

KEY PLAN

1 BOH SUPPORT - PILING LAYOUT PLAN  
1 : 100

RC PILE LEGEND: CONCRETE GRADE= C40/50

PILE SYMBOL	RC PILE SIZE	NO OF PILE
	200x200	275

LEGEND:

PC1	PILECAP TYPE MARKING
C1	CUL/WALL MARKING
3-200	NO OF PILE - SIZE OF PILE
- AN	(COMBINATION 1)
- AN	(COMBINATION 2)

NOTES:  
1.) IF SHORT PILES (>20% DIFFERENCE IN DESIGN PILE LENGTH) ARE ENCOUNTERED, CONTRACTORS TO INFORM CONSULTANT FOR REVIEW AND ADDITIONAL PILE TESTS TOGETHER WITH AMENDMENT SUBMISSION MAY BE REQUIRED TO VERIFY THE CAPACITIES

BOH - DENOTES BOREHOLE LOCATION

01 sheet of 02

BUILDING AND CONSTRUCTION AUTHORITY

APPROVED SECTION 5 / SECTION 6A OF THE BUILDING CONTROL ACT (CHAPTER 30)

Project Ref: A1775-00001-2018-ST101

For Commissioner of Building Control

STANDARD CERTIFICATION ON STRUCTURAL PLANS AND DESIGN CALCULATIONS BY THE ACCREDITED CHECKER

1. I, **Leung Wai Man** (ACCREDITED CHECKER) hereby certify that I have carried out an evaluation, analysis and review of the detailed structural plans and design calculations presented herein and am satisfied that there are no inadequacies in the key structural elements.

2. I further certify that these detailed structural plans and design calculations are in reference to Project Ref. No.: **A1775-00001-2018-ST101**.

3. Total number of structural plans checked: **02**.

4. I hereby declare that I have no professional or financial interest in the building works shown in the plans as defined in section 18 of the Building Control Act (Cap 30).

ACCREDITED CHECKER

No: 1139

LEUNG WAI MAN

in AC Organisation

Registration No: A006

BUILDING CONTROL ACT SINGAPORE

(ACCREDITED CHECKER'S STAMP & SIGNATURE)

DATE: \_\_\_\_\_

STANDARD CERTIFICATION BY THE QUALIFIED PERSON FOR STRUCTURAL WORKS

1. In accordance with Regulation 9 of the Building Control Regulations, I, **Chin Kheng Ming**, the Qualified Person for structural works appointed under section 8(1)(a) or 11(1)(i) of the Building Control Act, hereby submit the detailed structural plans and design calculations prepared by me and certify that they have been prepared in accordance with the provisions of the Building Control Regulations, the Building Control Act and any other written law pertaining to buildings and constructions for the time being in force.

2. I further certify that these detailed structural plans and design calculations are in reference to Project Ref. No.: **A1775-00001-2018-ST101**.

3. Total number of structural plans submitted: **02** and total number of pages of design calculations in this book: **02**.

PROFESSIONAL ENGINEER

CIVIL

CHIN KHENG MING

4447

SINGAPORE

(QUALIFIED PERSON FOR STRUCTURAL WORKS' STAMP & SIGNATURE)

DATE: \_\_\_\_\_

1	14/04/20	DL	AS PER BCA'S WD
NO	DATE	BY	AMENDMENTS

CLIENT:

MANDAI PARK DEVELOPMENT PTE LTD  
80 MANDAI LAKE ROAD, SINGAPORE 728805  
TEL: 6360 2191 EMAIL: PHILIP.TYNN@MANDAI.COM

ARCHITECT:

DP ARCHITECTS PTE LTD  
6 RAFFLES BOULEVARD  
#02-049 MARINA SQUARE  
SINGAPORE 038994  
TEL: 63383988 FAX: 63379889

PROJECT TITLE:

PROPOSED MANDAI RAINFOREST PARK NORTH COMPRISING THEMED ANIMAL NORTH COMPRISING THEMED ANIMAL HABITATS  
2 STOREY ANIMAL BACK OF HOUSE, 3 STOREY EDUCATION CENTRE  
WITH OPEN-BOX, 2 STOREY FARM HUB, 2 STOREY CATERING, ELEVATED WALKWAY AND ANCILLARY FACILITIES ON LOT 018900 PT M14 AT MANDAI LAKE ROAD (CENTRAL WATER CATCHMENTS PLANNING AREA)

DRAWING TITLE:

BOH SUPPORT - PILING LAYOUT PLAN

☐ PRELIMINARY

☐ INFORMATION

☒ AUTHORITY SUBMISSION

☐ TENDER

☐ CONSTRUCTION

.....

DRAWN BY : DL

DESIGN BY : LEE

CHECKED BY : CWM

SCALE : AS SHOWN

DATE : 04/14/20

MEN-304-EAC-CS-R0E-1000

REV.

Emerald Asia Consulting Pte Ltd  
16 Jalan Kilang  
#03-03 Hot Hip Building Singapore 159416  
TEL : 63367078 FAX : 63360229

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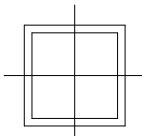
GENERAL NOTES FOR PILING WORKS:

- PILE DESIGN IN ACCORDANCE TO SS EN 1997-1:2010 & NA TO SS EN 1997-1:200
- CONCRETE GRADE:  
a) RC PILE: GRADE C40/50  
"f"<sub>c</sub> = HIGH TENSILE BARS, f<sub>yk</sub>=500N/mm<sup>2</sup>  
ALL PILECAP CENTRE SHALL COINCIDE WITH COLUMN CENTRE U.O.S.
- TOLERANCE FOR INSTALLATION SHALL BE:  
a) VERTICALLY ±100  
b) POSITION ± 75mm
- PILE TERMINATION CRITERIA:  
a) ALL PILES SHALL BE JACKED TO SPECIFIED JACKING FORCES.  
JACKING FORCE SHALL BE 2x PILE RESISTANCE UNDER COMBINATION 2.  
b) SPECIFIED JACKING FORCE SHALL BE MAINTAINED FOR 2 MINUTES  
FINAL PILE SET SHALL NOT EXCEED 5mm
- AT LEAST TWO CYCLES OF LOADING TO SPECIFIED JACKING FORCE SHALL BE CARRIED OUT  
AND SET CRITERIA UNDER (b) SHALL BE SPECIFIED FOR ALL LOADING CYCLES
- INSTALLATION OF PILES SHALL COMPLY WITH NOISE CONTROL REQUIREMENT OF NEA.  
THE ALLOWABLE VIBRATION LIMIT DURING THE INSTALLATION OF PILES IS 5mm/s AS  
ACCORDING TO DIN STANDARD.
- ALL THE ABOVE SHALL BE READ IN CONJUNCTION WITH THE CONTRACT SPECIFICATIONS. IN THE EVENT OF  
DISCREPANCIES BETWEEN THE ABOVE STATED NOTES AND THE CONTRACT SPECIFICATIONS, THE MORE  
ONEROUS CLAUSE/SPECIFICATION SHALL GOVERN.
- DESIGN PARAMETER  
a) SKIN FRICTION (f<sub>s</sub>)=k<sub>s</sub> x N ; k<sub>s</sub>=3.0  
END BEARING (f<sub>b</sub>)=k<sub>b</sub> x q<sub>u</sub> ; k<sub>b</sub>=6.0 (f<sub>b</sub> LIMITED TO 18,000kpa)  
b) MODEL FACTOR = 1.55 (RESISTANCE VERIFIED BY MAINTAINED LOAD TEST)

	COMBINATION-1	COMBINATION-2
ACTION (PERMANENT)	1.35	1.0
ACTION (VARIABLE)	1.5	1.3
WSP (DOWN DRAG)	1.35	1.25
RESISTANCE (END BEARING)	1.0	1.7
RESISTANCE (SHAFT)	1.0	1.5
RESISTANCE (TOTAL COMPRESSION)	1.0	1.7
SHAFT IN TENSION	1.0	2.0

- MAX ALLOWABLE SETTLEMENT SHALL BE 15mm UNDER ONE (1) TIMES WORKING LOAD  
DIFFERENTIAL SETTLEMENT = 1/500
- CONTRACTOR TO SUBMIT COORDINATED CUT-OFF LEVEL FOR ENGINEER'S APPROVAL PRIOR TO PILING.

RC COMPRESSION PILE SCHEDULE

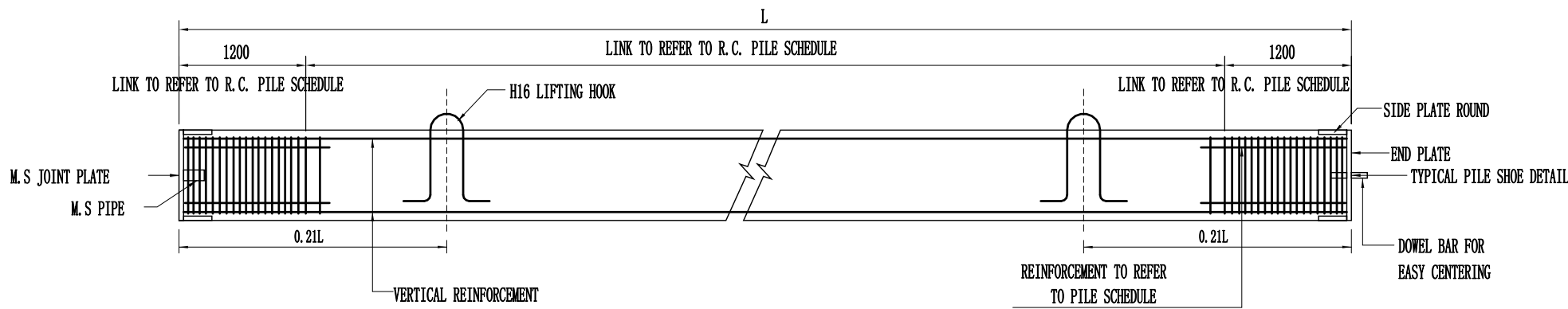
PILE SYMBOL	RC PILE SIZE (MM)	MAIN REINFORCEMENT MAIN BAR/END, CENTRE LINK	TOTAL NO. OF PILE		BBS
	200x200	4H12 / 11RS 5-57, RS 5-100	275	DA1-C1 (DN)	700
				DA1-C2 (DN)	450
				PILE EFFECTIVE PENETRATION DEPTH (a)	23.9

(ESTIMATED C.O.L = 126.9m)

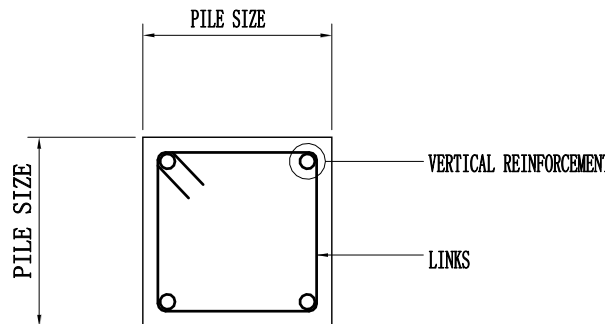
PILE TEST FOR RC PILES		
TYPE OF LOAD TEST	PILE TEST SCHEDULE	NO. & SIZE OF TEST PILE
1) WORKING LOAD TEST (TEST TO MIN. 2.0 x PILE RESISTANCE UNDER COMBINATION 2)	1 NOS. OR 1% OF THE WORKING PILES INSTALLED OR 1 EVERY 50m LENGTH OF PROPOSED BUILDING, WHICHEVER IS GREATER	TOTAL 3 NOS.
2) NON-DESTRUCTIVE TEST, PMA (TEST TO MIN. 2.0 x PILE RESISTANCE UNDER COMBINATION 2)	2 NOS. OR 2% OF THE WORKING PILES INSTALLED, WHICHEVER IS GREATER	6 NOS. (TO BE SELECTED ON SITE)
3) FIT TEST		TOTAL 3 NOS.

GENERAL GUIDELINE FOR  
VIBRATION LIMIT OF PILING WORK

LINE	TYPE OF STRUCTURE	VIBRATION VELOCITY, V, IN mm/s FOUNDATION
1	BUILDINGS USED FOR COMMERCIAL PURPOSES INDUSTRIAL BUILDINGS AND BUILDINGS OF SIMILAR DESIGN	5
2	DWELLING AND BUILDINGS OF SIMILAR DESIGN AND/OR USE.	5
3	STRUCTURES THAT, BECAUSE OF THEIR PARTICULAR SENSITIVITY TO VIBRATION, DO NOT CORRESPOND TO THOSE LISTED IN LINES 1 AND 2 AND ARE OF GREAT INTRINSIC VALUE (e.g. BUILDING THAT ARE UNDER A PRESERVATION ORDER)	5

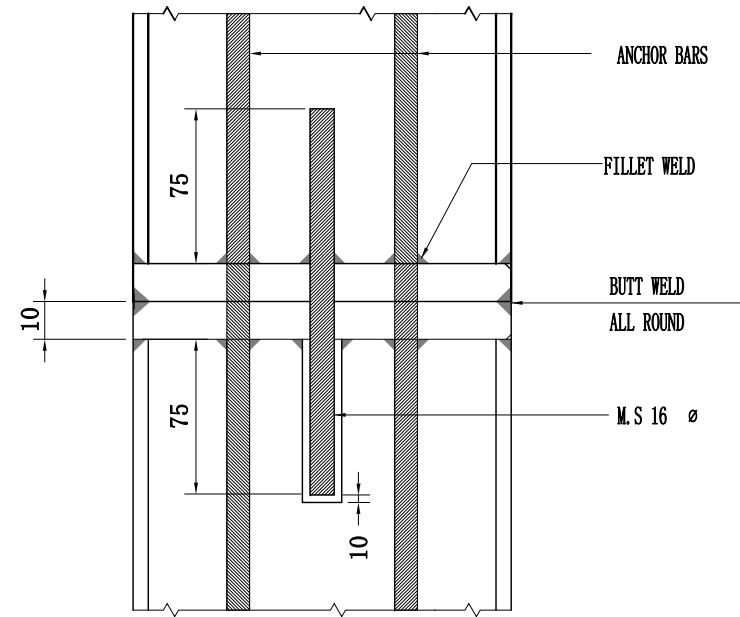


TYPICAL RC PILE DETAIL  
SCALE 1:20

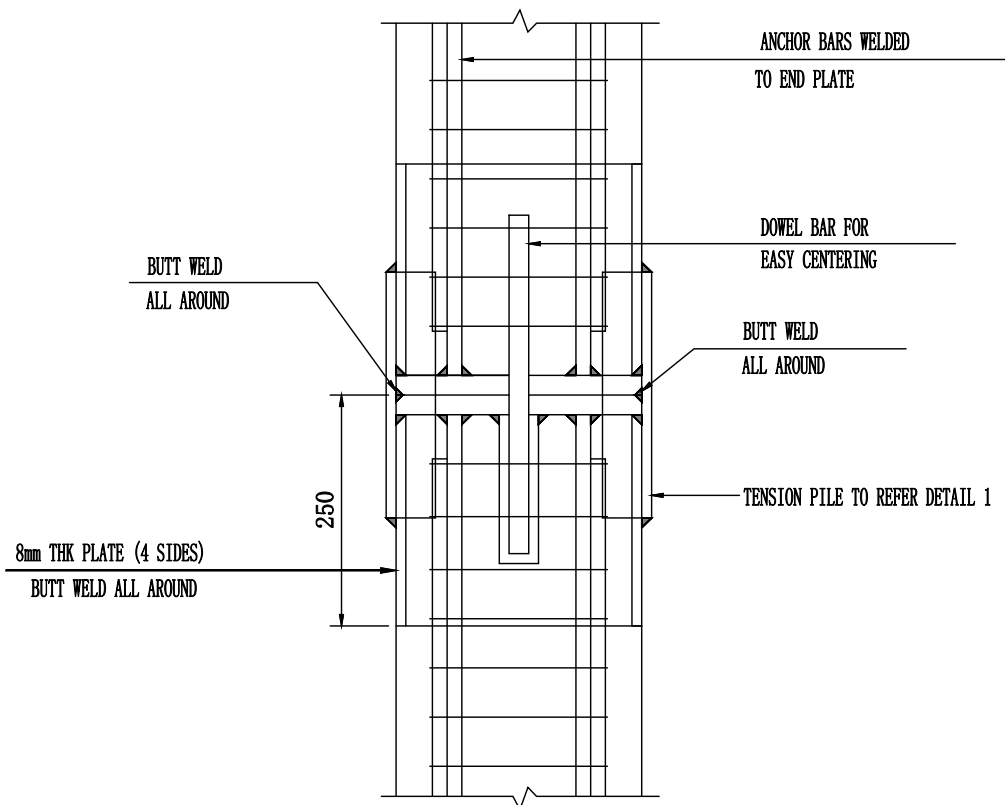


TYPICAL R.C. PILE SECTION  
SCALE 1:100

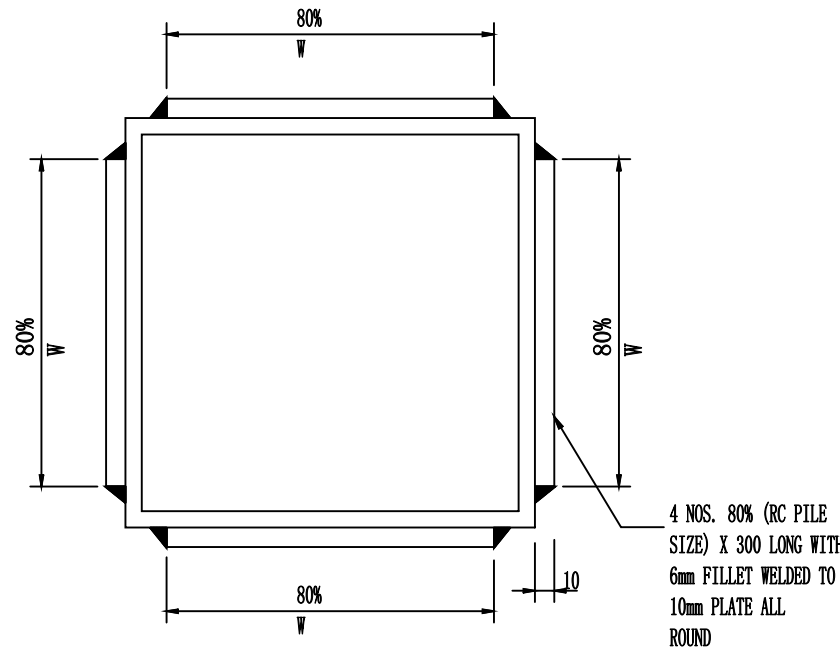
NOTE: ALL PILE SIZE,  
VERTICAL REINFORCEMENT TO  
REFER TO PILE SCHEDULE.



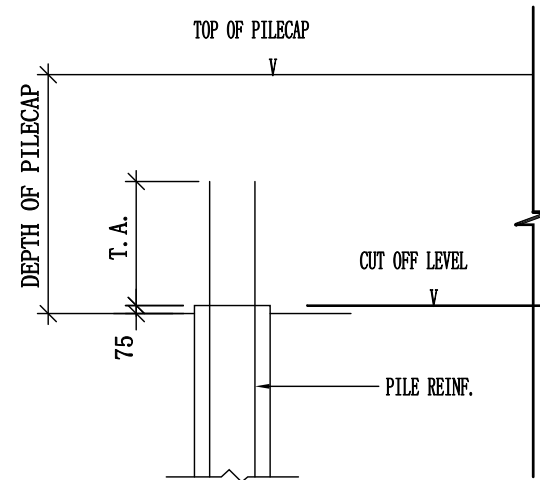
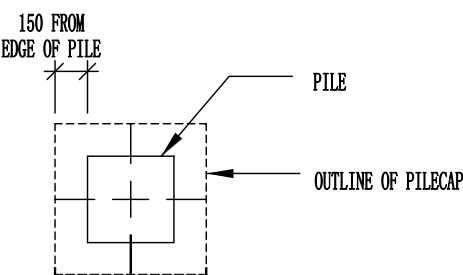
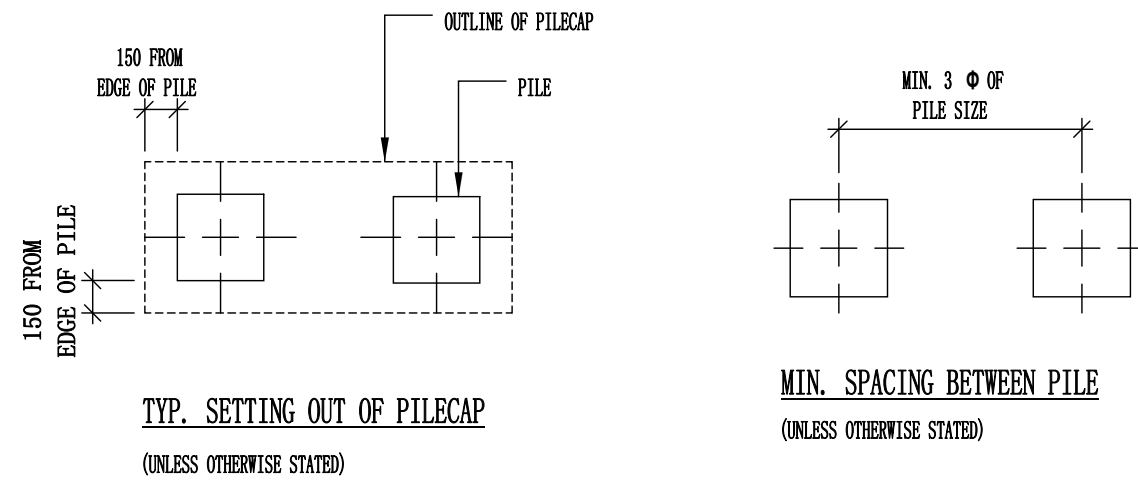
TYPICAL R.C. PILE JOINT DETAIL  
(FOR COMPRESSION PILE)  
SCALE 1:100



TYPICAL R.C. PILE JOINT DETAIL (FOR TENSION PILE)  
SCALE 1:100



DETAIL 1  
SPLICE FOR TENSION PILES  
SCALE 1:30



TYPICAL RC PILE SECTION

02 sheet of 02

BUILDING AND CONSTRUCTION AUTHORITY  
APPROVED SECTION 5 / SECTION 6A OF THE BUILDING CONTROL ACT (CHAPTER 30)  
Project Ref: A1775-00001-2018-ST101  
For Commissioner of Building Control

STANDARD CERTIFICATION ON STRUCTURAL PLANS AND DESIGN CALCULATIONS BY THE ACCREDITED CHECKER

- I, Leung Wai Man (ACCREDITED CHECKER) hereby certify that I have carried out an evaluation, analysis and review of the detailed structural plans and design calculations presented herein and am satisfied that there are no inadequacies in the key structural elements.
- I further certify that these detailed structural plans and design calculations are in reference to Project Ref. No.: A1775-00001-2018-ST101.
- Total number of structural plans checked: 02.
- I hereby declare that I have no professional or financial interest in the building works shown in the plans as defined in section 18 of the Building Control Act (Cap 30).

ACCREDITED CHECKER  
No: 1139  
LEUNG WAI MAN  
in AC Organisation  
Registration No: A006  
BUILDING CONTROL ACT  
SINGAPORE

(ACCREDITED CHECKER'S STAMP & SIGNATURE)

DATE: \_\_\_\_\_

STANDARD CERTIFICATION BY THE QUALIFIED PERSON FOR STRUCTURAL WORKS

- In accordance with Regulation 9 of the Building Control Regulations,  
1. Chee Wen Jia, the Qualified Person for structural works appointed under section 8(1)(a) or 1(1)(1)(1) of the Building Control Act, hereby submit the detailed structural plans and design calculations prepared by me and certify that they have been prepared in accordance with the provisions of the Building Control Regulations, the Building Control Act and any other written law pertaining to buildings and construction for the time being in force.
- I further certify that these detailed structural plans and design calculations are in reference to Project Ref. No.: A1775-00001-2018-ST101.
- Total number of structural plans submitted: 02 and total number of pages of design calculations in this book: 02.



(QUALIFIED PERSON FOR STRUCTURAL WORKS' STAMP & SIGNATURE)

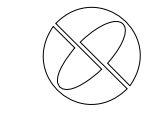
DATE: \_\_\_\_\_

1	14/04/20	DL	AS PER BCA'S WD
NO	DATE	BY	AMENDMENTS

CLIENT:

**Mandai**  
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6 RAFFLES BOULEVARD  
#02-049 MARINA SQUARE  
SINGAPORE 038994  
TEL: 63889888 FAX: 63379889

PROJECT TITLE:

PROPOSED MANDAI RAINFOREST PARK NORTH COMPRISING  
THEMED ANIMAL NORTH COMPRISING THEMED ANIMAL HABITATS  
2 STOREY ANIMAL BACK OF HOUSE, 3 STOREY EDUCATION CENTRE  
WITH OPEN-BOX, 2 STOREY FARM HUB, 2 STOREY CATERING, ELEVATED  
WALKWAY AND ANCILLARY FACILITIES ON LOT 01890C PT M14 AT  
MANDAI LAKE ROAD (CENTRAL WATER CATCHMENTS PLANNING AREA)

DRAWING TITLE:

BOH SUPPORT - PILING NOTES  
& DETAILS

<input type="checkbox"/> PRELIMINARY	<input type="checkbox"/> TENDER
<input type="checkbox"/> INFORMATION	<input type="checkbox"/> CONSTRUCTION
<input checked="" type="checkbox"/> AUTHORITY SUBMISSION	<input type="checkbox"/> .....

DRAWN BY :	DL	SCALE :	AS SHOWN	REV.
DESIGN BY :	LKE	DATE :	04/14/20	
CHECKED BY :	CWM	MRN-304-EAC-CS-R0E-1001		

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TEL : 6536708 FAX : 65360229

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