R3 plant design

Industrial Structures

Modeling & Detailing

SUPPORTS, WALKWAYS, STAIRS,
WARE HOUSE STRUCTURES
CONVEYOR STRUCTURES, TRANSFER TOWERS

AS 1170.0
AS 1170.2
AS 1170.4

AS1657
AS4024
AS4100

Modeling & Detailing

Since 2012, R3 have been modeling and detailing industrial structures. If you are looking for a single stair, or a complete industrial structure, we can offer you a customized solution, tailored to your needs.
Whether you are a company with your own steel detailing office, or a fabrication facility or a one-man operation we can help with drawing needs.

Our Service Includes

- 3D BIM Modelling & Clash detection
- Generating tender models
- Erection plans
- Structural analysis & reports
- General Arrangement drawings
- Layout out drawings.
- Fabrication drawings
- DXF Files for plate work
- NC Files for cutting & drilling
- Base plate & Anchor plate details.
- Material lists/Take-offs & Tonnage estimations
- Anchor bolt drawings
- Connection and Joint details
- Bolt List

Benefits of BIM

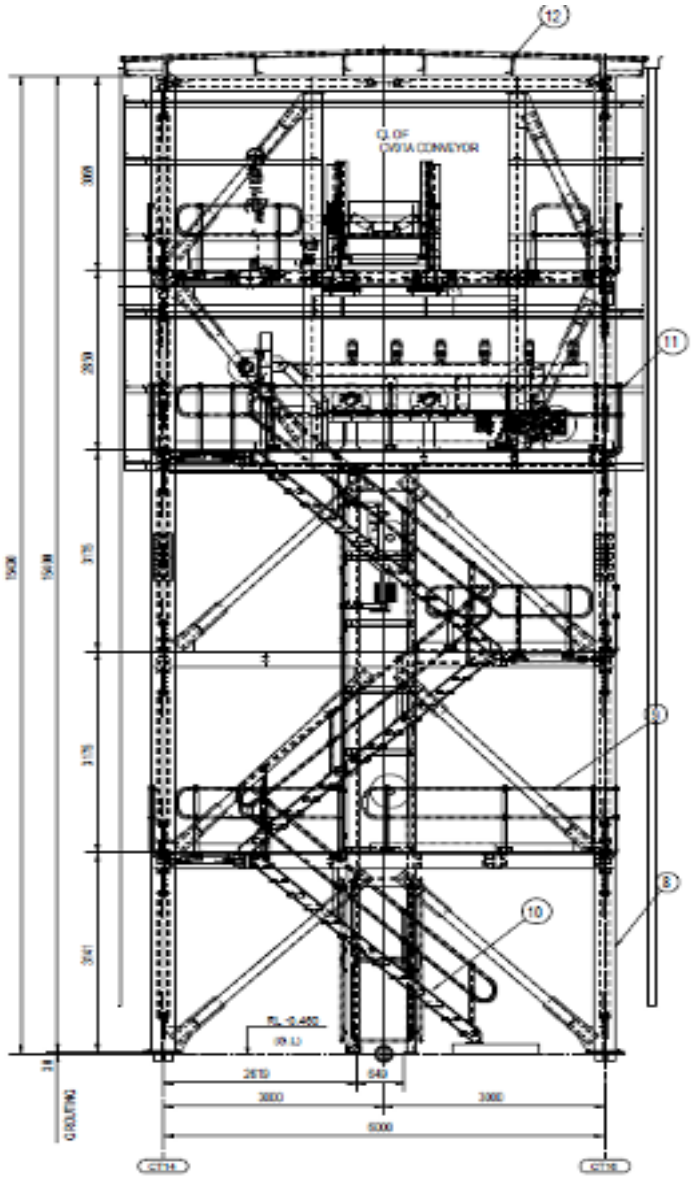
Our Building Information Modelling (BIM) service provides our clients with an intelligent 3D model and we carry out a virtual construction analysis to test for construction-ability and potential conflicts. This analysis allows us to accurately predict how various items of equipment and structures will integrate on-site, thus eliminating costly time delays due to onsite clashes and any required design changes.

Cost Savings

We provide significant cost savings to projects by utilizing local Engineers, Modelers and Detailers, greatly helping our clients to meet their project budget.

Time Savings

Overall design time is reduced when more labour is involved on your project – we provide both shift work and also time zone work, getting very close to 24 hour resources. This greatly reduces project lead-time and moreover, if any urgent design changes were made in Australia, these would be addressed by the following morning due to time zone work and shift work.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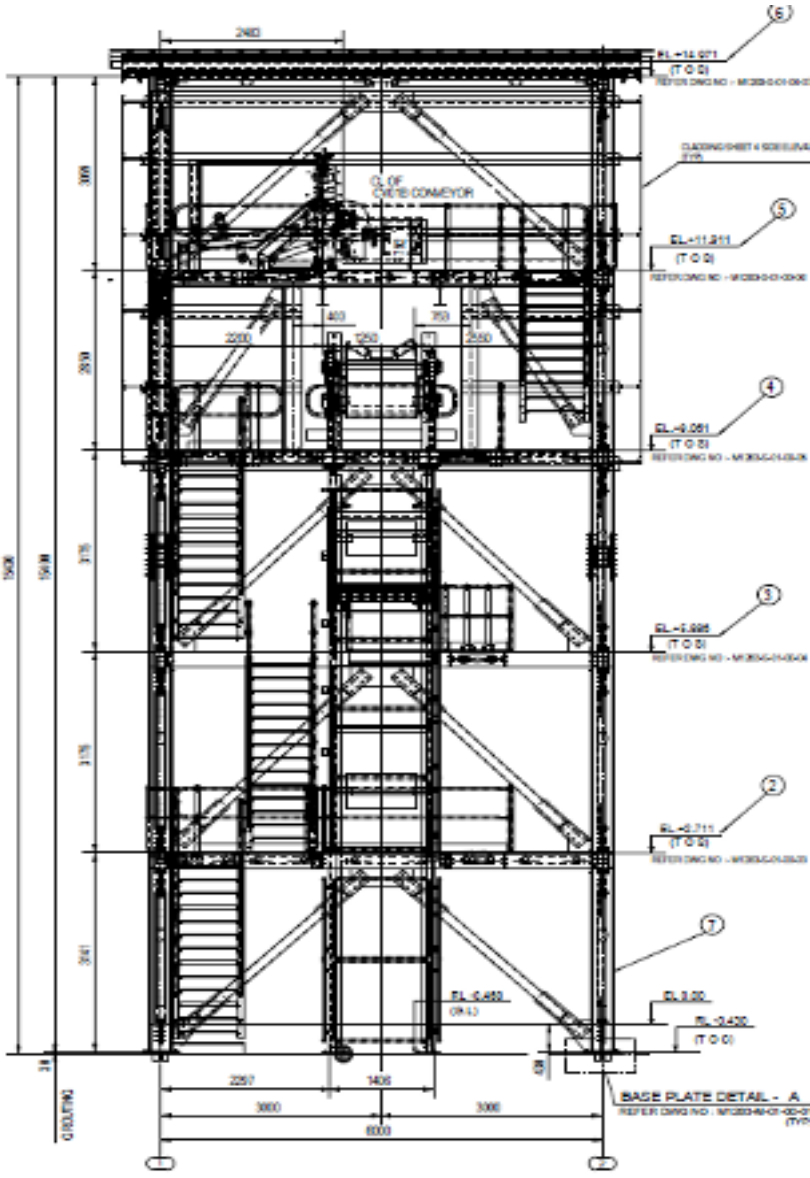
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BASE PLATE DETAIL - A
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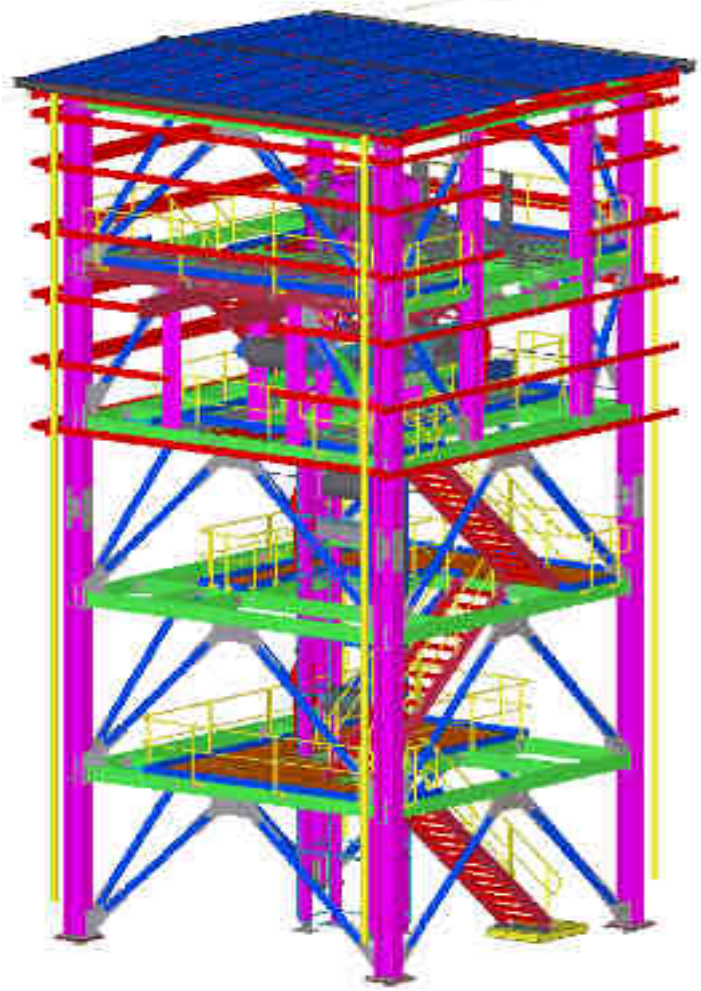


Structural Design & Detailing

We can provide optimized structure designs & reports for steel structures, or we can work with your design inputs to generate models. We have extensive experience working on Australian, AISC and IS Standards as required by our clients / overseas structural engineers.

Australian CODE AND STANDARD

AS/NZS 1170.0-2002 Structural design actions
AS/NZS 1170.2-2002 Structural design actions
AS 1170.4-2007 Structural design actions –
AS 4100-1998 Steel structures

General Codes

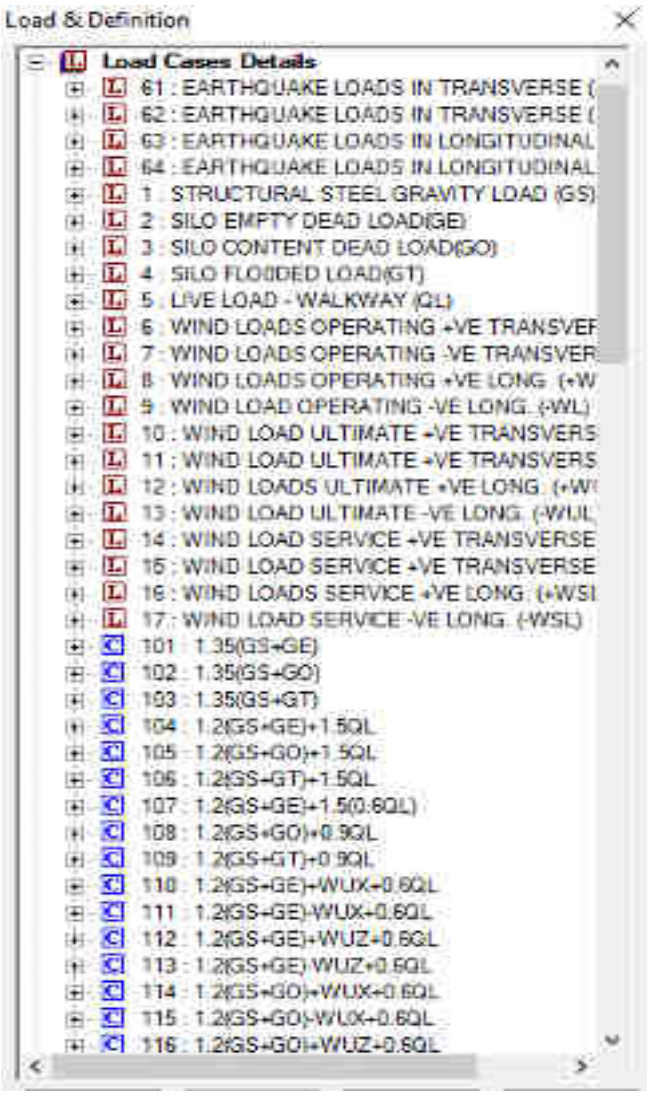
AS1657	Walkways maintenance and access platforms
AS4024-2015	Safety of Machinery
AS1755-2000	Conveyor Safety Requirements
AS4100	Steel Structures
AS1359	Rotating Electrical Machines,
AS1470	Health & Safety at Work,
AS 1554.1	Structural Steel Welding, Australian standard
AS3990	Mechanical Equipment – Steelwork,

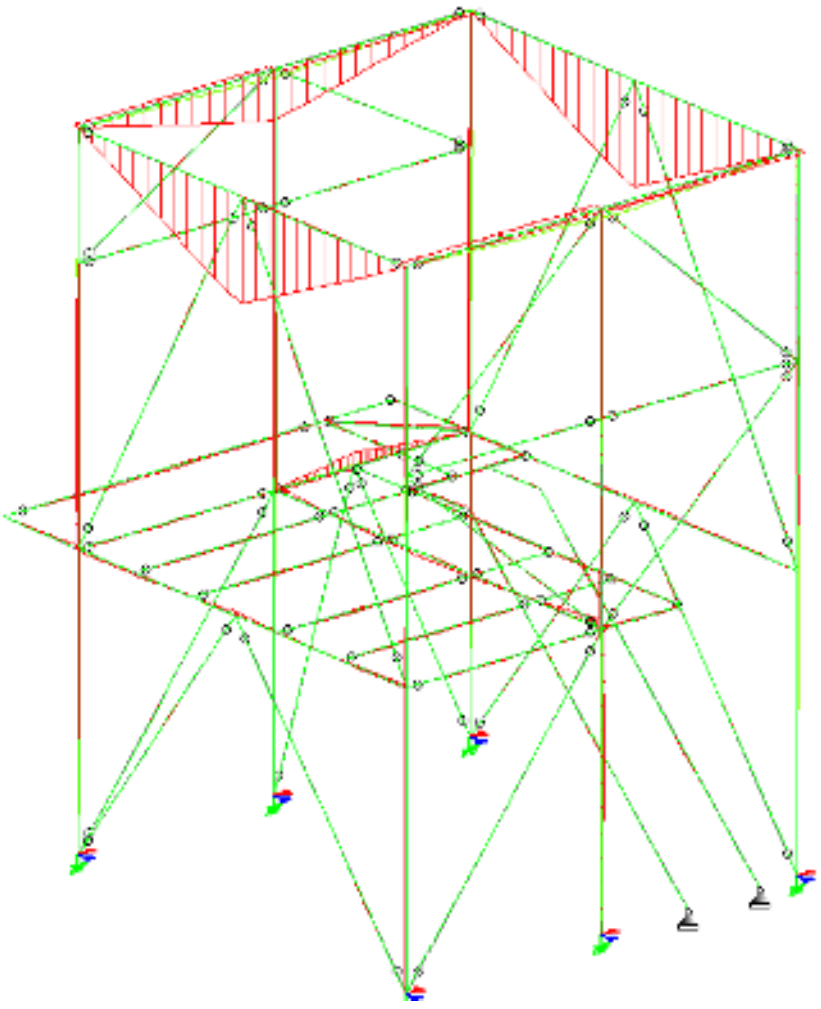
American Codes:

ASCE-7-10: Minimum Design Loads for Buildings & other structures.
ASCE-7-10: Wind Loads
ASCE-7-10: Seismic Loads
STEEL DESIGN: AISC Steel Construction Manual 14th Edition for Design of steel Structures.
AWS D 1.1 & 1.3: Structural Steel Welding, American standard

Codes & Standards for Euro code:

EN 1990 Euro code: - Basis of structural design
EN 1991 Euro code 1:- Actions on structures
EN 1993 Euro code 3:- Design of steel Structures
EN 1998 Euro code 8:- Design of structures for earthquake resistance.





Structural Design

Structure analyzing using the finite element computer program, subjected to independent loads.

Software also performs a combined bending and axial load unity check in accordance

With Australian Standard AS4100-steel structures.

Seismic Load Calculation - Equivalent Static Method [Per Clause 6.2, AS1170.4-2007]

Design base shear $V = C_d(T_1)W_t$ [Clause 6.2.1]

Where,

$C_d(T_1)$ = horizontal design action coefficient
= $C(T_1)S_p/\mu$ = 0.016

$C(T_1)$ = value of the elastic site hazard spectrum
= $k_p Z C_h(T_1)$ = 0.042

$C_h(T_1)$ = value of the spectral shape factor for the fundamental natural period of the structure (calculated below)

k_p = probability factor [Table 3.1]
= 1.00

Z = hazard factor [Table 3.2]
= 0.05 [Figure 3.2(c)]

W_t = seismic weight of the structure [Clause 6.2.2]

S_p = structural performance factor [Clause 6.5]
= 0.77

μ = structural ductility factor [Clause 6.5]
= 2.00 [Considering 'Ordinary moment-resisting frames(limited ductile)]

T_1 = natural period of the structure [Clause 6.2.3]
= $1.25 k_t h_n^{0.75}$
= 1.048s

k_t = 0.110 [for moment-resisting steel frames]
= 0.075 [for moment-resisting concrete frames]
= 0.060 [for eccentrically-braced steel frames]
= 0.050 [for all other structures]
= 0.110

h_n = height from base of the structure to the uppermost seismic weight or mass (in metres)

Wind Pressures Calculation [Per AS/NZS 1170.2-2002]

Wind region		:	A4	[Non-cyclonic]
Average recurrence interval	(R)	:	250 Years	
Terrain category		:	Category 2	
Density of air	(ρ_{air})	:	1.20 kg/m^3	
Regional wind speed	(V_R)	:	44 m/s	[Ultimate Limit States]
		:	44 m/s	[Serviceability Limit States]

Wind direction multipliers (M_d):

Cardinal directions								
N	NE	E	SE	S	SW	W	NW	Any Direction
0.90	0.85	0.90	0.90	0.95	0.95	0.95	0.90	1.00

Shileding multiplier (M_s) : 1.0 [Considered conservatively]

Topographic multiplier = Max(M_h, M_{lee}) (M_t) : 1.0

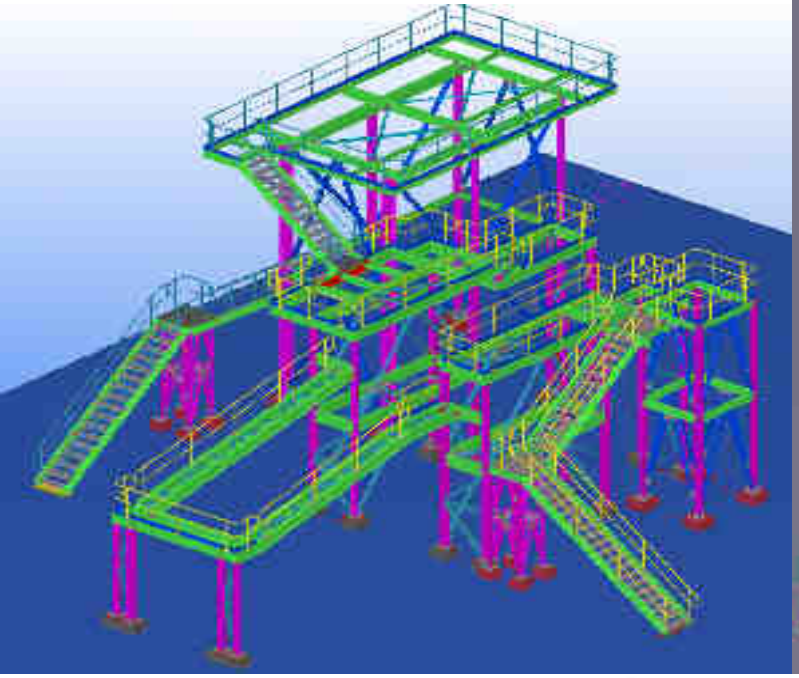
Where,

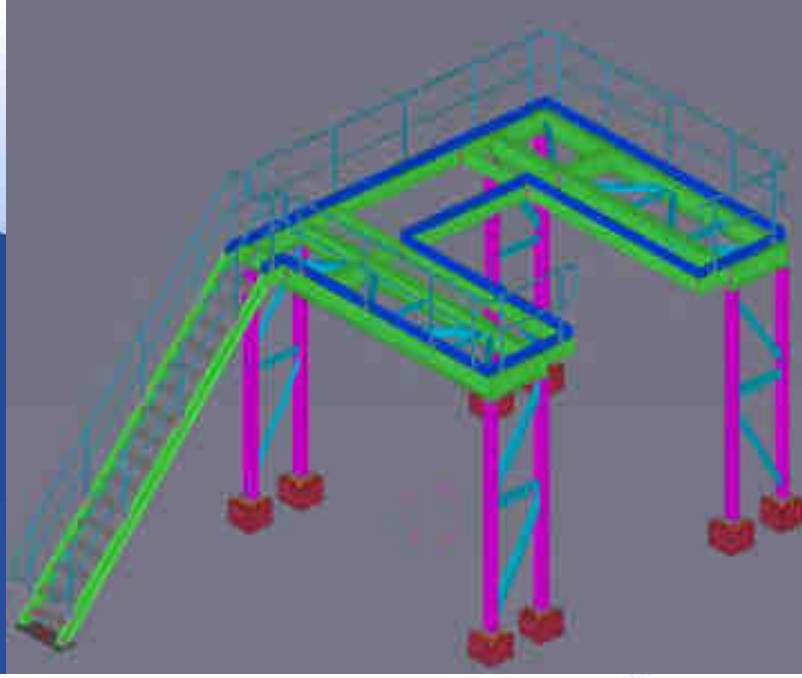
M_h = hill-shape multiplier
= 1.0 [for an assumed $H/2L_u$ value < 0.05]

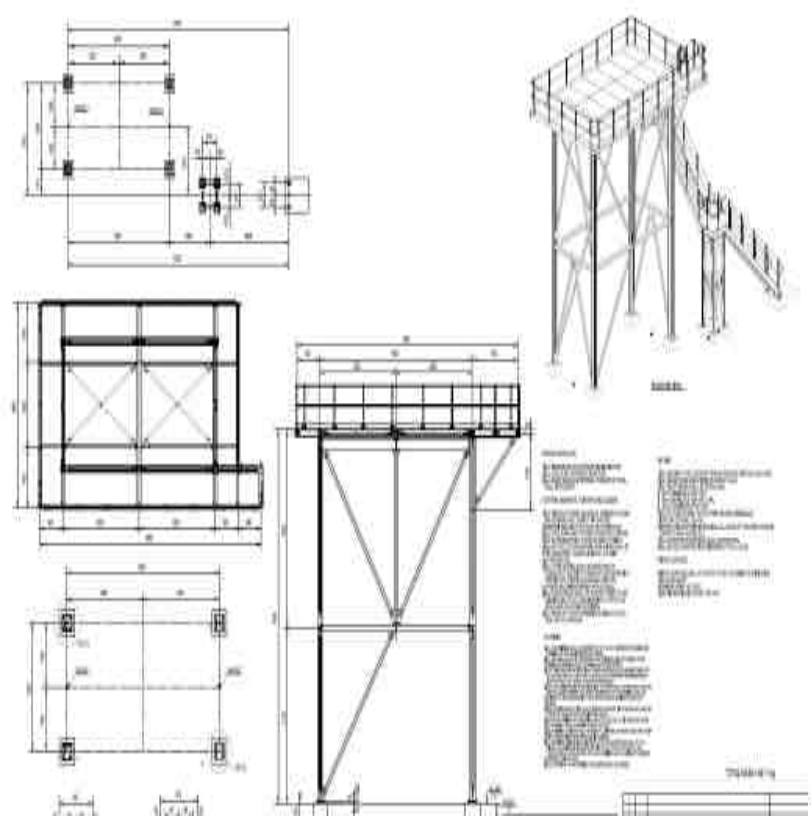
M_{lee} = lee multiplier
= 1.0

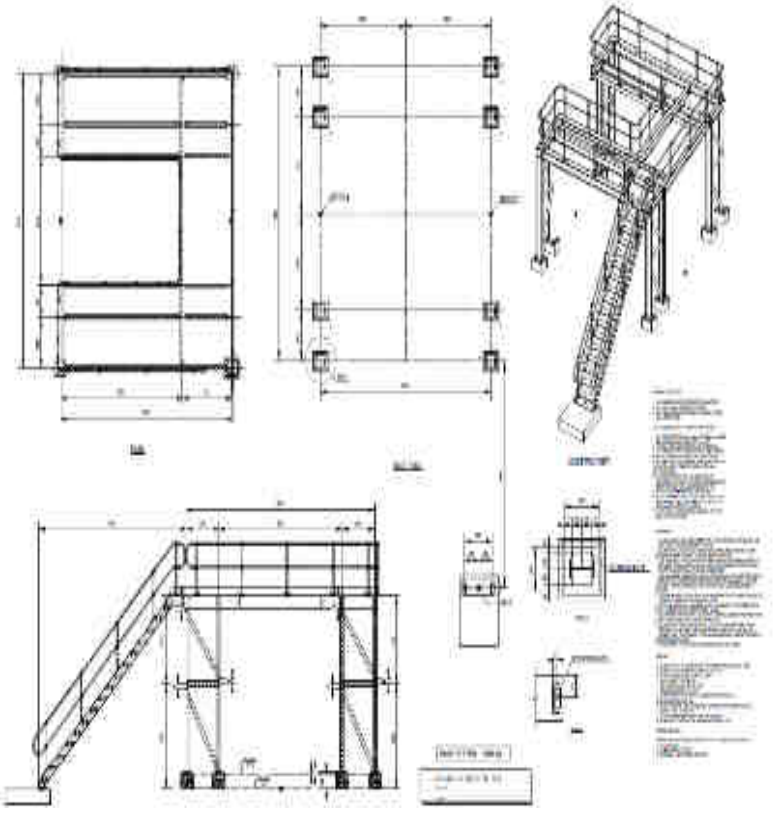
Site wind speeds ($V_{sit,\beta}$):

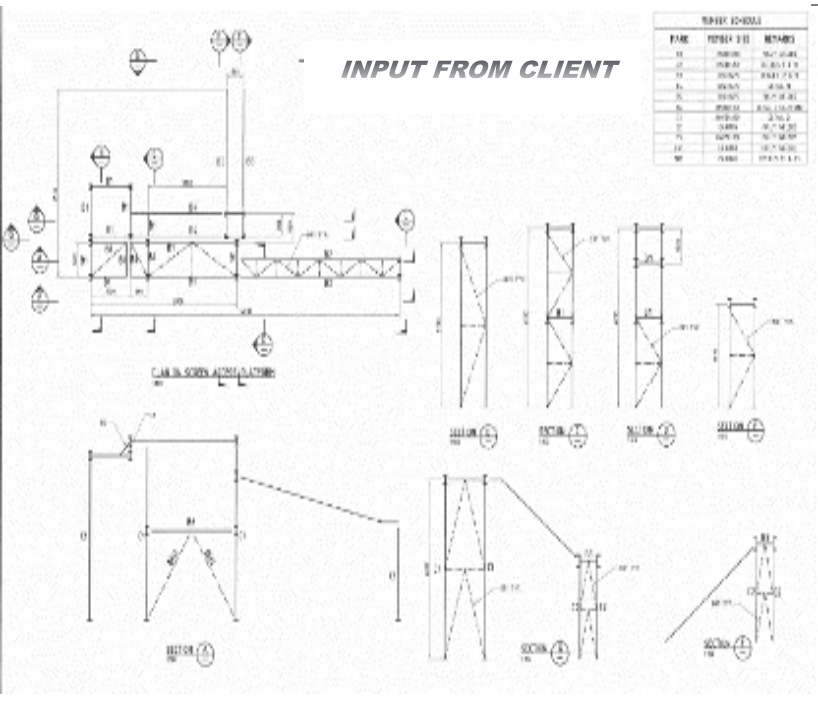
Site wind speeds are calculated as	($V_{sit,\beta}$)	=	$V_R M_d (M_{z,cat} M_s M_t)$
Dynamic response factor	(C_{dyn})	=	1.0 [Considered conservatively]
Aerodynamic shape factor	(C_{fig})	=	-0.6
Design wind speed	($V_{des,\theta}$)	=	48 m/s
Pressure at the specified elevation [in N/m^2]	(p)	=	$(0.5\ \rho_{air})\ [V_{des,\theta}]^2\ C_{fig}\ C_{dyn}$
		=	-0.813 kN/m^2







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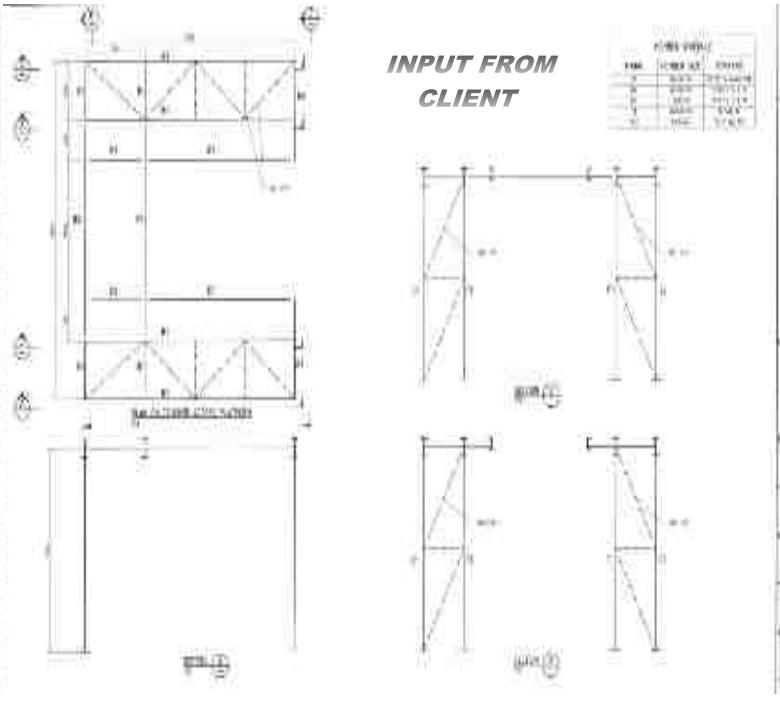
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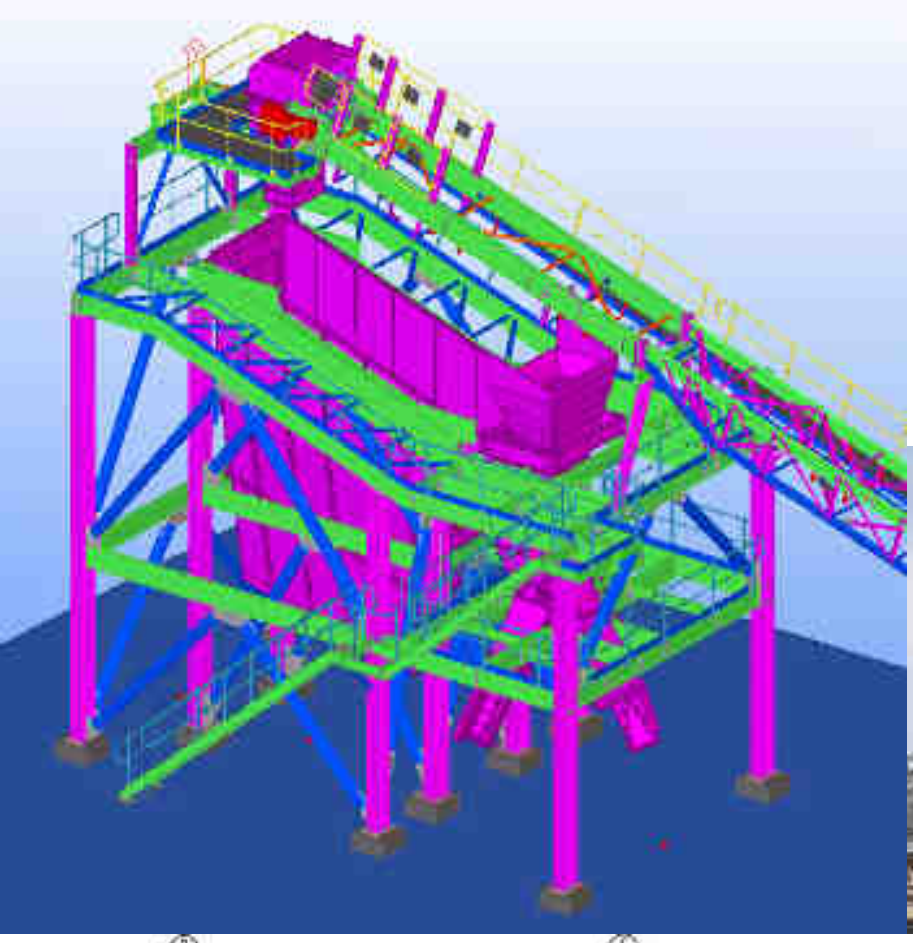
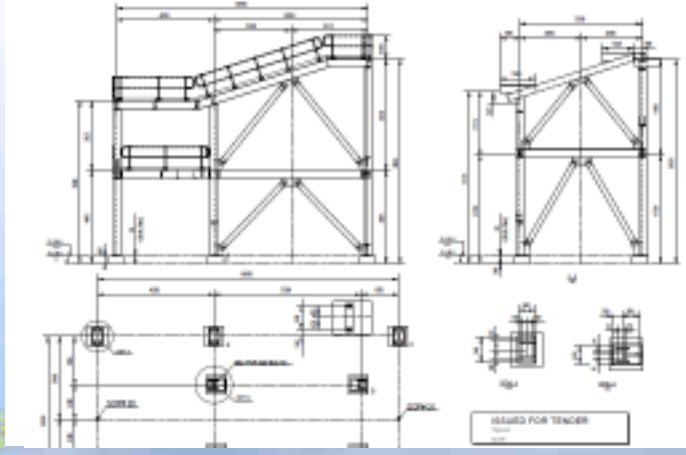
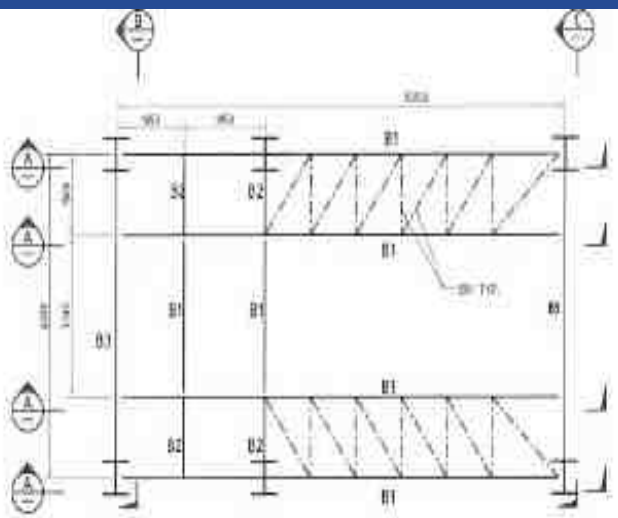
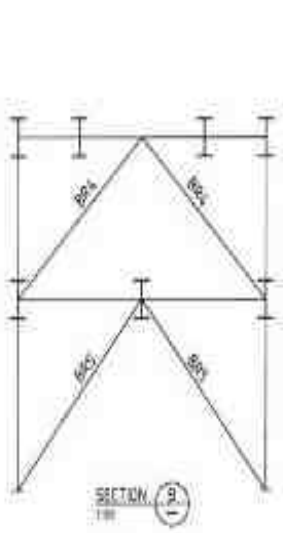


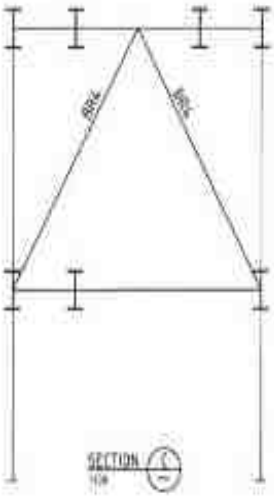




PLAN ON SCREEN ACCESS PLATFORM

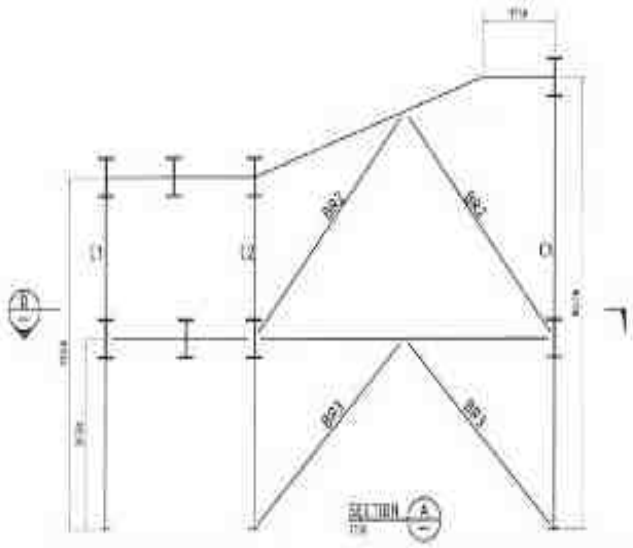


SECTION



SECTION

MEMBER SCHEDULE		
MARK	MEMBER SIZE	REMARKS
B1	[illegible]	[illegible]
B2	[illegible]	[illegible]
B3	[illegible]	[illegible]
B4	[illegible]	[illegible]
B5	[illegible]	[illegible]
C1	[illegible]	[illegible]
C2	[illegible]	[illegible]
BR1	[illegible]	[illegible]
BR2	[illegible]	[illegible]
BR3	[illegible]	[illegible]
BR4	[illegible]	[illegible]
BR5	[illegible]	[illegible]



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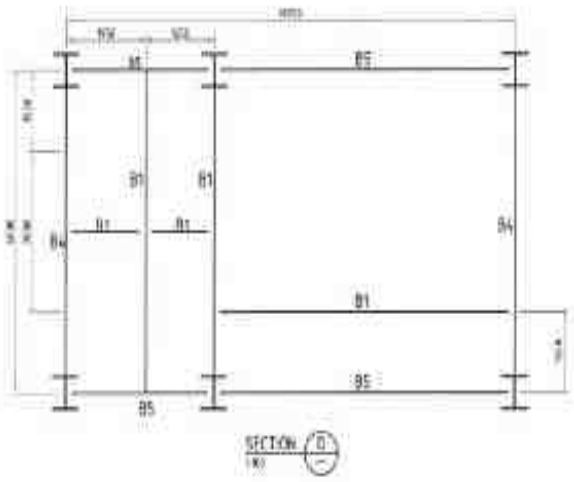

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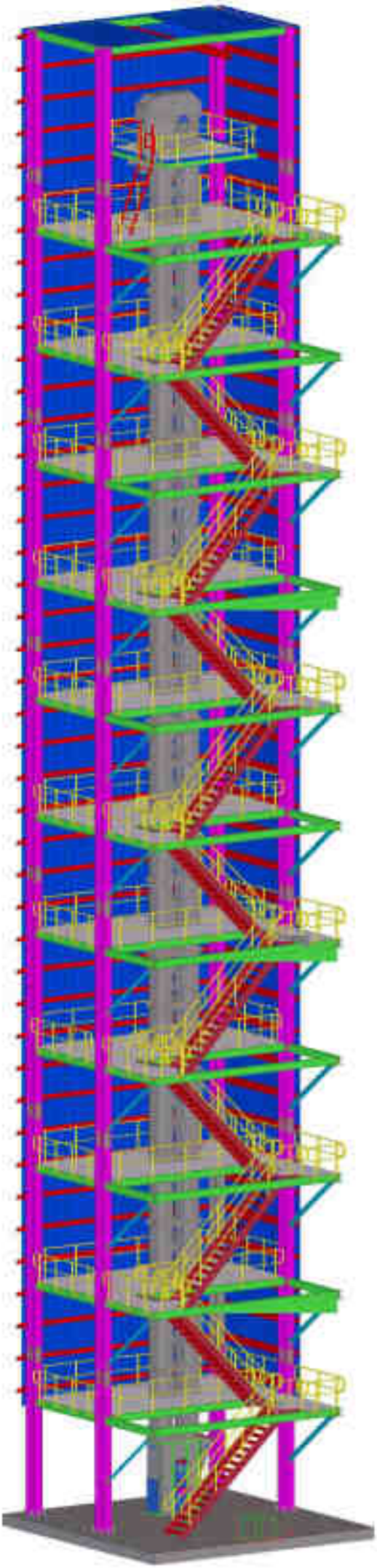
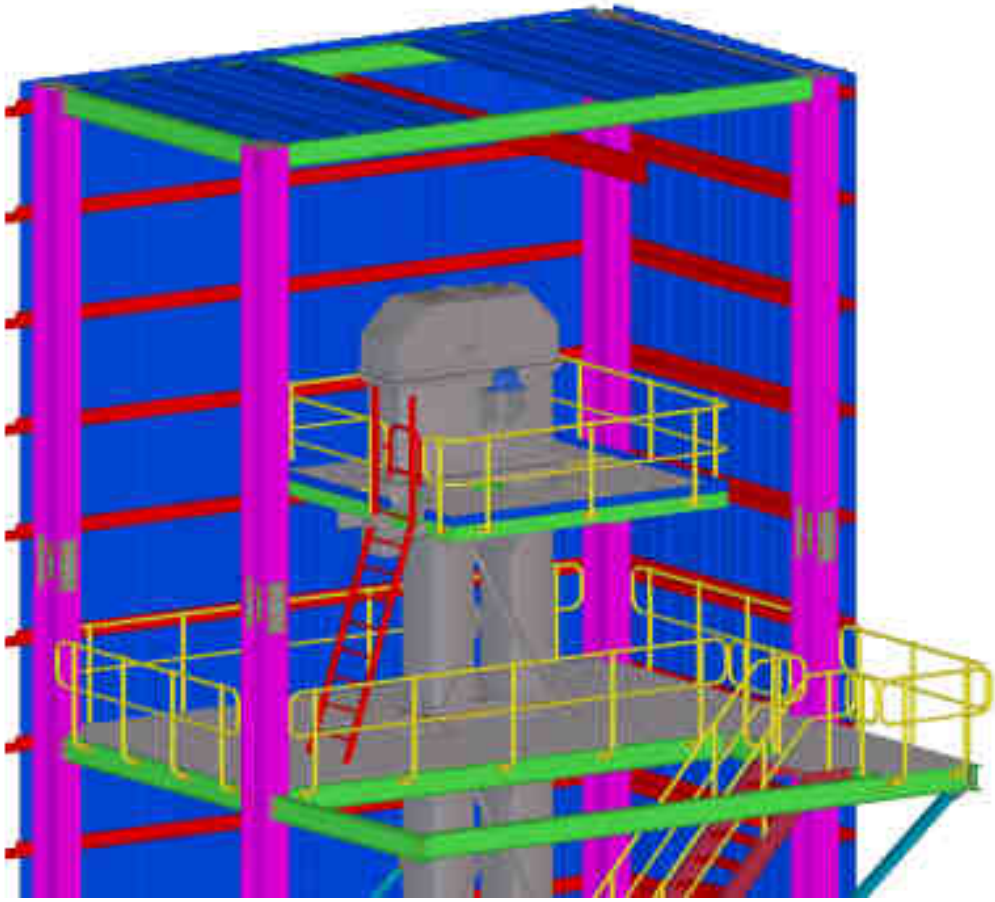
INPUT FROM CLIENT



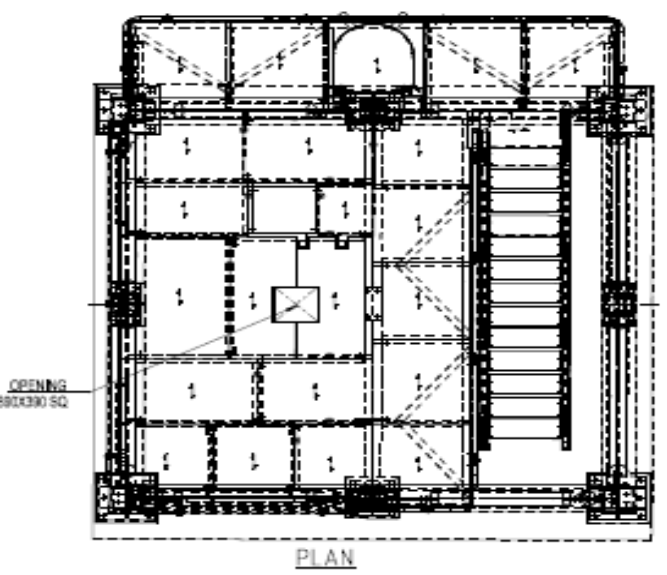


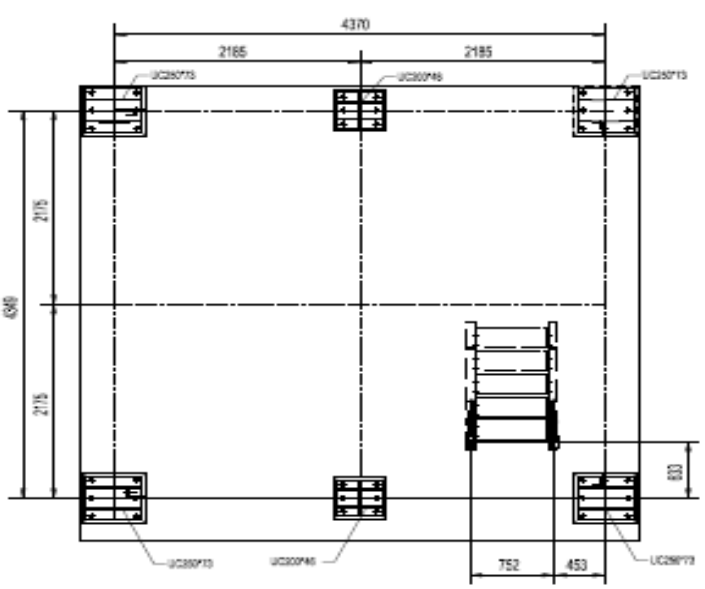
Bucket Elevator Towers

Bucket elevator support towers are custom designed to suit client specifications.

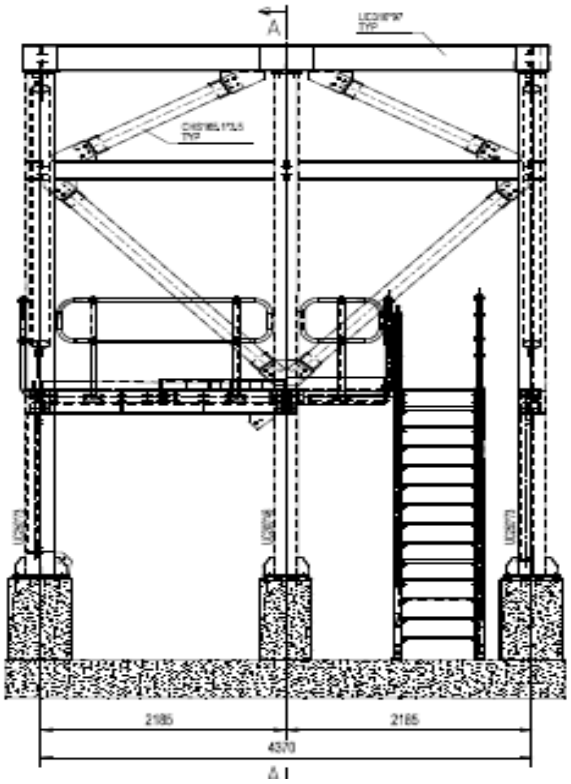
Platforms built as separate units, which can be placed between tower sections, this design allows the installer to build the platform separately and then place it between tower sections.

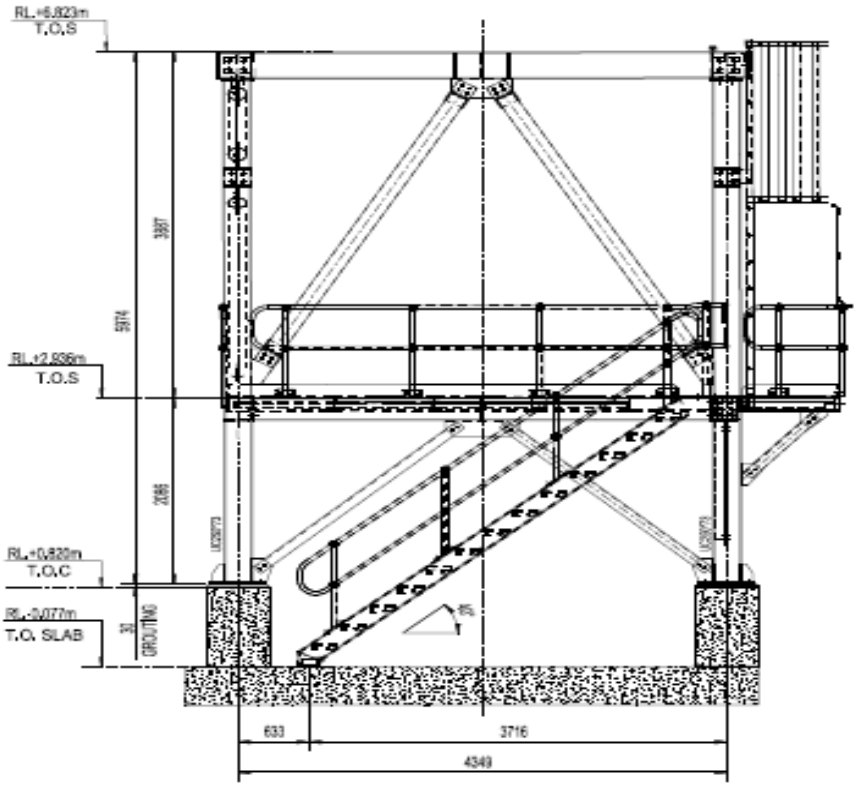
Design available to pre-weld Stairs as single assemblies to reduce erection time

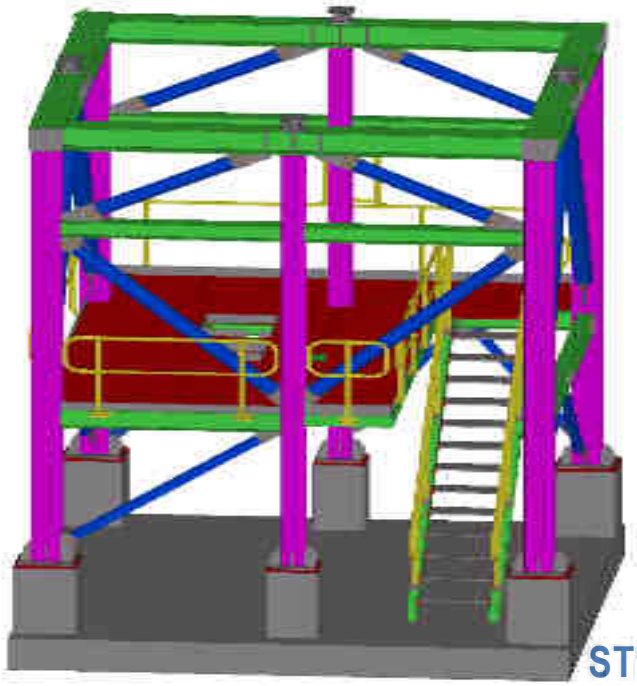


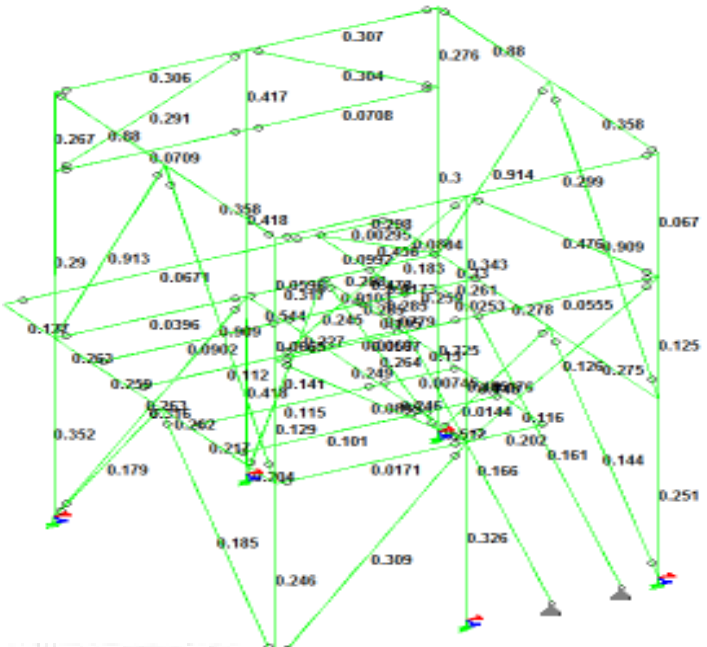


BASE PLATE PLAN
1:35

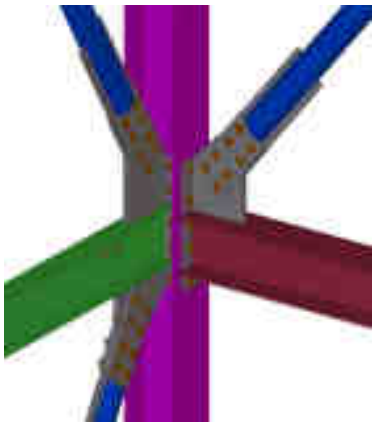
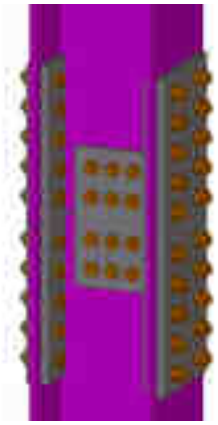
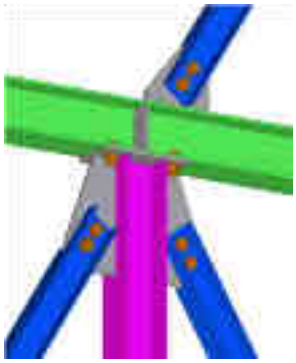
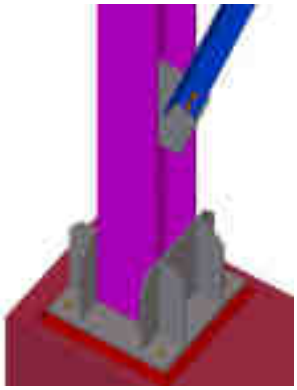




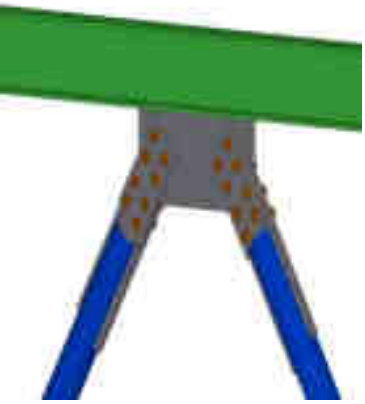
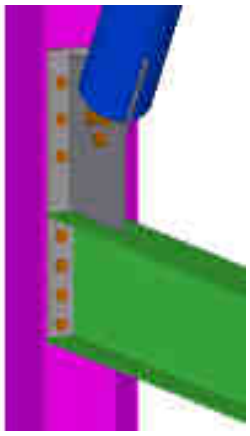
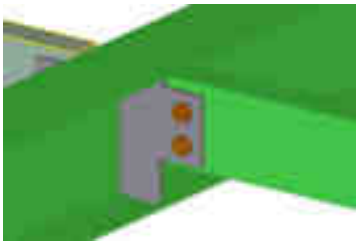




STRUCTURE Samples

Connection Samples


BOLT LIST

Sl No.	Grade	Site / Workshop	Size	Bolt Qty.	Nut Qty.	Washer Qty.	Bolt Wt. only(Kg)	Remarks
1	8.8S	Site	BOLT 12X25	10	10	10	0.4	BOLT QTY AS SHOWN EXACT
2	8.8S	Site	BOLT 12X35	82	82	82	4.9	
3	8.8S	Site	BOLT 16X35	54	54	54	5.04	
4	8.8S	Site	BOLT 16X40	107	107	107	9.58	
5	8.8S	Site	BOLT 16X45	462	462	462	43.36	
6	8.8S	Site	BOLT 16X50	54	54	54	4.87	
7	8.8S	Site	BOLT 16X55	8	8	8	1.06	
8	8.8S	Site	BOLT 16X65	2	2	2	0.19	
9	8.8S	Site	BOLT 20X45	24	24	24	3.12	
10	8.8S	Site	BOLT 20X50	210	210	210	20.67	
11	8.8S	Site	BOLT 20X55	32	32	32	4.56	
12	8.8S	Site	BOLT 20X60	8	8	8	0.59	
13	8.8S	Site	BOLT 20X70	4	4	4	1.29	

ASSEMBLY & PART LIST

SL No.	DRAWING NO & PART MARK	PROFILE	QTY	MATERIAL	LENGTH(mm)	WEIGHT/QTY	TOTAL WEIGHT
1	CPA-17-385-02-01-FR1		1			465.8	465.8
2	EA43	EA75*75*6	1	AS3678/250(GALV)	634	4.3	
3	EA44	EA75*75*6	1	AS3678/250(GALV)	819	5.6	
4	EA48	EA75*75*6	1	AS3678/250(GALV)	634	4.3	
5	EA49	EA75*75*6	1	AS3678/250(GALV)	819	5.6	
6	EA102	EA65*65*6	2	AS3678/250(GALV)	400	2.3	
7	PFC2	PFC100*50	1	AS3678/250(GALV)	160	1.3	
8	PFC34	PFC180*75	1	AS3678/250(GALV)	501	10.5	
9	PFC46	PFC180*75	1	AS3678/250(GALV)	645	13.5	
10	PFC47	PFC180*75	1	AS3678/250(GALV)	645	13.5	
11	PFC48	PFC180*75	1	AS3678/250(GALV)	1931	40.3	
12	PFC49	PFC180*75	1	AS3678/250(GALV)	1931	40.3	

SUPPORTS, WALKWAYS, STRUCTURES, WARE HOUSE CHUTES, TRANSFER TOWERS

R3 Plant design founded By Anthony Foster, in 2010 collaborating with an Indian design company. The goal was to build a cost effective design and detailing company specializing in belt conveyors and structures. It is a unique combination of Australian design with Indian modelling and detailing team to meet the challenges of the Global Market. Nowadays the company is involved in various projects and expanding business activities to Europe Australia and South Africa.

Founder member, Anthony Foster has over 20 years' experience in designing belt conveyors & structures. He started his career at Worley Parsons in Australia as a Design Engineer and has worked at various senior levels in India and South Africa.

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