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DESIGN CALCULATION COVER SHEET

Project	Detailed Design on Port Reactivation Project in La Union Province.	**Project Code**	JC1N004
Section	**BUILDING WORKS**	Calc. File No.	
Sub-Section	**CONTAINER GATE**	Calc. Index No.	

Subject:

STRUCTURAL DESIGN

Calculation Objective:

The objective of the calculation is to provide a safe structure for the ocupation of the building, by the use of the Republic of El Salvador and American design standards.

References, Calculation Notes and Comments

The Structural Analysis has been made using the program: "STAAD-III rev 21.1W, RESEARCH ENGINEERS, Inc.". The analysis of the structure considers only the concrete frames to resist the lateral forces, not considering the walls in the model.

One model for the structure has been constructed:

1- For the calculation of the Seismic and Dead & Live load.

The Key for the STAAD-III rev 21.1W program is attached for future convinience.

All the design has been made by calculations sheet created for the project in Microsoft Excel, and based in the following bibliography:

1. Building Code Requirements for Structural Concrete (318M-99), American Concrete Institute (ACI).
2. Technical Specification for Seismic Design, Ministry of Public Works, El Salvador, 2001.
3. AISC, American Institute of Steel Construction, ninth Edition, 1989.
4. Technical Specification for Wind Design, Ministry of Public Works, El Salvador, 1997.
5. UBC, Uniform Building Code, Volume 2: Structural Engineering Design Provisions, 1997.

Rev	Prepared		No. of	Checked		Reviewed		Superseded
	by	Date	Pages	by	Date	by	Date	by Calc No.
O	H. WATANABE	Jul-02	78	A. MORIOKA	Jul-02	[signature]	11 July '02	
A				[signature]				
B								
C								

FN : Calculation_Cover_Sheet

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Loads	Date	July-02	Page	1/78

gate (cargo,container)

	room	material	thickness	density	(kg/m2) weight	
		metal roof			15	
RF	Roof	purlin			15	
	(metal)	sub-beam			15	
		beam			30	
					75	
2F	office	finish	30		60	
		slab syste	200		345	precast prestress slab,
		ceiling			20	include top concrete t=50
					425	
		finish			20	
2F	Roof	concrete sl	150		360	
		ceiling			20	
					400	
		c pl			30	
2F	Bridge wal	porin			20	
					50	
		finish	30		60	
1F	sidewalk	slab	120	2.4	288	
					348	
1F	office	finish	30		60	
		slab	120	2.4	288	
					348	
1F	Pit	slab	250	2.4	600	
					600	
C.B	t=200mm				293	kg/m2
	t=150mm				226	kg/m2

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Loads	Date	July-02	Page	2/78

gate

Floor	Room	Dead Load	Live Load	Total Load	Notes
RF	roof	75	20	95	*
			0	75	
2F	office	425	250	675	*
			180	605	
2F	roof	400	100	500	
			50	450	
2F	bridge wal	50	180	230	
			60	110	
1F	office	348	250	598	
			180	528	
1F	sidewalk	348	350	698	
			150	498	
1F	pit	600	2000	2600	
			1800	2400	

* The selfweight for the Columns & Beams calculated by the MultiFrame structural Analisys Program.

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Loads	Date	July-02	Page	3/78

Dead Load

X direction model

position		unit weight	area,length	load
roof	roof	30 kg/m2	3 m	0.09 t/m
	(exclude beam and sub beam self-weight)			
roof top	roof	45 kg/m2	11.64 m2	0.524 t
	(exclude beam self-weight)			
roof bottom 1	roof	45 kg/m2	11.64 m2	0.524 t
roof bottom 2	RC beam	0.47 t/m	3 m	1.41 t
2nd floor 1	CB (200)	0.293 t/m2	1.75 m	0.513 t/m
(7/8 axis)	bridge walk	0.05 t/m2	0.5 m	0.025 t/m
				0.538 t/m
2nd floor 2	CB (200)	0.293 t/m2	5.25 m	1.538 t
(B-7 axis)	slab	0.425 t/m2	5.325 m2	2.263 t
	B-10	0.47 t/m	3 m	1.41 t
	CB-10	0.22 t/m	1.3 m	0.286 t
	stairs	0.05 t/m2	2 m2	0.1 t
	bridge walk	0.05 t/m2	4.4875 m2	0.224 t
				5.822 t
2nd floor 3	CB (200)	0.293 t/m2	5.25 m	1.538 t
(B-8 axis)	slab	0.425 t/m2	5.325 m2	2.263 t
	B-10	0.47 t/m	3 m	1.41 t
	RC beam	0.3 t/m	3 m	0.9 t
	bridge walk	0.05 t/m2	3 m2	0.15 t
	bridge walk	0.05 t/m2	4.4875 m2	0.224 t
				6.486 t
2nd floor 4	CB-10	0.22 t/m	1.3 m	0.286 t
(B-9 axis)	bridge walk	0.05 t/m2	2.6125 m2	0.131 t
				0.416625 t
2nd floor 5	RC beam	0.3 t/m	6 m	1.8 t
(B-2 axis)	bridge walk	0.05 t/m2	7.775 m2	0.38875 t
				2.18875 t
2nd floor 6	CB-10	0.22 t/m	1.3 m	0.286 t
(B-3,4,5,6)	bridge walk	0.05 t/m2	9.4 m2	0.47 t
	stairs	0.05 t/m2	2 m2	0.1 t
				0.856 t

Dead Load

X direction model

position		unit weight	area,length	load
1st floor 1	FB-1	0.77 t/m	6 m	4.62 t
(B-1/2,8/9)	pit	0.6 t/m2	12 m2	7.2 t
				11.820 t
1st floor 2	FB-2	0.47 t/m	6 m	2.82 t
(B-3/4,4/5,5/6,6/7)	side walk	0.348 t/m2	3.6 m2	1.2528 t
	2nd roof	0.4 t/m2	2.43 m2	0.972 t
	CB (200)	0.293 t/m2	17.57625 m2	5.149841 t
				10.19464 t
1st floor 3	FB-1	0.77 t/m	6 m	4.62 t
(B-1,9 axis)	side walk	0.348 t/m2	6 m2	2.088 t
				6.708 t
1st floor 4	FB-1	0.77 t/m	6 m	4.62 t
(B-2,3,7,8 axis)	side walk	0.348 t/m2	7.56 m2	2.631 t
				7.251 t
1st floor 5	FB-1	0.77 t/m	6 m	4.62 t
(B-4,5,6 axis)	side walk	0.348 t/m2	7.2 m2	2.5056 t
				7.126 t

Live Load

X direction model

position		unit weight	area,length	load
roof	roof	20 kg/m2	3 m	0.06 t/m
roof top	roof	20 kg/m2	11.64 m2	0.233 t
roof bottom 1	roof	20 kg/m2	11.64 m2	0.233 t
2nd floor 1 (7/8 axis)	bridge walk	0.18 t/m2	0.5 m	0.090 t/m
				0.090 t/m
2nd floor 2 (B-7 axis)	office	0.25 t/m2	5.325 m2	1.331 t
	stairs	0.18 t/m2	2 m2	0.36 t
	bridge walk	0.18 t/m2	4.4875 m2	0.808 t
				2.499 t
2nd floor 3 (B-8 axis)	slab	0.25 t/m2	5.325 m2	1.331 t
	bridge walk	0.18 t/m2	3 m2	0.54 t
	bridge walk	0.18 t/m2	4.4875 m2	0.808 t
				2.679 t
2nd floor 4 (B-9 axis)	bridge walk	0.18 t/m2	2.6125 m2	0.470 t
				0.47025 t
2nd floor 5 (B-2 axis)	bridge walk	0.18 t/m2	7.775 m2	1.3995 t
				1.3995 t
2nd floor 6 (B-3,4,5,6)	bridge walk	0.18 t/m2	9.4 m2	1.692 t
	stairs	0.18 t/m2	2 m2	0.36 t
				2.052 t

Live Load

X direction model

position		unit weight	area,length	load
1st floor 1				
(B-1/2,8/9)	pit	2 t/m2	12 m2	24 t
				24.000 t
1st floor 2				
(B-3/4,4/5,5/6,6/7)	side walk	0.35 t/m2	3.6 m2	1.26 t
	2nd roof	0.1 t/m2	2.43 m2	0.243 t
				1.503 t
1st floor 3				
(B-1,9 axis)	side walk	0.35 t/m2	6 m2	2.100 t
				2.1 t
1st floor 4				
(B-2,3,7,8 axis)	side walk	0.35 t/m2	7.56 m2	2.646 t
				2.646 t
1st floor 5				
(B-4,5,6 axis)	side walk	0.35 t/m2	7.2 m2	2.52 t
				2.520 t

SEISMIC FORCES

V = Cs W

Cs = (A I Co / R) (To / T)^2/3

Coefficient of Aceleration, A = 0.40

Importance Factor, I = 1.00

Response Modification Factor, R = 12.00

Soil Conditions Factors

Co = 3.00

To = 0.60

Period of the Sructure, T = Ct hn^3/4

Type of structure coefficient, Ct = 0.073

Structure height, hn = 7.85

T = 0.342 seg

Cs = 0.145

Dead Load

	1	2	3	4	5	6
RF	1.24	2	2	2.2	2.3	2.2
2F	1.46	3.6	2.3	2.3	2.3	2.3

	7	8	9
RF	4.3	4.6	1.20
2F	8.9	10.5	1.9

Live Load

	1	2	3	4	5	6
RF	0.0					
2F	0.0	0.5	0.7	0.7	0.7	0.7

	7	8	9
RF			
2F	1.7	2.2	0.2

Each floor weight for seismic

hight		1	2	3	4	5	6
7.85	RF	1.2	2.0	2.0	2.2	2.3	2.2
5.45	2F	1.5	4.1	3.0	3.0	3.0	3.0
wh=		17.7	37.9	31.9	33.6	34.4	33.6

		7	8	9
	RF	4.3	4.6	1.2
	2F	10.6	12.7	2.1
wh=		91.7	105.1	20.7

Total weight for seismic

	1	2	3	4	5	6
RF	1.2	2.0	2.0	2.2	2.3	2.2
2F	2.7	6.1	5.0	5.2	5.3	5.2

	7	8	9
RF	4.3	4.6	1.2
2F	14.9	17.3	3.3

Total seismic load

1	2	3	4	5	6
0.4	0.9	0.7	0.8	0.8	0.8

7	8	9
2.2	2.5	0.5

Each seismic load

	1	2	3	4	5	6
RF	0.2	0.4	0.4	0.4	0.4	0.4
2F	0.2	0.5	0.4	0.4	0.4	0.4

	7	8	9
RF	0.8	0.9	0.2
2F	1.4	1.6	0.3

Dead Load

Y direction model (6 Frame)

position		unit weight	area,length	load
roof 1	roof	45 kg/m2	11.64 m	0.5238 t
(tip of B-2)	(exclude beam self-weight)			
roof 2	roof	45 kg/m2	23.28 m2	1.048 t
	(exclude beam self-weight)			
2nd floor 1				
(B axis)	bridge walk	0.05 t/m2	2.95625 m2	0.148 t
				0.148 t
2nd floor 2	bridge walk	0.05 t/m2	2.95625 m2	0.148 t
(tip of CB-10)	stairs	0.05 t/m2	2 m2	0.100 t
	bridge walk	0.05 t/m2	2.5 m2	0.125 t
				0.373 t
2nd floor 3	CB-10	0.216 t/m	1.2 m	0.259 t
(C axis)	bridge walk	0.05 t/m2	2.5 m2	0.125 t
				0.384 t
1st floor 1	wall	0.5 t/m2	3.3912 m2	1.696 t
(tip of CB)	side walk	0.35 t/m2	4.2 m2	1.470 t
				3.166 t
1st floor 2	side walk	0.35 t/m2	4.20 m2	1.47 t
(A,D axis)	office	0.35 t/m2	3.60 m2	1.26 t
	2nd roof	0.40 t/m2	4.25 m2	1.70 t
	CB	0.29 t/m2	33.52 m2	9.82 t
	FB-1	0.77 t/m	11.71 m2	9.00 t
				23.25 t

Dead Load

Y direction model (6 Frame)

position		unit weight		area,length		load	
1st floor 3 (A/B,C/D)	office	0.35	t/m2	1.2	m	0.42	t/m
1st floor 4 (B/C)	side walk	0.35	t/m2	1.2	m	0.42	t/m
1st floor 5 (B,C axis)	side walk	0.35	t/m2	7.2	m2	2.52	t
	2nd roof	0.4	t/m2	4.25	m2	1.70	t
	CB	0.29	t/m2	33.52	m2	9.82	t
	FB-1	0.77	t/m	17.9125	m	13.76	t
						27.798	t

Live Load

Y direction model (6 Frame)

position		unit weight	area,length	load
roof 1	roof	20 kg/m2	11.64 m	0.2328 t
(tip of B-2)	(exclude beam self-weight)			
roof 2	roof	20 kg/m2	23.28 m2	0.466 t
	(exclude beam self-weight)			
2nd floor 1				
(B axis)	bridge walk	0.18 t/m2	2.95625 m2	0.532 t
				0.532 t
2nd floor 2	bridge walk	0.18 t/m2	2.95625 m2	0.532 t
(tip of CB-10)	stairs	0.18 t/m2	2 m2	0.360 t
	bridge walk	0.18 t/m2	2.5 m2	0.45 t
				1.342 t
2nd floor 3				
(C axis)	bridge walk	0.18 t/m2	2.5 m2	0.450 t
				0.450 t
1st floor 1				
(tip of CB)	side walk	0.35 t/m2	4.2 m2	1.470 t
				1.470 t
1st floor 2	side walk	0.35 t/m2	4.20 m2	1.47 t
(A,D axis)	office	0.25 t/m2	3.60 m2	0.90 t
	2nd roof	0.10 t/m2	4.25 m2	0.43 t
				2.80 t

Live Load

Y direction model (6 Frame)

position		unit weight	area,length	load
1st floor 3 (A/B,C/D)	office	0.25 t/m2	1.2 m	0.3 t/m
1st floor 4 (B/C)	side walk	0.35 t/m2	1.2 m	0.42 t/m
1st floor 5 (B,C axis)	side walk	0.35 t/m2	7.2 m2	2.52 t
	2nd roof	0.1 t/m2	4.25 m2	0.43 t
				2.945 t

Dead Load

	A	B	C	D
RF	2.63	1.45	1.45	2.63
2F	1.47	2.25	1.85	1.47

Live Load

	A	B	C	D
RF	0.84	0.33	0.34	0.84
2F	0	3.58	0.45	0

Each floor weight for seismic

height		A	B	C	D
7.85	RF	3.5	1.8	1.8	3.5
5.45	2F	1.5	5.8	2.3	1.5
wh		35.25	45.75	26.59	35.25

Total weight for seismic

	A	B	C	D
RF	3.5	1.8	1.8	3.5
2F	4.9	7.6	4.1	4.9

Total seismic load

A	B	C	D
0.7	1.1	0.6	0.7

Each seismic load

	A	B	C	D
RF	0.6	0.3	0.3	0.6
2F	0.2	0.8	0.3	0.2

Dead Load

Y direction model (7 Frame)

position		unit weight		area,length		load	
roof 1	roof	45	kg/m2	11.64	m	0.52	t
(tip of B-2)	(exclude beam self-weight)						
roof 2	roof	45	kg/m2	23.28	m2	1.05	t
	(exclude beam self-weight)						
roof bottom	B-5	0.468	t/m	1.775	m	0.83	t
(A,B axis)							
2nd floor 1	CB (200)	0.293	t/m2	1.75	m	0.513	t/m
(A/B)	office	0.425	t/m2	1.775	m	0.754	t/m
						1.267	t/m
2nd floor 2	bridge walk	0.05	t/m2	2.24375	m2	0.112	t
(B axis)	CB (200)	0.293	t/m2	3.150625	m2	0.923133	t
	B-10	0.468	t/m	1.775	m	0.8307	t
						1.866	t
2nd floor 3	stairs	0.05	t/m	2	m	0.100	t
(tip of CB-10)	bridge walk	0.05	t/m2	2.24375	m2	0.112	t
						0.212	t
1st floor 1	wall	0.5	t/m2	0.9	m	0.450	t/m
(tip of CB)	side walk	0.35	t/m2	1.775	m	0.621	t/m
						1.071	t/m
1st floor 2	office	0.35	t/m2			0.35	t/m2
(A/B)							
	CB	0.29	t/m2	5.40	m	1.58	t/m
						1.58	t/m
1st floor 3	office	0.35	t/m2	1.58	m2	0.55	t
(A axis)	FB-1	0.77	t/m	4.49	m	3.45	t
	CB (200)	0.29	t/m2	8.52	m2	2.50	t
						6.49	t

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Loads	Date	July-02	Page	16 / 78

Dead Load

Y direction model (7 Frame)

position		unit weight		area,length		load	
1st floor 4	office	0.35	t/m2	1.58	m2	0.55	t
(B axis)	side walk	0.35	t/m2	1.58	m2	0.55	t
	FB-1	0.77	t/m	4.49	m	3.45	t
	CB (200)	0.29	t/m2	8.52	m2	2.50	t
						7.05	t
1st floor 5	side walk	0.35	t/m2			0.35	t/m2
(B/C, C/D)							
1st floor 6	side walk	0.35	t/m2	3.15	m2	1.10	t
(C axis)	FB-1	0.77	t/m	4.49	m	3.45	t
						4.55	t
1st floor 7	side walk	0.35	t/m2	1.58	m2	0.55	t
(D axis)	FB-1	0.77	t/m	4.49	m	3.45	t
						4.00	t
2nd floor 4	CB (200)	0.29	t/m2	3.15	m2	0.92	t
(A axis)	B-10	0.47	t/m	1.78	m	0.83	t
						1.75	t

Live Load

Y direction model (7 Frame)

position		unit weight	area,length	load
roof 1	roof	20 kg/m2	11.64 m	0.2328 t
(tip of B-2)	(exclude beam self-weight)			
roof 2	roof	20 kg/m2	23.28 m2	0.466 t
	(exclude beam self-weight)			
2nd floor 1				
(A/B)	office	0.25 t/m2	1.775 m	0.444 t/m
				0.444 t/m
2nd floor 2	bridge walk	0.18 t/m2	2.24375 m2	0.404 t
(B axis)				
				0.404 t
2nd floor 3	stairs	0.18 t/m	2 m	0.360 t
(tip of CB-10)	bridge walk	0.18 t/m2	2.24375 m2	0.404 t
				0.764 t
1st floor 1				
(tip of CB)	side walk	0.18 t/m2	1.775 m	0.320 t/m
				0.320 t/m
1st floor 2	office	0.25 t/m2		0.25 t/m2
(A/B)				
1st floor 3	office	0.25 t/m2	1.58 m2	0.39 t
(A axis)				
				0.39 t

Live Load

Y direction model (7 Frame)

position		unit weight		area,length		load	
1st floor 4	office	0.25	t/m2	1.58	m2	0.39	t
(B axis)	side walk	0.35	t/m2	1.58	m2	0.55	t
						0.95	t
1st floor 5 (B/C, C/D)	side walk	0.35	t/m2			0.35	t/m2
1st floor 6 (C axis)	side walk	0.35	t/m2	3.15	m2	1.10	t
						1.10	t
1st floor 7 (D axis)	side walk	0.35	t/m2	1.58	m2	0.55	t
						0.55	t

Dead Load

	A	B	C	D
RF	5.38	5.11	2.67	2.96
2F	8.65	9.41	1.42	1.42

Live Load

	A	B	C	D
RF	0.98	0.89	0.87	1
2F	1.2	2.6	0	0

Each floor weight for seismic

hight		A	B	C	D
7.85	RF	6.4	6.0	3.5	4.0
5.45	2F	9.9	12.0	1.4	1.4
wh		103.61	112.55	35.53	38.83

Total weight for seismic

	A	B	C	D
RF	6.4	6.0	3.5	4.0
2F	16.2	18.0	5.0	5.4

Total seismic load

A	B	C	D
2.4	2.6	0.7	0.8

Each seismic load

	A	B	C	D
RF	1.1	1.1	0.6	0.6
2F	1.2	1.5	0.2	0.2

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Loads	Date	July-02	Page	20 / 78

Dead Load

Y direction model (8 Frame)

position		unit weight	area,length	load
roof 1	roof	45 kg/m2	11.64 m	0.52 t
(tip of B-2)	(exclude beam self-weight)			
roof 2	roof	45 kg/m2	23.28 m2	1.05 t
	(exclude beam self-weight)			
roof bottom	B-5	0.468 t/m	1.775 m	0.83 t
(A,B axis)				
2nd floor 1	CB (200)	0.293 t/m2	1.75 m	0.513 t/m
(A/B)	office	0.425 t/m2	1.775 m	0.754 t/m
				1.267 t/m
2nd floor 2	bridge walk	0.05 t/m2	2.24375 m2	0.112 t
(B axis)	CB (200)	0.293 t/m2	3.150625 m2	0.923133 t
	B-10	0.468 t/m	1.775 m	0.8307 t
				1.866 t
2nd floor 3	bridge walk	0.05 t/m2	3.69375 m2	0.185 t
(B/C)				
	bridge walk	0.05 t/m2	0.5 m	0.025 t/m
2nd floor 4	bridge walk	0.05 t/m2	3 m2	0.150 t
(C axis)	CB-10	0.216 t/m	1.3 m	0.281 t
				0.431 t
2nd floor 5	bridge walk	0.05 t/m2	1.5 m2	0.075 t
(D axis)	CB-10	0.216 t/m	1.3 m	0.281 t
				0.36 t

Dead Load

Y direction model (8 Frame)

position		unit weight		area,length		load	
1st floor 1	wall	0.5	t/m2	0.9	m	0.450	t/m
(tip of CB)	side walk	0.35	t/m2	1.775	m	0.621	t/m
						1.071	t/m
1st floor 2	office	0.35	t/m2			0.35	t/m2
(A/B)							
	CB	0.29	t/m2	5.40	m	1.58	t/m
						1.58	t/m
1st floor 3	office	0.35	t/m2	1.58	m2	0.55	t
(A axis)	FB-1	0.77	t/m	4.49	m	3.45	t
	CB (200)	0.29	t/m2	8.52	m2	2.50	t
						6.49	t
1st floor 4	office	0.35	t/m2	1.58	m2	0.55	t
(B axis)	side walk	0.35	t/m2	1.58	m2	0.55	t
	FB-1	0.77	t/m	4.49	m	3.45	t
	CB (200)	0.29	t/m2	8.52	m2	2.50	t
						7.05	t
1st floor 5	side walk	0.35	t/m2			0.35	t/m2
(B/C, C/D)							
1st floor 6	side walk	0.35	t/m2	3.15	m2	1.10	t
(C axis)	FB-1	0.77	t/m	4.49	m	3.45	t
						4.55	t
1st floor 7	side walk	0.35	t/m2	1.58	m2	0.55	t
(D axis)	FB-1	0.77	t/m	4.49	m	3.45	t
						4.00	t
2nd floor 4	CB (200)	0.29	t/m2	3.15	m2	0.92	
(A axis)	B-10	0.47	t/m	1.78	m	0.83	
						1.75	

Live Load

Y direction model (8 Frame)

position		unit weight	area,length	load
roof 1 (tip of B-2)	roof	20 kg/m2	11.64 m	0.23 t
roof 2	roof	20 kg/m2	23.28 m2	0.47 t
2nd floor 1 (A/B)	office	0.25 t/m2	1.775 m	0.444 t/m
				0.444 t/m
2nd floor 2 (B axis)	bridge walk	0.18 t/m2	2.24375 m2	0.404 t
				0.404 t
2nd floor 3 (B/C)	bridge walk	0.18 t/m2	3.69375 m2	0.665 t
	bridge walk	0.05 t/m2	0.5 m	0.025 t/m
2nd floor 4 (C axis)	bridge walk	0.18 t/m2	3 m2	0.540 t
				0.540 t
2nd floor 5 (D axis)	bridge walk	0.18 t/m2	1.5 m2	0.270 t
				0.27 t
2nd floor 6 (C/D)	bridge walk	0.05 t/m2	0.5 m	0.025 t/m

Live Load

Y direction model (8 Frame)

position		unit weight	area,length	load
1st floor 1				
(along of CB)	side walk	0.35 t/m2	1.775 m	0.621 t/m
				0.621 t/m
1st floor 2	office	25.00 t/m2		25.00 t/m2
(A/B)				
1st floor 3	office	0.25 t/m2	1.58 m2	0.39 t
(A axis)				
				0.39 t
1st floor 4	office	0.25 t/m2	1.58 m2	0.39 t
(B axis)	side walk	0.35 t/m2	1.58 m2	0.55 t
				0.95 t
1st floor 5	side walk	0.35 t/m2		0.35 t/m2
(B/C, C/D)				
1st floor 6	side walk	0.35 t/m2	3.15 m2	1.10 t
(C axis)				
				1.10 t
1st floor 7	side walk	0.35 t/m2	1.58 m2	0.55 t
(D axis)				
				0.55 t

Dead Load

	A	B	C	D
RF	5.4	5.09	2.67	2.96
2F	8.57	10.15	3.6	2.57

Live Load

	A	B	C	D
RF	1	0.88	0.87	1
2F	1.25	2.5	0.75	0.36

Each floor weight for seismic

hight		A	B	C	D
7.85	RF	6.4	6.0	3.5	4.0
5.45	2F	9.8	12.7	4.4	2.9
wh		103.76	115.81	51.50	47.05

Total weight for seismic

	A	B	C	D
RF	6.4	6.0	3.5	4.0
2F	16.2	18.6	7.9	6.9

Total seismic load

A	B	C	D
2.4	2.7	1.1	1.0

Each seismic load

	A	B	C	D
RF	1.1	1.1	0.6	0.7
2F	1.2	1.6	0.5	0.3

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: **Vertical reactions**	Date	July-02	Page	25 / 78

Reaction of each point

	1	2	3	4	5	6	7	8	9
A	24.1	23.0	35.8	39.0	39.0	39.0	35.8	38.4	24.1
	26.2	11.3	3.8	6.4	6.4	6.4	3.8	11.8	26.2
	50.3	**34.3**	**39.6**	**45.4**	**45.4**	**45.4**	**39.6**	**50.2**	**50.3**
B	24.0	30.6	16.5	36.6	38.4	37.7	25.6	40.6	24.1
	26.0	30.8	3.9	8.6	8.4	8.6	4.2	32.7	26.2
	50.0	**61.4**	**20.4**	**45.2**	**46.8**	**46.3**	**29.8**	**73.3**	**50.3**
C	24.1	40.6	25.6	37.7	38.4	36.6	16.5	30.6	24.0
	26.2	32.7	4.2	8.6	8.4	8.6	3.9	30.8	26.0
	50.3	**73.3**	**29.8**	**46.3**	**46.8**	**45.2**	**20.4**	**61.4**	**50.0**
D	24.1	38.4	35.8	39.1	39.1	39.1	19.3	23.0	24.1
	26.2	11.8	3.8	7.0	7.0	7.0	3.1	11.3	26.2
	50.3	**50.2**	**39.6**	**46.1**	**46.1**	**46.1**	**22.4**	**34.3**	**50.3**

upper line DL
middle line LL
lower line TL=DL+LL

Total dead load = 1128.4 ton

Seismic load = 164.03 ton

NIPPON KOEI CO.,LTD.

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: **Vertical reactions**	Date	July-02	Page	26 / 78

Number of pile

	1	2	3	4	5	6	7	8	9
A	1-40	1-40	1-40	1-40	1-40	1-40	1-40	1-40	1-40
B	1-40	1-45	1-40	1-40	1-40	1-40	1-40	2-40	1-40
C	1-40	2-40	1-40	1-40	1-40	1-40	1-40	1-45	1-40
D	1-40	1-40	1-40	1-40	1-40	1-40	1-40	1-40	1-40

Pile bearing strength

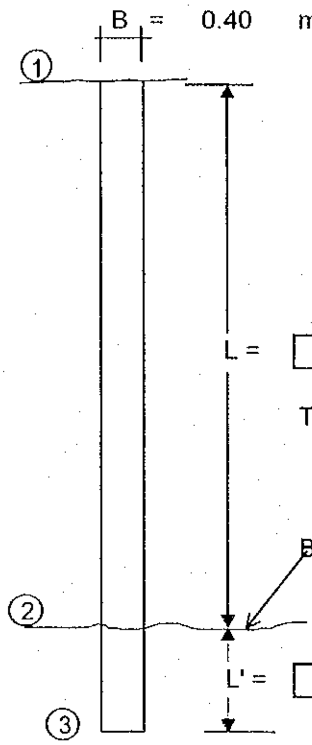
diameter (cm)	strength (t)
40	58.4
45	74.0

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Pile design	Date	July-02	Page	27 / 78

BEARING CAPACITY OF SQUARE DRIVEN CONCRETE PILES

B = 0.40 m 20xB = 8.00 m

Side dimension = 0.40 m



	Properties In Top Soil:		Properties In Bearing Stratum:	
N of hits by SPT =	8	N	50	N
$\phi = \sqrt{12N} + 20$				
Ø =	29.80	°	42.39	°
γ =	1.430	ton/m³	1.840	ton/m³
Nq =	21		145	
δ =	22.35	°	31.79	°
KHc =	1		1	
Factor of safety (F.S.) =			3	

L = 4 m

Top Soil

L' = 1 m

Pressure due to soil:

P1 = 0.00 ton/m³
P2 = 5.72 ton/m³
P3 = 7.56 ton/m³

Qult = Qt + Qf

- Tip Resistance (Qt)

Qp = PtxNqxAt Pt = P3 = 7.56 ton/m²

Pile Area = 0.160 m² **Qp = 175.39 ton**

- Friction Capacity (Qf) Consider Friction ? N Y/N

Qf = Σ(KHc)xPoxTAN(δ)xS

S1 = 2BLD S1 = 3.20 m² Po1 = (P1 + P2)/2

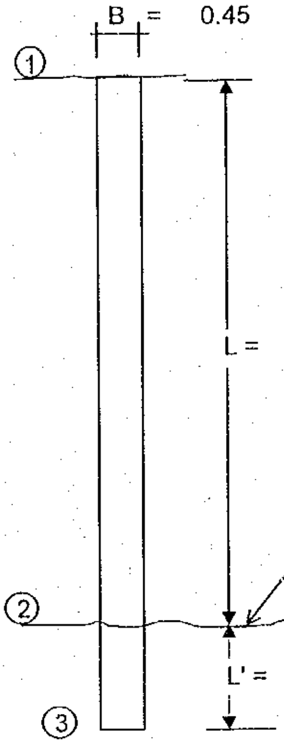
S2 = 2BL'D S2 = 0.80 m² Po2 = (P2 + P3)/2

Po1 = 2.860 ton/mt² Po2 = 6.640 ton/m² **Qf = 0.00 ton**

Qult = Qt + Qf Qult = 175.39 ton

Qadm = Qult / F.S. **Qadm = 58.46 ton**

BEARING CAPACITY OF SQUARE DRIVEN CONCRETE PILES



B = 0.45 m   20xB = 9.00 m

Side dimension = 0.45 m

	Properties In Top Soil:		Properties In Bearing Stratum:	
N of hits by SPT =	8	N	50	N
$\phi = \sqrt{12N} + 20$				
Ø =	29.80	°	44.49	°
γ =	1.430	ton/m³	1.840	ton/m³
Nq =	21		145	
δ =	22.35	°	33.37	°
KHc =	1		1	
Factor of safety (F.S.) =			3	

L = 4 m

Top Soil

Bearing Layer

L' = 1 m

Pressure due to soil:

P1 = 0.00 ton/m³
P2 = 5.72 ton/m³
P3 = 7.56 ton/m³

Qult = Qt + Qf

- Tip Resistance (Qt)

Qp = PtxNqxAt   Pt = P3 = 7.56 ton/m²

Pile Area = 0.203 m²   **Qp = 222.04 ton**

- Friction Capacity (Qf)   Consider Friction ? N Y/N

Qf = Σ(KHc)xPoxTAN(δ)xS

S1 = 2BLD   S1 = 3.60 m²   Po1 = (P1 + P2)/2

S2 = 2BL'D   S2 = 0.90 m²   Po2 = (P2 + P3)/2

Po1 = 2.862 ton/mt²   Po2 = 6.642 ton/m²   **Qf = 0.00 ton**

Qult = Qt + Qf   Qult = 222.04 ton

Qadm = Qult / F.S.   **Qadm = 74.01 ton**

PILE SEISMIC STRESS

Based on chung equation

mark	size (cm)	length (m)	I (cm4)	kh (kg/cm3)	(cm-1) (cm-1)	L	I 3
P1	40	5	2.13E+05	3.169	0.00472	2.4	0.022
P2	45	5	3.42E+05	2.901	0.00422	2.1	0.026

	N of piles	nI 3	Q (t)	Q (t/n)	y0 (cm)	M0 (t m)	Mmax (t m)	lm (m)
	36	0.806	154.2	4.3	0.2	4.5	0.9	3.3
	2	0.052	9.9	4.9	0.2	5.8	1.2	3.7
Σ=	38	0.858	164.0					

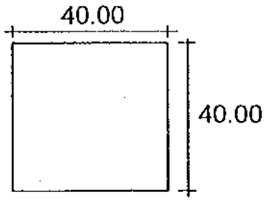
Young's Modulus, E = 3.00E+05 kg/cm2   N = 9

Seismic force, Q = 164.03 t   E0 = 63

40 x 40		
L (cm)	M (t m)	Q (t)
0	4.5	4.3
-50	2.6	3.3
-100	1.2	2.4
-150	0.2	1.6
-200	-0.4	1.0
-250	-0.8	0.5
-300	-0.9	0.2
-350	-0.9	-0.1
-400	-0.9	-0.2
-450	-0.7	-0.3
-500	-0.6	-0.3
-550	-0.5	-0.3
-600	-0.3	-0.2
-650	-0.2	-0.2
-700	-0.1	-0.2
-750	-0.1	-0.1

45 x 45		
L (cm)	M (t m)	Q (t)
0	5.8	4.9
-50	3.6	3.9
-100	1.9	2.9
-150	0.7	2.1
-200	-0.2	1.4
-250	-0.8	0.8
-300	-1.1	0.4
-350	-1.2	0.1
-400	-1.2	-0.1
-450	-1.1	-0.2
-500	-1.0	-0.3
-550	-0.8	-0.3
-600	-0.6	-0.3
-650	-0.5	-0.3
-700	-0.4	-0.3
-750	-0.2	-0.2

PILE DESIGN



f'c = 350.00 kg/cm²

At release, f'c = 280.00 kg/cm²

Section Area = 1600 cm²

Section Inertia = 213333.33 cm4

- Prestressing Force

Cables.
Uncoated seven wire stress relieved strands.
ϕ = 12.7 mm. Area = 92.90 mm.

Ultimate Strenght, Fpu = 17,500 kg/cm²

\# of strands to use = 6

Prestressing force, Po = 0.70 Fpu A = 68.28 ton

Allowable stress

At service
0.4 f'c = 140 kg/cm²

At release
0.4 f'c = 112 kg/cm²

a) Stress at release

Axial Load, Pa = 0.00 ton

Excentricity, e = 0.00 cm

Moment, Ma = 0.00 ton-m

c = 20.00 cm

(Pa+Po) / A ± (Po e c / I + Ma c / I)

42.68 ± 0.00

Stress 1 = 42.68 kg/cm² < 0.4f'c o.k!!!

Stress 2 = 42.68 kg/cm² < 0.4f'c o.k!!!

b) Stress at Service

Axial Load, Pa = 58.40 ton

Excentricity, e = 0.00 cm

Moment, Ma = 4.54 ton-m

Prestress force, Pe = 58.04 cm (15% losses)

(Pa+Pe) / A ± (Pe e c / I + Ma c / I)

72.77 ± 42.56

Stress 1 = 115.33 kg/cm² < 0.4f'c o.k!!!

Stress 2 = 30.22 kg/cm² < 0.4f'c o.k!!!

PILE DESIGN

45.00 × 45.00

f'c = 350.00 kg/cm²

At release, f'c = 280.00 kg/cm²

Section Area = 2025 cm²

Section Inertia = 341718.8 cm4

- Prestressing Force

Cables.
Uncoated seven wire stress relieved strands.
ϕ = 12.7 mm. Area = 92.90 mm.

Ultimate Strenght, Fpu = 17,500 kg/cm²

# of strands to use = 6

Prestressing force, Po = 0.70 Fpu A = 68.28 ton

Allowable stress

At service
0.4 f'c = 140 kg/cm²

At release
0.4 f'c = 112 kg/cm²

a) Stress at release

Axial Load, Pa = 0.00 ton

Excentricity, e = 0.00 cm

Moment, Ma = 0.00 ton-m

c = 22.50 cm

(Pa+Po) / A ± (Po e c / I + Ma c / I)

33.72 ± 0.00

Stress 1 = 33.72 kg/cm² < 0.4f'c o.k!!!

Stress 2 = 33.72 kg/cm² < 0.4f'c o.k!!!

b) Stress at Service

Axial Load, Pa = 74.00 ton

Excentricity, e = 0.00 cm

Moment, Ma = 5.83 ton-m

Prestress force, Pe = 58.04 cm (15% losses)

(Pa+Pe) / A ± (Pe e c / I + Ma c / I)

65.20 ± 38.39

Stress 1 = 103.60 kg/cm² < 0.4f'c o.k!!!

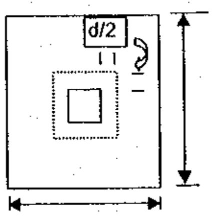
Stress 2 = 26.81 kg/cm² < 0.4f'c o.k!!!

FOOTING DESIGN

Design for foundation F-3

a) Punching

For Column



ϕ= 0.85

Dead load P_D =	30.60	ton
Live load P_L=	30.80	ton
Seismic P_S =	9.18	ton
1.4D + 1.7L =	95.20	ton
0.75(1.4D + 1.7L + 1.87S) =	84.27	ton
Pu=	95.20	ton
d =	66.00	cm
Column width =	45.00	cm
Column base =	45.00	cm
bo=4(c+d)=	444	cm

Th = 80 cm

f'c = 210 kg/cm²
20.59 Mpa

Concrete shear strength, Vc ACI 11.12

βc = 1.000

αs = 40

$Vc1 = \phi(1+2/\beta c)\sqrt{f'c}\ b_o d/6 =$ 576.49 ton

$Vc2 = \phi(2+\alpha_s d/b_o)\sqrt{f'c}\ b_o d/12 =$ 249.29 ton

$Vc3 = \phi(1/3)\sqrt{f'c}\ b_o d =$ 384.33

Vc = 249.29 > 95.20 o.k!!!

For Pile

ϕ= 0.85

Dead load P_D =	17.84	ton/pile
Live load P_L=	15.40	ton/pile
Carga sismica P_S =	4.59	ton/pile
1.4D + 1.7L =	51.16	ton
0.75(1.4D + 1.7L + 1.87S) =	44.80	ton
Pu=	51.16	ton
d =	33.73	cm
Pile width =	40.00	cm
Pile base =	40.00	cm
bo=4(c+d)=	294.92	cm

Distance from edge = 43.00 cm

βc = 1 αs = 20

$Vc1 = \phi(1+2/\beta c)\sqrt{f'c}\ b_o d/6 =$ 195.70 ton

$Vc2 = \phi(2+\alpha_s d/b_o)\sqrt{f'c}\ b_o d/12 =$ 232.13 ton

$Vc3 = \phi(1/3)\sqrt{f'c}\ b_o d =$ 130.47

Vc = 130.47 > 51.16 o.k!!!

b) Shear Reinforcement

Base = 126 cm fy = 4200 kg/cm²

d = 70.00 cm

$V_c = (1/6)\sqrt{f'c}\ b_o d =$ 68.04 ton

$V_n = V_c + V_s$ $V_s = V_u/\phi - V_c$ $\phi = 0.85$

V_u = 51.16 ton

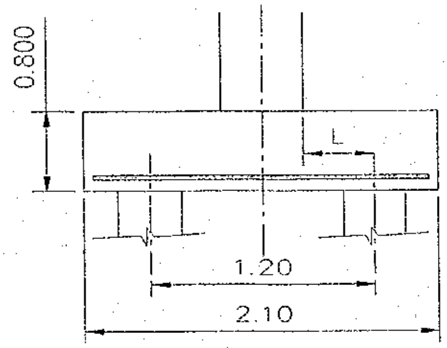
V_s = (7,861.1) kg

Bar denomination = 4 Bar area = 1.27 cm²

\# of legs = 2 Spacing, S_{req} = -94.75 cm

Use 2 legs of N 4 @ 30 cm

c) Reinforcing Steel



fy = 4200 kg/cm²

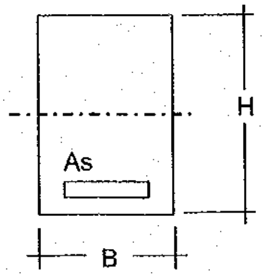
Moment generated by pile reaction

M = Pp x L

L = 0.60 m

M1 = 1.4D + 1.7L = 30.69 ton-m

M2 =0.75(1.4D + 1.7L + 1.87S) = 26.88 ton-m



H = 80.00 cm

b = 126.00 cm

f'c = 280 kg/cm²

fy = 4200 kg/cm²

Force for design: Mu z-z = 30.69 ton-m

d = 62.78 cm　　Clear cover = 5.00 cm

fy²/1.7bf'c As² - fyd As + Mu/ϕ =　ϕ = 0.90

294.12 As² 263666 As 3410414.9 = 0　　As = 13.13 cm²

Asmin = (4/3)Asreq :
(4/3)Asreq = 17.50 cm²
(14/fy) b d = 26.37 cm²　　Asmin = 17.50 cm²

Asmax : ρb = 0.0459　Asmax (0.75ρb) = 272.59 cm²

As = 17.50 cm²　o.k!! As < Amax

Bar denomination, N = 6　　Bar Area (Av) = 2.85 cm²

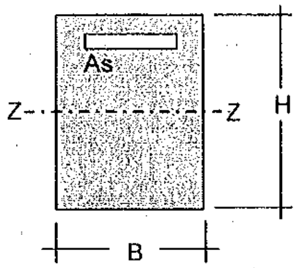
Number of bars = 6.14　Use 7 - N6

Pitch = 18.59 cm　　**6 @ 18.5 cm**

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Foundation beam design	Date	July-02	Page	35 / 78

FOUNDATION BEAM FB-1 X-dir

BEAM DESIGN



H = 80.00 cm

b = 40.00 cm

f'c = 210 kg/cm²

fy = 4200 kg/cm²

Forces and Moments, from Structural Analysis (ton , m) :

TYPE O LOAD	MOMENT Mz-z
Dead Loa	11.67
Live Load	1.74
Seismic x	2.30
Seismic y	0.00

COMBINATION	Mu z-z
C1=1.4 DL+1.7 LL	19.30
.75(1.4DL+1.7LL+1.8	17.70
.75(1.4DL+1.7LL+1.8	14.47

Force for design: Mu z-z = 19.30 ton-m

d = 72.46 cm Clear cover = 5.00 cm

fy²/1.7bf'c As² - fyd As + Mu/f f = 0.90

1235.29 As²304332 2144444 = 0 As = 7.26 cm²

Asmin = (4/3)Asreq :

(4/3)Asreq = 9.68 cm²
(14/fy) b d = 9.66 cm² } Asmin = 9.66 cm²

Asmax : rb = 0.0345 Asmax (0.75rb) = 74.91 cm²

As = 9.66 cm² o.k!! As < Amax

Bar denomination, N = 8 Bar Area (Av) = 5.07 cm²

Number of bars = 1.91 **Use 2 - N 8** 4-D25

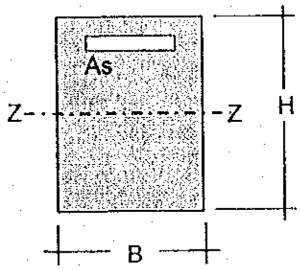
Minimun Base Required:

Max. bars per layer = 4 Minimum Base = 32.86 cm

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Foundation beam design	Date	July-02	Page	36 / 78

FOUNDATION BEAM **FB-1** Y-dir

BEAM DESIGN



H = 80.00 cm

b = 40.00 cm

f'c = 210 kg/cm²

fy = 4200 kg/cm²

Forces and Moments, from Structural Analysis (ton , m) :

TYPEO LOAD	MOMENT Mz-z
Dead Loa	11.20
Live Load	13.52
Seismic x	2.39
Seismic y	0.00

COMBINATION	Mu z-z
C1=1.4 DL+1.7 LL	38.66
.75(1.4DL+1.7LL+1.8	32.35
.75(1.4DL+1.7LL+1.8	29.00

Force for design: Mu z-z = 38.66 ton-m

d = 72.46 cm Clear cover = 5.00 cm

fy²/1.7bf'c As² - fyd As + Mu/f f = 0.90

1235.29 As²304332 4295556 = 0 As = 15.03 cm²

Asmin = (4/3)Asreq :

(4/3)Asreq = 20.04 cm²
(14/fy) b d = 9.66 cm² } Asmin = 9.66 cm²

Asmax : rb = 0.0345 Asmax (0.75rb) = 74.91 cm²

As = 15.03 cm² o.k!! As < Amax

Bar denomination, N = 8 Bar Area (Av) = 5.07 cm²

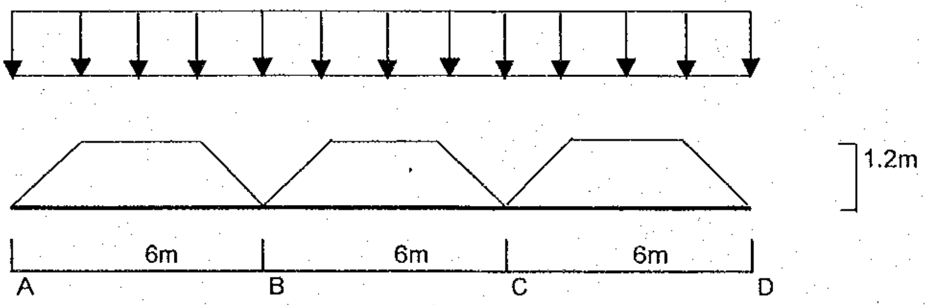
Number of bars = 2.97 **Use3 - N 8** 4-D25

Minimun Base Required:

Max. bars per layer = 4 Minimum Base = 32.86 cm

FB-2

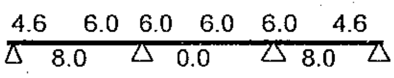
Load Condition



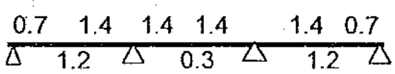
			for trapezoid weight	distribution weight		
DL	0.35t/m2					
		A/B, C/D		self weight	0.50	t/m
				CB (200)	1.60	t/m
				roof slab	0.48	t/m
					2.58	t/m
		B/C		self weight	0.50	t/m
LL	0.35t/m2					
		A/B, C/D		roof slab	0.12	t/m

Stress Result

DL



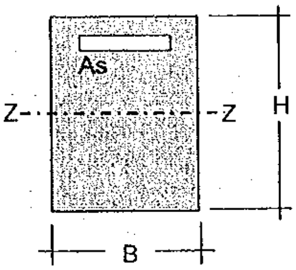
LL



PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.	Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.	Checked by	A.MORIOKA
SUBJECT: Foundation beam design	Date July-02	Page	138 /78

FOUNDATION BEAM FB-2

BEAM DESIGN



H = 65.00 cm

b = 30.00 cm

f'c = 210 kg/cm²

fy = 4200 kg/cm²

Forces and Moments, from Structural Analysis (ton , m) :

TYPE O LOAD	MOMENT Mz-z
Dead Loa	8.00
Live Load	1.20
Seismic x	0.00
Seismic y	0.00

COMBINATION	Mu z-z
C1=1.4 DL+1.7 LL	13.24
.75(1.4DL+1.7LL+1.8	9.93
.75(1.4DL+1.7LL+1.8	9.93

Force for design: Mu z-z = 13.24 ton-m

d = 57.46 cm   Clear cover = 5.00 cm

$fy^2/1.7bf'c\ As^2$ - fyd As + Mu/f   f = 0.90

1647.06 As²241332   1471111 = 0   As = 6.37 cm²

Asmin = (4/3)Asreq :

(4/3)Asreq = 8.50 cm²
(14/fy) b d = 5.75 cm²   Asmin = 5.75 cm²

Asmax : rb = 0.0345   Asmax (0.75rb) = 44.55 cm²

As = 6.37 cm² o.k!! As < Amax

Bar denomination, N = 8   Bar Area (Av) = 5.07 cm²

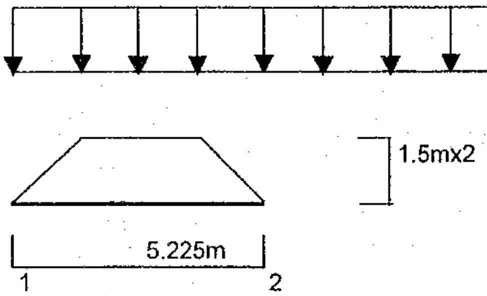
Number of bars = 1.26   **Use2 - N 8**   3-D25

Minimun Base Required:

Max. bars per layer = 3   Minimum Base = 27.78 cm

FB-3

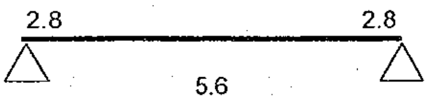
Load Condition



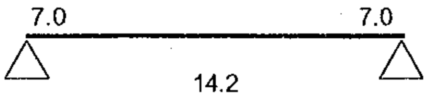
	for trapezoid weight		distribution weight	
DL	0.60t/m2	self weight	0.58	t/m
LL	2.00t/m2			

Stress Result

DL

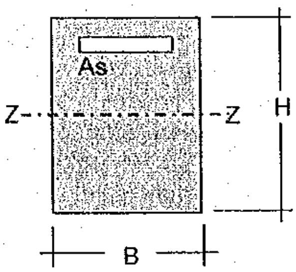


LL



FOUNDATION BEAM **FB-1**

BEAM DESIGN



H = 80.00 cm

b = 40.00 cm

f'c = 210 kg/cm²

fy = 4200 kg/cm²

Forces and Moments, from Structural Analysis (ton , m) :

TYPE OF LOAD	MOMENT Mz-z
Dead Loa	5.60
Live Load	14.20
Seismic x	0.00
Seismic y	0.00

COMBINATION	Mu z-z
C1=1.4 DL+1.7 LL	31.98
.75(1.4DL+1.7LL+1.8	23.99
.75(1.4DL+1.7LL+1.8	23.99

Force for design: Mu z-z = 31.98 ton-m

d = 72.46 cm Clear cover = 5.00 cm

$fy^2/1.7bf'c\ As^2$ - fyd As + Mu/f f = 0.90

1235.29 $As^2$304332 3553333 = 0 As = 12.29 cm²

Asmin = (4/3)Asreq :

(4/3)Asreq = 16.39 cm²
(14/fy) b d = 9.66 cm² } Asmin = 9.66 cm²

Asmax : rb = 0.0345 Asmax (0.75rb) = 74.91 cm²

As = 12.29 cm² o.k!! As < Amax

Bar denomination, N = 8 Bar Area (Av) = 5.07 cm²

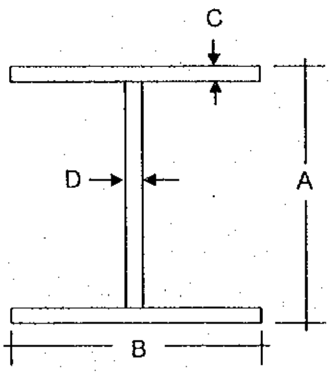
Number of bars = 2.43 **Use3 - N 8** 4-D25

Minimun Base Required:

Max. bars per layer = 4 Minimum Base = 32.86 cm

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Steel member design	Date	July-02	Page	41 / 78

Roof Beam **B1**



Beam type = **W10X22**

A = 10.17 in

B = 5.75 in

C = 0.36 in

D = 0.240 in

Area = 6.490 in^2 I = 118.00 in4

Yc = 5.085 in S = 23.21 in^3

Pd = 0.90 ton Md = 0.70 ton-m

PL = 0.40 ton ML = 0.30 ton-m

PS = 0.40 ton MS = 1.10 ton-m

P/A(d+L) 31.05

P/A(d+L+s) 30.45

Md+ L/S = 262.97

Ms+d+L/S= 414.18

} 444.63 kg/cm^2

Fy = 36 ksi

0.6 Fy = 1512.00 kg/cm^2 **o.k.!!**

- Shear

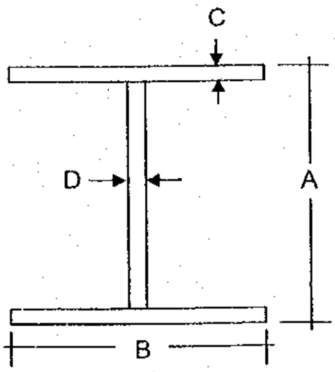
Max. Shear = 700.0 kg

Fv = V / (h tw) = 44.45 kg/cm^2

0.4 Fy = 1008.00 kg/cm^2 **o.k.!!**

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Steel member design	Date	July-02	Page	42 / 78

Roof Beam **B2**



Beam type = **W12X40**

A = 11.94 in

B = 8.01 in

C = 0.52 in

D = 0.300 in

Area = 11.800 in²

Yc = 5.970 in

I = 310.00 in4

S = 51.93 in³

Pd = 1.00 ton

PL = 0.30 ton

PS = 0.10 ton

Md = 1.80 ton-m from analysis

ML = 0.20 ton-m

MS = 0.00 ton-m

P/A(d+L) 17.08

P/A(d+L+s) 13.79

Md+ L/S = 235.04

Ms+d+L/S= 176.28

Fy = 36 ksi

252.12 kg/cm²

0.6 Fy = 1512.00 kg/cm² **o.k.!!**

- Shear

Max. Shear = 900.0 kg

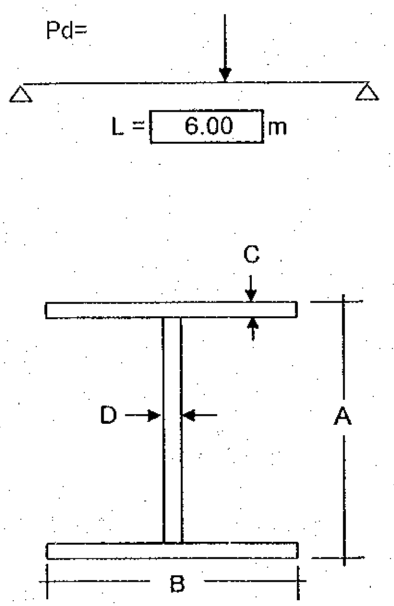
Fv = V / (h tw) = 38.94 kg/cm²

0.4 Fy = 1008.00 kg/cm² **o.k.!!**

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE	
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA	
SUBJECT: Steel member design	Date	July-02	Page	43	/ 78

Roof Beam B3

DL= 45 kg/m2
LL= 20 kg/m2
LLd= 0 kg/m2
Tributary Width = 3.88 m



Pd= 523.8 kg
Wd =selfw. = 27.00 kg/m

PL= 232.8 kg
PLd= 0 kg

Beam type = **W8x18**

A = 8.14 in
B = 5.25 in
C = 0.33 in
D = 0.230 in

Area = 5.260 in^2 | I = 61.90 in4
Yc = 4.070 in | S = 15.21 in^3
Fy = 36 ksi | Md = 0.91 ton-m
ML = 0.35 ton-m

Md / S = 364.00
ML / S = 140.11
} 504.12 kg/cm^2
0.6 Fy = 1512.0 kg/cm^2 **o.k.!!**

- Shear

Max. Shear = 459.3 kg

Fv = V / (h tw) = 38.03 kg/cm^2

0.4 Fy = 1008.00 kg/cm^2 **o.k.!!**

- Deflection

d admi.= L/360 = 1.67 cm

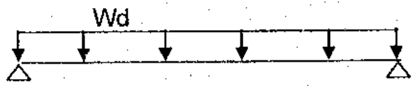
E = 2.0E+10 kg/m^2

d dead = 0.54 cm
d Total = 0.54 cm o.k!!
d live = 0.00 cm

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE	
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA	
SUBJECT: Steel member design	Date	July-02	Page	44	/ 78

Roof Beam B4

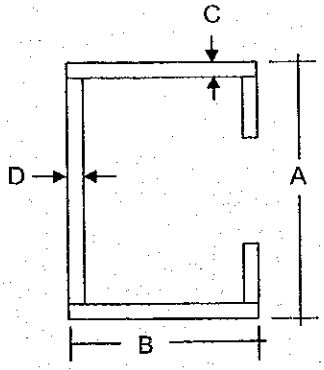
DL= 30 kg/m2
LL= 20 kg/m2
LLd= 0 kg/m2
Tributary Width = 3.00 m



L = 3.88 m

Wd1 = 90.0 kg/m
Wd2 =selfw. = 8.00 kg/m
Wd = 98.00 kg/m

WL = 60.0 kg/m



Beam type = **C4x5.4**

A = 4 in

B = 1.584 in

C = 0.296 in

D = 0.184 in

Area = 1.590 in²

Yc = 2.000 in

Fy = 36 ksi

I = 3.85 in4

S = 1.93 in³

Md = 0.18 ton-m

ML = 0.11 ton-m

Md / S = 584.61
ML / S = 357.93
} 942.54 kg/cm²

0.6 Fy = 1512.00 kg/cm² **o.k.!!**

- Shear

Max. Shear = 306.5 kg

Fv = V / (h tw) = 64.55 kg/cm²

0.4 Fy = 1008.00 kg/cm² **o.k.!!**

- Deflection

d admi.= L/360 = 1.08 cm

E = 2.0E+10 kg/m²

d dead = 0.88 cm
d Total = 0.88 cm o.k!!
d live = 0.00 cm

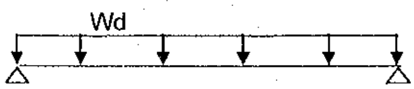
PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Steel member design	Date	July-02	Page	45 / 78

Polin

Tributary Width = 1.00 m

Dead Load = 20 kg/m²　　Wd = 20.0 kg/m

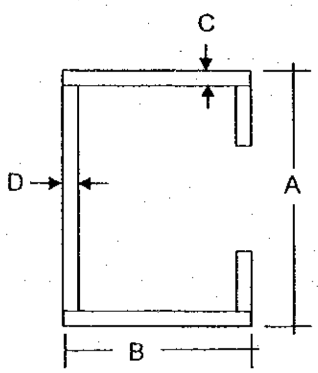
Live load = 20 kg/m²　　WL = 20.0 kg/m



L = 3.00 m

Wd1 = 20.0 kg/m
Wd2 = selfweight. = 2.70 kg/m
Wd = 22.70 kg/m

WL = 20.0 kg/m



Beam type = **C4x3/64**

A = 4 in

B = 2 in

C = 0.0469 in

D = 0.0469 in

Area = 0.406 in²　　I = 1.06 in4

Yc = 2.000 in　　S = 0.53 in³

Fy = 36 ksi　　Md = 0.03 ton-m

ML = 0.02 ton-m

Md / S = 294.04 }　553.10 kg/cm²

ML / S = 259.06 }　0.6 Fy = 1512.00 kg/cm²　**o.k.!!**

- Deflection

d admi.= L/360 = 0.83 cm

E = 2.0E+10 kg/m²

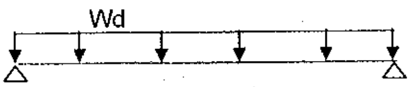
d dead = 0.27 cm

d Total = 0.50 cm o.k!!

d live = 0.23

2nd Beam B11

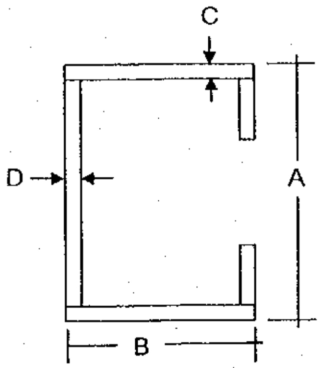
DL= 30 kg/m2
LL= 180 kg/m2
LLd= 60 kg/m2
Tributary Width = 0.50 m



L = 6.40 m

Wd1 = 15.0 kg/m
Wd2 =selfw. = 38.00 kg/m
Wd = 53.00 kg/m

WL = 90.0 kg/m



Beam type = **C10x25**

A = 10 in

B = 2.886 in

C = 0.436 in

D = 0.526 in

Area = 7.350 in²

Yc = 5.000 in

Fy = 36 ksi

I = 144.00 in4

S = 24.10 in³

Md = 0.27 ton-m

ML = 0.46 ton-m

Md / S = 68.71
ML / S = 116.68
} 185.39 kg/cm²
0.6 Fy = 1512.00 kg/cm² **o.k.!!**

- Shear

Max. Shear = 457.6 kg

Fv = V / (h tw) = 13.48 kg/cm²

0.4 Fy = 1008.00 kg/cm² **o.k.!!**

- Deflection

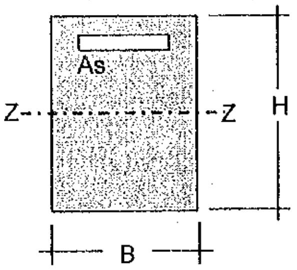
d admi.= L/360 = 1.78 cm

E = 2.0E+10 kg/m²

d dead = 0.09 cm
d Total = 0.15 cm o.k!!
d live = 0.05 cm

RF BEAM **B-5**

BEAM DESIGN



H = 65.00 cm

b = 30.00 cm

f'c = 280 kg/cm²

fy = 4200 kg/cm²

Forces and Moments, from Structural Analysis (ton , m) :

TYPE OF LOAD	MOMENT Mz-z
Dead Loa	1.30
Live Loa	0.10
Seismic	3.00
Seismic	0.00

COMBINATION	Mu z-z
C1=1.4 DL+1.7 LL	1.99
.75(1.4DL+1.7LL+1.	5.70
.75(1.4DL+1.7LL+1.	1.49

Force for design: Mu z-z = 5.70 ton-m

d = 57.46 cm Clear cover = 5.00 cm

fy²/1.7bf'c As² - fyd As + Mu f = 0.90

1235.29 As²41332 633333 = 0 As = 2.66 cm²

Asmin = (4/3)Asreq :

(4/3)Asreq = 3.55 cm²
(14/fy) b d = 5.75 cm² } Asmin = 3.55 cm²

Asmax : rb = 0.0459 Asmax (0.75rb) = 59.40 cm²

As = 3.55 cm² o.k!! As < Amax

Bar denomination, N = 8 Bar Area (Av) = 5.07 cm²

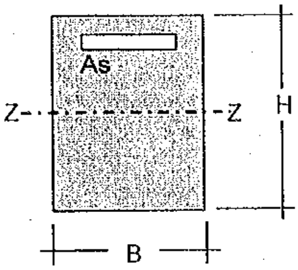
Number of bars = 0.70 **Use 1 - N 8** 3-D25

Minimun Base Required:

Max. bars per layer = 3 Minimum Base = 27.78 cm

2nd Beam B-10

BEAM DESIGN



H = 65.00 cm

b = 30.00 cm

f'c = 280 kg/cm²

fy = 4200 kg/cm²

Forces and Moments, from Structural Analysis (ton , m) :

TYPE O LOAD	MOMENT Mz-z
Dead Loa	4.30
Live Loa	1.50
Seismic	8.10
Seismic	0.00

COMBINATION	Mu z-z
C1=1.4 DL+1.7 LL	8.57
.75(1.4DL+1.7LL+1.	17.79
.75(1.4DL+1.7LL+1.	6.43

Force for design: Mu z-z = 17.80 ton-m

d = 57.46 cm   Clear cover = 5.00 cm

fy²/1.7bf'c As² - fyd As + Mu f = 0.90

1235.29 As² 241332 1977778 = 0   As = 8.57 cm²

Asmin = (4/3)Asreq :

(4/3)Asreq = 11.43 cm²
(14/fy) b d = 5.75 cm²   Asmin = 5.75 cm²

Asmax : rb = 0.0459   Asmax (0.75rb) = 59.40 cm²

As = 8.57 cm² o.k!! As < Amax

Bar denomination, N = 8   Bar Area (Av) = 5.07 cm²

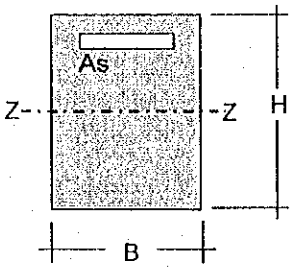
Number of bars = 1.69   **Use2 - N8**   4-D25

Minimun Base Required:

Max. bars per layer = 3   Minimum Base = 27.78 cm

Canti Beam CB-10

BEAM DESIGN



H = 30.00 cm

b = 30.00 cm

f'c = 280 kg/cm²

fy = 4200 kg/cm²

Forces and Moments, from Structural Analysis (ton , m) :

TYPE OF LOAD	MOMENT Mz-z
Dead Loa	0.39
Live Loa	0.75
Seismic	0.00
Seismic	0.00

COMBINATION	Mu z-z
C1=1.4 DL+1.7 LL	1.82
.75(1.4DL+1.7LL+1.	1.37
.75(1.4DL+1.7LL+1.	1.37

Force for design: Mu z-z = 1.82 ton-m

d = 22.46 cm Clear cover = 5.00 cm

$fy^2/1.7bf'c\ As^2$ - fyd As + Mu f = 0.90

1235.29 As² 94332 202222 = 0 As = 2.21 cm²

Asmin = (4/3)Asreq :

(4/3)Asreq = 2.94 cm²
(14/fy) b d = 2.25 cm² } Asmin = 2.25 cm²

Asmax : rb = 0.0459 Asmax (0.75rb) = 23.22 cm²

As = 2.25 cm² o.k!! As < Amax

Bar denomination, N = 8 Bar Area (Av) = 5.07 cm²

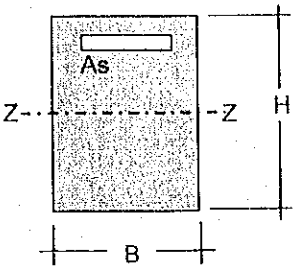
Number of bars = 0.44 **Use 1 - N 8** 2-D25

Minimun Base Required:

Max. bars per layer = 3 Minimum Base = 27.78 cm

2nd Beam B-12

BEAM DESIGN



H = 40.00 cm

b = 30.00 cm

f'c = 280 kg/cm²

fy = 4200 kg/cm²

Forces and Moments, from Structural Analysis (ton , m) :

TYPE OF LOAD	MOMENT Mz-z
Dead Loa	1.30
Live Loa	0.60
Seismic	1.60
Seismic	0.00

COMBINATION	Mu z-z
C1=1.4 DL+1.7 LL	2.84
.75(1.4DL+1.7LL+1.	4.37
.75(1.4DL+1.7LL+1.	2.13

Force for design: Mu z-z = 4.37 ton-m

d = 32.46 cm Clear cover = 5.00 cm

fy²/1.7bf'c As² - fyd As + Mu f = 0.90

1235.29 As² 136332 485556 = 0 As = 3.68 cm²

Asmin = (4/3)Asreq :

(4/3)Asreq = 4.91 cm²
(14/fy) b d = 3.25 cm² } Asmin = 3.25 cm²

Asmax : rb = 0.0459 Asmax (0.75rb) = 33.56 cm²

As = 3.68 cm² o.k!! As < Amax

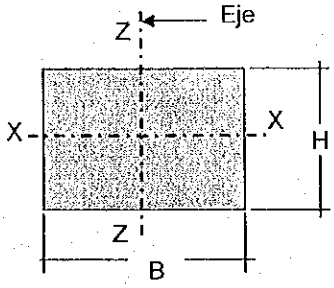
Bar denomination, N = 8 Bar Area (Av) = 5.07 cm²

Number of bars = 0.73 **Use 1 - N 8** 3-D25

Minimun Base Required:

Max. bars per layer = 3 Minimum Base = 27.78 cm

Column C1



H = 0.40 m

B = 0.40 m

f 'c = 280 kg/cm²

fy = 4200 kg/cm²

Area = 1,600 cm²

Inertia Z = 2.1E+05 cm^4

Inertia Y = 2.1E+05 cm^4

Forces and Moments

From Structural Analisis (ton , m) :

TYPE O LOAD	AXIAL P	MOMENT Mz-z	Mx-x	SHEAR Vx	Vz
Dead Loa	5.10	2.10	1.00	0.20	0.10
Live Loa	0.40	1.10	1.60	0.10	0.20
Seismic Loa	0.00	3.90	0.00	0.60	0.00
Seismic Loa	0.00	0.00	5.30	0.00	0.70

COMBINATI	Pu	Mu z-z	Mu x-x	Vu x	Vu z
C1	7.82	4.81	4.12	0.45	0.48
C2	5.87	10.28	---	1.34	---
C3	5.87	---	11.41	---	1.48

Forces for design.

Pu z = 5.87 ton   Pu x = 5.87 ton

Mu x-x = 11.41 ton-m   Mu z-z = 10.28 ton-m

Vu z = 1.34 ton   Vu x = 1.48 ton

C1 = 1.4 DL + 1.7 LL
C2 = 0.75(1.4DL + 1.7LL + 1.87SLy)
C3 = 0.75(1.4DL + 1.7LL + 1.87SLz)

Ortogonal Combination

MX = 100%EQX + 30%EQZ　　　MZ = 100%EQZ + 30%EQX

Mx = Mx + Mz(H/B)(1 - b) b = 0.65　　　MZ = Mz + Mx(B/H)(1 - b / β) b = 0.65

Slenderness.

iF klu/r > 22　Consider Slenderness .

k = 2.0　　lu = 15.7 m　　r = (Inetia/Area)^½

Y Direction
r = 0.115 m　　klu/r = 271.932 > 22 Consider slenderness

Z Direction
r = 0.115 m　　klu/r = 271.932 > 22 Consider slenderness

Slenderness

Mc = dbMb + dsMs

db = cm/(1 - Pu/fP cm = 1.0

Pc = p²EI / (klu)²　　E = 2526713 ton/m²

Pu = 1.3xFuerza A　7.82　ton

X Dir. :			Z Dir. :		
Inercia =	0.0021	m²	Inercia =	0.0021	m²
Pc =	53.96	ton	Pc =	53.96	ton
db =	1.184		db =	1.184	

Mu x-x = 12.17 ton-m

Mu z-z = 13.50 ton-m

- Design by flexure and Axial load

Z Direction : f = 0.70

Gross Area (Ag) = 0.16 m² = 248.02 in²

h = 0.40 m = 15.75 in

P = 5.87 ton = 12.93 kips

M = 12.17 ton-m = 1056.12 kips-in

Pu/Ag = 0.05 u/Agh 0.27

From the Load-Moment strength interaction diagram R4-60.90, the ρ value is:

r = 1.5 % As =Ag x r = 24.00 cm²

Bar denomination = 8 Bar area = 5.07 cm²

Quantity of bars = 4.74

Coloca 6 N 8

X Direction : f = 0.7

Gross Area (Ag) = 0.16 m² = 248.02 in²

h = 0.40 m = 15.75 in

P = 5.87 ton = 12.93 kips

M = 13.50 ton = 1172.12 kips-in

Pu/Ag = 0.05 u/Agh 0.30

From the Load-Moment strength interaction diagram R4-60.90, the ρ value is:

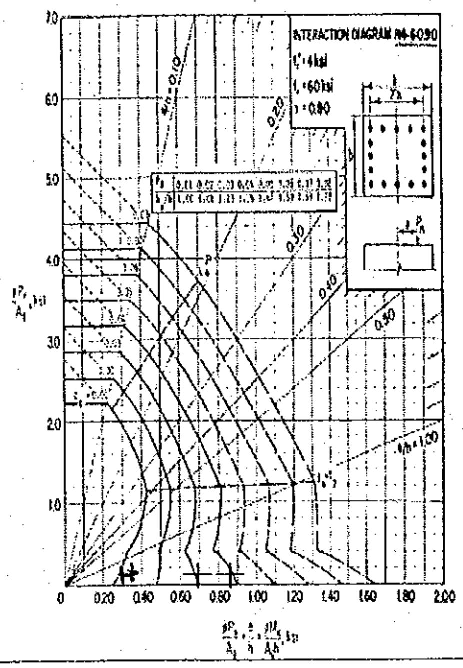
r = 1 % As = Ag x r = 16.00 cm²

Bar Denomination = 8 Bar area = 5.07 cm²

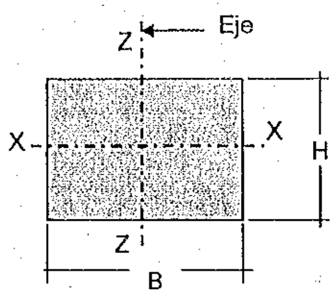
Quantity of bars = 3.16

Use 4 N8

COLUMNS 7.4.4—Load-moment strength interaction diagram for R4-60.90 columns



Column **C2**



H = 0.45 m

B = 0.45 m

f 'c = 280 kg/cm²

fy = 4200 kg/cm²

Area = 2,025 cm²

Inertia Z = 3.4E+05 cm^4

Inertia Y = 3.4E+05 cm^4

Forces and Moments

From Structural Analisis (ton , m) :

TYPE O LOAD	AXIAL P	MOMENT Mz-z	Mx-x	SHEAR Vx	Vz
Dead Loa	14.50	0.80	1.10	0.20	0.40
Live Loa	3.10	0.60	0.00	0.20	0.00
Seismic Loa	5.40	7.60	0.00	2.70	0.00
Seismic Loa	2.60	0.00	6.90	0.00	2.40

COMBINATI	Pu	Mu z-z	Mu x-x	Vu x	Vu z
C1	25.57	2.14	1.54	0.62	0.56
C2	26.75	13.83	---	4.80	---
C3	22.82	---	12.55	---	4.40

Forces for design.

Pu z = 22.82 ton Pu x = 26.75 ton

Mu x-x = 12.55 ton-m Mu z-z = 13.83 ton-m

Vu z = 4.80 ton Vu x = 4.40 ton

C1 = 1.4 DL + 1.7 LL
C2 = 0.75(1.4DL + 1.7LL + 1.87SLy)
C3 = 0.75(1.4DL + 1.7LL + 1.87SLz)

Ortogonal Combination

MX = 100%EQX + 30%EQZ   MZ = 100%EQZ + 30%EQX

Mx = Mx + Mz(H/B)($\underline{1 - b}$) b = 0.65   MZ = Mz + Mx(B/H)($\frac{1 - b}{\beta}$) b = 0.65

Slenderness.

iF klu/r > 22   Consider Slenderness .

k = 1.0   lu = 5.45 m   r = (Inercia/Area)^½

Y Direction
r = 0.130 m   klu/r = 83.908 > 22 Consider slenderness

Z Direction
r = 0.130 m   klu/r = 83.908 > 22 Consider slenderness

Slenderness

Mc = dbMb + dsMs

db = cm/(1 - Pu/fP cm = 1.0

Pc = $\pi^2 EI / (klu)^2$ E = 2526713 ton/m²

Pu = Axial Force = 26.75 ton

X Dir. :			Z Dir. :		
Inercia =	0.0034	m²	Inercia =	0.0034	m²
Pc =	717.25	ton	Pc =	717.25	ton
db =	1.056		db =	1.048	

Mu x-x = 14.61 ton-m

Mu z-z = 13.15 ton-m

- Design by flexure and Axial load

Z Direction : f = 0.70

Area Gruesa 0.20 m² = 313.91 in²

h = 0.45 m = 17.72 in

P = 26.75 ton = 58.98 kips

M = 14.61 ton-m = 1267.75 kips-in

Pu/Ag = 0.19 u/Agh 0.23

From the Load-Moment strength interaction diagram R4-60.90, the ρ value is:

r = 1 % As =Ag x r = 20.25 cm²

Bar denomination = 8 Bar area = 5.07 cm²

Quantity of bars = 4.00

Use 4 N 8

X Direction : f = 0.7

Gross Area (Ag) = 0.20 m² = 313.91 in²

h = 0.45 m = 17.72 in

P = 22.82 ton = 50.32 kips

M = 13.15 ton = 1141.59 kips-in

Pu/Ag = 0.16 u/Agh 0.21

From the Load-Moment strength interaction diagram R4-60.90, the ρ value is:

r ? 1 % As = Ag x r = 20.25 cm²

Bar Denomination = 8 Bar area = 5.07 cm²

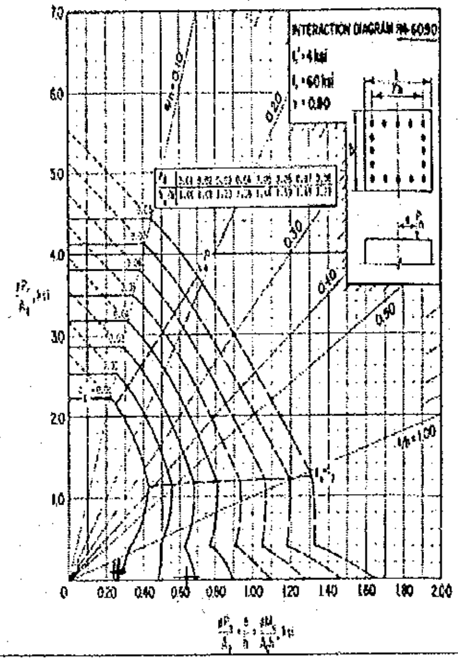
Cantidad de varrillas = 4.00

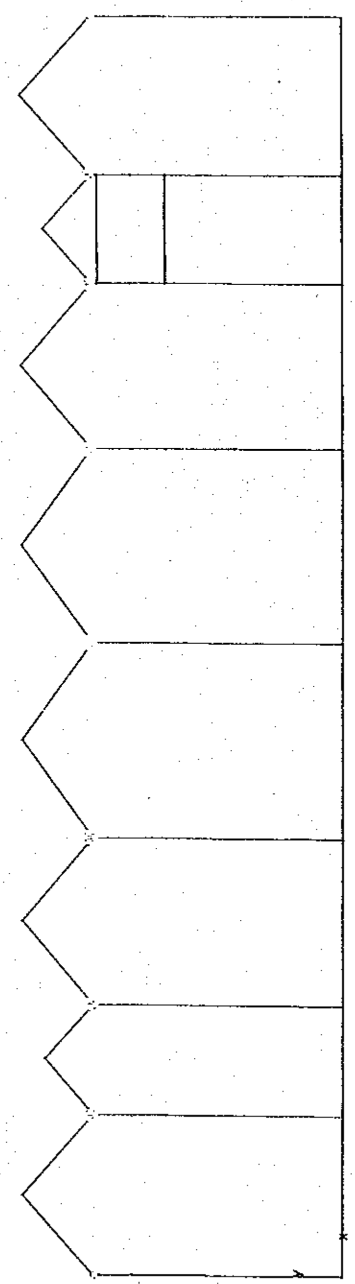
1371

11996.25

Use 4 N8

COLUMNS 7.4.4—Load-moment strength interaction diagram for R4-60.90 columns





CONTAINER GATE
STRUCTURAL MODEL

X - DIRECTION MODEL

Container Gate

Model X- direction

Node Coordinate

Node No.	x (m)	y (m)	z (m)
1	0	0	6
2	5.2	0	6
3	8.8	0	6
4	14.2	0	6
5	20.6	0	6
6	27	0	6
7	32.4	0	6
8	36	0	6
9	41.2	0	6
10	0	6.6	6
11	5.2	6.6	6
12	8.8	6.6	6
13	14.2	6.6	6
14	20.6	6.6	6
15	27	6.6	6
16	32.4	6.6	6
17	36	6.6	6
18	41.2	6.6	6
19	0	7.8	6
20	5.2	7.8	6
21	8.8	7.8	6
22	14.2	7.8	6
23	20.6	7.8	6
24	27	7.8	6
25	32.4	7.8	6
26	36	7.8	6
27	41.2	7.8	6
28	0	5.4	6
29	5.2	5.4	6
30	8.8	5.4	6
31	14.2	5.4	6
32	20.6	5.4	6
33	27	5.4	6
34	32.4	5.4	6
35	36	5.4	6
36	41.2	5.4	6
37	32.4	7.7	6
38	36	7.7	6
39	2.6	10.1	6
40	7	9.4	6
41	11.5	10.1	6
42	17.4	10.1	6
43	23.8	10.1	6
44	29.7	10.1	6
45	34.2	9.4	6
46	38.6	10.1	6

Element data

Member No.	node 1	node 2	length (m)	Member No.	node 1	node 2	length (m)
1	1	2	5.2	46	22	42	3.9
2	2	3	3.5	47	42	23	3.9
3	3	4	5.4	48	23	43	3.9
4	4	5	6.4	49	43	24	3.9
5	5	6	6.4	50	24	44	3.5
6	6	7	5.4	51	44	25	3.5
7	7	8	3.5	52	25	45	2.3
8	8	9	5.2	53	45	26	2.3
9	1	28	5.4	54	26	46	3.4
10	2	29	5.4	55	46	27	3.4
11	3	30	5.4				
12	4	31	5.4				
13	5	32	5.4				
14	6	33	5.4				
15	7	34	5.4				
16	8	35	5.4				
17	9	36	5.4				
18	10	19	1.3				
19	11	20	1.3				
20	12	21	1.3				
21	13	22	1.3				
22	14	23	1.3				
23	15	24	1.3				
24	16	37	1.1				
25	17	38	1.1				
26	18	27	1.3				
27	28	10	1.1				
28	29	11	1.1				
29	30	12	1.1				
30	31	13	1.1				
31	32	14	1.1				
32	33	15	1.1				
33	34	16	1.1				
34	35	17	1.1				
35	36	18	1.1				
36	34	35	3.5				
37	37	25	0.2				
38	38	26	0.2				
39	37	38	3.5				
40	19	39	3.4				
41	39	20	3.4				
42	20	40	2.3				
43	40	21	2.3				
44	21	41	3.5				
45	41	22	3.5				

Section

Membe	group	section	direction
1	Custom1	bd-40x80	0
2	Custom1	bd-40x80	0
3	Custom1	bd-40x80	0
4	Custom1	bd-40x80	0
5	Custom1	bd-40x80	0
6	Custom1	bd-40x80	0
7	Custom1	bd-40x80	0
8	Custom1	bd-40x80	0
9	Custom1	bd-40x40	0
10	Custom1	bd-40x40	0
11	Custom1	bd-40x40	0
12	Custom1	bd-40x40	0
13	Custom1	bd-40x40	0
14	Custom1	bd-40x40	0
15	Custom1	bd-45x45	0
16	Custom1	bd-45x45	0
17	Custom1	bd-40x40	0
18	Custom1	bd-35x35	0
19	Custom1	bd-35x35	0
20	Custom1	bd-35x35	0
21	Custom1	bd-35x35	0
22	Custom1	bd-35x35	0
23	Custom1	bd-35x35	0
24	Custom1	bd-45x45	0
25	Custom1	bd-45x45	0
26	Custom1	bd-35x35	0
27	Custom1	bd-40x40	0
28	Custom1	bd-40x40	0
29	Custom1	bd-40x40	0
30	Custom1	bd-40x40	0
31	Custom1	bd-40x40	0
32	Custom1	bd-40x40	0
33	Custom1	bd-45x45	0
34	Custom1	bd-45x45	0
35	Custom1	bd-40x40	0
36	Custom1	bd-30x65	0
37	Custom1	bd-45x45	0
38	Custom1	bd-45x45	0
39	Custom1	bd-30x65	0
40	W	W10x22	0
41	W	W10x22	0
42	W	W10x22	0
43	W	W10x22	0
44	W	W10x22	0
45	W	W10x22	0
46	W	W10x22	0
47	W	W10x22	0
48	W	W10x22	0
49	W	W10x22	0
50	W	W10x22	0

Member	group	section	direction
51	W	W10x22	0
52	W	W10x22	0
53	W	W10x22	0
54	W	W10x22	0
55	W	W10x22	0

REACTION

DL

Node	Rx	Ry	Rz	Mx	My	Mz
1	0.268	14.357	0	0	0	0
2	0.112	21.011	0	0	0	0
3	0.131	16.549	0	0	0	0
4	0.097	36.618	0	0	0	0
5	0.028	38.386	0	0	0	0
6	-0.032	36.659	0	0	0	0
7	-0.238	25.633	0	0	0	0
8	-0.178	30.922	0	0	0	0
9	-0.188	14.561	0	0	0	0

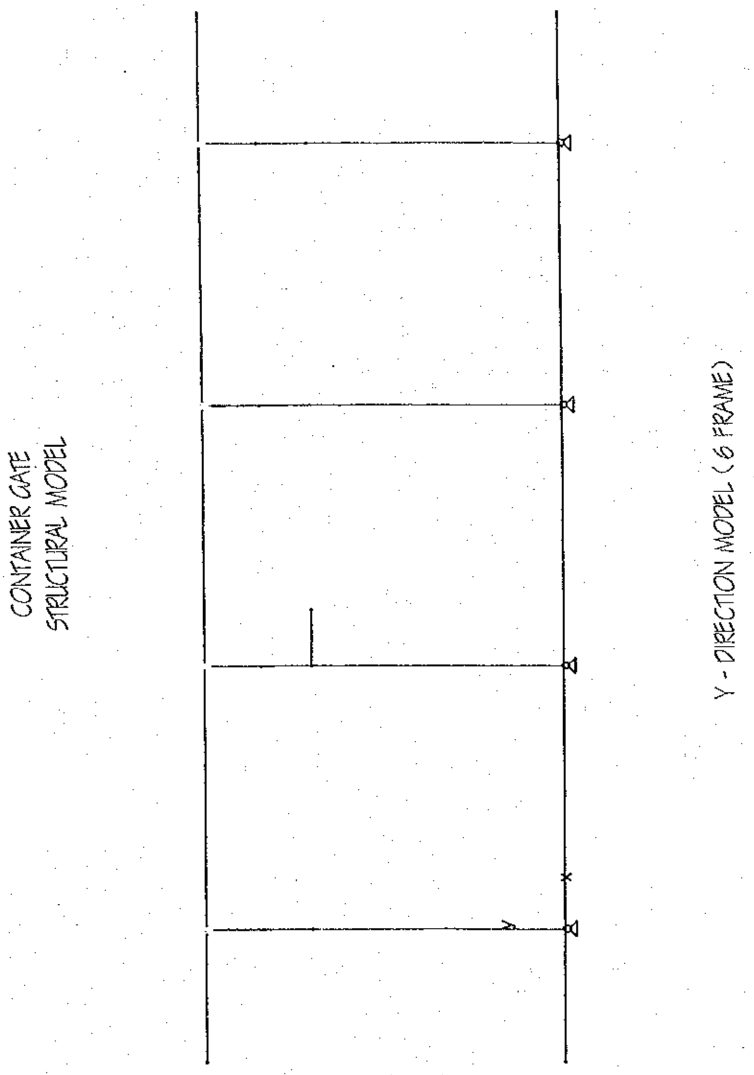
LL

Node	Rx	Ry	Rz	Mx	My	Mz
1	0.161	8.822	0	0	0	0
2	0.013	16.329	0	0	0	0
3	0.062	3.544	0	0	0	0
4	0.037	8.573	0	0	0	0
5	0.011	8.346	0	0	0	0
6	-0.012	8.537	0	0	0	0
7	-0.212	3.894	0	0	0	0
8	0.071	18.106	0	0	0	0
9	-0.13	9.216	0	0	0	0

SL

Node	Rx	Ry	Rz	Mx	My	Mz
1	-0.56	-1.249	0	0	0	0
2	-0.774	-0.125	0	0	0	0
3	-0.73	0.538	0	0	0	0
4	-0.713	0.125	0	0	0	0
5	-0.659	0.182	0	0	0	0
6	-0.556	-0.308	0	0	0	0
7	-2.668	-7.345	0	0	0	0
8	-2.673	7.251	0	0	0	0
9	-0.366	0.933	0	0	0	0

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Structural Input	Date	July-02	Page	64 / 78



Container Gate

Model Y- direction 6 FRAME

Node Coordinate

Node No.	x (m)	y (m)	z (m)
1	0	0	0
2	6	0	0
3	12	0	0
4	18	0	0
5	-3	0	0
6	21	0	0
7	0	5.45	0
8	6	5.45	0
9	12	5.45	0
10	18	5.45	0
11	0	6.55	0
12	6	6.55	0
13	12	6.55	0
14	18	6.55	0
15	0	7.85	0
16	6	7.85	0
17	12	7.85	0
18	18	7.85	0
19	-3	7.85	0
20	21	7.85	0
21	7.3	5.45	0

Element data

Member No.	node 1	node 2	length (m)
1	1	2	6
2	2	3	6
3	3	4	6
4	5	1	3
5	4	6	3
6	1	7	5.45
7	2	8	5.45
8	3	9	5.45
9	4	10	5.45
10	7	11	1.1
11	8	12	1.1
12	9	13	1.1
13	10	14	1.1
14	11	15	1.3
15	12	16	1.3
16	13	17	1.3
17	14	18	1.3
18	19	15	3
19	18	20	3
20	15	16	6
21	16	17	6
22	17	18	6
23	8	21	1.3

Section

Membe	group	section	direction
1	Custom1	bd-40x80	0
2	Custom1	bd-40x80	0
3	Custom1	bd-40x80	0
4	Custom1	bd-40x80	0
5	Custom1	bd-40x80	0
6	Custom1	bd-40x40	0
7	Custom1	bd-40x40	0
8	Custom1	bd-40x40	0
9	Custom1	bd-40x40	0
10	Custom1	bd-40x40	0
11	Custom1	bd-40x40	0
12	Custom1	bd-40x40	0
13	Custom1	bd-40x40	0
14	Custom1	bd-35x35	0
15	Custom1	bd-35x35	0
16	Custom1	bd-35x35	0
17	Custom1	bd-35x35	0
18	W	W12x40	0
19	W	W12x40	0
20	W	W12x40	0
21	W	W12x40	0
22	W	W12x40	0
23	Custom1	bd-30x30	0

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Structural Input	Date	July-02	Page	68 / 78

REACTION

DL

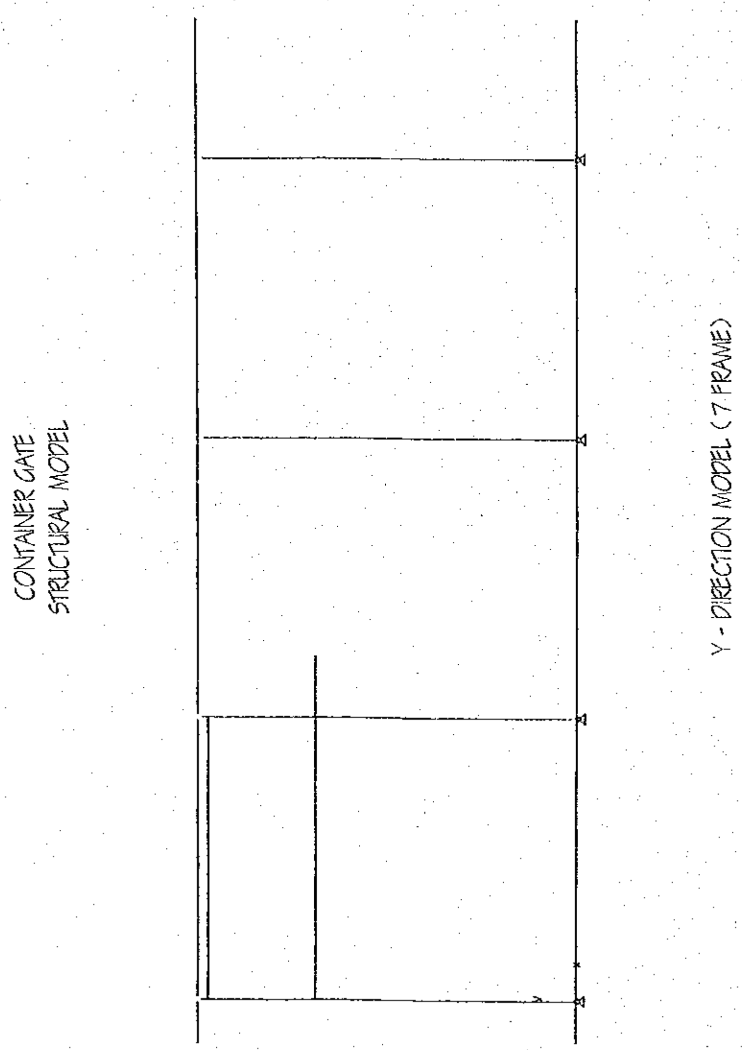
Node	Rx	Ry	Rz	Mx	My	Mz
1	-0.121	39.002	0	0	0	0
2	0.113	37.724	0	0	0	0
3	-0.059	37.208	0	0	0	0
4	0.066	39.11	0	0	0	0

LL

Node	Rx	Ry	Rz	Mx	My	Mz
1	-0.207	6.361	0	0	0	0
2	0.541	8.608	0	0	0	0
3	-0.194	4.819	0	0	0	0
4	-0.139	7.042	0	0	0	0

SL

Node	Rx	Ry	Rz	Mx	My	Mz
1	-0.734	-1.526	0	0	0	0
2	-1.027	0.805	0	0	0	0
3	-0.807	-0.75	0	0	0	0
4	-0.732	1.471	0	0	0	0


CONTAINER GATE
STRUCTURAL MODEL
Y - DIRECTION MODEL (7 FRAME)

Container Gate

Model Y- direction 7 FRAME

Node Coordinate

Node No.	x (m)	y (m)	z (m)
1	0	0	0
2	6	0	0
3	12	0	0
4	18	0	0
5	0	5.45	0
6	6	5.45	0
7	12	5.45	0
8	18	5.45	0
9	0	6.55	0
10	6	6.55	0
11	12	6.55	0
12	18	6.55	0
13	0	7.65	0
14	6	7.65	0
15	0	7.85	0
16	6	7.85	0
17	12	7.85	0
18	18	7.85	0
19	7.3	5.45	0
20	-3	7.85	0
21	21	7.85	0
22	-3	0	0
23	21	0	0
24	3	7.85	0
25	9	7.85	0
26	15	7.85	0

Element data

Member No.	node 1	node 2	length (m)
1	1	2	6
2	2	3	6
3	3	4	6
4	1	5	5.45
5	2	6	5.45
6	3	7	5.45
7	4	8	5.45
8	5	9	1.1
9	6	10	1.1
10	7	11	1.1
11	8	12	1.1
12	9	13	1.1
13	10	14	1.1
14	13	15	0.2
15	14	16	0.2
16	11	17	1.3
17	12	18	1.3
18	5	6	6
19	13	14	6
20	6	19	1.3
21	15	24	3
22	20	15	3
23	16	25	3
24	17	26	3
25	18	21	3
26	22	1	3
27	4	23	3
28	24	16	3
29	25	17	3
30	26	18	3

Section

Membe	group	section	direction
1	Custom1	bd-40x80	0
2	Custom1	bd-40x80	0
3	Custom1	bd-40x80	0
4	Custom1	bd-45x45	0
5	Custom1	bd-45x45	0
6	Custom1	bd-40x40	0
7	Custom1	bd-40x40	0
8	Custom1	bd-45x45	0
9	Custom1	bd-45x45	0
10	Custom1	bd-40x40	0
11	Custom1	bd-40x40	0
12	Custom1	bd-45x45	0
13	Custom1	bd-45x45	0
14	Custom1	bd-45x45	0
15	Custom1	bd-45x45	0
16	Custom1	bd-35x35	0
17	Custom1	bd-35x35	0
18	Custom1	bd-30x65	0
19	Custom1	bd-30x65	0
20	Custom1	bd-30x30	0
21	W	W12x40	0
22	W	W12x40	0
23	W	W12x40	0
24	W	W12x40	0
25	W	W12x40	0
26	Custom1	bd-40x80	0
27	Custom1	bd-40x80	0
28	W	W12x40	0
29	W	W12x40	0
30	W	W12x40	0

REACTION

DL

Node	Rx	Ry	Rz	Mx	My	Mz
1	0.374	35.841	0	0	0	0
2	-0.408	34.967	0	0	0	0
3	-0.006	15.178	0	0	0	0
4	0.039	19.307	0	0	0	0

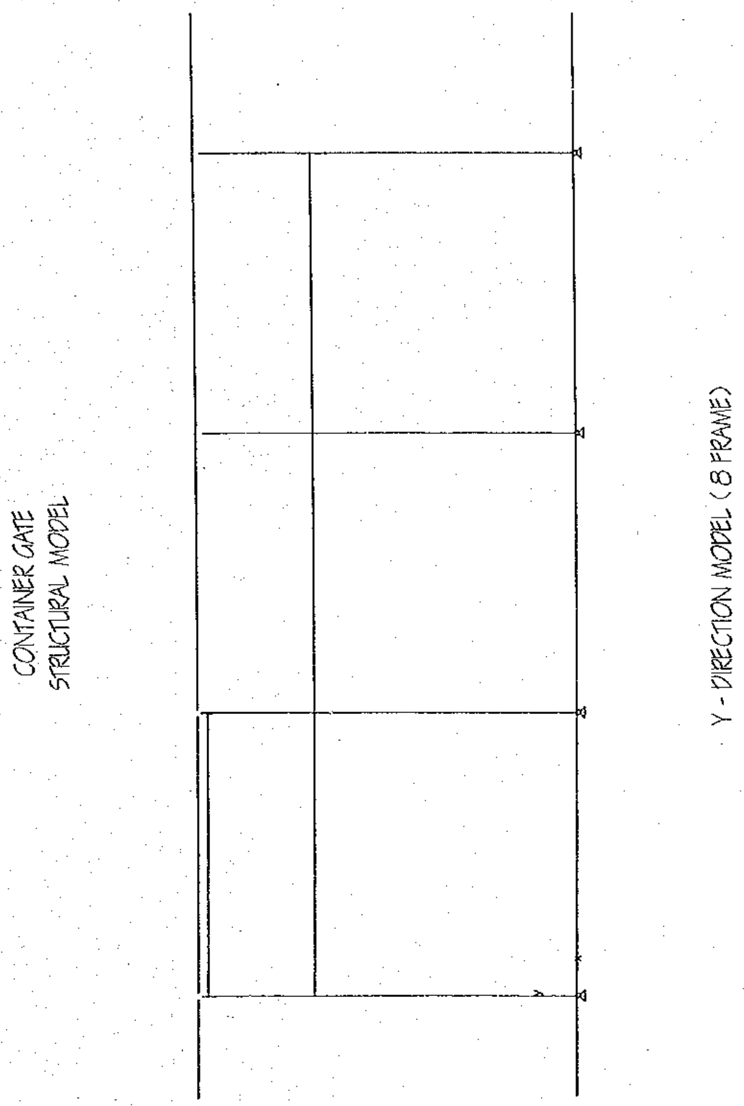
LL

Node	Rx	Ry	Rz	Mx	My	Mz
1	0.057	3.76	0	0	0	0
2	-0.046	6.653	0	0	0	0
3	-0.002	4.81	0	0	0	0
4	-0.009	3.055	0	0	0	0

SL

Node	Rx	Ry	Rz	Mx	My	Mz
1	-2.823	-6.046	0	0	0	0
2	-3.029	5.377	0	0	0	0
3	-0.334	0.192	0	0	0	0
4	-0.314	0.477	0	0	0	0

PROJECT: Detailed Design on Port Reactivation Project In La Union Province	Calc. File No.		Prepared by	H.WATANABE
SECTION: Container Gate	Calc. Index No.		Checked by	A.MORIOKA
SUBJECT: Structural Input	Date	July-02	Page	28 / 78



Container Gate

Model Y- direction 8 FRAME

Node Coordinate

Node No.	x (m)	y (m)	z (m)
1	0	0	0
2	6	0	0
3	12	0	0
4	18	0	0
5	0	5.45	0
6	6	5.45	0
7	12	5.45	0
8	18	5.45	0
9	0	6.55	0
10	6	6.55	0
11	12	6.55	0
12	18	6.55	0
13	0	7.65	0
14	6	7.65	0
15	0	7.85	0
16	6	7.85	0
17	12	7.85	0
18	18	7.85	0
19	-3	7.85	0
20	21	7.85	0
21	-3	0	0
22	21	0	0
23	3	7.85	0
24	9	7.85	0
25	15	7.85	0

Element data

Member No.	node 1	node 2	length (m)
1	1	2	6
2	2	3	6
3	3	4	6
4	1	5	5.45
5	2	6	5.45
6	3	7	5.45
7	4	8	5.45
8	5	9	1.1
9	6	10	1.1
10	7	11	1.1
11	8	12	1.1
12	9	13	1.1
13	10	14	1.1
14	13	15	0.2
15	14	16	0.2
16	11	17	1.3
17	12	18	1.3
18	5	6	6
19	13	14	6
20	15	23	3
21	19	15	3
22	16	24	3
23	17	25	3
24	18	20	3
25	21	1	3
26	4	22	3
27	23	16	3
28	24	17	3
29	25	18	3
30	6	7	6
31	7	8	6

Section

Membe	group	section	direction
1	Custom1	bd-40x80	0
2	Custom1	bd-40x80	0
3	Custom1	bd-40x80	0
4	Custom1	bd-45x45	0
5	Custom1	bd-45x45	0
6	Custom1	bd-40x40	0
7	Custom1	bd-40x40	0
8	Custom1	bd-45x45	0
9	Custom1	bd-45x45	0
10	Custom1	bd-40x40	0
11	Custom1	bd-40x40	0
12	Custom1	bd-45x45	0
13	Custom1	bd-45x45	0
14	Custom1	bd-45x45	0
15	Custom1	bd-45x45	0
16	Custom1	bd-35x35	0
17	Custom1	bd-35x35	0
18	Custom1	bd-30x65	0
19	Custom1	bd-30x65	0
20	W	W12x40	0
21	W	W12x40	0
22	W	W12x40	0
23	W	W12x40	0
24	W	W12x40	0
25	Custom1	bd-40x80	0
26	Custom1	bd-40x80	0
27	W	W12x40	0
28	W	W12x40	0
29	W	W12x40	0
30	Custom1	bd-30x40	0
31	Custom1	bd-30x40	0

REACTION

DL

Node	Rx	Ry	Rz	Mx	My	Mz
1	0.564	38.367	0	0	0	0
2	-0.462	43.118	0	0	0	0
3	0.01	24.896	0	0	0	0
4	-0.112	22.998	0	0	0	0

LL

Node	Rx	Ry	Rz	Mx	My	Mz
1	0.469	11.783	0	0	0	0
2	-0.208	23.461	0	0	0	0
3	0.055	22.675	0	0	0	0
4	-0.316	11.289	0	0	0	0

SL

Node	Rx	Ry	Rz	Mx	My	Mz
1	-2.107	-4.876	0	0	0	0
2	-2.372	3.647	0	0	0	0
3	-1.437	-0.442	0	0	0	0
4	-1.185	1.671	0	0	0	0

NIPPON KOEI CO.,LTD.

DESIGN CALCULATION COVER SHEET			
Project	Detailed Design on Port Reactivation Project in La Union Province.	**Project Code**	JC1N004
Section	**BUILDING WORKS**	Calc. File No.	
Sub-Section	**CONTAINER GATE**	Calc. Index No.	

Subject:

STRUCTURAL DESIGN FOR SPREAD FOUNDATIONS

Calculation Objective:

The objective of the calculation is to provide a safe structure for the ocupation of the building, by the use of the Republic of El Salvador and American design standards.

References, Calculation Notes and Comments

The Structural Analysis has been made using the program: "STAAD-III rev 21.1W, RESEARCH ENGINEERS, Inc.". The analysis of the structure considers only the concrete frames to resist the lateral forces, not considering the walls in the model.

One model for the structure has been constructed:

1- For the calculation of the Seismic and Dead & Live load.

The Key for the STAAD-III rev 21.1W program is attached for future convinience.

All the design has been made by calculations sheet created for the project in Microsoft Excel, and based in the following bibliography:

1. Building Code Requirements for Structural Concrete (318M-99), American Concrete Institute (ACI).
2. Technical Specification for Seismic Design, Ministry of Public Works, El Salvador, 2001.
3. AISC, American Institute of Steel Construction, ninth Edition, 1989.
4. Technical Specification for Wind Design, Ministry of Public Works, El Salvador, 1997.
5. UBC, Uniform Building Code, Volume 2: Structural Engineering Design Provisions, 1997.

Rev	Prepared		No. of	Checked		Reviewed		Superseded
	by	Date	Pages	by	Date	by	Date	by Calc No.
O	R.MARTINEZ	Aug-02	7	A. MORIOKA	Aug-02	[illegible]	14 Aug 02	
A	[signature]			[signature]				
B								
C								

Reaction of each point

Row	Line	1	2	3	4	5	6	7	8	9
A	DL	24.1	23.0	35.8	39.0	39.0	39.0	35.8	38.4	24.1
	LL	26.2	11.3	3.8	6.4	6.4	6.4	3.8	11.8	26.2
	TL	**50.3**	**34.3**	**39.6**	**45.4**	**45.4**	**45.4**	**39.6**	**50.2**	**50.3**
B	DL	24.0	30.6	16.5	36.6	38.4	37.7	25.6	40.6	24.1
	LL	26.0	30.8	3.9	8.6	8.4	8.6	4.2	32.7	26.2
	TL	**50.0**	**61.4**	**20.4**	**45.2**	**46.8**	**46.3**	**29.8**	**73.3**	**50.3**
C	DL	24.1	40.6	25.6	37.7	38.4	36.6	16.5	30.6	24.0
	LL	26.2	32.7	4.2	8.6	8.4	8.6	3.9	30.8	26.0
	TL	**50.3**	**73.3**	**29.8**	**46.3**	**46.8**	**45.2**	**20.4**	**61.4**	**50.0**
D	DL	24.1	38.4	35.8	39.1	39.1	39.1	19.3	23.0	24.1
	LL	26.2	11.8	3.8	7.0	7.0	7.0	3.1	11.3	26.2
	TL	**50.3**	**50.2**	**39.6**	**46.1**	**46.1**	**46.1**	**22.4**	**34.3**	**50.3**

upper line DL
middle line LL
lower line TL=DL+LL

Total dead load = 1128.4 ton

Seismic load = 164.03 ton

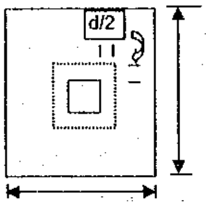
PROJECT: Detailed Design on Port Reactivation Project In La Union Province	Calc. File No.		Prepared by	R.Martinez
SECTION: Container Gate	Calc. Index No.		Checked by	A. Morioka
SUBJECT: Spread Foundation design	Date	Aug-02	Page	>- / 7

FOOTING DESIGN

Design for foundation F-1

a) Punching

For Column



ϕ= 0.85

Dead load PD =	35.80	ton
Live load PL=	3.80	ton
Seismic Ps =	17.90	ton
1.4D + 1.7L =	56.58	ton
0.75(1.4D + 1.7L + 1.87S) =	67.54	ton
Pu=	67.54	ton
d =	46.23	cm
Column width =	40.00	cm
Column base =	40.00	cm
bo=4(c+d)=	344.92	cm

Th = 55 cm

f'c = 210 kg/cm²
20.59 Mpa

Concrete shear strength, Vc ACI 11.12

βc = 1.000

αs = 40

$Vc1 = \phi(1+2/\beta c)\sqrt{f'c}\ b_o d/6$ = 313.70 ton

$Vc2 = \phi(2+\alpha_s d/b_o)\sqrt{f'c}\ b_o d/12$ = 132.60 ton

$Vc3 = \phi(1/3)\sqrt{f'c}\ b_o d$ = 209.13

Vc = 132.60 > 67.54 o.k!!!

b) Foundation Size

Soil Capacity = 20 ton/m² P = 54.27 ton

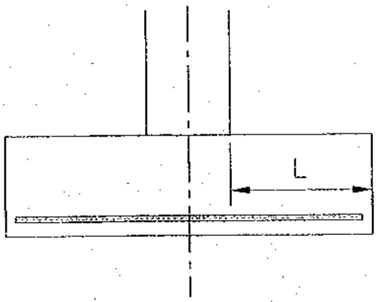
Square Foundation, Size = 1.65 m, ok!

Soil reaction = 18.78 ton/m²

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	R.Martinez
SECTION: Container Gate	Calc. Index No.		Checked by	A. Morioka
SUBJECT: Spread Foundation design	Date	Aug-02	Page	() / 7

c) Reinforcing Steel

fy = 4200 kg/cm²



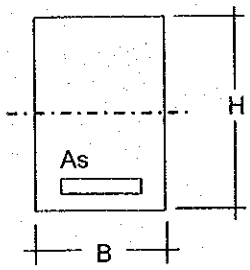
Moment generated by pile reaction

M = [(B-Bcolumn)/2]² x Soil reaction / 2

L = 0.65 m

M1 = 1.4D + 1.7L = 5.17 ton-m

M2 =0.75(1.4D + 1.7L + 1.87S) = 8.06 ton-m



H = 55.00 cm

b = 40.00 cm

f'c = 280 kg/cm²

fy = 4200 kg/cm²

Force for design: Mu z-z = 8.06 ton-m

d = 46.23 cm Clear cover = 5.00 cm

fy²/1.7bf'c As² - fyd As + Mu/ϕ = ϕ = 0.90

926.47 As² 194166 As 895339.39 = 0 As = 4.72 cm²

Asmin = (4/3)Asreq :
(4/3)Asreq = 6.29 cm²
(14/fy) b d = 6.16 cm² Asmin = 6.16 cm²

Asmax : ρb = 0.0459 Asmax (0.75ρb) = 63.73 cm²

As = 6.16 cm² o.k!! As < Amax

Bar denomination, N = 7 Bar Area (Av) = 3.88 cm²

Number of bars = 1.59 Use 2 - N7

Pitch = 25.24 cm **7 @ 25 cm**

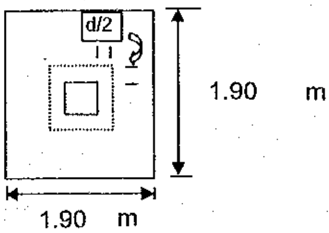
PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	R.Martinez
SECTION: Container Gate	Calc. Index No.		Checked by	A. Morioka
SUBJECT: Spread Foundation design	Date	Aug-02	Page	/ 7

FOOTING DESIGN

Design for foundation F-2

a) Punching

For Column



ϕ= 0.85

Dead load P_D =	38.40	ton
Live load P_L=	11.80	ton
Seismic P_S =	19.20	ton
1.4D + 1.7L =	73.82	ton
0.75(1.4D + 1.7L + 1.87S) =	82.29	ton
Pu=	82.29	ton
d =	46.23	cm
Column width =	40.00	cm
Column base =	40.00	cm
bo=4(c+d)=	344.92	cm

Th = 55 cm

f'c = 210 kg/cm²
20.59 Mpa

Concrete shear strength, Vc ACI 11.12

βc = 1.000

αs = 40

$Vc1 = \phi(1+2/\beta c)\sqrt{f'c}\ bod/6$ = 313.70 ton

$Vc2 = \phi(2+\alpha s d/bo)\sqrt{f'c}\ bod/12$ = 132.60 ton

$Vc3 = \phi(1/3)\sqrt{f'c}\ bod$ = 209.13

Vc = 132.60 > 82.29 o.k!!!

b) Foundation Size

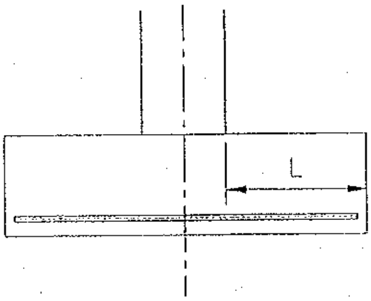
Soil Capacity = 20 ton/m²   P = 68.71 ton

Square Foundation, Size = 1.85 m, ok!

Soil reaction = 19.03 ton/m²

PROJECT: Detailed Design on Port Reactivation Project in La Union Province	Calc. File No.		Prepared by	R.Martinez
SECTION: Container Gate	Calc. Index No.		Checked by	A. Morioka
SUBJECT: Spread Foundation design	Date	Aug-02	Page	5 / 7

c) Reinforcing Steel



fy = 4200 kg/cm²

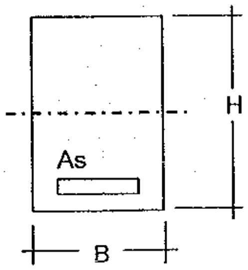
Moment generated by pile reaction

M = [(B-Bcolumn)/2]² x Soil reaction / 2

L = 0.75 m

M1 = 1.4D + 1.7L = 7.19 ton-m

M2 =0.75(1.4D + 1.7L + 1.87S) = 10.41 ton-m



H = 55.00 cm

b = 40.00 cm

f'c = 280 kg/cm²

fy = 4200 kg/cm²

Force for design: Mu z-z = 10.41 ton-m

d = 46.23 cm   Clear cover = 5.00 cm

fy²/1.7bf'c As² - fyd As + Mu/ϕ =   ϕ = 0.90

926.47 As² -194166 As 1156785.1 = 0   As = 6.14 cm²

Asmin = (4/3)Asreq :
(4/3)Asreq = 8.18 cm²
(14/fy) b d = 6.16 cm²   Asmin = 6.16 cm²

Asmax :   ρb = 0.0459   Asmax (0.75ρb) = 63.73 cm²

As = 6.16 cm²   o.k!! As < Amax

Bar denomination, N = 7   Bar Area (Av) = 3.88 cm²

Number of bars = 1.59   Use 2 - N7

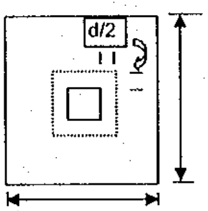
Pitch = 25.24 cm   **7 @ 25 cm**

FOOTING DESIGN

Design for foundation F-3

a) Punching

For Column



2.25 m

2.25 m

Th = 55 cm

f'c = 210 kg/cm²
20.59 Mpa

ϕ= 0.85

Dead load P_D =	40.60	ton
Live load P_L=	32.70	ton
Seismic P_S =	20.30	ton
1.4D + 1.7L =	112.43	ton
0.75(1.4D + 1.7L + 1.87S) =	112.79	ton
Pu=	112.79	ton
d =	46.23	cm
Column width =	45.00	cm
Column base =	45.00	cm
bo=4(c+d)=	364.92	cm

Concrete shear strength, Vc ACI 11.12

βc = 1.000

αs = 40

$Vc1 = \phi(1+2/\beta c)\sqrt{f'c}\ b_o d/6 =$ 331.89 ton

$Vc2 = \phi(2+\alpha s d/b_o)\sqrt{f'c}\ b_o d/12 =$ 138.66 ton

$Vc3 = \phi(1/3)\sqrt{f'c}\ b_o d =$ 221.26

Vc = 138.66 > 112.79 o.k!!!

b) Foundation Size

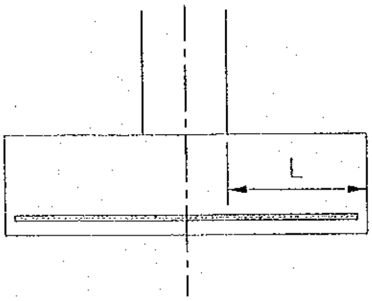
Soil Capacity = 20 ton/m²   P = 99.98 ton

Square Foundation, Size = 2.24 m, ok!

Soil reaction = 19.75 ton/m²

c) Reinforcing Steel

fy = 4200 kg/cm²



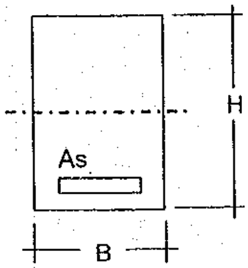
Moment generated by pile reaction

M = [(B-Bcolumn)/2]² x Soil reaction / 2

L = 0.90 m

M1 = 1.4D + 1.7L = 11.24 ton-m

M2 =0.75(1.4D + 1.7L + 1.87S) = 14.53 ton-m



H = 55.00 cm

b = 45.00 cm

f'c = 280 kg/cm²

fy = 4200 kg/cm²

Force for design: Mu z-z = 14.53 ton-m

d = 46.23 cm   Clear cover = 5.00 cm

$fy^2/1.7bf'c\ As^2 - fyd\ As + Mu/\phi =$ $\phi = 0.90$

823.53 As² -194166 As 1614024.2 = 0   As = 8.63 cm²

Asmin = (4/3)Asreq :

(4/3)Asreq = 11.50 cm²

(14/fy) b d = 6.93 cm²   Asmin = 6.93 cm²

Asmax : ρb = 0.0459   Asmax (0.75ρb) = 71.69 cm²

As = 8.63 cm²   o.k!! As < Amax

Bar denomination, N = 8   Bar Area (Av) = 5.07 cm²

Number of bars = 1.70   Use 2 - N8

Pitch = 29.92 cm   **8 @ 29.5 cm**