

# A. A. Barnes & Coy Pty Ltd

41 Evans Court  
Toorak Vic 3142

Consulting Engineers

Tel: 03 9822 5889

ABN 16-004-919-340 aabarnes2@bigpond.com

TuffLift Imports P/L

20 Jun 17

## **Machinery description:**

4 Post Hoist

## **Mark machinery:**

Plant model, EE-6435V2(48L) 4.0 T

Rated capacity, 4.00 t

## **Engineer's Certification:**

This machinery has been checked for compliance with:

AS 1418.1 - 2002

Cranes code

AS 1418.9 - 1996

Vehicle hoists

AS 3990 - 1993

Mechanical Equipment - Steelwork

Occupational Health & Safety Regulations 2007, Victoria

From the information provided, this design adequately complies with the current codes & regulations as required by WorkSafe Victoria & is capable of safely & effectively carrying out the functions for which it was designed.

A copy of the calculations & drawings is attached.



Alex A. Barnes



**4. Design Verifier's Statement (Design verifier must not have participated in the design)**

Please complete the verifier's signature in blue ink and include original, signed copy in the submission.

Name

Alex A Barnes

Qualifications

FIEAust; CPEng NER

Employed by

A.A.Barnes &amp; Coy P/L

Business Address

41 Evans Ct Toorak Vic

Postcode

3142

Postal Address

41 Evans Ct Toorak Vic

Postcode

3142

Telephone

03 9822 5889

Facsimile

03 9822 5542

Mobile

Email

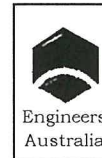
aabarnes2@bigpond.com

I hereby verify that the design portrayed on this registration has been produced in accordance with the record of published technical standards and/or engineering principles recorded by the designer.

Signature

Date

24/6/17



Alex A Barnes  
FIEAust CPEng NER  
Chartered Professional Engineer  
Membership No: 336698

Print Name

Alex A Barnes

**NOTE: The Code of Practice for Plant states that Design Verifiers should have acquired, through academic qualifications or design experience, the knowledge and skills to independently verify the tasks performed by the designer.****5. Attached Representational Drawings**

Title of Drawing

Drawing Number

Revision

Title of Drawing	Drawing Number	Revision
General arrangement	EE-6435V2	
Platform	Csect02G	
Column	Column03AH	

**NOTE: Any drawings submitted may be subject to Freedom of Information requests. Information relating to trade secrets or other matters of commercial or financial nature should be marked "TRADE SECRET".****6. Proposed Location of Plant (if known)**

Owner

Address

Postcode

**7. Company/Person Responsible for Importing Plant into or Supplying Plant within Victoria**

Name

Tufflift Imports Pty Ltd

Telephone

03 8375 3600

Facsimile

03 8353 2525

Mobile

0407 224 990

Address

46 Saintly Drive, Truganina Vic 3029

Postcode

3058

Email

david@tufflift.com.au

# A. A. Barnes & Coy Pty Ltd

41 Evans Court  
Toorak Vic 3142

Consulting Engineers

Tel: 03 9822 5889

ABN 16-004-919-340 aabarnes2@bigpond.com

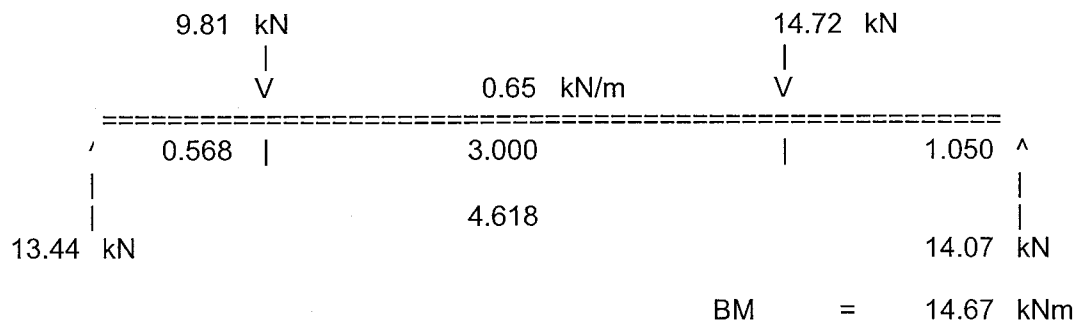
TuffLift Imports P/L

20 Jun 17

## 4 Post Hoist

Plant model	=	EE-6435V2(48L) 4.0 T		
Ø1	=	1.10		
Ø2	=	1.25		
Lifted load	=	4.00 t	Design load	= 49.05 kN
Heavy axle ratio	=	60.00 %	Light axle ratio	= 40.00 %
			Heavy axle load	= 29.43 kN
			Light axle load	= 19.62 kN

### Check platforms:



### See drawing " Csect02G "

D	=	140.0 mm	D3	=	115.0 mm
D1	=	60.0 mm	D4	=	35.0 mm
D2	=	27.0 mm	D5	=	47.5 mm
B	=	675.0 mm	Beff	=	253.0 mm
			B3	=	605.0 mm
B1	=	27.0 mm	B4	=	14.5 mm
B2	=	50.0 mm	B5	=	25.0 mm
t	=	5.00 mm	Ri/T	=	1.50
			Ri	=	7.5 mm
			Ro	=	12.5 mm
Fy	=	250.00 MPa	Ac	=	78.54 mm <sup>2</sup>
			yc	=	6.0 mm
			lc	=	4.17 x10 <sup>3</sup> mm <sup>4</sup>

Calculate properties about X--X axis:

	A	Aef	1st mt about top	Y	A x Y <sup>2</sup>	2nd mt	Ix
B3, flat	3025	1265	3162	29.7	1.112	0.003	1.12
2 Corners	157	157	943	26.2	0.107	0.008	0.12
D3, flat	575	575	40250	37.8	0.823	0.634	1.46
D4, flat	175	175	5250	2.2	0.001	0.018	0.02
D5, flat	238	238	5641	8.4	0.017	0.045	0.06
B4, flat	73	73	9969	87.9	0.56	0.000	0.56
B5, flat	125	125	7188	7.9	0.008	0.000	0.01
2 Corners	157	157	8482	4.4	0.003	0.008	0.01
1 Corner	79	79	10524	84.4	0.560	0.004	0.56
	4603	2843	91408				3.91

$$Y_{top} = 32.2 \text{ mm}$$

Plus twin RHS:

D	=	120.0 mm	d2	=	95.0 mm
B	=	50.0 mm	b2	=	25.0 mm
t	=	5.0 mm	Ro/t	=	2.50
		Corners,	Ro	=	12.5 mm
			Ri	=	7.5 mm
			Ac	=	79 mm <sup>2</sup>
			yc	=	6.0 mm
			Ic	=	0.0042 x10 <sup>6</sup> mm <sup>4</sup>

Calculate properties about X--X axis:

	Area	1st mt about top	Y	A x Y <sup>2</sup>	2nd mt	Ix
B2 flat	125	313	57.5	0.41	0.000	0.41
2 corners	157	943	54.0	0.46	0.008	0.47
D2 flats	950	57000	0.0	0.00	0.714	0.71
2 corners	157	17907	54.0	0.46	0.008	0.47
B2 flat	125	14688	57.5	0.41	0.000	0.41
	1514	90850				2.474

$$Y_{top} = 60.0 \text{ mm}$$

$$Y_{bot} = 60.0 \text{ mm}$$

Properties of combined section:

(3)

DB = 155.0 mm

	Area	Aef	1st mt about top	Y	A x Y <sup>2</sup>	2nd mt	Ix
Platform	4603	2843	91408	32.4	2.99	3.912	6.90
2 x RHS	3028	3028	287690	30.4	2.80	4.949	7.75
	7631	5871	379098				14.65

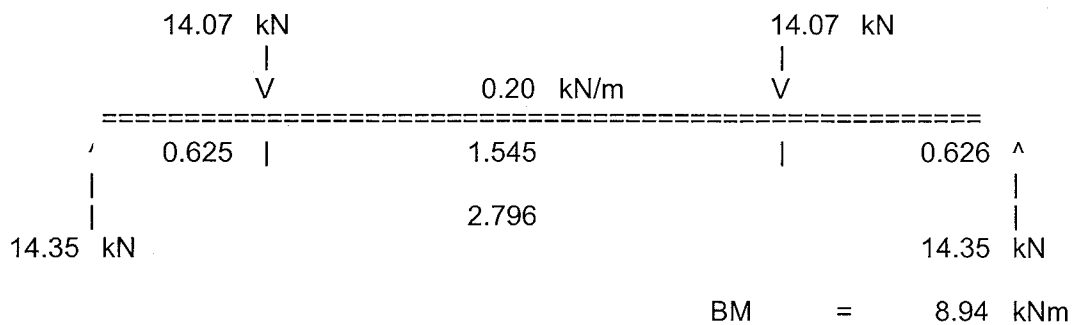
- Ytop = 64.6 mm
- Ybot = 90.4 mm
- Ztop = 226.91 x10<sup>3</sup>mm<sup>3</sup>
- Zbot = 162.03 x10<sup>3</sup>mm<sup>3</sup>
- Ae = 5871 mm<sup>2</sup>
- Mass = 59.90 kg/m
- Fy = 235.00 MPa
- Fbc = 141.00 MPa
- BM = 14.67 kNm
- \*\*\* Fbc = 141.00 MPa
- \*\*\* fc = 64.64 MPa
- \*\*\* ft = 90.53 MPa

**Beam O.K. in bending**

- Maximum allowable SHEAR stress: Effective area = 2888 mm<sup>2</sup>
- d1/tw = 19.0
- V = 14.07 kN
- \*\*\* Fv = 86.95 MPa
- \*\*\* fv = 4.87 MPa

**Beam O.K. shear**

Check cross beams: Per wheel, Design load = 14.07 kN



Beam Design to AS 3990

(4)

D	=	140.0 mm	d2	=	110.0 mm
B	=	80.0 mm	b2	=	50.0 mm
t	=	6.0 mm	Ro/t	=	2.50
		Corners,	Ro	=	15.0 mm
			Ri	=	9.0 mm
			Ac	=	113 mm <sup>2</sup>
			yc	=	7.2 mm
Fy	=	235.00 MPa	lc	=	0.0087 x10 <sup>6</sup> mm <sup>4</sup>

Calculate properties about X--X axis:

	Area	1st mt about top	Y	A x Y <sup>2</sup>	2nd mt	lx
B2 flat	300	900	67.0	1.35	0.001	1.35
2 corners	226	1629	62.8	0.89	0.017	0.91
D2 flats	1320	92400	-0.0	0.00	1.331	1.33
2 corners	226	30038	62.8	0.89	0.017	0.91
B2 flat	300	41100	67.0	1.35	0.001	1.35
	2372	166067				5.845
	=====	=====				=====
			Ytop	=	70.0 mm	
			Ybot	=	70.0 mm	
			Zx	=	83.50 x10 <sup>3</sup> mm <sup>3</sup>	
			A	=	2372 mm <sup>2</sup>	
			Mass	=	18.62 kg/m	

Calculate properties about Y--Y axis:

	Area	Moment about LHS	Y	A x Y <sup>2</sup>	2nd mt	ly
D2 flat	660	1980	37.0	0.90	0.002	0.91
2 corners	226	1629	32.8	0.24	0.017	0.26
B2 flats	600	24000	-0.0	0.00	0.125	0.13
2 corners	226	16467	32.8	0.24	0.017	0.26
D2 flat	660	50820	37	0.90	0.002	0.91
	2372	94896				2.457
	=====	=====				=====

$$\begin{aligned} Y_{lhs} &= 40.0 \text{ mm}^{(5)} \\ Y_{rhs} &= 40.0 \text{ mm} \\ Z_y &= 61.43 \times 10^3 \text{ mm}^3 \\ r_y &= 32.2 \text{ mm} \end{aligned}$$

Maximum allowable BENDING stress:

Compression,	(		Fb	=	155.10 MPa
	(		Fbc	=	Fy x 0.60
	(		Fbc	=	141.00 MPa
	(	*** OR ***	Fbc	=	163.53 MPa
	(	Maximum,	Fbc	=	163.53 MPa
	(				

$$\begin{aligned} F_b &= 155.10 \text{ MPa} \\ F_{bc} &= F_y \times 0.60 \\ F_{bc} &= 141.00 \text{ MPa} \\ F_{bc} &= 163.53 \text{ MPa} \\ F_{bc} &= 163.53 \text{ MPa} \\ BM &= 8.94 \text{ kNm} \end{aligned}$$

Minimum of Fb & Fbc,	***	Fbc	=	155.10 MPa
	***	fc	=	107.02 MPa

**Beam O.K. in bending**

<u>Maximum allowable SHEAR stress:</u>		Effective area	=	1320.00 mm <sup>2</sup>
		d1/t	=	18.33
		V	=	14.35 kN
	***	Fv	=	86.95 MPa
	***	fv	=	10.87 MPa

**Beam O.K. in shear**

<u>Check columns:</u>	<u>See drawing " Column03AH ":</u>	Pa	=	14.35 kN	
D	=	180.0 mm			
D1	=	25.0 mm	D2	=	165.0 mm
B	=	180.0 mm	D3	=	17.5 mm
B1	=	35.0 mm	B2	=	165.0 mm
T	=	3.0 mm	B3	=	20.0 mm
			Ri/T	=	1.50
	Corners,		Ri	=	4.5 mm
			Ro	=	7.5 mm
			Ac	=	28.27 mm <sup>2</sup>
			ey	=	4.1 mm
			b/T	=	6.7

Calculate properties about X--X axis:

	A	Aef	1st mt about top	Y	A x Y <sup>2</sup>	2nd mt	Ix
B2, flat	495	495	743	77.5	2.977	0.000	2.98
2 Corners	57	57	231.1	75.0	0.318	0.000	0.32
D2, flats	990	990	89100	11.0	0.119	2.246	2.36
D3, flats	105	105	17194	67.2	0.474	0.003	0.48
B3, flats	120	120	21420	99.5	1.187	0.000	1.19
4 Corners	113	113	19895	96.9	1.061	0.000	1.06
	1880	1880	148583				8.38

Ytop	=	79.0	mm
Ybot	=	101.0	mm
Ztop	=	106.07	x10 <sup>3</sup> mm <sup>3</sup>
Zbot	=	83.06	x10 <sup>3</sup> mm <sup>3</sup>
A	=	1880	mm <sup>2</sup>
Ae	=	1880	mm <sup>2</sup>
Mass	=	14.76	kg/m
rx	=	66.8	mm

Calculate properties about Y--Y axis:

	Aef	1st mt about LHS	Y	A x Y <sup>2</sup>	2nd mt	Iy
B2, flat	495	44550	-0.0	0.000	1.123	1.12
L Corner	28	116	85.9	0.209	0.000	0.21
R Corner	28	4974	85.9	0.209	0.000	0.21
D2, flat L	495	743	88.5	3.877	0.000	(6) 3.88
D2, flat R	495	88358	88.5	3.877	0.000	3.88
B3 flat L	60	1050	72.5	0.315	0.002	0.32
B3 flat R	60	9750	72.5	0.315	0.002	0.32
L Corner L	28	116	85.9	0.209	0.000	0.21
L Corner R	28	874	50.9	0.073	0.000	0.07
R Corner L	28	4215	50.9	0.073	0.000	0.07
R Corner R	28	4974	85.9	0.209	0.000	0.21



D3, flat L	53	1759	53.5	0.150	0.000	(7) 0.15
D3, flat R	53	7691	53.5	0.150	0.000	0.15
		-----			-----	
	1880	169168				10.79
	=====	=====				=====
			YLHS	=	90.0	mm
			YRHS	=	90.0	mm
			Zy	=	119.94	x10 <sup>3</sup> mm <sup>3</sup>
Fy	=	235.00	MPa			
			ry	=	75.8	mm
Strut length X - X	=	1830.0	mm			
Length ratio X - X	=	1.00		Effective length	=	1830.0 mm
				l/rx	=	27.40
Length ratio Y - Y	=	1.00		Effective length	=	1830.0 mm
				l/ry	=	24.15
			Design, l/r	=	27.40	

Maximum allowable compressive stress:

Euler critical stress,	Foc	=	2629.30	MPa
	[Fy + (n+1)Foc]/2	=	1461.76	
	Pa	=	14.35	kN
	*** Fac	=	137.60	MPa
	*** fac	=	7.63	MPa

**Direct stress O.K.**

Check column bending due to eccentricity,

Beam Design to AS 3990

Lever arm	=	90.0	mm	P	=	14.35	kN
				BM	=	1.29	kNm
				Fbc	=	141.00	MPa
Calculate bending stress:				BM	=	1.29	kNm
				*** Fbc	=	141.00	MPa
				*** fc	=	15.55	MPa
				*** ft	=	12.18	MPa

**Bending stress O.K.**

Check combined stress:  $fac/Fac = 0.06$  (8)

Formula 8.3.1 (a)(2) applies

$fb/Fb = 0.09$

$Cmx fb / \{(1 - fac / 0.6Foc)Fb\} = 0.09$

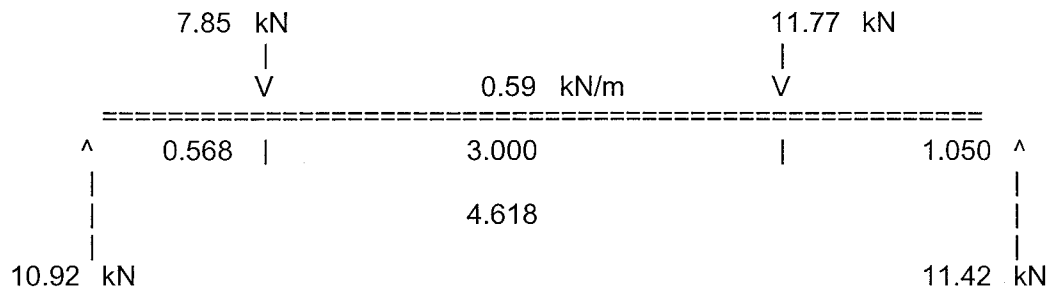
Combined stresses  $\leq 1.00$

Combined stresses = 0.14

**Combined Stresses O.K.**

Check steel wire rope:

Unfactored design loads.



Unfactored line pull = 11.42 kN

Steel wire rope:

Design line pull = 11.42 kN

Factor of safety = 6

Minimum breaking force = 68.51 kN

Is SWR, wire rope core ? Yes

$Fu = 1770.00$  MPa  $As/Ag = 0.45$

Minimum diameter, dia = 10.4 mm

Actual dia = 12.0 mm

**Steel wire rope O.K.**

Check pins:

Line pull, Vertical = 14.35 kN

Horiz = 14.35 kN

In shear: Grade C25 steel. Design load = 20.29 kN

$Fuf = 440.00$  MPa

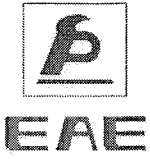
$Fyf = 230.00$  MPa

$df = 40.0$  mm Area = 1256.64 mm<sup>2</sup>

\*\*\*  $Fvf = 75.90$  MPa

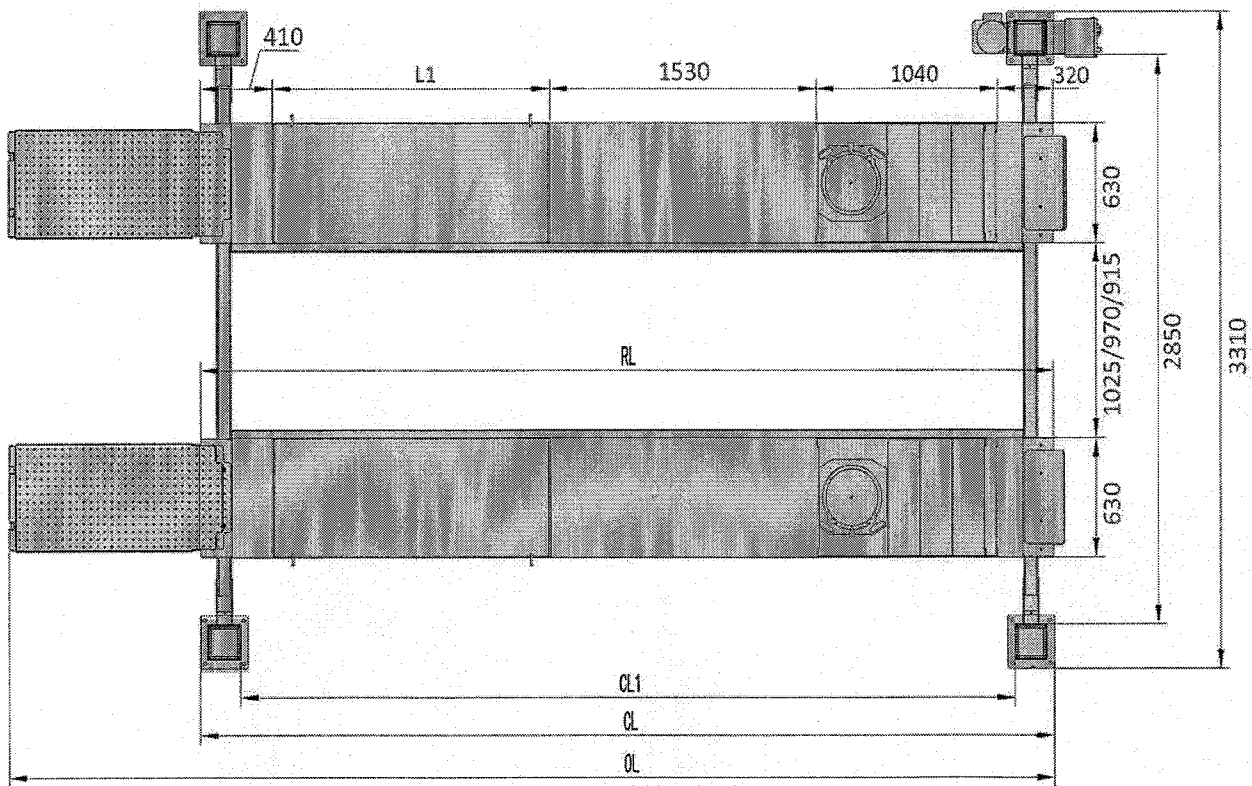
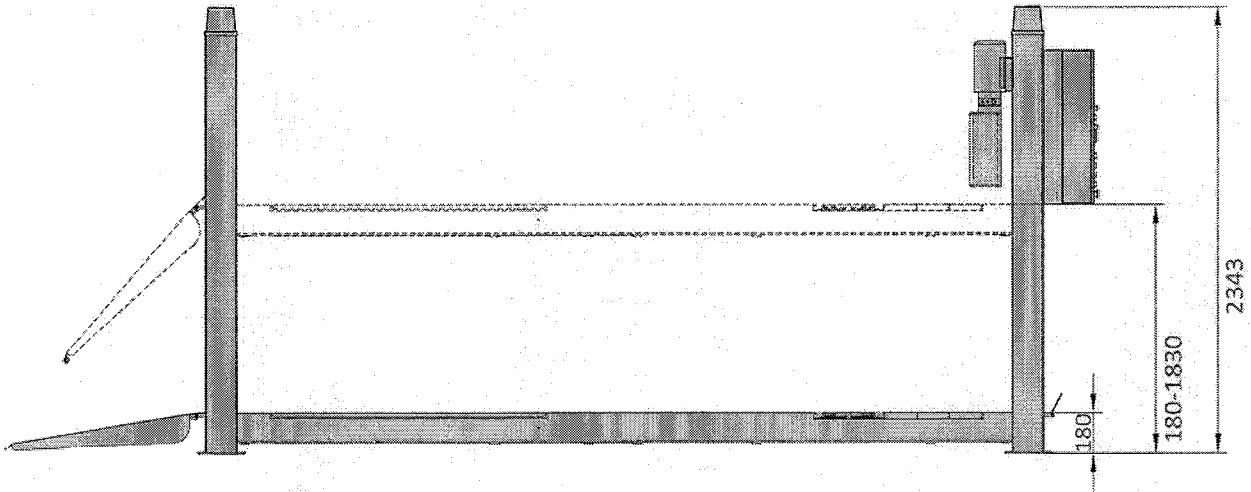
\*\*\*  $fvf = 8.07$  MPa (twin shear)

**Pin O.K. in shear**

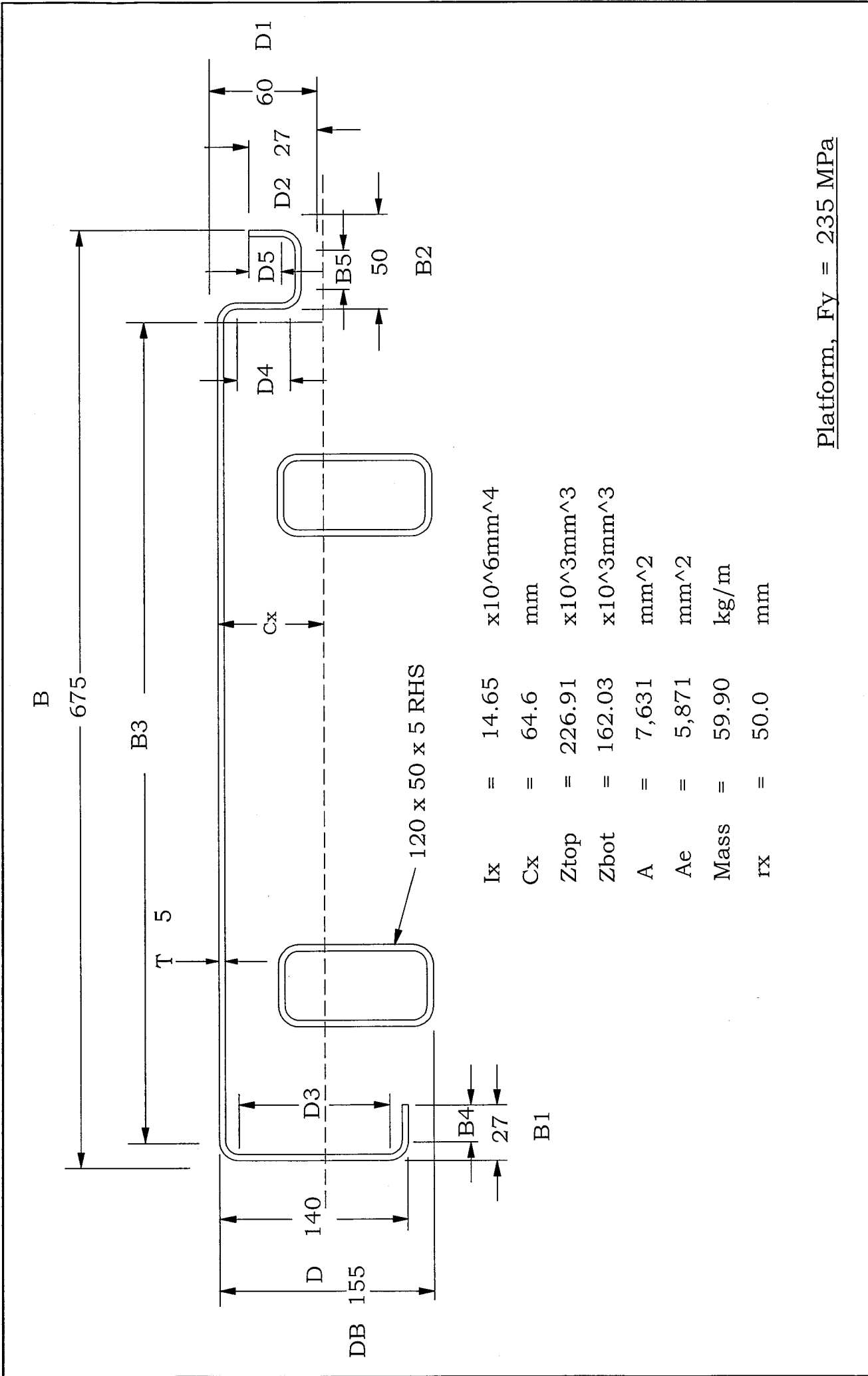


# General Arrangement

(EE-6435V2)

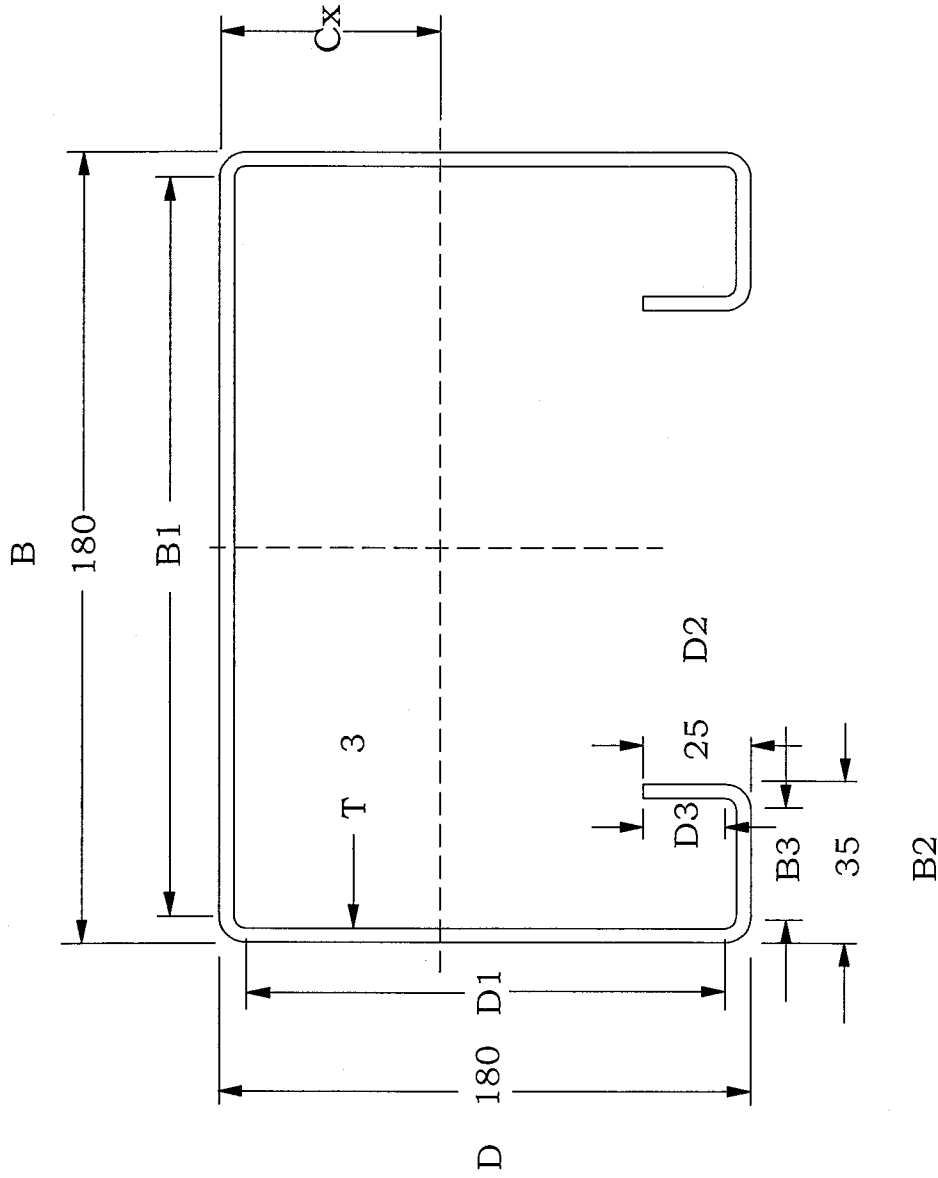


NO.	Item No.	EE-6435V2(48L)	EE-6435V2(52L)
Overall dimension	L1	1580	1980
	CL1	4438	4838
	CL	4888	5288
	OL	5948	6348
	RL	4880	5280
Specification	Lifting Capacity	Max Lifting Height	Min Lifting Height
	4000kg	1830mm	180mm



Platform,  $F_y = 235 \text{ MPa}$

A.A.Barnes & Coy.Pty.Ltd 41 Evans Ct, Toorak 3142	Tel: (03) 9822 5889 aabarnes2@bigpond.com	NOT to scale	Csect02G 20 Jun 17
--	--	-----------------	-----------------------



$I_x$	=	8.38	$\times 10^6 \text{mm}^4$
$C_x$	=	79.0	mm
$Z_{web}$	=	106.7	$\times 10^3 \text{mm}^3$
$Z_{toe}$	=	83.6	$\times 10^3 \text{mm}^3$
$A$	=	1,880	$\text{mm}^2$
$A_e$	=	1,880	$\text{mm}^2$
Mass	=	14.76	kg/m
$r_x$	=	66.8	mm
$I_y$	=	10.79	$\times 10^6 \text{mm}^4$
$Z_y$	=	119.94	$\times 10^3 \text{mm}^3$
$r_y$	=	75.8	mm

Column,  $F_y = 235 \text{ MPa}$

A.A.Barnes & Coy.Pty.Ltd  
41 Evans Ct, Toorak 3142

Tel: (03) 9822 5889  
aabarnes2@bigpond.com

NOT  
to scale

Column03AH

20 Jun 17