacement was observed to steel MRFs, columns, braces or welded or bolted connections.

6 Structural Safety Evaluation of Building

We did not observe any apparent structural safety hazards.

7 Temporary Securing of the Building

As the building is new, has suffered no significant structural damage and there are no observed falling hazards, we consider that no temporary securing work is required.

8 Long Term Repair

The following further investigation work should be undertaken:

- Exterior survey of precast panels and stone cladding. Please note extents and locations of any concrete cracking and spalling, locations where panels have "bound", as well as any panels that are now misaligned which may indicate damage/failure of a panel connection. The panel fixings at these locations should be exposed on the inside face for inspection.
- Ongoing correspondence with Charles Clifton (University of Auckland) has suggested a further assessment and estimate of the inelastic demand on the active links may be warranted. This would require a measurement or estimate of the interstorey displacements at the frame locations followed by a desktop study based on the frame geometries. We can conduct this assessment early in the repair phase.

The following repair work should be undertaken based on our observations to date:

- Repair damaged panels/balconies. Drill and epoxy inject cracks 0.2mm wide or greater with Sika Injectokit system. Finish with a faring coat. Cracks smaller than 0.2mm may be painted with a flexible brushable crack filler. Spalled sections of concrete should be repaired with the Sika Monotop system (primer, structural mortar and faring coat). Install in accordance with manufacturers literature. Panels that have "bound" should be sawcut free, so there is no connection between adjacent panels, and any damaged joints resealed.
- Repair stair landings with Sika Monotop system as above and floor levelling compound. Please provide 20mm seismic gap at ends of the lightweight/Gib lined stairwell central wall at landing locations and fill with fire rated sealant.
- Reinstate carstacker cross braces and top lateral restraints. Re-weld fractured restraints with FPBW, examine other restraints for signs of damage and

repair/reinforce welds as required. Replace and re-fix anchors which have pulled out of the blockwork masonry.

- Install missing anchors between braces and floor at L2 (top of ramp) on east wall.
- Repair non-structural damage to roofing, flashings, tiles, door frames, ceilings, linings, etc in accordance with manufacturer's recommendations.
- Repair lifts and fire systems in accordance with lift technician's report and fire engineer's report respectively.
- Repaint flaked intumescent paint to exposed steel beams at L2 (prepare steel in accordance with manufacturer's recommendations).

9 Limitations

Findings presented as part of this report are for the sole use of the client. The findings are not intended for use by other parties, and may not contain sufficient information for the purposes of other parties or other uses. Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

Report by:

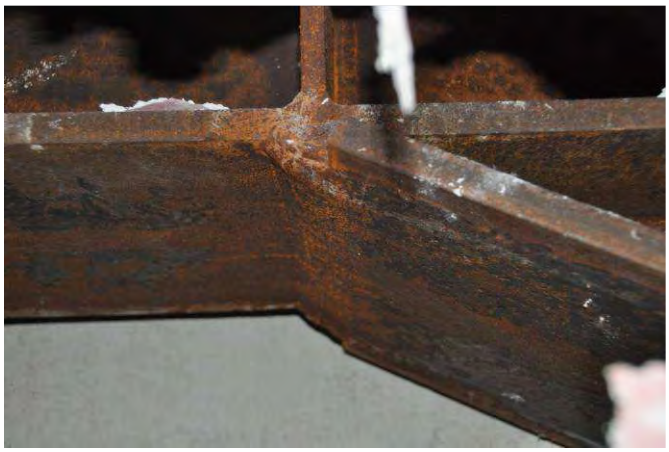
Sean Gardiner
B.E.(Hons), MIPENZ, CPEng (#242020)
Structural Engineer
Studio2 Limited

Reviewed by:

Geoff Banks
B.E.(Hons), MIPENZ
Director
Studio2 Limited

Appendix: Photos of Damage

L6, Grid C2, active link



L6, Grid C2, brace weld

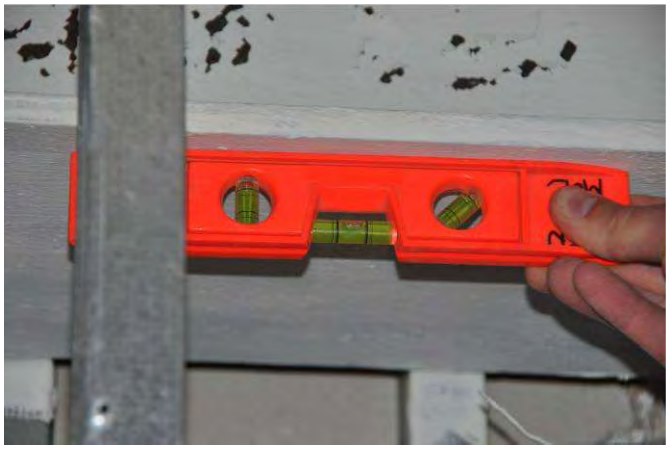
L6, Grid C2

L6, Grid C2, no offset

L6, Grid C2, column weld

L6, Grid C2, brace weld

L6, Grid D4(east), active link



L6, Grid D4(east), no offset

L6, Grid D4(east), brace weld

L6, Grid D4(east), column weld

L6, Grid C4(west), active link

L6, Grid C4(west), brace connection

L6, Grid C½6 active link

L6, Grid C½6 active link

L7, Grid C2, active link

L7, Grid C2, some offset

L7, Grid C2, Lueder's lines to active link

L7, Grid C2, brace connection

L7, Grid C4(west), no offset

L7, Grid C4(west), active link

L7, Grid D4(east), no offset

L7, Grid C½6

L7, Grid C½6, minor offset

L7 floor at Grid C½6, essentially level

L7, Grid F5, active link

L7, Grid F5, active link and brace connection

L11, Grid C2, active link

L11, Grid C2, damaged panel fixing

L11, Grid D4(east), active link

L11, Grid C4(west), active link

L11, Grid D4(west), active link

L11, grid C½6, active link

L11, grid C½6, active link

L11, grid C½6, active link

L11, Grid C½6, active link

L11, Grid D4(east), active link

L11, Grid D4, column joint

L16, Grid D4(east), active link

L16, Grid D4(west) active link

L16, Grid D4(west) active link

L16, Grid C4(west), active link

L22, Grid E MRF

L22 crack to floor diaphragm (from stairwell to NE)

L22, Grid D4, active link.

L22, Grid C½ 4 and 6 active links

L2, Grid C4(west) active link

L2, Grid C4(west) active link

L2, Grid E½1, active link, permanent offset

L2, Grid E½1, active link

L2, Grid F5, active link

L1, Grid E1, MRF

L1, Grid E1, MRF

L1, Grid F, MRF

L2 Carstacker crossbraces "unhooked"

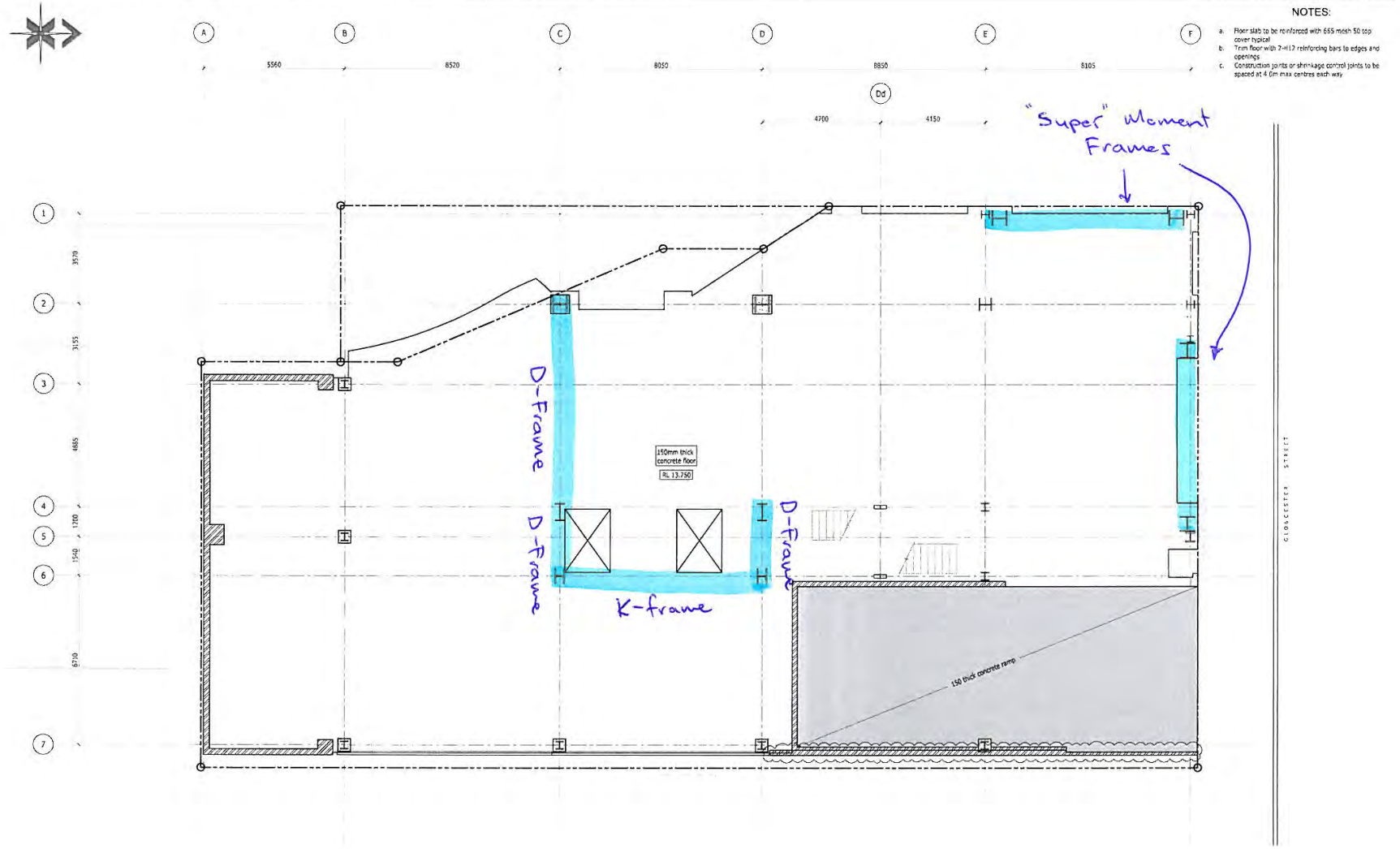
Movement of L2 east wall

Missing floor anchors at L2 east wall at top of ramp

Flashings between masonry block and tower

Fractured carstacker top lateral restraints

Pacific Tower 2 March 2011 (some damage to north balcony soffits visible).



CONSTRUCTION

2	CONSTRUCTION ISSUE	JL	SG	12-12-07	GA	GB		1:100	AMC CONSTRUCTION	C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

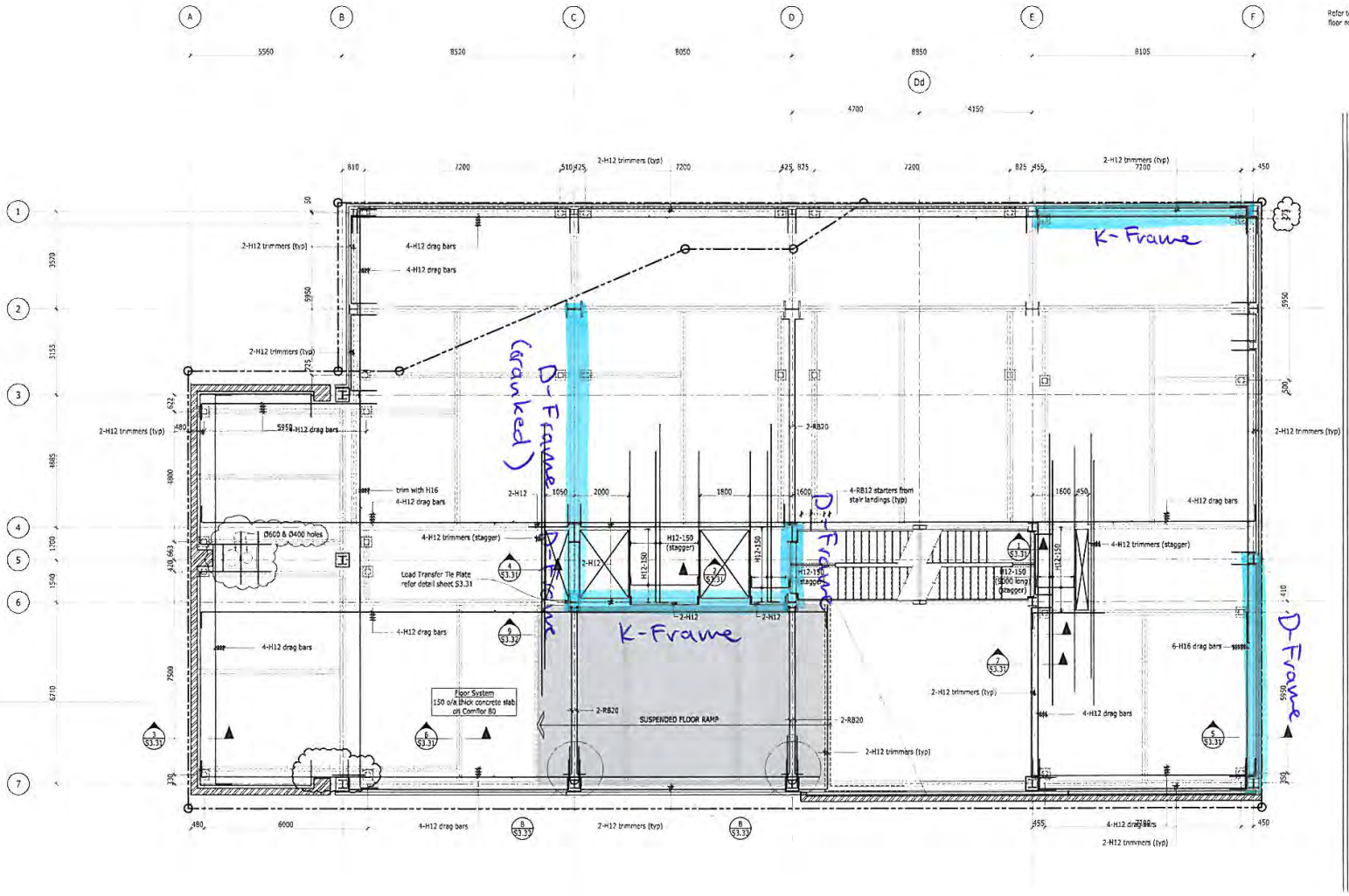
LEVEL 1 REINFORCING PLAN | S1.52 | project 1770 | 2

BUI.GLO166.0019.77

P:\PROJECTS\1770\0\1770S3.0.DWG - 25/10/07 17:59 A2 ORIGINAL

NOTES:

Refer to drawing S3.00 for suspended floor notes & general details



CONSTRUCTION

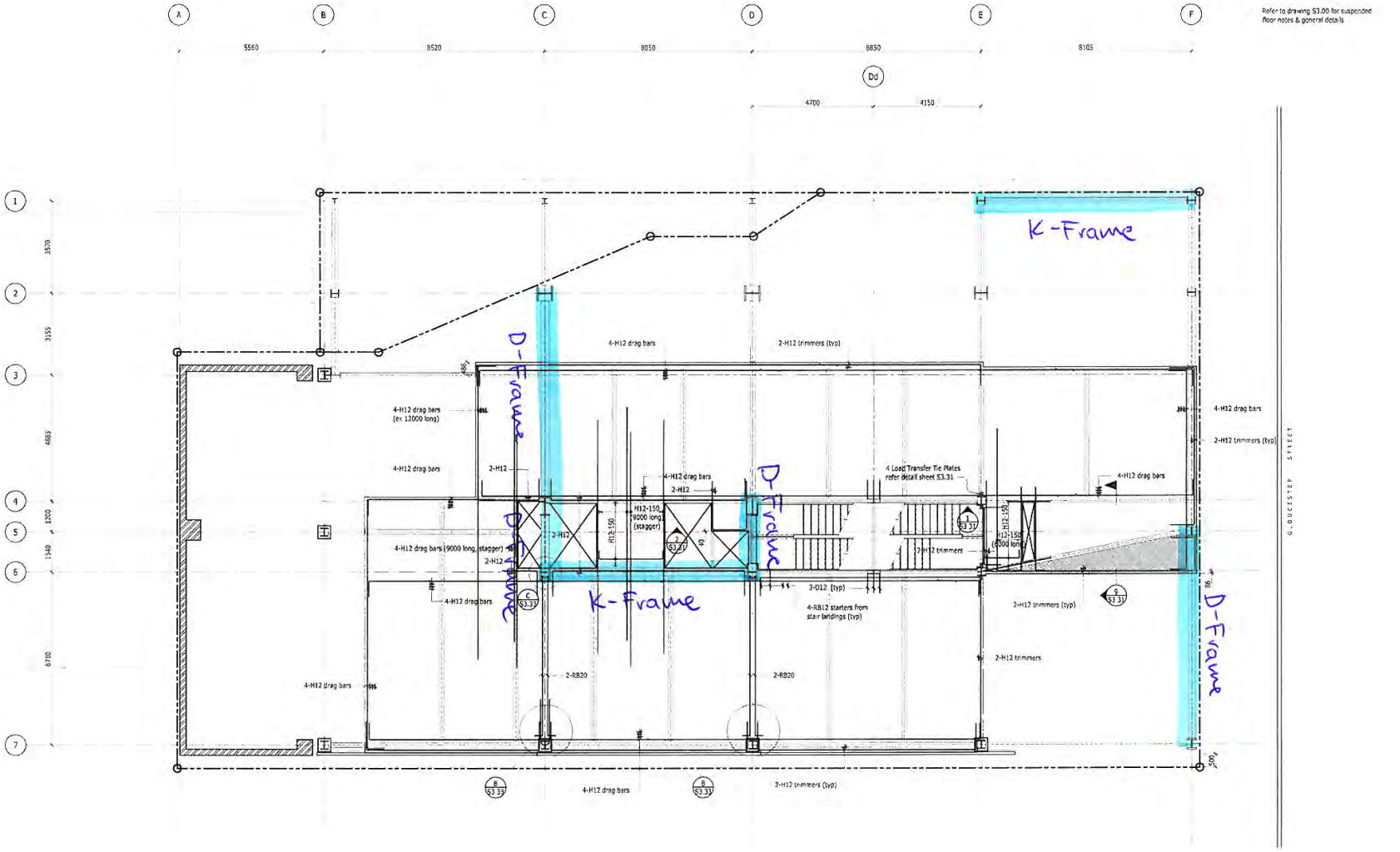
2	CONSTRUCTION ISSUE	JL	SG	12-12-07	GA	GB		1:100	AMC CONSTRUCTION	C1 TOWER	structex "Giving support a whole new meaning" www.structex.co.nz	LEVEL 2 FLOOR PLAN	S3.02	project 1770 issue 2

BUI.GLO166.0019.78

P:\PROJECTS\1770\DWG\1770S3.0.DWG : Z5110407 17:59 A2 ORIGINAL

NOTES.

Refer to drawing S3.00 for suspended floor notes & general details



CONSTRUCTION

2	CONSTRUCTION ISSUE	JL	SG	12-12-07	GA	GB		1:100	AMC CONSTRUCTION	C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

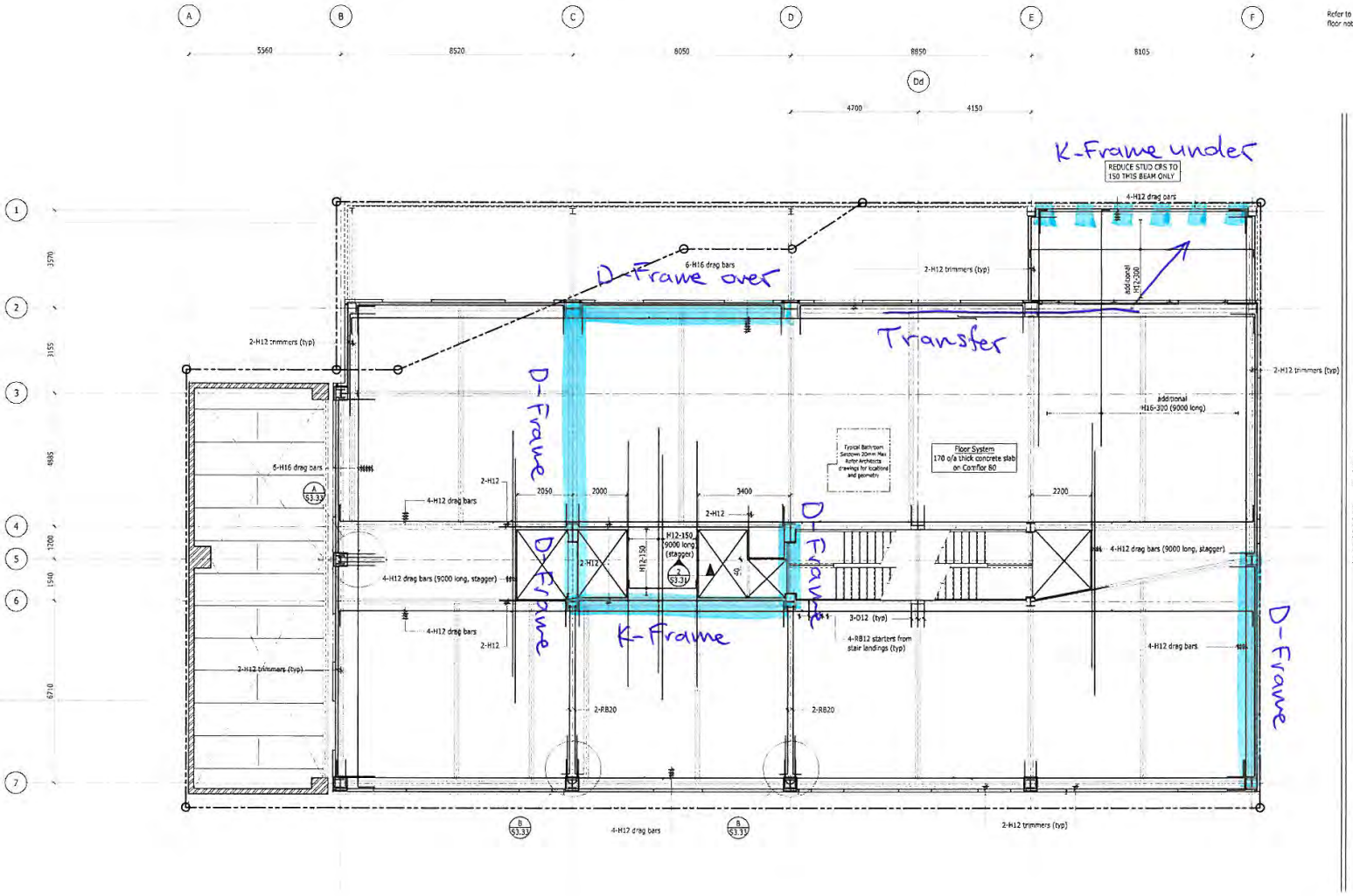
LEVEL 3 FLOOR PLAN

S3.03 | project 1770 | 2

P:\PROJECTS\1270+\P1270S3.0.DWG - 23/10/07 17:19 - A2 ORIGINAL

NOTES:

Refer to drawing S3.00 for suspended floor notes & general details



CONSTRUCTION

2	CONSTRUCTION ISSUE	JL	SG	12-12-07	GA	GB		1:100	AMC CONSTRUCTION	C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

LEVEL 6 FLOOR PLAN

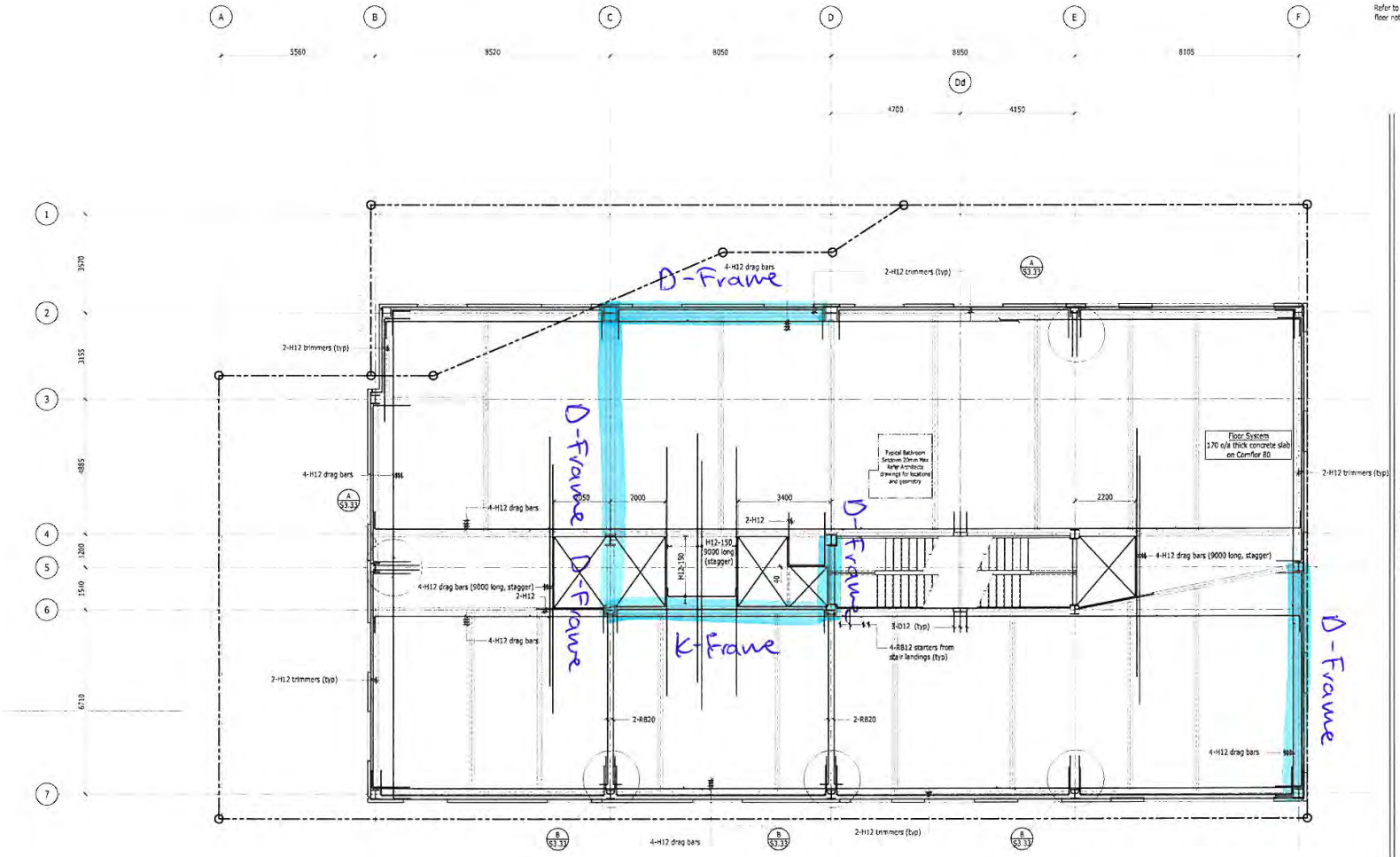
S3.06 | 1770 | 2

BUI.GLO166.0019.80

P:\PROJECTS\1770\2\1770S3.0.DWG - 23/10/07 17:59 A2 ORIGINAL

NOTES:

Refer to drawing S3.00 for suspended floor notes & general details



CONSTRUCTION

2	CONSTRUCTION ISSUE	JL	SG	12-12-07	GA	GB		1:100	AMC CONSTRUCTION	C1 TOWER	LEVEL 9 FLOOR PLAN

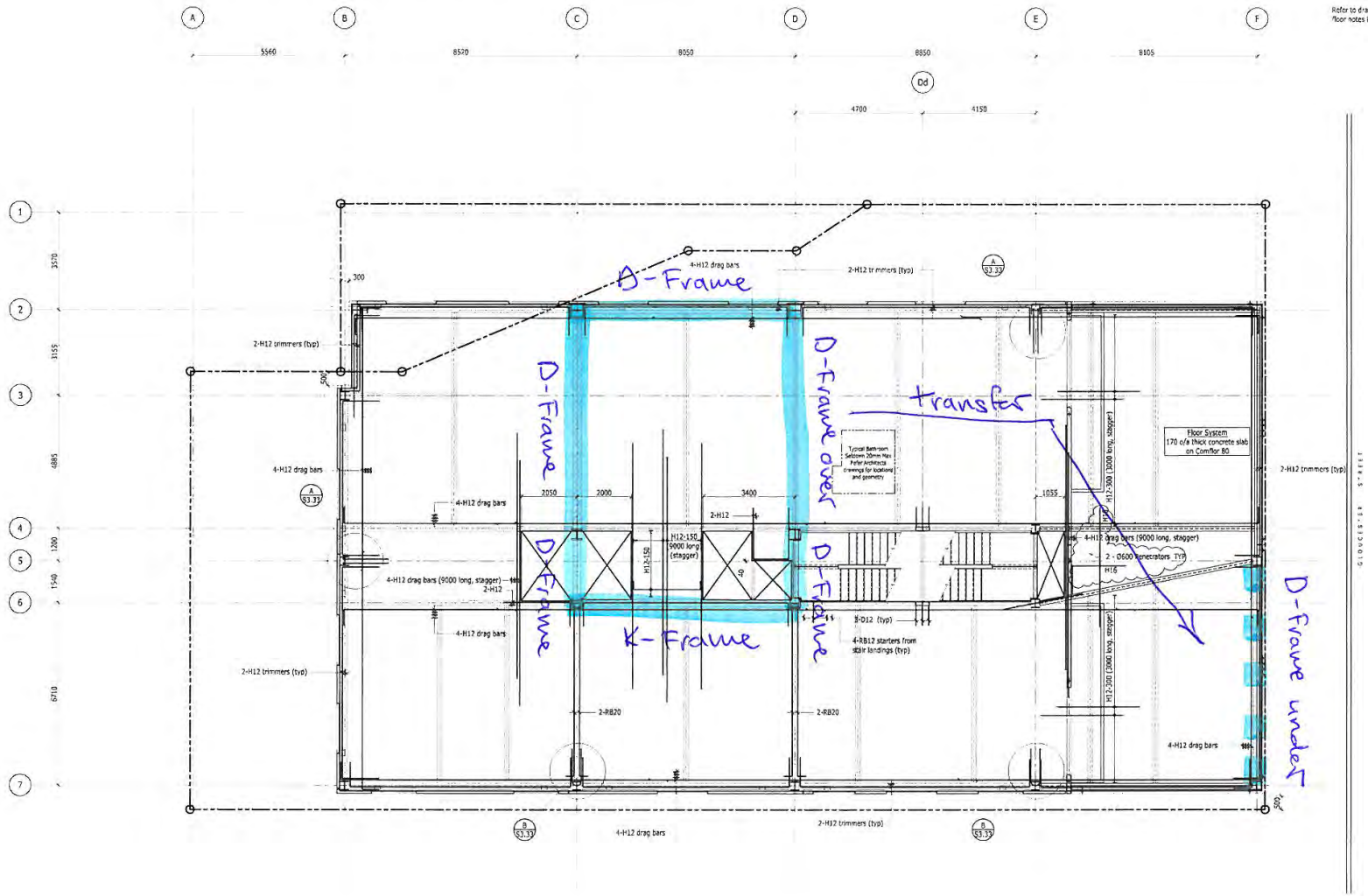
structex "Giving support a whole new meaning" www.structex.co.nz

S3.09 | project 1770 | issue 2

P:\PROJECTS\1770\D\170S3.0.DWG - 25/11/97 17:39 A2 ORIGINAL

NOTES:

Refer to drawing S3.00 for suspended floor notes & general details



CONSTRUCTION

2	CONSTRUCTION ISSUE	JL	SG	12-12-07	GA	GB		1:100	AMC CONSTRUCTION	C1 TOWER

structex "Giving support a whole new meaning" www.structex.co.nz

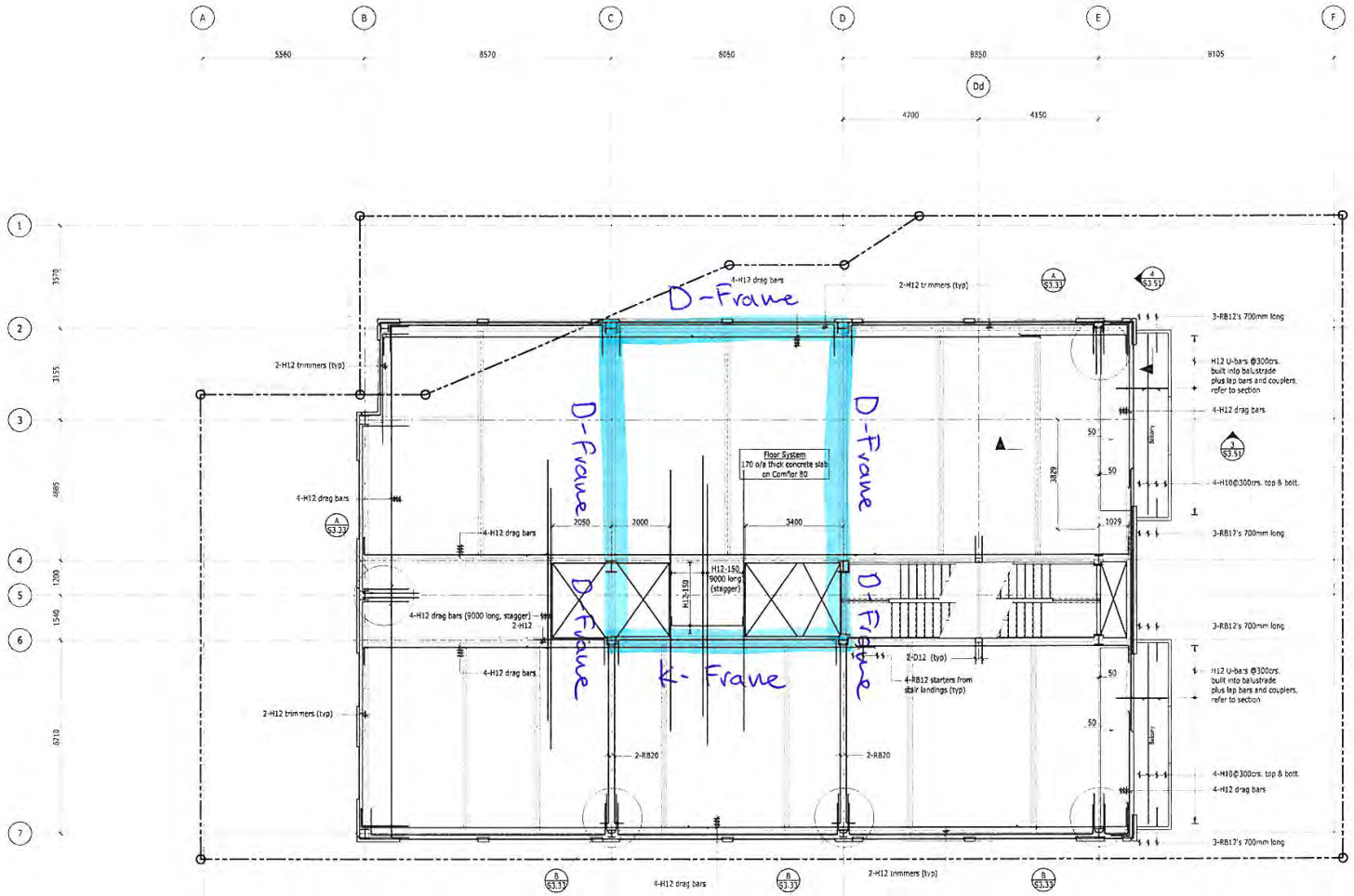
LEVEL 11 FLOOR PLAN | S3.11 | project 1770 | issue 2

BUI.GLO166.0019.82

P:\PROJECTS\1770\DWG\1770S3.0.DWG - 25/10/07 12:59 A2 ORIGINAL

NOTES:

Refer to drawing S3.00 for suspended floor notes & general details



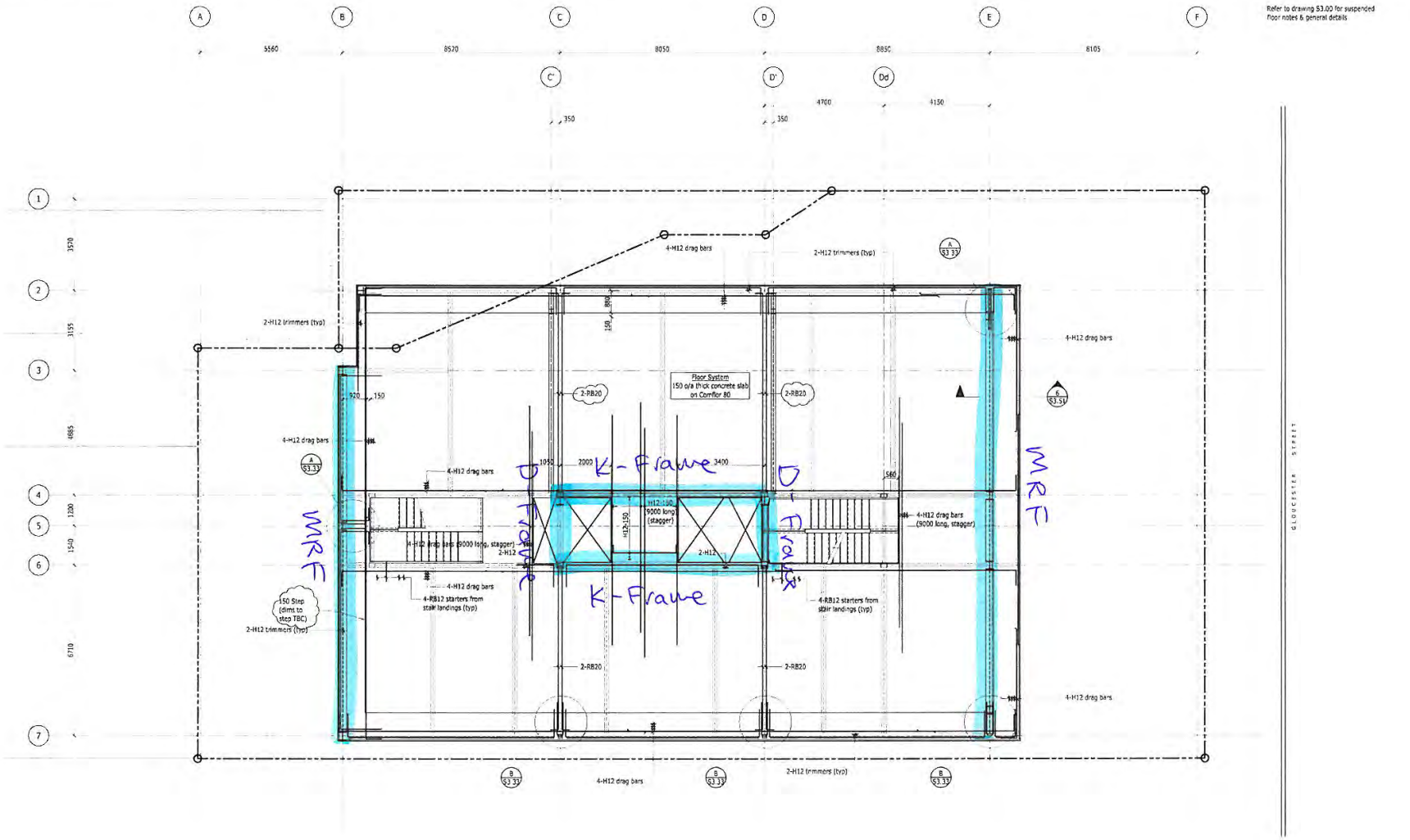
CONSTRUCTION

2	CONSTRUCTION ISSUE	JL	SG	12-12-07	GA	GB		1:100	AMC CONSTRUCTION	C1 TOWER	structex "Giving support a whole new meaning" www.structex.co.nz	LEVEL 16 FLOOR PLAN	S3.16	1770 2
issue	description	by	appd	date	drawn	designed	approved	scales	client	project title		drawing title	drawing no	project no issue

P:\PROJECTS\1770\DWG\1770S3.0.DWG - 25/10/07 17:59 A2 ORIGINAL

NOTES

Refer to drawing S3.00 for suspended floor notes & general details



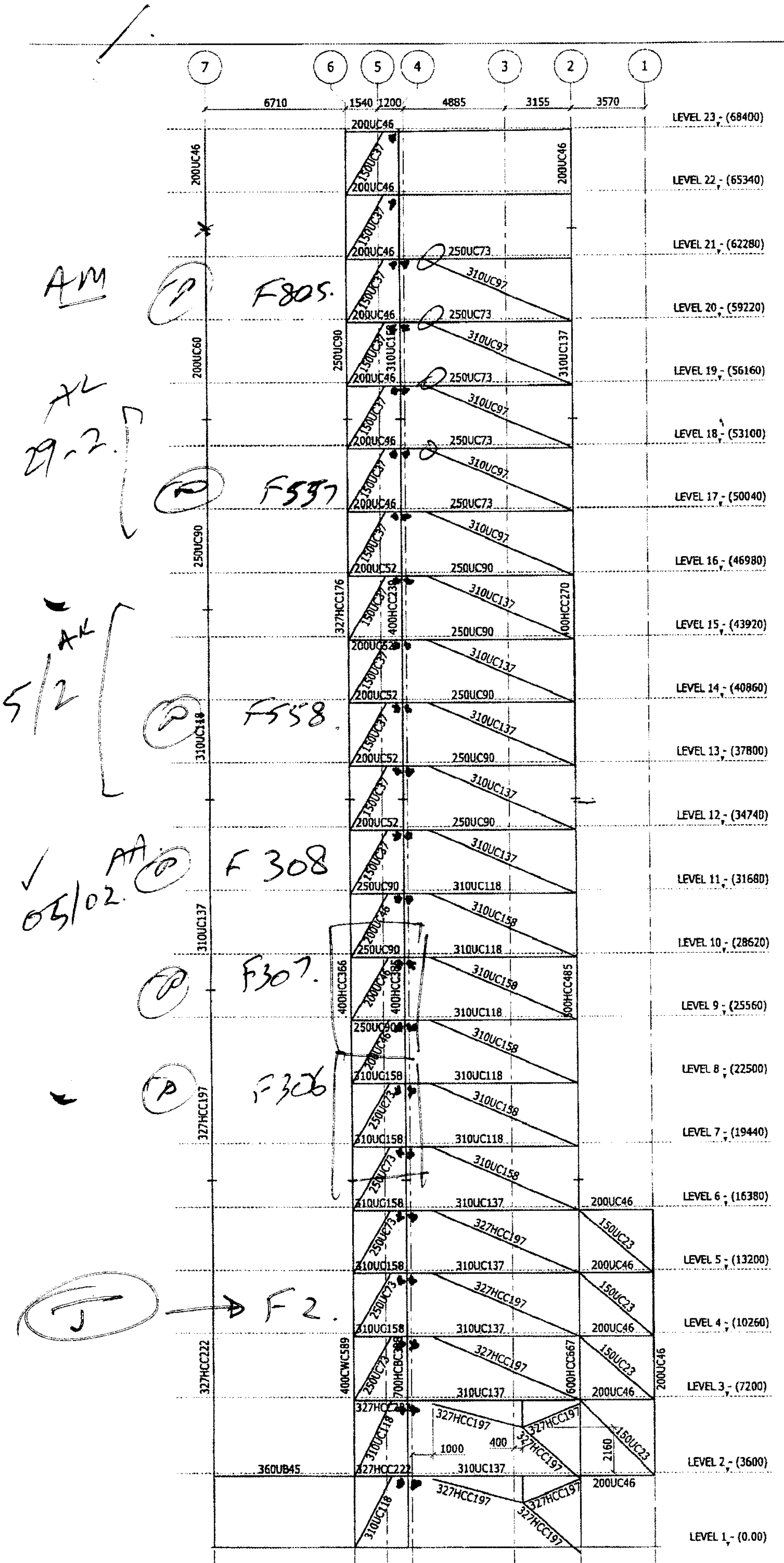
CONSTRUCTION

2	CONSTRUCTION ISSUE	JL	SG	12-12-07	GA	GB		1:100	AMC CONSTRUCTION	C1 TOWER	LEVEL 22 FLOOR PLAN

structex "Giving support a whole new meaning" www.structex.co.nz

S3.22 | project 1770 | 2

P:\PROJECTS\1770\D\1770S4.0.DWG - 27\04\07 09:55 A2 ORIGINAL



NOTES:

a. Refer to steelwork framing plans for beam sizes

b. ┼ Indicates location of change in column size

* REQUIRES 100% ULTRASONIC TESTING BETWEEN LINK BEAM AND COLUMN

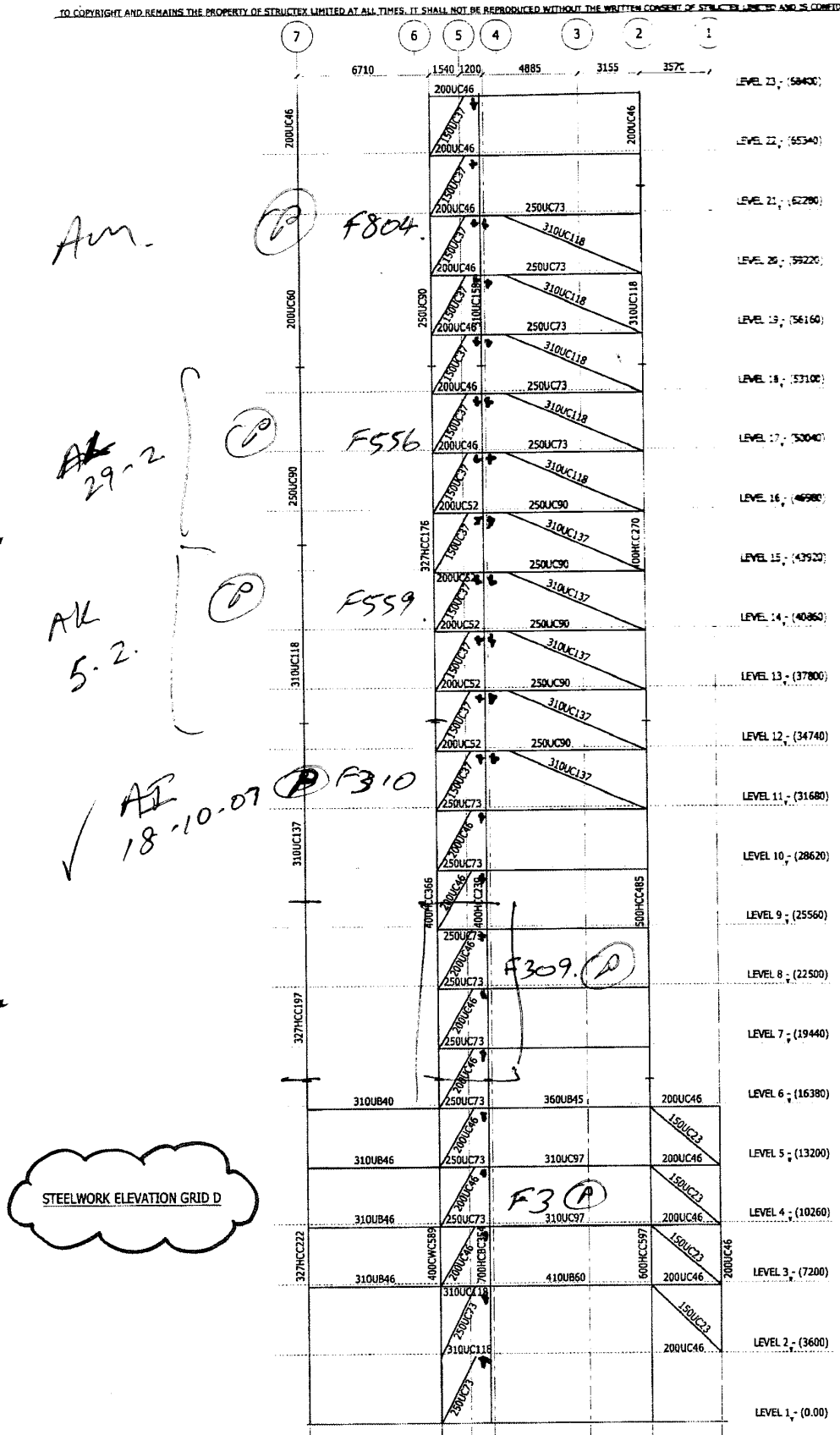
42 THIS FRAME

OTHERWISE, TESTING AS PER AS/NZS 1554

STEELWORK ELEVATION GRID C

CONSENT

C1 TOWER project title	structex "Giving support a whole new meaning" www.structex.co.nz	STEELWORK ELEVATION GRIDS B & C drawing title	S4.31 drawing no	project 1770 issue 0A



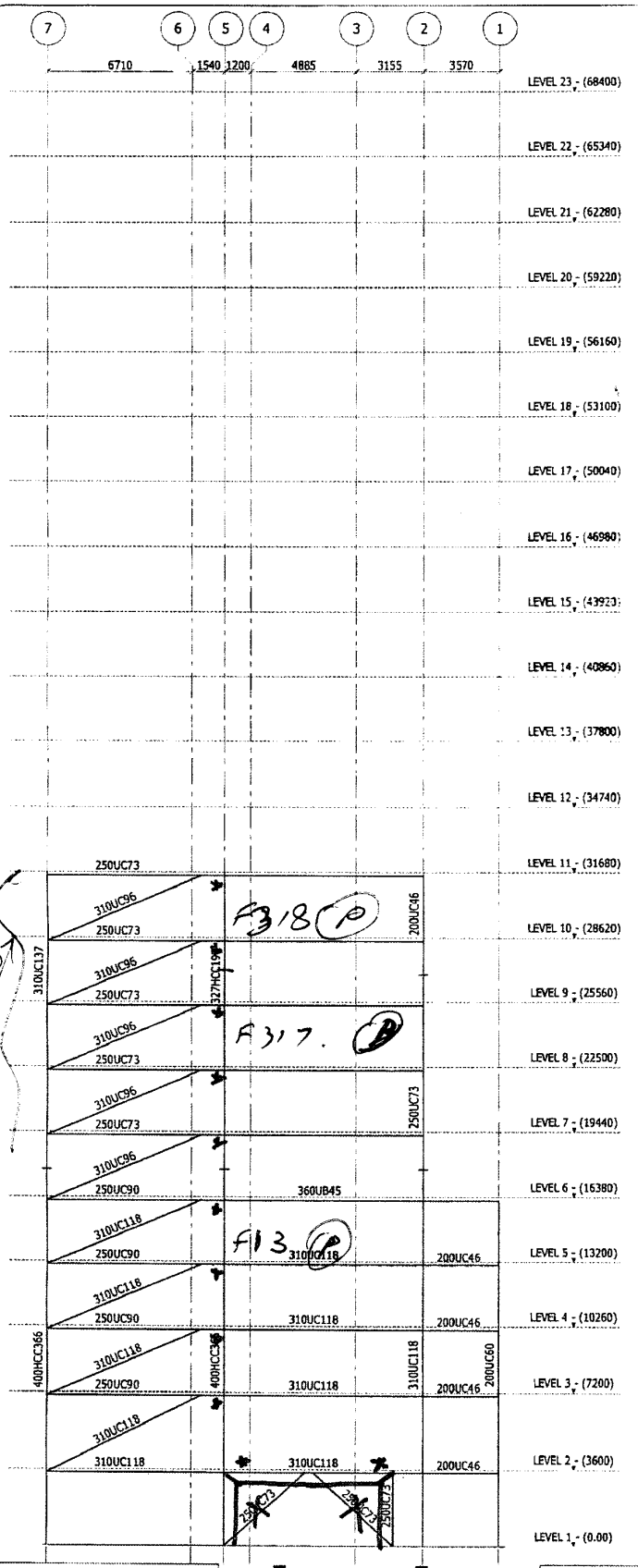
STEELWORK ELEVATION GRID D

- REQUIRES 100% ULTRASONIC TESTING BETWEEN WEB BEAM & COLUMN

32 THIS FRAME

OTHERWISE TESTING AS PER AS/NZS 1554

A	FOR CONSENT - STAGE 4	GA	GB	30-04-07	PH	GB	1:200	AMC CONSTRUCTION
0	FOR CONSENT - STAGE 3	GA	GB	19-04-07				
	description	by	appd.	date	drawn	designed	approved	scales	client



NOTES:

a. Refer to steelwork framing plans for beam sizes

b. — Indicates location of change in column size

Shop Adj 18-11-07

* REQUIRES 100% ULTRASONIC TESTING BETWEEN LINK BEAM & COLUMN + AT PORTAL FRAME KNEE JOINT

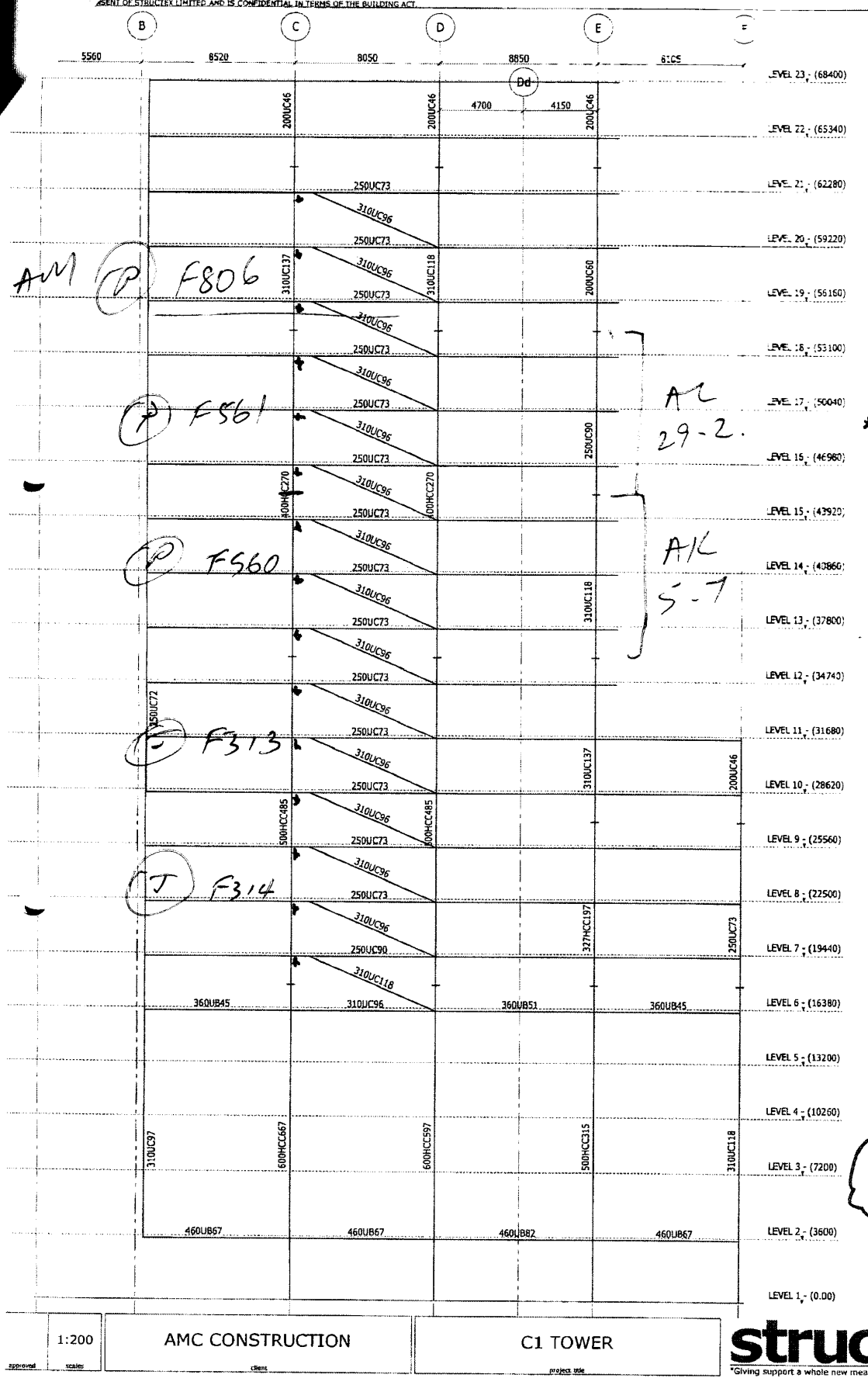
11 THIS FRAME

OTHERWISE TESTING AS PER AS/NZS 1554

STEELWORK ELEVATION GRID F

CONSENT

C1 TOWER (project title)	structex "Giving support a whole new meaning" www.structex.co.nz	STEELWORK ELEVATION GRIDS E & F (drawing title)	S4.33 (drawing no)	project 1770 / OA (issue)



AM P F806

P F561

P F560

J F313

J F314

A/C 29-2.

A/C 5-7

* 100% ULTRASONIC TESTING BET LINK BEAMS & COLUMNS

IS THIS FRAME

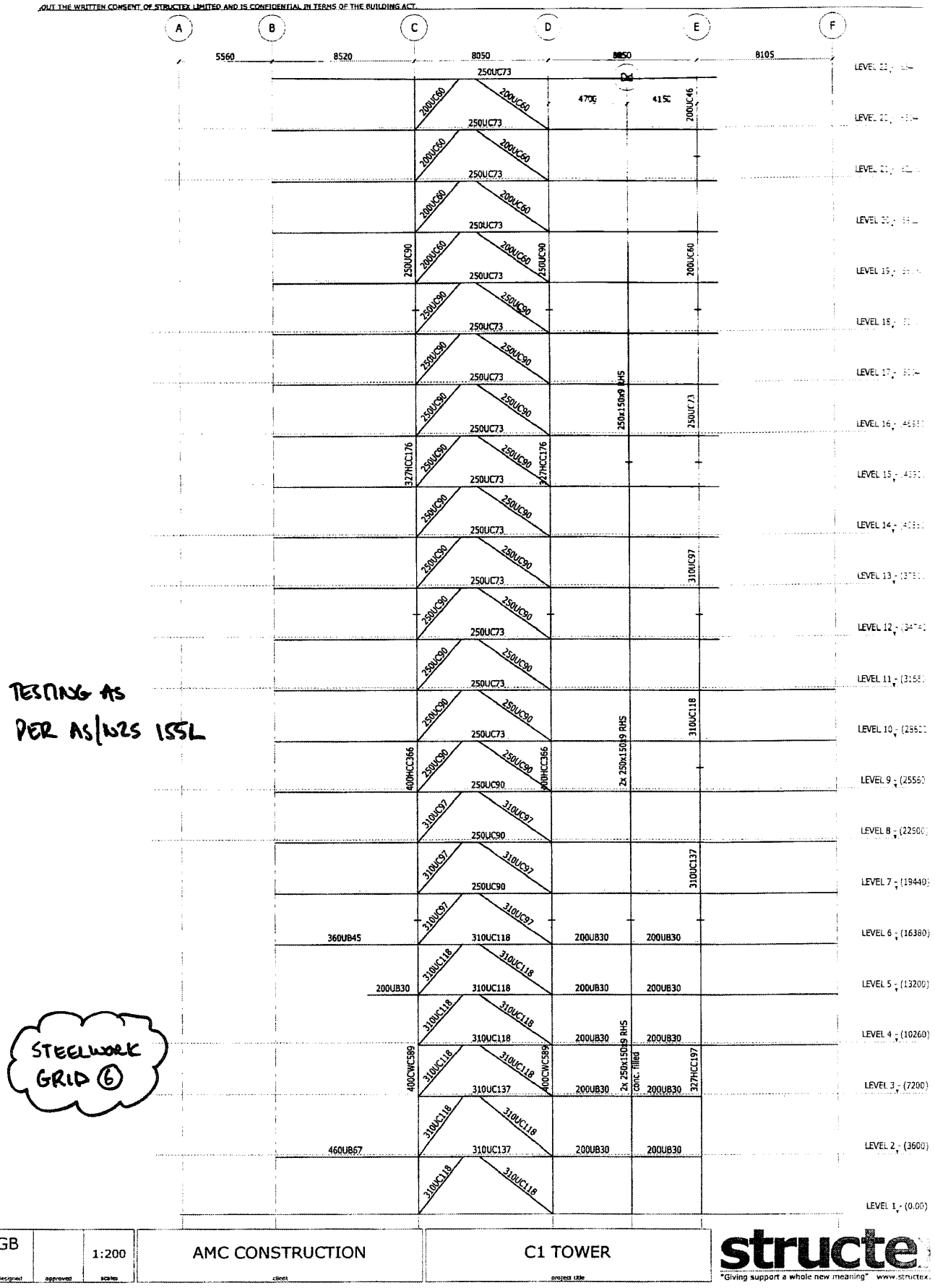
OTHERWISE TESTING AS PER AS/NZS 1554

STEELWORK GRID (2)

approved	1:200 scales	AMC CONSTRUCTION client	C1 TOWER project title

structex "Giving support a whole new meaning" www.structex.co.nz

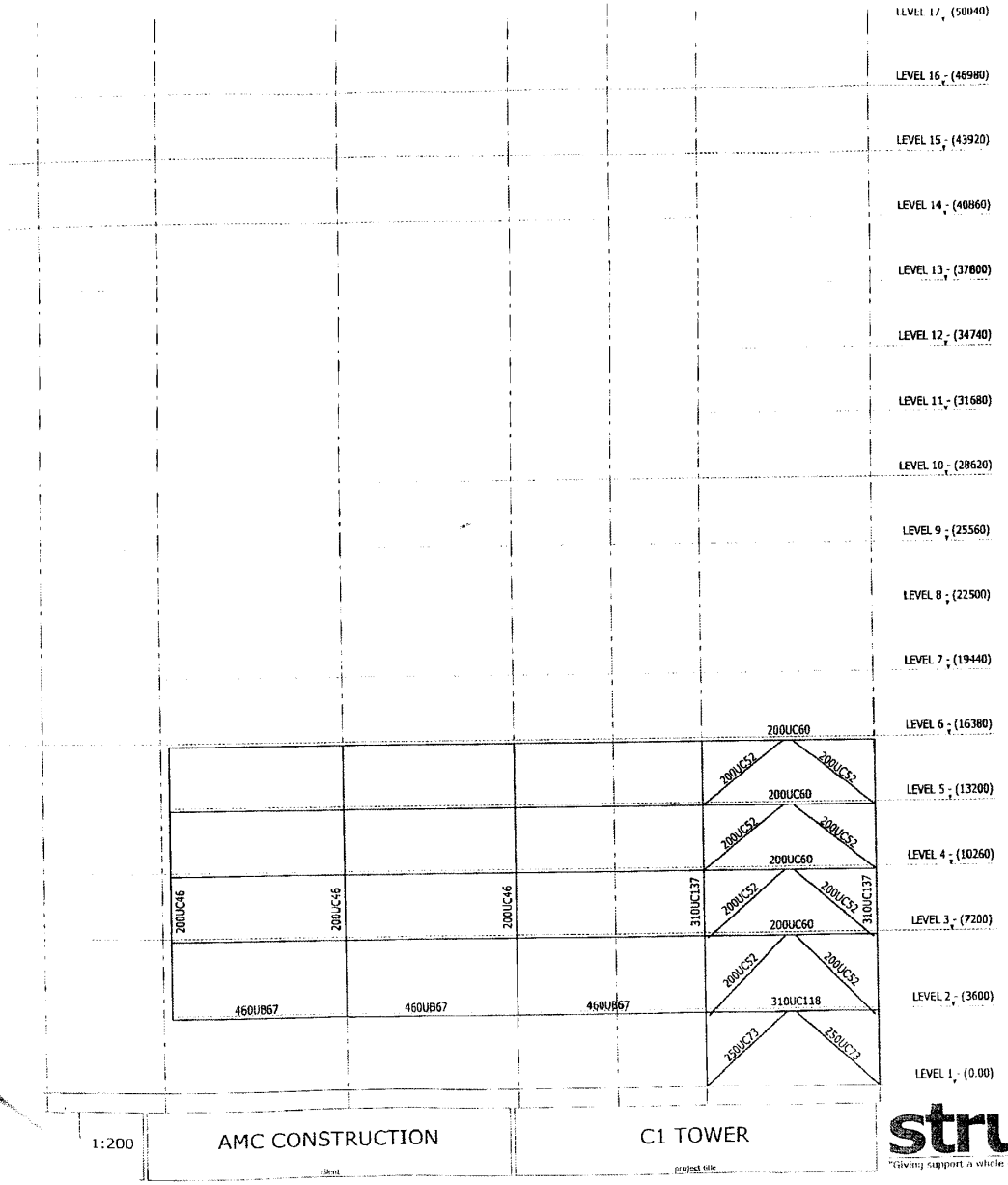
STE



TESTING AS PER AS/NZS 155L

STEELWORK GRID ⑥

H	GB		1:200	AMC CONSTRUCTION	C1 TOWER	structex
awn	designed	approved	scales	client	project title	"Giving support a whole new meaning" www.structex.



% ULTRASONIC TESTING
AS PER AS/NZS 1554

CONSENT

1:200

AMC CONSTRUCTION
client

C1 TOWER
project title

structex
"Giving support a whole new meaning" www.structex.co.nz

STEELWORK ELEVATION
GRID 1
drawing title

S4.34
drawing no

project 1770
issue 0A

NATIONAL FACILITIES MANAGEMENT LTD.

FULL EXTERNAL EARTHQUAKE ASSESSEMENT

PACIFIC TOWER

Attn Mark Tonks
PO Box 13-413
CHRISTCHURCH 8141
NEW ZEALAND
Post Earthquake

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Executive Summary

NFM's Assessment Team possesses substantial building & construction experience so as to provide more specific assessments. Assessments, that we believe are useful to undertake damage cost quantity surveying and for structural engineers to take into consideration when determining what has actually transpired during these quakes. The focus of this report pertains to the building exterior affected by the series of earthquakes since September 4th, 2010 that culminated in February 22nd, 2011. After-shocks have continued since then, and do continue to impose damage up to this point (May 20th, 2011). This report took place mostly in the weeks of May 2011.

Exterior Observational Building Report

The following is a rather comprehensive external assessment of the Pacific Tower in Cathedral Junction.

Summary of works:

We have made a full detailed exterior inspection to all elevations for earthquake damage. Additionally, we took photographs of damaged areas which are an Addendum to this Report.

- **Tap test of all areas of concern -** Removed any loose concrete.
- **Abseil anchor points -** No Earthquake damage found.
- **Windows -** (glass, frame, and sealant) some damage to window sealant noted.
- **Hardie Boards on top two floors -** Extensive cracking, particularly along the joints.
- **Concrete exterior walls -** Numerous hairline cracking noted, predominantly around window corners. These range from deep concrete cracks to light cracking of the paint work.
- **Expansion joints –** Even more expansion joints have split as a result of the recent bouts of earthquakes, with some and slight concrete slab displacement.
- **Historic south frontage -** Some cracking noted particularly at the east end (?)
- **Flashing -** Most of the flashing around the building has been damaged and will require replacement.
- **Balcony Faces –** Cracks to most balcony faces, soffits and balcony slab floors of Pacific Tower
- **Level 6 Pacific Tower Car Park South Deck –** Damage to the wooden underlay of flashing interfacing adjoining Car Park (historical building) and the new Pacific Tower.
- **Level 11 Deck Pacific Tower North End -** One significant crack in the Parapet facing Gloucester Street both internal and external face.

***Otherwise, we will highlight in RED, those areas of the Pacific Tower where we recommend further engineering assessments to damage-affected Concrete Panel – Girder/Beam attachments may be made both externally and internally.**

(03) 359-6406 / Mobile 021 686-925

Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

PACIFIC TOWER

SOUTH FACE

Southwest Corner

Level 20

- Bottom-left & bottom-right corners of the Only Window have 300 mm diagonal hairline cracks.

Level 19

- No notable damage

Level 18

- Top-left, bottom-left & bottom-right corners of the Window have 300 mm diagonal hairline cracks.

Level 17

- Top-left & top-right corners of this window, have 300 mm diagonal hairline cracks. The bottom-left has a 300 mm horizontal hairline crack. The bottom-right has a 500 mm horizontal hairline crack.

*At the horizontal join on the left-bottom side of the Panel between Levels 16 & 17, the Panel has popped-out 10 mm.

Level 16

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

- Bottom left corner of this window has a 300 mm horizontal hairline crack. Top left corner has a diagonal 100 mm diagonal hairline crack. The top-right corner has a 300 mm vertical hairline crack.

Level 15

- The right side of this Panel on the vertical join has popped-out 10 mm.

Level 14

- No notable damage

Level 13

- No notable damage

Level 12

- The bottom-right corner of this Panel at the Panel join between Levels 11 & 12 has popped out 20 mm.

Level 11

- No notable damage

Level 10

- No notable damage

GENERAL SOUTH FACE ABOVE PARKING GARAGE

Panel Displacements

Level 6 - Right Concrete Slab panel is distorted above the middle window at the top and is bowed-out 10 mm approximately in the centre of the window.

Level 6, 7, 8 & 9 – Vertical Concrete Slab displacement approximately 15 mm at the centre join between the left and right panels (there are only two panels on this side of the building).

NATIONAL FACILITIES MANAGEMENT LTD.

***Level 9 bottom-right corner of left panel, panel is popping out 15 mm. Horizontal silicone between Levels 8 & 9 is a bit distorted and torn. Bottom of right panel has popped out 15 mm. Silicone is ripped and distorted.**

***Between Levels 9 & 10, the silicone join is torn.**

General Face Damage Descriptions:

South Face Level 6 Deck (Worcester Street Side) – Approximately 15 meters x 320 mm of plywood flashing situated 100 mm above the „Equis'-covered deck requires entire replacement; as does new flashing.

Level 6 above Deck

Left Panel, left side of panel has a 2-meter hairline vertical crack. Lower Left of window on this panel has a diagonal 1-meter crack. Upper right side of window has a 300 hairline crack. A 1-meter horizontal crack runs right to the panel edge.

***It appears that the right side of this Left Panel has popped out approximately 15 mm.**

Right Panel, Left Window has a 1500 mm hairline crack descending to lower panel edge. Upper Left of Left Window has a 300 mm vertical hairline crack. Middle of right side of this window has a 1200 mm hairline crack running to the right window. The upper right window has a 400 mm diagonal crack.

***There is a horizontal silicone distortion between Level 6 & Level 7 panels.**

Level 7 above Deck - Approximately 18 meters of hairline cracks to be repaired.

Left Panel, from bottom left of window has a horizontal 2 meter hairline crack to the panel edge. From this same point, a vertical hairline crack descends 1 meter to lower panel edge. Upper left of window has a 300 mm diagonal hairline crack. Lower right of window has a horizontal hairline crack extending to right panel edge.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Right Panel, Left Window, top-left corner has a 300 mm hairline crack to panel edge. Top-right corner of the same window has a 300 mm diagonal hairline crack to the panel edge. Bottom-right corner has a horizontal hairline crack 1200 mm long to the left-bottom corner of the Right Window. Two-Hundred (200) mm above this crack on the Left Window is another hairline crack 1700 vertical to the bottom panel edge. This hairline crack has a 200 mm fork to the same bottom panel edge.

Right Window, 300 mm diagonal hairline crack on top-left corner of window to the panel edge. The right-bottom corner of this window has a 1200 mm hairline crack to the panel edge.

Level 8 above Deck - Approximately 20 meters of hairline cracks to be repaired.

Panel # 1 (left), top-left corner of window has a 300 mm hairline crack to the panel edge. The bottom-left corner has a 1500 mm hairline crack to panel edge.

Panel #2 (right), Left Window, top-left corner of window has a 350 diagonal hairline crack to the panel edge above. There is a 300 mm hairline vertical crack close to this diagonal crack, running to this panel edge above. Top-right corner of this window, there is a 350 mm hairline diagonal crack to the panel edge. Bottom-left corner of window has a horizontal 1500 mm hairline crack running to the left of the panel edge. From the same corner runs a 3000 mm diagonal hairline crack running to the left panel edge. 500 mm down from this corner, the crack forks, with a 500 mm hairline crack running right. There is a 500 mm horizontal hairline crack running to the centre of the window. Right-bottom corner of window, there is a 1200 mm horizontal hairline crack running to bottom-left corner of this right window. 200 mm above the right-bottom corner of the Left Window there is a 1-meter diagonal hairline crack joining the previous one.

Right Window, bottom-left corner vicinity is a 500 vertical hairline crack running downwards to the panel edge. 200 mm to the right of this crack, there is a one-meter diagonal hairline crack towards the bottom-right corner of the panel edge. The top-left corner, 2 – 300 mm vertical hairline cracks towards the panel edge.

***Horizontal silicone distortion between Panels 8 & 9 along the join of both the Left & Right Panels.**

***This Panel has popped-out 15 mm between the right and left panel join.**

Level 9 above Deck - Approximately 20 meters of hairline cracks to be repaired

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Left Panel, Left Window, top-left corner has a 300 mm diagonal hairline crack to panel edge. Bottom-right corner of this window has a 1 meter diagonal hairline crack to the panel edge.

***There is a 10 mm pop-out at the vertical join between the Left & Right Panel.**

Right Panel, Left Window, top-left corner has 2 – 300 mm diagonal hairline cracks in the shape of a "V" going to the panel edge. Top-right corner of this same window has a 300 mm diagonal hairline crack to the above panel edge. The Left-bottom corner has a 1500 mm horizontal hairline crack running to the left panel edge. Bottom edge of this same window, 1/3 distance to the right of the bottom-left corner has a 3000 diagonal hairline crack running towards the bottom-left corner of the panel edge. This crack forks into another 2000 mm crack to the same bottom left corner of this Panel. Bottom-left corner of the window, there is a1200 mm horizontal hairline crack running to the bottom-left of the Right Window. 200 mm upwards from the bottom-right corner of this Left Window, there is a 1700 mm vertical hairline crack running down to the bottom of panel edge.

Right Window, 300 mm vertical hairline crack, 1/3 in from the top-left corner of this window to the panel edge above. 200 mm in from the bottom-left of this window, is a 1500 mm diagonal hairline crack running towards the bottom-right corner of the panel. Bottom-right of corner, there is a 1500 mm vertical hairline crack crossing this crack running towards the bottom of panel edge. There is horizontal 1 meter hairline crack running to the right panel edge.

Level 10

Left Panel, a 3 meter-horizontal crack running from the middle of window to the panel edge. Bottom-right corner of window has a 500 mm diagonal crack running towards the panel edge. Top-left corner of window has a 400 mm diagonal crack running to the panel edge.

Right Panel, top-right of Left Window edge has a crack 300 mm long running to the panel edge. The bottom-right corner of window has a horizontal 1000 mm hairline crack running to the adjacent window with a second similar horizontal crack. Left-edge of the window has a 2500 mm-long crack running panel edge. Bottom-centre of Right Window beneath window has a 2500 mm-long crack running downwards nearly to the panel edge. The right side of this window has a 900 mm crack running to the panel edge.

***The top-right corner of the slab is fractured and the bottom of Level 11 Panel has popped out about 5 mm.**

(03) 359-6406 / Mobile 021 686-925

Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Level 11

*Between Levels 10 & 11, level 10 is popping out 7 mm, silicone is torn and distorted.

Right Panel, Left Window, bottom-right corner is fractured to the panel edge 1500 mm. On the left side of this window is a large 2500 mm crack running to the panel edge. The top-left corner of this window has a 300 mm hairline crack to the panel edge. The right-bottom of this window has 2 horizontal cracks 800 mm and 1200 mm to the panel edge.

Right Window, right corner has a horizontal crack one meter long to the panel edge.

Left Panel, left-top corner of the window has a 300 mm vertical hairline crack to the panel edge.

***Horizontal silicone distortions between Levels 10 & 11.**

Level 12

Left Panel, Window, bottom-right corner has a 1200 mm diagonal crack to the panel edge. Top-left corner has a 300 mm vertical hairline crack to panel edge.

Right Panel, Left Window, right bottom corner has a vertical crack 1500 mm long to the panel edge. The right-top corner window has a 300 mm diagonal crack to the panel edge. There are 2 horizontal 1000 mm cracks running between this window and the adjacent one. In the middle of the two windows, joining the upper horizontal crack, there is a 1000 mm vertical hairline crack up to the panel edge. The left-top corner has a 300 mm vertical hairline crack to the panel edge. The bottom-left corner has a 400 mm horizontal hairline crack running left to the panel edge.

Right Window, top-left corner, has a 300 mm vertical crack running to the panel edge. The bottom-edge has a 400 mm horizontal hairline crack running to the right panel edge.

***The right-top of this Right Panel is popping out 10 mm, with silicone torn and distorted between Levels 11 & 12 on both the Right & Left Panels.**

Level 13

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Left Panel, right top corner of the window (only one window) has a 300 mm diagonal crack to the panel edge. Top-left corner of window has a 300 mm vertical hairline crack to the panel edge. Right-bottom corner of this window has a 1200 mm horizontal hairline crack running to the panel edge.

Right Panel, Left Window, right-bottom corner has a vertical 1500 mm hairline crack to the panel edge.

Right Window, bottom-right corner has a 1000 mm horizontal hairline crack to the panel edge.

***Between Levels 13 & 14, there is a silicone distortion and panels across the horizontal join.**

Level 14

No damage noted

Level 15

Left Panel – No damage

Right Panel, Left Window, top-left window vertical hairline crack 300 to panel edge. Bottom-right corner of window has a horizontal 1000 mm crack running to the bottom-left corner of the window.

Level 16

Left Panel – No noted damage

Right Panel, Left Window, left-top corner has a 400 mm diagonal hairline crack to panel edge.
Right Window, left-top corner has a 400 mm horizontal hairline crack to panel edge.

Level 17

No noted damage

***Recommend Slab Displacement needs internal inspection by engineer**

Level 18

No noted damage

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

*The right and left panels pop-out along with silicone distortion on the horizontal joins between Levels 17 & 18.

Level 19

No noted damage

*Between Levels 18 & 19, 19 & 20, 20 & 21, there is silicone distortion in the horizontal joins.

Level 20

*Horizontal silicone joins between Levels 19 & 20 the entire length of the horizontal join has distortion and is partially torn.

***Between Levels 6 & 12 on the Right Panel, there is significant systemic/general cracking in similar places between the windows and the lower and upper areas. We recommend further engineering inspection in the internal wall beams in this vicinity.**

* **FLASHING - Replacement required of vertical flashing on both sides of the South side, (car park side), of 15 meters each side.**

WEST SIDE (described left-to-right)

Level 6 – Five meters of hairline cracks require repair above deck level.

Left Side, Panel #1, left window, bottom-left corner has a 200 mm horizontal hairline crack to panel edge. Top-right corner has a 300 mm diagonal hairline crack to panel edge.

*This panel has popped-out 10 mm on the horizontal join on the right side between Levels 6 & 7.

Panel #2, top-left corner of window has a 200 mm diagonal hairline crack. Top-right corner has a 300 mm vertical hairline crack to panel edge above.

Panel #3, Left Window, has 2-300 mm vertical hairline cracks running from the top of window to the panel edge above.

* This Panel has popped-out 10 mm on the vertical join of both the right and left sides between Panels # 2 & 3, and #3 & #4.

NATIONAL FACILITIES MANAGEMENT LTD.

Panel #4, Left Window, right-bottom corner, there is a 500 mm horizontal hairline crack running towards the right window. Right Window, top-right window has a 300 mm vertical hairline crack running towards the panel edge above.

Panel # 5, Right Window, top-left corner, there is a 400 mm hairline crack to the panel edge above.

*This Panel has popped-out 10 mm between Panels 4 & 5 on the vertical join.

Level 7 -

- Left Side, Panel #1, Left-bottom corner has 2 hairline cracks. One is 300 mm diagonal hairline crack down to the panel edge; and also a 200 mm horizontal hairline crack to the panel edge. The right-top corner has a 300 mm diagonal hairline crack to the Panel edge above. The bottom-left corner has a 2000 mm diagonal hairline crack running to the bottom of the Panel edge.
- Panel # 2, Middle of Window has a 200 mm vertical hairline crack running towards the bottom Panel edge.
- Panel # 3, Left Window, top-right corner, has a 400 mm diagonal crack to running to the Panel edge above.

*This Panel has popped-out 10 mm on the right vertical join between panel #3 and #4.

- Panel # 4, Right Window, bottom-left corner has a 1500 mm vertical hairline crack running downwards to the Panel Edge. There is another 1500 mm vertical hairline crack half-way along the base of the window, running down to the panel edge. Half-way down between these 2 cracks, there is a 500 mm hairline crack joining them.

***This panel has popped out 10 mm from the right-bottom corner, 1500 mm along the horizontal join between Panels 6 & 7.**

- Panel # 5, Right Window, bottom-left corner has a 300 mm diagonal hairline crack running towards the bottom of the panel.

Level 8

- Panel #1, Left-bottom corner, 500 mm diagonal hairline crack running to the panel edge. Right-bottom corner, 2000 mm diagonal hairline crack running to the panel edge below. The top-right corner, 300 mm diagonal hairline crack to the panel edge above.
- Panel #2, One meter of hairline cracks to be repaired. Vertical distorted Concrete Slab silicone requires replacement.
- Panel #3, Left Window, bottom-left corner has a 300 mm diagonal hairline crack running towards the left panel edge. Right-bottom corner of window has a 1500 mm hairline vertical crack to the bottom panel edge. 1200 mm hairline crack from the corner of this window, running towards the bottom-left corner of the Right Window. Right Window, bottom-left corner has a 2500 hairline crack heading towards the Left Window and down to the Panel edge below.
- Panel #4, Left window, top-right corner has a 300mm diagonal hairline crack to the slab edge above. Right window, top-left corner has a 300mm diagonal hairline crack to the panel edge above. Top-right corner has a 300mm diagonal hairline crack to the panel edge above. Bottom right corner has a horizontal 1000mm hairline crack to the slab edge. Bottom left corner has a 1500mm vertical hairline crack to the panel edge below. Half way along the bottom of this window a 1500mm vertical hairline crack to the bottom of the slab edge. From the left-bottom corner a 2000mm diagonal hairline crack intersects these 2 cracks and continues to the bottom edge of this slab.

  *** This panel has popped out 10 mm from the right-bottom corner; 1500 mm vertically along the slab join between panels #4 & #5.**

- Panel # 5, (right panel), approximately 4 meters of hairline cracks require repair.

Level 9

Panel # 1, bottom-left corner of window has a 1000 mm diagonal hairline crack to panel edge. There are 3 x 500 mm vertical cracks to the panel edge below, along the bottom of the window. Bottom-right corner of window has a diagonal 500 mm hairline crack to the Panel Edge. 500 mm up from the right-bottom corner of the window, there is a horizontal 200 mm hairline crack running to the panel edge, which runs diagonally downwards to the bottom corner of the window on Panel #2. There are 3 – 500 mm vertical hairline cracks from the bottom of the window down to the Panel edge.

NATIONAL FACILITIES MANAGEMENT LTD.

Panel # 2, bottom-left corner of window has a diagonal 500 mm hairline crack joining the 200 mm crack at the Panel edge.

Panel # 3, top-left corner has a 300 mm diagonal crack to Panel edge. Bottom-right corner has a 1500 mm vertical hairline crack to the Panel edge. This bottom-right corner has a 1200 mm hairline crack going to the bottom-left of the Right Window. In this centre of this crack, there is a 800 mm vertical crack running to the panel edge, with a 400 mm crack and (a fork) to the panel edge.

Panel # 4, Right Window, bottom-left corner has a 2000 meter horizontal hairline crack heading towards the Left Window.

Panel # 5, Left Window, bottom-left of window, 1000 diagonal hairline has a crack running towards the bottom panel edge. The Right Window, bottom-left window has a diagonal 1000 mm hairline crack heading towards the Left Window down to the panel edge. Two to 3 meters of general hairline cracks are on the panel face; Right window, Left-top corner, 500 mm hairline diagonal crack to slab edge; Left window, top-right window diagonal 500 mm hairline crack to slab edge.

***Top-left corner of left panel where it joins with Panel #4 (to its left) and with the Panels above (between Level 9 & 10) the Right Panel #5 is proud by 15 mm, with some silicone join tear.**

Level 10

- Panel # 1, (left panel), top-left corner of window has a 300 mm diagonal hairline crack to the Panel edge.
- Panel # 2, Left Window, bottom-right corner has a 1200 mm hairline crack running to the bottom-left corner of the Right Window. At the top of this panel, approximately in the centre between the two windows, there is a 3000 mm vertical crack running down to the bottom of panel. To the left of this crack is a fork, 1200 mm running up from the bottom slab edge, 1000 mm long.

Right Window, top-right corner has a 500 mm horizontal crack running to the panel edge.

- Panel #4 (to its left), right window, multiple hairline horizontal cracks 500 mm to slab edge; right-top corner of right window diagonal 400 mm hairline crack to slab edge. Left Window, right-top corner has a 300 mm diagonal hairline crack to the panel edge.

- Panel # 5 (Right), right window, top-right corner 400 mm diagonal crack; right window, top-left window 400 mm diagonal crack; Left window, right-top corner 400 mm diagonal hairline crack to slab edge.

***Where Panels #4 & # 5 join at top of Level 9 & bottom of Level 10, Panel # 5 Level 10 is about a 20 mm Proud; Panel # 4 has multiple hairline cracks around the window on the right side.**

*** Recommend that Engineer check the internal steel connection to Panels #4 & # 5 between Levels 9 & 10**

Level 11

Panel # 3, Middle Window, top-right corner has a 300 mm diagonal hairline crack to panel edge.

Panel # 4, no noted damage

Right panel #5, Left Window, top right corner, 400mm diagonal hairline crack to panel edge. Multiple hairline cracks to panel. Right Window, right top corner 400 mm diagonal crack to panel edge. Left-top corner has a 400 mm diagonal crack to the panel edge.

***Panel is popped-out 20 mm on the vertical join between Panels 4 & 5.**

Level 12

Panel # 3, Middle Window, bottom-left corner, has a 400 mm horizontal hairline crack running towards the Left Window.

NATIONAL FACILITIES MANAGEMENT LTD.

Panel # 4, Middle panel #4, right window, has multiple vertical cracks around window. Top right corner, 400mm diagonal hairline crack to slab edge

***Panel has popped out 20 mm on the Left-bottom corner between the Panel Crossing of Panels 3 & 4.**

Panel #5, Left Window, centre-top of window has a 300 mm vertical hairline crack running to the above panel edge. Right Window, top-right corner of window has a 400mm diagonal hairline crack to slab edge.

Level 13

Panel # 3, Left Window, bottom-centre has a 1500 mm vertical hairline crack running to bottom panel edge.

Middle Window, bottom-left corner has 600 mm diagonal hairline crack running to the left towards the bottom panel edge. Bottom-right corner of window has a 1500 mm diagonal hairline crack towards the bottom of panel edge.

Right Window, top-right corner has a 300 mm diagonal hairline crack running to panel edge above. Bottom-right corner has a 400 mm diagonal hairline crack running towards the panel edge below.

Panel # 4, right window, top right corner 500 mm hairline crack to panel edge. Horizontal hairline crack 500mm between window and panel edge.

***Panel has a 20 mm pop-out between Panels 3 & 4.**

Panel #5, (Right) right window, left top corner, 500mm diagonal hairline crack to panel edge. Left window, top-right corner has a 400 mm diagonal hairline crack running to panel edge.

***Level 13 & 14 middle and panel right panel intersection have vertical movement with a 15mm pop out.**

Level 14

Panel # 3, in the centre between the Left Window and Middle Window there is a 3000 mm vertical hairline crack running from top-to-bottom of panel edge.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Middle Window, top-left corner has a 300 mm vertical hairline crack running to panel edge above.

Panel #4, Left Window, bottom-centre has a hairline vertical crack, 1500 mm long running to the panel edge bottom. Right Window, right top corner, 500mm diagonal hairline crack to panel edge.

***Panel has popped-out 20 mm on the vertical join, between Panels 3 & 4.**

Panel #5 (Right), right window, top left corner, 400mm diagonal hairline crack to panel edge. Right window, top right corner, 400mm diagonal hairline crack to panel edge. Left Window, top right corner, 400mm diagonal hairline crack to panel edge.

Level 15

Panel # 3, Middle Window, left-bottom corner has a 200 mm diagonal hairline crack towards the left.

Panel #4 (middle), Right Window, top right corner has a 500mm hairline crack to panel edge.

Panel #5 (right), Right Window, top left corner, 400mm diagonal hairline crack to panel edge. Left Window, top right corner, 400mm diagonal hairline crack to panel edge.

Level 16

Panel # 3, Left Window, bottom-left corner has a 300 mm hairline crack to panel edge. Middle Window, bottom-left corner has a 1500 mm diagonal hairline crack running to the left towards panel edge. Approximately 500 mm in from the corner towards the centre of the window, there is a 1500 mm hairline vertical crack towards the panel edge. Bottom-right corner has a diagonal 1500 mm hairline crack running to the panel edge. Multiple horizontal hairline 300 mm cracks from the middle of this window to the middle of the window on the right. Right Window, top-left corner has a diagonal 300 mm crack running to the panel edge. The bottom-left corner of this window has a 1500 mm vertical hairline crack running to the panel edge below. Top-right corner of this window has 3 – 300 mm hairline diagonal cracks to the panel edge above. At the top of this window, there are multiple vertical 300 mm hairline cracks running to the panel edge. Bottom-right corner of this window has a 300 mm diagonal crack to the panel edge.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Panel #4 (middle), Left Window, bottom-left corner, has 2 – 500 mm diagonal hairline cracks running to the panel edge. Top-left corner of this window has a 500 mm diagonal hairline crack to the panel edge.

Panel #5 (right), the Right Window has multiple hairline vertical cracks in slab below right window. The Middle Window, top left and right corners, has 400mm hairline cracks to slab edge. Vertical multiple cracks above window, 300 mm long, from the window to the slab edge. Multiple cracks in slab below middle window 500mm long.

Level 17

Panel # 3, Right Window, has multiple hairline horizontal cracks on the left side of the window to Window # 2. Top-right corner has a 300 mm diagonal hairline crack running to the panel edge above. The bottom-right corner has a 300 diagonal hairline crack to the panel edge.

Panel #4 (middle), the Right Window, top right corner has a 400 mm hairline crack to panel edge.

Panel #5 (right), right and left windows, multiple hairline vertical and diagonal cracks between the top of the windows and slab edge approximately 300mm – 400mm long. Multiple horizontal hairline cracks between right and left windows 200 – 300mm long.

Level 18

Panel # 3, Right Window, left side has multiple hairline cracks 500 mm long from the left side of the window to the middle window. The right side of this window has multiple hairline horizontal cracks 400 mm long to the panel edge.

Panel # 4, Left Window has multiple hairline horizontal cracks 300 mm long on the left side of the window to the Panel edge. Top-left corner has 2 – 300 mm vertical hairline cracks to the panel edge. Top-right corner has a 300 mm diagonal crack to the panel edge above. Right Window, top-right corner has a 200 mm diagonal hairline crack running towards the panel edge above. The bottom-right corner has a 200 mm diagonal hairline crack running towards the panel edge.

Level 19

NATIONAL FACILITIES MANAGEMENT LTD.

Panel # 3, Left Window, bottom-left corner has 2 – 300 mm horizontal hairline cracks running to the panel edge. Multiple horizontal hairline 600 mm cracks running from the window edge to the Window # 2 (middle window).

Right Window has multiple horizontal 500 mm hairline cracks running from the left side of window to the Middle Window. Left-top corner has a 300 mm diagonal hairline crack to the panel edge above. Bottom-left corner has a diagonal 1500 mm hairline crack running to the panel edge where Window # 2 connects. Right-bottom corner of this window has multiple hairline vertical cracks 1500 mm long to the panel edge below. There is a 300 mm horizontal hairline crack to the panel edge to the corner. Top-right corner has 2 – 300 mm hairline cracks, one is vertical, one is horizontal to the panel edge.

Panel # 4, no noted damage

***The left-hand side of this panel on the vertical join has popped-out 15 mm. On the horizontal join below, has also popped-out 15 mm. We recommend an Engineer's internal inspection at interior floor of this level.**

Level 20

Panel # 3, Left Window, top-left corner, 300 mm diagonal hairline crack to the panel edge above. The same applies for the top-right corner. The Middle Window, top-right corner, has a 300 mm diagonal crack to the panel edge above. Right Window has multiple horizontal hairline cracks 600 mm long from the left side of window to the edge of Window # 2. Top-right corner has a 300 mm diagonal crack running to the panel edge above.

***At the bottom-left corner of this panel, there is a 15 mm pop-out of the panel along the horizontal join running towards the Middle Window.**

Panel # 4, Left Window, there are multiple horizontal hairline cracks 300 mm long from the left side of this window to the panel edge. Top-left corner of this window has a 300 mm diagonal crack to the panel edge above.

***This panel has a 20 mm pop-out along the vertical join between panels 3 & 4.**

Panel # 5, has no noted damage.

* Corner flashing has distended at the joints between Levels 13 & 14 West, Cathedral Jct. Side of building by the balcony face. This is likely due to fracturing, and consequent distortion of building corner concrete slab.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

North Side (Gloucester Street)

Level 6

Below Level 6, there are a few tiles that have moved slightly due to the quake. One in particular is the top-most left tile juxtaposing the left upper-edge where the neighbouring property flashing interfaces with the Marque Hotel. That one is bent out slightly. Otherwise, no notable damage has occurred with these tiles. Further hands-on touching may prove otherwise.

Panel #1

- Lower left window corner, diagonal crack to panel edge downwards 300mm long. Top right window corner, diagonal crack to panel edge upwards 300mm long.

Panel #2

- Lower left window corner, diagonal crack to panel edge downwards 300mm long. Top right window corner, diagonal crack to panel edge upwards 300mm long.

Panel#3

- Top right window corner, diagonal crack to panel edge upwards 300mm long.

Right panel#4

- Top right window corner, diagonal crack to panel edge upwards 300mm long.

***Horizontal panel joins between top of Level 6 & bottom of Level 7 is a bit distorted, with some gaps where it has dislodged. The "T" section joining horizontal with vertical panels between panels 2 & 3 is distorted.**

Level 7

Left panel #1

- Minor hairline cracks in and around windows.

Panel # 2

- Minor hairline cracks in and around windows

Panel # 3

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

- Top-right window corner diagonal crack 300 mm upwards to panel edge.

Panel # 4

- Top-right window corner diagonal crack 300 mm upwards to panel edge.

*Tears in silicone all along levels 7 & 8 where panels join.

Level 8

Panel #1 – No noted damage

Panel # 2

- Top-right window corner diagonal crack 300 mm upwards to panel edge.

Panel #3

- Bottom right corner, diagonal crack 300 mm downwards to panel edge.

Right Panel # 4

- Top-left corner of window has a diagonal crack 300 mm down to panel edge.

Level 9

Left Panel #1

- Lower bottom centre of window has a 2 meter vertical crack downwards to panel edge. Right-bottom corner of window has a diagonal 300 mm crack downwards to panel edge.

Middle Panel # 2

- Right-bottom corner of window has a crack 2 meters downward –bowing over to the adjacent window (panel # 3).

Panel # 3

- Multiple horizontal cracks to panel edge on left side of the window. Bottom-right of window corner, 500 mm to the right has a 300 vertical crack. Centre-bottom of window has a one-meter long crack in direction of panel edge (but not to the edge itself). Right-bottom of window, 400 mm in, has a 400 mm vertical crack (not going to panel edge).

Panel # 4

- Horizontal crack 400 mm long, 200 mm upwards from the lower-left of window. Right-bottom corner of window has a 3 1000 mm horizontal crack going to the right edge of panel.

*Silicone horizontal tears in between Levels 8 & 9.

Level 10

Panel # 1

- Left panel, right-top of window has a three-meter crack descending down from the parapet with a downward "U" shape and returning to the parapet.

Panel # 2

- Minor crack up above window, 300 mm long.

Panel # 3

- Top-left corner of window has a 300 mm diagonal crack going upwards to panel edge. Horizontal crack from left-side of window edge 350 mm long to panel edge. Top-right window corner has a horizontal crack to panel edge 300 mm.

Panel # 4 (right panel)

- Top-left window has a horizontal crack 300 mm to panel edge. Right side of the same window top right-hand corner, some 400 mm down has a horizontal crack 400 mm going towards the right across the panel join.

*There are some minor hairline cracks above panels 1, 2, 3, & 4 just above windows.

Level 11 Deck

Approximately one meter of Equis-aqua-treated deck requires repair near the ventilation fans against the wall.

- Gloucester Street-side Parapet, approximately 4400 mm from the right of NE corner, there is a hairline crack that carries from the interior of the parapet to the exterior and carries further down the wall into the Lintel. Might be further evaluated by an engineer.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Level 1109 West

- Room 1109 exterior, Soffit panels require replacement approximately 7 meters x 1100 mm. Recommend repair to the hairline cracks of balcony concrete floor slab prior to soffit replacement.
- Approximately 3 meters of hairline cracks to be repaired along the balcony wall.

Level 1115 East

- Approximately 3 meters of hairline cracks require repair along the balcony wall.
- Recommend repair to the hairline cracks of balcony concrete floor slab prior to soffit replacement.

Level 1209 West

- Approximately 5 meters of hairline cracks to be repaired along the balcony wall, with special attention to area above the window.
- Recommend repair to the hairline cracks of balcony concrete floor slab prior to soffit replacement.
- Soffit panels require replacement approximately 7 meters x 1100 mm.
- Balcony Face, Approximately 2 meters of hairline cracks to be repaired.
- Balcony edge underneath by the soffit needs repair on both balcony sides.

Level 1215 East

- Approximately 6 meters of hairline cracks to be repaired along the balcony wall, with special attention to area above the window.
- Recommend repair to the hairline cracks of balcony concrete floor slab prior to soffit replacement.
- Soffit panels require replacement approximately 7 meters x 1100 mm.
- Balcony Face, Approximately 3 meters of hairline cracks to be repaired.
- Concrete Slab against the balcony face requires repair along the edge of the slab.

Level 1309 West

- Approximately 14 meters of hairline cracks to be repaired along the balcony wall, with special attention to area above the window.
- Recommend repair to the hairline cracks of balcony concrete floor slab prior to soffit replacement.

(03) 359-6406 / Mobile 021 686-925

Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

- Soffit panels require replacement approximately 7 meters x 1100 mm.
- Balcony Face, Approximately 4 meters of hairline cracks to be repaired.
- Concrete Slab against the balcony face requires repair along the edge of the slab.
- Balcony edge underneath by the soffit needs repair on both sides.
- Horizontal Silicone join between Levels 12 & 13 is distorted and requires repair.

Level 1315 East

- Approximately 6 meters of hairline cracks to be repaired along the balcony wall, with special attention to area above the window.
- Recommend repair to the hairline cracks of balcony concrete floor slab prior to soffit replacement.
- Soffit panels require replacement approximately 7 meters x 1100 mm.
- Balcony Face, Approximately 4 meters of hairline cracks to be repaired.
- Concrete Slab against the balcony face requires repair along the edge of the slab.
- Balcony edge underneath by the soffit needs repair on both balcony sides.

Level 1409 West

- Approximately 7 meters of hairline cracks to be repaired along the balcony wall, with special attention to area above the window.
- Recommend repair to the hairline cracks of balcony concrete floor slab prior to soffit replacement.
- Soffit panels require replacement approximately 7 meters x 1100 mm.
- Balcony Face, Approximately 4 meters of hairline cracks to be repaired.
- Concrete Slab against the balcony face requires repair along the edge of the slab.
- Balcony edge underneath by the soffit needs repair on both sides.
- Horizontal Silicone join between Levels 13 & 14 is distorted and requires repair.

Level 1415 East

- Approximately 7 meters of hairline cracks to be repaired along the balcony wall, with special attention to area above the window.
- Recommend repair to the hairline cracks of balcony concrete floor slab prior to soffit replacement.
- Soffit panels require replacement approximately 7 meters x 1100 mm.
- Balcony Face, Approximately 4 meters of hairline cracks to be repaired.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

- Concrete Slab against the balcony face requires repair along the edge corner of the slab with silicone injection to be re-done.
- Balcony edge underneath by the soffit needs repair on both balcony sides.

Apartment 15 West

- Soffit Repair, one panel.
- Balcony edge requires repair on the East side.
- Tiled areas removed and repaired.
- Wall requires crack repair, 2 meters
- External Balcony face has 3 meters of hairline cracks

Apartment 15 East

- Tiled area along internal wall needs removal and repair
- The external face of the West side between levels 15 & 16 needs panel repair between the balcony and flashing. Silicone needs repair.
- The balcony face has hairline cracks 4 meters
- Panel corner needs repair.

Apartment 16 West

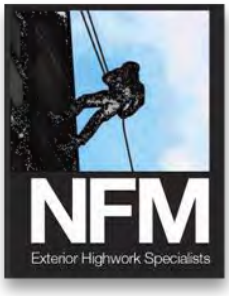
- Soffit Repair, one panel East side
- Balcony edge underneath by the soffit requires repair on both balcony sides.
- Repair to wall on both sides where edge tiles are fixed prior to new tiles being laid. Equis aqua-treatment should proceed.
- Balcony Cupboard floor concrete slab has a crack along the edges and another one meter along the floor need repair.
- Concrete Slab against the balcony face requires repair along the edge corner of the slab with silicone injection to be re-done.

Apartment 16 East

- Balcony edge underneath by the soffit requires repair on both balcony sides.
- Tiles broken and require repair around the West Pillar base.

(03) 359-6406 / Mobile 021 686-925

Fred.nfm@hotmail.co.nz



NATIONAL FACILITIES MANAGEMENT LTD.

- Soffit Repair, one panel on the West end of the balcony
- Exterior East Pillar has a 400 mm hairline crack requiring repairs

Apartment 17 West

- Replace Soffit panel East side
- Concrete repair required on upper balcony on both East & West sides
- Broken/cracked Ranch Slider Door glass
- Balcony face on East side has 3 meters of hairline cracks

Apartment 17 East

- Soffit Replacement, West side panel
- Balcony edge underneath on the West side require hairline crack repair
- External wall requires hairline crack repair
- Balcony face on the West side requires 2 meters of hairline crack repair.

*The external wall between the East and West balconies has diagonal hairline cracks 3 meters in length.

Apartment 18 West

- Soffit replacement required on East side
- Concrete repair required on the upper balcony edge East side

Apartment 18 East

- Soffit replacement required on the West side
- Balcony edge underneath on both sides require concrete repair
- The external wall on the East side behind the tiles requires repair, along with respective tiles.
- Balcony face on the West side requires 3 meters of hairline crack repairs.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Apartment 19 East

- Soffit Panel to be replaced on the West side of the Soffit; the West side pillar to be repaired at the base by the tiles.
- External wall between East and West balconies has approximately 5 meters of hairline cracks to be repaired.
- Upper balcony, East side underneath edge on the West side, needs repair.

Apartment 19 West

- Balcony edge underneath running the full-extent requires repair.
- Concrete needs repair underneath the West edge on the upper balcony.
- Crack needs repair on the balcony face, West corner.

Apartment 20

- External wall between East and West balconies on the North side has hairline cracks of approximately total 2 meters damage to the concrete slab.
- The East balcony, west face, as 2 meters total of hairline cracks.
- The panel edge between Levels 19 & 20 on the building face itself need silicone repair.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

EAST SIDE

(The block wall on the Manchester Street side from the Wilson's Car Park side)

- Hairline cracks in the block work, from the Ground Level to Level 6.
- Some hairline cracks run the entire width of the Panels (approximately 3500 mm)
- The flashing on the SE corner, from the Ground Level to the Level 2 requires replacement.

Level 2

Left Panel #1

- Multiple hairline cracks with one horizontal crack running the entire length of the Panel (approximately 3500 mm)
- There is a concave hole in the panel towards the bottom-right of the Panel.
- There is horizontal compression of the Panels between Level 2 & 3 in this area.

Panel #2 ? access located in dodgy area between the PT and the juxtaposing Korean Restaurant

Panel #3 ? access located in dodgy area between the PT and the juxtaposing Korean Restaurant

Panel #4 ? access located in dodgy area between the PT and the juxtaposing Korean Restaurant

Level 3

Left Panel #1

- There is a round hole in the Panel on the left side in the middle of the Panel. There are multiple hairline cracks.
- There is torn silicone between the vertical joins between Left (#1) and Middle (#2) Panels.

Panel #2

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

NATIONAL FACILITIES MANAGEMENT LTD.

Panel #3

- There is a vertical crack 3500 mm long down the centre of the Panel.

Panel #4

Level 4

Left Panel #1

- Multiple vertical, horizontal and diagonal hairline cracks up to 5000 mm in length.

Middle Panel #2

- Left Window, bottom-left corner has a 400 mm horizontal hairline crack running to the Panel edge.
- Right Window, bottom-left corner has a 1000 mm hairline diagonal crack. Bottom-right Corner has the same. Top-Right Corner has the same.

Panel #2

Panel #3

- Left Window has a 400 mm horizontal hairline crack from the Left edge of the window to the Panel edge.
- Right Window, bottom-right corner, has a 2500 mm diagonal hairline crack running to the Panel edge.
- Top-Right & Top-Left Corners both have 400 mm hairline diagonal cracks running to the Panel edge above.
- There is a 3500 mm horizontal crack running from the top to the bottom of the panel edge running between the windows.

Panel #4

Level 5

Left Panel #1

- Multiple hairline cracks, vertical and horizontal cracks running the entire width of the Panels.

Middle Panel #2

- Left Window, Left-bottom corner, has a horizontal hairline 400 mm crack running from the window edge to the panel edge.
- Right-bottom corner has a 500 mm horizontal hairline crack running from the Left Corner to the Right-bottom corner of the Right Window.
- Right Window, Left-bottom corner has a 1000 mm vertical hairline crack to the Panel edge below. Bottom-Right corner has a 500 mm diagonal hairline crack running to the Panel edge.

Right Panel #3

- Left Window, bottom right corner has 2 hairline cracks 1000 mm in length running to the Panel edge. Top-right corner has 4 - 400 mm diagonal hairline cracks to the Panel edge.
- Right Window, centre bottom of window has a 1000 mm hairline crack to the Panel edge below. Top-left corner has a 400 mm vertical hairline crack to the Panel edge above.

*Silicone distortion exists at the Panel join on the Top-right corner below Level 6.

Panel #4

Level 6

Left Panel #1

- Left Window, top-left & right corners have 400 mm hairline cracks to the Panel edge above.
- Right Window, bottom-right corner has a 400 mm horizontal hairline crack to the Panel edge.

Panel #2

- Bottom-left corner of the one Window has a 2000 mm diagonal hairline crack running to the Panel edge.

Panel #3

- Left Window, bottom-left side has a 350 mm horizontal crack to Panel edge. Bottom-right corner of this window has a diagonal hairline crack to the mid-point of the middle window 1000 mm.

- Middle Window, top-right corner has a diagonal 300 mm hairline crack to the Panel edge.

*Between the middle and right windows, approximately at the centre, there is a 1500 mm hairline vertical crack going towards the Panel edge below.

Level 7

Left Panel #1

- Left Window, bottom-left, middle & right-bottom corners have 2000 mm vertical hairline cracks running to the Panel edge. Top-left & right corners have 400 mm diagonal hairline cracks to the Panel edge above.

- Right Window, bottom-centre and bottom-right corner have horizontal hairline cracks 500 mm in length. Left-top corner has a 400 mm diagonal hairline crack running to the Panel edge above.

*Silicone distortion in the horizontal join between Left & Middle Panels.

Panel #2

- There is a 3500 mm vertical crack running the extent of the Panel from top-to-bottom.

- The only Window, bottom-left & bottom-right corners both have 2000 mm diagonal hairline cracks running towards the Panel edge. The top of the window has 3 vertical 400 mm hairline cracks running to the Panel edge above.

Panel #3

- Between the centre of the left and middle windows, at the bottom-right corner of the Left Window to the bottom Left corner of the middle window there is a 1500 mm horizontal hairline crack.

- The centre of the right window, there is a 1500 mm hairline crack that runs vertical then diagonal towards the Panel edge below.

Panel #4

NATIONAL FACILITIES MANAGEMENT LTD.

- Only one window, the top-left & top-right corners of this window has a 300 mm hairline diagonal crack to the Panel edge above. At the centre of the bottom of this window, there is a 1500 mm vertical hairline crack to the Panel edge below. Off this hairline crack runs another 1500 mm hairline crack running horizontal, then vertical to the Panel edge below.

Level 8

Left Panel #1

- Left Window, bottom-left corner & middle & bottom-right corners all have 2000 mm hairline cracks running to the Panel edge. Horizontal crack 400 mm in length close to the bottom-left corner of the Panel edge. Top-left & right corners have 400 mm diagonal hairline cracks to the Panel edge above.

- Right Window, top-left corner & right-bottom corner both share a diagonal hairline crack running from the top edge of the Panel down towards the bottom right corner of the Panel.

Panel #2

- The only Window, at the bottom, has multiple hairline cracks running to the Panel edge below.

Panel #3

- Left window, bottom-left corner of this window has 2-300 mm hairline cracks running to the Panel edge.

- The top-right corner of this panel has a 1000 mm diagonal hairline crack running from the horizontal join above to the vertical join on the right.

Panel # 4

- The top-left corner of the only window has a 300 mm diagonal hairline crack running to the Panel edge above. The bottom-right corner of this window has a 400 mm diagonal hairline crack to the vertical Panel edge. To the left of the centre of the bottom of this window, there is a vertical hairline crack 1000 mm in length that progresses horizontally to the right approximately 2000 mm towards the Panel edge.

Level 9

NATIONAL FACILITIES MANAGEMENT LTD.

Panel #1

- Left Window, bottom-left corner has a 2000 mm diagonal hairline crack running to the Panel edge below. Top-left & right corners have a 400 mm diagonal hairline crack running to the Panel edge above.
- Right Window, Top-left & right corners have a 400 mm diagonal hairline crack running to the Panel edge above.

Panel #2

- The only Window, bottom-left & bottom-right corners have 2500 mm hairline vertical cracks running to the Panel edge below.

Panel #3

- Left window, left-bottom corner of this window has a 500 mm hairline horizontal crack towards the panel edge. The top-left and top-right corners of this window have a 300 mm diagonal hairline crack to the panel edge above.
- Middle Window, The top-left and top-right corners of this window have a 300 mm diagonal hairline crack to the panel edge above.
- Right Window, The top-left and top-right corners of this window have a 300 mm diagonal hairline crack to the panel edge above. Bottom-right corner of this window has a 2000 mm hairline horizontal crack to the panel edge on the right.

Panel #4

- Part of a large window complex, with the lower part of this panel at the left-bottom corner of this window there is a 1000 mm hairline horizontal crack to the panel edge on the left. On the right-bottom corner of this window, there is a 500 mm hairline horizontal crack to the panel edge on the right. Intersecting this crack is a vertical hairline crack approximately 500 mm long.

Level 10

Panel #1

- Left Window, top-left & right corners of window have 400 mm diagonal hairline cracks running to the Panel edge above.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

- Right Window, bottom-right corner has a 400 mm horizontal hairline crack to the Panel edge. Top-right corner has 2 400 mm hairline cracks running to the corner of the panel above.

Panel #2

- No Notable Damage

Panel #3

- Left Window, bottom-left corner has a diagonal hairline 1500 mm crack running to the panel edge below. Top-right corner of this window has a diagonal 300 mm hairline crack running to the panel edge above.
- Between the Left & Middle Windows, there are 2 – 1500 mm hairline horizontal cracks from window edge-to-window-edge.
- Middle Window, there are 2 – 300 mm vertical hairline cracks running from the top of this window to the panel edge above.
- Between the Middle and Right Windows, there are 2 – 1500 mm hairline horizontal cracks from window edge-to-window-edge.
- Under the Parapet and architrave of the level 11 Deck, there are 5 vertical cracks running the width/height of the architrave.

Panel #4

- Part of a large window complex, the top-left corner of this window, above the window and the top-right corner of this window, has multiple hairline cracks 300 mm long, diagonal and vertical to the panel edge above.

Level 11

Left Panel #1

- Left Window, bottom-left corner has a 1500 mm diagonal hairline crack running to the Panel corner below. Top left & right corners have 400 mm diagonal hairline cracks running to the Panel edge above.
- Right Window, top-left corner has a 400 mm diagonal hairline crack to the Panel edge above.

Middle Panel #2

- Left Window, bottom-left corner has a horizontal crack 400 mm to the Panel edge.

Level 12

Left Panel #1

- Left Window, bottom-left has a diagonal 1000 mm crack running to the Panel edge below. Top-left & right corners of this window have 400 mm diagonal hairline cracks running to the Panel edge above.
- Right Window, top-left corner has a 400 mm diagonal hairline crack running to the Panel edge above.

*** Horizontal Panel along the join between Levels 12 & 13 has Panel Compression.**

***Vertical Join between Panels #1 & #2 is popping out.**

Middle Panel #2

- Left Window, bottom –left corner has a 400 mm horizontal hairline crack running to the Panel edge on the left. The top-left corner has the same. It also has a diagonal hairline crack 400 mm to the Panel edge above.
- Right Window, top-left, top-right, bottom-left & bottom-right have diagonal hairline cracks running to the Panel edges.

Level 13

Left Panel #1

- Left Window, bottom-left corner has a diagonal 1000 mm hairline crack running to the Panel edge. The top-left & top-right corners have a 400 mm diagonal hairline crack running to the Panel edge above.
- Right Window, bottom-left & bottom-right corners have a diagonal 1000 mm crack running towards the Panel edge. The left-top corner has a 400 mm diagonal hairline crack running to the Panel edge above.

Middle Panel #2

- Left Window, bottom-left corner has a 1200 mm diagonal hairline crack running to the Panel edge. The top-left corner has a 400 mm diagonal hairline crack running to the Panel edge above.

Level 14

Left Panel #1

- Left Window, bottom-left corner has a 1200 mm diagonal hairline crack running to the Panel edge. The bottom-centre of the Window has a vertical hairline crack running to the Panel edge below. Top-left & top-right corners of this window have diagonal hairline cracks 400 mm to the Panel edge above.

- Right Window, bottom-left & bottom-right corners of this window have 1200 mm diagonal hairline cracks running to the Panel edge below. Left-top corner has a 400 mm diagonal hairline crack running to the Panel edge above.

Middle Panel #2

***The horizontal join at the bottom of this Panel between Levels 13 & 14 have has torn silicone. The silicone is also torn along the horizontal join of this Panel at the top, between Levels 14 & 15.**

Level 15

Left Panel #1

- Left Window, bottom-left corner has a 1200 hairline diagonal crack running towards the Panel edge below. The top-left & top-right corners of this window have 400 mm hairline diagonal cracks running to the Panel edge above.

Middle Panel #2

- Left Window, left-bottom corner has a 1000 mm diagonal hairline crack running towards the Panel edge below. The left-centre of this window has a 500 mm horizontal crack running towards the Panel edge. The top-left corner of this window has a 400 mm diagonal hairline crack running to the Panel edge above.

- Right Window has 3 vertical hairline cracks running from the top edge of the window, 400 mm to the Panel edge above.

NATIONAL FACILITIES MANAGEMENT LTD.

***The bottom of this Panel along the horizontal join has Panel Displacement**

Level 16

Left Panel #1

- Left Window, bottom-left corner has a 1200 mm hairline diagonal crack running to the Panel edge below. The top edge of this window has 3 vertical 400 mm hairline cracks running to the Panel edge above. There are 3 horizontal 300 mm hairline cracks running between the edges of this window and the one to the Right.
- Right Window, 3 vertical 400 mm hairline cracks running from the top of window the Panel edge above. The right edge of this window has 4 horizontal cracks running to the Panel edge approximately 400 mm in length.

Middle Panel #2

- Left Window, left side has 4 horizontal 400 mm cracks running from the window edge to the Panel edge. The top-left corner has 2 vertical 400 mm hairline cracks running to the Panel edge above. The same applies to the top-right corner of this window. There are 3 horizontal hairline cracks between the edge of the Left Window and the edge of the Right Window approximately 400 mm long.
- Right Window, top-left corner has 2 vertical 400 mm hairline cracks running to the Panel edge above. The bottom-right corner of this window has a vertical 1500 mm hairline crack running to the Panel edge below.

Right Panel #3

- Left Window, bottom-left corner in the centre of this window has a 1500 vertical mm crack running to the Panel edge below. Top-left & right of this corner has 400 mm vertical hairline cracks to the Panel edge above.

Level 17

Left Panel #1

- Left Window, bottom-left corner has a1200 mm hairline crack running towards the Panel edge below. The bottom-right of this window has a similar crack running towards the Panel

edge below. Top-right corner of this window has a 400 mm vertical hairline crack running to the Panel edge above. There are 4 horizontal 350 mm hairline cracks running from the left window edge to right window edge.

- Right Window, bottom-left corner has a 1500 mm hairline crack running to the Panel edge below. The top of this window has 6 vertical 400 mm hairline cracks running to the Panel edge above.

Middle Panel #2

- Left Window, 4 horizontal 400 mm hairline cracks running from the left side of this window to the Left Panel edge. 5 vertical 400 mm hairline cracks running from the top of the window to the Panel edge above. There are 2 horizontal 350 mm cracks running between the Left & Right windows.

- Right Window, bottom-left corner has a 1500 mm horizontal crack to the Panel edge below. The top-left & top-right corners of this window have 400 mm hairline vertical cracks running to the Panel edge above.

Right Panel #3

- Left Window has multiple vertical 400 mm hairline cracks running from the top of the window to the Panel edge above. Bottom-left corner & bottom-right corners of this window have 1200 mm vertical hairline cracks running towards the Panel edge below.

- Right Window has 4 hairline vertical 400 mm cracks running to the Panel edge above.

Level 18

Left Panel #1

- Left Window, bottom-left corner has a 1200 mm diagonal hairline crack running to the Panel edge. The top-left & right corners of this window have 400 mm diagonal hairline cracks running to the Panel edge above. There are 3 horizontal hairline 350 mm cracks running between the Left & Right windows.

Middle Panel #2

- Left Window, there are multiple horizontal & vertical hairline cracks approximately 400 mm long running from the left edge of this window to the Panel edge. The top-left & right corners

of this window have 400 mm vertical hairline cracks to the Panel edge above. There are 3 horizontal 350 mm hairline cracks running between the Left & Right windows.

- Right Window, top-left corner has 2 vertical 400 mm hairline cracks to the Panel edge above. The top-right corner has a diagonal hairline crack running to the Panel edge above. There are 2 horizontal 400 mm hairline cracks running form the window edge to the Panel edge on the right.

Right Panel #3

- Left Window, top-right corner has 3 vertical 400 mm hairline cracks running to the Panel edge above. There are 3 hairline horizontal 350 mm cracks running between the 2 windows.

Level 19

Left Panel #1

- Left Window, bottom-left corner & bottom-right corners both have 1200 mm diagonal hairline cracks running towards the Panel edge below. Top-left & right corners have 400 mm diagonal hairline cracks running to the Panel edge above.

- Right Window, top-left &right corners have 400 mm vertical hairline cracks to the Panel edge above.

Middle Panel #2

- Left Window, bottom-left & bottom-right corners have 1500 mm vertical hairline cracks running to the Panel edge below. The bottom-left corner has a horizontal 500 mm hairline crack running to the Panel edge. The top-left corner of this window has 2 vertical 400 mm hairline cracks running to the Panel edge above. There are 2 horizontal hairline cracks running between the two windows approximately 350 mm long.

- Right Window, bottom-right corner has 1500 mm hairline vertical crack running to the Panel edge below.

Right Panel #3

- Left Window has multiple vertical 1500 mm hairline cracks running to the Panel edge below. The top-right of this window has a 400 mm diagonal hairline crack running to the Panel above.

NATIONAL FACILITIES MANAGEMENT LTD.

***The Rubber Glass Seals on this window have popped out. If this persists with subsequent aftershock activity, the window is danger of falling out.**

Level 20

Left Panel #1

- Left Window, no damage noted
- Right Window, bottom-right corner has a 400 mm horizontal crack running to the Panel edge.

Middle Panel #2

- Left Window, bottom-left corner has a 500 mm diagonal hairline crack running to the Panel edge.
- Right Window, bottom-right corner has the same.

Right Panel #3

- Left Window has multiple horizontal hairline cracks running from the left side of the window to the Panel edge. At the top of this window, there are 4 vertical 400 mm cracks running to the Panel edge above. There are 3 horizontal 350 mm hairline cracks running between the Left & Right Windows.
- Right Window, top-right corner has a 400 mm diagonal crack running to the Panel edge above. The bottom edge of this window has a 1500 mm hairline crack in the shape of an "L", going vertical, then horizontal to the vertical Panel edge join.

(03) 359-6406 / Mobile 021 686-925
Fred.nfm@hotmail.co.nz

National Facilities Management Ltd.

fred.nfm@hotmail.co.nz

(021) 686-925 (03) 359-6406 GST #

FRED H. HAERING

PACIFIC TOWER BUILDING QUAKE DAMAGE MAY 2011

North Level 14 West

North Side East Level 11 Balcony

North Side Level 11 Deck

North Side Level 11 West balcony floor

North Side Level 11East underneath balcony

North Side Level 13 east balcony

Nth Side Level 13 West corner

Nth Side level 14 Ctr Panel between balconies

6th Floor Deck Flashing Cover Broken

Level 10, Panel 4 West Side

Level 12, Nth Side, Between Balconies

W Side Panel protrusions 13 & 14

NATIONAL FACILITIES MANAGEMENT LTD.

EARTHQUAKE DAMAGES REPORT

August 18th, 2011

PACIFIC TOWER

SOUTH SIDE INTERNAL - EXTERNAL ASSESSMENT

(LEVELS 8 – 12) & NORTHWEST CAR STACKER AREA LEVEL 2 - 8

Initially, when we undertook the external assessment above the Car Park at Level 4, we noted that Some of the Concrete Panels had been moved about by the February 22nd Quake. Several cracks were noted in our May Report. A pronounced horizontal crack ran across the Mid-Panel at Levels 8 & 9.

After the June 13th Quake, we noted that these same cracks were much more pronounced. Notably, around the 8th & 9th floors, the severity of battering done by the North – South pounding of the horizontal beam to the External Concrete Panels appears to have pushed the Panels around even more.

Level 8 Right Panel

Level 10 Left Side of Window, Rt Panel

On the Southeast building corner, it appears that the concrete panels received even more of a beating.

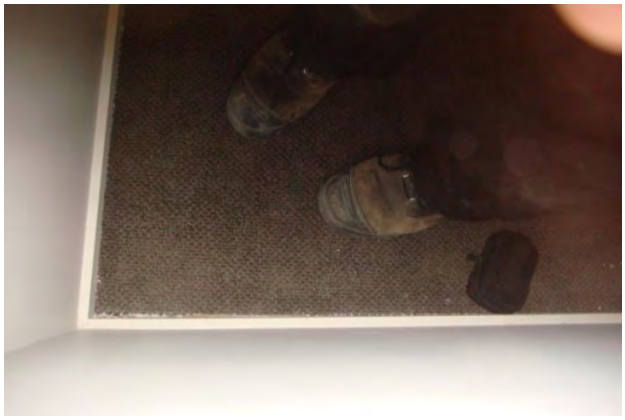
We decided to investigate the level of damage sustained to the interior rooms where we have seen concrete panel movements and distortions. Herewith are our comments and photos taken:

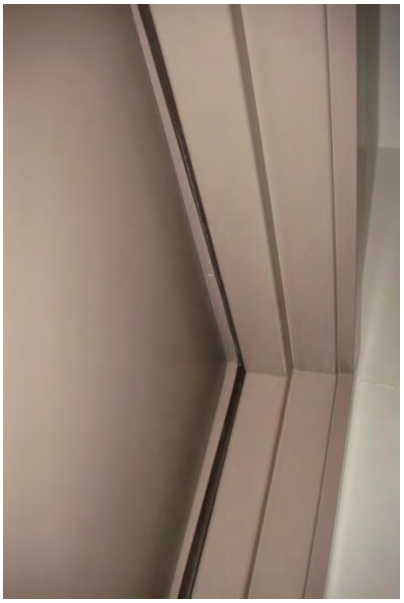
This photo above is not brilliant, but there are several horizontal hairline cracks between the Right Panel Window on the Pacific Tower South Facade Concrete Panel. As well, this is common-place on the Eastern Side of this building.

NATIONAL FACILITIES MANAGEMENT LTD.

Sth Room # 801 - Nth – Sth Movement Battering Ram Effect

Nth – Sth Battering Ram I Beam Effect Sth Room #921





Camera placed flat on wall – note: no longer 90 degrees, showing here with doors 25 mm off at tops, on levels 10, 11 & 12. (Rooms 820, 920, 1020, 1120) showing wall is on a slope.

NATIONAL FACILITIES MANAGEMENT LTD.

Notably, the Car Stacker area on the PT Second Floor did have various issues posed by the February & June quakes. We are attaching photos herein of a 300 x 200 mm 'I' Beam that actually fractured/Ripped diagonally. This occurred at around Level 10 in the Northwest corner area. Further down that side, again within the Stacker, at Level 4, nuts actually broke off the bolts that connect the 'I' Beam. Photos are shown here below. The resulting beam displacement is shown here in the photo. It could be related to pile movements in the NW corner.

Diagonal Beam Fracture in Car Stacker NW area at highest level, just beneath the roof at Level 10.

Note the nuts have actually broken off the connecting beam bolts. This is at Level 4 or so again in the same area as above (NW corner of Car Stacker).

SUMMARY

1. **Pacific Tower Levels 8 & 9 appear to have been severely rocked, as observation both the internal and external facades of the rooms shows severe cracks to Gib and concrete panels. At these levels, again, the North – South battering by internal horizontal beams appears to have been the culprit. Photos below illustrate this.**

   We are wondering whether, at this point, it would be best to unpeel the Gib skins of these affected rooms to further investigate the possibility of damage to the exterior concrete Panel Attachments.

NATIONAL FACILITIES MANAGEMENT LTD.

2. **Evidence of entrance-way to Southeast Rooms starting from Level 8 and peaking at Level 11, where wall has been bent on multiple levels, possibly due to upward pillar movement or side-ways wall wrenching. This damage is significant and consistently & physically evident internally. We recommend further engineering investigation.**

3. **Above the noted broken/fractured beam in the Car Stacker & the broken beam bolts (Northwest corner), we inspected the external facade of PT and internal rooms in the vicinity to look for corresponding damages, possibly due to upward pillar movements. Aside from the various external facade diagonal cracks, we noted nothing of significance. However, within the hotel rooms directly above the Car Stacker, there is a partition wall separating two rooms.**

4. **We have not as yet undertaken a full Eastern External Facade re-examination following the June 13th quake event. Upon initial investigation with binoculars, however, we note that external concrete panels have shifted more and there are copious more hairline cracks evident. We intend to rappel off this facade later this week to undertake a comprehensive post-June quake event examination. We shall report findings soon thereafter. However, we do speculate that there may be a need for internal Gib/skin removal to determine whether there are any corresponding concrete panel attachment damages.**

5. **The Car Stacker Beam Sheer at around Level 10, has sheered diagonally and remains displaced and offset, as evident in the photo. This will require further engineering examination for writing repair instructions. Lower level Beam connecting bolts have probably been stressed throughout the entire Pacific Tower, but the actual noted broken bolts should be replaced.**

We look forward to your visitation for further engineering examination of the Pacific Tower, as we shall require further detailed investigation instruction.

Yours Faithfully,

Fred H. Haering
PROJECT MANAGER, NFM

NEW EARTHQUAKE DAMAGE

Post December 2011 – Jan 13th, 2012

Balcony Report – January 13th, 2012

NORTH FACE

SOFFIT DAMAGE - There is little soffit damage with 6 panels needing to be replaced on the north face balconies. The others require minor repairs and re-painting.

WALLS - There is minor damage

Level 11

West balcony, bottom east side

Level 12

East balcony

West balcony - east corner

Level 13

East balcony - east side

East balcony - west side

West balcony - west side

Level 14

East balcony - east top side

East balcony

East balcony - east

West balcony - east

Level 15 – No damages

Level 16

West - west

West - west

West - east

West - east

East balcony - west

East balcony - east

Level 17

East balcony - west

East balcony - west

East balcony - west

East balcony - east

West balcony - east

West balcony - east

Level 18

East balcony - west

East balcony - west

East balcony - east

East balcony - east

East balcony - east

West balcony - west

West balcony - west

West balcony - west

West balcony - east

West balcony - east

West balcony - east

Level 19

West balcony - west

West balcony – west

West balcony - east

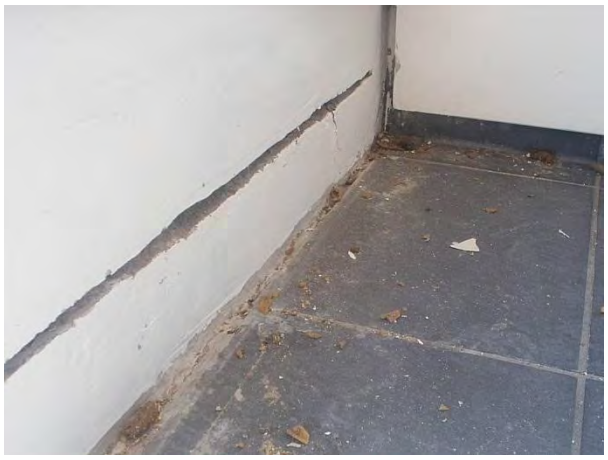
West balcony - east

West balcony east

East balcony - west

East balcony - east

East balcony - east



East balcony - east

East balcony - west

SOUTH FACE

Level 6

Southwest corner internal wall

Southwest corner external wall

Southwest corner external Parapet wall

Southeast corner internal Parapet wall

Southeast corner internal Parapet wall

Southeast corner internal Parapet wall

Southeast corner external wall

- The flashing from the deck to the building needs total removal and rebuilding.
- The structural supports underneath will need to be checked.
- The plywood deck may need to be replaced

OVERALL DAMAGES FROM POST DECEMBER 2011 EARTHQUAKES:

- Overall on the North Face there is a 15% increase in new damage
- Overall on the East Face there is a 10% increase in existing damage
- Overall on the West Face there is a 10 % increase in existing damage
- Overall on the South face there is a 25% increase in existing damage

January 31st, 2012

PACIFIC TOWER

Engineering advice required

EXTERNAL NORTHEAST & NORTHWEST CORNER FLASHING & CONCRETE DAMAGES

- The external wall between balcony and corner flashings has sustained damage as you will see by the attached photographs/report. This has occurred on both east and west corners with greater damage from levels 12 to 15.
- There is damage all the way up to level 22, some areas greater than others.
- The carpets will need to be lifted and floors inspected for cracks and damage. I have attached photographs of damaged floor areas in the corners where we have already inspected.
- There is a serious blow out on the corner of 13 West which will require a thorough inspection. The steel is bent and the bottom of the panel has moved out of place and inwards.
- 15 East has sustained damage and requires the gib to be removed on the both corners of the north and east walls of the kitchen/lounge – I would advise this to be done in most of the rooms that show external damage of this nature.
- Repairs will need to be carried out hanging in a harness from a rope due to poor accessibility. This will be very time consuming.

Please inspect and advise.

Regards,

Gene Ward
NFM/Fortis

12 East

12 East

12 East Interior

12 West

12 West

13 East

13 East

13 West

13 West

14 East

14 East

14 West

14 West

15 West

15 West

15 East

15 East

15 East Interior

16 West Interior Corner

16 West Exterior Corner

16 East Interior Corner

16 East Exterior Corner

CROSS BRACING – SOUTH CAR STACKER CEILING

Dec 20th, 2011

South West Corner Attachment – no damage

Central South Side Plate Attachment – no damage

South East Corner Attachment – no damage

North East Corner Attachment – no damage

South West Attachment – no damage

FLAG POLE DAMAGES

July 6th, 2011

(Note Photo Dates on Photographs are inaccurate)

Top Base Roof Ring Water Seal Broken

FLAG POLE BASE MOUNT

Mostly Fractured Concrete Block & Base Mount Bolt Mounts below Roof