PORTFOLIO
(2022 - 2024)

Presented by

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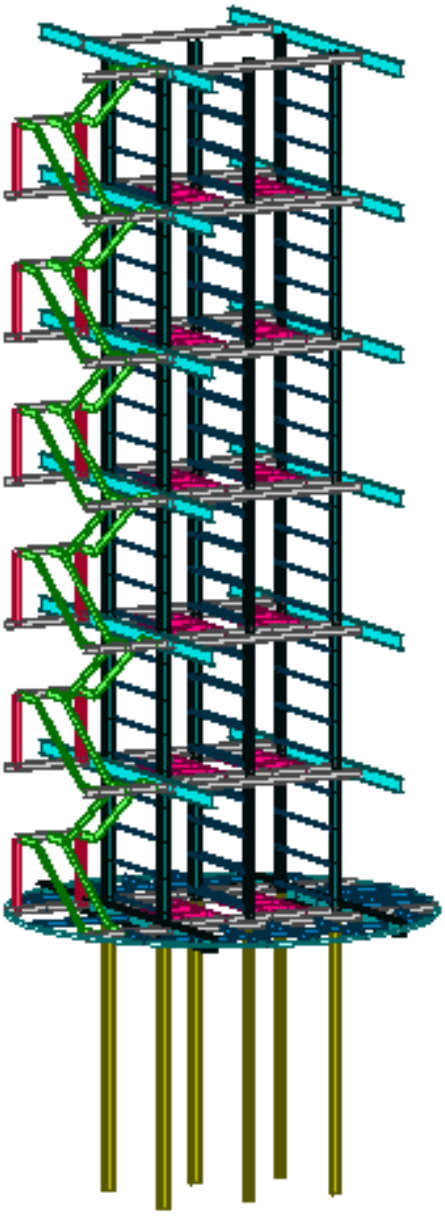
Project	:	Underground Cable Tunnel Construction Under Chao Phraya River
Company	:	Nawarat Patanakarn Public Company Limited
Title	:	Design Steel Platform (include checkered plate, grating slab and stairway)

The purpose of this project is to design steel member, steel connection, checkered plate, grating slab and stairway that refer from ANSI/AISC and ACI standard design code.

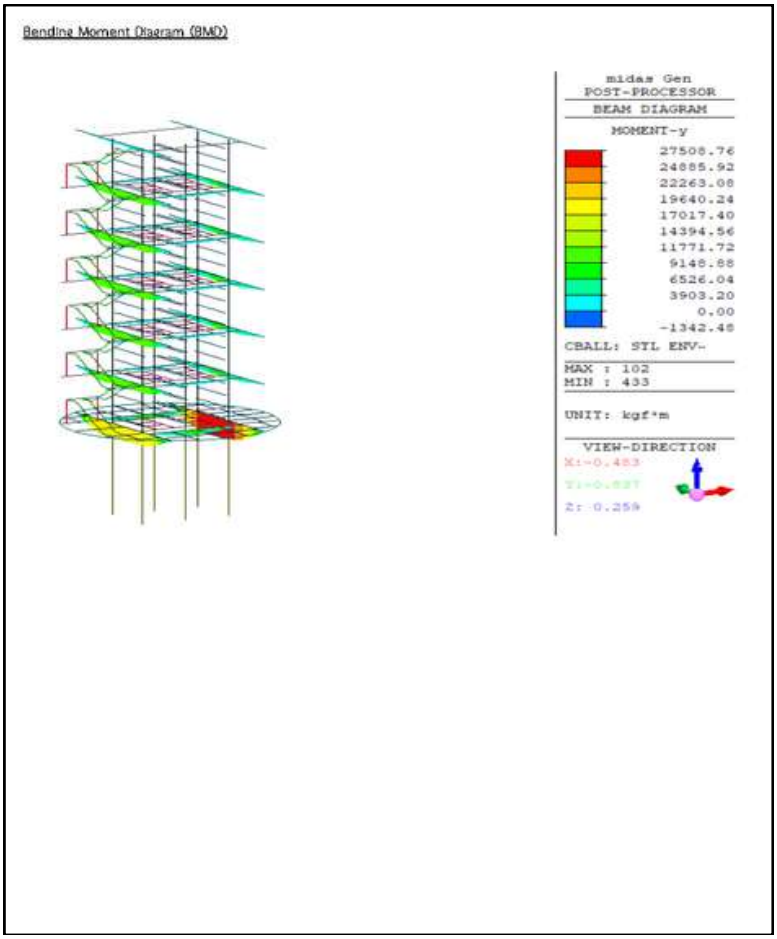
The structure model is refer from the owner that will give general dimension, general steel member section and general specification.

Procedure of this project is

1.Structure Analysis and Design by using Midas Gen
2.Steel Connection by using IDEA StatiCa
3.Checkered Plate and Grating Slab by using Microsoft Excel
4.Recheck result from Midas Gen and IDEAL Statica by using Microsoft Excel



Structure Model



Midas Gen Analysis

midas Gen **Steel Checking Result**

Company		Project Title	
Author	USER	File Name	D:\...igned Load PlatformN.542.mgb

1. Design Information

Design Code AISC-ASD89
Unit System kgf, m
Member No 135
Material SS400 (No:1)
(Fy = 24000000, Es = 210000000000)
Section Name WF200x200 beam (No:3)
(Rolled : H 200x200x8/12).
Member Length : 5.86000

Depth	0.20000	Web Thick	0.00800
Top F Width	0.20000	Top F Thick	0.01200
Bot.F Width	0.20000	Bot.F Thick	0.01200
Area	0.00635	Asz	0.00160
Qyb	0.03207	Qzb	0.00500
Iyy	0.00005	Izz	0.00002
Ybar	0.10000	Zbar	0.10000
Syy	0.00047	Szz	0.00016
ry	0.05620	rz	0.05020

2. Member Forces

Axial Force Fxx = 0.00000 (LCB: 1, POS:1/2)
Bending Moments My = 7039.12, Mz = 0.00000
End Moments Myi = 6237.02, Myj = 7039.12 (for Lb)
Myi = -68.302, Myj = -160.97 (for Ly)
Mzi = 0.00000, Mzj = 0.00000 (for Lz)
Shear Forces Fyy = 0.00000 (LCB: 1, POS:1/2)
Fzz = 4171.34 (LCB: 1, POS:J)

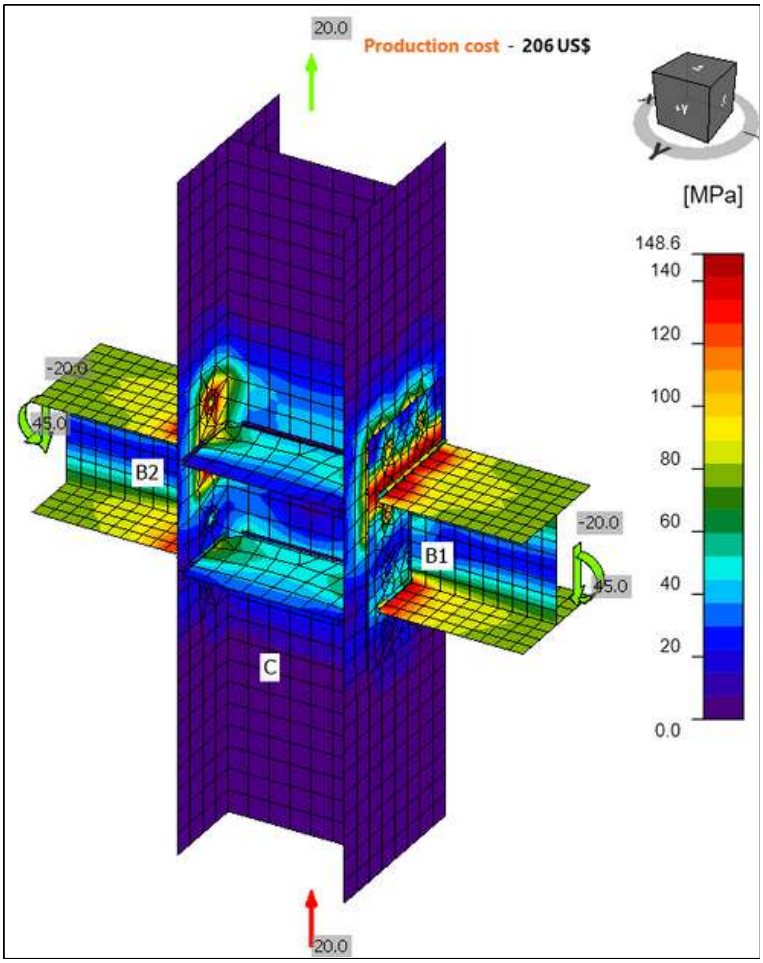
3. Design Parameters

Unbraced Lengths Ly = 5.86000, Lz = 1.46500, Lb = 1.46500
Effective Length Factors Ky = 1.00, Kz = 1.00
Moment Factor / Bending Coefficient
Cmy = 1.00, Cmz = 1.00, Cb = 1.00

4. Checking Results

Slenderness Ratio
L/r = 116.7 < 300.0 (Memb:204, LCB: 1) ..... O.K
Axial Stress
ft/Ft = 0/12000000 = 0.000 < 1.000 ..... O.K
Bending Stresses
fby/Fby = 14913382/15840000 = 0.942 < 1.000 ..... O.K
fbz/Fbz = 0/14400000 = 0.000 < 1.000 ..... O.K
Combined Stress (Tension+Bending)
Rmax = fby/Fby + fbz/Fbz = 0.942 < 1.000 ..... O.K
Shear Stresses
fvy/Fvy = 0.000 < 1.000 ..... O.K
fvz/Fvz = 0.272 < 1.000 ..... O.K

Midas Gen Result



IDEA StatiCa Analysis

Project:
Project no:
Author:

Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	C	20.0	0.0	0.0	0.0	0.0	0.0
	C	20.0	0.0	0.0	0.0	0.0	0.0
	B1	0.0	0.0	-20.0	0.0	45.0	0.0
	B2	0.0	0.0	-20.0	0.0	45.0	0.0

Check

Summary

Name	Value	Check status
Analysis	100.0%	OK
Plates	0.1 < 5.0%	OK
Bolts	70.4 < 100%	OK
Welds	75.1 < 100%	OK
Buckling	32.43	

Plates

Name	f_y [MPa]	Thickness [mm]	Loads	σ_{Ed} [MPa]	ε_{pl} [%]	σ_{Ed} [MPa]	Check status
C-bfl 1	248.2	15.0	LE1	148.8	0.1	22.4	OK
C-tfl 1	248.2	15.0	LE1	148.8	0.1	22.4	OK
C-w 1	248.2	10.0	LE1	70.4	0.0	0.0	OK
B1-bfl 1	248.2	12.0	LE1	148.6	0.0	0.0	OK
B1-tfl 1	248.2	12.0	LE1	148.6	0.0	0.0	OK
B1-w 1	248.2	8.0	LE1	99.0	0.0	0.0	OK
B2-bfl 1	248.2	12.0	LE1	148.6	0.0	0.0	OK
B2-tfl 1	248.2	12.0	LE1	148.6	0.0	0.0	OK
B2-w 1	248.2	8.0	LE1	99.0	0.0	0.0	OK
EP1a	248.2	20.0	LE1	148.7	0.0	31.0	OK
EP1b	248.2	20.0	LE1	148.7	0.0	31.0	OK
STIFF1a	248.2	12.0	LE1	78.9	0.0	0.0	OK
STIFF1b	248.2	12.0	LE1	79.1	0.0	0.0	OK
STIFF1c	248.2	12.0	LE1	91.3	0.0	0.0	OK
STIFF1d	248.2	12.0	LE1	91.7	0.0	0.0	OK

Design data

Material	f_y [MPa]	ε_{lim} [%]
A36	248.2	5.0

IDEA StatiCa Result

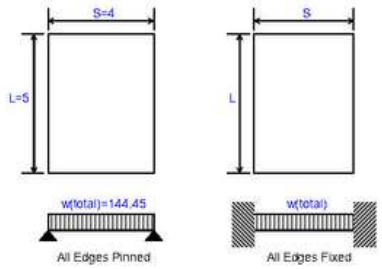
STEEL CHECKERED FLOOR PLATE DESIGN

For Rectangular Flat Plates Subjected to Uniformly Distributed Live Loading with Either All Edges Pinned or All Edges Fixed (per AISC 9th Edition ASD Manual)

Job Name:	อุโมงค์สงสายไฟฟ้าใต้ดิน N.542 Tunnel Shaft8	Subject:	Checker Plate (Pin joint)
Job Number:		Originator:	Checker:

Input Data:

Long Span of Plate, L =	5.0000	ft.
Short Span of Plate, S =	4.0000	ft.
Plate Thickness, t =	1/2	in.
Uniform Live Load, wLL =	123.00	psf
All Edges Condition =	Pinned	
Yield Stress, Fy =	33.00	ksi
Allow. Deflection Ratio =	S/360	



All Edges Pinned

All Edges Fixed

Nomenclature for Rectangular Flat Plates

Results:

Flexural Stress:

Unif. Dead Load, wDL =	21.45	psf	wDL = floor plate self-weight in psf (per Reference #1)
Unif. Load, w(total) =	144.45	psf	w(total) = wDL+wLL
fb(max) =	3.80	ksi	fb(max) = 0.75*(w(total)/144)*(S*12)^2/(t^2*(1+1.61*(S/L)^3))/1000
Fb(allow) =	25.00	ksi	Fb(allow) = 0.75*Fy

fb(max) <= Fb(allow), O.K.

Deflection:

Aspect Ratio, α =	0.8000		α = S/L
Mod. of Elasticity, E =	29000000	psi	E = 29,000,000 psi (assumed value for steel)
Δ(max) =	0.0980	in.	Δ(max) = 0.1422*(w(total)/144)*(S*12)^4/(E*t^3*(1+2.21*(S/L)^3))
Δ(ratio) =	S/490		Δ(ratio) = (S*12)/Δ(max)
Allow. Δ(ratio) =	S/360		Allow. Δ(ratio) = S/360 (user defined and selected)

S/490 <= S/360, O.K.

References:

1. AISC Manual of Steel Construction (ASD) 9th Edition (Fourth Impression, 9/00), page 2-145.
2. "Design of Welded Structures", by Omer W. Blodgett (James F. Lincoln Arc Welding Foundation) Table 1, page 6.5-4 - taken from "Formulas for Stress and Strain" by Raymond J. Roark. These same formulas are found in "Design of Weldments" by Omer W. Blodgett (James F. Lincoln Arc Welding Foundation) in Table 1 on page 4.6-4.

Comments:

Checkered Plate Design

Steel Grating Design (G1)

1 Input Data

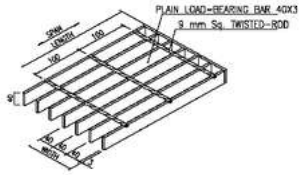
Req. Live Load	=	600.00	kg/m2
Clear Span	=	1.10	m
Yielding Stress (Fy)	=	2,400.00	ksc
Allowable Stress (0.6Fy)	=	1,440.00	ksc
Grating Width	=	3,340.00	mm
Grating Length	=	1,100.00	mm
Impacted Factor	=	1.25	
Bar Thick.	=	3.00	mm
Pitch of Load Bar	=	40.00	mm
Flat Bar Height	=	25.00	mm
Grating Weight	=	0.59	kg/m

2 Design

Qty of Load Bar (N)	=	84	ea.	
Moment Required (Mr)	=	120.92	kgm	
Required Flatbar Height	=	**14.14**	**mm**	ok

3 Check

Section Modulus (S)	=	312.50	mm3		
Allowable Stress (0.6Fy)	=	1,440.00	ksc		
Moment Capacity (Ma)	=	378.00	kgm		
Moment ratio (Mr/Ma)	=	**0.32**	<=	**1.00**	ok



DETAIL GRATING

Grating Slab Design

Project	:	Underground Cable Tunnel Construction Under Chao Phraya River
Company	:	Nawarat Patanakarn Public Company Limited
Title	:	Design Tunnel Cable Support

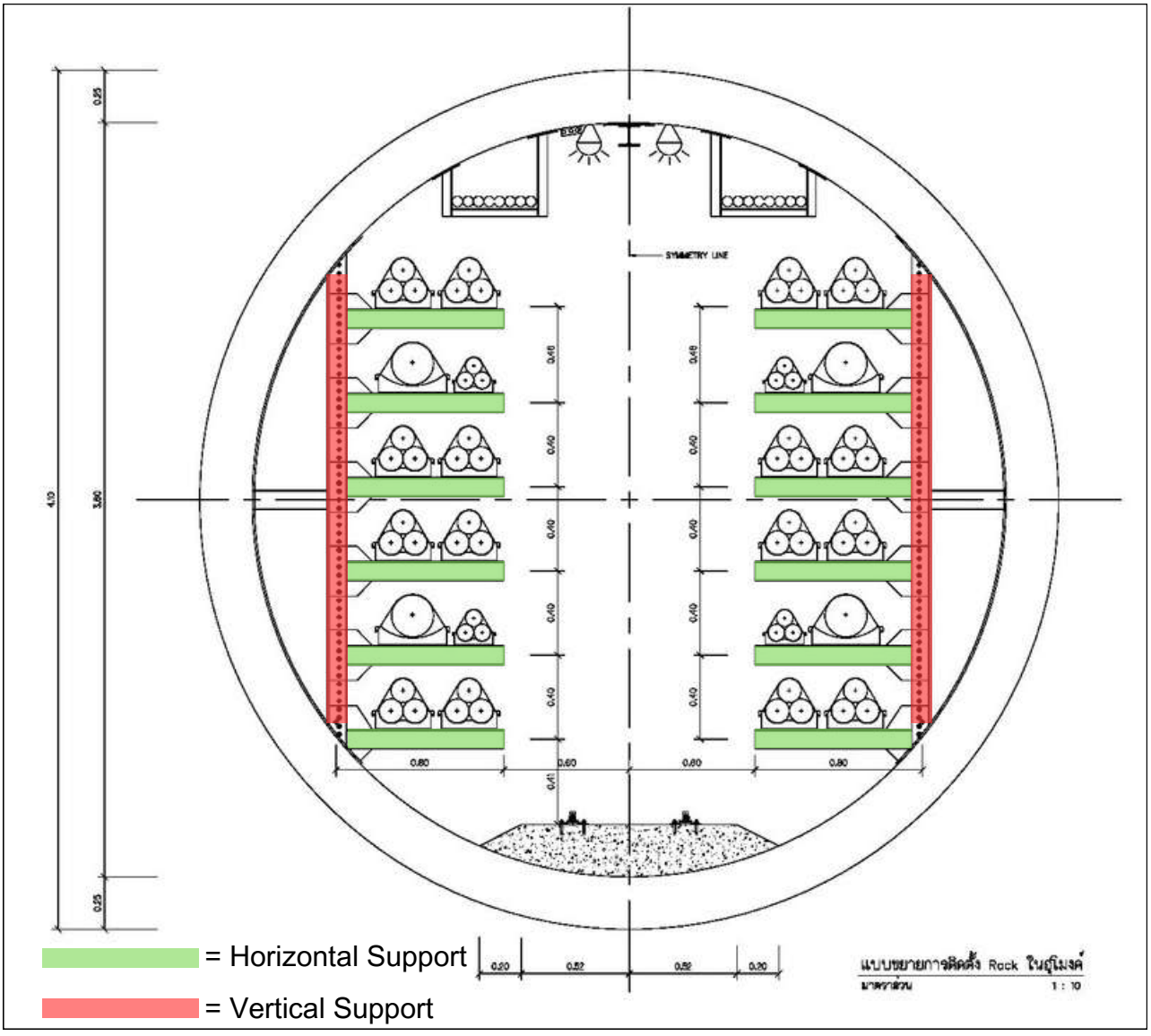
The purpose of this project is to design steel member (horizontal support and vertical support) and steel connection that refer from ANSI/AISC and ACI standard design code.

The structure model is refer from the owner that will give general dimension, general steel member section and general specification.

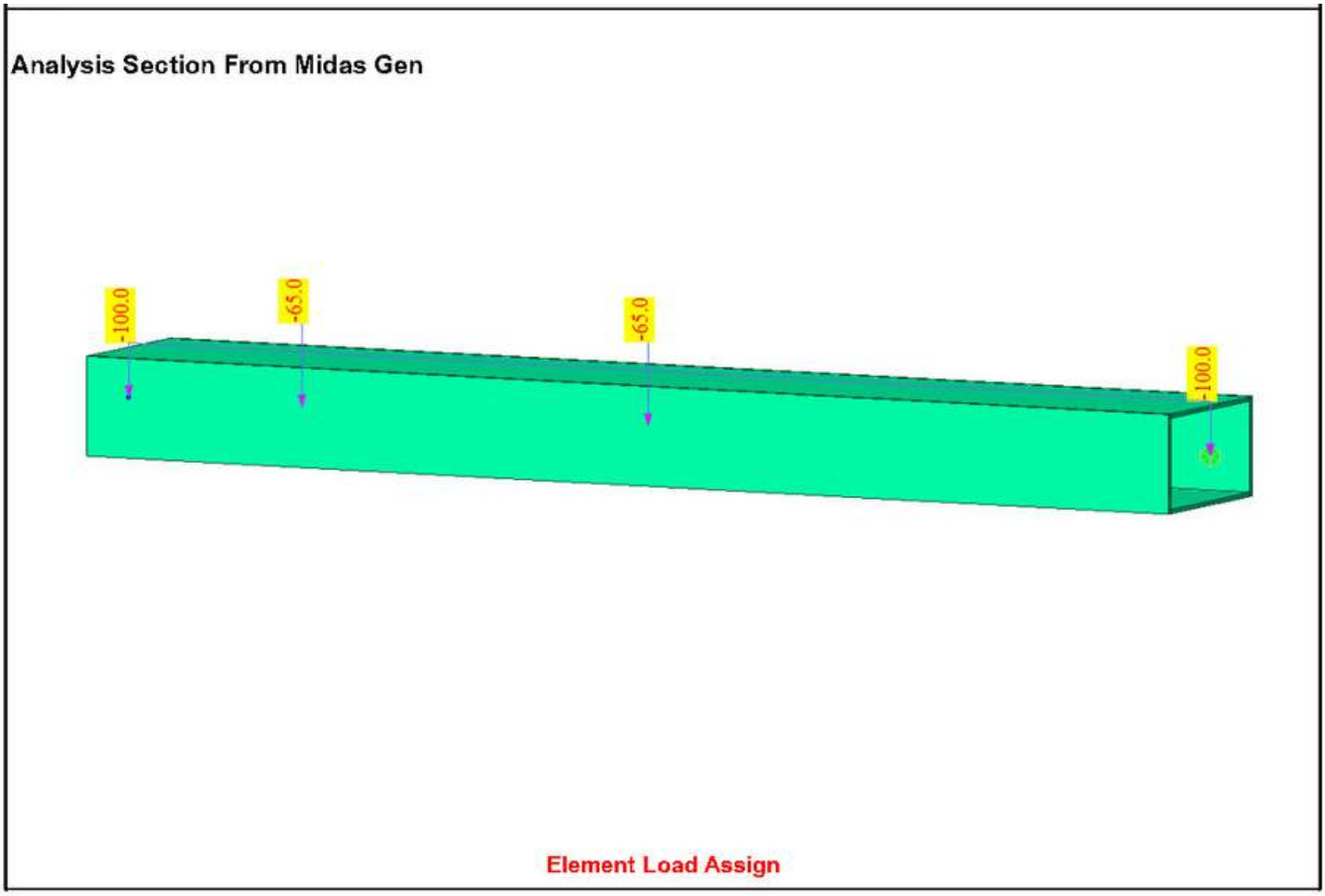
Procedure of this project is

1.Structure Analysis and Design by using Midas Gen

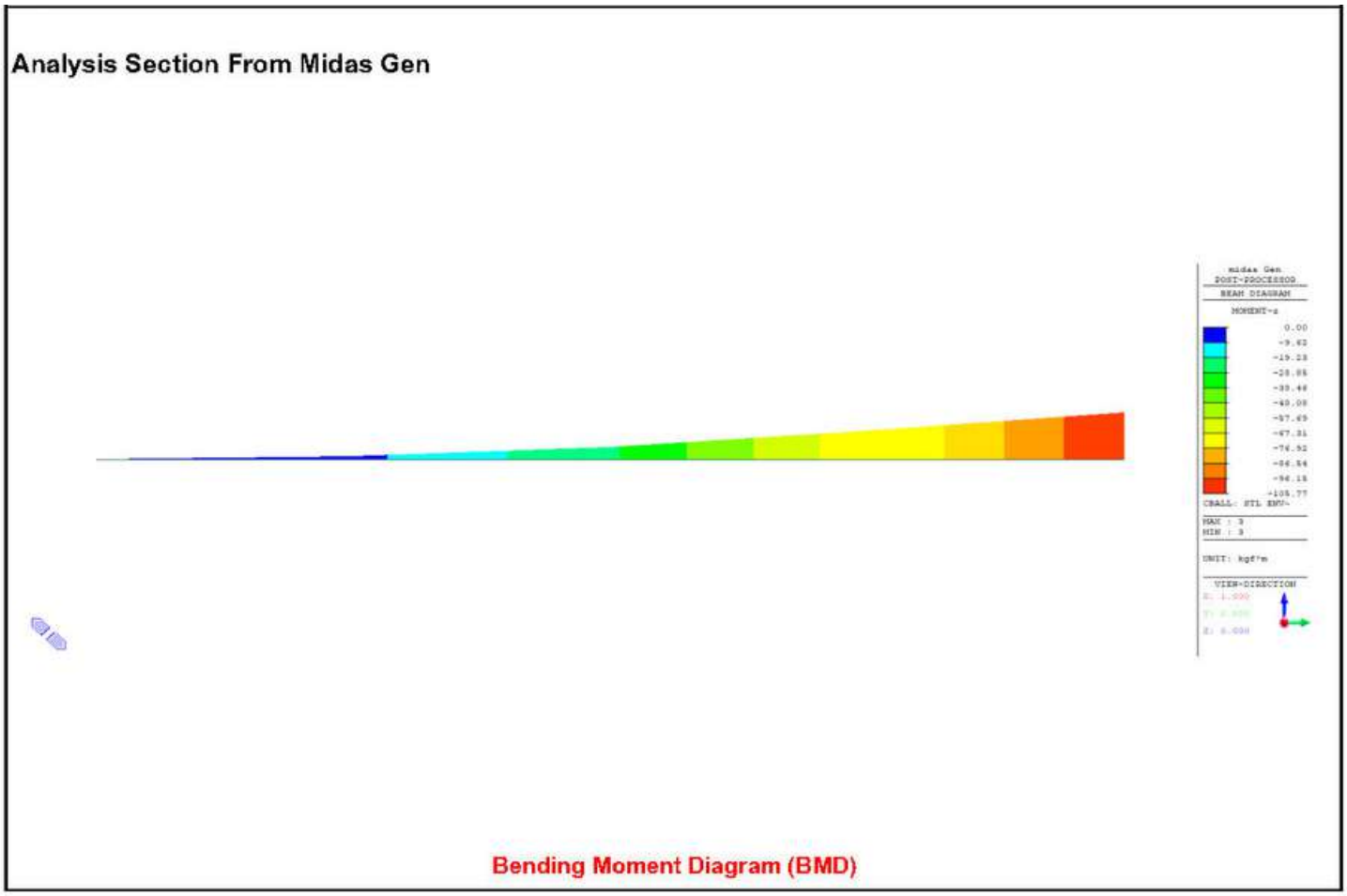
2.Steel Connection by using Microsoft Excel



Reference Drawing



Horizontal Support Model



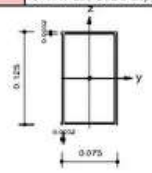
Midas Gen Analysis

midas Gen **Steel Checking Result**

Company		Project Title	
Author	USER	File Name	D:\...\Midas\Cable SupportLmgb

1. Design Information

Design Code AISC(16th)-ASD16
Unit System kgf, m
Member No 3
Material SS400 (No:1)
(Fy = 24000000, Es = 21000000000)
Section Name B 125x75x3.2 (No:1)
(Rolled : B 125x75x3.2)
Member Length : 0.80000



2. Member Forces

Axial Force Fxx = 0.00000 (LCB: 2, POS:J)
Bending Moments My = 0.00000, Mz = -105.77
End Moments Myi = 0.00000, Myj = 0.00000 (for Lb)
Myi = 0.00000, Myj = 0.00000 (for Ly)
Mzi = 0.00000, Mzj = -105.77 (for Lz)
Shear Forces Fyy = 133.809 (LCB: 3, POS:1/2)
Fzz = 0.00000 (LCB: 3, POS:1/2)

Depth	0.12500	Web Thick	0.00320
Flg Width	0.07500	Top F Thick	0.00320
Web Center	0.07180	Bot F Thick	0.00320
Area	0.00121	Asz	0.00060
Qyb	0.00404	Qzb	0.00263
Iyy	0.00000	Izz	0.00000
Ybar	0.03750	Zbar	0.06250
Syy	0.00004	Szz	0.00003
ry	0.04600	rz	0.03100

3. Design Parameters

Unbraced Lengths Ly = 0.80000, Lz = 0.80000, Lb = 0.80000
Effective Length Factors Ky = 1.00, Kz = 1.00
Moment Factor / Bending Coefficient
Cmy = 1.00, Cmz = 1.00, Cb = 1.00

4. Checking Results

Slenderness Ratio
Lr = 26.8 < 300.0 (Memb:3, LCB: 2) ..... O.K
Axial Strength
Pr/Pc = 0.0/17432.3 = 0.000 < 1.000 ..... O.K
Bending Strength
Mry/Mcy = 0.000/743.533 = 0.000 < 1.000 ..... O.K
Mrz/Mcz = 105.787/468.618 = 0.226 < 1.000 ..... O.K
Combined Strength (Tension+Bending)
Pr/Pc = 0.00 < 0.20
Rmax = Pr/(2*Pc) + (Mry/Mcy + Mrz/Mcz) = 0.226 < 1.000 ..... O.K
Shear Strength
Vry/Vcy = 0.067 < 1.000 ..... O.K
Vrz/Vcz = 0.000 < 1.000 ..... O.K

5. Deflection Checking Results

L/360.0 = 0.0022 > 0.0008 (Memb:3, LCB: 4, POS: 0.0m, Dir-Z) ..... O.K

Modeling, Integrated Design & Analysis Software Print Date/Time : 03/26/2024 16:42

Midas Gen Result

DESIGN WELD CONNECTION FOR CANTILIVER ARM, ASD2016

1 Data Criteria

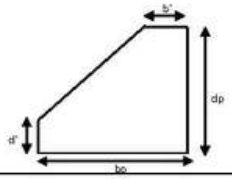
1.1 Shear Force Required
Shear Force Required (Va) = 220.00 kg

1.2 Material Property
Steel
Yielding Strength (Fy) = 2,400.00 ksc
Ultimate Strength (Fu) = 4,000.00 ksc
Elastic Modulus (Es) = 2,040,000.00 ksc

Weld
Weld Grade = E60
Ultimate Strength (Fexx) = 4,200.00 ksc

1.3 Cantilever Section Property
Section HSS125x75x3.2mm
Weight (W) = 9.52 kg/m
Depth (d) = 125.00 mm
Width (bf) = 75.00 mm
Web Thick. (tw) = 3.20 mm
Flange Thick. (tf) = 3.20 mm

1.4 Plate Section Property
Depth (dp) = 90.00 mm
Width (bp) = 90.00 mm
Thick. (tp) = 3.20 mm
d' = 50.00 mm
b' = 50.00 mm



2 Determine Weld Connection

Shear Force Required (Va) = 220.00 kg
Ultimate Strength (Fexx) = 4,200.00 ksc
Safety Factor (Ω) = 2.00
Weld Length (Le) = 9.00 cm
Leg Size (tw) = 6.00 mm ok
Allowable Shear Strength (Ra) = (0.6Fexx x 0.707 x Le x tw) / Ω
= 4,810.43 kg
Strength ratio = 0.05 <= 1.00 ok

Steel Connection Calculation Sheet

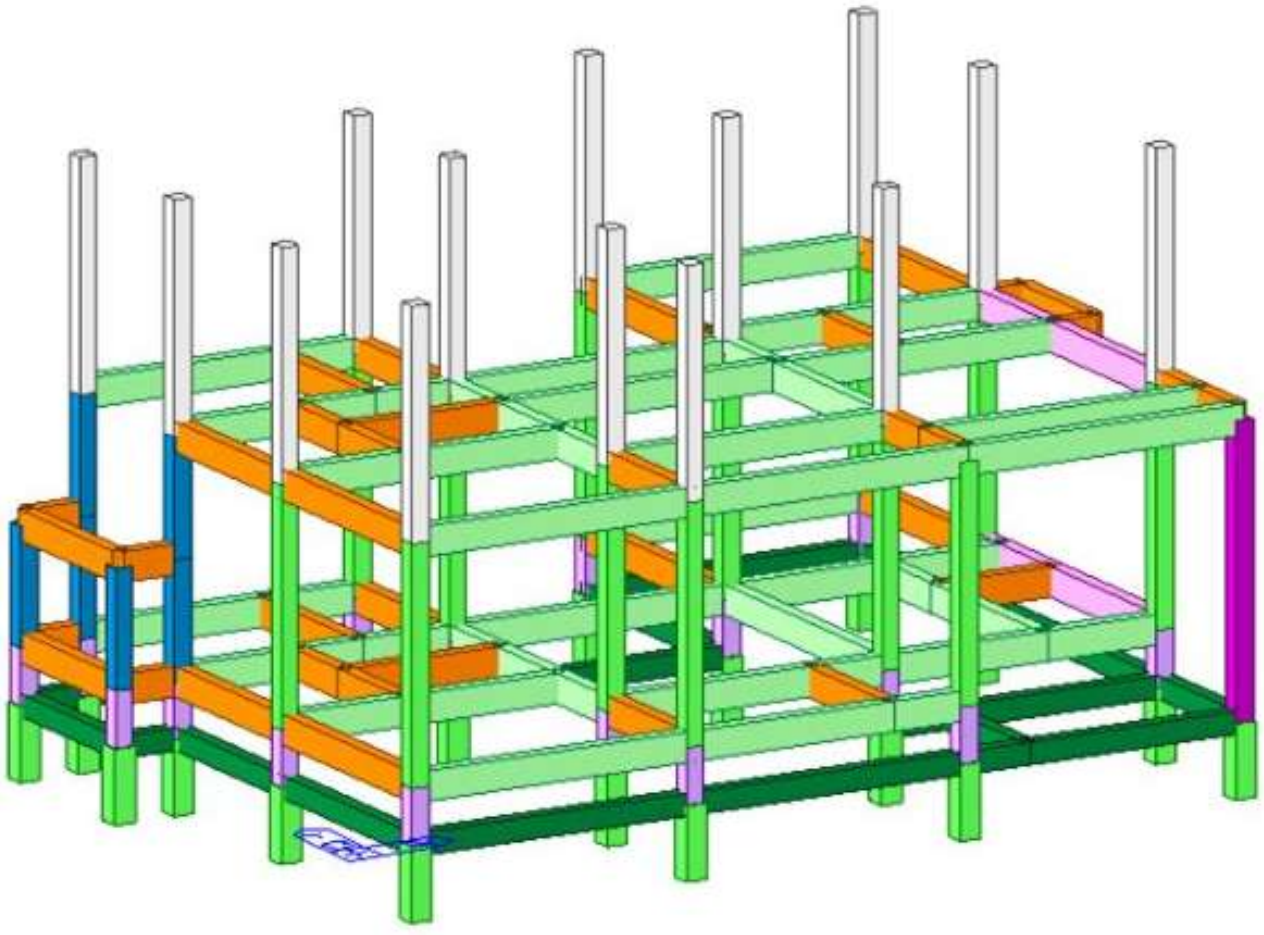
Project	:	2 Floor Reinforced Concrete Residential House
Company	:	-
Title	:	Design Reinforced Concrete Structure

The purpose of this project is to design reinforced concrete beam, column, slab, stair and footing that refer from ACI standard design code.

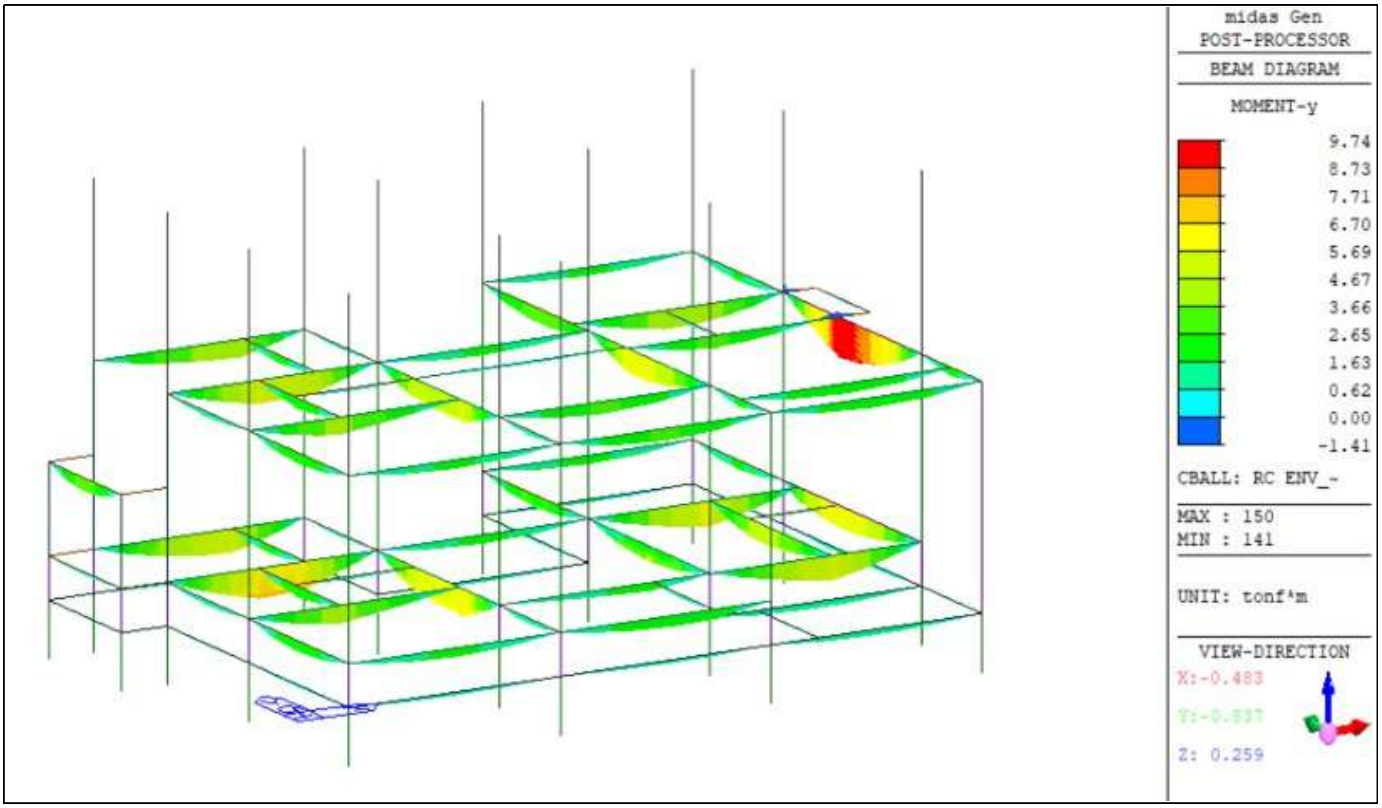
The structure model is refer from the owner that will give general dimension and requirements for section dimension.

Procedure of this project is

1.Structure Analysis by using Midas Gen
2.Beam and Column Design by using Midas Design+
3.Slab, Stair and Footing Design by Microsoft Excel



Structure Model



Midas Gen Analysis

■ **MEMBER NAME : B1**

1. General Information

Design Code	Unit System	Section	F_{ck}	F_y	F_{ys}
ACI318M-08	N,mm	200x400	23.54MPa	392MPa	235MPa

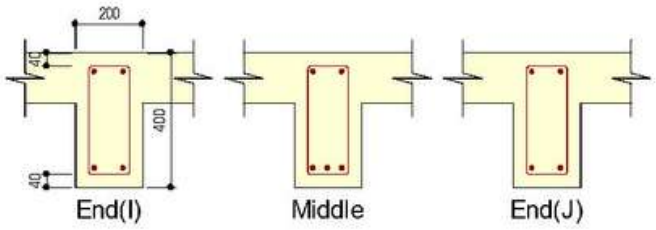
2. Forces and Reinforcement

SECT.	$M_{u,top}$	$M_{u,bot}$	V_u	Top Bar	Bot Bar	Stirrup
End(I)	9.463kN-m	42.35kN-m	62.21kN	2-P16	2-P16	2-P9@150
Middle	6.464kN-m	35.97kN-m	30.72kN	2-P16	3-P16	2-P9@150
End(J)	1.733kN-m	43.35kN-m	54.73kN	2-P16	2-P16	2-P9@150

3. Deflection

Support	Span	Short-term	Long-term	Duration
Case-1 (Pin-Pin)	3.500m	Span/360	Span/480	60 Months or more

$M_{cs(-)}$	$M_{cs(+)}$	$M_{cs(-)}$	$M_{cs(-)}$	$M_{cs(+)}$	$M_{cs(-)}$	M_{sus}
0.000kN-m	22.16kN-m	0.000kN-m	0.000kN-m	6.129kN-m	0.000kN-m	100%



4. Check Bending Moment Capacity

SECT.	End(I)		Middle		End(J)	
POS.	Top	Bot	Top	Bot	Top	Bot

http://www.midasuser.com

1/8

Midas Design+ Result

TWO WAY SLAB DESIGN USD METHOD

Unit : MKS

PROJECT Didsaya House
DATE 4/8/2024

Step 1 Input Data Criteria

1.1 Load Required
- Dead Load (DL.) = 2,400.00 kg/m3
- Super Dead Load (SDL.) = 50.00 kg/m2
- Live Load (LL.) = 200.00 kg/m2

1.2 Material Property
Concrete
- Compressive Strength (f'c) = 240.00 ksc
- Elastic Modulus (Ec) = 233,928.00 ksc

Main Reforcement
- Class = SD40
- Yielding Strength (Fy) = 4,000.00 ksc
- Ultinate Strength (Fu) = 5,700.00 ksc
- Elastic Modulus (Es) = 2,040,000.00 ksc

Stirrup Reforcement
- Class = SR24
- Yielding Strength (Fy) = 2,400.00 ksc
- Ultinate Strength (Fu) = 3,900.00 ksc
- Elastic Modulus (Es) = 2,040,000.00 ksc

1.3 Slab Dimension
- Short Side (S) = 1.73 m
- Long Side (L) = 2.70 m
- S/L ratio = 0.64

Step 2 Determine Minimum Slab Thick.
- Minimum Slab Thick. = (S + L)/90 or 10.00 cm
  = 5.00 or 10.00 cm
- Provide Slab Thick. (h) = 10.00 cm ok
- Slab Self Weight Load (DL.) = 240.00 kg/m2

Step 3 Determine Load Combination
- Strength Load Case = 1.2DL. + 1.6LL.
- 1.2DL. + 1.6LL. = 668.00 kg/m (consider per b = 1.00 m)
- Service Load Case = DL. + LL.
- DL. + LL. = 490.00 kg/m (consider per b = 1.00 m)

Step 4 Calculated Design Parameter
- β1 = 0.85
- Balanced As ratio (ρb) = β1 x (0.85f'c)/Fy x 6120/(6120+Fy) = 0.0262
- Min.As ratio (ρmin) = % Temp. Bar = 0.0018
- Max.As ratio (ρmax) = 0.75ρb = 0.0197
- Concrete Clear Cover (cc.) = 2.00 cm
- Expect Rebar = DB12
- Effective Depth (d) = h - 2cc. - 0.5db = 5.40 cm (short span)
  = h - 2cc. - 1.5db = 4.20 cm (long span)

Slab Calculation Sheet

DESIGN บันไดห้องเรียบพาดช่วงยาว USD METHOD

Unit : MKS

PROJECT Didsaya House
DATE 4/8/2024

Step 1 Input Data Criteria

1.1 Load Required
- Dead Load (DL.) = 2,400.00 kg/m3
- Super Dead Load (SDL.) = 50.00 kg/m2
- Live Load (LL.) = 200.00 kg/m2

1.2 Material Property
Concrete
- Compressive Strength (f'c) = 240.00 ksc
- Elastic Modulus (Ec) = 233,928.00 ksc

Main Reforcement
- Class = SD40
- Yielding Strength (Fy) = 4,000.00 ksc
- Ultinate Strength (Fu) = 5,700.00 ksc
- Elastic Modulus (Es) = 2,040,000.00 ksc

Temp. Reforcement
- Class = SD40
- Yielding Strength (Fy) = 4,000.00 ksc
- Ultinate Strength (Fu) = 5,700.00 ksc
- Elastic Modulus (Es) = 2,040,000.00 ksc

1.3 Stair Dimension
- 1st Floor Elevation = +0.75 m
- Landing Elevation = +2.35 m
- 2nd Floor Elevation = +3.95 m
- Landing Length = 1.30 m

Step 2 Calculated Design Parameter
- Trial Stair Step = 9 step
- Lower and Upper Elevation = 1.60 m
- Riser (R) = 17.78 cm
- Tread (T) = 25.00 cm + 2.50 cm (nosing)
  = 27.50 cm
- Horizontal Length (Lh) = (0.25x9)+1.3 = 3.55 m
- Asuume Beam Width (b) = 20.00 cm
- Min. Stair Thick. = (Lh + b)/20 = 18.75 cm
- Provide Stair Thick. (h) = 20.00 cm ok
- Stair Slab Load = 2400 x h x (sqrt(T^2 + R^2)/T) = 588.99 kg/m2
- Stair Step Load = 2400 x 0.5 x R = 213.34 kg/m2
- Stair Self Weight Load (DL.) = 588.99 + 213.34
  = 802.33 kg/m2

Step 3 Determine Load Combination
- Strength Load Case = 1.2DL. + 1.6LL.
- 1.2DL. + 1.6LL. = 1,342.80 kg/m (consider per b = 1.00 m)
- Service Load Case = DL. + LL.
- DL. + LL. = 1052.33 kg/m (consider per b = 1.00 m)

Stair Calculation Sheet

DESIGN SQUARE AND RECTANGULARISOLATED SPREAD FOOTING USD METHOD

Unit : MKS

PROJECT Didsaya House
DATE 4/8/2024

Step 1 Input Data Criteria

1.1 Load Required
- Dead Load (DL.) = 24.00 t
- Live Load (LL.) = 5.00 t

1.2 Material Property
Concrete
- Compressive Strength (f'c) = 240.00 ksc
- Elastic Modulus (Ec) = 233,928.00 ksc

Main Reforcement
- Class = SD40
- Yielding Strength (Fy) = 4,000.00 ksc
- Ultinate Strength (Fu) = 5,700.00 ksc
- Elastic Modulus (Es) = 2,040,000.00 ksc

1.3 Soil Property
- Soil Type = ดินแน่น หรือทรายหยาบ (พรบ.ควบคุมอาคาร พ.ศ.2522)
- Soil Unit Weight (γ) = 2.00 t/m3
- Bearing Capacity (qa) = 10.00 t/m2

Step 2 Determine Footing Dimension
- Service Load (DL.+LL.) = 29.00 t
- Assume Wf = 10% x 29 = 2.90 t
- Design Load = DL. + LL. + Wf = 31.90 t
- Required Area of Footing = (DL. + LL. + Wf)/qa
  = 3.19 m2
- Provide Footing Width (B) = 1.80 m
  Footing Long (L) = 1.80 m
- Area of Footing (Af) = 3.24 m2 >= 3.19 m2 ok
- Trial Depth of Footing (h) = 30.00 cm
- Concrete Cover (cc.) = 8.00 cm
- Effective Depth (d) = 22.00 cm >= 15.00 cm ok
- Footing Self Weight Load (Wf) = 2400 x Af x h = 2.33 t
- Soil Pressure (qu) = 9.67 t/m2 <= 10.00 t/m2 ok

Step 3 Determine Load Combination
- Strength Load Case = (1.2DL. + 1.6LL.)/Af
- (1.2DL. + 1.6LL.)/Af = 11.36 t/m2

Step 4 Calculated Design Parameter
- β1 = 0.85
- Balanced As ratio (ρb) = β1 x (0.85f'c)/Fy x 6120/(6120+Fy) = 0.0262
- Min.As ratio (ρmin) = % Temp. Bar = 0.0018
- Max.As ratio (ρmax) = 0.75ρb = 0.0197

Isolated Footing Calculation Sheet

DESIGN COMBINED FOOTING USD METHOD

Unit : MKS

PROJECT Didsaya House
DATE 4/14/2024

Step 1 Input Data Criteria

1.1 Load Required
Pier A
- Dead Load (DL.) = 15.00 t
- Live Load (LL.) = 2.00 t

Pier B
- Dead Load (DL.) = 7.00 t
- Live Load (LL.) = 1.00 t

1.2 Material Property
Concrete
- Compressive Strength (f'c) = 240.00 ksc
- Elastic Modulus (Ec) = 233,928.00 ksc

Main Reforcement
- Class = SD40
- Yielding Strength (Fy) = 4,000.00 ksc
- Ultinate Strength (Fu) = 5,700.00 ksc
- Elastic Modulus (Es) = 2,040,000.00 ksc

Temp. Reforcement
- Class = SD40
- Yielding Strength (Fy) = 4,000.00 ksc
- Ultinate Strength (Fu) = 5,700.00 ksc
- Elastic Modulus (Es) = 2,040,000.00 ksc

1.3 Soil Property
- Soil Type = ดินแน่น หรือทรายหยาบ (พรบ.ควบคุมอาคาร พ.ศ.2522)
- Soil Unit Weight (γ) = 2.00 t/m3
- Bearing Capacity (qa) = 10.00 t/m2

1.4 Pier Dimension
Pier A
- Pier Width (c1A) = 30.00 cm
- Pier Length (c2A) = 30.00 cm

Pier B
- Pier Width (c1B) = 30.00 cm
- Pier Length (c2B) = 30.00 cm

Combined Footing Calculation Sheet

Project	:	The MRT Purple Line Project Contract 3 Underground Civil Works
Company	:	Nawarat Patanakarn Public Company Limited
Title	:	Design Steel Temporary Fence

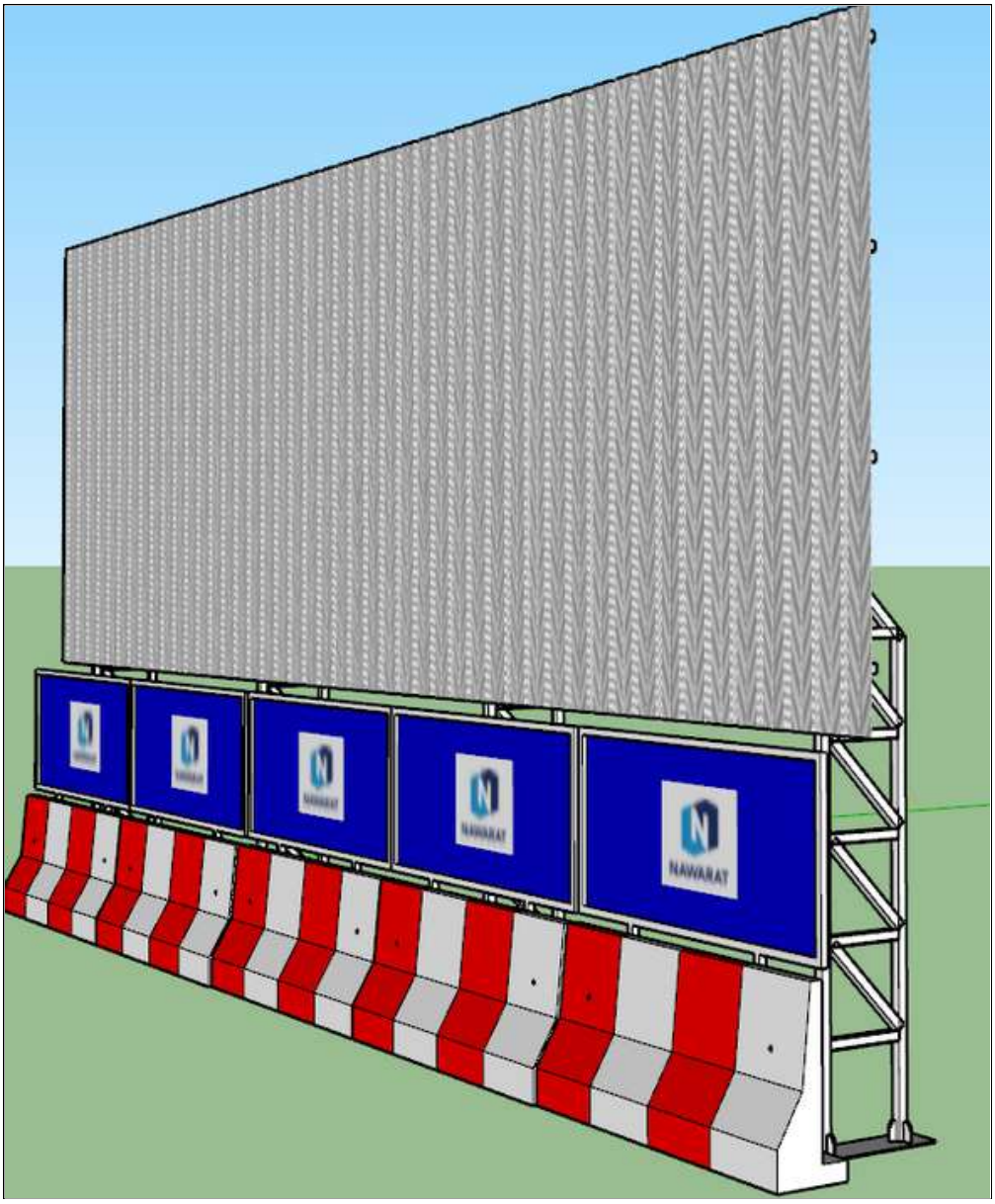
The purpose of this project is to design steel temporary fence at the site location for protect public seeing the construction activity and equipment in work site that refer from ANSI/AISC and ACI standard design code.

The structure model is refer from site requirements that will give general dimension.

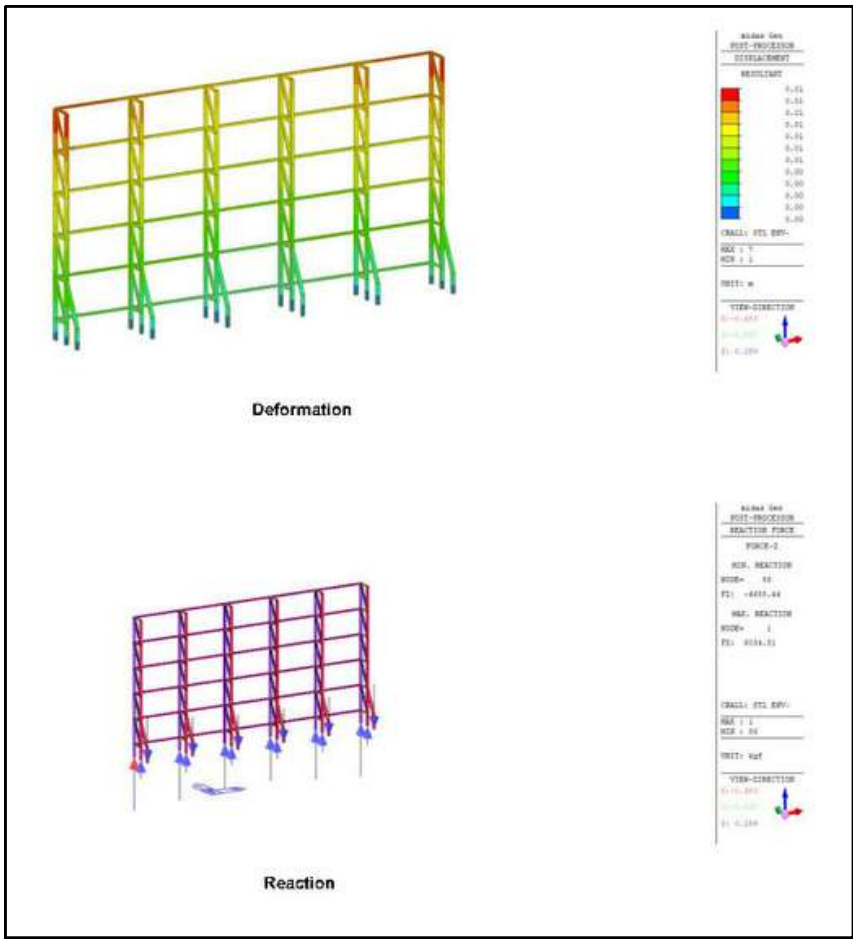
Procedure of this project is

1.Structure Analysis and Design by using Midas Gen

2.Steel Connection by using IDEA StatiCa



Site Requirement



Midas Gen Analysis

midas Gen **Steel Checking Result**

MIDAS	Company		Project Title
	Author	USER	File Name

1. Design Information

Design Code AISC(15th)-LRFD16
Unit System kgf, m
Member No 56
Material SS400 (No:1)
(Fy = 24000000, Es = 21000000000)
Section Name square 2"x2"x2.3mm (No:2)
(Rolled : B 50x50x2.3).
Member Length : 2.00000

2. Member Forces

Axial Force Fxx = 0.00000 (LCB: 4, POS:J)
Bending Moments My = -59.612, Mz = 0.00000
End Moments Myi = -8.3483, Myj = -59.612 (for Lb)
Myi = -8.3483, Myj = -59.612 (for Ly)
Mzi = 0.00000, Mzj = 0.00000 (for Lz)
Shear Forces Fyy = 0.00000 (LCB: 37, POS:1/2)
Fzz = 165.762 (LCB: 2, POS:J)

Depth	0.05000	Web Thick	0.00230
Flg Width	0.05000	Top F Thick	0.00230
Web Center	0.04770	Bot F Thick	0.00230
Area	0.00043	Asz	0.00023
Qyb	0.00065	Qzb	0.00065
Iyy	0.00000	Izz	0.00000
Ybar	0.02500	Zbar	0.02500
Syy	0.00001	Szz	0.00001
ry	0.01930	rz	0.01930

3. Design Parameters

Unbraced Lengths Ly = 2.00000, Lz = 2.00000, Lb = 2.00000
Effective Length Factors Ky = 1.00, Kz = 1.00
Moment Factor / Bending Coefficient
Cmy = 1.00, Cmz = 1.00, Cb = 1.00

4. Checking Results

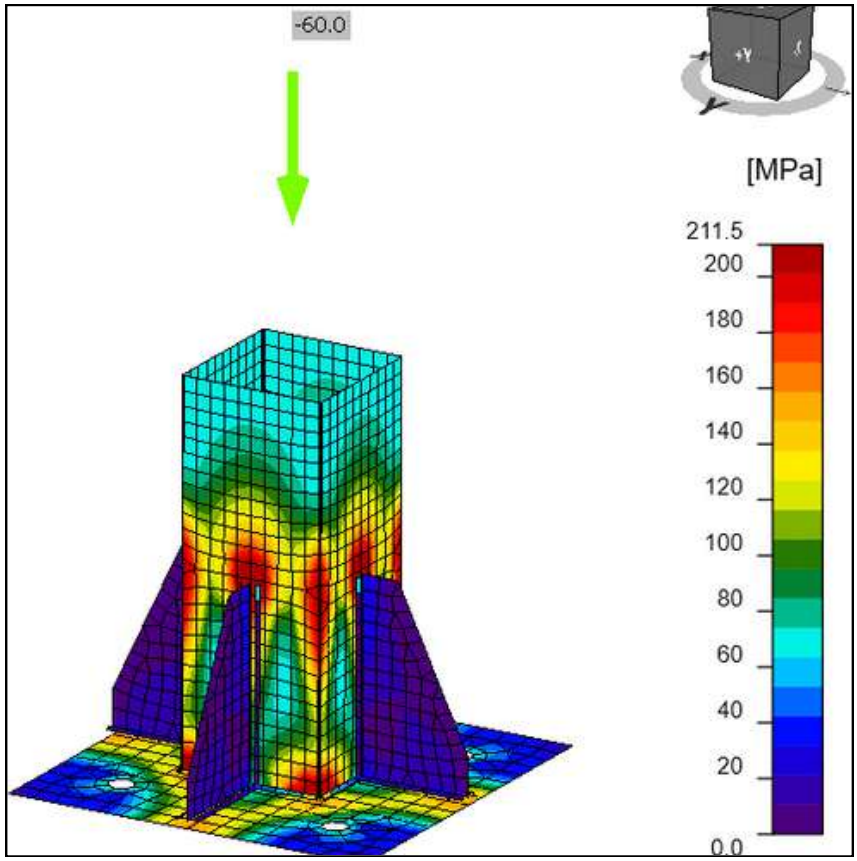
Slenderness Ratio
L/r = 103.6 < 300.0 (Memb:56, LCB: 4) ..... O.K
Axial Strength
Pr/Pc = 0.00/9184.32 = 0.000 < 1.000 ..... O.K
Bending Strength
Mry/Mcy = 59.612/169.686 = 0.351 < 1.000 ..... O.K
Mrz/Mcz = 0.000/169.686 = 0.000 < 1.000 ..... O.K
Combined Strength (Tension+Bending)
Pr/Pc = 0.00 < 0.20
Rmax = Pr/(2*Pc) + [Mry/Mcy + Mrz/Mcz] = 0.351 < 1.000 ..... O.K
Shear Strength
Vry/Vcy = 0.000 < 1.000 ..... O.K
Vrz/Vcz = 0.089 < 1.000 ..... O.K

5. Deflection Checking Results

L/ 360.0 = 0.0056 > 0.0014 (Memb:11, LCB: 20, POS: 1.0m, Dir-Z) ..... O.K

Modeling, Integrated Design & Analysis Software Print Date/Time: 03/12/2024 15:16

Midas Gen Result

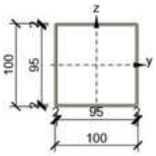


IDEA StatiCa Analysis

Project: Temporary Fence Segment Yard
Project no:
Author:

StatiCa

Cross-sections

Name	Material	Drawing
4 - Box100x100x2.3	SS400	

Anchors

Name	Bolt assembly	Diameter [mm]	fu [MPa]	Gross area [mm²]
5/8 A325	5/8 A325	16	827.4	198

Load effects (equilibrium not required)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	COL	-60.0	0.0	0.0	0.0	0.0	0.0

Foundation block

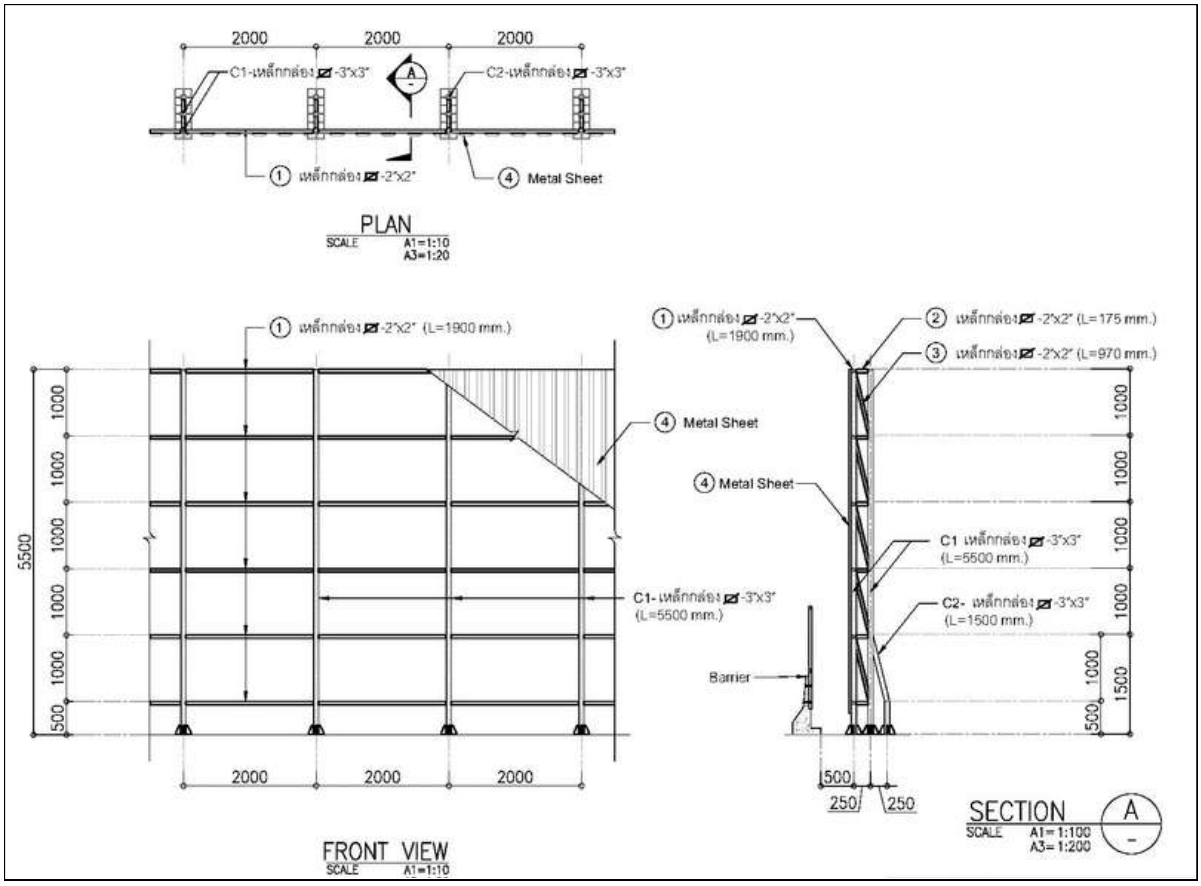
Item	Value	Unit
CB 1		
Dimensions	850 x 850	mm
Depth	600	mm
Anchor	5/8 A325	
Anchoring length	160	mm
Shear force transfer	Anchors	
Gap	10	mm

Check

Summary

Name	Value	Check status
Analysis	100.0%	OK
Plates	0.5 < 5.0%	OK
Anchors	47.0 < 100%	OK
Welds	77.6 < 100%	OK
Concrete block	Not calculated	
Buckling	Not calculated	

IDEA StatiCa Result



Construction Drawing

Project	:	The MRT Purple Line Project Contract 3 Underground Civil Works
Company	:	Nawarat Patanakarn Public Company Limited
Title	:	Design Reinforced Concrete Beam for Support TBM

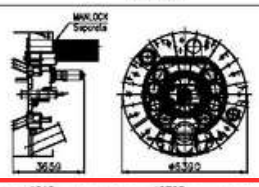
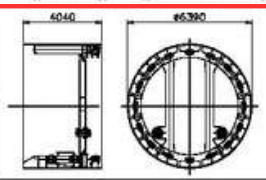
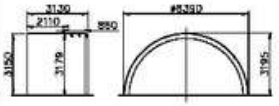
The purpose of this project is to design reinforced concrete beam for support TBM at site location that refer to ACI standard design code.

The structure dimension is refer from site requirements and Information for calculation is refer from TBM specification.

Procedure of this project is

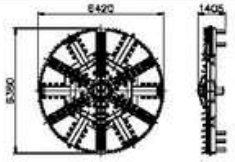
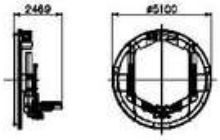
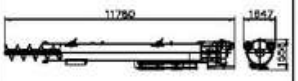
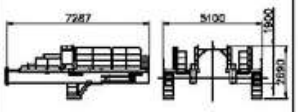
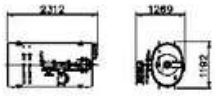
1.Structure Analysis and Design by using Microsoft Excel

1/2

S/No	NAME	SKETCH	NUM	WEIGHT	NOTE
01	SHIELD BODY A-RING		1	90ton	INCLUDING
02	SHIELD BODY B,C,D-RING		1	95ton	INCLUDING
03	SHIELD BODY E,F-RING (UPPER)		1	13ton	INCLUDING
04	SHIELD BODY E,F-RING (LOWER)		1	13ton	INCLUDING
	s.TOTAL			212ton	

Maximum Weight for Design

2/2

S/No	NAME	SKETCH	NUM	WEIGHT	NOTE
05	CUTTER HEAD		1	40ton	INCLUDING
06	ERECTOR		1	16ton	INCLUDING
07	SCREW		1	17ton	INCLUDING
08	REAR SCAFFOLD		1	9ton	INCLUDING
09	MANLOCK		1	2.4ton	
	s.TOTAL			84.4ton	
	TOTAL			295.4+α ton	

TBM Specification

Structure Beam Type I

Requirement Load

Point Load, P	=	**30.00** t	
Ultimate Point Load, Pu	=	42.00 t	(1.4Pd)
Span Length, L	=	**1.55** m	
Max. Shear, Vmax	=	21.00 t	
Max. Moment, Mmax	=	8.66 tm	

ค่าคงที่สำหรับการออกแบบ

β_1	=	0.76	
Balanced Steel Ratio, ρb	=	0.03929	
Max. Steel Ratio, ρmax	=	0.02947	
Min. Steel Ratio, ρmin	=	0.00350	
Trial Ultimate Resistance, Ru	=	69.47 ksc	
ϕ moment	=	0.90	
ϕ shear	=	0.85	

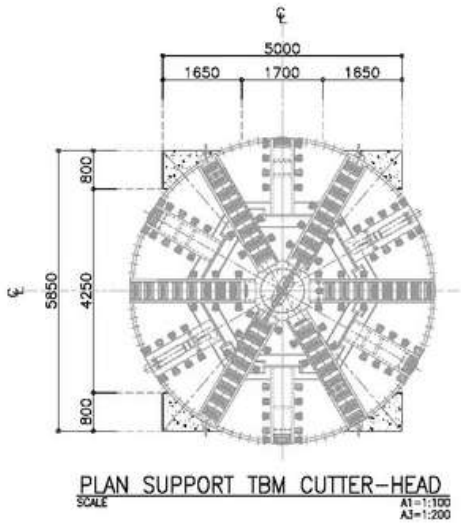
Required Section Area

Trial ρ	=	0.01964 (0.5 balanced)	
Trial Width, b	=	**80.00** cm	
Effective Depth, d	=	13.16 cm	(distance from extreme compression to centroid rebar tension)
Choose d	=	**54.00** cm	
asuume d'	=	**6.00** cm	(distance from extreme tension to centroid rebar tension)
Beam Type	=	**general beam**	
Depth, h	=	60.00 cm	ok
b x h	=	80 x 60 cm	

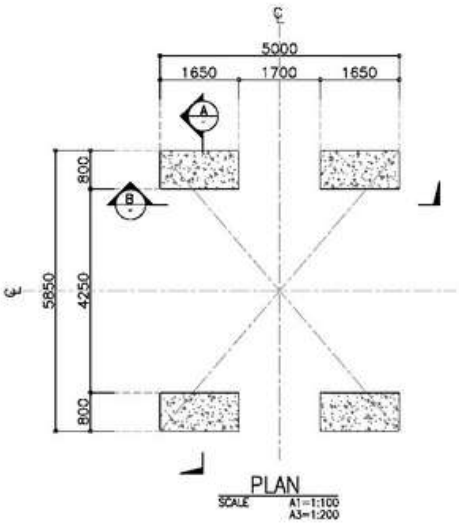
Design Longitudinal Reinforcement

Actual Ultimate Resistance, Ru	=	4.13 ksc	
Steel Ratio, ρ	=	0.00104	
Use Steel Ratio, ρuse	=	0.00350	**use min. % reinforced**
Rebar Required, As,req.	=	15.12 sq.cm.	
Choose Rebar		**4 - DB25**	**1 layer**
Rebar Provided, As,prov.	=	19.63 sq.cm.	ok

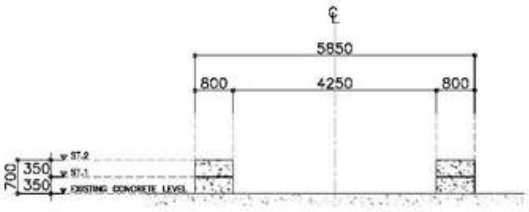
Calculation Sheet



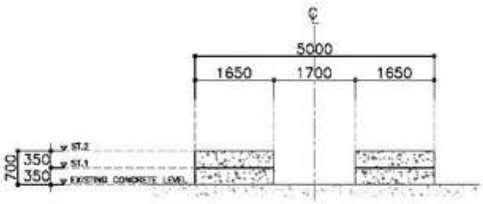
PLAN SUPPORT TBM CUTTER-HEAD
SCALE A1=1:100 A3=1:200



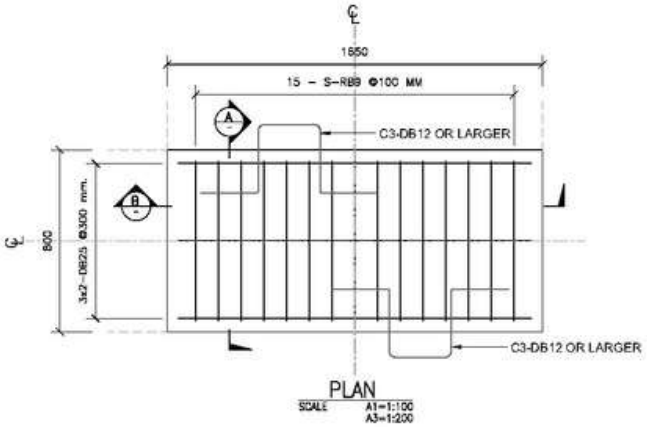
PLAN
SCALE A1=1:100 A3=1:200



SECTION A
SCALE A1=1:100 A3=1:200



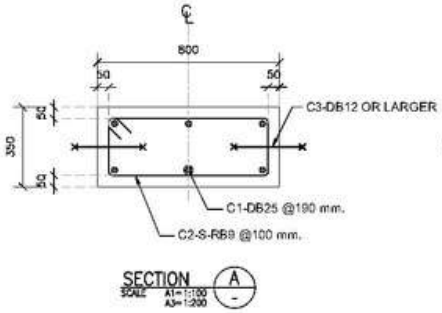
SECTION B
SCALE A1=1:100 A3=1:200



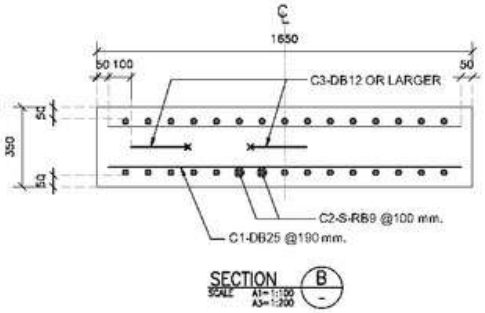
PLAN
SCALE A1=1:100 A3=1:200

BARBENDING FOR SUPPORT TBM

CODE	Dia	DIMENSION(mm.) A	B	C	D	RADIUS R	CUTING LENGTH	NOS	SHAPE BAR
C1	DB25	1550					1550	6	
C2	RB9	700	250	150		17.5	2200	15	
C3	DB12	250	300			17.5	1350	2	



SECTION A
SCALE A1=1:100 A3=1:200



SECTION B
SCALE A1=1:100 A3=1:200

รายการประกอบแบบ
1 คอนกรีต
1.1 คอนกรีต มีกำลังต้านทานแรงอัดประลัยไม่น้อยกว่า 400 กก./ซม.² ที่อายุ 28 วัน
โดยทดสอบจากแท่งตัวอย่าง CYLINDER ø15x30 ซม.
2 เหล็กเส้นกลมเหล็ก
2.1 เหล็กรอบ(ROUND BAR) ใช้ชนิดเส้นกลมเรียบ ตามมาตรฐาน มอก.20
GRADE SR 24 ส่วนเหล็กข้ออ้อย ใช้เหล็กเส้นกลมเรียบตามมาตรฐาน มอก.
24 GRADE SD 40

Construction Drawing

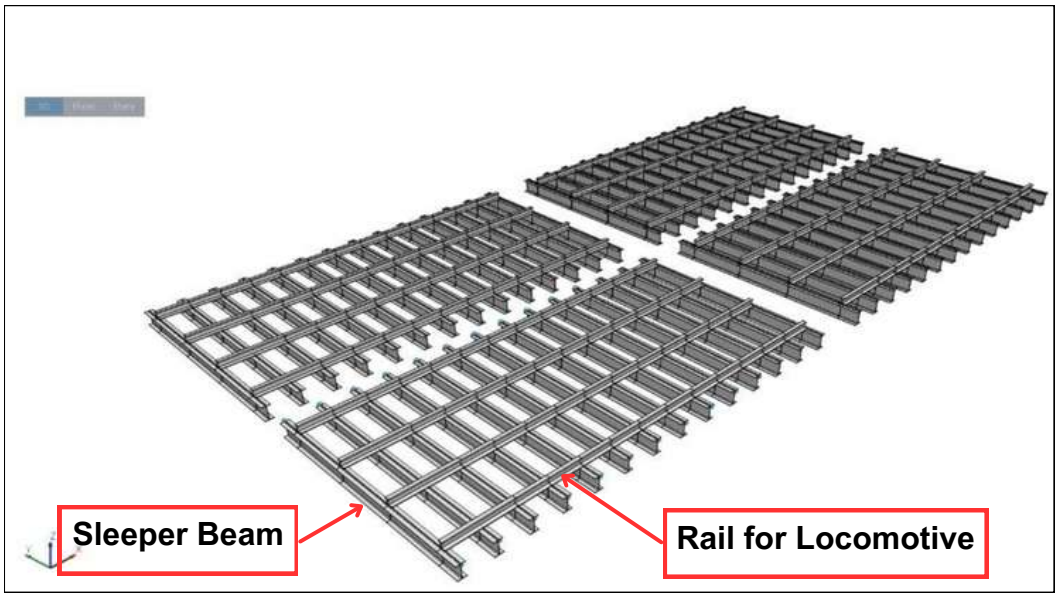
Project	:	The MRT Purple Line Project Contract 3 Underground Civil Works
Company	:	Nawarat Patanakarn Public Company Limited
Title	:	Design Rail Section for Support Locomotive

The purpose of this project is to design rail section with sleeper beam spacing for support locomotive that use for transportation equipment in tunnel.

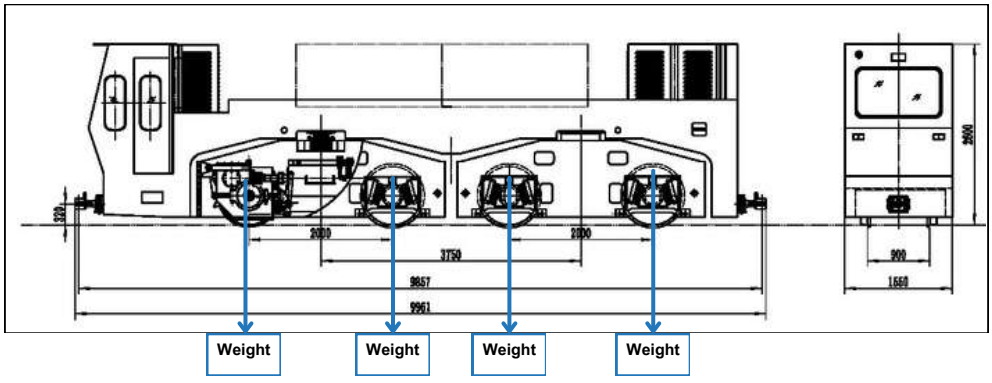
Information for calculation is refer from locomotive specification and rail section property.

Procedure of this project is

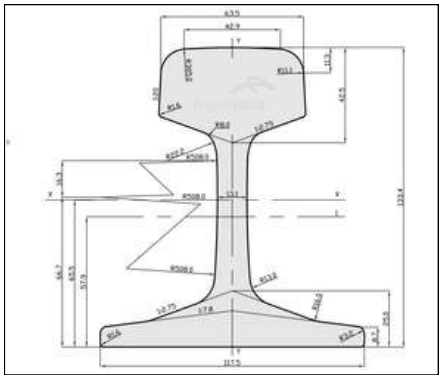
1.Design Rail Section by using Microsoft Excel



Structure Model



Locomotive Drawing



Rail Section Drawing

Rail Calculations for Main Drive (45 T Locomotive 8 wheels)

1 Condition

1.1 Spacing :	L	140.00	cm
1.2 1 Wheel Maximum Load :	W	5,625.00	kg
	Number of Wheel	8	wheel
	Total Load	45,000.00	kg
1.3 Tensile Strength :	σ	7,000.00	ksc
1.4 Safety Factor :	SF.	6	
1.5 Allowable Stress of Rail :	σ allow	1,166.00	ksc
1.6 Elastic Modulus :	E	2,100,000.00	ksc

1.7 Type and Section for Rail Property

Type	Weight (kg/m)	Moment of Inertia : I (cm4)	Section Modulus : Z
15 kg	15.20	167.00	40.80
22 kg	22.30	339.00	69.60
30 kg	30.10	604.00	108.00
37 kg	37	952.00	149.00
39 E1	39.77	1204.90	177.80

2 Calculation

2.1 Required Section Modulus : Z

$$Z_{required} = \frac{L}{4} \times \frac{W}{\sigma_{allow}}$$

$$Z_{required} = \frac{140.00}{4} \times \frac{5{,}625.00}{1{,}166.00}$$

$$Z_{required} = 168.85 \ cm3$$

2.2 Provided Section

Select Type 39 E1 $Z_{provided}$ 177.80 cm3 Ok

2.3 Deflection of Rail

$$\delta_{allow} = 0.39 \ cm$$

$$\delta = \frac{1}{48} \times \frac{W}{E} \times \frac{L^3}{I}$$

$$\delta = \frac{1}{48} \times \frac{5{,}625.00}{2{,}100{,}000.00} \times \frac{2{,}744{,}000.00}{1204.90}$$

$$\delta = 0.127 \ cm$$ Ok

So, Sleeper with spacing 1400 mm with Rail 39 E1 Ok

Calculation Sheet

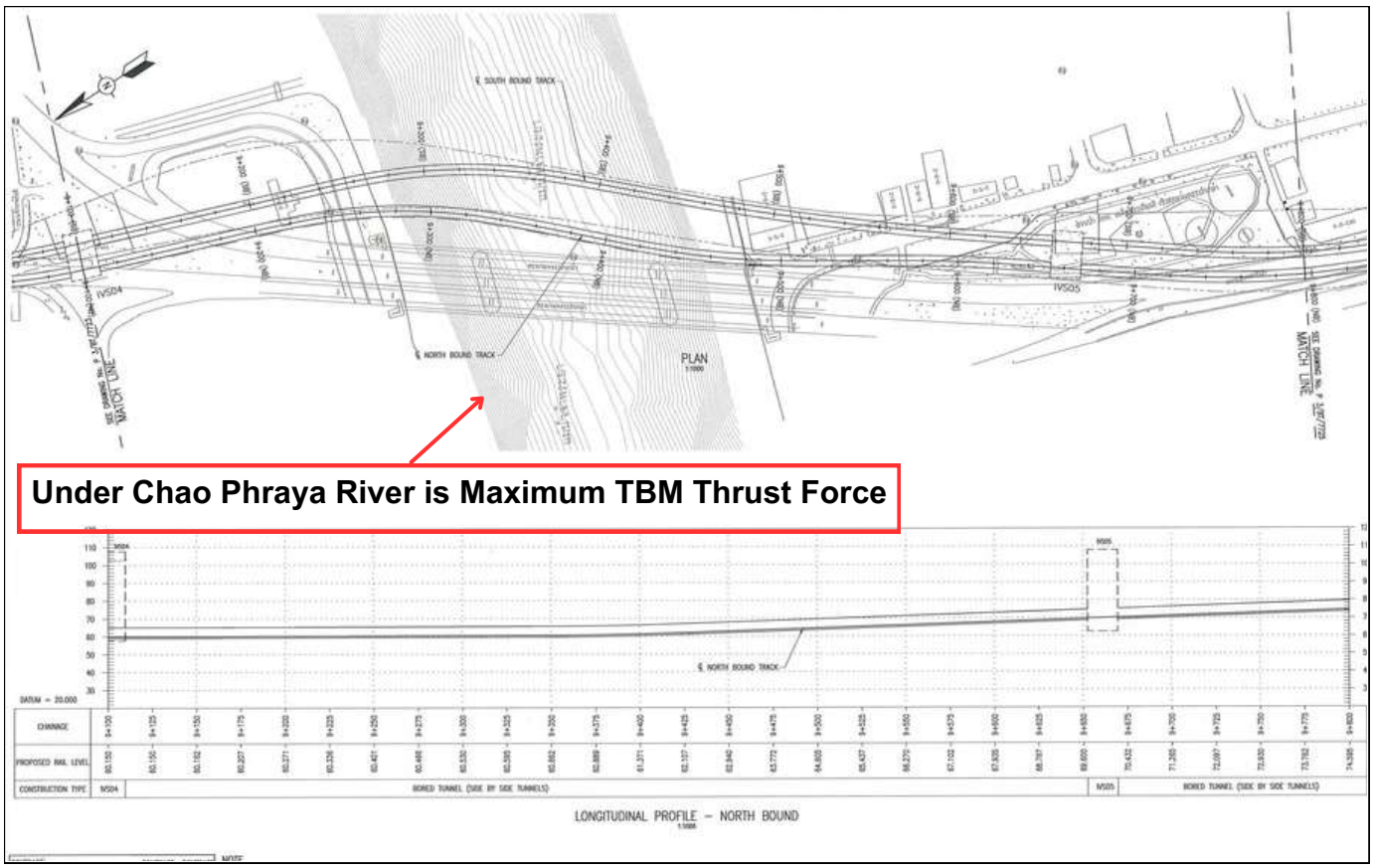
Project	:	The MRT Purple Line Project Contract 3 Underground Civil Works
Company	:	Nawarat Patanakarn Public Company Limited
Title	:	Calculation TBM Thrust Force

The purpose of this project is to evaluate and recheck TBM thrust force with the TBM distributor that consistent with actual situation.

Information for calculation is refer from TBM specification and soil investigation report.

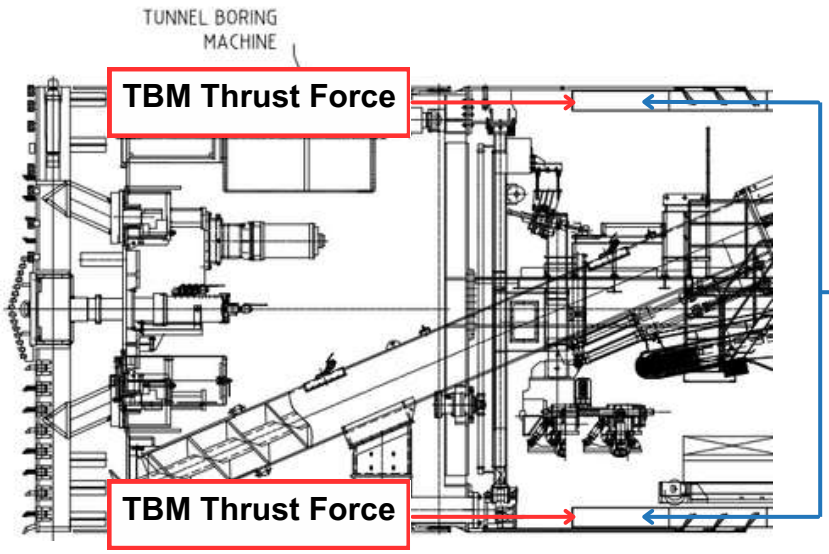
Procedure of this project is

1.Calculation TBM Thrust Force by using Microsoft Excel



Under Chao Phraya River is Maximum TBM Thrust Force

Reference Drawing



TBM Drawing

THK-TD-6822053 6.39m EPB TBM DESIGN CALCULATION DOCUMENT (NEW)

Launching Thrust Force Estimation Result

		D-wall Cutting (KN)	Temporary(KN) Ring (T11-T1)	Permanent Ring(KN) (P1 to P100)
Frictional Resistance of Shield Outer Circumference and the Soil	F1(KN)	Shield Frame Remaining inside Shaft	7,824	7,824
Cutting Front Face Resistance	F2(KN)	13,935	13,935	13,935
Frictional Resistance between Tail Frame Plate and Segment	F3(KN)	110	110	110
Traction Resistance of Backup Cars	F4(KN)	0	0	308
Friction of Entrance Seal	F5(KN)	300	300	0
Cutting Friction of Dwall	F6(KN)	1500 (Estimated)	0	0
Friction of Launching Cradle	F7(KN)	100	100	0
Total Required Thrust Force	FXT(KN)	15,945	22,269	22,177

Details of Calculation

F1 7,824 kN *(Frictional resistance of shield outer circumference and the soil)*

Parameter

Pe	170.71	kN/m2				
Q1e	85.36	kN/m2	Pm	134.43	kN/m2	*(Average earth pressure working on shield outer diameter)*
Q2e	110.92	kN/m2				
Lm	9.665	m				
D0	6.39	m	A1	194.0	m2	*(Shield machine body surface area)*
	Mu1			0.3		*(Friction coefficient between soil and shield)*

F2 13,934.8 kN *(Cutting front face resistance)*

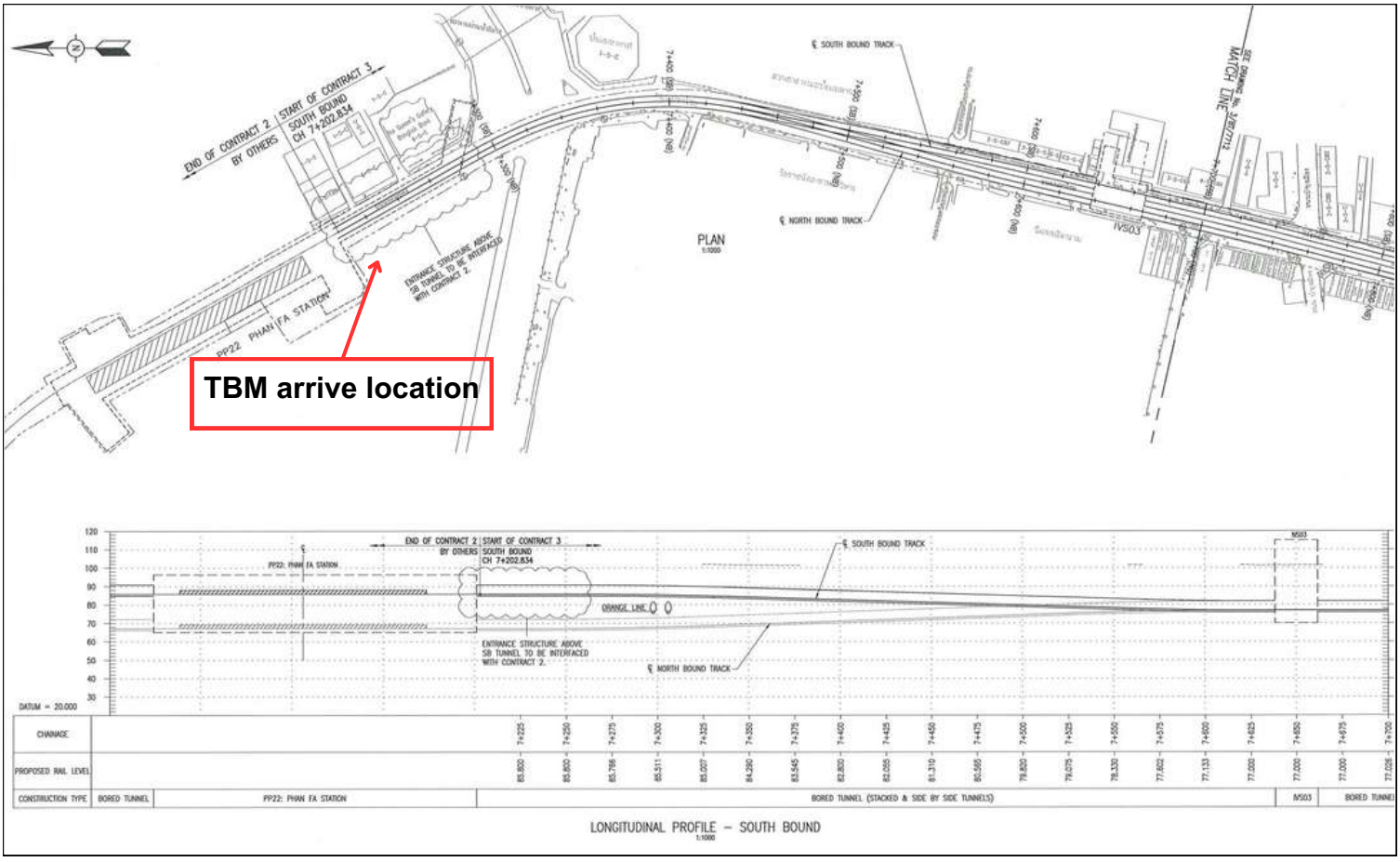
Parameter

	A0			32.4	m2	*(Sheild machine excavating area)*
Q1	385.36	kN/m2	Pf	430.09	kN/m2	*(Cutting front face resistance earth pressure)*
Q2	474.82	kN/m2				

Calculation Sheet

Project	:	The MRT Purple Line Project Contract 3 Underground Civil Works
Company	:	Nawarat Patanakarn Public Company Limited
Title	:	Calculation Soil Bearing Capacity for TBM

The purpose of this project is to calculated soil bearing capacity when TBM arrive at the location that refer from Terzaghi theory and Meyerhof theory.
If soil bearing capacity is not enough the company have to do ground improvement.
Information for calculation is refer from TBM specification and soil investigation report.
Procedure of this project is
1.Calculation Soil Bearing Capacity by using Microsoft Excel



Reference Drawing

Shallow Foundation for TBM

Unit weight	2.04	t/m3	TBM Weight	310.5	t	TMB Dia.	6.39	m
h (from GL.)	11.405	m	L	9.665	m	Df	17.795	m
Bearing Pressure	23.2662	t/m2	B	4.52	m			
			TBM Uniform Load	7.11	t/m2			
Bearing Pressure above TMB		23.2662	t/m2					
Bearing Pressure below TBM		30.38	t/m2	Applied				

Terzaghi Theory

Lf<B *Wrong*

Type of Soil	Clay							
C	10.7	t/m2	ϕ	0	degree			
			Nc	5.70	Nq	1.00	Nγ	0.00
qu	97.29	t/m2						
Factor Safety	3							
qa	32.43	t/m2	Allowable	*OK*	Allowable Bearing Pressure > Bearing Pressure			

Meyerhof Theory

Shape Factors		Depth Factors		Load Inclination Factors		Bearing Capacity Factors	
Sc	1.09	dc	1.79	ic	1.00	Nc	5.14
Sq	1.05	dq	1.39	iq	1.00	Nq	1.00
Sγ	0.81	dγ	1.00	iγ	1.00	Nγ	0.00
qu	160.47	t/m2					
Factor Safety	3						
qa	53.49	t/m2	Allowable	*OK*	Allowable Bearing Pressure > Bearing Pressure		

* SPT-N Value for estimated cohesion (C)

* Assume Soil until Gl. Level - below TBM Level is same classification

* Unit weight is maximum value estimate from upper depth sample and below depth sample

Calculation Sheet