



KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
STATE RAILWAY OF THAILAND

MASS TRANSIT SYSTEM PROJECT IN BANGKOK
(RED LINE) (D) BANG SUE – RANGSIT SECTION
BANG SUE GRAND STATION

CALCULATION REPORT

Elevator Steel Hoist way Structure



OCTOBER
2015

D

CE 8784

USE FOR CALCULATION REPORT AND DESIGN DRAWING OF
ELEVATOR STEEL HOIST WAY STRUCTURE



ใบอนุญาตประกอบวิชาชีพวิศวกรรมควบคุม
ตามพระราชบัญญัติวิศวกร พ.ศ. ๒๕๕๒

ชื่อ-สกุล นายวีระธรรม วรรณกร
เลขประจำตัวประชาชน 5100599066849

ประเภทวิชา วิศวกรรมเทคนิค สาขา วิศวกรรมโยธา
ระดับ **สามัญศึกษา** ประเภทอื่น สย.8784

ใบอนุญาต 17 พ.ย. 2556 วันมีอายุ 16 พ.ย. 2561

ประเภทสมาชิกสามัญ เลขที่ 85822

วันออกบัตร 17 พ.ย. 2556 มีอายุหมดอายุ 16 พ.ย. 2561

ผู้รับใบอนุญาต *(Signature)*
วิศวกรโยธา

ใบอนุญาตวิศวกร *(Signature)*
วิศวกรโยธา

CALCULATION SHEET

PROJECT : Red Line (Bang Sue – Rangsit)

SHEET NO. :

SUBJECT : ELEVATOR STEEL FRAME

JOB NO. :

COMPUTER : VV CHK'D BY : SI

APP'D BY : DATE : 31 Oct -15

TABLE OF CONTENTS

TITLE	PAGE
1. Objective	1
2. Design Criteria	1
3. Calculation	2-16
Appendix A: Elevator Load issued by OTIS	
Appendix B: Gen2 Regen Elevator Model	

Redline Contract 1	Job No.	Sheet No.	Rev.
	GS Steel EL		1 of 16
Member/location			
Checked			

Job Title	Design of Steel Elevator Hoist way	Drawing Ref.	Filename	Checked
Site Area	Grand Station Red line	Made By	WV	NDCE
		Date	31-Oct-19	

Objective
To proposed Design Steel hoist way in lieu of Concrete in order to expedite Construction work

General

Elevator hoist way are mostly not started from Basement/Foundation but Elevator Hoist way sit on Concourse level Structure (i.e. Band Beam or I Girder) and only being laterally supported by upper Structure level Platform 1 and 2 (Means the vertical load is 100% transfer to concourse level)
To Provide Steel hoist way in lieu of Concrete provide several advantage as follows
1) Reduce load on Concourse level Structure
2) Reduce construction time as cast in place concrete require 5 weeks for construction while Steel frame require 1 week
3) Eliminate requirement of Formwork to be employed to catch-up the Construction time frame

Design criteria

- Design load included
1) Structure Steel selfweight : Software Calculated
2) Cladding and Lighwright block Sub weight : 150 kg/sqm **
3) Wind load : 120 kg/m2
4) Operating Elevator load case 30 KN
5) Service elevator load case
6) Lift Car belt(cable) failure (2 car) and Safety Brake actuated load case

(SEE Appendix #A)

Notes
Noted that loadcase 4,5 and 6 require written confirmation from OTIS (Elevator Supplier)
** Alternative subtrade may utilize Steel subframe in lieu of Blockwall (design consider blockwall which is governed)

Loadcase combination	Design loadcase					
LC1 Deadload	1	2	3	4	5	6
LC2 Dead+Wind	1	1	0	0	0	0
LC3 Dead+Wind+Elevator OP	1	1	1	0	0	0
LC4 Dead+Wind+Elevator Service	1	1	1	2	0	0
LC5 Dead+Wind+Elevator Car failure	1	1	1	0	1	0

Notes
Using AISC allowable Stress Design with multiply Elevator load factor =2
20KN service need not to apply impact factor
Loadcase of Car cable failure consider 2 car fail at same time (Very low likelihood)
Loadcase of Service Elevator consider 2 Car service at same time (very low likelihood)

- Material grade
1) Saure Hollow section Steel tube ,Min Fy = 235 Mpa
2) Welding electrode E70

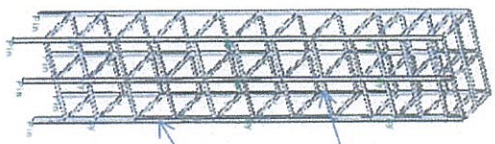
Attachment
1) Load diagram drawing provided by OTIS

D CE 8784

Redline Contract 1

Job No.	Sheet No.	Rev
GS Steel	2 of 16	0
Member/Location		
Job Title	Drawing Ref.	Filename
Design of Steel Elevator Hoist way		
Site Area	Made By	Date
Grand Station Red line	WV	31-Oct-15
	Checked	
	NCE	

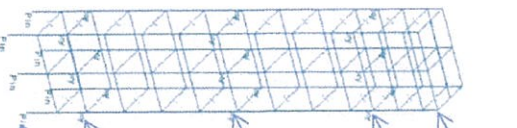
ANALYSIS LAYER
SBRW 1148 2



Main Column SHS 200*200*6 mm

Horizontal SHS 150*150*4 mm
Max spacing 2500mm

Fig#1 Solid Model#1 Double Cell start from Basement to Upper platform
(Represent most critical case of double cell , 2 cars)



ANALYSIS LAYER
SBRW 1148 2

Top level (Z=28.30) No support

X,Y support at Platform#2(z=24.00)

X,Y support at Platform#1 (z=13.75)

X,Y support at Concourse (z=5)

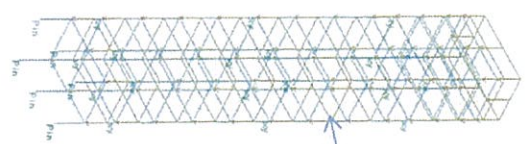
Pin support at Basement (z=1)

Fig#2 Wire frame

[Handwritten signature]
CE 8184

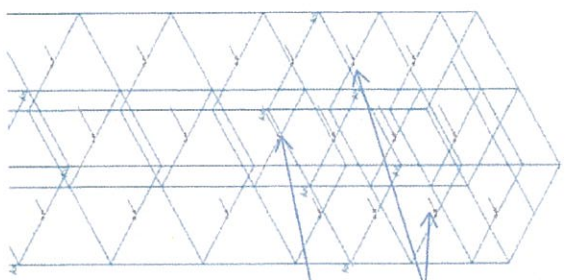
Redline Contract 1

Job Title	Design of Steel Elevator Hoist way	Member/Location	Job No.	Sheet No.	Rev.
Site Area	Grand Station Red line	Member/Location	GS Steel EL	3 of 16	0
Drawing Ref.	WV	Filename	Checked		
Made By	WV	Date	31-Oct-15	NCE	



Fig#3 finishing Dead load (Light weight block + Aluminium composite)

ANALYSIS LAYER
 Scale: 1:148.3
 Beam Post: 200x400
 Case: A2 "Finishing"
 Case: L2 "Finishing"



ANALYSIS LAYER
 Scale: 1:50.72
 Beam Post: 200x400
 Case: A3 "Lateral EL"
 Case: L3 "Lateral EL"

Fx = 2.3 and Fy = 1.5 KN at middle of edge Horizontal member (Typ)

Fx = 4.6 and Fy = 3 KN at middle of intermediate Horizontal member (Typ)

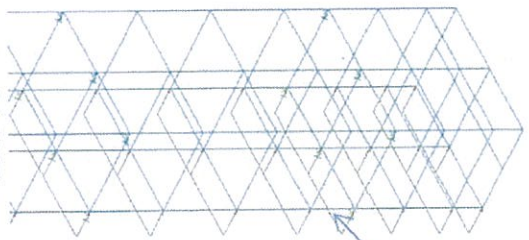
Fig#4 Lateral Load acting on Horizontal Member where contact with Rail
 (Load occur during Lift operation)

CE 8184

Redline Contract 1

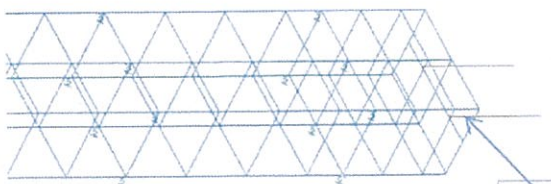
Job Title	Design of Steel Elevator Hoist way	Member/Location	GS Steel EL	Sheet No.	4 of 16	Rev.	0
Site Area	Grand Station Red line	Drawing Ref.		Checked			
		Made By	VV	Date	31-04-15		
						NCE	

ANALYSIS LAYER
 SILE 178.51
 BEM LAYER FROM 200.00mm
 CHG AE -Wind
 CHG LE -Wind



Uniform load 3 KN/m (Wind)
 acting on Horizontal member (Typ)

Fig#5 Wind load 1.2 KPA (1.2*2.5= 3 KN/m)



Service Maintenance Load
 30 KN

Fig#6 Service Maintenance load 20 KN per Car

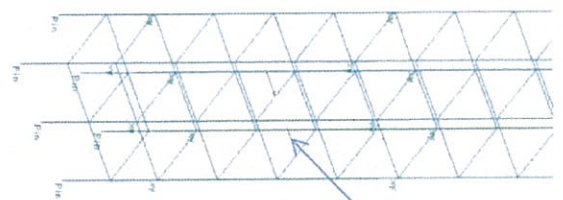
2 LAYER
 SILE 178.51
 BEM LAYER FROM 200.00mm
 CHG AE -Wind
 CHG LE -Wind

D CE 8784

Redline Contract 1

Job Title	Design of Steel Elevator Hoist way	Member/Location	Job No.	Sheet No.	Rev.
Site Area	Grand Station Red line	Member/Location	GS Steel EL	5 of 16	0
Drawing Ref.	Member/Location	Filename	Member/Location	Member/Location	Member/Location
Made By	VV	Date	31-Oct-15	Checked	NCE

ANALYSIS LAYER
 Size: 400x150
 Span: 4000 mm
 Beam Length: 4000 mm
 Chs: 150x100x8x12.5



9.2 KN During Liftcar cable failure and safety brake actuate
 (Critical case acting between Platform1 and CC level support)

Fig#7 Car cable failure (2 car) and Safety Brake actuated load case



Max Uy = 9mm
 Distance from support = 4.3m
 Allowable = $L/175 = 4300/175 = 24.57\text{mm}$
 Utilized = $4.3/24.57 = 0.17\text{ OK}$

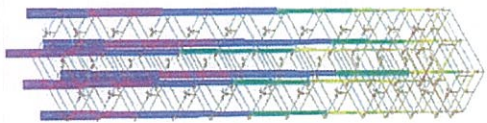
ANALYSIS LAYER
 Scale: 1:450
 Deflection: 9mm/Location: 1250
 Max Uy = 9mm
 Distance from support = 4.3m
 Allowable = $L/175 = 4300/175 = 24.57\text{mm}$
 Utilized = $4.3/24.57 = 0.17\text{ OK}$

Fig#8 Deformation Uy Loadcase DL+Wind+Lateral OP

CE 8784

Redline Contract 1

Job Title	Design of Steel Elevator Hoist way	Member/Location	GS Steel EL	Job No.	Sheet No.	Rev.
Site Area	Grand Station Red line	Drawing Ref.		6 of 16	0	
		Made By	VV	Date	31-04-15	Checked
						NCE




AXL STRESS MEMBER
 Max = 21.30 MPa
 Min = -4.84 MPa
 Beam: I200, Fy=235, Fw=40.00
 Beam: I200, Fy=235, Fw=40.00
 Column: I200, Fy=235, Fw=40.00
 Axial Stress, A: 100.0 MPa-Action
 4.84 MPa
 12.50 MPa
 12.50 MPa
 24.30 MPa
 24.30 MPa
 20.10 MPa
 20.10 MPa
 Color of: Stress-MPa-Service*

Max Axial Stress on
 Vertical member SHS 200*200*6mm
 36.02 MPA between Basement and CC level
 23.17 MPA between CC level and Platform#1
 21.30 MPA between Platform#1 and #2

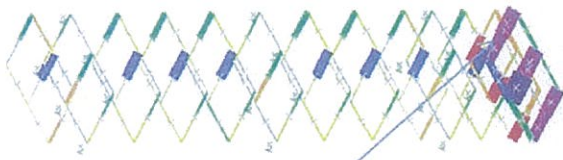
Fig#9 Axial stress Loadcase DL+Wind+Lateral OP+ Lift cable failure

$r = 7.88 \text{ cm}$, $KL = 0.9 * 8.75 = 7.875 \text{ cm}$
 $KL/r = 99.9365$ (Omit frame action by Horizontal member 150*150*4mm @2.5 meter)
 Allowable $F_a = 68.116 \text{ Mpa}$ (Ref AISC 2005 Fig C.E3.2)
 Increase 1.33 for combine windload case = 90.594 Mpa
 $f_a/F_a = 36.02 / 90.594 = 0.3976$ Eq -1
 From Analysis report
 Max Combine Stress = 108.7 Mpa (P/A+Mx/Zx+My/zy)
 $P/A = 36.02$, Thus $Mx/Zx+My/zy = 108.7 - 36.02 = 72.68 \text{ Mpa}$
 Allowable $F_{bx,y} = 155.1 \text{ Mpa}$ (0.66Fy)
 , Increase 1.33 for combine wind = 1.33* 155.1 = 206.28 Mpa
 $f_{bx}/F_{bx}+f_{by}/F_{by} = 72.68 / 206.28 = 0.3523$
 Combine stress interaction $f_a/F_a + f_{bx}/F_{bx}+f_{by}/F_{by} = 0.3976 + 0.3523 = 0.74993 \text{ OK}$
 Design valid for Vertical member SHS 200*200*6mm

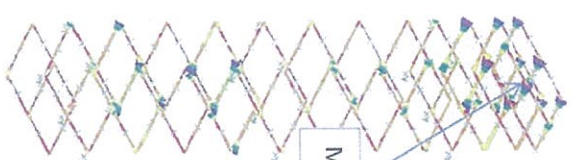

 CE 8784

Redline Contract 1

Job Title	Design of Steel Elevator Hoist way	Job No.	Sheet No.	Rev.
Site Area	Grand Station Red line	Member/Location	GS Steel EL	7 of 16
		Member/Location		0
Drawing Ref.	WV	Filename		Checked
Made By		Date	31-Oct-15	NCE



Fig#10 Axial stress Loadcase DL+Wind+Lateral OP + Lift cable failure



Fig#11 Combine stress Loadcase DL+Wind+Lateral OP + Lift cable failure

DE 8784

Redline Contract 1

Job No.	Sheet No.	Rev.
	GS Steel	8 of 16
	EL	0
Member/Location		
Job Title	Drawing Ref.	Filename
Design of Steel Elevator Hoist way		
Site Area	Made By	Date
Grand Station Red line	VV	31-Oct-15
	Checked	NCE

Horizontal Member 150*150*4mm Design check

Max length = 2.9 m
 L col = 2833 cm4 L col = 250 cm I/L col = 11.332
 I hor = 808 cm4 L hor = 290 cm I/L hor = 2.7862
 G= 2.7862 / 2* 11.332 = 0.1229 , K = 1.1
 KL/r = 1.1 * 290 / 5.93 = 53.794 , Fa= 108.99 Mpa
 fa= 3.4 MPA fa/Fa = 0.0312

Max Combine stress = 108 Mpa (P/A+Mx/Zx+My/zy)
 P/A = 5.9 Mpa , Thus Mx/Zx+My/zy = 108 - 5.9 = 102.1 Mpa
 Allowable Fbx,y = 155.1 Mpa (0.66FY)
 , Increase 1.33 for combine wind = 1.33* 155.1 = 206.28 Mpa
 fbx/Fbx+fbv/Fbv = 102.1 / 206.28 = 0.495

Combine stress interaction fa/Fa + fbx/Fbx+fbv/Fbv = 0.0312 + 0.495
 = 0.52615 OK

Design valid for Horizontal member SHS 150*150*4mm

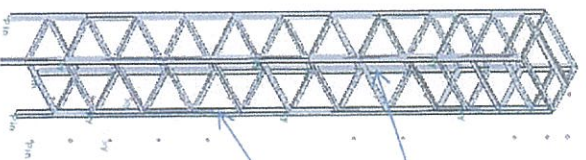
- Conclusion for Model#1 (Double car Hoisway)
- 1) Use vertical section SHS 200*200*6mm and Horizontal Section 150*150*4mm
 - 2) Design valid base on most critical load case (2 car fail at same time , 2 service load 20KN acting at same time with 120kg/m2 wind acting)
 - 3) Optional to use Light wright blockwall or steel subframe for Aluminium cladding
 - 4) Connection for vertical Member provide partial penetration butt weld*
 - 5) Connection for Horizontal Member provide fillet weld 4 mm all around*

Continue Design check for Model#2 Single Car Hoisway

[Handwritten Signature]
CE 8784

Redline Contract 1

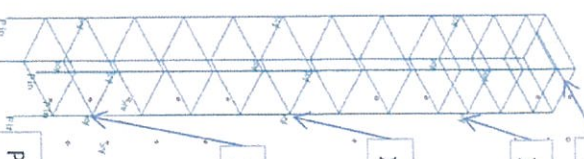
Job No.	Sheet No.	Rev.
GS Steel EL	9 of 16	0
Member/Location		
Job Title	Drawing Ref.	Filename
Design of Steel Elevator Hoist way	WV	
Site Area	Made By	Date
Grand Station Red line	WV	31-01-15
	Checked	NCE



ANALYSIS LAYER
 52M 11177
 12M 12516 11441

- Horizontal SHS 150*150*4 mm
Max spacing 2500mm
- Main Column SHS 200*200*6 mm

Fig#12 Solid Model Single Lift car (Model#2)



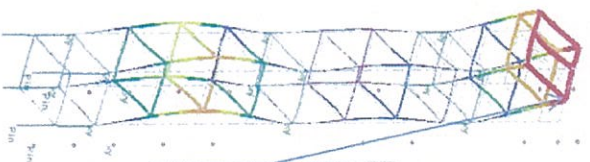
- Top level (Z=28.30) No support
ANALYSIS LAYER
52M 11177
- X,Y support at Platform#2(z=24.00)
- X,Y support at Platform#1 (z=13.75)
- X,Y support at Concourse (z=5)
- Pin support at Basement (z=1)

Fig#13 Wireframe and support (Model#2)

DE 0784

Redline Contract 1		Job No.	Sheet No.	Rev.
		GS Steel EL		10 of 16
		0		
Job Title	Design of Steel Elevator Hoist way	Member/Location		
Site Area	Grand Station Red line	Drawing Ref.	Filename	Checked
		Made By	Date	NCE
		VV	31-Oct-15	

Apply same loadcase and loads from Model #1 to Model#2
 (Noted that Horizontal load acting horizontal member between 2 cell of Liftcar shall
 reduction 50% in Model#2, As only one Liftcar acting!!)



ANALYSIS/LAYER
 Scale: 1:117.7
 Deformation magnification: 122.4
 Elem: 17, Nodal: 0, 0.0500 m/r/s
 0.007554 m
 0.0045259 m
 0.0032451 m
 0.0023247 m
 0.001042 m
 0.000000 m
 Case: CE "Case-1114 - Seismic"

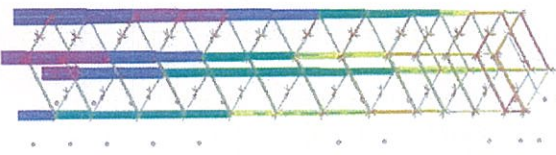
Max Uy = 9mm Distance from
 support = 4.3m
 Allowable = $L/175 = 4300/175 =$
 24.57mm
 Utilized = $4.3/24.57 = 0.17$ OK

Fig#14 Deformation Uy Loadcase DL+Wind+Lateral OP (Model#2)

[Handwritten signature]
 CE 8784

Redline Contract 1

Job Title	Design of Steel Elevator Hoist way	Member/Location	GS Steel EL	Job No.	Sheet No.	Rev.
Site Area	Grand Station Red line	Member/Location	11 of 16			0
Drawing Ref.	File name	Checked				
Made By	VV	Date	31-04-15	NCE		



Max Axial Stress on Vertical member SHS 200*200*6mm
 35.30 MPA between Basement and CC level
 29.80 MPA between CC level and Platform#1
 20.47 MPA between Platform#1 and #2

Fig#9 Axial stress Loadcase DL+Wind+Lateral OP+ Lift cable failure
 Fig#15 Axial stress Loadcase DL+Wind+Lateral OP+ Lift cable failure

$r = 7.88 \text{ cm}$, $KL = 0.9 * 8.75 = 787.5 \text{ cm}$
 $KL/r = 99.9365$ (Omit frame action by Horizontal member 150*150*4mm @2.5 meter)
 Allowable $F_a = 68.116 \text{ Mpa}$ (Ref AISC 2005 Fig C E3.2)
 Increase 1.33 for combine windload case = 90.594 Mpa
 $f_a/F_a = 34.57 / 90.594 = 0.3816$ Eq -1

From Analysis report
 Max Combine Stress = 98 Mpa (P/A+Mx/Zx+My/zy)
 P/A = 35.3, Thus $Mx/Zx+My/zy = 98 - 35.3 = 62.7 \text{ Mpa}$
 Allowable $F_{bx,y} = 155.1 \text{ Mpa}$ (0.66Fy)
 , Increase 1.33 for combine wind = $1.33 * 155.1 = 206.28 \text{ Mpa}$

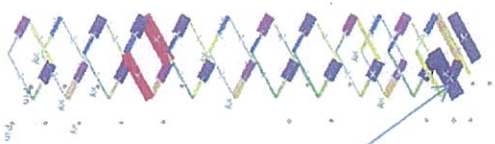
$f_{bx}/F_{bx} + f_{by}/F_{by} = 62.7 / 206.28 = 0.304$

Combine stress interaction $f_a/F_a + f_{bx}/F_{bx} + f_{by}/F_{by} = 0.3816 + 0.304 = 0.68554 \text{ OK}$

Design valid for Vertical member SHS 200*200*6mm

CE 87 84

Redline Contract 1		Job No.	Sheet No.	Rev.
		GS Steel EL		12 of 16
				0
Member/Location				
Job Title	Design of Steel Elevator Hoist way	Drawing Ref.	Filename	Checked
Site Area	Grand Station Red line	Made By	WV	Date
				31-04-15
				NCE



ANALYSIS LAYER
 Element: 2 3 5 7 10 11 13 15
 Scale: 1:127.5
 1:452.4
 Member Scale: 0.001 MPa/Elem
 2 229 MPa
 1 527 MPa
 0 1535 MPa
 -0.4583 MPa
 -1.551 MPa
 -2.529 MPa
 Case C2: Dead+Wind+Lateral+

Fig#16 Axial stress Loadcase DL+Wind+Lateral OP + Lift cable failure



ANALYSIS LAYER
 Element: 2 3 5 7 10 11 13 15
 Scale: 1:127.5
 1:452.4
 Member Scale: 0.001 MPa/Elem
 2 229 MPa
 1 527 MPa
 0 1535 MPa
 -0.4583 MPa
 -1.551 MPa
 -2.529 MPa
 Case C2: Dead+Wind+Lateral+

Fig#17 Combine stress Loadcase DL+Wind+Lateral OP + Lift cable failure

[Handwritten Signature]
 CE 8784

Redline Contract 1

Job Title	Design of Steel Elevator Hoist Way	Member/Location	GS Steel EL	Job No.	Sheet No.	Rev.
Site Area	Grand Station Red line	Drawing Ref.			13 of 16	0
		Made By	VV	Date	31-Oct-15	Checked NCE

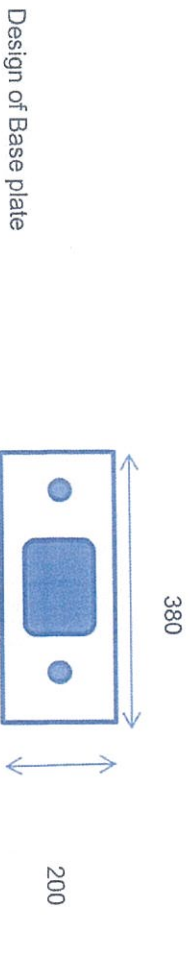
Horizontal Member 150*150*4mm Design check

Max length = 2.9 m
 l col = 2833 cm⁴ L col = 250 cm I/L col = 11.332
 I hor = 808 cm⁴ L hor = 290 cm I/L hor = 2.7862
 G= 2.7862 / 2* 11.332 = 0.1229 , K = 1.1
 KL/r = 1.1 * 290 / 5.93 = 53.794 , Fa = 108.99 Mpa
 fa = 2.53 MPA fa/Fa = 0.0232

Max Combine stress = 98 Mpa (P/A+Mx/Zx+My/zy)
 P/A = 5.9 Mpa , Thus Mx/Zx+My/zy = 98 - 5.9 = 92.1 Mpa
 Allowable Fbx,y = 155.1 Mpa (0.66Fy)
 , Increase 1.33 for combine wind = 1.33* 155.1 = 206.28 Mpa
 fbx/Fbx+fy/Fby = 92.1 / 206.28 = 0.4465

Combine stress interaction fa/Fa + fbx/Fbx+fy/Fby = 0.0232 + 0.4465
 = 0.4699 OK

Design valid for Horizontal member SHS 150*150*4mm



Design of Base plate

Max Axial Stress (P/A) = 35.3 MPA Ax = 45.6 mm²
 P = 160.97 KN , Base plate size = 380*200 mm²
 P/A = 2.118 MPA , Allowable Concrete bearing = 10.5 MPA
 Utilized = 0.2017
 Plate bending Moment = 2.118 *200*(75)²/2 = 1.1914 KN-m
 Allowable Stress = 0.75*Fy = 0.75*250 = 187.5 Mpa
 S req = 1.1914 *1000/ 187.5 = 6.354 cm³
 Provide I=15mm , S provide =20*1.5²/6 = 7.5 cm³
 Utilized = 0.8472 OK

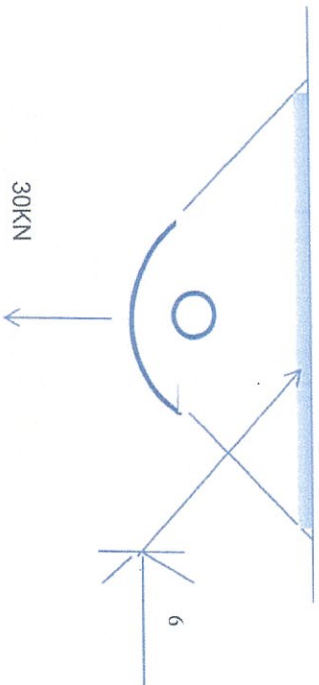
CE 8784

Redline Contract 1

Job No.	Sheet No.	Rev.
	14 of 16	0

**GS Steel
EL**

Job Title	Design of Steel Elevator Hoist way	Member/Location	Drawing Ref.	Filename	Checked
Site Area	Grand Station Red line		Made By	Date	
			VV	31-Oct-15	NCE



Effective weld Area = $250 \times 6 \times 2 = 3000$ mm
 Allowable Stress = $0.5 \times 235 = 117.5$ MPA
 Weld Capacity = $3000 \times 117.5 = 352.5$ KN
 Utilized = 0.0851 OK

Check local punching Shear

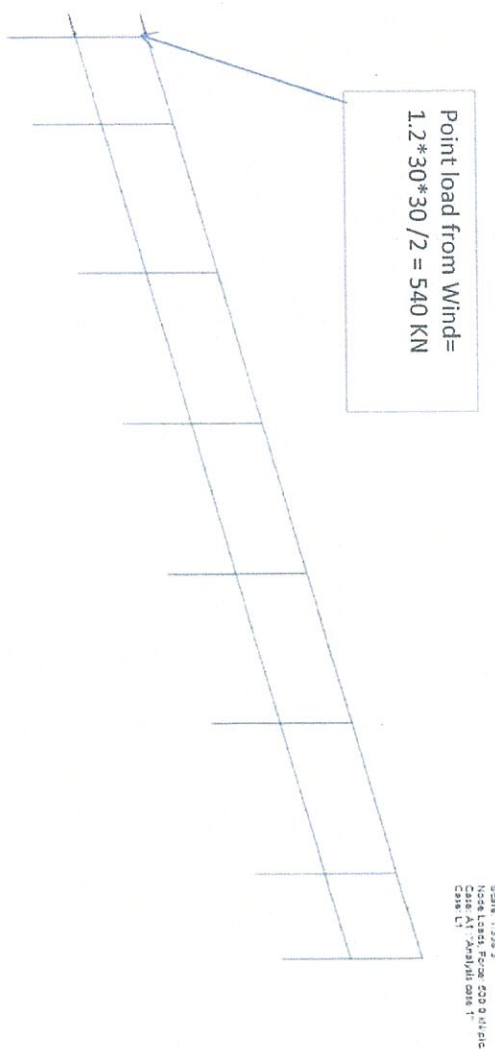
Weld Perimeter = $250 \times 2 = 500$ mm
 Steel Tube wall thickness = 6 mm
 Punching shear stress = $\frac{30 \times 1000}{(500 \times 6)}$
 Utilized = 0.1064 OK
 Allowable = $0.4 \times 235 = 94$ MPA

Provide Stiffener for allow incline Load during service and improve connection strenght

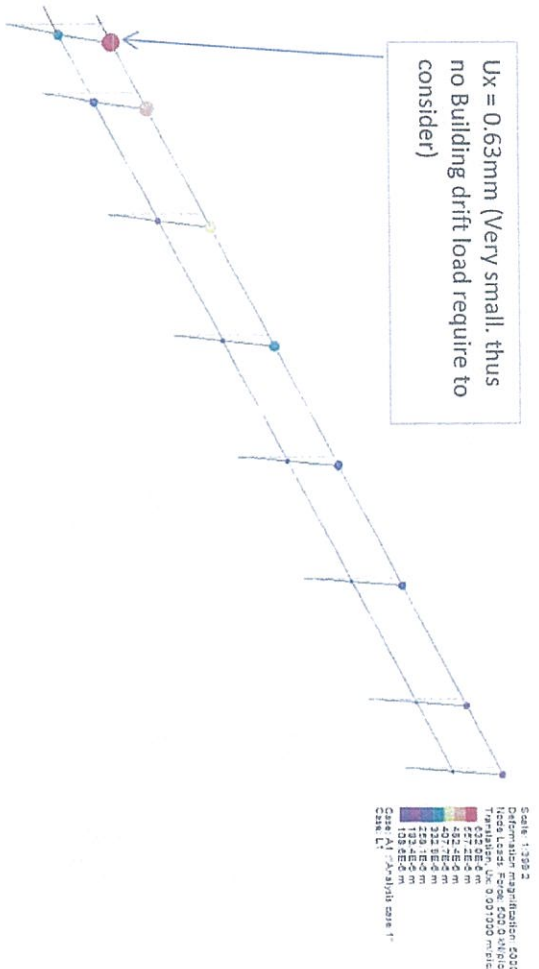
[Handwritten Signature]
CE 8784

Redline Contract 1

Job Title	Design of Steel Elevator Hoist way	Member/Location	GS Steel EL	Sheet No.	15 of 16	Rev.	0
Site Area	Grand Station Red line	Drawing Ref.		Made By	VV	Date	31-04-15
		Checked					NCE



Fig#18 Model Concrete Portal Frame for Analysis Building Drift



Fig#19 Displacement Ux from Wind load

D
E 8194

Redline Contract 1

Job No.	Sheet No.	Rev.
GS Steel EL	16 of 16	0
Member/Location		
Drawing Ref.	Filename	Checked
Made By VV	Date 31-Oct-15	NCE
Job Title Design of Steel Elevator Hoist way	Site Area Grand Station Red line	

Conclusion for Model#1 and Model#2 (Single and Double car Hoistway)
 1) Use vertical section SHS 200*200*6mm and Horizontal Section 150*150*4mm
 2) Design valid base on most critical load case (2 car fail at same time , 2 service load 20KN acting at same time with 120kg/m2 wind acting)
 3) Optional to use Light wieght blockwall or steel subframe for Aluminium cladding
 4) Connection for vertical Member provide partial penetration butt weld*
 5) Connection for Horizontal Member provide fillet weld 4 mm all around*
 6) Model 1 and 2 represent critical case for all Elevator type in Grand Station starting from Basement to upper platform, thus this design is valid to use for all type included type A, B, C/A, C/B, I, D, E/A, E/B, E/C, F, F/A, F/B, G, G/A and H

Comparison Matrix Between Concrete and Steel Hoistway are summarize as Table1

Item	Description	Original RC	Proposed Steel	Note
1	Load reduction on Concourse level	Require Deep Beam		Note1
2	Construction time(Structure only)	1.5 Month/ location	1.5 Week/location	
	Acoustic Noise reduction in	Better Noist reduction	Poorer noise reduction (Unless Acoustic board provide)	
3	passenger car	2 Hour Fire rate*	No Fire resistant*	*Note2,3
4	Fire resistant	Not support	Support	Note4
5	Future upgrade to Glaze Elevator			

Notes

- 1) Further optimize Deep Beam shall provide cost advantage and free more space for Service Pipe and other usage of building at basement
- 2) Hoistway are not part of Building Structure therefore it shall not require fire resistant when look in aspect of performance base design
- 3) Inspection by certify party shall require for both RC and Steel after fire occure in order to certify to use as is or repair/replace for the hoistway Structure
- 4) Future Upgrade to Glaze Elevator shall improve noise reduction (Acoustic) and improve appearance and safety of this public building

 CE 0784

CALCULATION SHEET

PROJECT : Red Lime (Bang Sue – Rangsit)

SHEET NO. :

SUBJECT : ELEVATOR STEEL FRAME

JOB NO. :

COMPUTER : VV CHK'D BY : SI

DATE : 31 Oct - 15

APP'D BY :

Appendix A
Design loading with OTIS confirmation letter

Ref. No. CSS/8342/001/2015.rev 1

November 6, 2015

Attention: Mr. Veeratham Vanakorn
Str. Manager
Unique Engineering and Construction Company Limited

Subject: Design load calculation confirm
Project: SRT RED LINE C1, Site area, Grand Station redline

Attachment: 1. Design of Steel Elevator Hoist way (17 Page)

Dear Sir,

Refer to above mention we are confirmed load as show only on fig #4, fig#6, fig#7 and design criteria at Item 4, 5, 6.

Please refer to the attached document.

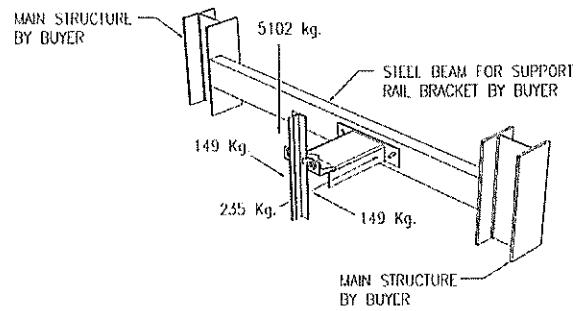
For your information

Yours sincerely,

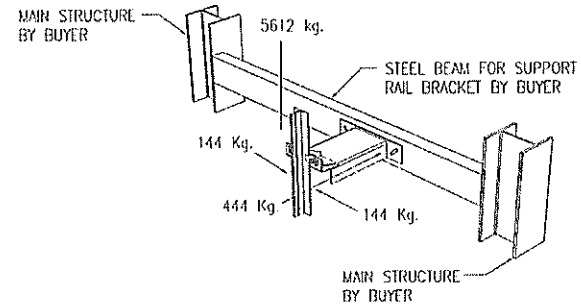


Chusak Somphong
Assistant Construction Manager

REACTION LOAD DETAIL



TYPE "A"



TYPE "B"

25/10/2015

REV.	DATE	BY	CHKD.	REVISION	DESCRIPTION	QUANTITY/DETAILS/REVISION	REVISION	DATE

CLIENT: CHANGHAI ELEVATOR SUPPLY AC: 373 VOLTS L PHASE MAIN ENGINE: 1 NO. 55 KW SPEED: 250 RPM AC COMPRESSION: SCREW	USED ARRANGEMENT AND SUPPLEMENTARY NOTES AND PREVIOUS WORK APPROVED DATE: _____ HOISTWAY SIZES GUARANTEED EQUAL WITHIN ± 3MM OF NOMINAL SIZE DATE: _____	HEADLINE: BANGKOK METRO STATION LOCATION: BANGKOK, THAILAND DRAWN BY: _____ ARCHITECT: _____ PROJECT NO.: _____ DATE: OCT 15, 2015 SALES BY: PHANICH M. PREPARED BY OTIS THAILAND
--	---	--

<b style="font-size: 14px;">OTIS OTIS ELEVATOR COMPANY (THAILAND) LIMITED 15/151-78 BANGKOK-THAI HOTEL BUILDING, BANGKOK TEL: 0-2751-4141 FAX: 0-2751-4143 WWW.OTIS.COM	DRAWING TITLE: RAIL BRACKET APPLICATION PROJECT: "SEE THIS DRAWING" CONTRACT NO.: 7490402/254 DRAWING NO.: CCI-SIEME-G500-LE001.00-GO SHEET NO.: 01
---	---

CALCULATION SHEET

PROJECT : Red Line (Bang Sue – Rangsit)

SHEET NO. :

SUBJECT : ELEVATOR STEEL FRAME

JOB NO. :

COMPUTER : VV CHK'D BY : SI

DATE : 31 Oct -15

APP'D BY :

Appendix B

GeN2 –Regen OTIS Elevator Model Brochure

GeN2-Regen

Leading to a Green Future



OTIS

Company and product names mentioned in this document are trademarks or registered trademarks of their respective owners. Otis cannot be responsible for any technical or typographical errors and reserves the right to make changes to products and documentation without prior notification.

All Rights Reserved
GeN2-Regen 2011-1-2

OTIS

 CE 8784

**XIZI
OTIS**

GeN2-Regen

OTIS

150 years of rich history, the NO. 1 brand in the elevator industry
Inventor of the world's first safety elevator
Inventor of the world's first escalator
Sales and Service operation located in over 200 countries and a service network covering over 1,700 locations worldwide
Annual Escalator and Elevator sales of more than 70,000 Elevator in 12 of the world's 20 highest buildings

XIZI OTIS

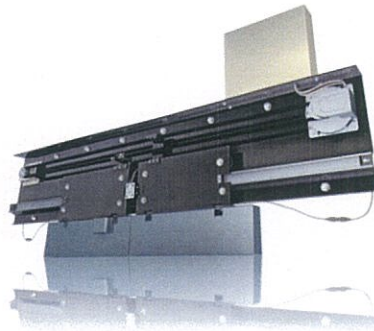
As the largest joint venture of OTIS Elevator Company, Xizi Otis has developed fastest with greatest potential.
Xizi Otis boasts the largest yearly escalator and travelator capacity of more than 5000 units
And the annual elevator production capacity is over 33,000 units.
In 2010, over 30,000 elevators and escalators (China included) have been provided to worldwide, covering more than 60 countries.

J 8784



E3 Qualified

IV Governor
E3 policy complied safety components
---Passed 25 times tripping test
without component replacement.

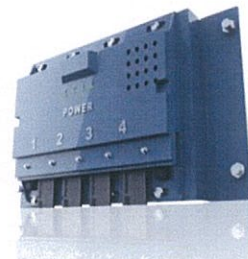


V Door System
Safe, Comfortable and Reliable.



E3 Qualified

VI Safety Gear
E3 policy complied safety components ---
Passed 25 times freefall and runaway test
without component replacement.



VI Resistance Based Inspection
OTIS unique Resistance Based Inspection (RBI) device
monitors Coated Steel Belt status 24 hours a day 7
days a week.

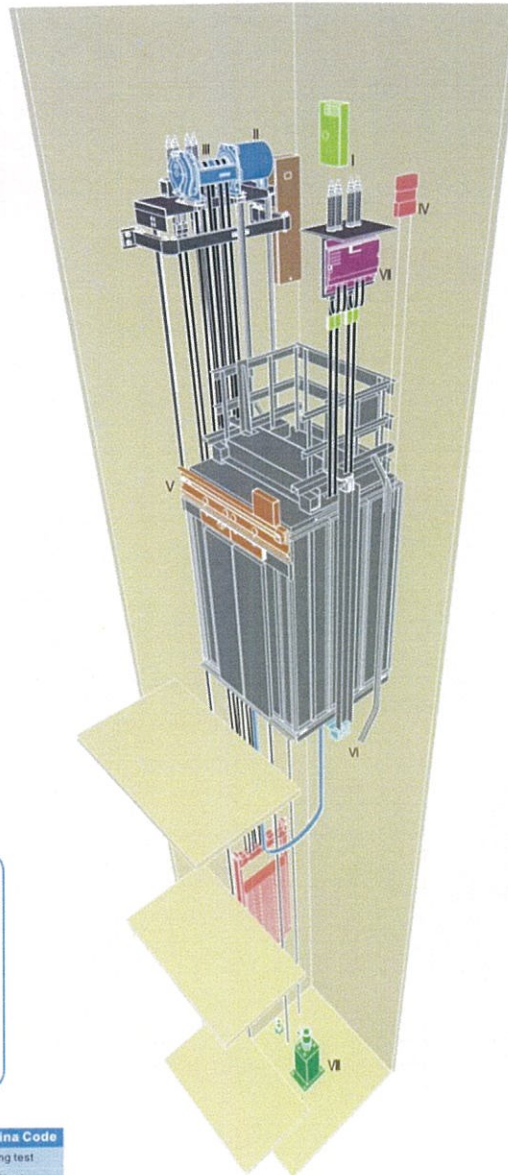


E3 Qualified

VI Buffer
E3 policy complied safety
components ---Passed 100
times strike test without
component replacement.

Note: E3 policy is an Otis global policy for safety components. The requirements cover safety components design, manufacturing, qualification and traceability, which captured the most severe requirements among all major international elevator codes and industry requirements. E3 compliance audit is led by Otis Worldwide Engineering, and approved by Otis world headquarter.

	OTIS E3 Policy	European & China Code
Governor	25 times tripping test	20 times tripping test
Safety Gear	25 times freefall and runaway test	4 times freefall test
Buffer	100 times strike test	6 times strike test

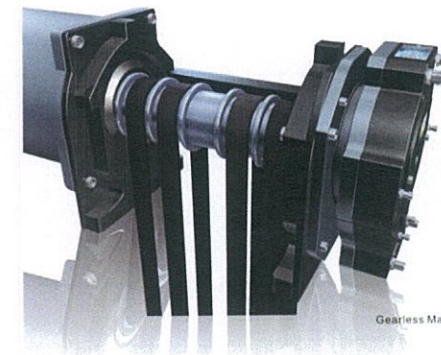


I Regenerative Driver
The unique regenerative technology
can transfer the potential energy to
green electrical power which could
be sent to internal grid. Obviously, it
could achieve high energy saving.



Gearless Machine (<=1000KG)

II Gearless Machine
The innovative design for gearless
machine lead to the refinement and
high-efficiency, building space
saving.



Gearless Machine (<=1000KG)

III Polyurethane-coated Steel Belt
A core renovation of the traction system: Conventional steel rope
is replaced by greener, lighter, tougher, and more flexible
polyurethane-coated steel belt. Subsequent renovations for
drive machine and control system are made accordingly.

Note: The model predicates hoistway's plan of GeN2-Regen(<=1000kg)

Handwritten signature and number 5784

Leading to a Green Future

Regenerative Drive

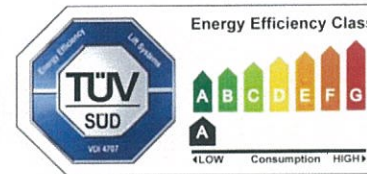
- Energy Saving**
 OTIS regenerative drive use up to 70 percent less energy than non-regenerative drive for equivalent elevator motion
- Environment Friendly**
 The converter unit of the drive can modulate the feedback energy by Plus-Width Modulation (PWM) to the power which has the same frequency (50Hz) and voltage(380V) as the building internal grid.
- Space Saving**
 OTIS regenerative drives have no DBR resistance, and the design of drive is more compact.



VDI 4707

VDI established its VDI 4707 standard to clearly assess elevator energy efficiency taking into account factors such as load, speed, frequency of use and travel height-both during travel and standby modes.

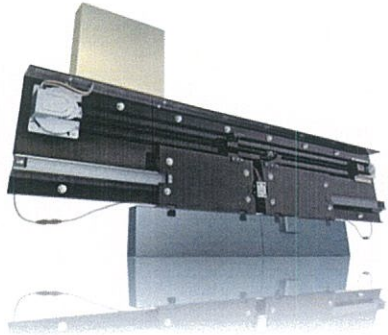
An elevator's energy efficiency is rated using seven different classes from A to G, where A represents the highest energy efficiency and G the lowest energy efficiency. VDI measures energy efficiency based on usage category on a scale from 1 to 5, where 1 represents low-usage elevator and 5 represents high-usage elevator.



Measurements taken on GeN2-Regen installation with standard configurations have the highest efficiency class rating. So when you add it all up-technologically and environment, the GeN2-Regen elevator system is clearly at the top of its class.



Handwritten signature and number: 9784



Door System

Door operator system represents a passenger's first interface with a vertical transport system.

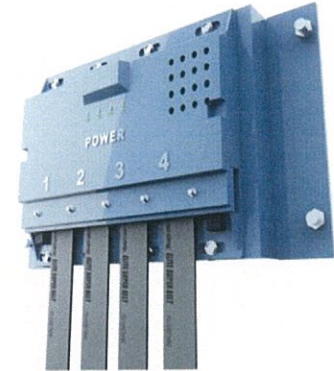
They must be safe, efficient and dependable. Door operator system of NGSOK adopts OTIS core technology. Superior reliability of NGSOK enhances a building's overall lift performance. Infra-red Curtain Door Protection offers maximum protection for passenger safety.

RBI Device

● **Resistance Based Inspection**

Otis developed this resistance based inspection to continuously monitor the resistance of CSB ropes to ensure your safety in elevator.

When CSB wire or cord broken, dynamic measurement of CSB cord's resistance will increase. CSB is required to be replaced when the resistance has a considerable increase. Any potential issue of Coated Steel Belt, such as wearing or steel cord broken, will be real time monitored to ensure the elevator always safe.



Polyurethane-coated Steel Belt

● **Flexible and Durable**

Compared with traditional steel rope, only 3mm thick and 30/60 mm wide coated steel belt is more durable, more flexible and 20% lighter. Coated steel belt can get GeN2-Regen system to the best balance between the intensity and traction force.

● **Unlubricated**

The unique design of polyurethane-coated allows steel belt to run durably without lubrication. Require no lubrication. There is no pollution of oil or grease in hoistway or on landing.

● **Energy Efficiency**

Simultaneously, the Polyurethane-coating increases the contact area and reduces greatly wearing of the drive sheave. The service lifetime of belt is three times of steel rope in the same situation of running and maintenance.

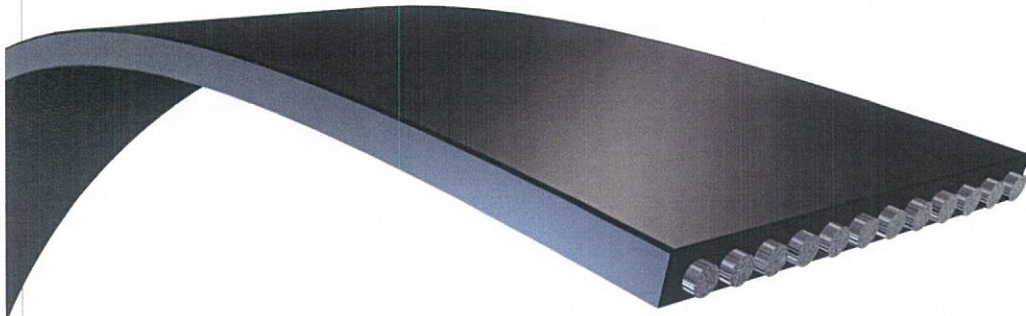


Gearless Machine (>1000KG)

Gearless Machine

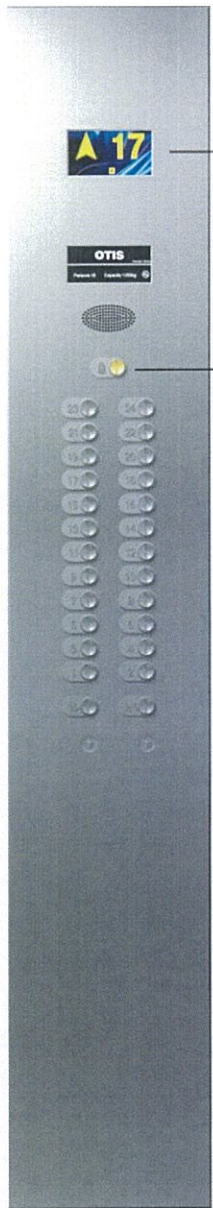
Gearless Machine of GeN2-Regen is only 25cm wide and 100cm long. The machine is located at the top of hoistway, so building space is saved dramatically, which also making the GeN2-Regen machine easier to install and less energy to consume.

The machine's design, with a radial air gap, is as much as 50% more efficient than a conventional geared machine, and 15% more efficient than a shaft-constructed machine.



INCOMPARABLE ADVANTAGE 

COP



OptionI Display
7" TFT-LCD



Button



Hairline stainless steel



10.4" TFT-LCD
UI 13

COP

COP:COP2

Faceplate:Hairline stainless steel[Ⓞ]

Button:BR27A

CPI:7" TFT-LCD

Optional COP:COP1,COP8-P

Standard Configurations

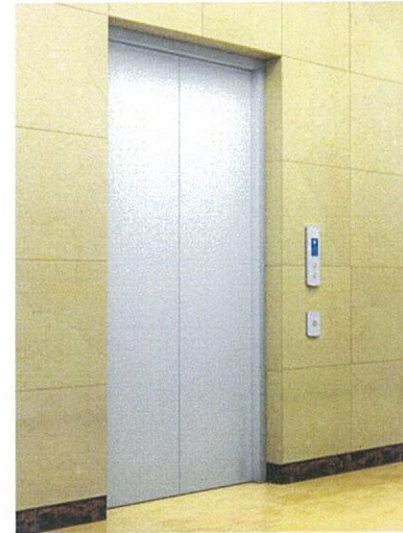
Wall:2130 Painted steel with color w1001

Door:Painted steel with color w1001

Car Floor Type:4901PVC



Hall Call Panel



HBP11-A

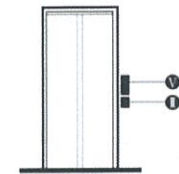
HBP11-STN



LCD Type: 4.3" STN-LCD
Material: Hairline st. steel

HBP

Standard HBP:HBP11-STN
Optional HBP:HBP11-TFT,
HBP11-B,HBP2



HBP11-TFT



LCD Type
Hairline interface

4.3" TFT-LCD
Hairline st. steel
UI 2



4.3" TFT-LCD
Mirror st. steel
UI 15

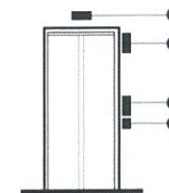


4.3" TFT-LCD
Hairline st. steel
UI 16



4.3" TFT-LCD
Mirror st. steel
UI 18

HBP 11-B



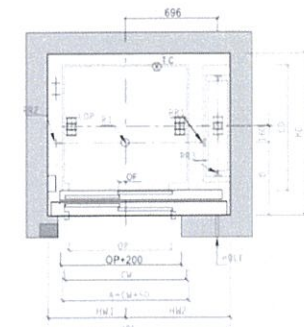
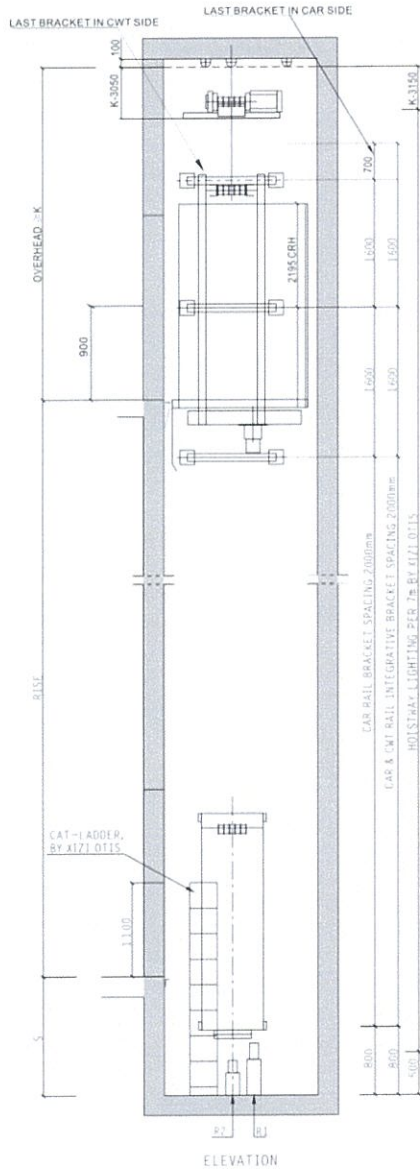
- ① Hall Position Indication
- ② Parking Key Switch
- ③ Hall Lantern
- ④ Separated Hall Button Box

Note
① When car panel is 2130, the default finish of COP faceplate is in the same as car panel's finish. ② More aesthetics choices please refer to Aesthetics Brochure



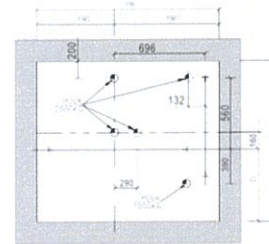
CE 8794
* Carpanel LCD please contact CLC





HOISTWAY PLAN (DL=250KG & 320KG)

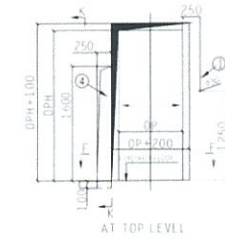
T.C = TRAVELL CABLE
 ○ = TRAVELLING CABLE CLAMP POINT



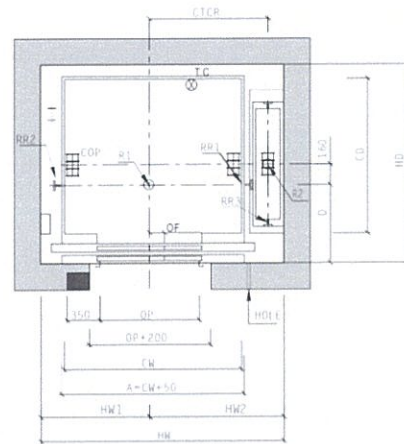
TOP HOISTWAY HOOK PLAN (DL=250KG & 320KG)



K-K VIEW

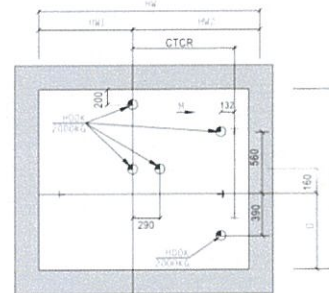


I-I VIEW

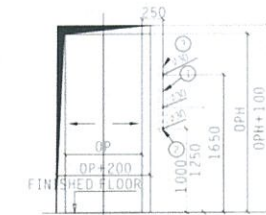


HOISTWAY PLAN (320KG ~DL= 630KG)

T.C = TRAVELL CABLE
 ○ = TRAVELLING CABLE CLAMP POINT



TOP HOISTWAY HOOK PLAN (320KG ~DL= 630KG)



OTHER FLOORS

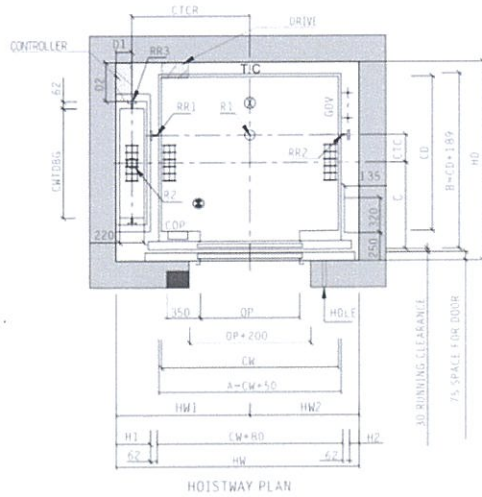
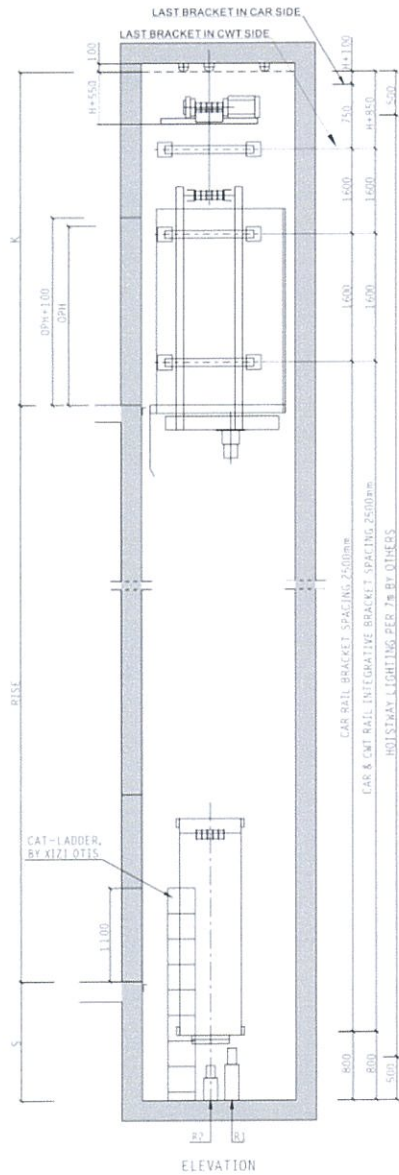
- 1: HB&HPI
- 2: P&K SW ONLY FOR MAIN LANDING
- 3: ONLY FOR FIRE SW. SELECTED AT MAIN LANDING
- 4: E&I PANEL

FREE HOLE FOR HALL FIXTURE, INTERIOR DIA. 30MM PVC PIPE IS RECOMMENDED
 (FRONT VIEW)

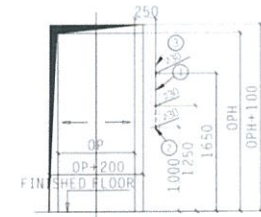
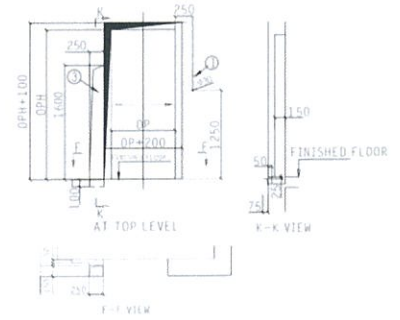
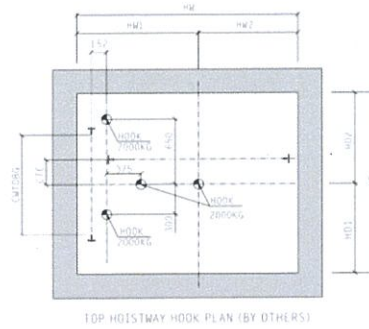
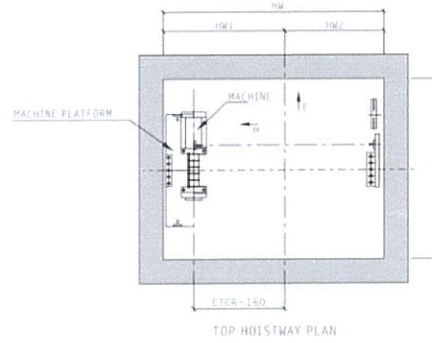
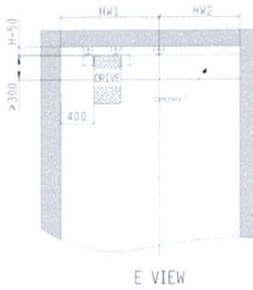
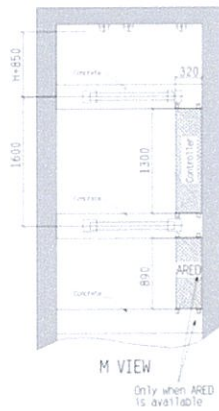
Load (kg)	Speed (m/s)	(CW) × (CD) (mm)	(OP) × (OPH) (mm)	(HW) × (HD) (mm)	HW1 (mm)	HW2 (mm)	S STD (mm)	K MIN (mm)	OF (mm)	D (mm)	CTCR (mm)	REACTION (kN)					Max FLOORS	Max RISE (m)
												RR1	RR2	RR3	R1	R2		
250	1	850 × 800	700 × 2000	1450 × 1400	645	805	1200	3650	40	655	696	9.5	8.9	4.4	40.8	35.6	16	20
												1350	3800	4.4	44.3	37.7	16	45
320	1	850 × 950	700 × 2000	1450 × 1450	645	805	1200	3650	40	655	696	9.9	9.3	4.4	44.3	37.7	16	20
												1350	3800	4.4	44.3	37.7	16	45
400	1	950 × 1150	700 × 2000	1550 × 1550	695	855	1200	3650	55	580	746	10.4	9.8	4.4	48.2	40	16	20
												1350	3800	4.4	48.2	40	16	45
450	1	1000 × 1250	700 × 2000	1600 × 1650	720	880	1200	3650	75	630	771	10.7	10.2	4.4	51	41.7	16	20
												1350	3800	4.4	51	41.7	16	45
550	1	1000 × 1400	700 × 2000	1600 × 1750	720	880	1200	3650	75	705	771	11.3	10.7	4.4	55.6	44.3	16	20
												1350	3800	4.4	55.6	44.3	16	45
630	1	1100 × 1400	700 × 2000	1700 × 1800	770	930	1200	3650	75	705	821	11.9	11.3	4.4	60	47	16	20
												1350	3800	4.4	60	47	16	45

NOTE: DO NOT SCALE THIS DRAWING UNLESS OTHERWISE STATED

CE 87 84



1.C = TRAVELL CABLE
 ○ = TRAVELLING CABLE CLAMP POINT
 ⊙ = COMPENSATION CHAIN CLAMP POINT
 (ONLY FOR SPEED > 1.0M/S & RISE > 4000)



- 1: HB5HP1
- 2: PAK SW ONLY FOR MAIN LANDING
- 3: ONLY FOR FIRE SW SELECTED AT MAIN LANDING
- 4: EXI PANEL

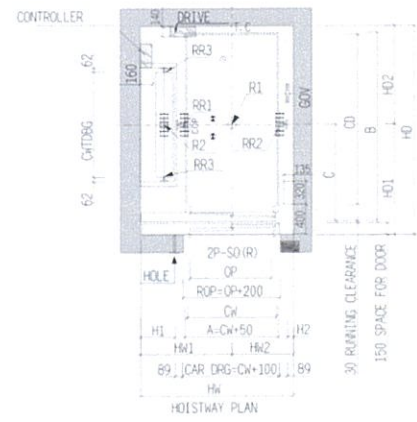
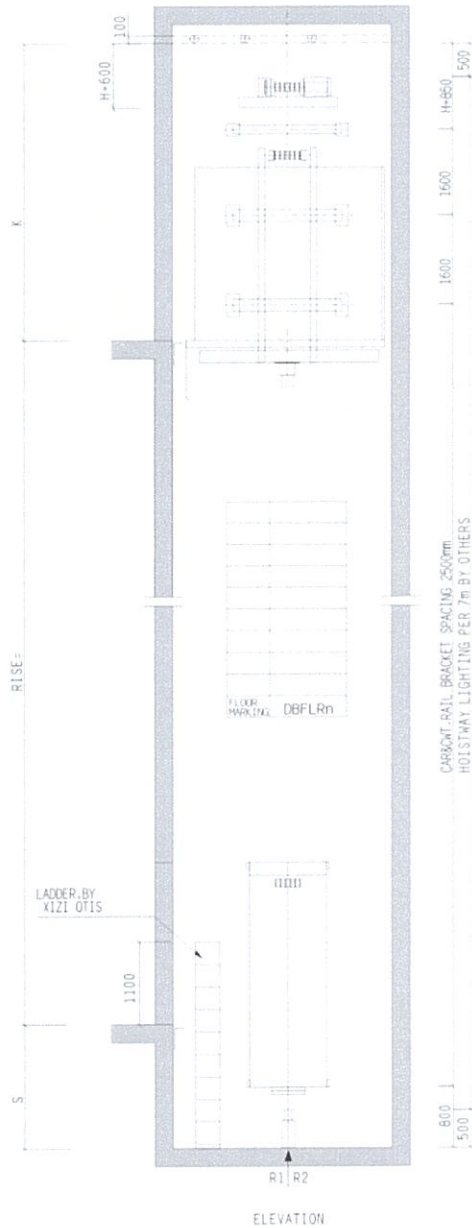
FREE HOLE FOR HALL FIXTURE, INTERIOR DIA. $\sqrt{30}$ MM PVC PIPE IS RECOMMENDED (FRONT VIEW)

Load (kg)	Speed (m/s)	CWI x (CD) (mm)	CPI x (CPI) (mm)	HW1 x (HD) (mm)	HW1 (mm)	HW2 (mm)	HD1 (mm)	HD2 (mm)	S STD (mm)	S MIN (mm)	K STD (mm)	K MIN (mm)	C (mm)	CWTDBG (mm)	CTCR (mm)	CTC (mm)	H1 (mm)	H2 (mm)	REACTION (kN)				Max FLOORS	Max RISE (m)					
																			RR1	RR2	R1	R2							
680	1	1150 x 1400	800 x 2100	1900 x 1800	1015	885	895	905	1400	1350	3900	3850	790	1000	842	185	338	208	29	24	18	72	60	0.4	0.8	0.1	0.6	16	50
	1.5-1.6	1150 x 1400	800 x 2100	1900 x 1800	1015	885	895	905	1450	1400	4050	4000	790	1000	842	185	338	208	32	27	21	72	60	0.4	0.8	0.1	0.6	24	75
	1.75	1150 x 1400	800 x 2100	1900 x 1800	1015	885	895	905	1450	1400	4100	4050	790	1000	842	185	338	208	32	27	21	72	60	0.4	0.8	0.1	0.6	24	75
800	1	1350 x 1400	800 x 2100	2000 x 1800	1115	885	895	905	1400	1350	3900	3850	790	1000	942	250	338	108	32	27	21	79	63	0.6	1	0.1	0.7	16	50
	1.5-1.6	1350 x 1400	800 x 2100	2000 x 1800	1115	885	895	905	1450	1400	4050	4000	790	1000	942	250	338	108	35	30	23	79	63	0.6	1	0.1	0.7	24	75
	1.75	1350 x 1400	800 x 2100	2000 x 1800	1115	885	895	905	1450	1400	4100	4050	790	1000	942	250	338	108	35	30	23	79	63	0.6	1	0.1	0.7	24	75
1000	1	1600 x 1400	900 x 2100	2200 x 1800	1210	990	895	905	1400	1350	3900	3850	790	1000	1067	250	308	88	34	29	22	89	69	0.8	1.2	0.1	0.7	16	50
	1.5-1.6	1600 x 1400	900 x 2100	2200 x 1800	1210	990	895	905	1450	1400	4050	4000	790	1000	1067	250	308	88	37	32	24	89	69	0.8	1.2	0.1	0.7	24	75
	1.75	1600 x 1400	900 x 2100	2200 x 1800	1210	990	895	905	1450	1400	4100	4050	790	1000	1067	250	308	88	37	32	24	89	69	0.8	1.2	0.1	0.7	24	75

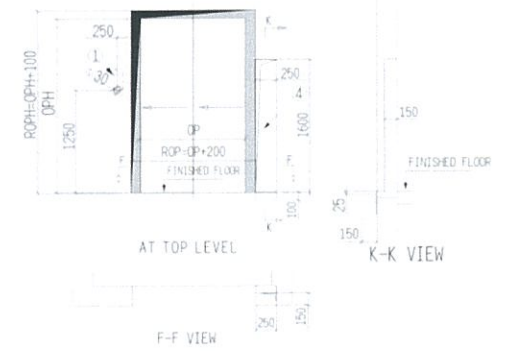
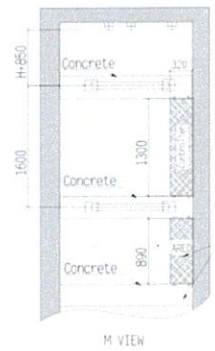
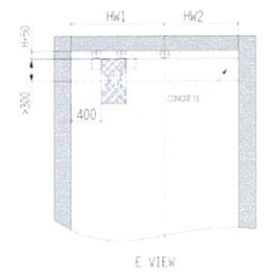
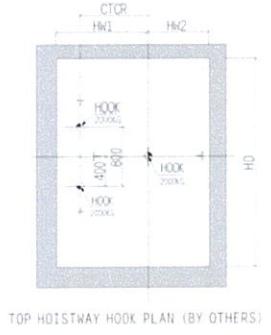
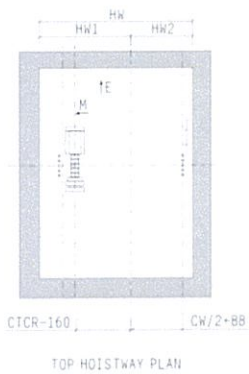
OVERHEAD (K)	K=4500	K=4500
H	50	K-4450

NOTE: DO NOT SCALE THIS DRAWING, UNLESS OTHERWISE STATED

CE 8784



1. C TRAVELL CABLE
 TRAVELLING CABLE CLAMP POINT
 2. COMPENSATION CHAIN CLAMP POINT
 (ONLY FOR SPEED > 1.0M/S & RISE > 40000)



- 1: HB&HPI
 - 2: PAKP SW ONLY FOR MAIN LANDING
 - 3: ONLY FOR FIRE SW SELECTED AT MAIN LANDING
 - 4: EXI PANEL
- FREE HOLE FOR HALL FIXTURE, INTERIOR DIA. ≥ 30 MM PVC PIPE IS RECOMMENDED FRONT VIEW

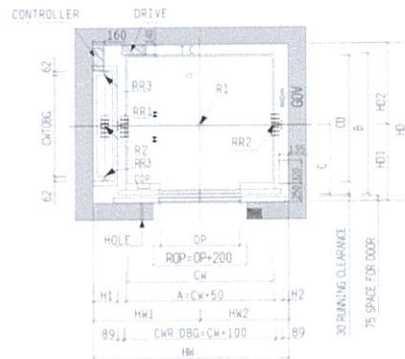
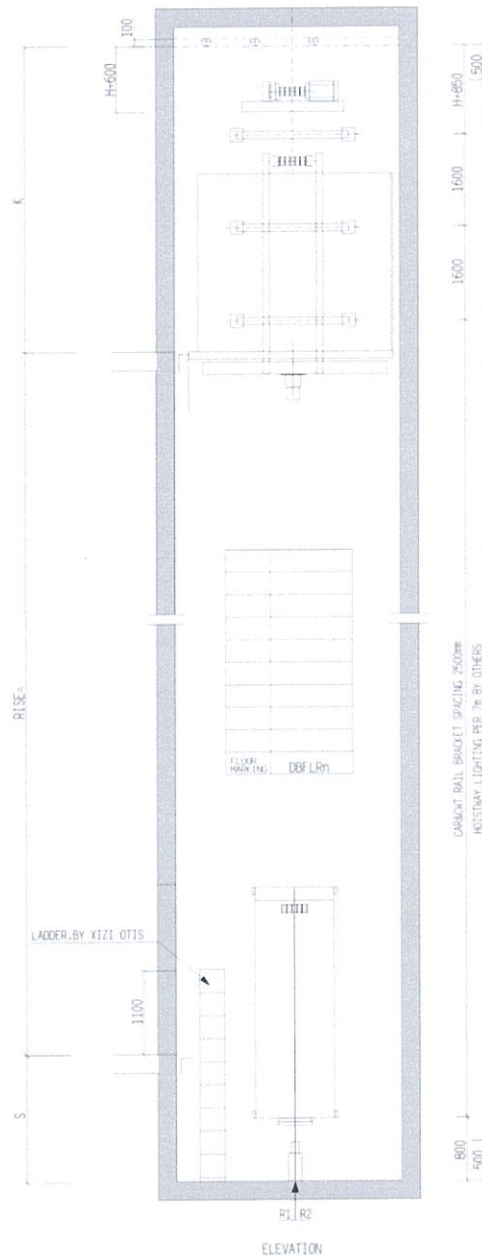
Load (kg)	Speed (m/s)	CW × CD (mm)	OP × OPH (mm)	HW × HD (mm)	HW1 (mm)	HW2 (mm)	HD1 (mm)	HD2 (mm)	S STD (mm)	S MIN (mm)	K STD (mm)	K MIN (mm)	C (mm)	CWTDBG (mm)	CTOR (mm)	H1 (mm)	H2 (mm)	REACTION (kN)				Reaction on CAR RAIL (kN)		Reaction on CNT RAIL (kN)		Max FLOORS	Min Rise (m)	
																		RR1	RR2	RR3	R1	R2	Rx	Ry	Rx			Ry
1275D	1	1200x2300	1100x2100	2050x2800	1225	825	1484	1316	1400	1350	3900	3850	1304	1400	909	486	86	44	40	26	125	102	0.76	2.39	0.09	0.96	16	50
	1.5 / 1.6 / 1.75	1200x2300	1100x2100	2050x2800	1225	825	1484	1316	1500	1450	4100	4050	1304	1400	909	486	86	50	46	30	125	102	0.76	2.39	0.09	0.96	24	75
1600D	1	1400x2400	1300x2100	2350x2900	1425	925	1534	1366	1400	1350	3900	3850	1354	1400	1009	586	86	50	46	31	145	111	1.07	3.12	0.11	1.20	16	50
	1.5 / 1.6 / 1.75	1400x2400	1300x2100	2350x2900	1425	925	1534	1366	1500	1450	4100	4050	1354	1400	1009	586	86	56	52	34	145	111	1.07	3.12	0.11	1.20	24	75
2000D	1	1500x2700	1300x2100	2400x3200	1425	975	1684	1516	1450	1400	3900	3850	1504	1400	1059	536	86	55	50	34	155	116	1.41	4.35	0.13	1.40	16	50
	1.5 / 1.6 / 1.75	1500x2700	1300x2100	2400x3200	1425	975	1684	1516	1550	1500	4100	4050	1504	1400	1059	536	86	61	56	37	155	116	1.41	4.35	0.13	1.40	24	75

OVERHEAD (K)	K-4500	K-4500
H	50	K-4450

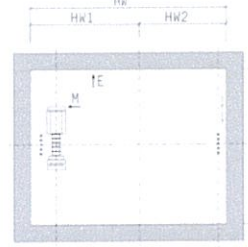
CE 8784

GeN2-Regen >1000KG Wide Car

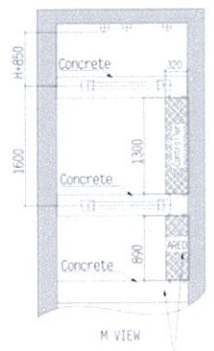
GeN2-Regen



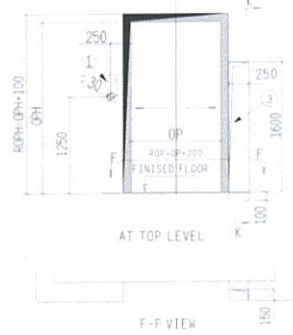
HOISTWAY PLAN
 T.C = TRAVELL CABLE
 ○ = TRAVELLING CABLE CLAMP POINT
 ⊠ = COMPENSATION CHAIN CLAMP POINT
 (ONLY FOR SPEED > 1.0M/S & RISE > 40000)



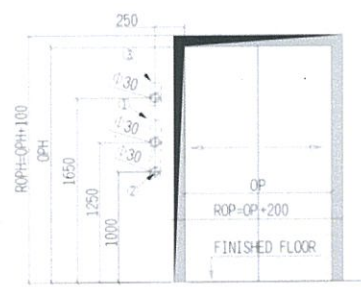
TOP HOISTWAY PLAN



Only when MED is available



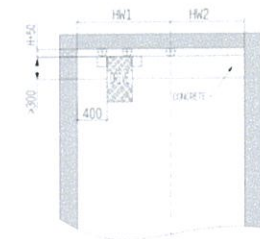
F-F VIEW



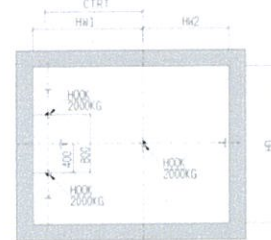
(OTHER FLOORS)



K-K VIEW



E VIEW



TOP HOISTWAY HOOK PLAN (BY OTHERS)

- 1: HB5/HPI
- 2: PAK SW ONLY FOR MAIN LANDING
- 3: ONLY FOR FIRE SW SELECTED AT MAIN LANDING
- 4: EXI PANEL

FREE HOLE FOR HALL FIXTURE, INTERIOR DIA. 30MM PVC PIPE IS RECOMMENDED (FRONT VIEW)

Load (kg)	Speed (m/s)	CW × CD (mm)	OP × OPH (mm)	HW × HD (mm)	HW1 (mm)	HW2 (mm)	HD1 (mm)	HD2 (mm)	S STD (mm)	S MIN (mm)	K STD (mm)	K MIN (mm)	C (mm)	CWDBG (mm)	CTCR (mm)	H1 (mm)	H2 (mm)	REACTION (kN)								Max FLOORS	Max RISE (m)	
																		RR1	RR2	RR3	R1	R2	Rx	Ry	Rx			Ry
1150W	1	1900X1400	1100X2100	2650X1800	1425	1225	895	905	1400	1350	3900	3850	790	1000	1259	336	136	41	37	25	124	96	1.0	1.35	0.08	0.86	16	50
	1.5/1.6	1900X1400	1100X2100	2650X1800	1425	1225	895	905	1500	1450	4100	4050	790	1000	1259	336	136	47	42	28	124	96	1.0	1.35	0.08	0.86	24	75
	1.75	1900X1400	1100X2100	2650X1800	1425	1225	895	905	1550	1500	4150	4100	790	1000	1259	336	136	47	42	28	124	96	1.0	1.35	0.08	0.86	24	75
1275W	1	2000X1450	1100X2100	2700X1850	1475	1225	920	930	1400	1350	3900	3850	815	1000	1309	336	86	43	39	26	125	102	1.16	1.55	0.09	0.96	16	50
	1.5/1.6	2000X1450	1100X2100	2700X1850	1475	1225	920	930	1500	1450	4100	4050	815	1000	1309	336	86	49	44	30	125	102	1.16	1.55	0.09	0.96	24	75
	1.75	2000X1450	1100X2100	2700X1850	1475	1225	920	930	1550	1500	4150	4100	815	1000	1309	336	86	49	44	30	125	102	1.16	1.55	0.09	0.96	24	75
1350W	1	2000X1550	1100X2100	2700X1950	1475	1225	970	980	1400	1350	3900	3850	865	1000	1309	336	86	45	41	27	131	105	1.23	1.74	0.09	1.01	16	50
	1.5/1.6	2000X1550	1100X2100	2700X1950	1475	1225	970	980	1500	1450	4100	4050	865	1000	1309	336	86	51	47	31	131	105	1.23	1.74	0.09	1.01	24	75
	1.75	2000X1550	1100X2100	2700X1950	1475	1225	970	980	1550	1500	4150	4100	865	1000	1309	336	86	49	45	30	140	108	1.46	2.30	0.11	1.20	16	50
1600W	1	2000X1750	1100X2100	2700X2180	1475	1225	1070	1110	1400	1350	3900	3850	965	1000	1309	336	86	45	51	34	140	108	1.46	2.30	0.11	1.20	24	75
	1.5/1.6	2000X1750	1100X2100	2700X2180	1475	1225	1070	1110	1500	1450	4100	4050	965	1000	1309	336	86	56	51	34	140	108	1.46	2.30	0.11	1.20	24	75
	1.75	2000X1750	1100X2100	2700X2180	1475	1225	1070	1110	1550	1500	4150	4100	965	1000	1309	336	86	56	51	34	140	108	1.46	2.30	0.11	1.20	24	75
1800W	1	2000X1900	1100X2100	2700X2300	1475	1225	1145	1155	1400	1350	3900	3850	1040	1000	1309	336	86	53	48	33	150	113	1.64	2.79	0.12	1.30	16	50
	1.5/1.6	2000X1900	1100X2100	2700X2300	1475	1225	1145	1155	1500	1450	4100	4050	1040	1000	1309	336	86	58	54	36	150	113	1.64	2.79	0.12	1.30	24	75
	1.75	2000X1900	1100X2100	2700X2300	1475	1225	1145	1155	1550	1500	4150	4100	1040	1000	1309	336	86	58	54	36	150	113	1.64	2.79	0.12	1.30	24	75
2000W	1	2000X2000	1100X2100	2700X2400	1475	1225	1195	1205	1400	1350	3900	3850	1090	1000	1309	336	86	55	50	34	155	116	1.82	3.31	0.13	1.40	16	50
	1.5/1.6	2000X2000	1100X2100	2700X2400	1475	1225	1195	1205	1500	1450	4100	4050	1090	1000	1309	336	86	61	56	37	155	116	1.82	3.31	0.13	1.40	24	75
	1.75	2000X2000	1100X2100	2700X2400	1475	1225	1195	1205	1600	1550	4150	4100	1090	1000	1309	336	86	61	56	37	155	116	1.82	3.31	0.13	1.40	24	75

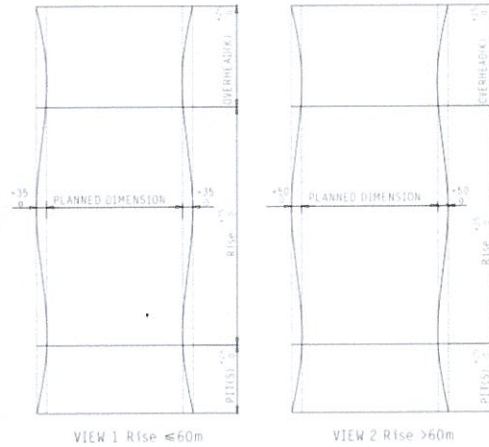
OVERHEAD (K) K<4500 K=4500
 H 50 K=4450

Handwritten signature and code: CE 8784

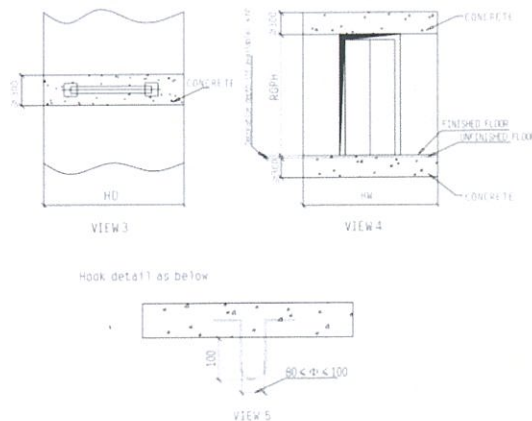
Done by the Owner & Builder

- The hoistway should be exclusively used for the lift. It should't contain cables or devices etc., other than for the lift. Hoistway and all parts attached to it should meet the requirement for fire protection.
- If accessible spaces do exist below the car and the counterweight, the base of the pit should be designed for an imposed load of at least 5000N/m², and the counterweight should be equipped with safety gear. Note: Lift hoistways should preferably not be situated above a space accessible to persons.
- Safety protection barrier with enough strength which height is not less than 1.2m should be placed in front of all entrances of hoistway before lift installed.
- Enclosed hoistway should be provided with perforated ventilation openings in the upper or lower hoistway, and the ventilation opening should be at least 1% of the available hoistway area.
- The reserved hole for landing door, hall call units etc., should be filled in after installation.
- When the distance between consecutive landing doorsills exceeds 11m, intermediate emergency doors of a minimum width of 300mm and a minimum height of 1800mm should be provided, which should not be opened towards inside of the hoistway. And the door should conform to the EN81-1 Standard.
- The pit should be impervious to infiltration of water. If there is a splash, it should be installed in the corner of the pit.
- According to requirement of the technical parameter sheet, the power supply should be placed in the switch box with protection switch and locked off. The fluctuation of the power supply should be less than ±10%. The neutral conductor and the protection conductor should always be separate, and the ground resistance should resistance should be no more than 4Ω.
- Hoistway wall and pit should withstand the loads marked in the layout.
- The temperature in the machine room should be maintained between 5-40 °C. Machine room floor should be approximately level and withstand average load of 7.0KN per square metre.
- User should set up rescue guardhouse. Each lift should be provided with a 3-pair twisted wiring cable or 6-wiring shield cable used as interphone cable (each wiring is not less than 0.75mm²). CAT-5 cable is acceptable if the above two kinds of cable are not available.
- Lift well should far away from bedroom & living room. If it is irrealizable, effective sound insulation and anti-vibration material is required.
- For steel landing door sill support, the thickness of landing floor decoration should less than 80mm.

1. While the Rise ≤ 60m, the verticality tolerance is 0 → +35mm. While the Rise > 60m, the verticality tolerance is 0 → +50mm.



2. We prefer concrete hoistway. If you adopt brick & concrete beam structure, concrete beam of 300mm in height should be made in the hoistway wall where the rails brackets will be fixed in. (VIEW 3) Meanwhile, there should be concrete beams of 300mm in height with the same width as the hoistways', locating upper and lower edge of the landing door hole. (VIEW 4) For CONTROLLER and DRIVER installation, the hoistway should be built as per (VIEW 5)



Riding Function



Safety Function

Standard	Description
CBC-Cancel Error Calls	Before the car starts, the registration of a call or operation can be canceled by double click of this button. After the car starts, registration cancel will not allowed for th
CCM-Passing Chime in Car	On the top of the car, a bell ring will be given out when the car stops at the destination floor. Note: Optional CCM if user select voice device.
CFT-Cafeteria	More open time for the cafeteria floor to meet with the requirement of the extra passenger flow.
DOB/DCB-Door Open/Close Button	The door open/close button in the car operating panel permits to open or close an automatic door, and to keep it open/close it by constant pressure.
DOBL/DCBL-Door Open/Close Button Light	Door Close/Open Button will highlighted if the buttons are pressed.
FCL-Full Collective Operation	All car and/or hall calls registered are answered in the order in which the landings are reached. Direction of travel will be established by the first car command / hall call registered. All calls on its way will be served, irrespective of the time sequence in which the calls were registered.
HCC-Hall Call Cancel	This feature allows the passenger to delete a hall call if a hall button was accidentally pushed. Hall call is deleted if the hall button is pushed twice again (within approximately 1 second).
LNS-Load Non Stop	When a car is loaded to a predetermined percentage of its capacity, it is considered 'full'. Additional passengers would be unable to enter.
RIN-Re-initialize	When the power recovered from a cut, position signals can not be given or the position can not be detected, the car will move to lobby and reinitiate. After that the floor info can be displayed and the elevator backs to normal.
RLEV-Releveling Operation	Stopping errors shall be corrected by releveling. The size of a possible stopping error depends on the type of drive and the accuracy of the position sensors.
ACP-model 1-Anti Crime Protection - model 1	Anti-Crime Protection forces each car in the group to stop at a pre-determined floor and open its door. This allows a security guard or receptionist at the floor to visually inspect the passengers of the elevator before the car completes its run. Mode 1-ACP is activated via installation parameters.
ADO-Advanced Door Opening	In order to accelerate traffic, automatic door opening starts while the elevator car approaches a landing.
DTC-Door Time Protection Close	If the car door does not completely within an adjustable time (default 20s-should be longer than the nudging time) after the door close command, the elevator will remove itself from group operation, i.e. Extinguish hall or car direction lanterns. Hall calls will be assigned to other elevators in the group. Open its doors and sound the buzzer in the car-operating panels. Attempts to close the doors again after 10s. After three unsuccessfully retries, the car will be shut down with its doors open and reenergized. Pending car calls will be cleared. The 'DTP' door time protection lamp will light.

Handwritten signature and code: CE 8794

Standard	Description
DTO-Door Time Protection Open	If the car door does not open completely within an adjustable time (default 20s) after the door open command, the elevator will remove itself from group operation, i.e. Extinguish hall or car direction lanterns. Hall calls will be assigned to other elevators in the group. Close its door and run in the current direction to the next floor and open its door. After three retries at consecutive landings, the car will be shut down with its doors closed. Pending car calls will be cleared. The 'DTP' door time protection lamp light.
ICU-3-Intercommunication Unit	The intercom system is an emergency alarm device, which by definition is required to call for outside assistance if necessary. It shall be activated by the alarm button in the car operating panel.
LWS- Overload Protection	If the load exceeds the rated load, the sound signal will be given out by speaker, and 'OVER LOAD' will be displayed, the car door will not close, the elevator will not start.
NTSD- End Protection	If the speed is not slowed to the preset value while the car reach the end floor, a forced deceleration will be carried out by system in order to protect the safety of the car.
OHT-Drive Overheat Protection	Self-protection mode will be achieved if the temp of the motor exceeds the preset value due to the heat made by motor itself or the high temp in the environment. The car stops at the nearest floor, unload and shut down the light and ventilation; once the temp falls down to the preset value, the car will recover.
TCI-Top of Car Inspection	The inspection operation switch and its push buttons and an emergency stopping device 'TES' shall be placed on the car roof that they are readily accessible.
ANS-Anti Nuisance Car Call Protection	If there is only one passenger in the car, and an excessive number of car calls is registered, nuisance is detected and all car calls will be canceled, requiring registration of a proper number of calls. The number of acceptable car calls is programmable; it is typically three (3). The passenger load value is set to 10% of the elevator rated load value.
PRK-Parking	Elevators in a same group will park on different floors once spare in order to shorten the response time.
ALARB-Alarm Bell	The car emergency alarm device (bell) which is installed at top of car, the alarm bell will be activated by passing the alarm button in operating panel, the device is powered by battery.
ELTU-Emergency Light	Emergency light in the car will start whenever there is a power cut.
ERO-Electrical Recall Operation	A switch in the controller that can raise the car bypassing the final limit switch and buffer switch in case of emergency situation such as the car is rest on the buffer.
FAN-Car Fan Control	There is a switch to control the car fan on or off.
PKS-Parking and Shutdown Operation	Parking and shutdown operation brings the car to selected landing. Keep the doors closed, shutdown the car and illuminates "PARK" in hall button box, the door open button "PARK" will remain illuminate and operative.



Special Function



Emergency Function



Energy saving Function



Emergency Function



Riding Function



Special Function

Optional	Description
ARED- Automatic Rescue Emergency Device	This device is used for rescue operation in case of power shutdown, it is powered by a rechargeable battery, when a sudden power cut happens, a sound signal will comfort the trapped passengers, then the car will move towards to the near floor, keep the door open, meanwhile trapped passengers can get out of the car.
EFO-Emergency Fireman Operation	Upon recognition of fireman's service, a car shall return non-stop to the designated return landing and park with the doors fully open. After that a dry contact signal from the controller can be sent to building automation system automatically.
ACP- model 2- Anti Crime Protection - model 2	Anti-Crime Protection forces each car in the group to stop at a pre-determined floor and open its door. This allows a security guard or receptionist at the floor to visually inspect the passengers of the elevator before the car completes its run. Mode 2- ACP is triggered from keyswitch.
CLI- Carlighting Control	There is a switch to control the car lighting on or off.
DCL-Down Collective	The system has UP hall buttons at the bottom floor and/or at the main landing only, all other floors have DN hall buttons only.
DHB-Door Hold Button	Pressure on the Door Hold button 'DHB' in the car operating panel opens the door and keeps the door open for a specified adjustable door hold time.
GROUP-Group Control Function	Two or more elevators in same series should adopt this function for better response performance, avoiding repeated response, shorten the system response.
HCM- Hall Chime	The Hall Chime fixture can be a substitute for hall lanterns and gong boards. It includes up and down lanterns, and a speaker. The chime is transmitted via the audio link to speakers in the lanterns.
EAC- Elevator Air Conditioner	The elevator air conditioner is designed specially to adjust the air in car, and it is an independent circulating system. The conditioner can keep the temperature, humidity, purity and flow velocity in a comfortable range for human, so as to make a satisfied space in car, through by the condensation water atomization, automatic switching working mode when the water level is over limit and water level limit protection, dehumidifying the air.
ISC-Independent Service	This function is designed for meeting customers' special needs. When switched on independent service the elevator will only answer any registered car call deviating from group control, regardless of the hall calls while opening or closing the door by manual control and operating according to customers' registered signals.
NSB- Non Stop Button	Once the NSB button is pressed, all calls outside will not be registered, and the car moves directly to the destination floor.



Optional	Description
AMS-Area Monitoring screen O*	It can be installed in the porter's lodge, simply display the condition signals by LED indicators and lock/unlock the elevator.
BA-Building Monitor Ports O*	Elevators with BA function can provide scattered elevator status for computed management of the buildings, such as running directions, floor numbers, safety signals, door signals.
EQO-Earthquake Operation O*	Once an earthquake has happened, all the calls and operations will be cleared after the earthquake signal. The car will stop at the nearest floor to unload passengers.
TBF-Time Based Feature	The user can select up to 4 features, with separate time settings for each feature at the one elevator and at the same time.
TBF-SHO-Time Based Feature- Shabat	The elevator will be into Shabat state when the Real Time Clock reaches a designated time zone.
TBF-ACP-Time Based Feature-Anti Crime Protection	The elevator will be in ACP state when the Real Time Clock reaches a designated time zone.
TBF-PKS-Time Based Feature-Park	The elevator will be into PKS state when the Real Time Clock reaches a designated time zone.

O*-Need confirmed by factory
TBF function need set up parameters on jobsite based on customer's requirement.

Significant projects



- | | |
|------------------------------|--|
| Taipei MRT | Aqua Portimão
Algarve
Portugal |
| Maracanã Stadium
Brazil | P.J Trade Center
Kuala Lumpur
Malaysia |
| Yas Island
Dubai UAE | Mumbai Metro
India |
| Hangzhou
Xiaoshan Airport | |

GeN2-Regen
Leading to a Green Future

Handwritten signature