

Inventors of the technology behind the RibRaft® Xpod™.

We are the best for keeping your foundation costs down
as we know the RibRaft® Xpod™ Foundation System best.

CALCULATION NOTE



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112 KING ROAD - MEEANEE, NAPIER

PROJECT

7887 C001 A

12.06.24 FPA

JOB

DOCUMENT

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DATE

ISSUED BY

Foundation Design - Calculation Note

Introduction

This calculation note has been prepared using the Wafflesuite® software.

In particular, a non-linear finite element analysis for a soil-structure interaction has been carried out using the Liquefaction-Induced Parabolic Method (L.I.P.S.), in compliance with MBIE/NZGS Module 4 “Earthquake resistant foundation design” and MBIE Guidance “Repairing and rebuilding houses affected by the Canterbury earthquakes” for the specific soil conditions (ref. to “Soil Performance” Paragraph) and foundation type (Ribraft® XPod™).

For this specific design, the Verification Method that has been adopted to demonstrate compliance with NZBC consists of AS/NZS 1170 used in conjunction with the relevant cited material standards as modified by Verification Method B1/VM1, B1/VM4, B1/AS1.

NZS3101 – 2006 was used to determine the capacities of the structural sections.

The following combinations of actions have been considered in the analysis:

ULS and SLS (waffle raft):

$Ed = [G + 0.3Q + L]$ permanent, imposed actions and soil loss of support actions

ULS (Short-term actions on soil):

$Ed = [1.2G + 1.5Q]$ permanent and imposed actions

SLS (Long-term actions on soil):

$Ed = [G + 0.4Q]$ permanent and imposed actions

This document and the annexed plans shall be read in conjunction with the Ribraft® XPod™ Designers guide issued by Firth Industries and it is accompanied by a Producer Statement Design.

Software Disclaimer

Anyone who distributes this document is a suitably qualified professional who has read the Wafflesuite® User Terms, understands them and agrees to be bound by them.

Wafflesuite® is a software developed by Cresco Group www.cresco-group.com

Project Information

Client:	Stuart and Sheryl Masters
Job Number:	7887
Project address- Street:	112 King Road
Project address - Town/City:	Meeanee, Napier
Project address - Local Authority:	Napier City Council

Soil Performance

Stable/Soft Soil:	No
Expansive Soil:	No
Liquefaction Prone Soil:	Yes
Ultimate Bearing Capacity:	200 kPa
Building Platform Stiffness:	10000 kPa/m
Natural Soil Unit Weight:	18 kN/m
Liquefaction Potential	TC2-LIKE
Total Liquefaction Settlements at ULS:	100 mm
Total Liquefaction Settlements at SLS:	50 mm

Foundation Type

Waffle raft system:	XPOD-750
Edge Beam Protrusion Beyond Waffle Raft Overall Standard Depth:	NIL
Foundation type:	Shallow
Engineered Fill Thickness Below Ground Level (BGL):	100 mm
Engineered Fill Thickness Above Ground Level (AGL):	0 mm
Fill Unit Weight :	22 kN/m

Load Analysis

Rectangle 1

1 storey
Lightweight roof
Standard Edge Beams

EL1	EL2	EB1	EB2
19.6 m	19.6 m	8.4 m	8.4 m
1. Cladframe	1. Cladframe	1. Cladframe	1. Cladframe
G = 2 kN/m	G = 1.8 kN/m	G = 2.2 kN/m	G = 2.2 kN/m
Q = 0.6 kN/m	Q = 0.5 kN/m	Q = 0.8 kN/m	Q = 0.8 kN/m

User defined additional loads:

Load #1: G= 2.6 kN/m Q= 1.2 kN/m
Load #2: G= 3.7 kN/m Q= 1.8 kN/m
Load #3: G = 4.8 kN Q = 3 kN

Rectangle 2

1 storey
Lightweight roof
Standard Edge Beams

EL1	EL2	EB1	EB2
13.8 m	13.8 m	9 m	9 m
1. Cladframe	1. Cladframe	1. Cladframe	1. Cladframe
G = 2.2 kN/m	G = 2.2 kN/m	G = 2.3 kN/m	G = 2.8 kN/m
Q = 0.8 kN/m	Q = 0.8 kN/m	Q = 0.8 kN/m	Q = 1.1 kN/m

User defined additional loads:

Load #1: G= 2.6 kN/m Q= 1.2 kN/m
Load #2: G= 3.7 kN/m Q= 1.8 kN/m
Load #3: G = 4.8 kN Q = 3 kN

Rib Reinforcing Summary

Rectangle 1		
	TOP Reinforcing	BTM Reinforcing
RL*	SE72	1 HD12 @rib
RB*	SE72	1 HD12 @rib
Rectangle 2		
	TOP Reinforcing	BTM Reinforcing
RL*	SE72	1 HD12 @rib
RB*	SE72	1 HD12 @rib

Design Summary

LIQUEFACTION POTENTIAL	TC2-LIKE
TOTAL LIQUEFACTION SETTLEMENTS AT ULS	100 mm
TOTAL LIQUEFACTION SETTLEMENTS AT SLS	50 mm
ULTIMATE BEARING CAPACITY	200 kPa
WAFFLE RAFT TYPE	RIBRAFT X-POD 750
TOP SLAB THICKNESS (T)	85 mm
WAFFLE RAFT OVERALL DEPTH (H)	300 mm
RIB SPACING	750 mm
INTERNAL RIB AVERAGE WIDTH	135 mm
EDGE BEAM MINIMUM WIDTH (B)	300 mm
INTERNAL RIB BTM REINFORCING (M1)	1 HD12
INTERNAL RIB TOP REINFORCING (M2)	-
EDGE BEAM BTM REINFORCING (M3)	2 HD12
EDGE BEAM TOP REINFORCING (M4)	1 HD12
SLAB FABRIC	SE72 TOP
CONCRETE STRENGTH (f_c')	20 MPa (Firth mixcode IP2019X)
DESIGNED WITH WAFFLESUITE	REF CRS-A-8530-0624

Checks Summary

Rib

Deflection ratio = 1 in 290 < 1 in 200 over 2 m cantilever
M*,hog = 12.7 kNm <ΦMu,hog = 13.5 kNm
M*,sag = 11.3 kNm <ΦMu,sag = 15 kNm
V*,max = 9.2 kN <ΦVu = 17 kN
P*,short term = 24.2 kPa <DBC = 100 kPa
P*,long term = 15.6 kPa <ABC = 66.7 kPa

Edge Beam

Deflection ratio = 1 in 320 < 1 in 200 over 2 m cantilever
M*,hog = 21 kNm <ΦMu,hog = 23 kNm
M*,sag = 16.9 kNm <ΦMu,sag = 28 kNm
V*,max = 13.2 kN <ΦVu = 39.6 kN
P*,short term = 25.3 kPa <DBC = 100 kPa
P*,long term = 17.2 kPa <ABC = 66.7 kPa

Rectangle 1 - Loss of Support 1



Loads

Loads in accordance with paragraph "Load Analysis"

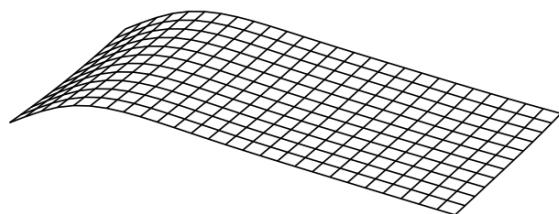
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

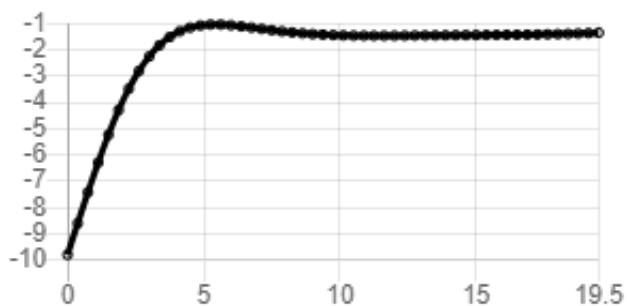


Edge Beam (EL) - Summary

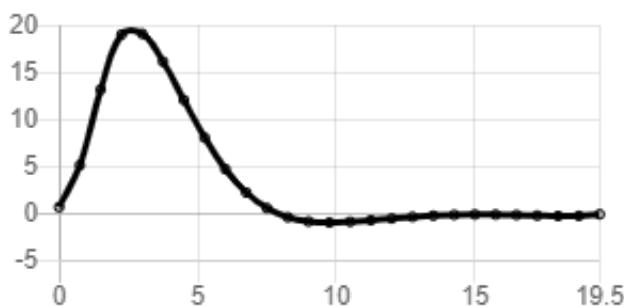
Deflection ratio = 1 in 341 < 1 in 200 over 2 m cantilever
 $M^*,\text{hog} = 19.5 \text{ kNm} < \Phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 0.9 \text{ kNm} < \Phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 12.2 \text{ kN} < \Phi V_{u} = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

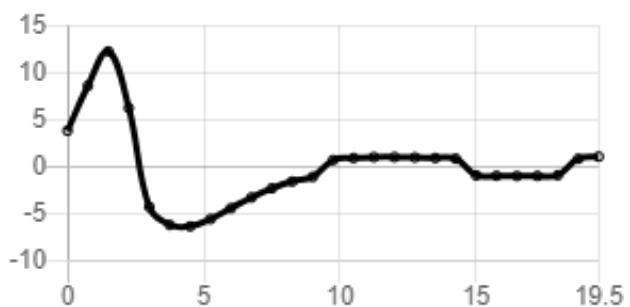
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]

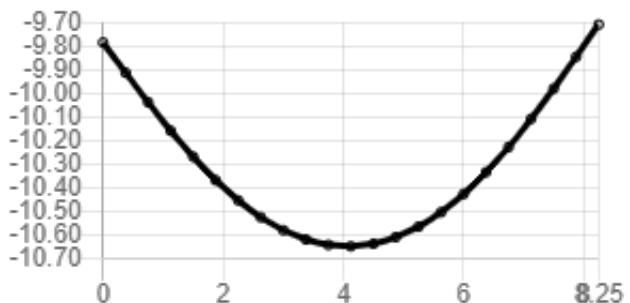


Edge Beam (EB) - Summary

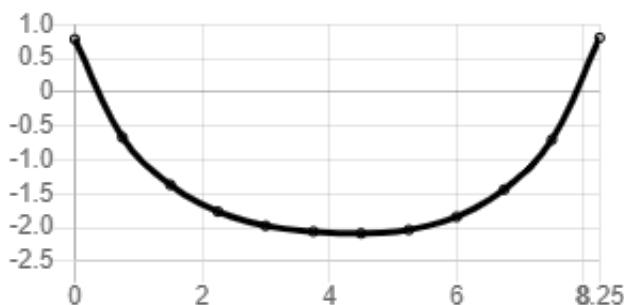
Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.8 \text{ kNm} < \Phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 2.4 \text{ kNm} < \Phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 3.9 \text{ kN} < \Phi V_{u} = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

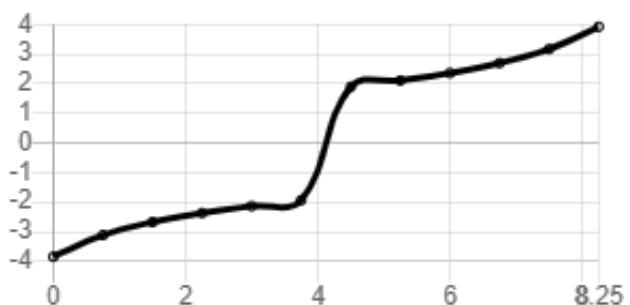
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

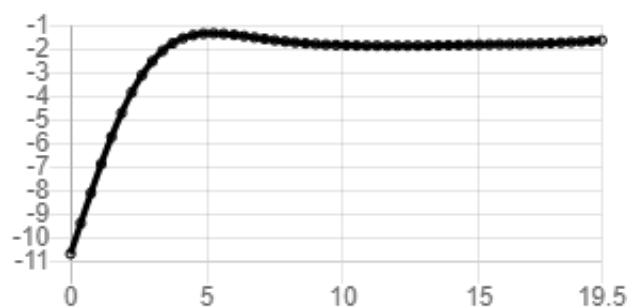


Rib (RL*) - Summary

Deflection ratio = 1 in 315 < 1 in 200 over 2 m cantilever
 $M^*, hog = 11.7 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 1.4 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 7.5 \text{ kN} < \phi Vu = 17 \text{ kN}$

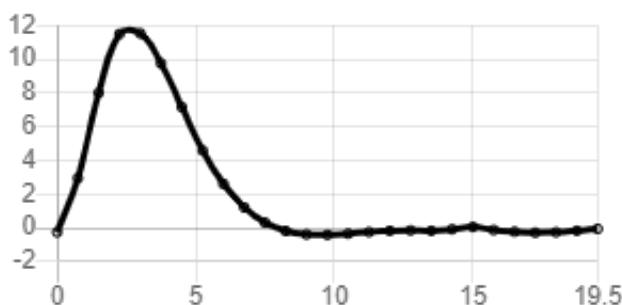
Rib (RL*) - Deflection

[X:m, Y:mm]



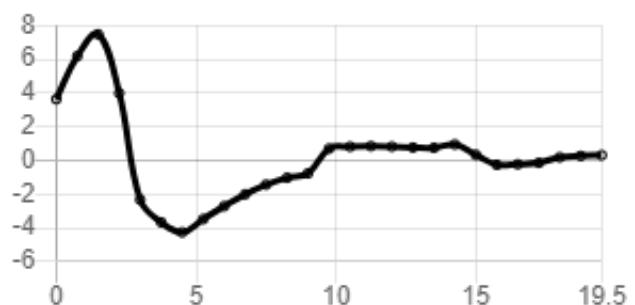
Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]

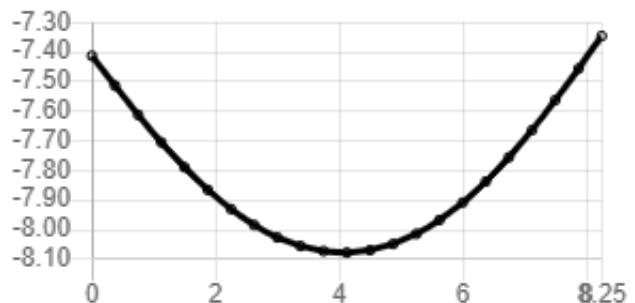


Rib (RB*) - Summary

Deflection ratio check not required along this direction
 $M^*, hog = 0.2 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 3.1 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 3.3 \text{ kN} < \phi Vu = 17 \text{ kN}$

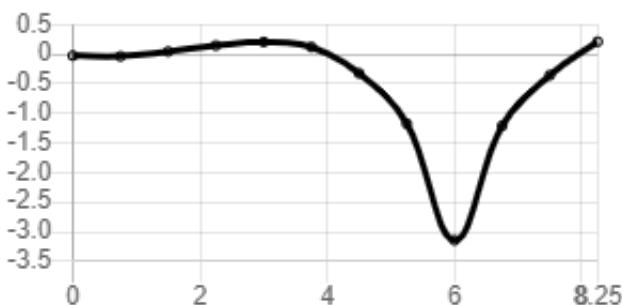
Rib (RB*) - Deflection

[X:m, Y:mm]



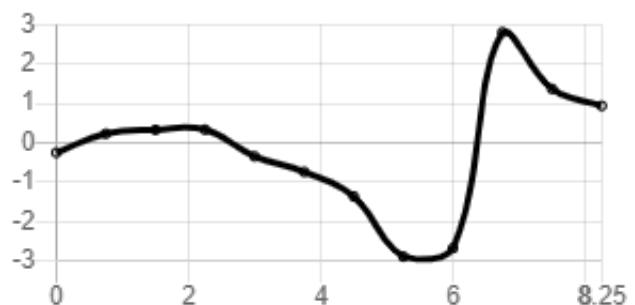
Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]

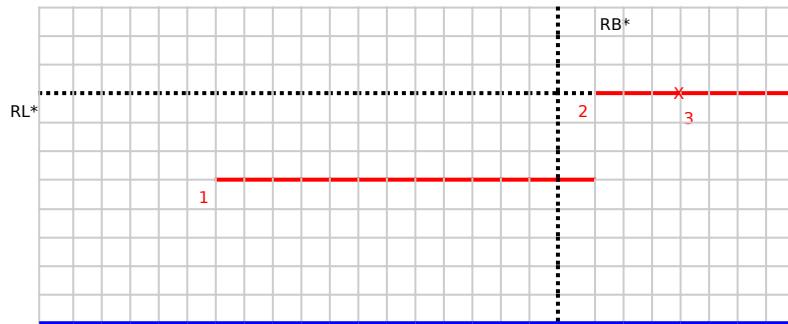


Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 1 - Loss of Support 2



Loads

S2

Loads in accordance with paragraph "Load Analysis"

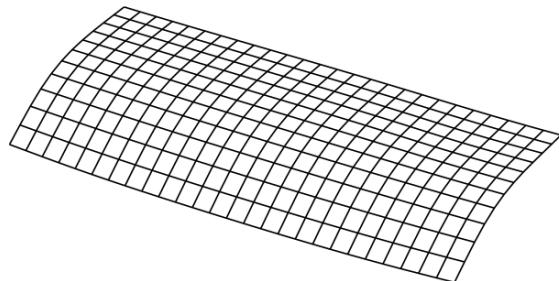
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

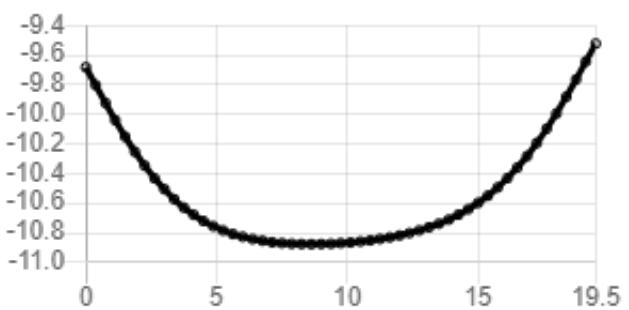
The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.



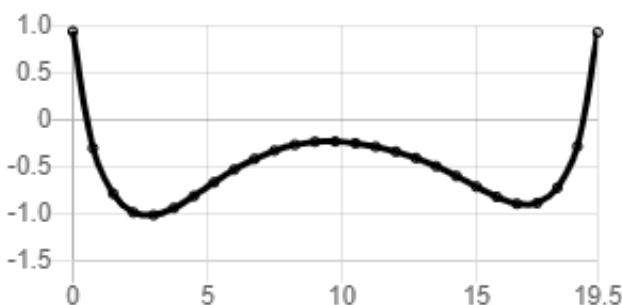
Edge Beam (EL) - Summary

Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.9 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 1.2 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 3.5 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

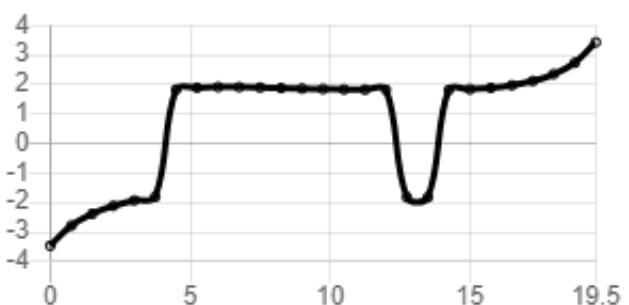
Edge Beam (EL) - Deflection [X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



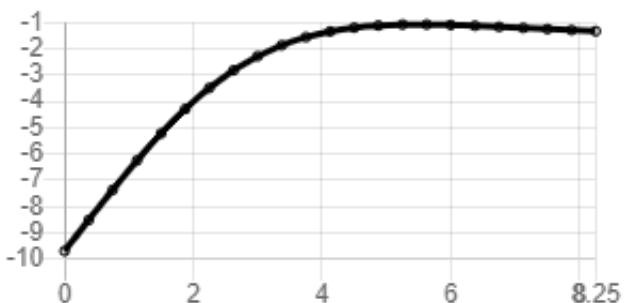
Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]



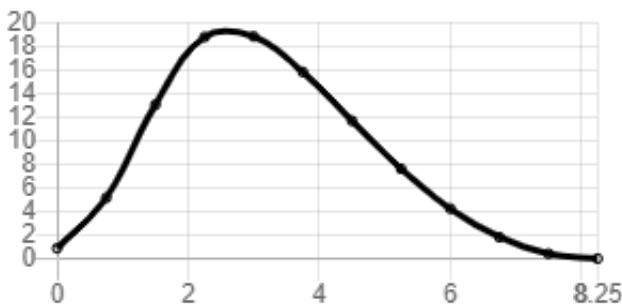
Edge Beam (EB) - Summary

Deflection ratio = 1 in 348 < 1 in 200 over 2 m cantilever
 $M^*,\text{hog} = 19.2 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 0 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 12.1 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

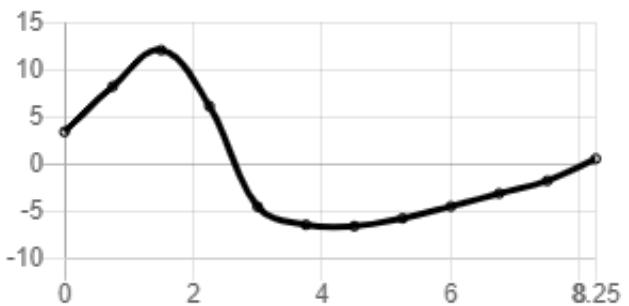
Edge Beam (EB) - Deflection [X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

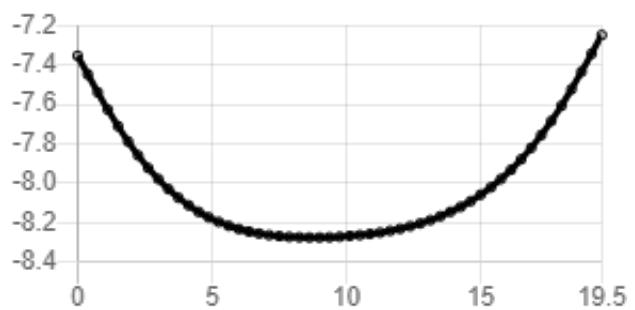


Rib (RL*) - Summary

Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.5 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 1.5 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 2.5 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

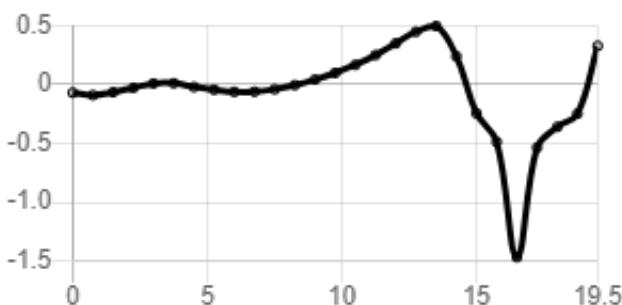
Rib (RL*) - Deflection

[X:m, Y:mm]



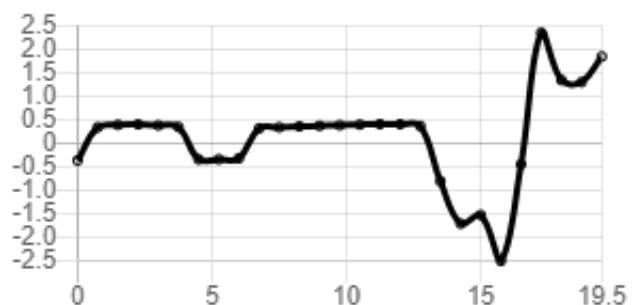
Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]

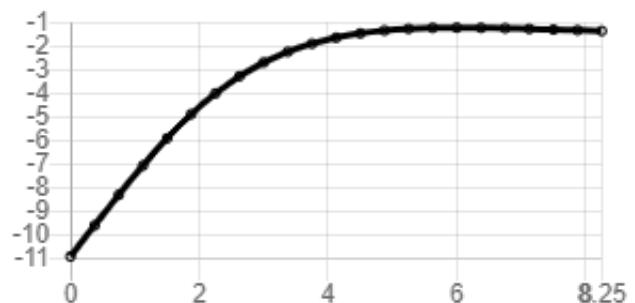


Rib (RB*) - Summary

Deflection ratio = 1 in 312 < 1 in 200 over 2 m cantilever
 $M^*,\text{hog} = 11.8 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 0.3 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 7.6 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

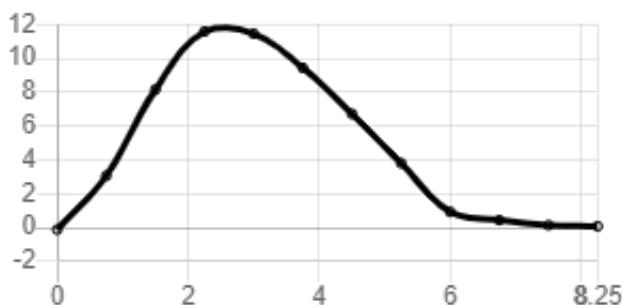
Rib (RB*) - Deflection

[X:m, Y:mm]



Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 1 - Loss of Support 3



Loads

Loads in accordance with paragraph "Load Analysis"

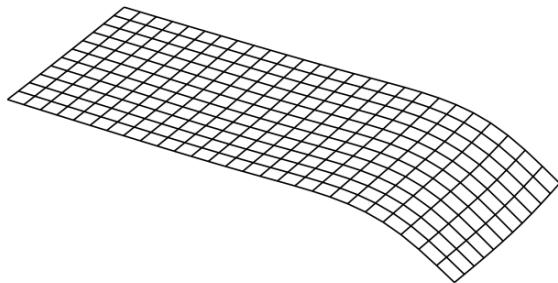
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

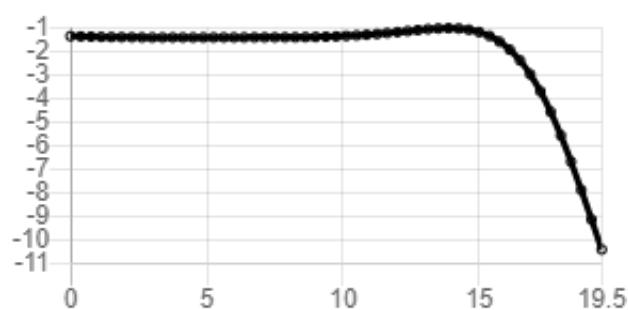
The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.



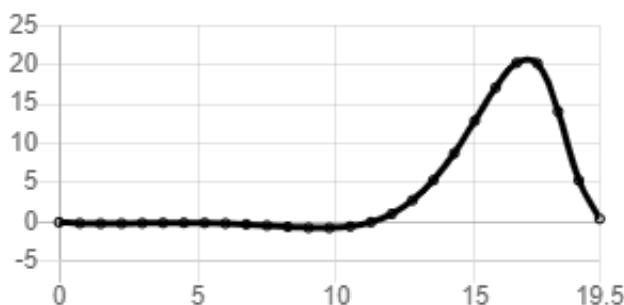
Edge Beam (EL) - Summary

Deflection ratio = 1 in 323 < 1 in 200 over 2 m cantilever
 $M^*, hog = 20.8 \text{ kNm} < \phi Mu, hog = 23 \text{ kNm}$
 $M^*, sag = 0.7 \text{ kNm} < \phi Mu, sag = 28 \text{ kNm}$
 $V^*, max = 13.2 \text{ kN} < \phi Vu = 39.6 \text{ kN}$

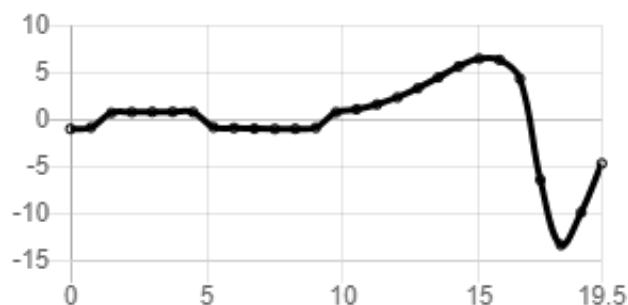
Edge Beam (EL) - Deflection [X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



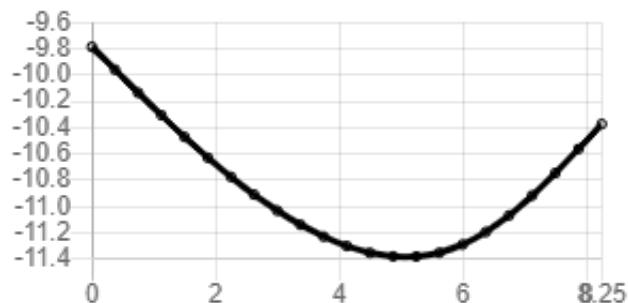
Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]



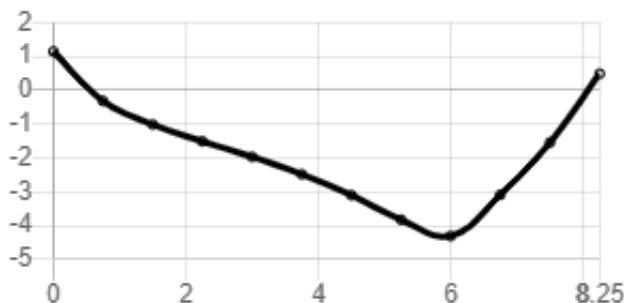
Edge Beam (EB) - Summary

Deflection ratio check not required along this direction
 $M^*, hog = 1.1 \text{ kNm} < \phi Mu, hog = 23 \text{ kNm}$
 $M^*, sag = 4.4 \text{ kNm} < \phi Mu, sag = 28 \text{ kNm}$
 $V^*, max = 4.6 \text{ kN} < \phi Vu = 39.6 \text{ kN}$

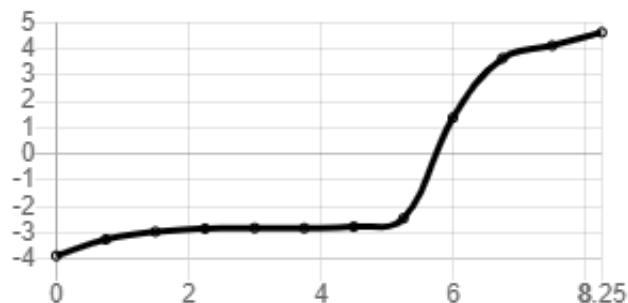
Edge Beam (EB) - Deflection [X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

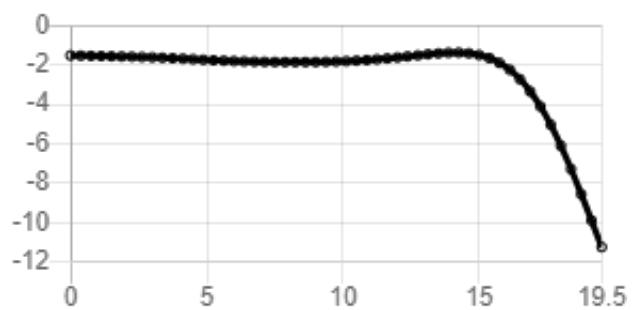


Rib (RL*) - Summary

Deflection ratio = 1 in 302 < 1 in 200 over 2 m cantilever
M*,hog = 12.1 kNm <ΦMu,hog = 13.5 kNm
M*,sag = 0.6 kNm <ΦMu,sag = 15 kNm
V*,max = 8.6 kN <ΦVu = 17 kN

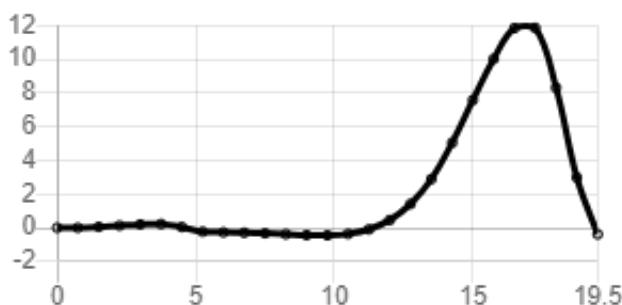
Rib (RL*) - Deflection

[X:m, Y:mm]



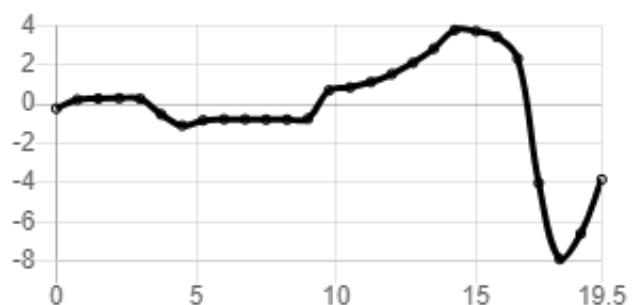
Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]

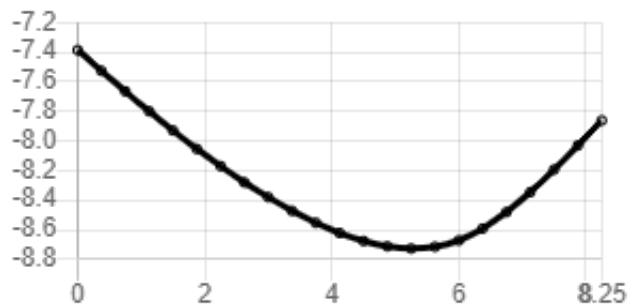


Rib (RB*) - Summary

Deflection ratio check not required along this direction
M*,hog = 0.1 kNm <ΦMu,hog = 13.5 kNm
M*,sag = 3.5 kNm <ΦMu,sag = 15 kNm
V*,max = 3.7 kN <ΦVu = 17 kN

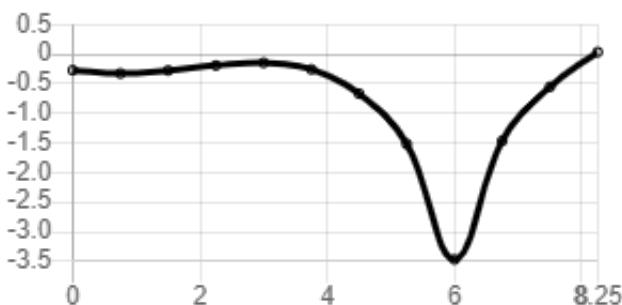
Rib (RB*) - Deflection

[X:m, Y:mm]



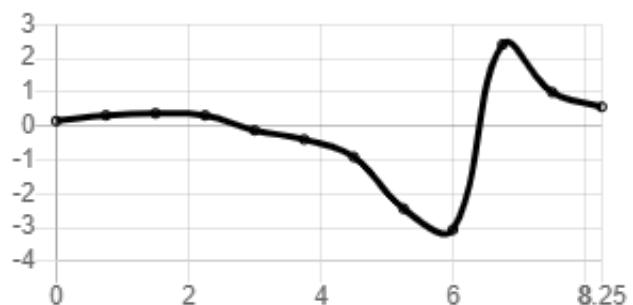
Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]

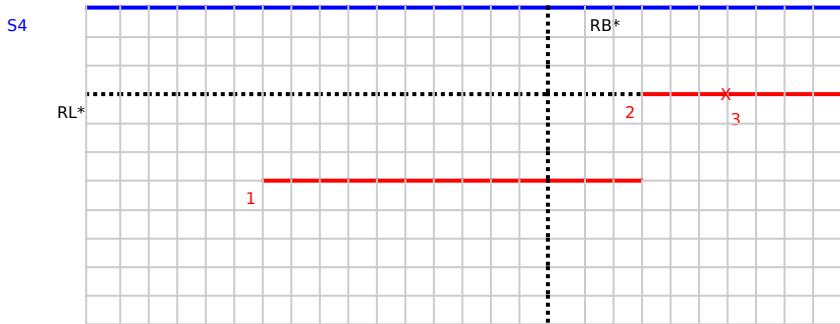


Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 1 - Loss of Support 4



Loads

Loads in accordance with paragraph "Load Analysis"

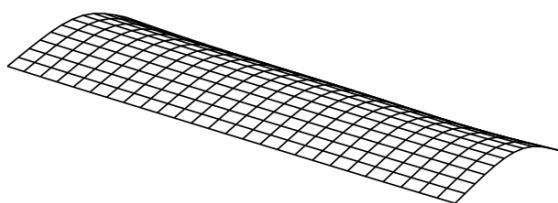
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

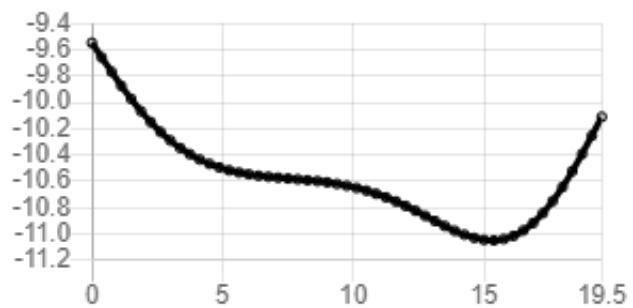


Edge Beam (EL) - Summary

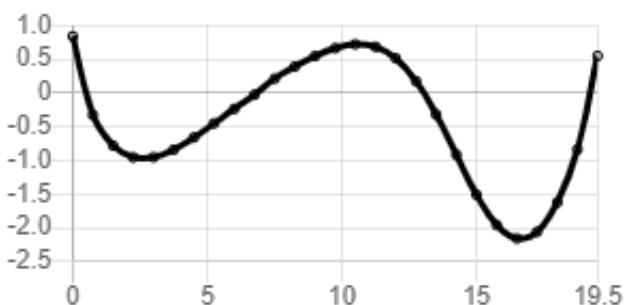
Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.8 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 2.4 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 3.6 \text{ kN} < \phi V_{u} = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

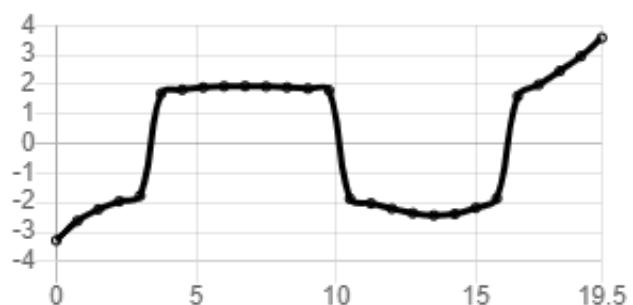
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]

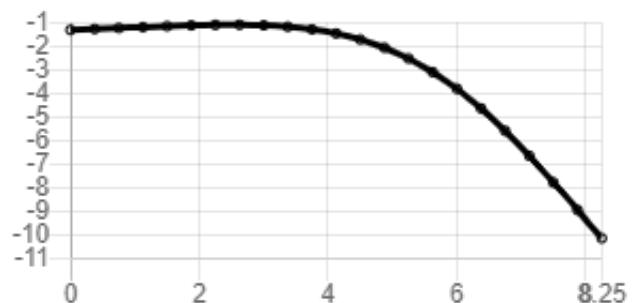


Edge Beam (EB) - Summary

Deflection ratio = 1 in 342 < 1 in 200 over 2 m cantilever
 $M^*,\text{hog} = 19.2 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 0 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 12.5 \text{ kN} < \phi V_{u} = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

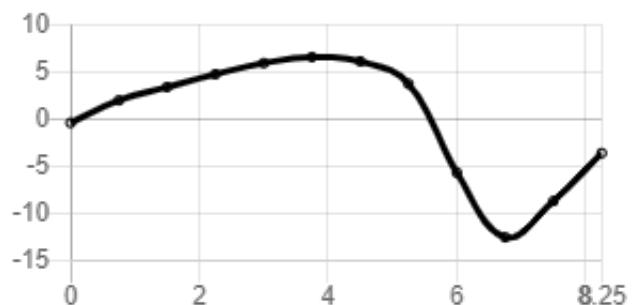
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

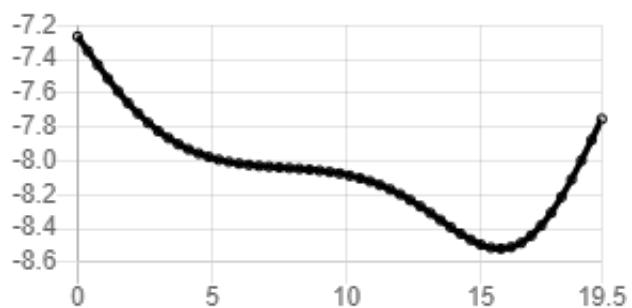


Rib (RL*) - Summary

Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.5 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 1.9 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 2 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

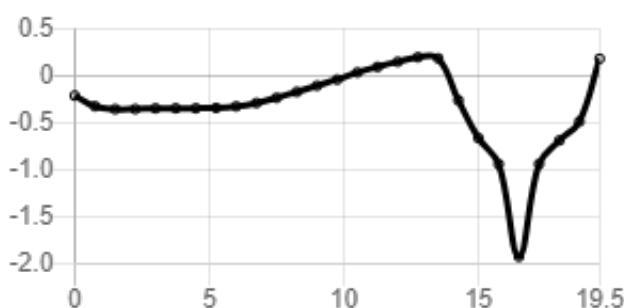
Rib (RL*) - Deflection

[X:m, Y:mm]



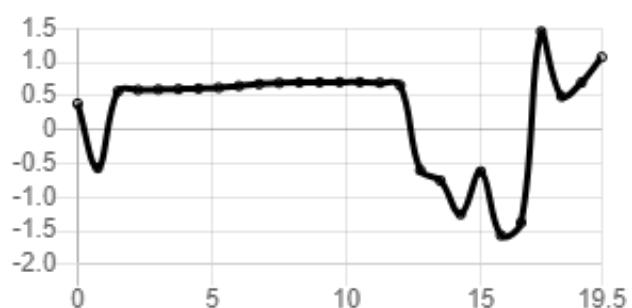
Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]

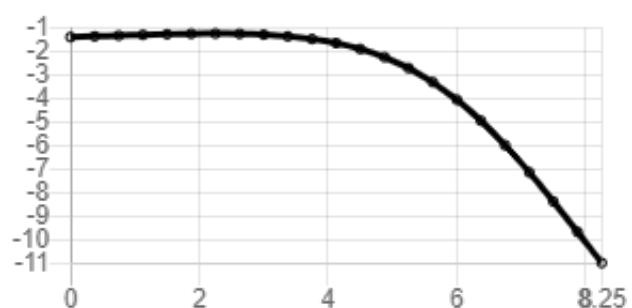


Rib (RB*) - Summary

Deflection ratio = 1 in 313 < 1 in 200 over 2 m cantilever
 $M^*,\text{hog} = 12 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 0.2 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 7.7 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

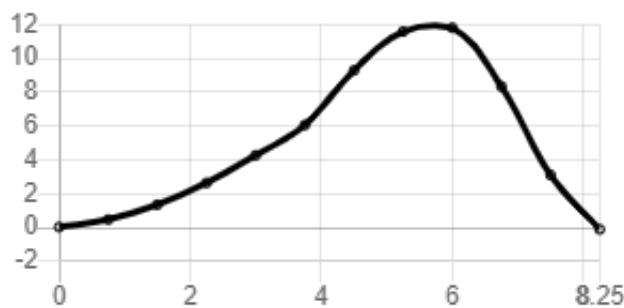
Rib (RB*) - Deflection

[X:m, Y:mm]



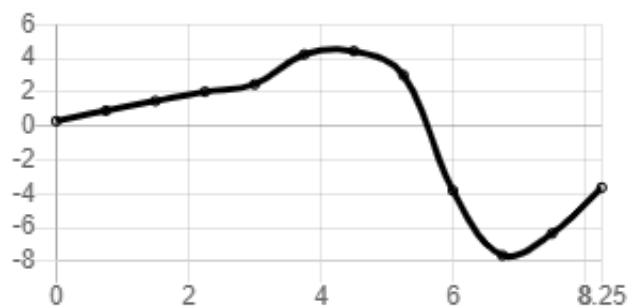
Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]

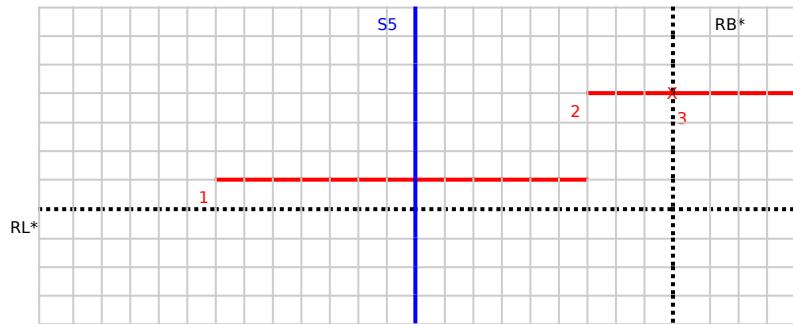


Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 1 - Loss of Support 5



Loads

Loads in accordance with paragraph "Load Analysis"

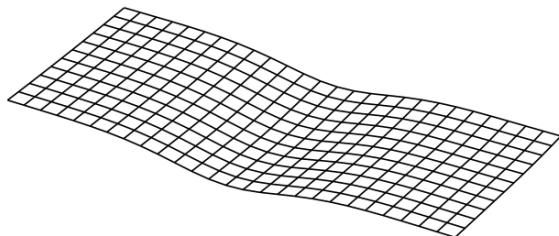
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

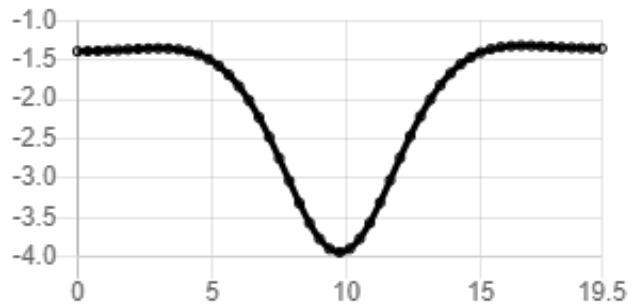


Edge Beam (EL) - Summary

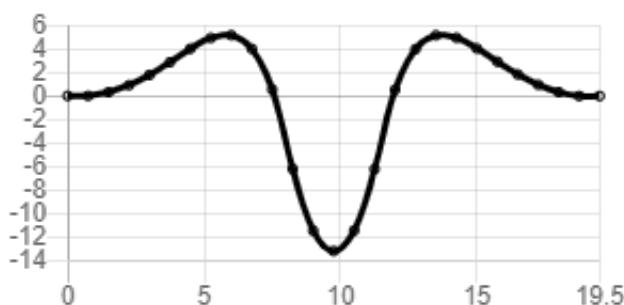
Deflection ratio = 1 in 2060 < 1 in 400 over 4 m length
 $M^*, hog = 5.2 \text{ kNm} < \phi M_u, hog = 23 \text{ kNm}$
 $M^*, sag = 13.1 \text{ kNm} < \phi M_u, sag = 28 \text{ kNm}$
 $V^*, max = 10.8 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

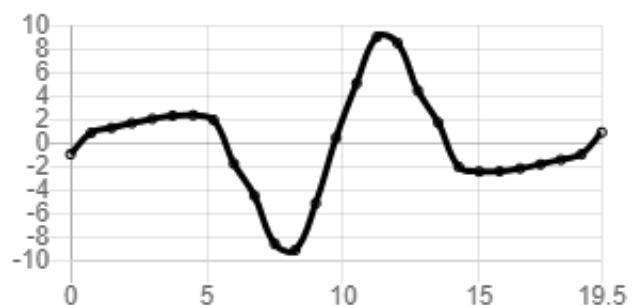
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]

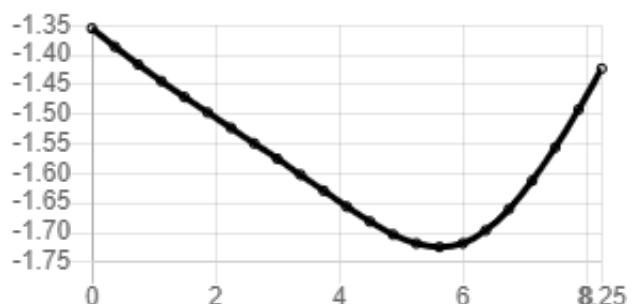


Edge Beam (EB) - Summary

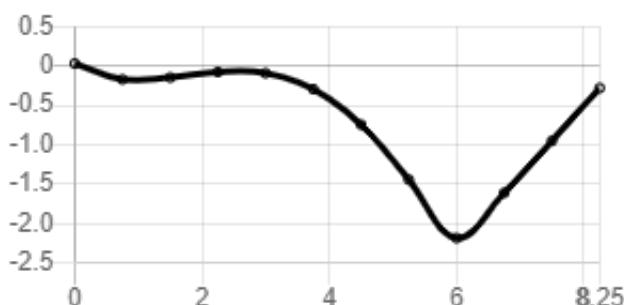
Deflection ratio check not required along this direction
 $M^*, hog = 0 \text{ kNm} < \phi M_u, hog = 23 \text{ kNm}$
 $M^*, sag = 2.2 \text{ kNm} < \phi M_u, sag = 28 \text{ kNm}$
 $V^*, max = 2.1 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

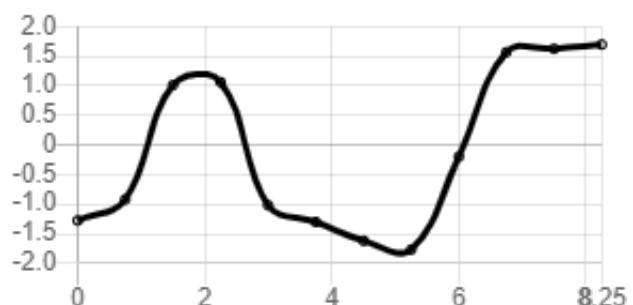
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

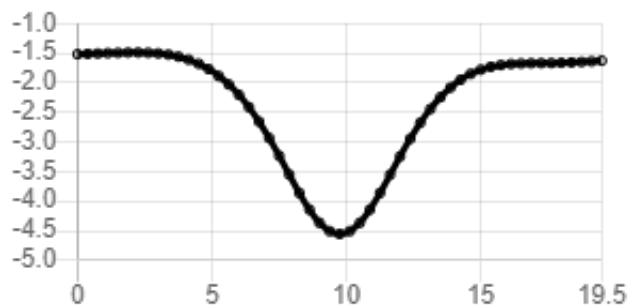


Rib (RL*) - Summary

Deflection ratio = 1 in 1868 < 1 in 400 over 4 m length
 $M^*, hog = 3.4 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 7.9 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 6.4 \text{ kN} < \phi Vu = 17 \text{ kN}$

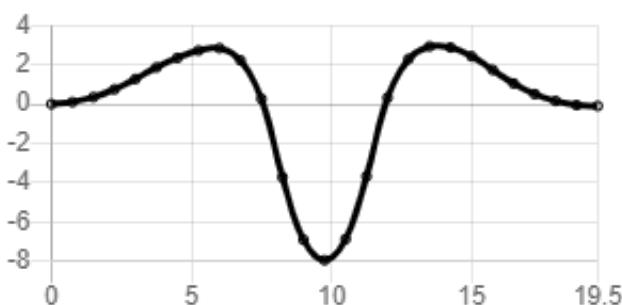
Rib (RL*) - Deflection

[X:m, Y:mm]



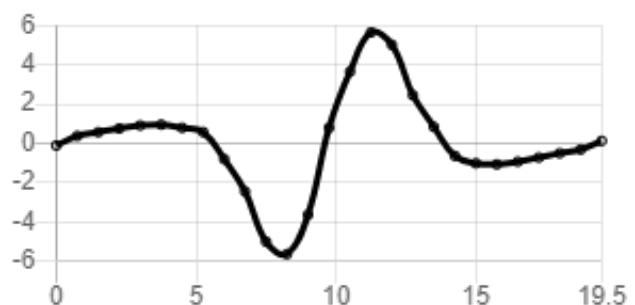
Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]

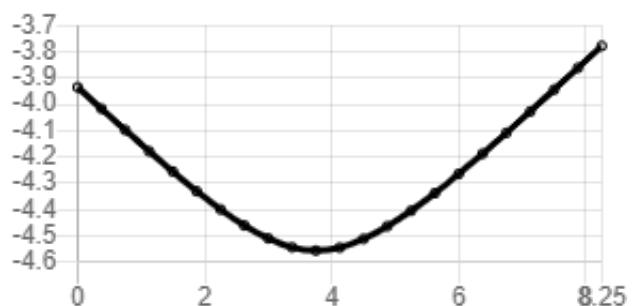


Rib (RB*) - Summary

Deflection ratio check not required along this direction
 $M^*, hog = 0.2 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 3.1 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 3.3 \text{ kN} < \phi Vu = 17 \text{ kN}$

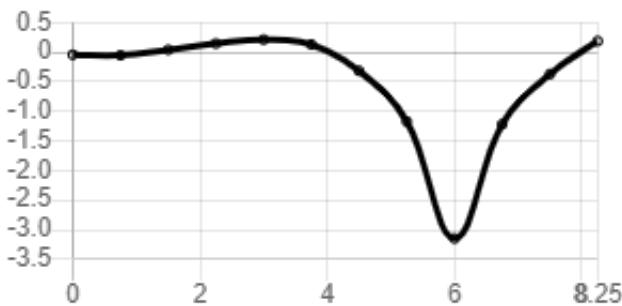
Rib (RB*) - Deflection

[X:m, Y:mm]



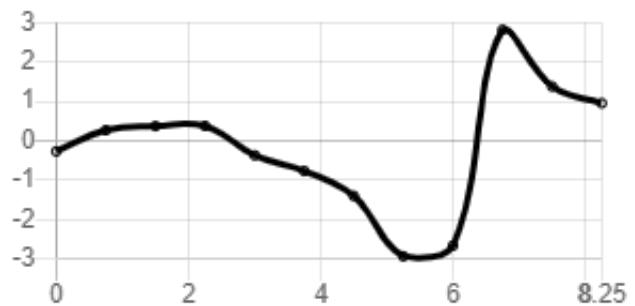
Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]

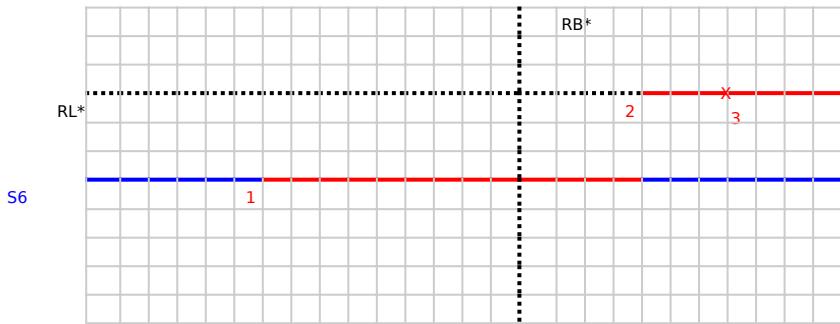


Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 1 - Loss of Support 6



Loads

Loads in accordance with paragraph "Load Analysis"

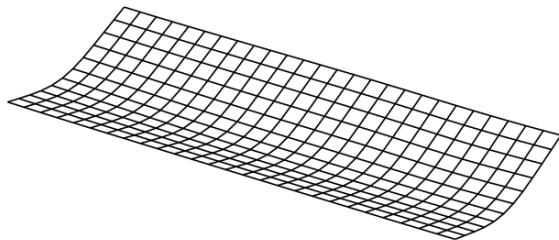
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

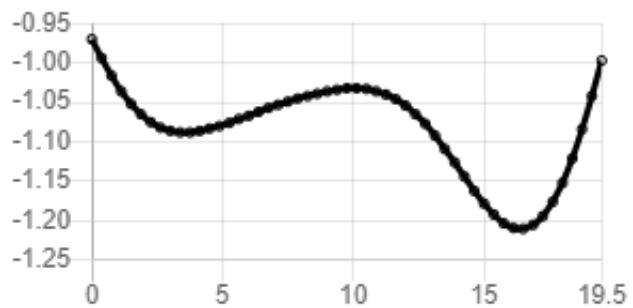


Edge Beam (EL) - Summary

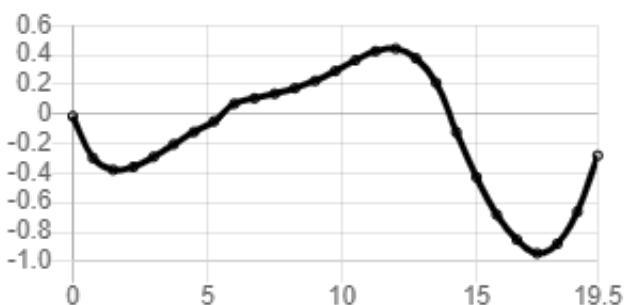
Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.4 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 0.9 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 1.3 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

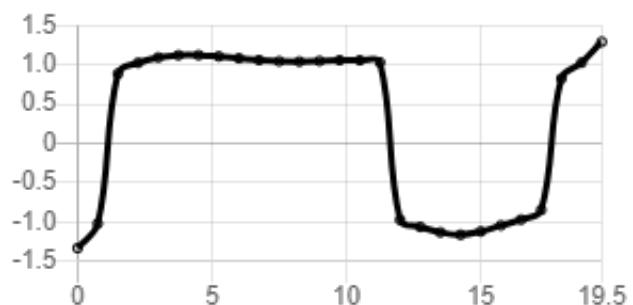
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]



Edge Beam (EB) - Summary

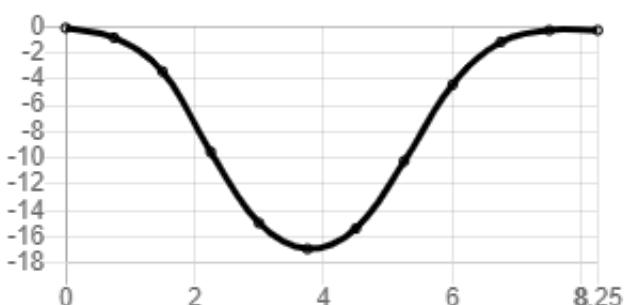
Deflection ratio = 1 in 1423 < 1 in 400 over 4 m length
 $M^*,\text{hog} = 0 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 16.9 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 10.3 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

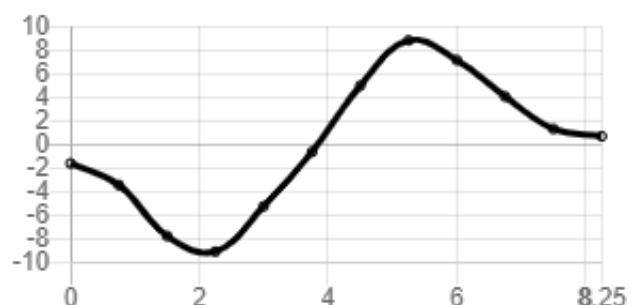
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

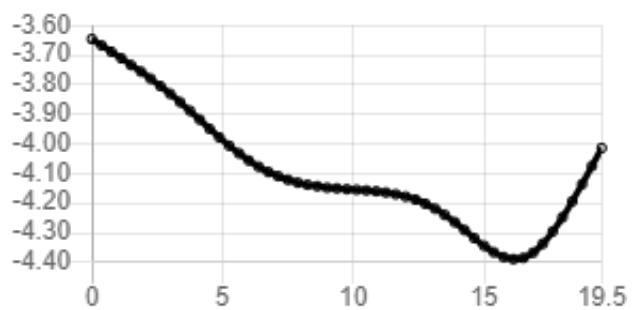


Rib (RL*) - Summary

Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.5 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 1.7 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 1.8 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

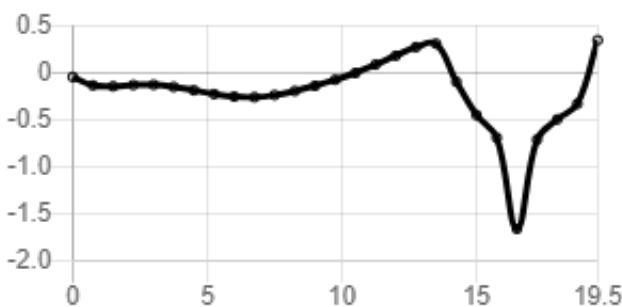
Rib (RL*) - Deflection

[X:m, Y:mm]



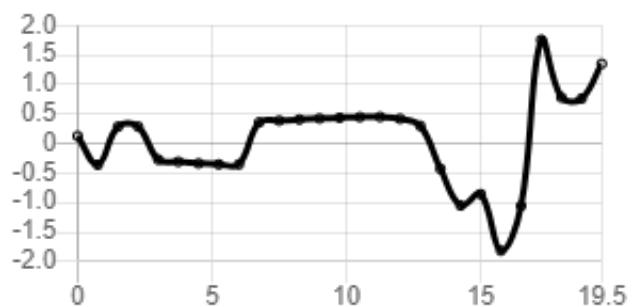
Rib (RL*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V^*)

[X:m, Y:kN/rib]



Rib (RB*) - Summary

Deflection ratio = 1 in 1308 < 1 in 400 over 4 m length
 $M^*,\text{hog} = 0.5 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 11.3 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 6.5 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

Rib (RB*) - Deflection

[X:m, Y:mm]



Rib (RB*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]



Rib (RB*) - Shear Force (V^*)

[X:m, Y:kN/rib]



Rectangle 1 - Pressure Analysis (Short Term)

Rib

Pressure at the foundation/building platform interface: **Pressure at the foundation/building platform interface:**

$P^*(z=0)$, short term = 32.6 kPa

Edge Beam

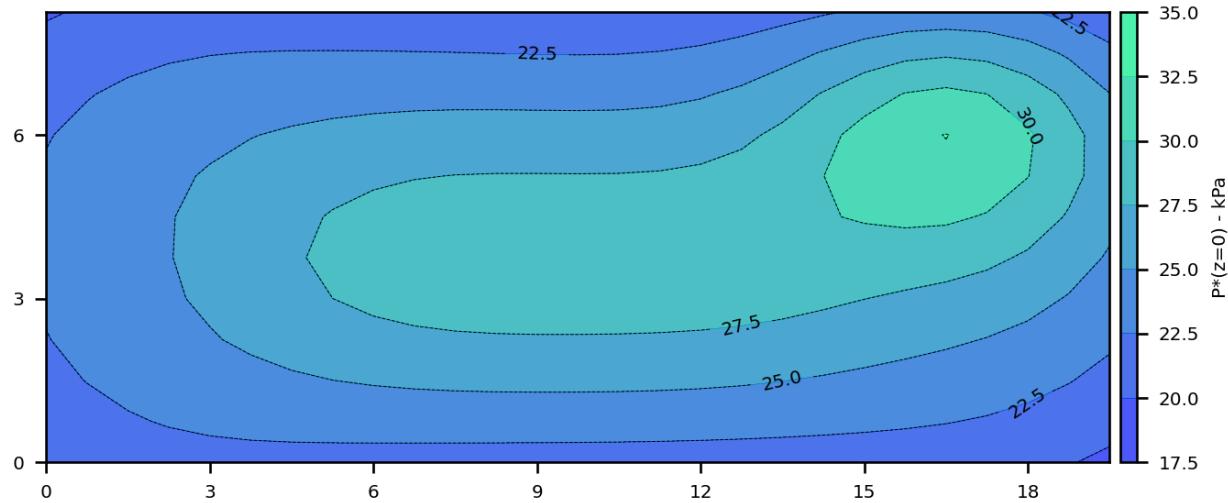
$P^*(z=0)$, short term = 26.3 kPa

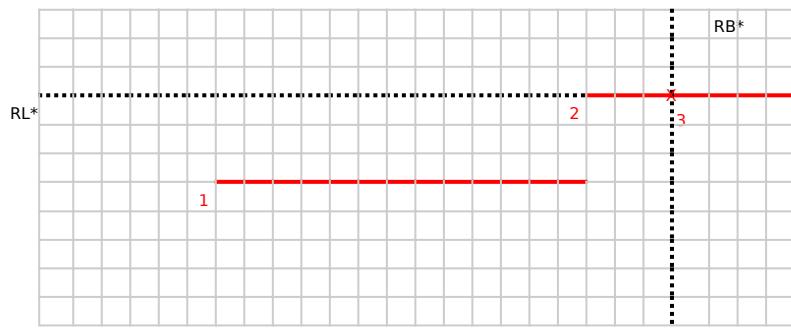
Pressure on natural soil

Engineered Fill Thickness = 100 mm
 P^* , short term = 23.5 kPa < DBC = 100 kPa

Pressure on natural soil

Engineered Fill Thickness = 100 mm
 P^* , short term = 25.3 kPa < DBC = 100 kPa





Loads

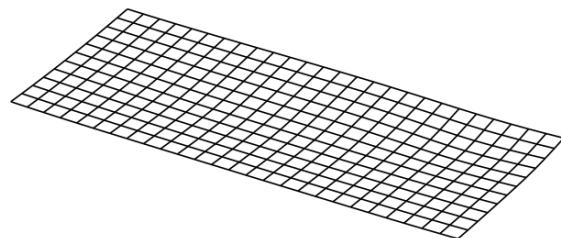
Loads in accordance with paragraph "Load Analysis"

Notes

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.



Edge Beam (EL) - Summary

Deflection check not applicable for a ULS Short Term combination.

Refer to Long Term combination check.

$$M^*,\text{hog} = 0.7 \text{ kNm} < \Phi M_u, \text{hog} = 23 \text{ kNm}$$

$$M^*,\text{sag} = 1.5 \text{ kNm} < \Phi M_u, \text{sag} = 28 \text{ kNm}$$

$$V^*,\text{max} = 2.1 \text{ kN} < \Phi V_u = 39.6 \text{ kN}$$

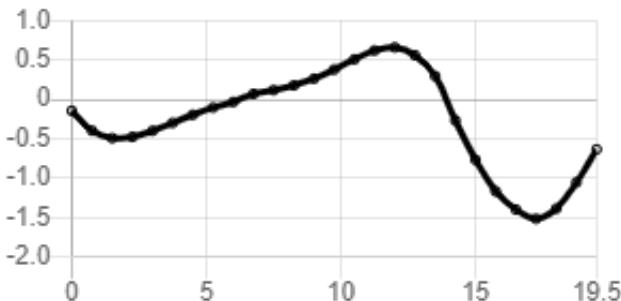
Edge Beam (EL) - Deflection

[X:m, Y:mm]

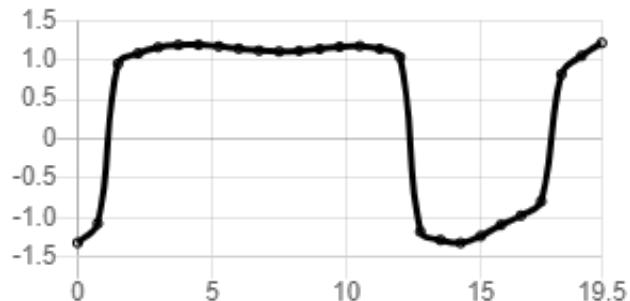
Deflection diagram not applicable for a ULS Short Term combination.

Refer to Long Term combination diagram.

Edge Beam (EL) - Bending Moment (M*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V*) [X:m, Y:kN/rib]



Edge Beam (EB) - Summary

Deflection check not applicable for a ULS Short Term combination.

Refer to Long Term combination check.

$$M^*,\text{hog} = 0 \text{ kNm} < \Phi M_u, \text{hog} = 23 \text{ kNm}$$

$$M^*,\text{sag} = 3.9 \text{ kNm} < \Phi M_u, \text{sag} = 28 \text{ kNm}$$

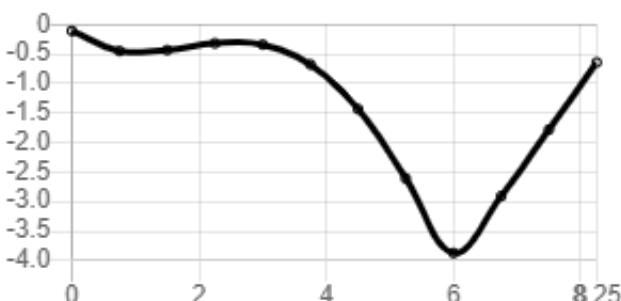
$$V^*,\text{max} = 3.5 \text{ kN} < \Phi V_u = 39.6 \text{ kN}$$

Edge Beam (EB) - Deflection [X:m, Y:mm]

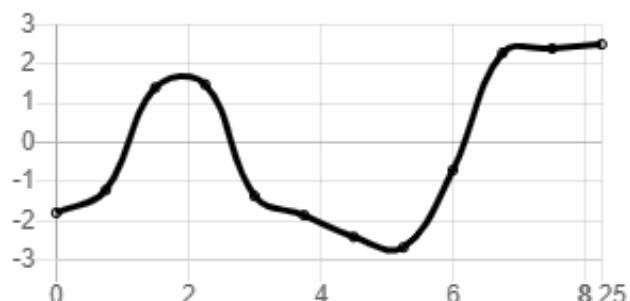
Deflection diagram not applicable for a ULS Short Term combination.

Refer to Long Term combination diagram.

Edge Beam (EB) - Bending Moment (M*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V*) [X:m, Y:kN/rib]



Rib (RL*) - Summary

Deflection check not applicable for a ULS Short Term combination.

Refer to Long Term combination check.

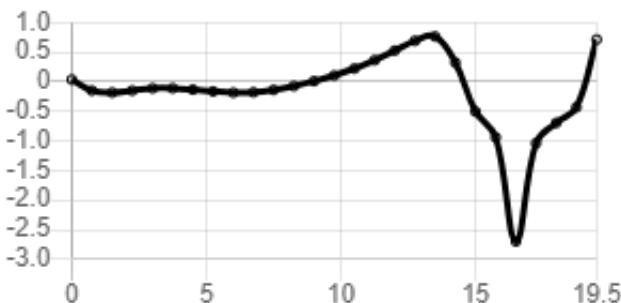
$M^*,\text{hog} = 0.8 \text{ kNm} < \Phi M_{u,\text{hog}} = 13.5 \text{ kNm}$

$M^*,\text{sag} = 2.7 \text{ kNm} < \Phi M_{u,\text{sag}} = 15 \text{ kNm}$

$V^*,\text{max} = 4.1 \text{ kN} < \Phi V_u = 17 \text{ kN}$

Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RB*) - Summary

Deflection check not applicable for a ULS Short Term combination.

Refer to Long Term combination check.

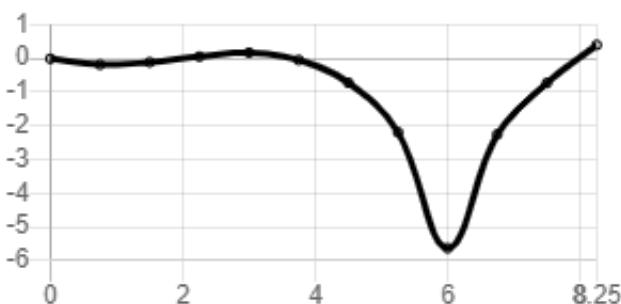
$M^*,\text{hog} = 0.4 \text{ kNm} < \Phi M_{u,\text{hog}} = 13.5 \text{ kNm}$

$M^*,\text{sag} = 5.6 \text{ kNm} < \Phi M_{u,\text{sag}} = 15 \text{ kNm}$

$V^*,\text{max} = 5.7 \text{ kN} < \Phi V_u = 17 \text{ kN}$

Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Deflection

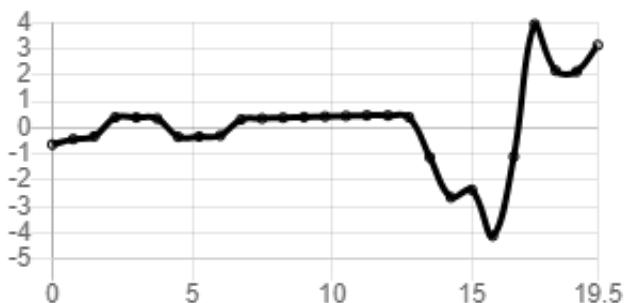
[X:m, Y:mm]

Deflection diagram not applicable for a ULS Short Term combination.

Refer to Long Term combination diagram.

Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rib (RB*) - Deflection

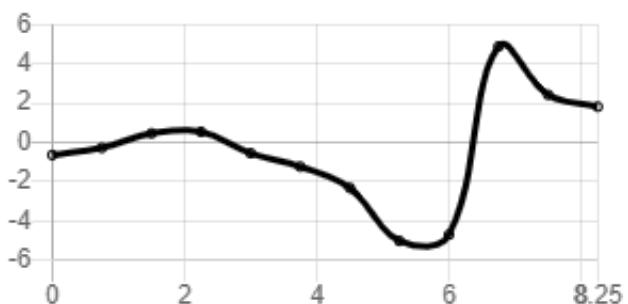
[X:m, Y:mm]

Deflection diagram not applicable for a ULS Short Term combination.

Refer to Long Term combination diagram.

Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 1 - Pressure Analysis (Long Term)

Rib

Pressure at the foundation/building platform interface: **Pressure at the foundation/building platform interface:**

$P^*(z=0)$, long term = 21.1 kPa

Edge Beam

Pressure at the foundation/building platform interface:

$P^*(z=0)$, long term = 17.7 kPa

Pressure on natural soil

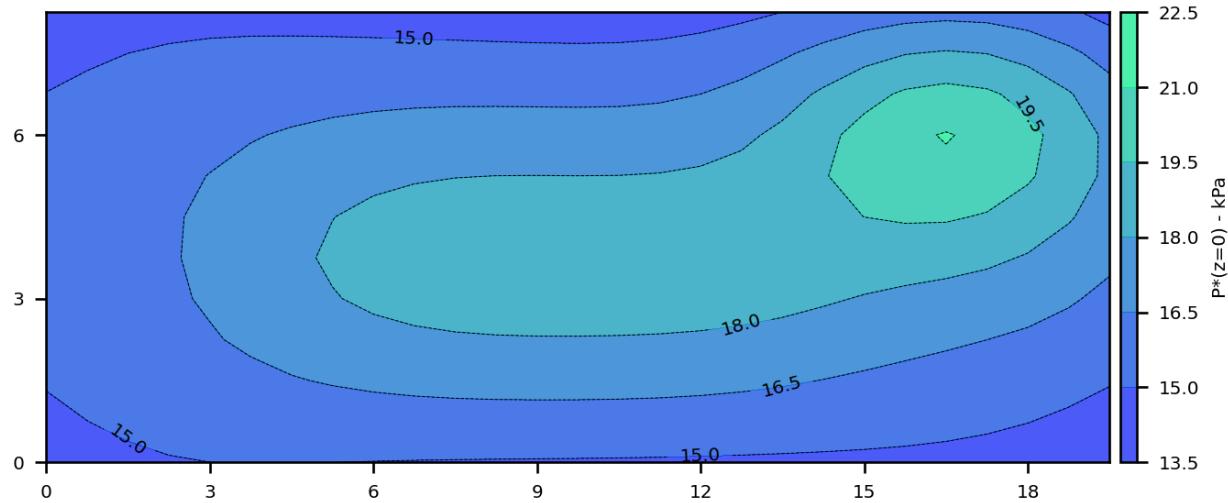
Engineered Fill Thickness = 100 mm

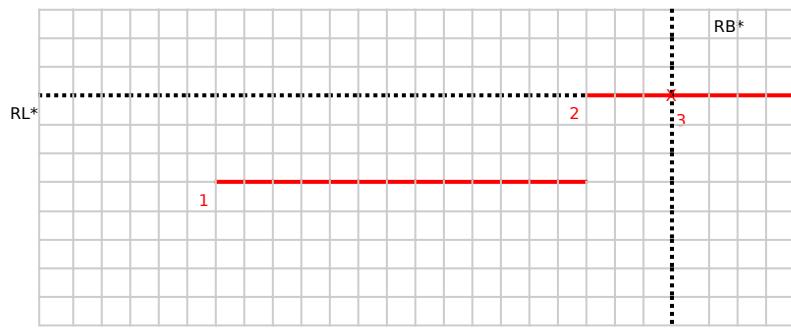
P^* , long term = 15.4 kPa <ABC = 66.7 kPa

Pressure on natural soil

Engineered Fill Thickness = 100 mm

P^* , long term = 17.2 kPa <ABC = 66.7 kPa





Loads

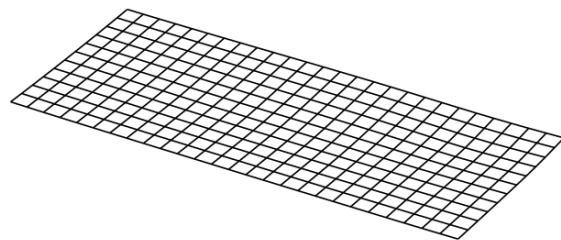
Loads in accordance with paragraph "Load Analysis"

Notes

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

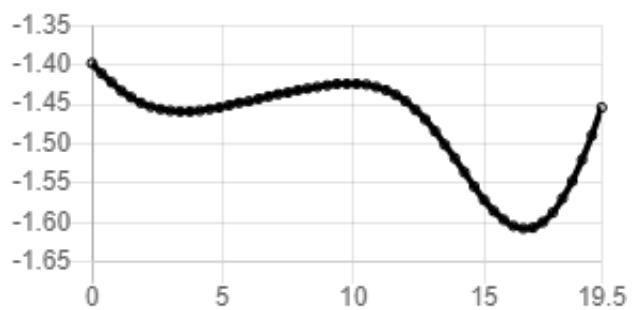


Edge Beam (EL) - Summary

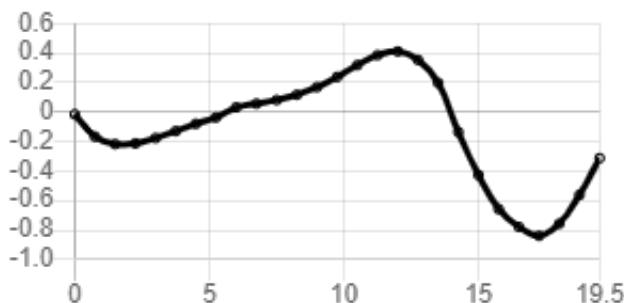
$\Delta = 0.2 \text{ mm} < \Delta_{\text{max}} = 40 \text{ mm}$
 $M^*, \text{hog} = 0.4 \text{ kNm} < \Phi M_{\text{u}}, \text{hog} = 23 \text{ kNm}$
 $M^*, \text{sag} = 0.8 \text{ kNm} < \Phi M_{\text{u}}, \text{sag} = 28 \text{ kNm}$
 $V^*, \text{max} = 1.4 \text{ kN} < \Phi V_{\text{u}} = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

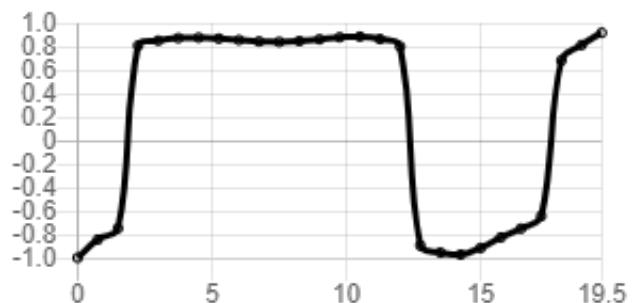
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]

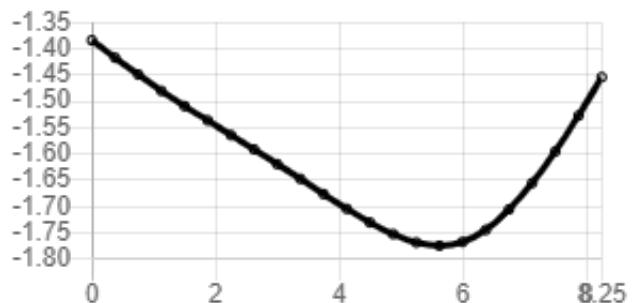


Edge Beam (EB) - Summary

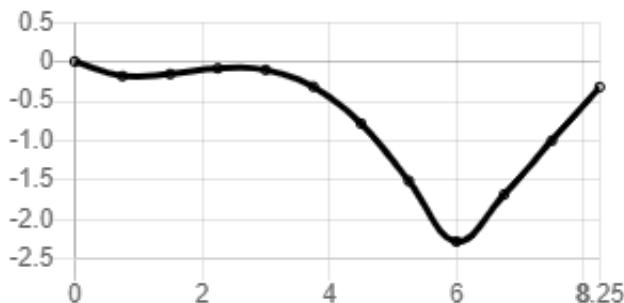
$\Delta = 0.4 \text{ mm} < \Delta_{\text{max}} = 28 \text{ mm}$
 $M^*, \text{hog} = 0 \text{ kNm} < \Phi M_{\text{u}}, \text{hog} = 23 \text{ kNm}$
 $M^*, \text{sag} = 2.3 \text{ kNm} < \Phi M_{\text{u}}, \text{sag} = 28 \text{ kNm}$
 $V^*, \text{max} = 2.2 \text{ kN} < \Phi V_{\text{u}} = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

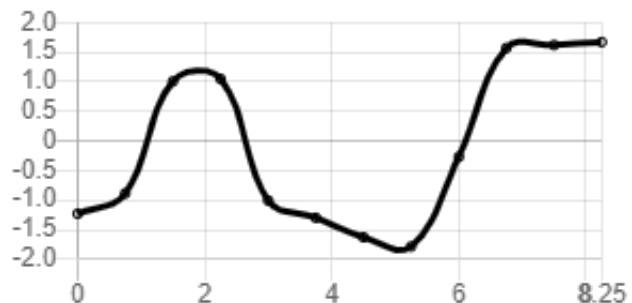
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

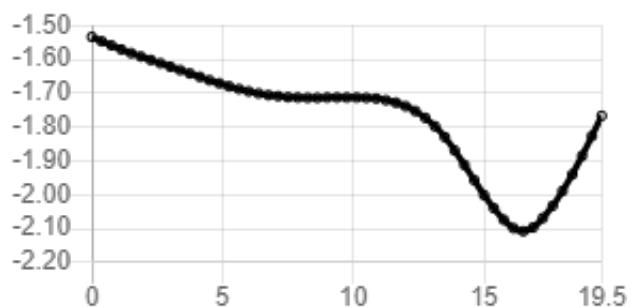


Rib (RL*) - Summary

$\Delta = 0.6 \text{ mm} < \Delta_{\text{max}} = 40 \text{ mm}$
 $M^*, \text{hog} = 0.5 \text{ kNm} < \Phi M_{\text{u,hog}} = 13.5 \text{ kNm}$
 $M^*, \text{sag} = 1.5 \text{ kNm} < \Phi M_{\text{u,sag}} = 15 \text{ kNm}$
 $V^*, \text{max} = 2.4 \text{ kN} < \Phi V_{\text{u}} = 17 \text{ kN}$

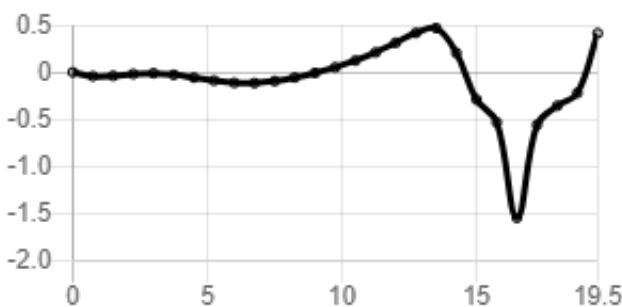
Rib (RL*) - Deflection

[X:m, Y:mm]



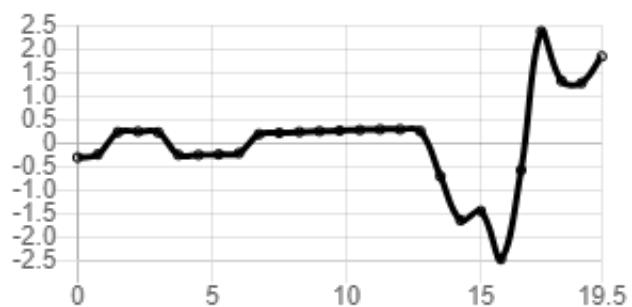
Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]

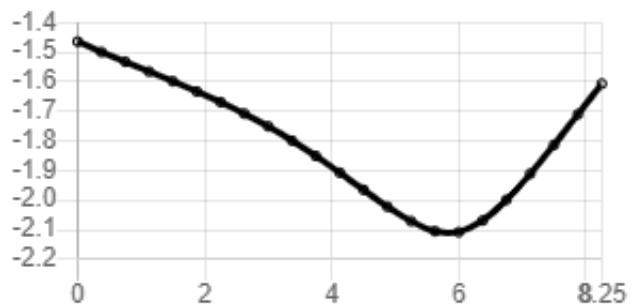


Rib (RB*) - Summary

$\Delta = 0.6 \text{ mm} < \Delta_{\text{max}} = 28 \text{ mm}$
 $M^*, \text{hog} = 0.2 \text{ kNm} < \Phi M_{\text{u,hog}} = 13.5 \text{ kNm}$
 $M^*, \text{sag} = 3.3 \text{ kNm} < \Phi M_{\text{u,sag}} = 15 \text{ kNm}$
 $V^*, \text{max} = 3.5 \text{ kN} < \Phi V_{\text{u}} = 17 \text{ kN}$

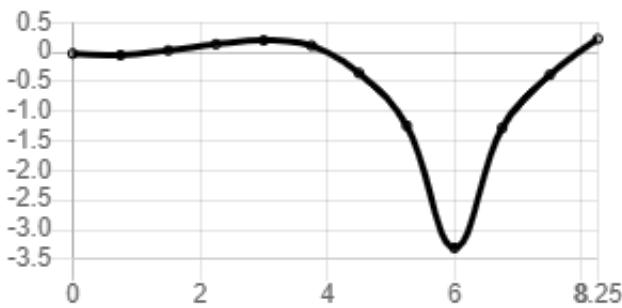
Rib (RB*) - Deflection

[X:m, Y:mm]



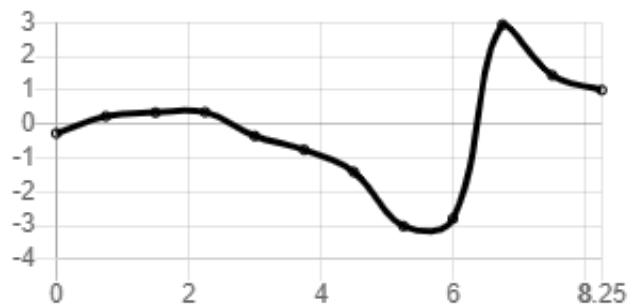
Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]

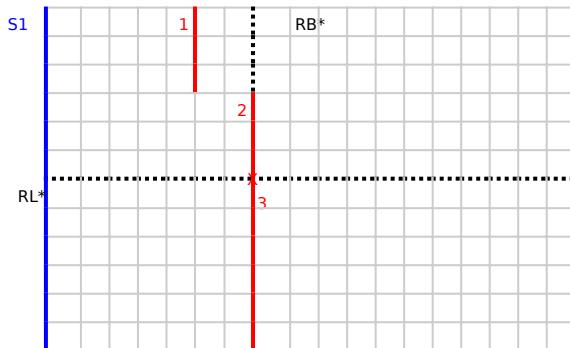


Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 2 - Loss of Support 1



Loads

Loads in accordance with paragraph "Load Analysis"

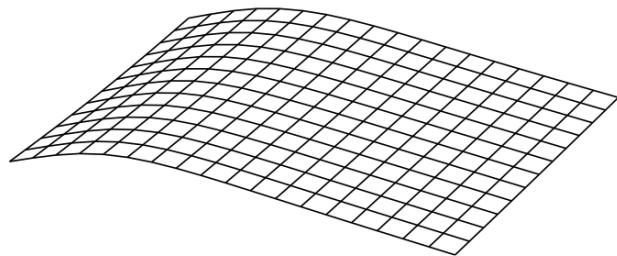
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

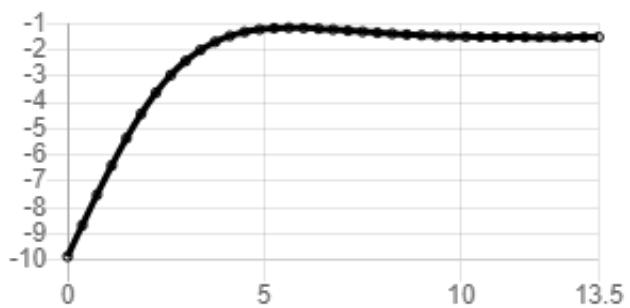


Edge Beam (EL) - Summary

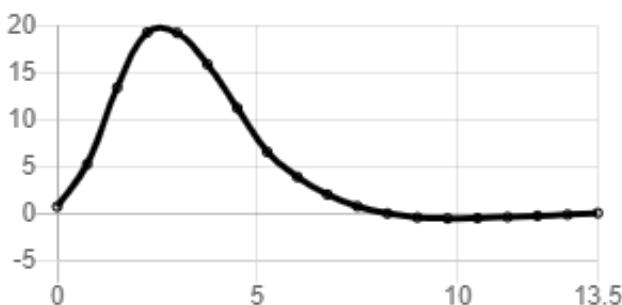
Deflection ratio = 1 in 346 < 1 in 200 over 2 m cantilever
 $M^*, hog = 19.7 \text{ kNm} < \phi Mu, hog = 23 \text{ kNm}$
 $M^*, sag = 0.4 \text{ kNm} < \phi Mu, sag = 28 \text{ kNm}$
 $V^*, max = 12.5 \text{ kN} < \phi Vu = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

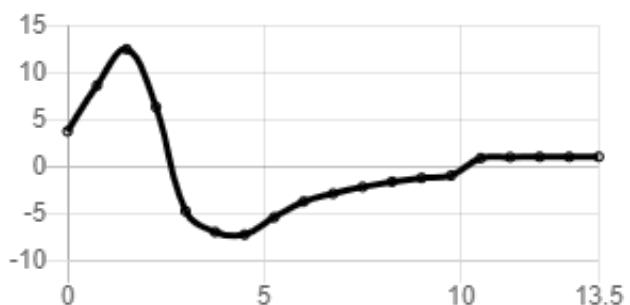
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]



Edge Beam (EB) - Summary

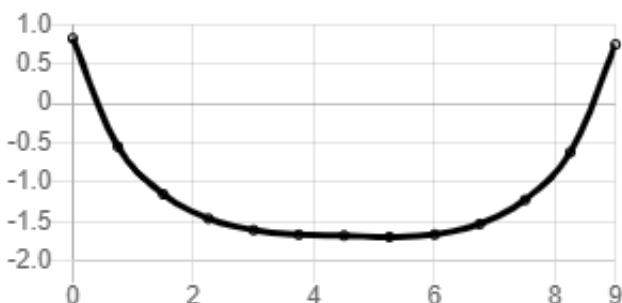
Deflection ratio check not required along this direction
 $M^*, hog = 0.8 \text{ kNm} < \phi Mu, hog = 23 \text{ kNm}$
 $M^*, sag = 2 \text{ kNm} < \phi Mu, sag = 28 \text{ kNm}$
 $V^*, max = 3.8 \text{ kN} < \phi Vu = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

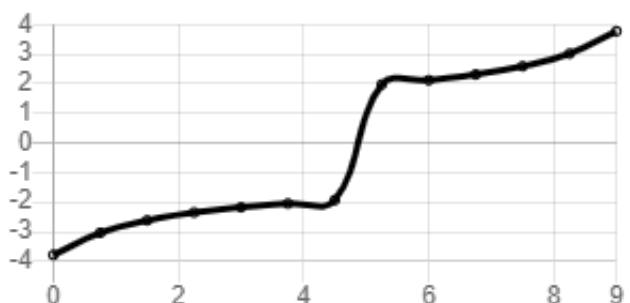
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

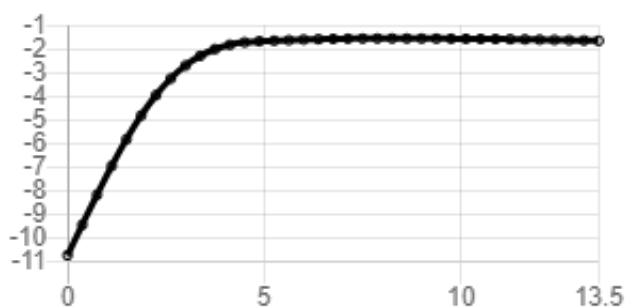


Rib (RL*) - Summary

Deflection ratio = 1 in 318 < 1 in 200 over 2 m cantilever
 $M^*, hog = 12 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 0.3 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 7.7 \text{ kN} < \phi Vu = 17 \text{ kN}$

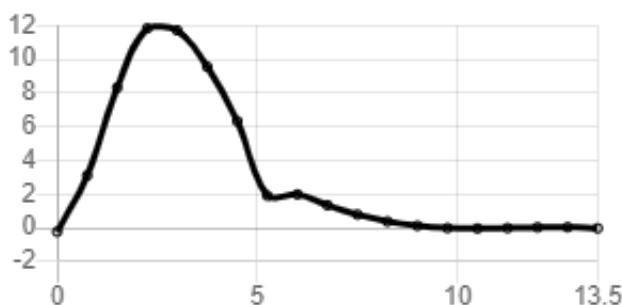
Rib (RL*) - Deflection

[X:m, Y:mm]



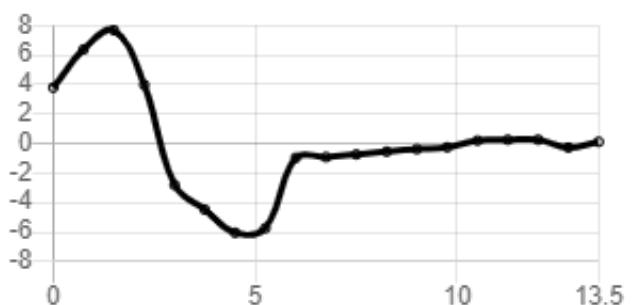
Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rib (RB*) - Summary

Deflection ratio check not required along this direction
 $M^*, hog = 0.3 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 1.3 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 2.4 \text{ kN} < \phi Vu = 17 \text{ kN}$

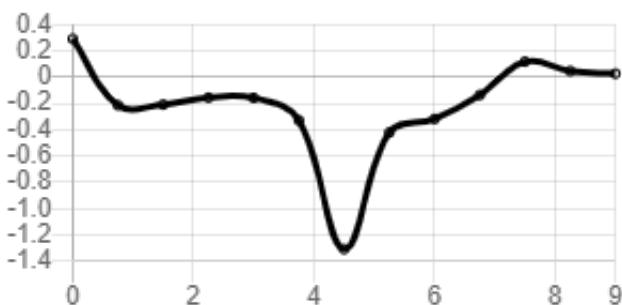
Rib (RB*) - Deflection

[X:m, Y:mm]



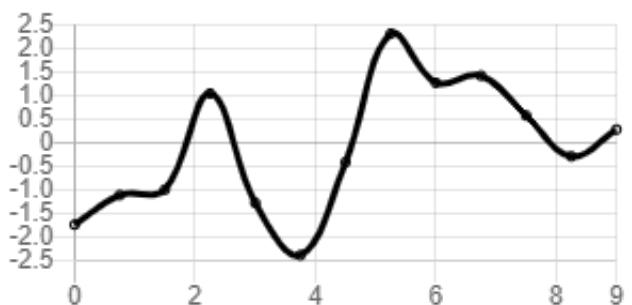
Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]

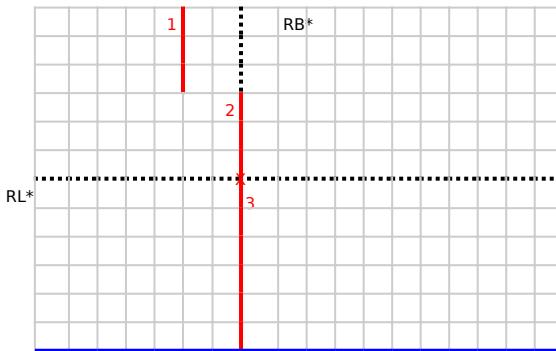


Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 2 - Loss of Support 2



Loads

S2

Loads in accordance with paragraph "Load Analysis"

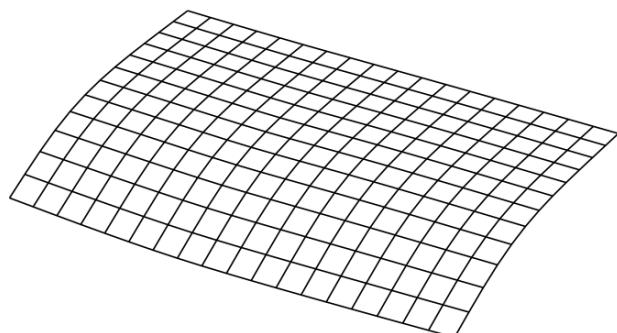
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.



Edge Beam (EL) - Summary

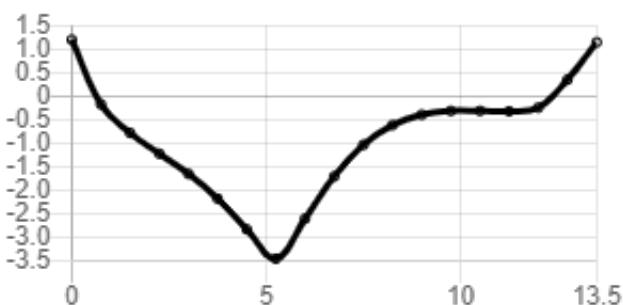
Deflection ratio check not required along this direction
 $M^*,\text{hog} = 1.2 \text{ kNm} < \phi M_u, \text{hog} = 23 \text{ kNm}$
 $M^*,\text{sag} = 3.4 \text{ kNm} < \phi M_u, \text{sag} = 28 \text{ kNm}$
 $V^*,\text{max} = 3.7 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

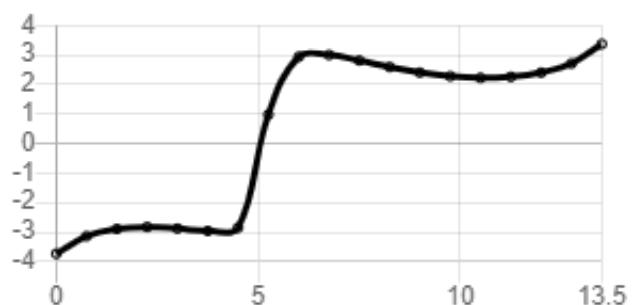
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]



Edge Beam (EB) - Summary

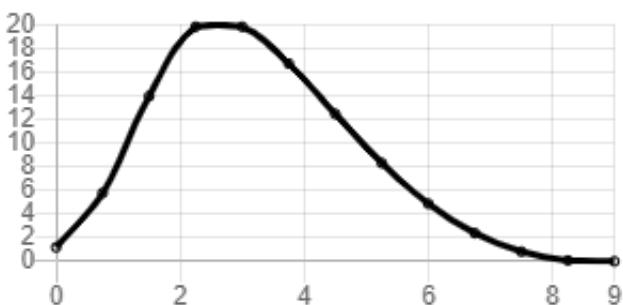
Deflection ratio = 1 in 335 < 1 in 200 over 2 m cantilever
 $M^*,\text{hog} = 20.2 \text{ kNm} < \phi M_u, \text{hog} = 23 \text{ kNm}$
 $M^*,\text{sag} = 0 \text{ kNm} < \phi M_u, \text{sag} = 28 \text{ kNm}$
 $V^*,\text{max} = 12.5 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

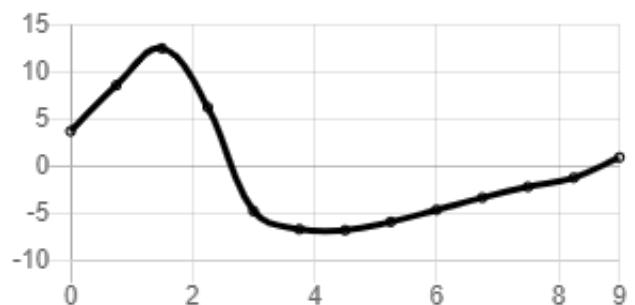
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

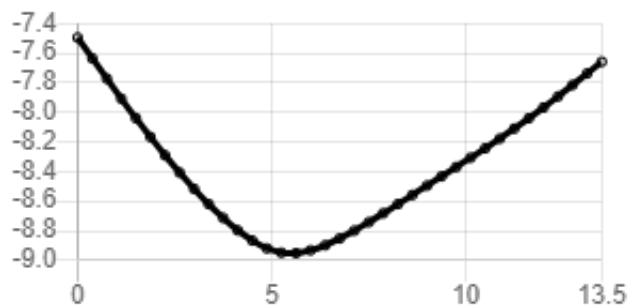


Rib (RL*) - Summary

Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.6 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 2.9 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 3.3 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

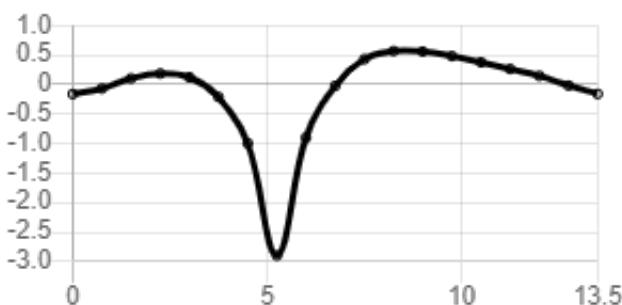
Rib (RL*) - Deflection

[X:m, Y:mm]



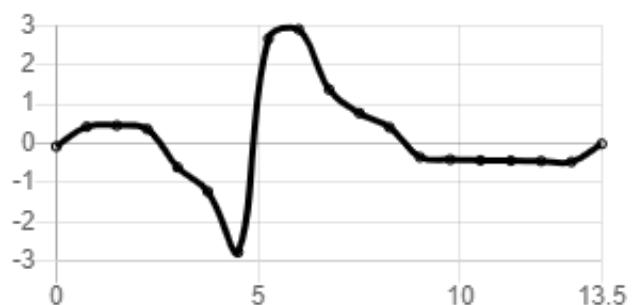
Rib (RL*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V^*)

[X:m, Y:kN/rib]

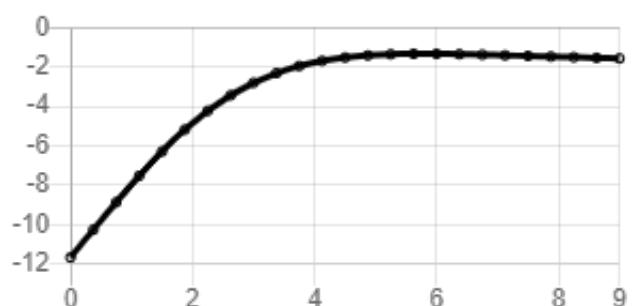


Rib (RB*) - Summary

Deflection ratio = 1 in 290 < 1 in 200 over 2 m cantilever
 $M^*,\text{hog} = 12.7 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 0.3 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 9 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

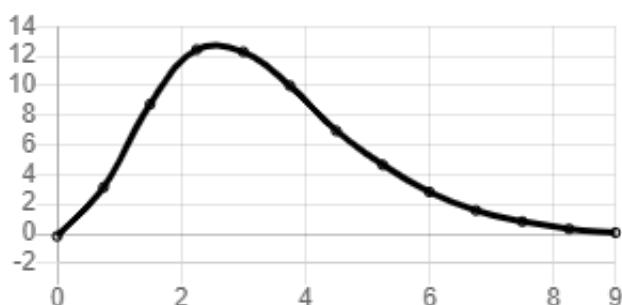
Rib (RB*) - Deflection

[X:m, Y:mm]



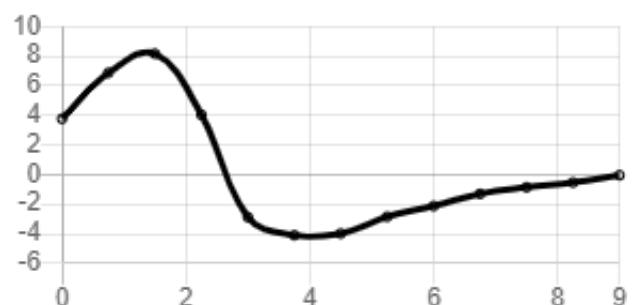
Rib (RB*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]



Rib (RB*) - Shear Force (V^*)

[X:m, Y:kN/rib]



Rectangle 2 - Loss of Support 3



Loads

Loads in accordance with paragraph "Load Analysis"

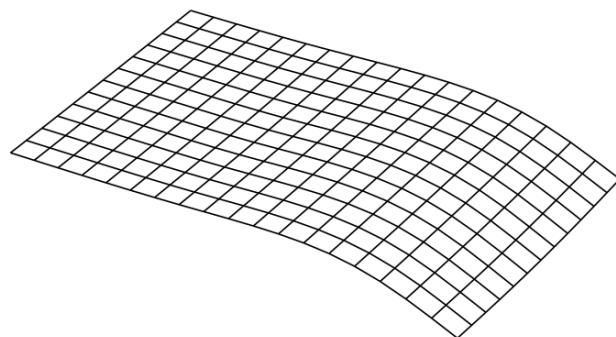
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

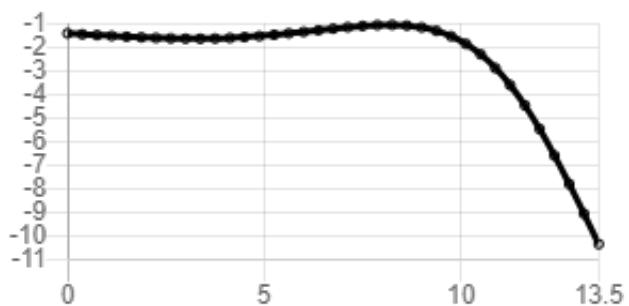


Edge Beam (EL) - Summary

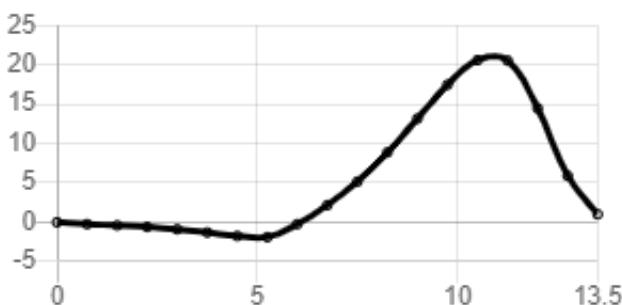
Deflection ratio = 1 in 320 < 1 in 200 over 2 m cantilever
 $M^*, hog = 21 \text{ kNm} < \phi M_u, hog = 23 \text{ kNm}$
 $M^*, sag = 1.9 \text{ kNm} < \phi M_u, sag = 28 \text{ kNm}$
 $V^*, max = 13 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

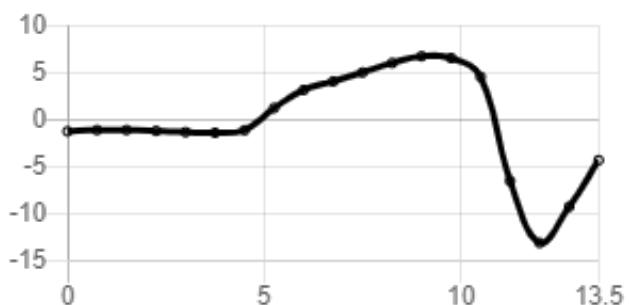
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]

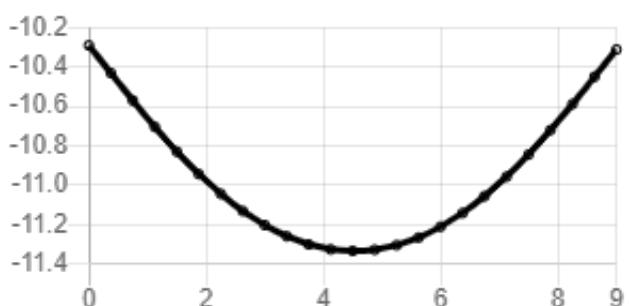


Edge Beam (EB) - Summary

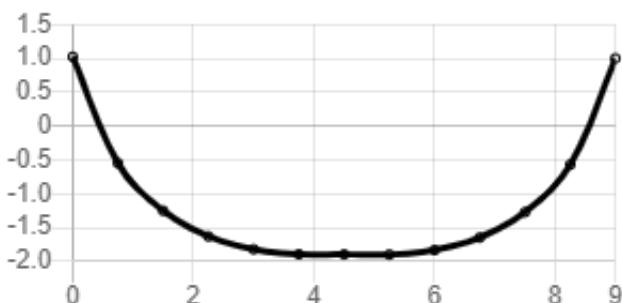
Deflection ratio check not required along this direction
 $M^*, hog = 1 \text{ kNm} < \phi M_u, hog = 23 \text{ kNm}$
 $M^*, sag = 2.3 \text{ kNm} < \phi M_u, sag = 28 \text{ kNm}$
 $V^*, max = 4.3 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

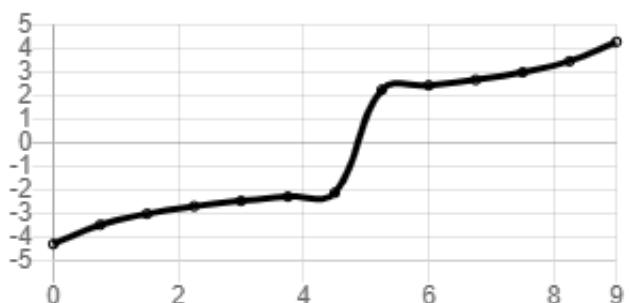
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

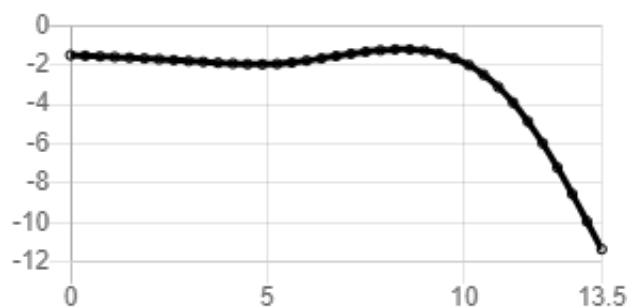


Rib (RL*) - Summary

Deflection ratio = 1 in 290 < 1 in 200 over 2 m cantilever
 $M^*, hog = 12.7 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 3.1 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 8 \text{ kN} < \phi Vu = 17 \text{ kN}$

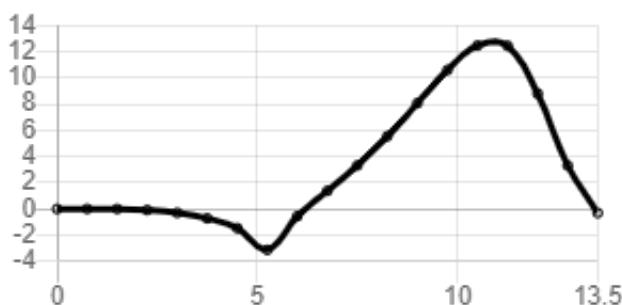
Rib (RL*) - Deflection

[X:m, Y:mm]



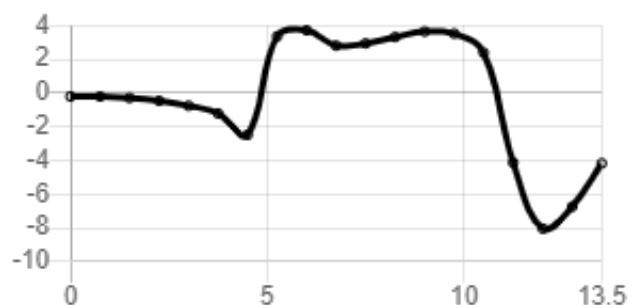
Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rib (RB*) - Summary

Deflection ratio check not required along this direction
 $M^*, hog = 0.4 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 1.3 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 2.4 \text{ kN} < \phi Vu = 17 \text{ kN}$

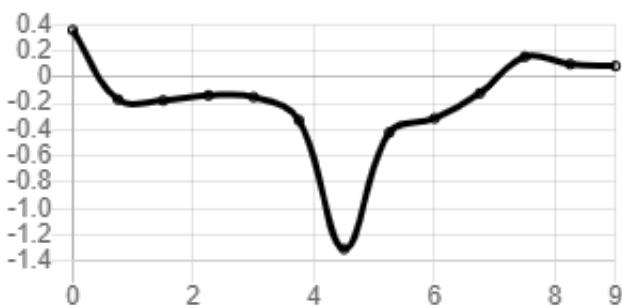
Rib (RB*) - Deflection

[X:m, Y:mm]



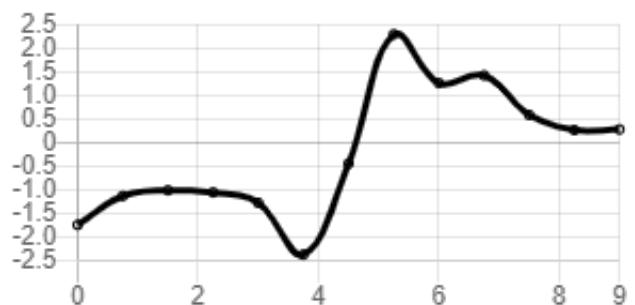
Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]

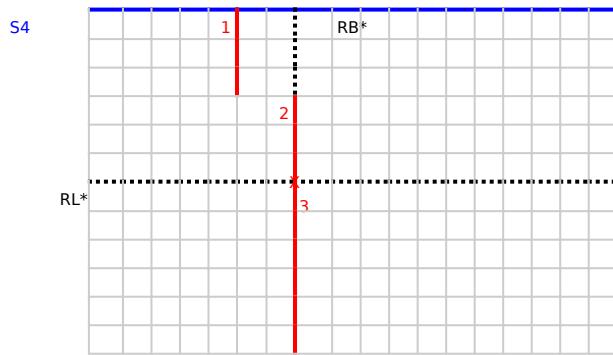


Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 2 - Loss of Support 4



Loads

Loads in accordance with paragraph "Load Analysis"

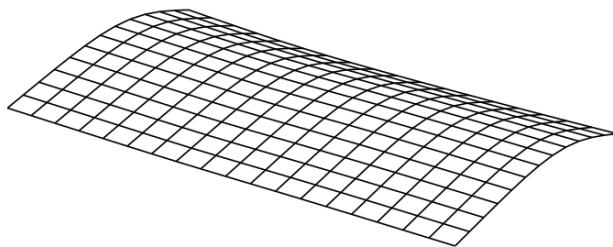
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

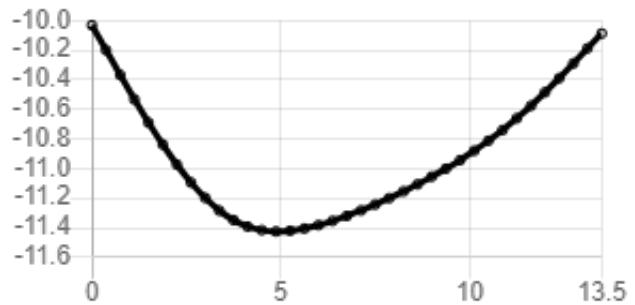


Edge Beam (EL) - Summary

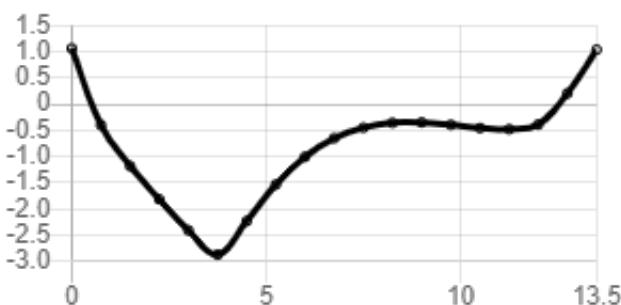
Deflection ratio check not required along this direction
 $M^*,\text{hog} = 1.1 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 2.9 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 3.9 \text{ kN} < \phi V_{u} = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

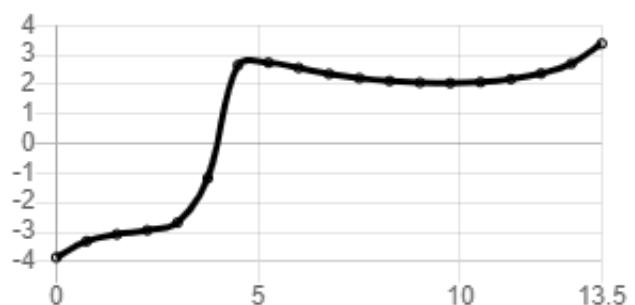
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]

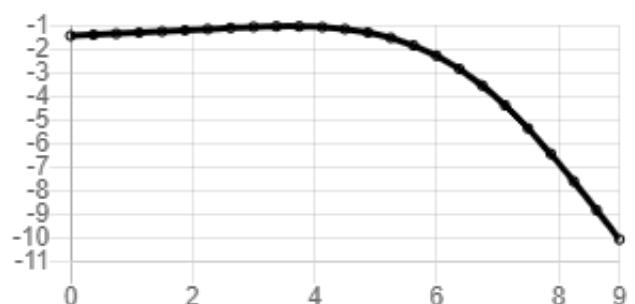


Edge Beam (EB) - Summary

Deflection ratio = 1 in 331 < 1 in 200 over 2 m cantilever
 $M^*,\text{hog} = 20.3 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 0 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 12.7 \text{ kN} < \phi V_{u} = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

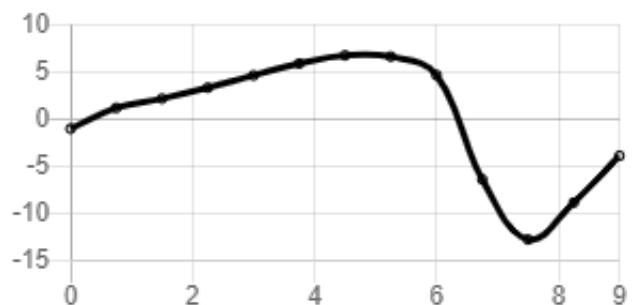
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

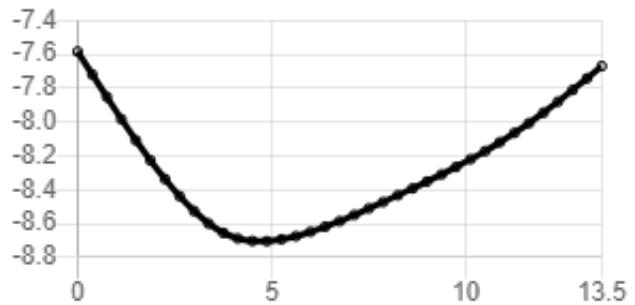


Rib (RL*) - Summary

Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.6 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 2.9 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 3.3 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

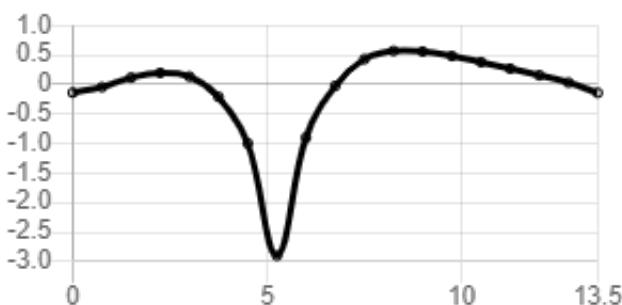
Rib (RL*) - Deflection

[X:m, Y:mm]



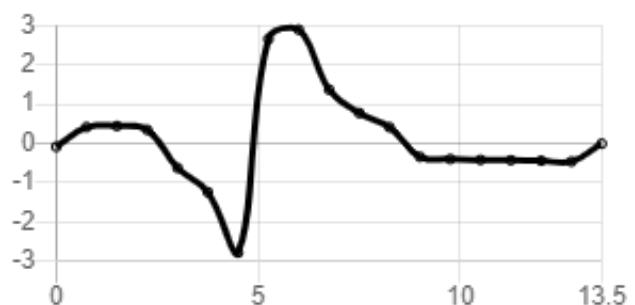
Rib (RL*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V^*)

[X:m, Y:kN/rib]

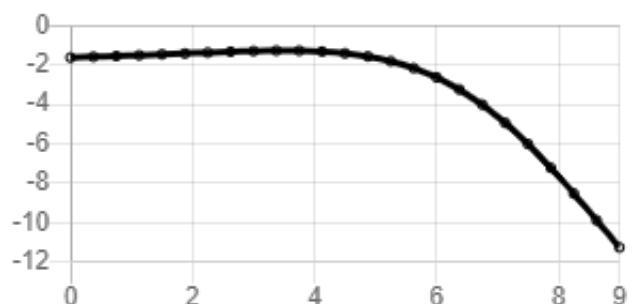


Rib (RB*) - Summary

Deflection ratio = 1 in 297 < 1 in 200 over 2 m cantilever
 $M^*,\text{hog} = 12.4 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 0.3 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 8.4 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

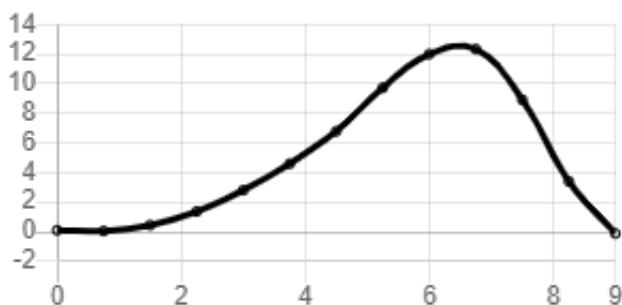
Rib (RB*) - Deflection

[X:m, Y:mm]



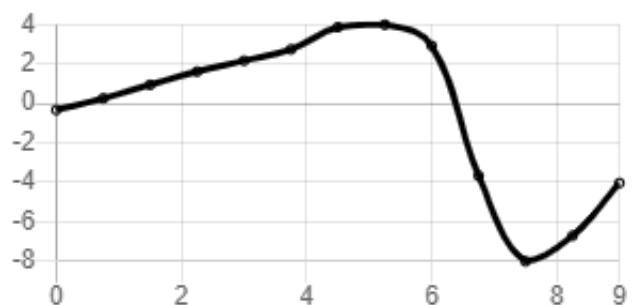
Rib (RB*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]

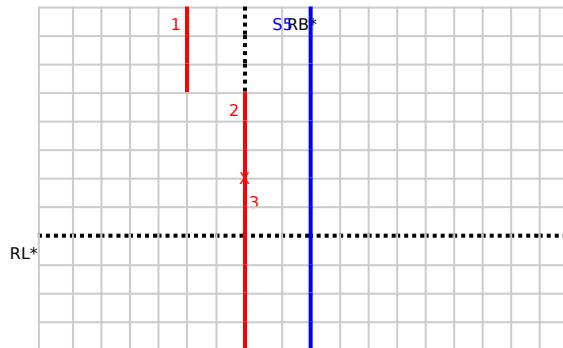


Rib (RB*) - Shear Force (V^*)

[X:m, Y:kN/rib]



Rectangle 2 - Loss of Support 5



Loads

Loads in accordance with paragraph "Load Analysis"

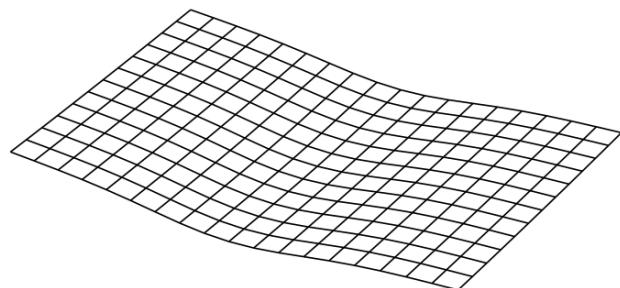
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

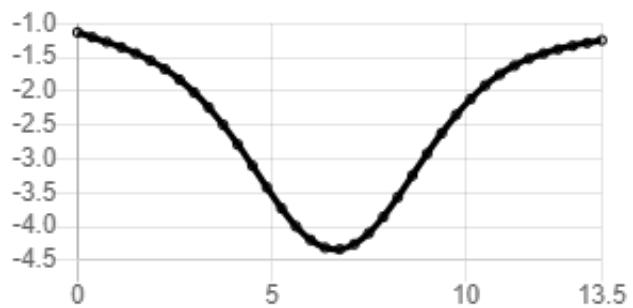


Edge Beam (EL) - Summary

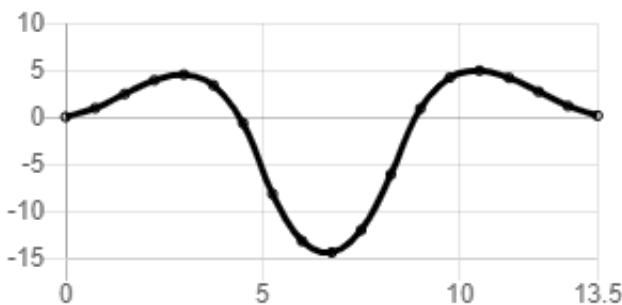
Deflection ratio = 1 in 1721 < 1 in 400 over 4 m length
 $M^*, hog = 5 \text{ kNm} < \Phi Mu, hog = 23 \text{ kNm}$
 $M^*, sag = 14.2 \text{ kNm} < \Phi Mu, sag = 28 \text{ kNm}$
 $V^*, max = 12.3 \text{ kN} < \Phi Vu = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

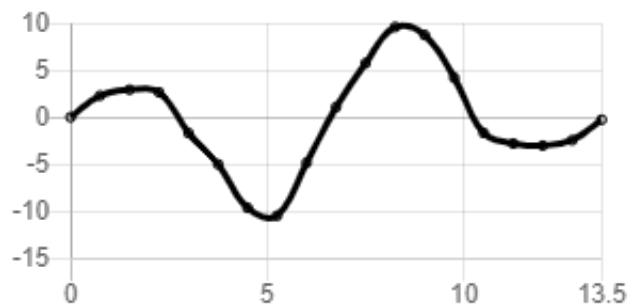
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]

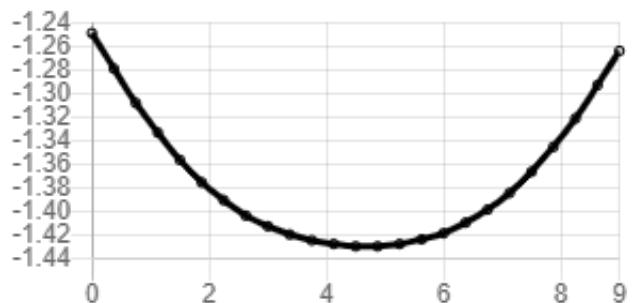


Edge Beam (EB) - Summary

Deflection ratio check not required along this direction
 $M^*, hog = 0.2 \text{ kNm} < \Phi Mu, hog = 23 \text{ kNm}$
 $M^*, sag = 0.5 \text{ kNm} < \Phi Mu, sag = 28 \text{ kNm}$
 $V^*, max = 2.1 \text{ kN} < \Phi Vu = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

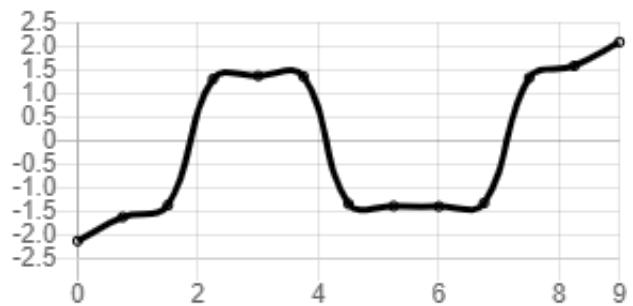
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]



Rib (RL*) - Summary

Deflection ratio = 1 in 1428 < 1 in 400 over 4 m length
 $M^*, hog = 3.2 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 8.4 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 9.2 \text{ kN} < \phi Vu = 17 \text{ kN}$

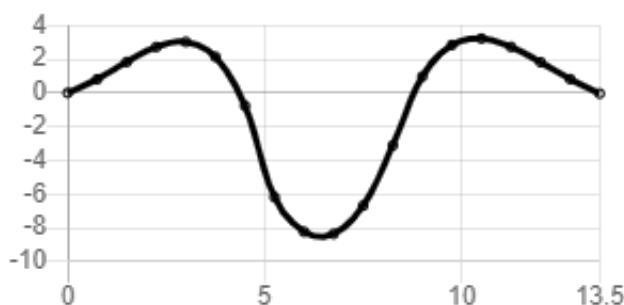
Rib (RL*) - Deflection

[X:m, Y:mm]



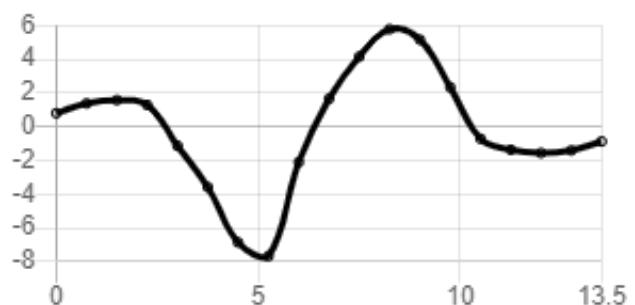
Rib (RL*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V^*)

[X:m, Y:kN/rib]



Rib (RB*) - Summary

Deflection ratio check not required along this direction
 $M^*, hog = 0.4 \text{ kNm} < \phi Mu, hog = 13.5 \text{ kNm}$
 $M^*, sag = 1.6 \text{ kNm} < \phi Mu, sag = 15 \text{ kNm}$
 $V^*, max = 2.5 \text{ kN} < \phi Vu = 17 \text{ kN}$

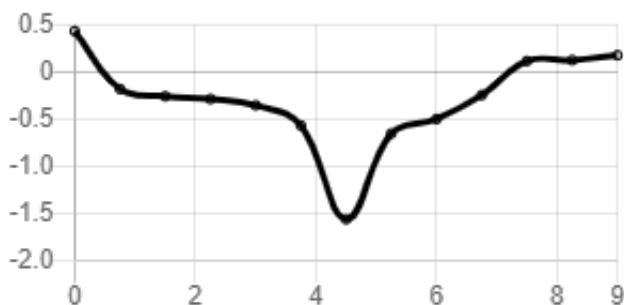
Rib (RB*) - Deflection

[X:m, Y:mm]



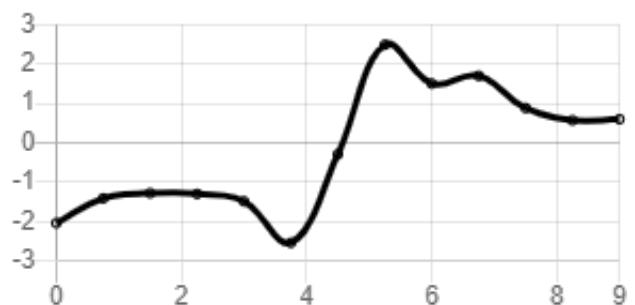
Rib (RB*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]

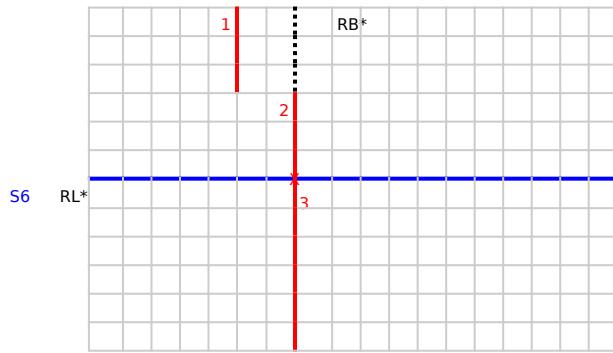


Rib (RB*) - Shear Force (V^*)

[X:m, Y:kN/rib]



Rectangle 2 - Loss of Support 6



Loads

Loads in accordance with paragraph "Load Analysis"

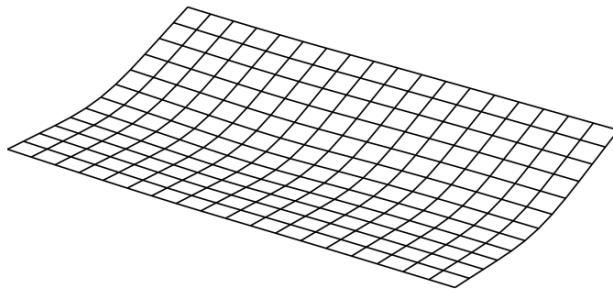
Notes

S: Line where maximum loss of support occurs

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

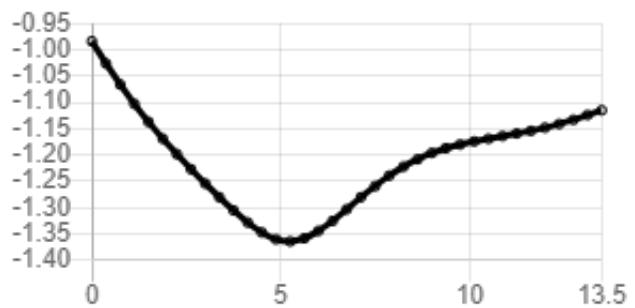


Edge Beam (EL) - Summary

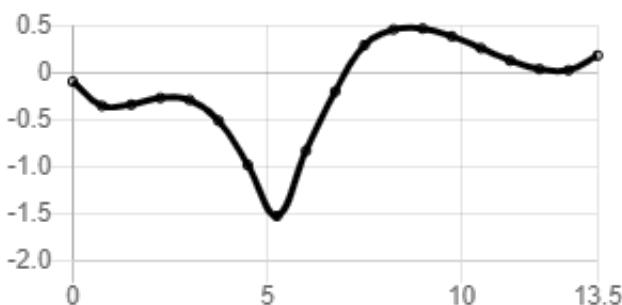
Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.5 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 1.5 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 1.9 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

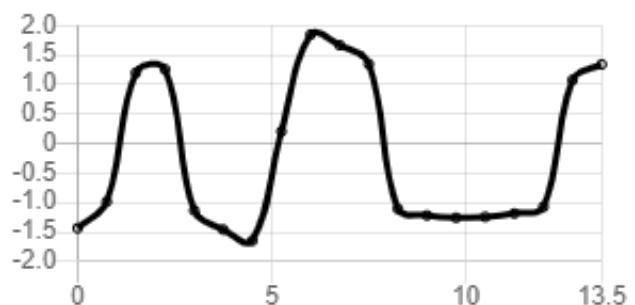
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]

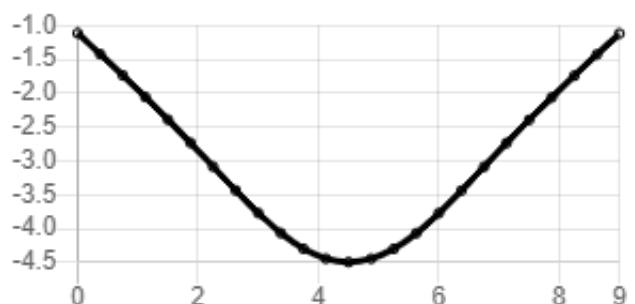


Edge Beam (EB) - Summary

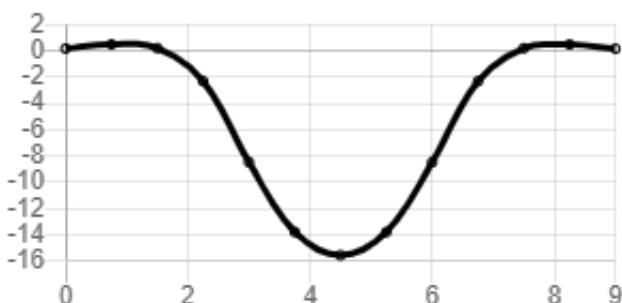
Deflection ratio = 1 in 1769 < 1 in 400 over 4 m length
 $M^*,\text{hog} = 0.5 \text{ kNm} < \phi M_{u,\text{hog}} = 23 \text{ kNm}$
 $M^*,\text{sag} = 15.5 \text{ kNm} < \phi M_{u,\text{sag}} = 28 \text{ kNm}$
 $V^*,\text{max} = 10.5 \text{ kN} < \phi V_u = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

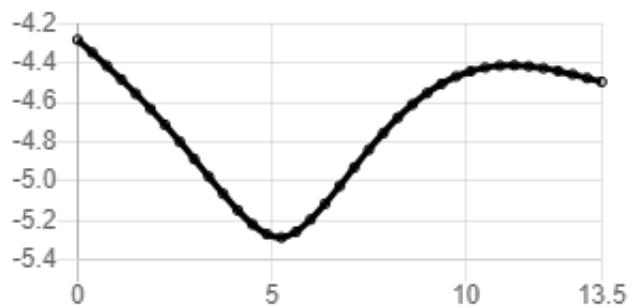


Rib (RL*) - Summary

Deflection ratio check not required along this direction
 $M^*,\text{hog} = 0.8 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 3.3 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 3.5 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

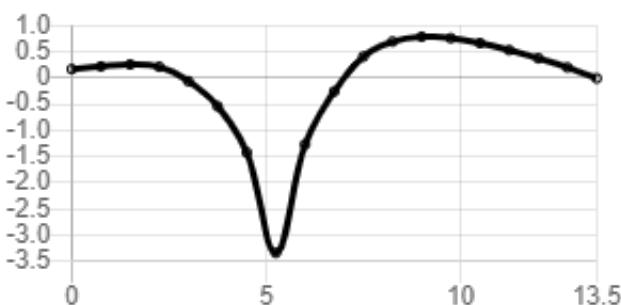
Rib (RL*) - Deflection

[X:m, Y:mm]



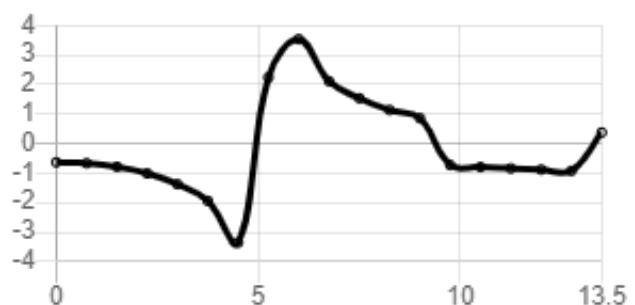
Rib (RL*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V^*)

[X:m, Y:kN/rib]

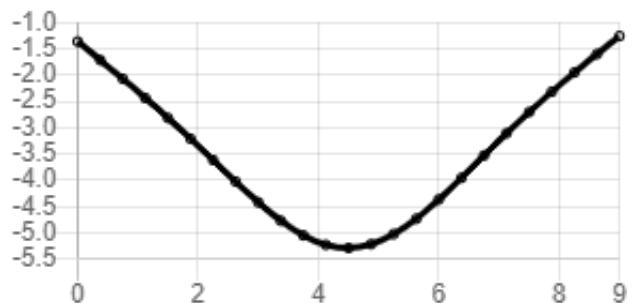


Rib (RB*) - Summary

Deflection ratio = 1 in 1408 < 1 in 400 over 4 m length
 $M^*,\text{hog} = 0.8 \text{ kNm} < \phi M_{u,\text{hog}} = 13.5 \text{ kNm}$
 $M^*,\text{sag} = 10.9 \text{ kNm} < \phi M_{u,\text{sag}} = 15 \text{ kNm}$
 $V^*,\text{max} = 6.7 \text{ kN} < \phi V_{u} = 17 \text{ kN}$

Rib (RB*) - Deflection

[X:m, Y:mm]



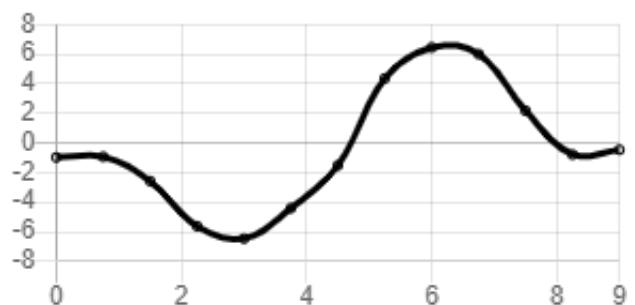
Rib (RB*) - Bending Moment (M^*)

[X:m, Y:kNm/rib]



Rib (RB*) - Shear Force (V^*)

[X:m, Y:kN/rib]



Rectangle 2 - Pressure Analysis (Short Term)

Rib

Pressure at the foundation/building platform interface: **Pressure at the foundation/building platform interface:**

$P^*(z=0)$, short term = 33.5 kPa

Pressure on natural soil

Engineered Fill Thickness = 100 mm

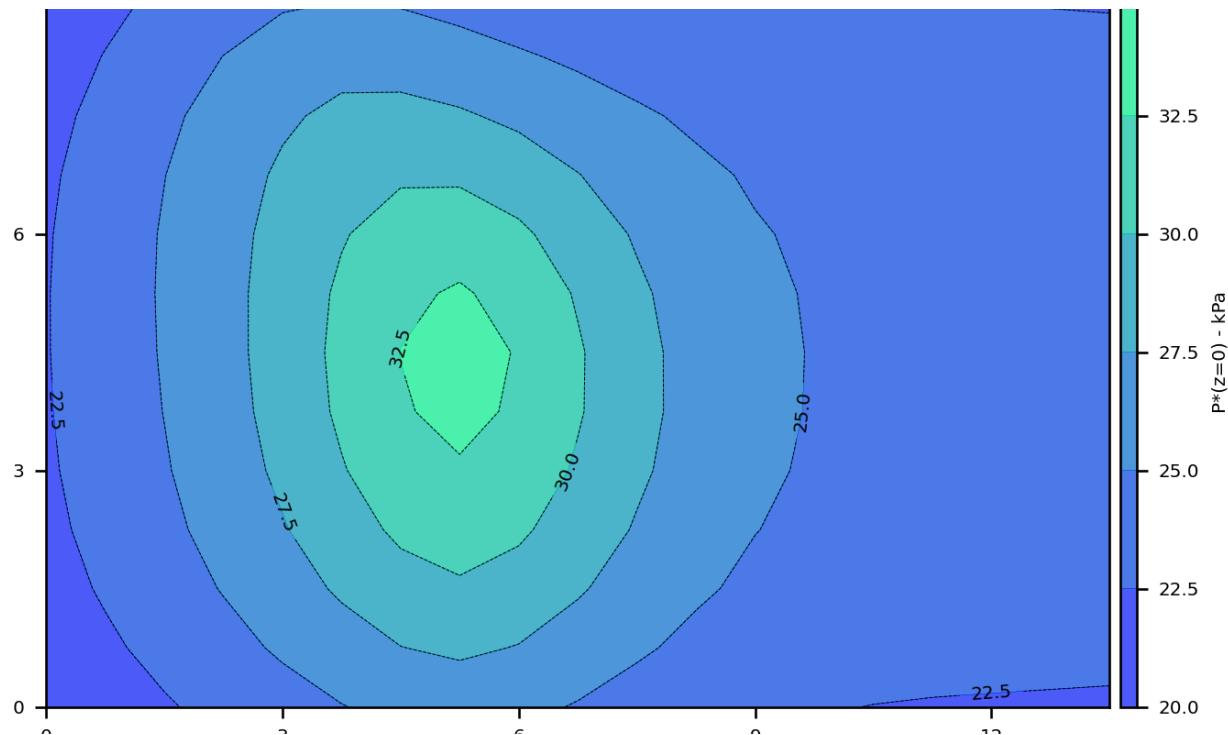
P^* , short term = 24.2 kPa < DBC = 100 kPa

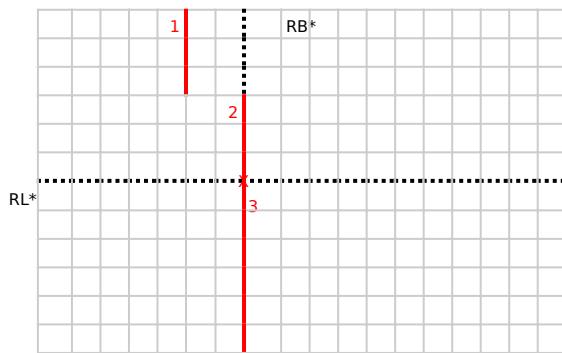
Edge Beam

Pressure on natural soil

Engineered Fill Thickness = 100 mm

P^* , short term = 25 kPa < DBC = 100 kPa





Loads

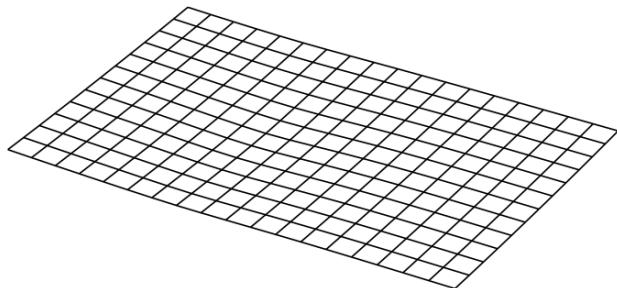
Loads in accordance with paragraph "Load Analysis"

Notes

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.



Edge Beam (EL) - Summary

Deflection check not applicable for a ULS Short Term combination.

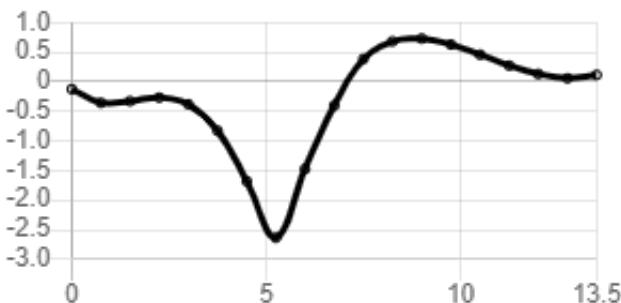
Refer to Long Term combination check.

$$M^*,\text{hog} = 0.8 \text{ kNm} < \Phi M_{u,\text{hog}} = 23 \text{ kNm}$$

$$M^*,\text{sag} = 2.6 \text{ kNm} < \Phi M_{u,\text{sag}} = 28 \text{ kNm}$$

$$V^*,\text{max} = 3.3 \text{ kN} < \Phi V_{u,\text{max}} = 39.6 \text{ kN}$$

Edge Beam (EL) - Bending Moment (M*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Summary

Deflection check not applicable for a ULS Short Term combination.

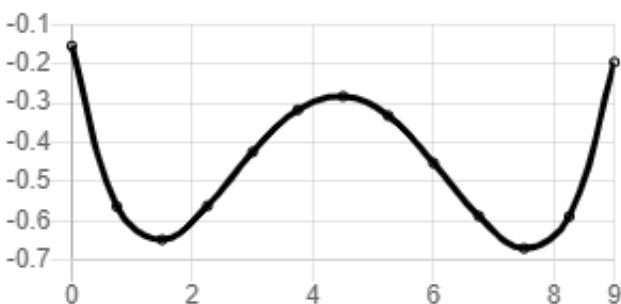
Refer to Long Term combination check.

$$M^*,\text{hog} = 0 \text{ kNm} < \Phi M_{u,\text{hog}} = 23 \text{ kNm}$$

$$M^*,\text{sag} = 0.7 \text{ kNm} < \Phi M_{u,\text{sag}} = 28 \text{ kNm}$$

$$V^*,\text{max} = 1.9 \text{ kN} < \Phi V_{u,\text{max}} = 39.6 \text{ kN}$$

Edge Beam (EB) - Bending Moment (M*) [X:m, Y:kNm/rib]

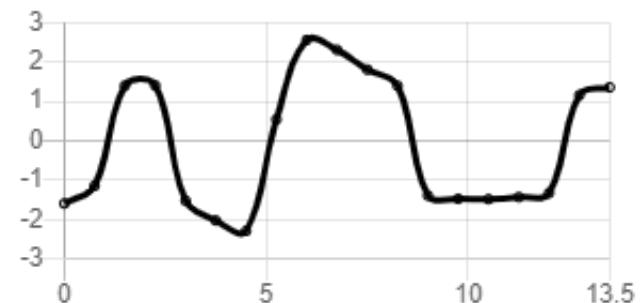


Edge Beam (EL) - Deflection [X:m, Y:mm]

Deflection diagram not applicable for a ULS Short Term combination.

Refer to Long Term combination diagram.

Edge Beam (EL) - Shear Force (V*) [X:m, Y:kN/rib]



Edge Beam (EB) - Deflection [X:m, Y:mm]

Deflection diagram not applicable for a ULS Short Term combination.

Refer to Long Term combination diagram.

Edge Beam (EB) - Shear Force (V*) [X:m, Y:kN/rib]



Rib (RL*) - Summary

Deflection check not applicable for a ULS Short Term combination.

Refer to Long Term combination check.

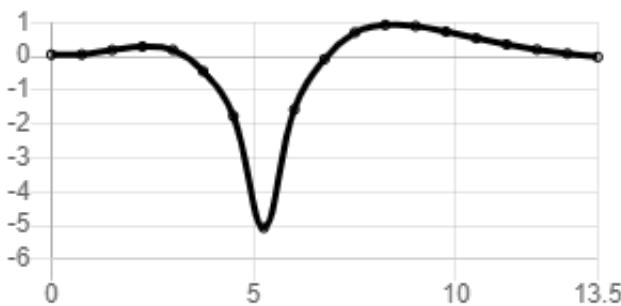
$M^*,\text{hog} = 1 \text{ kNm} < \Phi M_u, \text{hog} = 13.5 \text{ kNm}$

$M^*,\text{sag} = 5.1 \text{ kNm} < \Phi M_u, \text{sag} = 15 \text{ kNm}$

$V^*,\text{max} = 5.7 \text{ kN} < \Phi V_u = 17 \text{ kN}$

Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RB*) - Summary

Deflection check not applicable for a ULS Short Term combination.

Refer to Long Term combination check.

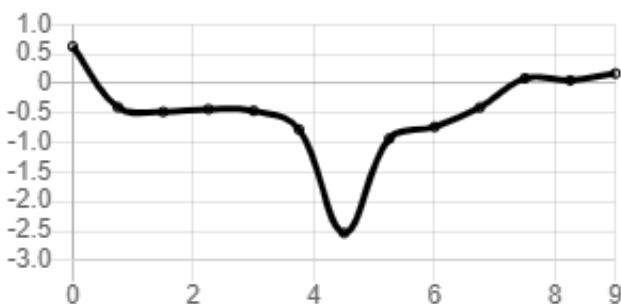
$M^*,\text{hog} = 0.6 \text{ kNm} < \Phi M_u, \text{hog} = 13.5 \text{ kNm}$

$M^*,\text{sag} = 2.5 \text{ kNm} < \Phi M_u, \text{sag} = 15 \text{ kNm}$

$V^*,\text{max} = 4 \text{ kN} < \Phi V_u = 17 \text{ kN}$

Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Deflection

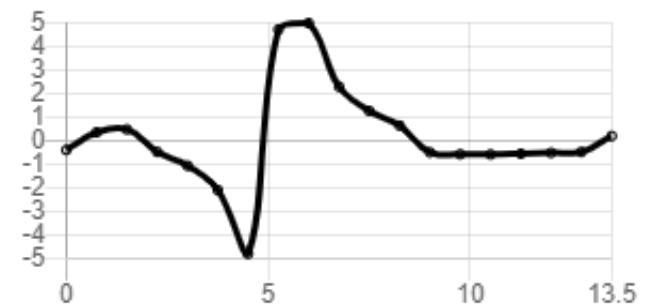
[X:m, Y:mm]

Deflection diagram not applicable for a ULS Short Term combination.

Refer to Long Term combination diagram.

Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rib (RB*) - Deflection

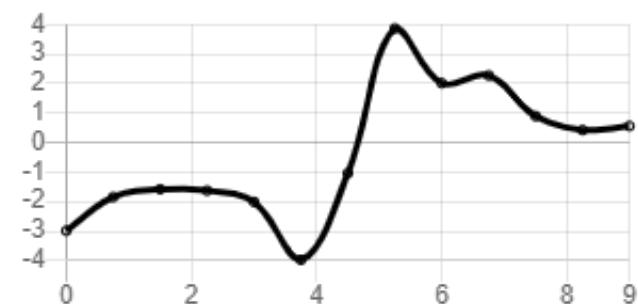
[X:m, Y:mm]

Deflection diagram not applicable for a ULS Short Term combination.

Refer to Long Term combination diagram.

Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]



Rectangle 2 - Pressure Analysis (Long Term)

Rib

Pressure at the foundation/building platform interface: **Pressure at the foundation/building platform interface:**

$P^*(z=0)$, long term = 21.5 kPa

Edge Beam

$P^*(z=0)$, long term = 17.5 kPa

Pressure on natural soil

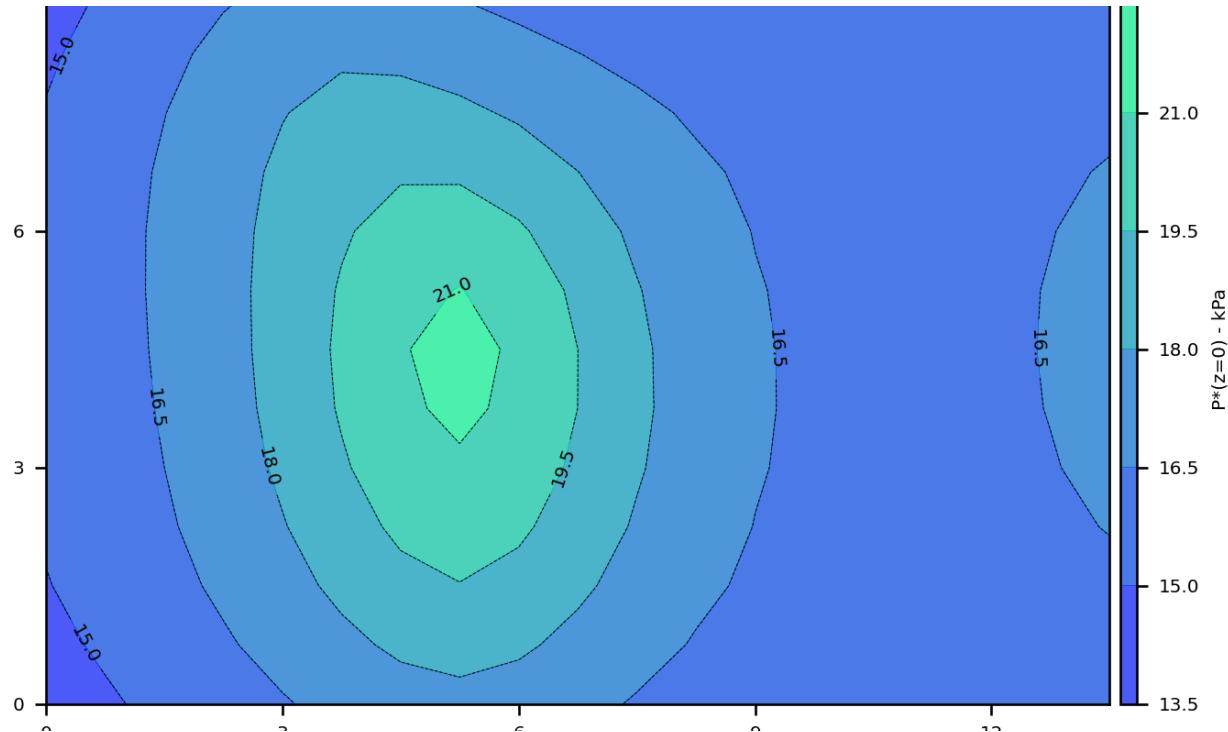
Engineered Fill Thickness = 100 mm

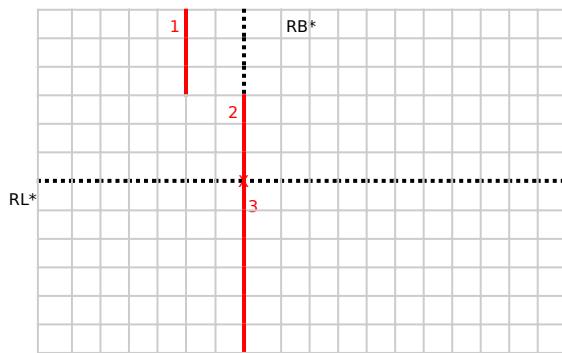
P^* , long term = 15.6 kPa <ABC = 66.7 kPa

Pressure on natural soil

Engineered Fill Thickness = 100 mm

P^* , long term = 17 kPa <ABC = 66.7 kPa





Loads

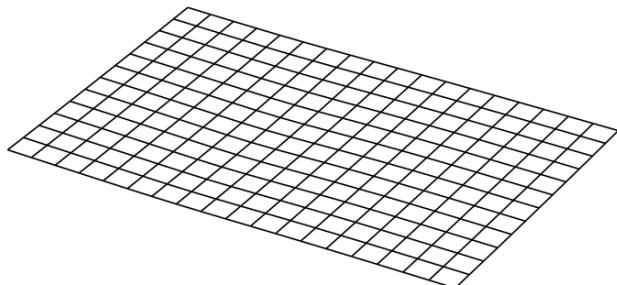
Loads in accordance with paragraph "Load Analysis"

Notes

RL: Rib for analysis along L

RB: Rib for analysis along B

The loads shown on this diagram are additional to the edge loads induced by the external walls and to the uniform surface load induced by the waffle raft.

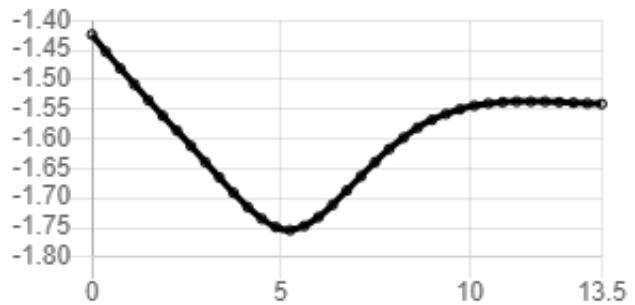


Edge Beam (EL) - Summary

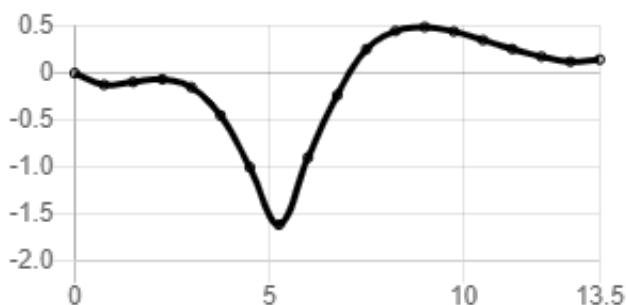
$\Delta = 0.3 \text{ mm} < \Delta_{\text{max}} = 40 \text{ mm}$
 $M^*, \text{hog} = 0.5 \text{ kNm} < \Phi M_{\text{u,hog}} = 23 \text{ kNm}$
 $M^*, \text{sag} = 1.6 \text{ kNm} < \Phi M_{\text{u,sag}} = 28 \text{ kNm}$
 $V^*, \text{max} = 2.1 \text{ kN} < \Phi V_{\text{u}} = 39.6 \text{ kN}$

Edge Beam (EL) - Deflection

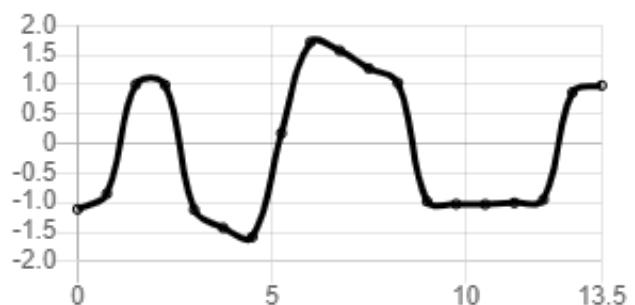
[X:m, Y:mm]



Edge Beam (EL) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EL) - Shear Force (V^*) [X:m, Y:kN/rib]

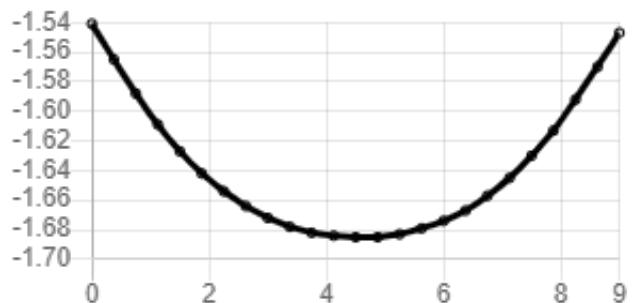


Edge Beam (EB) - Summary

$\Delta = 0.1 \text{ mm} < \Delta_{\text{max}} = 30 \text{ mm}$
 $M^*, \text{hog} = 0.1 \text{ kNm} < \Phi M_{\text{u,hog}} = 23 \text{ kNm}$
 $M^*, \text{sag} = 0.3 \text{ kNm} < \Phi M_{\text{u,sag}} = 28 \text{ kNm}$
 $V^*, \text{max} = 1.6 \text{ kN} < \Phi V_{\text{u}} = 39.6 \text{ kN}$

Edge Beam (EB) - Deflection

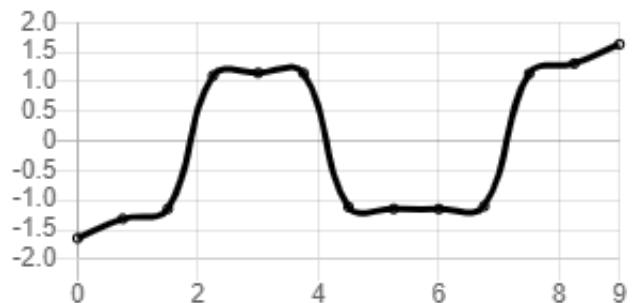
[X:m, Y:mm]



Edge Beam (EB) - Bending Moment (M^*) [X:m, Y:kNm/rib]



Edge Beam (EB) - Shear Force (V^*) [X:m, Y:kN/rib]

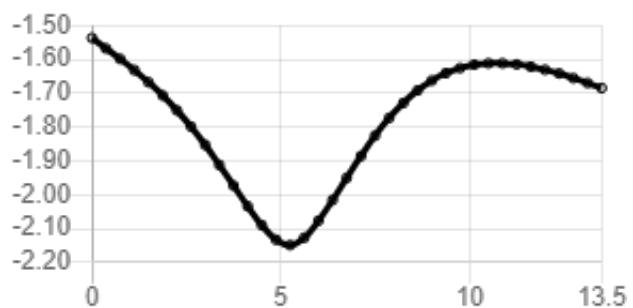


Rib (RL*) - Summary

$\Delta = 0.6 \text{ mm} < \Delta_{\text{max}} = 40 \text{ mm}$
 $M^*, \text{hog} = 0.6 \text{ kNm} < \Phi M_{\text{u,hog}} = 13.5 \text{ kNm}$
 $M^*, \text{sag} = 3 \text{ kNm} < \Phi M_{\text{u,sag}} = 15 \text{ kNm}$
 $V^*, \text{max} = 3.5 \text{ kN} < \Phi V_{\text{u}} = 17 \text{ kN}$

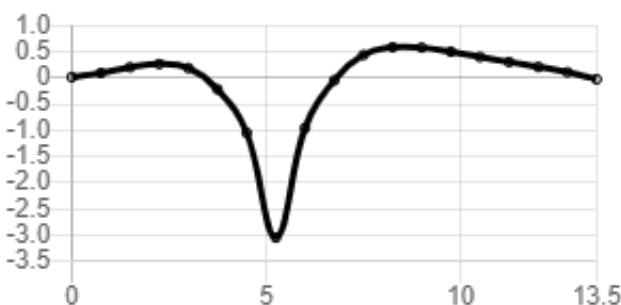
Rib (RL*) - Deflection

[X:m, Y:mm]



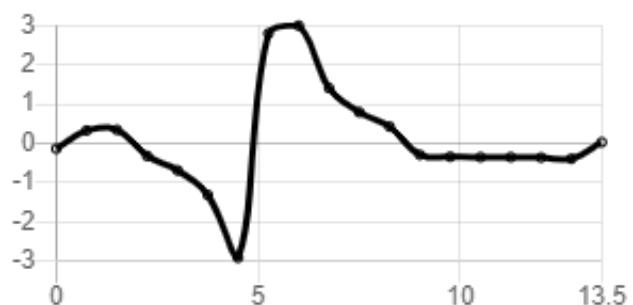
Rib (RL*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RL*) - Shear Force (V*)

[X:m, Y:kN/rib]

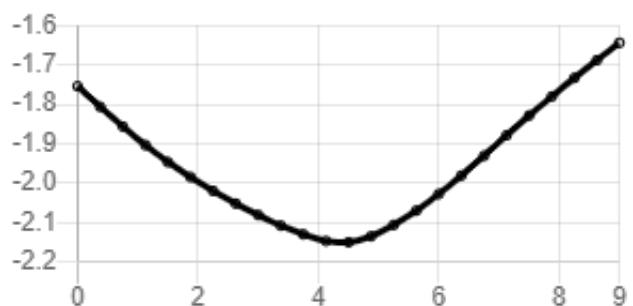


Rib (RB*) - Summary

$\Delta = 0.5 \text{ mm} < \Delta_{\text{max}} = 30 \text{ mm}$
 $M^*, \text{hog} = 0.4 \text{ kNm} < \Phi M_{\text{u,hog}} = 13.5 \text{ kNm}$
 $M^*, \text{sag} = 1.4 \text{ kNm} < \Phi M_{\text{u,sag}} = 15 \text{ kNm}$
 $V^*, \text{max} = 2.4 \text{ kN} < \Phi V_{\text{u}} = 17 \text{ kN}$

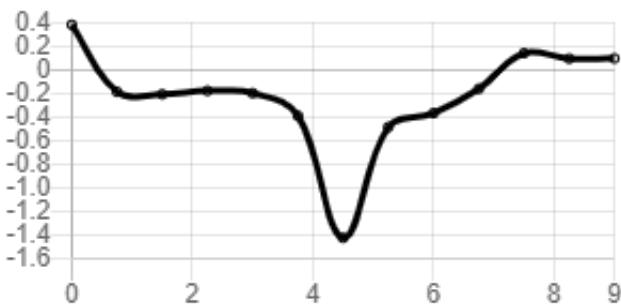
Rib (RB*) - Deflection

[X:m, Y:mm]



Rib (RB*) - Bending Moment (M*)

[X:m, Y:kNm/rib]



Rib (RB*) - Shear Force (V*)

[X:m, Y:kN/rib]

