Appendix 2

Structural Proposal

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PROJECT:

HUNG HOM BAY RECLAMATION PHASE II, HUNG HOM (NORTH) FERRY PIER, HONG KONG

Structural Appraisal Report
Apr 2024

Title	AP/RSE
Name	Wong Shing Tsang (RSE 12/00)
Signature	
Date	03 April 2024

I.   *Introduction*

This report presents a structural appraisal calculation for addition of a proposed sprinkler water tank

and sprinkler pump room on the roof floor of Hung Hom (North) Ferry Pier, Hung Hom, Kowloon, Hong Kong.

II.   *Relevance Regulations and Code of Practices for Checking*

The works shall be carried out in strict compliance with, but not limited to the following:

- Hong Kong Building (Construction) Regulation
- Code of Practice for the Structural Use of Steel –2011
- Code of Practice for Structural Use of Concrete – 2013
- Code of Practice for Dead and Imposed Load – 2011
- Code of Practice on Wind Effects in Hong Kong – 2019

III.   *Design Data*

1.1   Dead Load:

Reinforced Concrete Self-weight = 24.5 kN/m^3,

Water Density = 9.81kN/m^3,

Sprinkler Water Tank Self-weight = 2150kg,

Sprinkler Pump Room Self-weight = 300kg.

1.2   Wind Pressure: Water Tank = 1.991kPa

Effective height = 13.65m, Q_o,z = 2.08kPa, C_p = 1.1, S_s = 1.024, $L_{0.5p}$ = 10

IV.   *Existing Structural Data*

       a).   Concrete Grade of structural elements to be designed concrete mix with following minimum strength at 28 days and maximum size of aggregate 20mm:

           Column, wall, beam, slab and staircases - 40MPa

       b).   Concrete Cover:

           40mm above +4.000 Chart Datum (C.D.)

           60mm at or below +4.000 C.D.

           75mm bottom of pile cap unless otherwise specified.

       c).   All reinforcement to comply with B.S. 4449.

       d).   Existing Slab Thickness = 150mm

V.   *Conclusion*

In conclusion, the proposed addition of water tanks on the roof is structurally feasible. Steel beams are proposed to transfer the extra load of the water tanks to the columns directly.

In general, the existing structures (columns and piles) are capable for supporting the new loading from the proposed water tanks.

Appendices

Appendix A
Structural Calculation

Loading

REF.	CALCULATIONS			OUTPUT
	Loading			
	Loading due to two new sprinkler water tanks and sprinkler pump room			
	(Assume Size = 7m x 4m x 3m (H) = 84m^3 x 2 tanks = 168m^3 with capacity of not less than 110m^3			
	Assume Size = 1.5m x 2.5m x 1m (H) = 3.75m^3			
	Loading due to New Steel Platform (Assume 8.3m x 5.3m x 3.9m(H)) and New Steel Catwalk			
	(Assume Size = 3.35m x 0.6m)			
	Dead Load (D.L.), Live Load (L.L.) and Wind Load (W.L.) should be considered are as follows:			
	<u>D.L.: Include Self-Weight of Water Tank, steel works, etc.</u>			
	Assume Dead Weight of New Steel Platform with Barrier Railing	=	1.000 kPa	
	On Steel Platform, D.L. = 8.3m x 5.3m x 1kPa	=	43.990 kN	
	On Steel Catwalk, D.L. = 3.35m x 0.6m x 1kPa	=	2.010 kN	
	Self-weight of Water Tank, D.L. = 2 x 2150kg x 9.81ms^{-2}/1000	=	42.183 kN	
	Self-weight of sprinkler pump room, D.L. = 300kg x 9.81ms^{-2}/1000	=	2.943 kN	
	<u>L.L.: Imposed Load for Roof and Water Load</u>			
	Imposed load for roof	=	2.000 kPa	
	On Steel Platform, L.L. = 8.3m x 5.3m x 2kPa	=	87.980 kN	
	On Steel Catwalk, L.L. = 3.35m x 0.6m x 2kPa	=	4.020 kN	
	Water Load			
	Case A) For the 110,000Litres (110m^3) water, 110m^{3}x9.81N/m^3	=	1079.1 kN	
	Case B) For the maximum 70% of the 168,000Litres (168m^3) water,			
	= (168x0.7)m^{3}x9.81kN/m^3	=	1153.7 kN	
	<u>W.L: Wind force acting on sprinkler water tank</u>			
	Breadth of the sprinkler water tank	=	7.000 m	
	Height of the sprinkler water tank	=	3.000 m	
	Pressure coefficient (C_p)	=	1.100	
	Effective height (Z_e)	=	13.650 m	
	Design wind reference pressure ($Q_{o,z}$)			
	= 3.7 x (13.65/500)$^{0.16}$	=	2.080 kPa	
	Topography factor (S_t)	=	1.000	
	The wind directionality factor (S_θ)	=	0.850	
	Design wind pressure (Q_z)			
	= $Q_{o,z}$ x S_t x S_θ = 2.08 x 1 x 0.85	=	1.768 kPa	
	Size of loaded area ($L_{0.5p}$)			
	= 7+3	=	10.000 m	
	Size factor (S_s)			
	= exp(0.17-0.07x10$^{0.32}$)	=	1.024	
	Design wind pressure (P)			
	= Q_z x C_p x S_s = 1.768x1.1x1.024	=	1.991 kPa	

Calc.		Checked		Remarks	

	S. T. Wong & Partners Ltd Consulting Engineers 黃成增顧問工程師有限公司	Project	Structural Study for the Existing Ferry Pier To Kwa Wan (DeSpace)			
Section	The existing loading			Rev.		Page:
Subject				Date		

REF.	CALCULATIONS			OUTPUT
	Loading Dead Load (D.L.), Live Load (L.L.) should be considered are as follows:			
	D.L.: Include self-weight of the slab, finishes, service			
	Finishes	=	0.600 kPa	
	Service	=	0.600 kPa	
	Self-weight of the slab	=	10.000 kPa	
	L.L.: Imposed Load			
	L.L.	=	5.000 kPa	
	Total loading			
	= 1.4D.L.+1.6L.L.	=	23.68 kPa	
	For considering the wind load x 1.25	=	29.60 kPa	
	There are three storey at the Pier, 4m, 7.3m and 10.65m level,			
	Hence, the loading add to the column should be 3 times of the total load		88.800 kPa	
	Load Area of Column C19 = 6.2m x 4.85m	=	30.070 m^2	(Critical)
	Hence, the loading adding to the column C19	=	2670.216 kN	

Calc.		Checked		Remarks

STV S. T. Wong & Partners Ltd Consulting Engineers 黃成堭顧問工程師有限公司	Project	Structural Study for the Existing Ferry Pier To Kwa Wan (DeSpace)			
Section	Loading for the Beam B1 (203x203x46kg/m UC) (6200mm(L))		Rev.		Page:
Subject			Date		

REF.	CALCULATIONS				OUTPUT
	Dead Load (D.L.) = 43.99 + 2.01 + 42.183 + 2.943 + 46.1kg/m x 6400/1000 x 9.81ms^{-2}/1000 + 24.5kN/m^3 x 60m^2 x 150/1000		=	314.520 kN	
	Live Load (L.L.) = 87.98 + 4.02 +1079.1 + 2kPa x 60m^2 (Case A) = 87.98 + 4.02 +1153.7 + 2kPa x 60m^2 (Case B)		= =	1291.1 kN 1365.7 kN	
	Wind Load (W.L.) = 1.991kPa x 7m x 3m		=	41.815 kN	
	Total Load = (314.52 + 1291.1 + 41.815)/6.2	(Case A)	=	265.715 kN/m	
	= (314.52 + 1365.7 + 41.815)/6.2	(Case B)	=	277.748 kN/m	
	Shear = (314.52 + 1291.1 + 41.815)/2	(Case A)	=	823.718 kN	
	= (314.52 + 1365.7 + 41.815)/2	(Case B)	=	861.018 kN	
	Moment Support moment		=	0.000 kNm	
	Mid-span momen = 265.715 x 6.2 x 6.2/8	(Case A)	=	1276.762 kNm	
	Mid-span momen = 277.748 x 6.2 x 6.2/8	(Case B)	=	1334.577 kNm	

Calc.

Section	Loading for the Beam B1 (203x203x46kg/m UC) (6200mm(L))		Rev.		Page:
Subject			Date		

REF.	CALCULATIONS				OUTPUT

Load Area of Steel Beams and Columns

Load Area of Steel Beam B1		=	21.235 m²	
Load Area of Column C19		=	30.070 m²	(Critical)

The Loading of Existing Columns are as follows:

	D.L.	L.L.	D.L.+L.L.
C19)	5000kN	1520kN	6520kN

Original Design Data
Concrete Grade = 40 MPa
Concrete Cover of column = 40 mm

Load Path of New Steel Platform
(D.L. +L.L. +W.L.) -->Steel Platform -->New Steel Beams (B1)-->Existing R.C. Columns
(B19, B20, C17, C19, C20, D17, D19 and D20) --> Existing Foundation

Calc.	Checked	Remarks

REF.	CALCULATIONS			OUTPUT
	For checking the Column C19			
	Area of Column C19	=	0.19635 m^2	
	Self-weight of the C19			
	= 24.5kN/m^3 x (0.19635m^2 x 6.65m)	=	31.990 kN	
	The loading of the beam B1 (New)			
	= 277.748kN/m x 6.2m	=	1722.038 kN	
	The loading adding to the Column C19	=	2670.216 kN	
	Total load on the Column C19			
	= 2670.216 + 1722.038 + 31.99	=	4424.244 kN	
		<	6520 kN	O.K.

Calc.	Checked	Remarks

Appendix B
Drawings

60 000
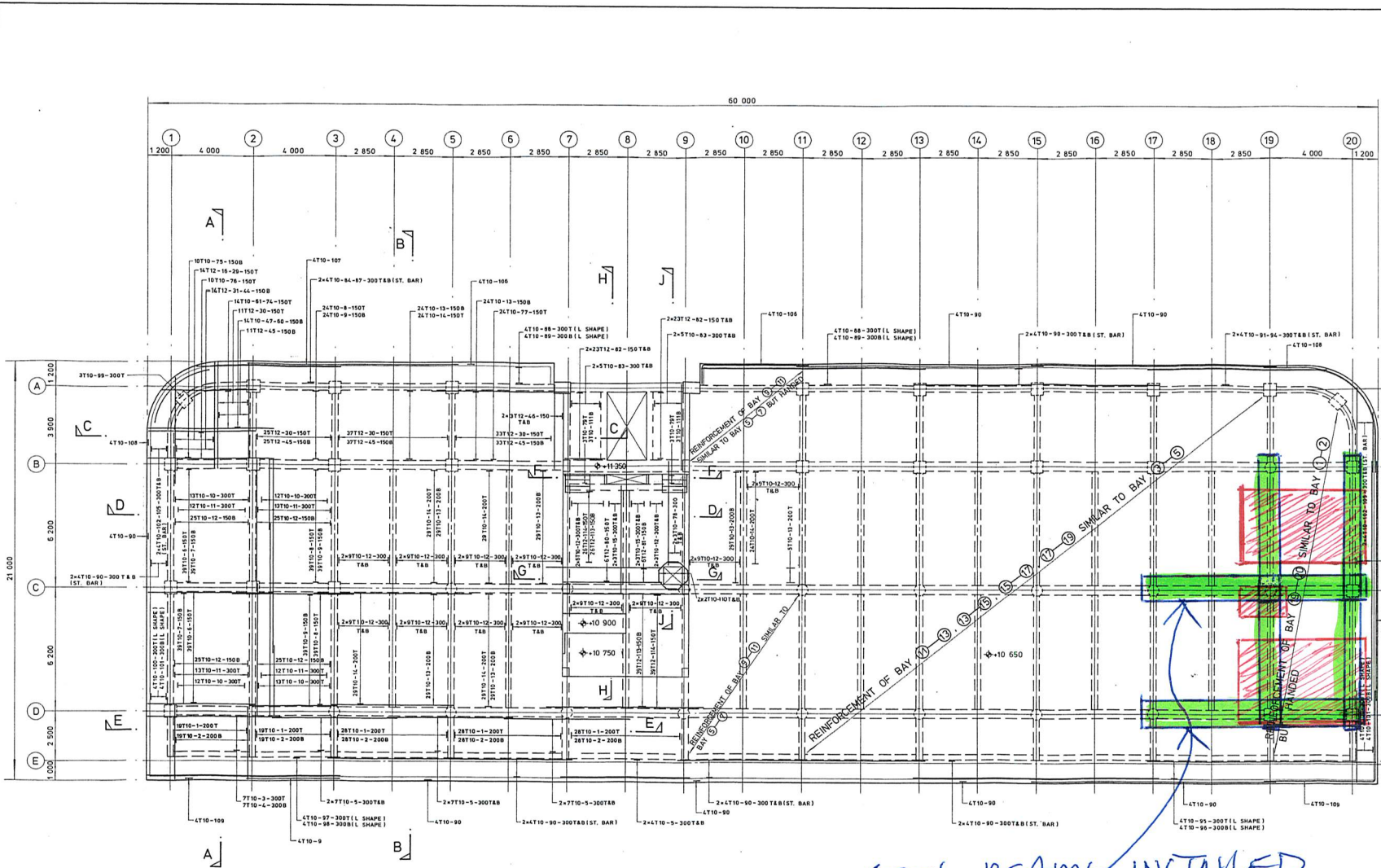
ROOF SLAB
(THICKNESS OF SLAB = 150)

STEEL BEAMS INSTALLED ON TOP OF ROOF COLUMN HEADS TO SUPPORT THE ADDITIONAL WATER TANKS (handwritten note)

	AS CONSTRUCTED		
A 4.93	PREPARED: (I.O.W.)	T. N. TSUI	
	CERTIFIED: (ENGINEER)	M. C. LEE	
no. date	description		initial

REVISION

	name	date
surveyed		
designed	T. K. CHEUNG	17-9-87
drawn	Y. M. LEUNG	3-11-87
traced	Y. M. LEUNG	3-11-87
checked	W. TSUI	6-1-88
approved		14-1-88

contract no. CV/87/08
file no. P.W.O. CV/87/08
project no. 228CL

contract
HUNG HOM BAY
RECLAMATION PHASE II
CONSTRUCTION OF
FERRY PIERS AND
SEAWALL STAGE I

drawing title
PIER B —
R. C. DETAILS OF
MAIN ROOF SLAB
(SHEET 1 OF 5)

drawing no. P 16093A
scale 1:100

office
PORT WORKS DIVISION
CIVIL ENGINEERING OFFICE

CIVIL ENGINEERING
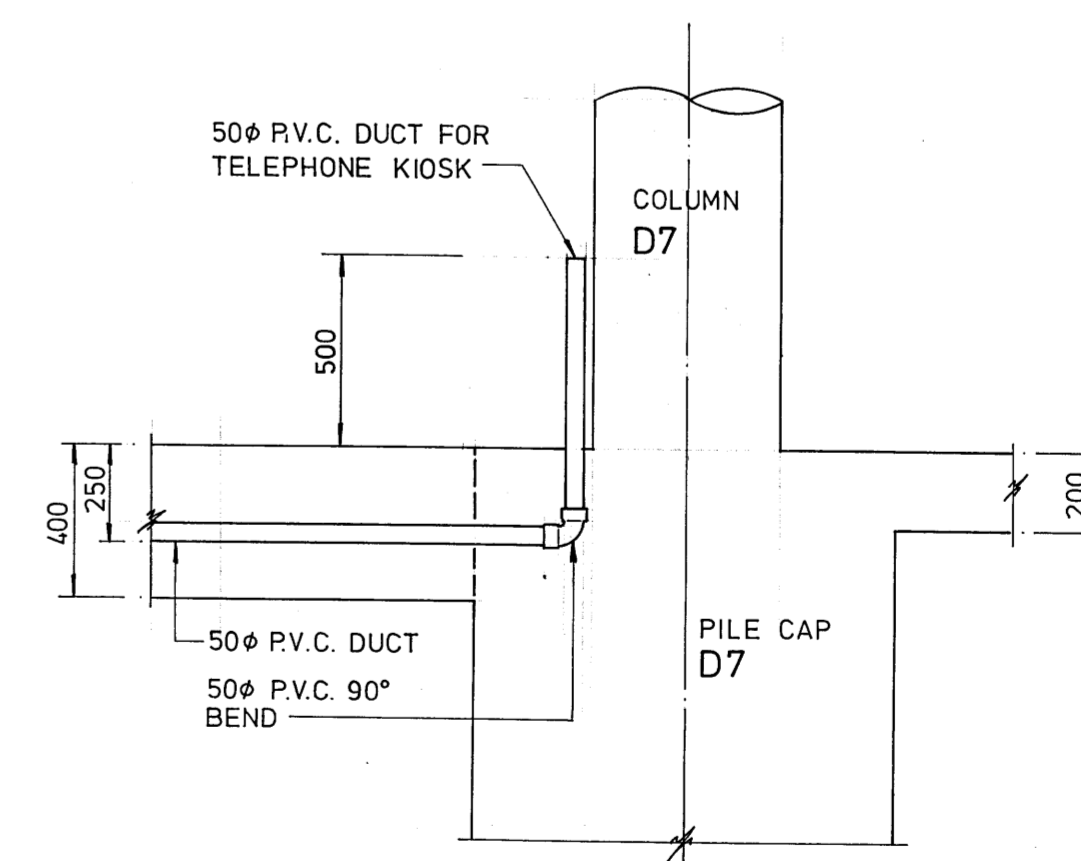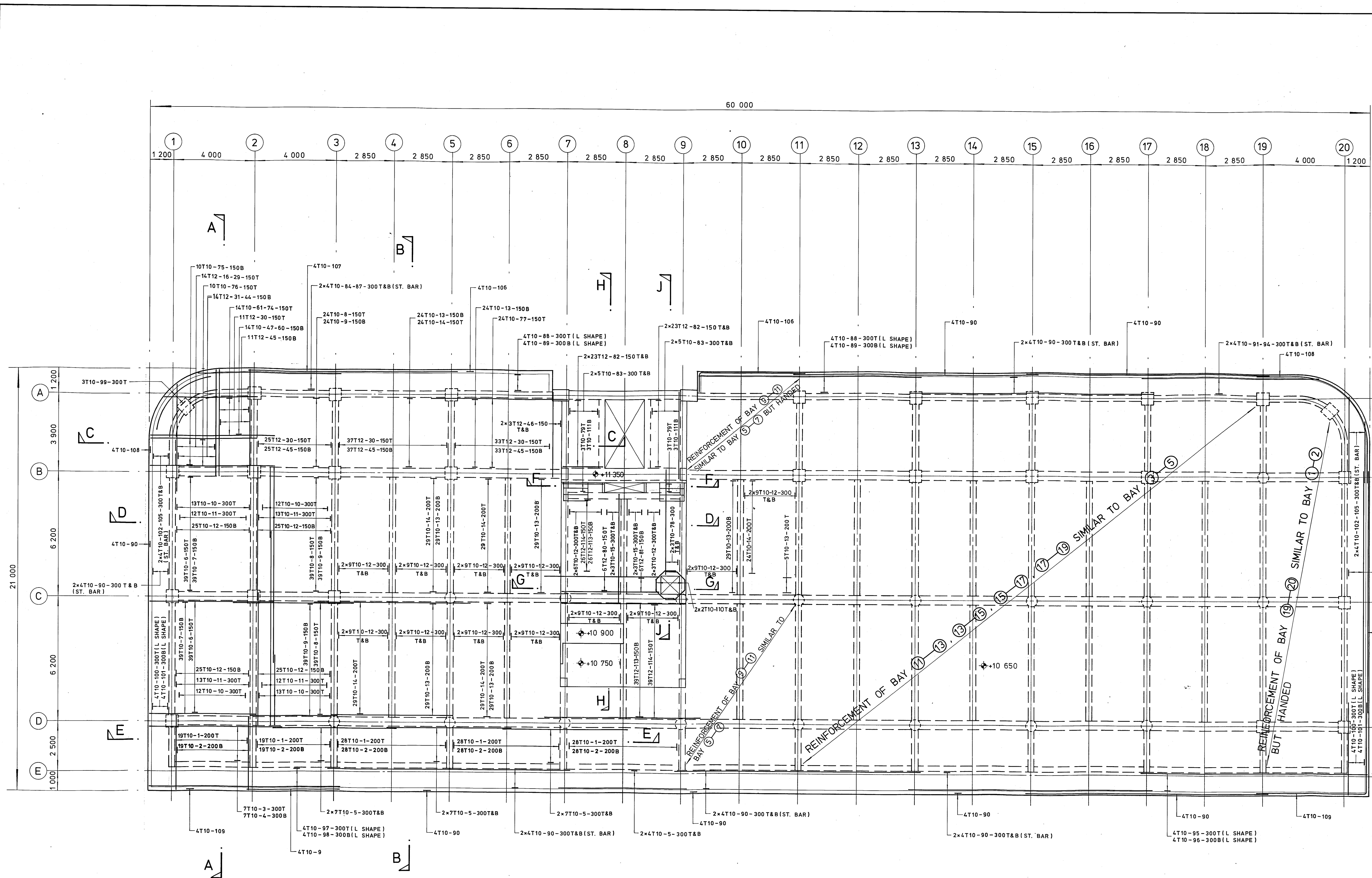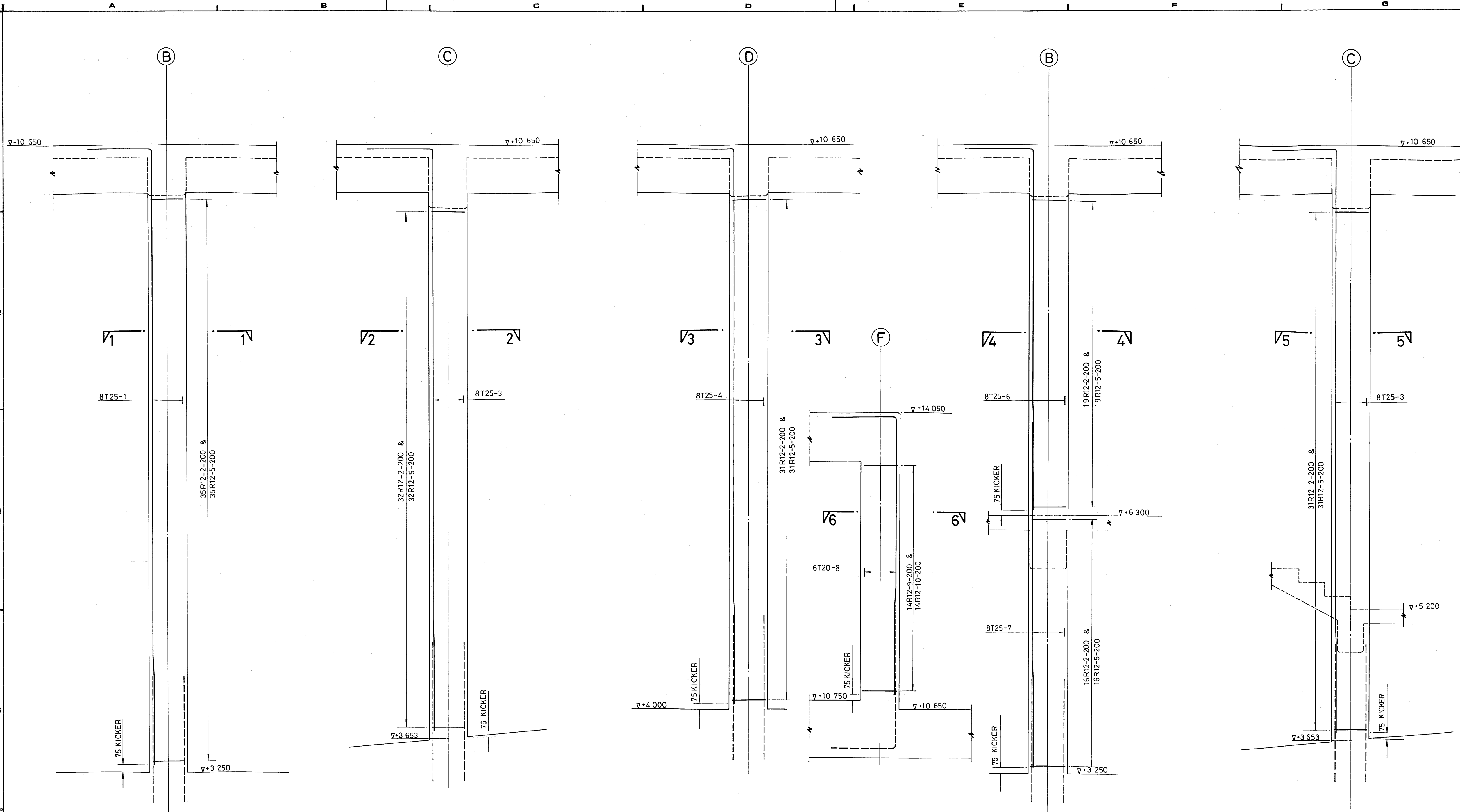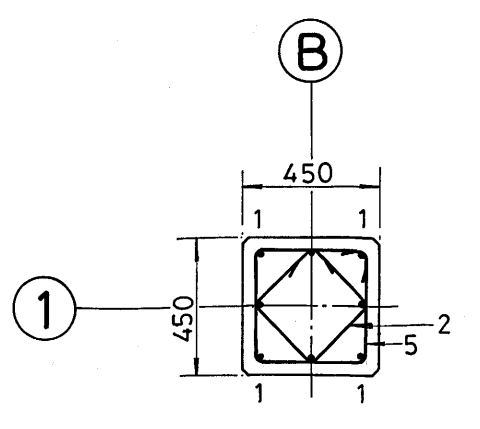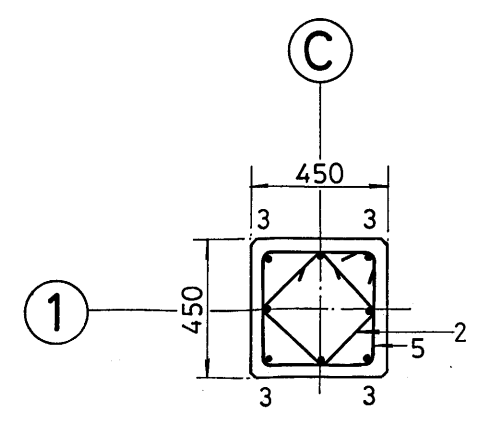SERVICES DEPARTMENT
HONG KONG

Appendix C
Record Plan

ROOF PLAN
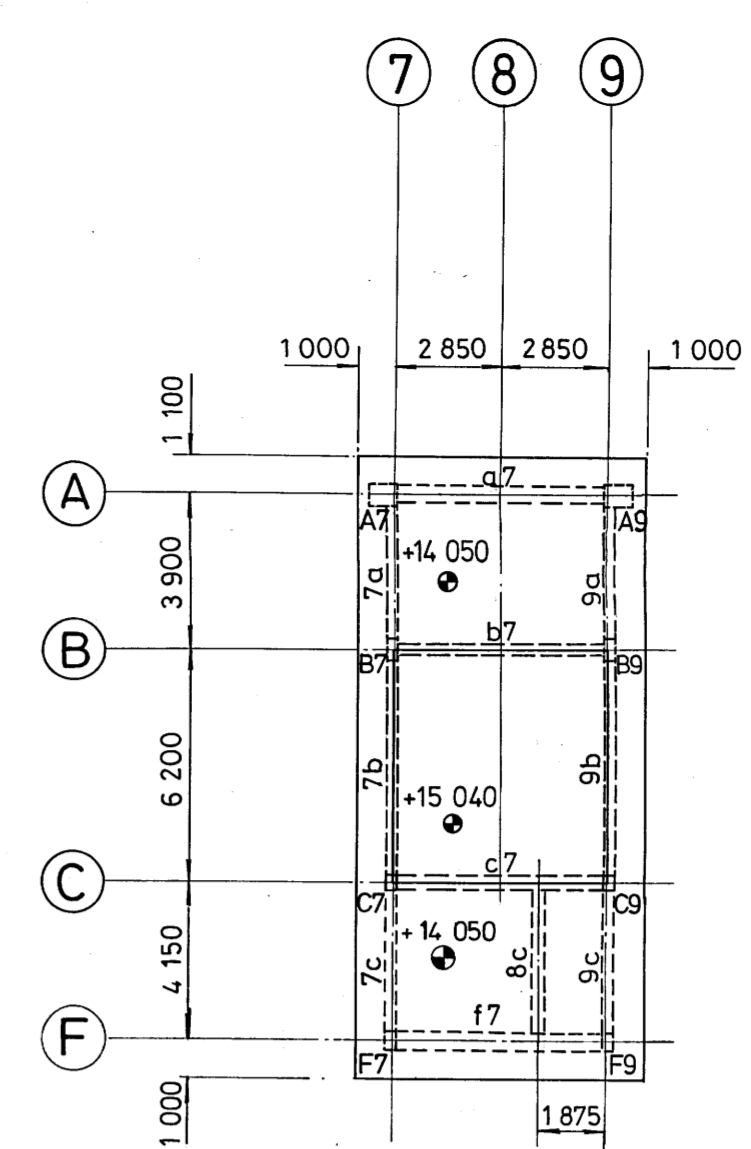
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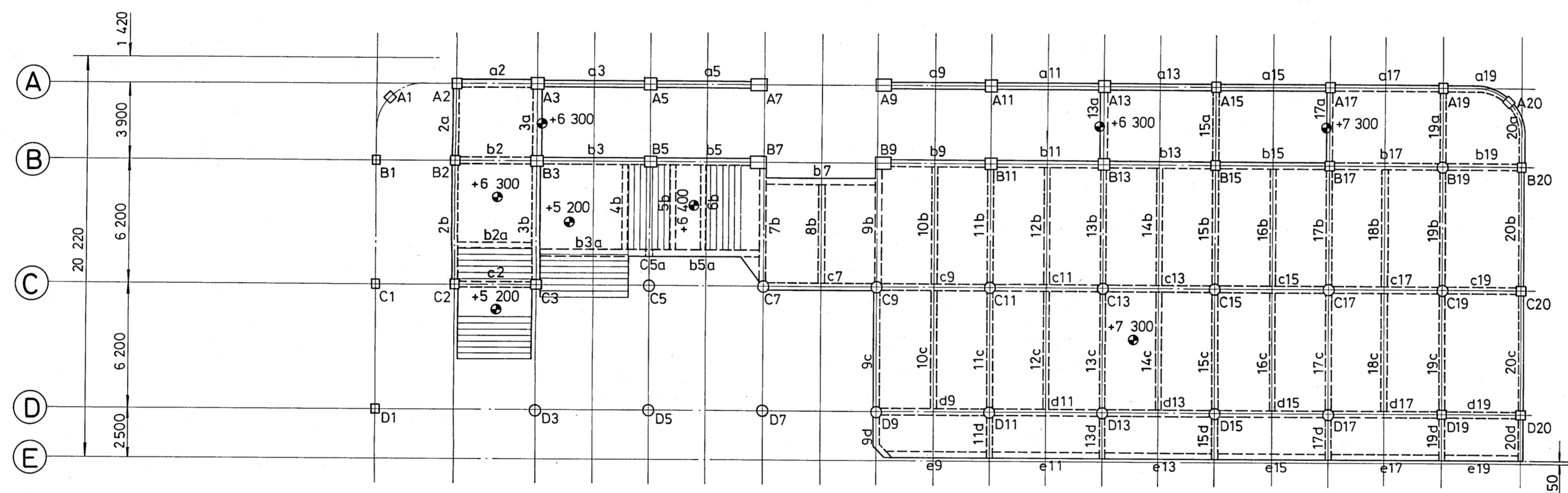
UPPER DECK PLAN
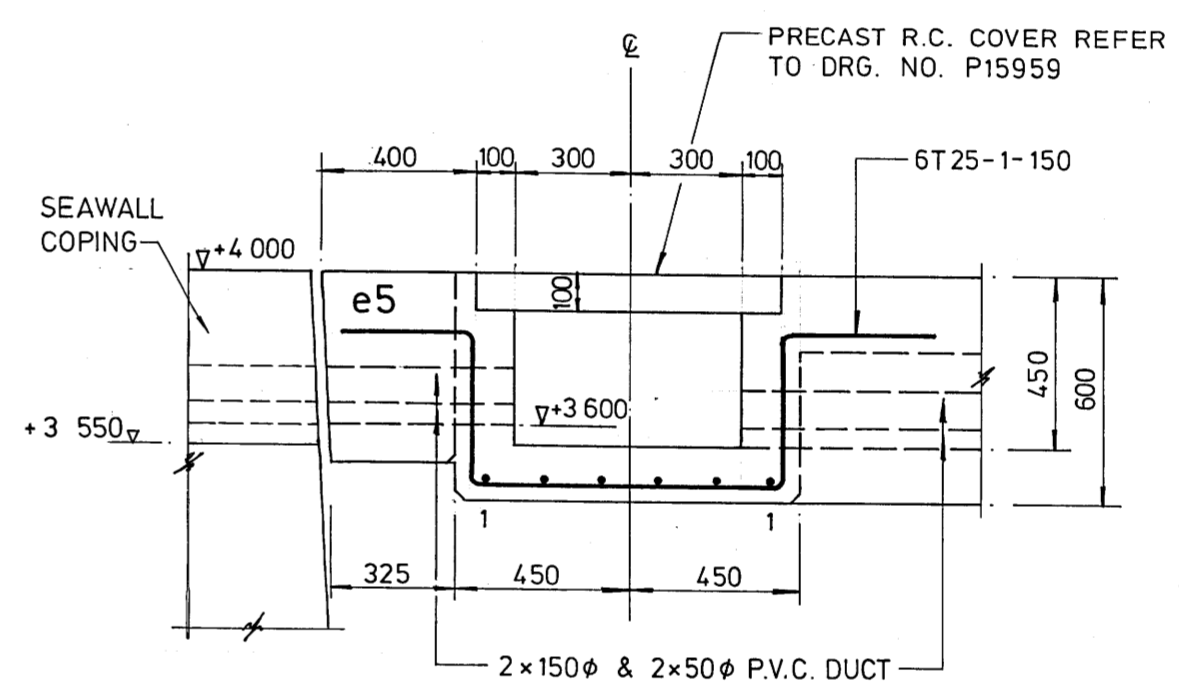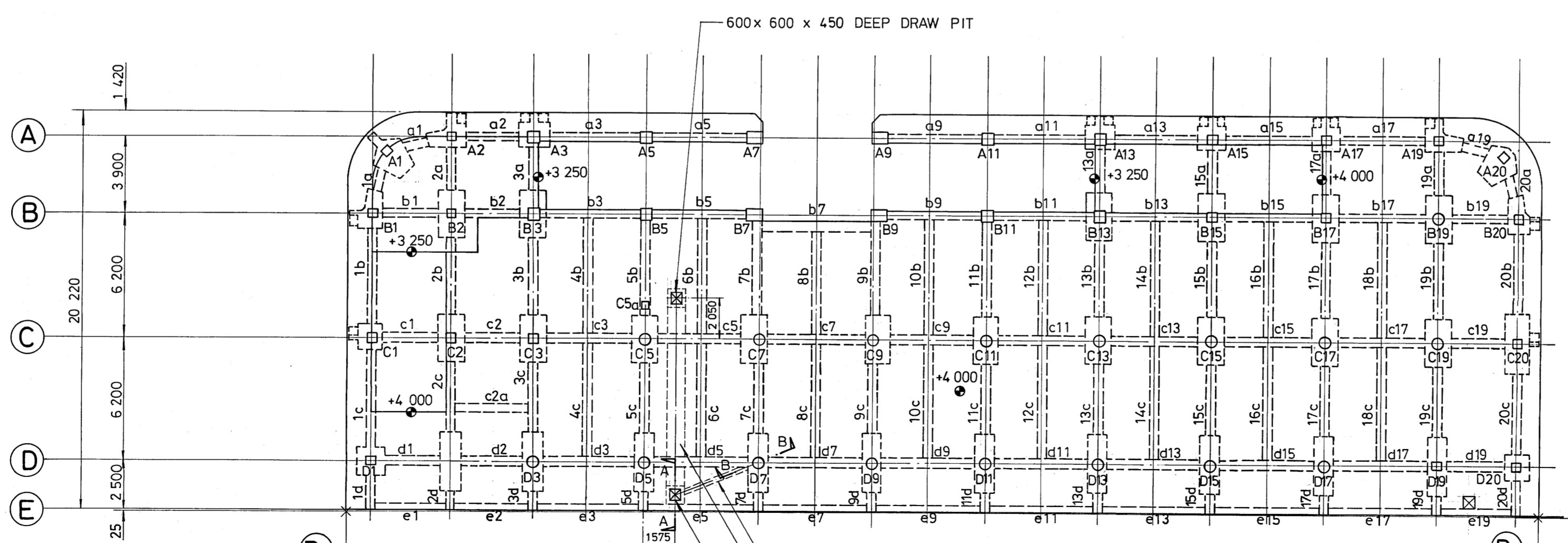
MAIN DECK PLAN

600 x 600 x 450 DEEP DRAW PIT
900 x 600 DUMMY BEAM
300 x 400 DUMMY BEAM

COPE LINE OF PROPOSED SEAWALL

SECTION A-A
SCALE:- 1 : 20

PRECAST R.C. COVER REFER TO DRG. NO. P15959
SEAWALL COPING +4 000
+3 550
+3 600
6T 25-1-150
2 x 150φ & 2 x 50φ P.V.C. DUCT
400 100 300 300 100
325 450 450
450 600

SECTION B-B
SCALE:- 1 : 20

50φ P.V.C. DUCT FOR TELEPHONE KIOSK
COLUMN D7
50φ P.V.C. DUCT
50φ P.V.C. 90° BEND
PILE CAP D7
500 400 250 200

Title Block

AS CONSTRUCTED

B	4.93	PREPARED: (I.O.W.) T. N. TSUI	CERTIFIED: (ENGINEER) M. C. LEE	
A	7-9-89	DUMMY BEAM WIDENED AND DRAW PIT SIZE INCREASED, SECTIONS A-A AND B-B ADDED		
no.	date	description		initial

REVISION

	name	date
surveyed		
designed	T. K. CHEUNG	17-9-87
drawn	C. Y. LAI	23-9-87
traced	C. Y. LAI	28-9-87
checked	W. TSUI	6-1-88
approved		13-1-88

contract no. CV / 87 / 08
file no. P.W.O. CV / 87 / 08
project no. 228 CL

contract
HUNG HOM BAY RECLAMATION PHASE II CONSTRUCTION OF FERRY PIERS AND SEAWALL STAGE I

drawing title
PIER B — FRAMING PLANS

drawing no. **P16040B**

scale 1 : 200 OR AS SHOWN

pwd 123

A1 841 x 594

ROOF SLAB
(THICKNESS OF SLAB = 150)

60 000

grid spacings (mm)
1 200, 4 000, 4 000, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 2 850, 4 000, 1 200

AS CONSTRUCTED

PREPARED: (I.O.W.)	T. N. TSUI		
CERTIFIED: (ENGINEER)	M. C. LEE		
no.	date	description	initial
A	4.93		

REVISION

	name	date
surveyed		
designed	T. K. CHEUNG	17-9-87
drawn	Y. M. LEUNG	3-11-87
traced	Y. M. LEUNG	3-11-87
checked	W. TSUI	6-1-88
approved		14-1-88

contract no. CV/87/08

file no. P.W.O. CV/87/08

project no. 228CL

contract
HUNG HOM BAY RECLAMATION PHASE II CONSTRUCTION OF FERRY PIERS AND SEAWALL STAGE I

drawing title
PIER B — R.C. DETAILS OF MAIN ROOF SLAB (SHEET 1 OF 5)

drawing no. P 16093A

scale 1 : 100

office
PORT WORKS DIVISION
CIVIL ENGINEERING OFFICE

CIVIL ENGINEERING SERVICES DEPARTMENT
HONG KONG

B1 (A1 SIMILAR)

C1

D1

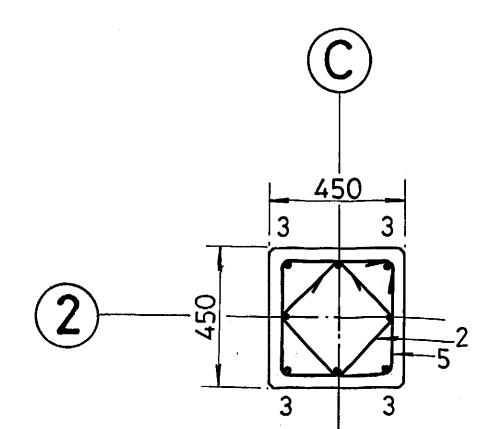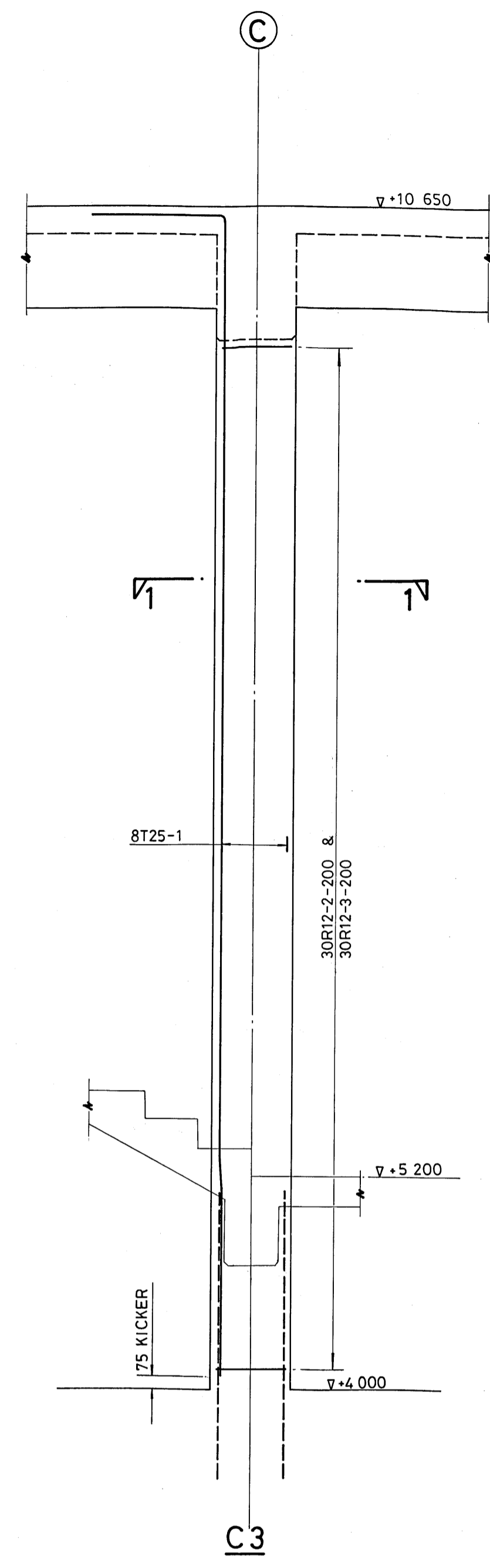F7 (F9 SIMILAR BUT HANDED)

B2 (A2 SIMILAR)

C2

SECTION 1-1

SECTION 2-2

SECTION 3-3   SECTION 6-6

SECTION 4-4

SECTION 5-5

AS CONSTRUCTED

A	493	PREPARED: (I.O.W.)	T. N. TSUI	
		CERTIFIED: (ENGINEER)	M. C. LEE	
no.	date	description		initial

REVISION

	name	date
surveyed		
designed	T. K. CHEUNG	17-9-87
drawn	C. Y. LAI	12-10-87
traced	C. Y. LAI	14-10-87
checked	W. TSUI	6-1-88
approved		13-1-88

contract no. CV / 87/ 08

file no. P.W.O. CV / 87 / 08

project no. 228 CL

contract

HUNG HOM BAY RECLAMATION PHASE II CONSTRUCTION OF FERRY PIERS AND SEAWALL STAGE I

drawing title

PIER B — R. C. DETAILS OF COLUMNS (SHEET 1 OF 4)

drawing no. P16099A   scale 1 : 25

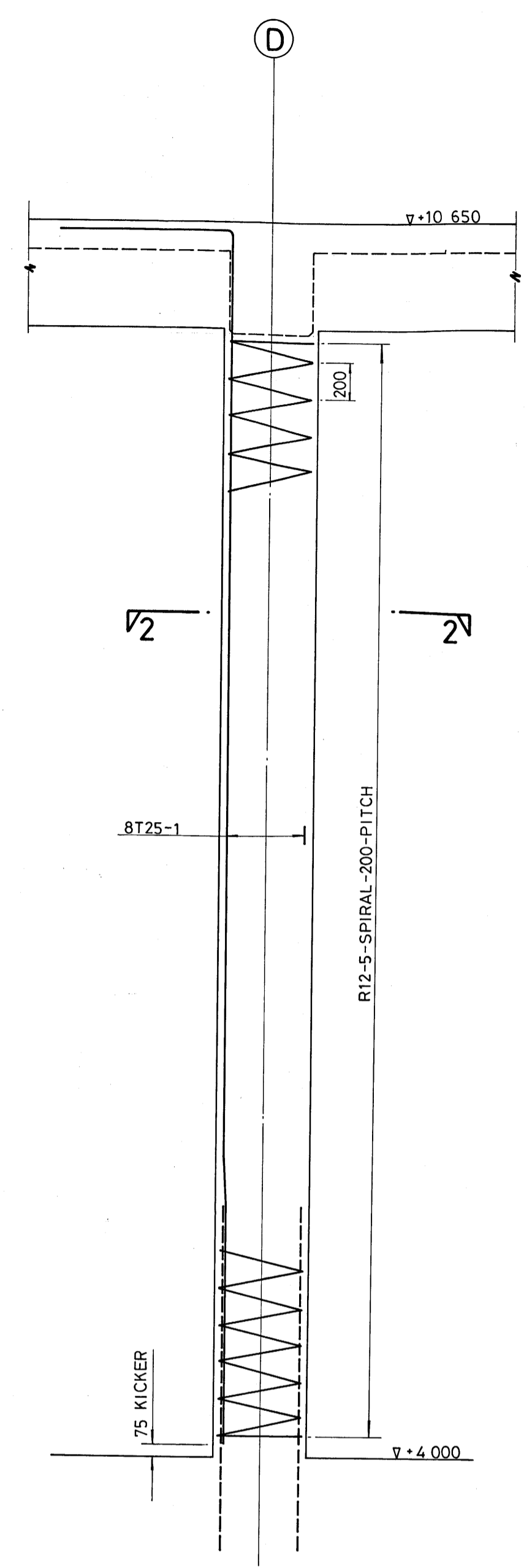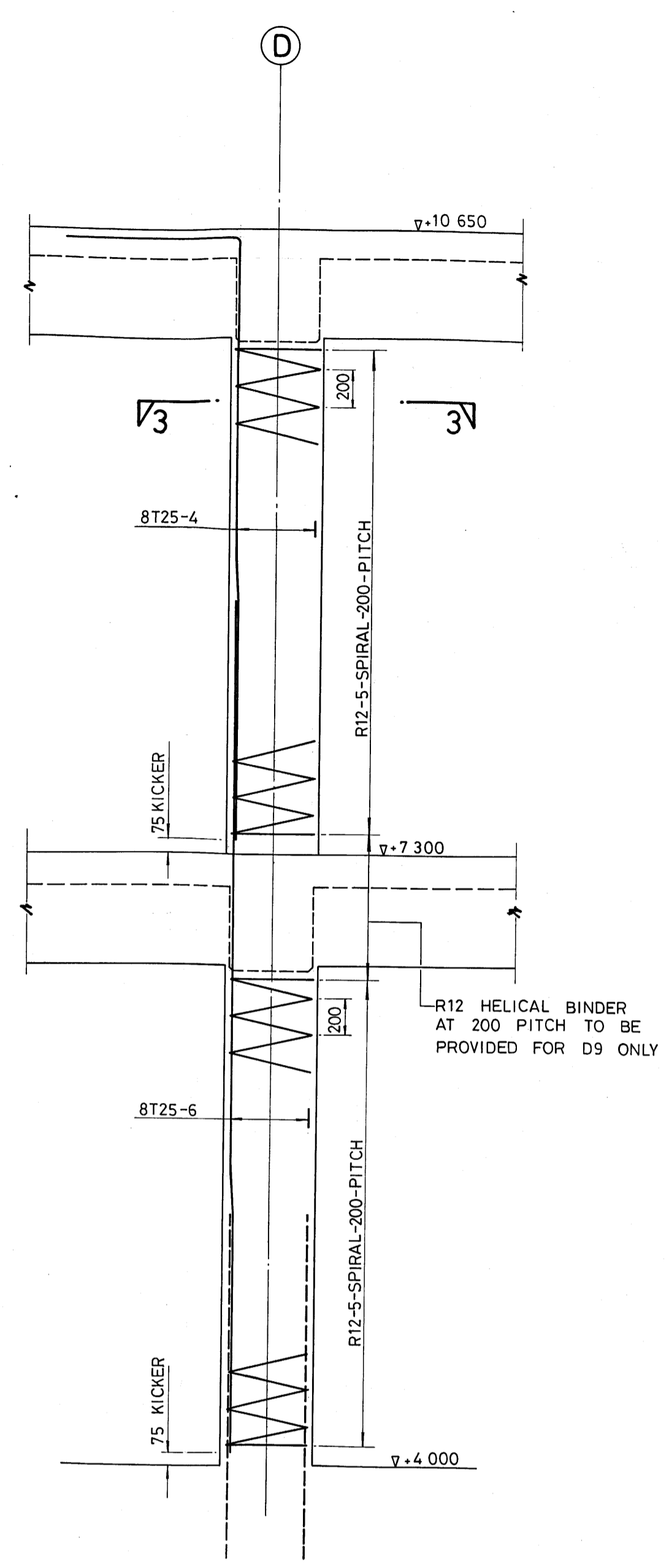office

PORT WORKS DIVISION
CIVIL ENGINEERING OFFICE

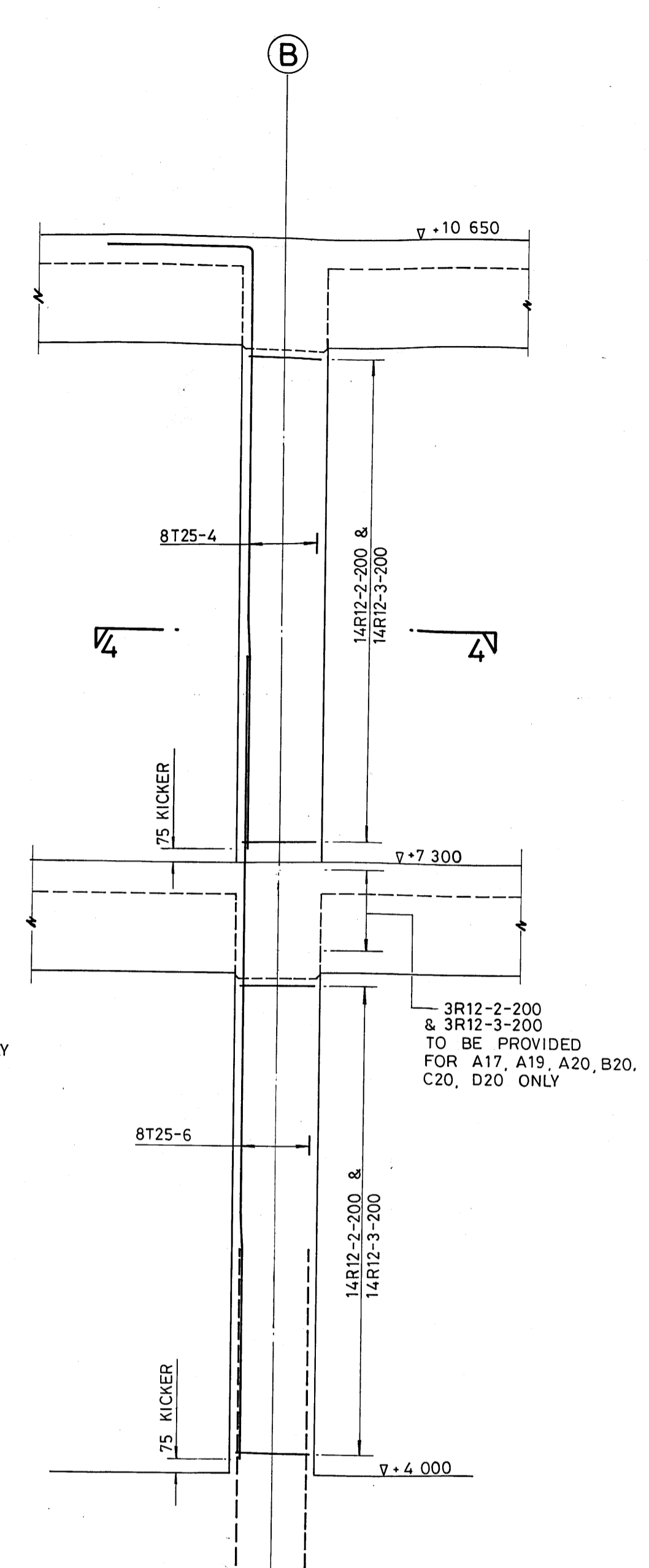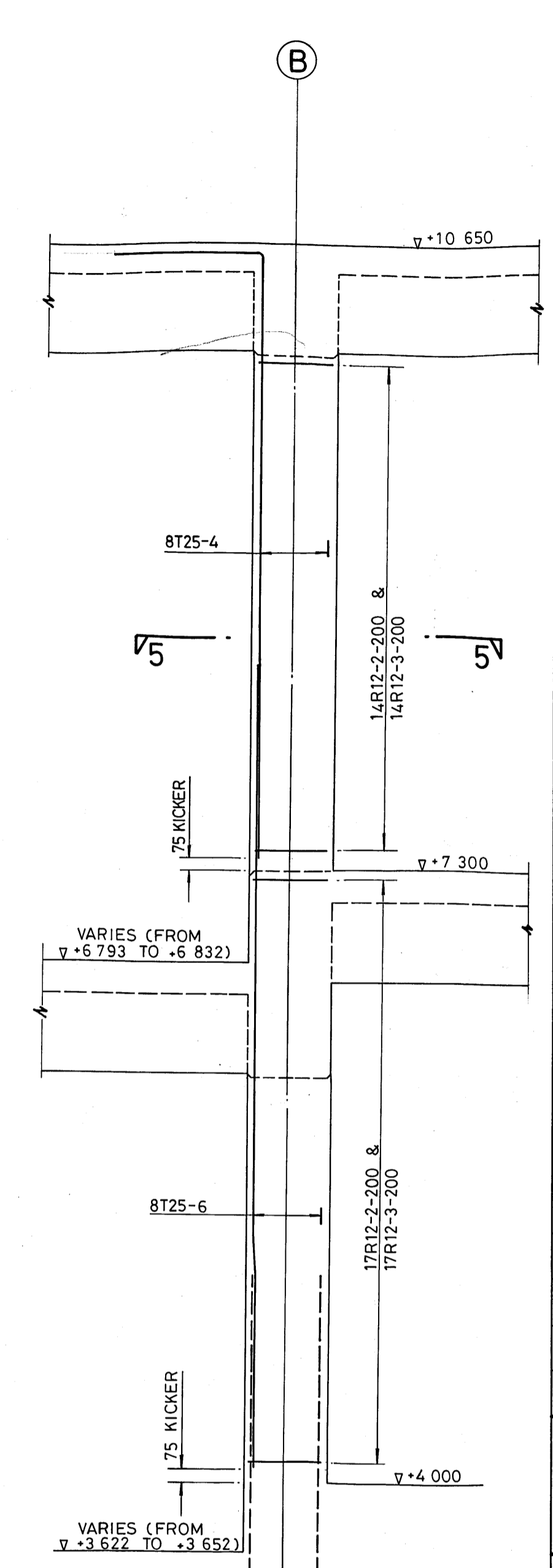CIVIL ENGINEERING SERVICES DEPARTMENT
HONG KONG
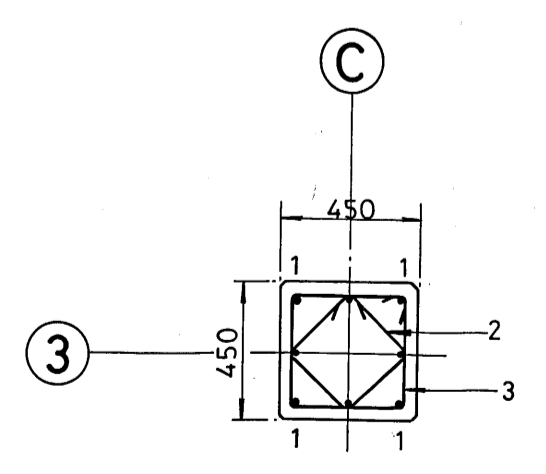
pwd 123

A1 841 x 594

C3

D3
(C5, D5, D7 SIMILAR)
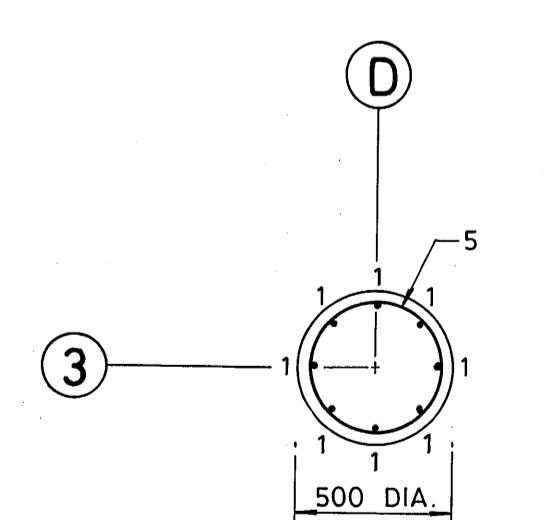
D9
(C11, D11, C13, D13, C15, D15
C17, D17, B19, C19 SIMILAR)

B17
(A17, A19, D19, A20, B20,
C20, D20 SIMILAR)

B15
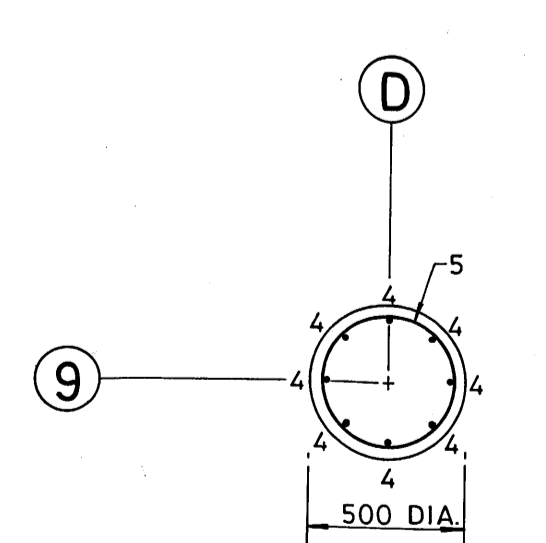(A15 SIMILAR)

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▽ +7 300
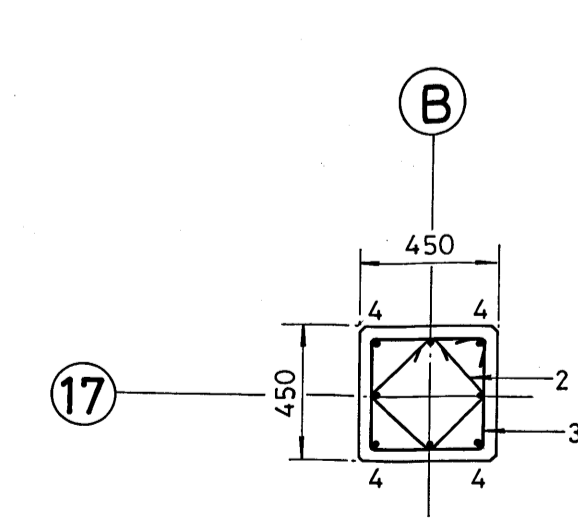▽ +5 200
▽ +4 000
▽ +6 793 TO +6 832
VARIES (FROM ▽ +3 622 TO +3 652)

8T25-1
8T25-4
8T25-6
30R12-2-200 & 30R12-3-200
R12-5-SPIRAL-200-PITCH
14R12-2-200 & 14R12-3-200
17R12-2-200 & 17R12-3-200
.75 KICKER
200

R12 HELICAL BINDER AT 200 PITCH TO BE PROVIDED FOR D9 ONLY

3R12-2-200 & 3R12-3-200 TO BE PROVIDED FOR A17, A19, A20, B20, C20, D20 ONLY

SECTION 1-1

SECTION 2-2

SECTION 3-3

SECTION 4-4

SECTION 5-5

450 × 450
500 DIA.

pwd 123
A1 841 x 594