BARRASON'S ENGINEERS
Structural and Civil Consultants

Building Act 1993
Section 238(1)(a)
Building Regulations 2018
Regulation 126

CERTIFICATE OF COMPLIANCE FOR PROPOSED BUILDING WORK

This certificate is issued to:

TBA

This certificate is issued in relation to the proposed building work at:

Non-site-specific design

Nature of proposed building work:

Construction of a generic slab for a portable spa of maximum dimensions 3500 x 3500 x 1100.

Building classification as per NCC 2022

Part of building: non-residential slab BCA Classification: 10b

Prescribed class of building work for which this certificate is issued:

Design or part of the design of building work relating to *Structural matter*

Documents setting out the design that is certified by this certificate:

Document no.	Document date	Type of document	No. pages	Prepared by
2104201	10/05/21	Computations	3	Barrason's Engineers
2104201	10/05/21	Drawings	2	Barrason's Engineers

The design certified by this certificate complies with the following provisions of Building Act 1993, Building Regulations 2018, National Construction Code Volume 2 or Australian Standard:

Act, Regulation, Code or Standard	Section, Regulation, Part, Performance Requirement or other provision
NCC 2022 Volume 2	Part 3.2, 3.4 & 3.11 of Volume 2
AS/NZS 1170.0	Structural Design Actions – General Principles
AS/NZS 1170.1	Structural Design Actions – Permanent, imposed and other actions
AS/NZS 1170.2	Structural Design Actions – Wind Actions
AS 3600	Concrete Structures
AS 4100	Steel Structures

CCAA T48	Industrial Floors and Pavements

I prepared the design, or part of the design, set out in the documents listed above.

I certify that the design set out in the documents listed above complies with the provisions set out above.

I believe that I hold the required skills, experience and knowledge to issue this certificate and can demonstrate this if requested to do so.

Engineer:

Full Name: Andrew Barraclough

Registrations: FIEAUST, CPEng, NER, RBP

Qualifications: BEng MEng PhD

Address: Lvl 2, 2 Pacific Promenade, Pakenham, VIC 3810

Email: admin@barrasons.com.au

Endorsed building engineer area of engineering: Structural
Endorsed building engineer registration no.: PE0000600, RPEQ 22822

Building practitioner registration category and class: C

Signed:

Andrew Barraclough

Date of issue of certificate: 14/11/2022

PORTABLE SPA GENERIC SLAB

CONSTRUCTION DRAWINGS

Sheet Index

Layout ID	Layout Name
S000	Title Sheet
S001	General Notes
S100	Portable Spa Slab

Barrason's Engineers
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TITLE: TITLE SHEET

FOR CONSTRUCTION

PROJECT: PORTABLE SPA SLAB

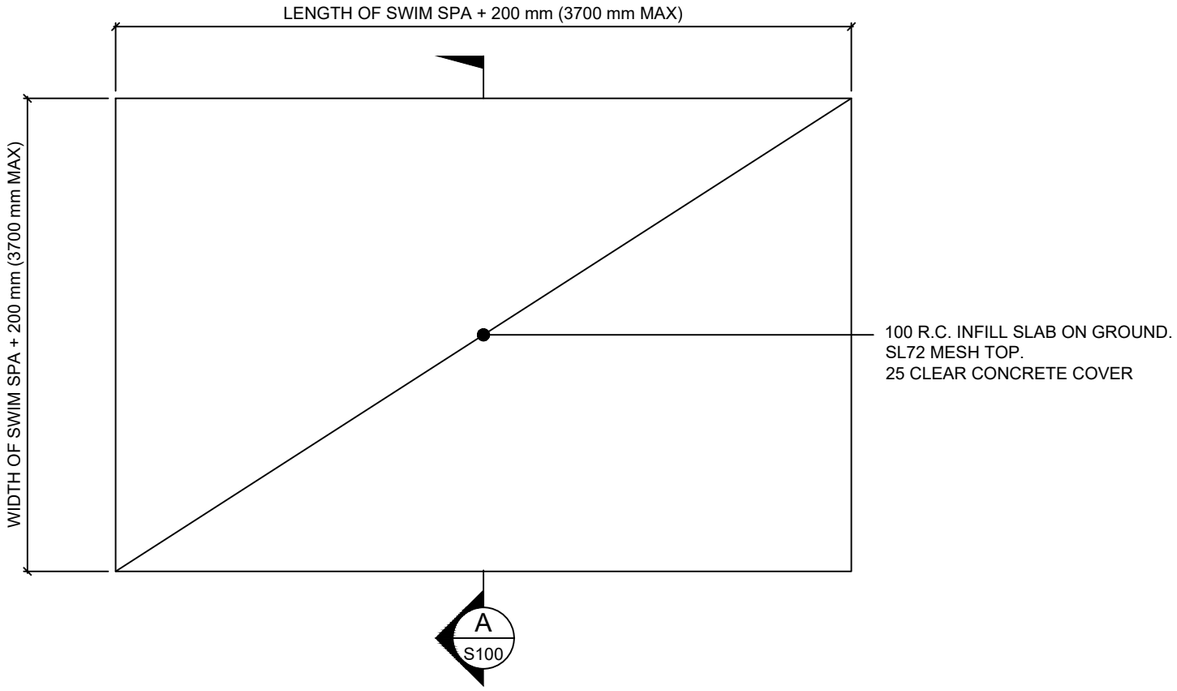
CLIENT: SPA WORLD

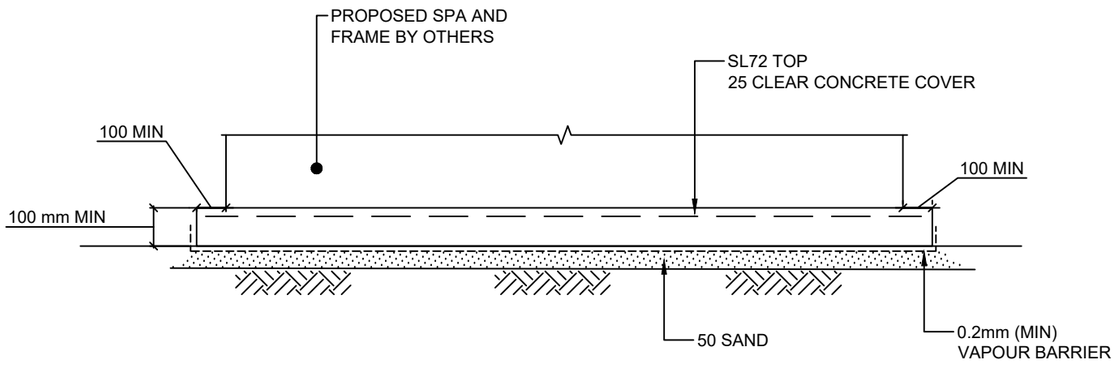
JOB No: 2104201

DRAWING No:

SCALE:

REVISION	AMENDED DESCRIPTION	DRAWN BY	DATE
A	FOR CONSTRUCTION	B.E.	10/05/21





SECTION A S100

NOTES:

- THIS GENERIC SLAB DESIGN IS ONLY FOR SPA WORLD PORTABLE SPA MODELS OF MAXIMUM DIMENSIONS: **3500 x 3500 x 1100.**
- FOR SPA MODELS EXCEEDING THESE DIMENSIONS USE THE SPA WORLD SWIM SPA SLAB DESIGN OR CONTACT THIS OFFICE FOR GUIDANCE
- SLAB DESIGN BASED ON POINT LOAD TRANSFERAL FROM PORTABLE SPA AT FULL CAPACITY.
- SLAB TO BE FOUNDED ON SOIL WITH A MINIMUM ALLOWABLE BEARING CAPACITY OF 50 kPa AND A MINIMUM 2% CBR SUBGRADE. THIS OFFICE TO BE CONTACTED IF DIFFERS.
- TREE EFFECTS, PROXIMITY OF ASSETS, ABNORMAL MOISTURE CONDITIONS, UNCONTROLLED FILL & AGGRESSIVE SOIL TYPES HAVE NOT BEEN TAKEN INTO CONSIDERATION. THIS OFFICE TO BE CONTACTED FOR SITE SPECIFIC DESIGN IF THESE CONDITIONS EXIST OR SITE IS CLASSIFIED 'P'
- SWIMMING POOL AND SPA SAFETY TO FOLLOW THE GUIDELINES OF PN-05-2018 PUBLISHED BY VBA.

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TITLE: PORTABLE SPA SLAB PLAN	**FOR CONSTRUCTION**	PROJECT: PORTABLE SPA SLAB	CLIENT: SPA WORLD	
			JOB No: 2104201	DRAWING No: S100
			SCALE:	

REVISION	AMENDED DESCRIPTION	DRAWN BY	DATE
A	FOR CONSTRUCTION	B.E.	10/05/21

INDUSTRIAL FLOOR SLABS V5.02

Barrasons Engineers

Slab:	**(Floor Slab SL01) 100mm thick slab, f'c = 25MPa, SL72 Top**	
Subgrade:	**Subgrade Modulus (K) = 17kPa/mm (2.0% CBR)**	
Position:	**Edge condition**	
Post loads:	**No post loading**	**OK (0.00)**
Wheels:	**No wheel loading**	**OK (0.00)**
UDL's:	**23kPa floor UDL**	**OK (0.88)**

Concrete Parameters

Normal density concrete

Concrete strength (f'c) =	25	MPa	
Slab thickness (h) =	100	mm	
Concrete density (ρ) =	2400	kg/m³	Normal density = 2400kg/m³
f'cmi =	27.9	MPa	AS 3600 - Table 3.1.2
Modulus of elasticity (Ec = $\rho^{1.5}$*0.043*√f'cmi) =	26700	MPa ± 20%	AS 3600 - Cl 3.1.2
Method for flexural strength =	A	(C)&CA,(T)48,(A)S 3600,(O)ther	
90 day flexural tensile strength (f'ct.f = 0.6*√f'c) =	3.00	MPa	
Section modulus (Z) =	1666667	mm³	
Poissons ratio (μ) =	0.15		
Radius of relative stiffness (l = [E*h³/(12*(1-μ²)*K)]$^{1/4}$ =	605	mm	
Point under consideration =	E	(I)nternal, (C)orner, (E)dge	
Consider load transfer between slabs at a joint =	Y	(Y)es, (N)o (Applicable - Corner and edge only)	
Corner transfer multiplier =	0.70	Chandler (Load transfer between slabs)	
Edge transfer multiplier =	0.85	Chandler (Load transfer between slabs)	
Consider distance reduction to edge of radius =	N	(Y)es, (N)o	

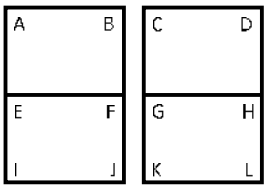
Soil Parameters

Modulus of subgrade reaction (K) =	17	kPa/mm	
Geotechnical report =	N/A		
Recommend nominal subbase thickness =	200	mm	T48-2009 - Table 1.5

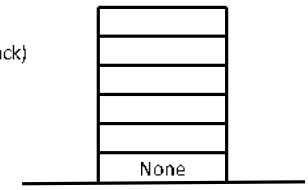
Conversions (Valid for CBR's between 2 & 30):

California Bearing Ratio (CBR) =	2	%	
Modulus of subgrade reaction (K) =	16.9	kPa/mm	
Modulus of subgrade reaction (K) =	17	kPa/mm	
California Bearing Ratio (CBR) =	2.0	%	
Bound sub-base thickness =	100	mm (100, 125, 150)	
California Bearing Ratio (CBR) =	2.0	% (max 12%)	
Equivalent design CBR =	10.2	% (35% max.)	T48-2009 - Figure 1.26
Modulus of subgrade reaction (K) =	55	kPa/mm	

Rack Loadings with Floor Pallets (Standard Dexian layout)



Number of above ground rack levels =	0	
Rack pallet weight =	0	kg (2 pallets per rack)
Ground pallet weight =	0	kg
Pallet side length =	1000	mm
Pallet side width =	1000	mm
Ground pallet load =	0.0	kPa
Working post load (RPL) =	0.0	kN
Aisle width =	1680	mm
Foot length (Fl) =	140	mm
Foot width (Fw) =	80	mm
Foot area (Fa) =	11200	mm^2
Radius of loaded area (r) =	60	mm
Equivalent radius of loaded area (b) =	58	mm
Material factor for racking (Rk1) =	0.85	
Repetitions factor for racking (Rk2) =	1.00	
Standard dexian racking system =	Y	(Y)es, (N)o

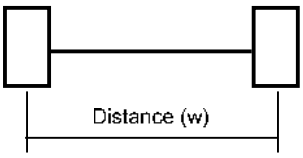


Dist A - B =	838	mm
Dist A - E =	2591	mm
Dist B - C =	381	mm

Chandler
T48 - 0.75 to 0.85 - Table 1.16
T48 - Cl 3.3.6

Wheel Loadings (Single Axle - 2 wheels per axle)

Vehicle description =	Standard Forklift		
Maximum single axle load (P) =	0.00	Tonne	Axle = Approx. 2.45 * Capacity
Number of Wheels per axle =	2	No.	
Applied wheel load (unfactored) (WPL) =	0.00	Tonne	P=0.0kN
Distance between wheels (across axle) (w) =	2600	mm	
Distance between axles =	0	mm (0 for single axle)	
Tyre pressure (Pr) =	700	kPa	
Radius of loaded area (r) = 1000*√(WPL*10/(π*Pr)) =	0	mm	
Equivalent radius of loaded area (b) =	33	mm	Chandler
Material factor for wheel loads (Wk1) =	0.95		T48 - 0.85 to 0.95 - Table 1.16
Design life =	25	Years	
Daily cycles =	50	No.	
Number of repetitions in design life =	456250	No.	
Load repetition factor (Wk2) =	0.50		T48 - Table 1.17



Uniform Floor Loading

Number of pallets on the floor =	1		
Ground pallet weight =	2288	kg	
Pallet side length =	1000	mm	
Pallet end length =	1000	mm	
Ground Pallet load (q) =	22.9	kPa	
Aisle width =	2000	mm	
Material factor for UDL (Uk1) =	0.85		T48 - 0.75 to 0.85 - Table 1.16
Repetition factor for UDL (Uk2) =	0.75		T48 - Cl 3.3.6

INDUSTRIAL FLOOR SLABS V5.02

Barrasons Engineers

Slab: **(Floor Slab SL01) 100mm thick slab, f'c = 25MPa, SL72 Top**
Subgrade: **Subgrade Modulus (K) = 17kPa/mm (2.0% CBR)**
UDL's: **23kPa floor UDL** **OK (0.88)**
Position: **Edge condition**

Uniform Loading

UDL Loading (q) =	22.9	kPa

Uniform stresses - Variable Storage Layout - C&CA Cl 5.6.3

Limiting stress (f'ct.f) =	3.000	MPa
Use FOS =	N	(Y)es, (N)o - No uses Uk1 & Uk2
Reduction = Uk1 * Uk2 =	0.638	
Factored limiting stress (fca = fct.f * Reduction) =	1.913	MPa
Total allowable UDL (W = 0.33*fca*√(h*K)) =	26.0	kPa (C&CA Cl 5.6.3)
		OK (0.88)

Uniform stresses - Patterned - M Hetenyi

Critical conditions

$\lambda = [3*k/(E*h^3)]^{1/4}$ =	0.001176		
$a = \pi/(4*\lambda)$ =	668	mm	
b = 5*a =	3340	mm	
Critical when aisle (2*a) =	1336	mm wide	
$Mc\ (max) = 5.313*q*\sqrt{(E*h^3/3K)}$ =	2.78	kNm/m	
Stress (σu) = $6*M/h^2$ =	1.669	MPa	
Factored UDL stress ($\sigma uf = \sigma u$ / (Uk1 * Uk2)) =	2.618	MPa	
Limiting stress (f'ct.f) =	3.000	MPa	OK (0.87)

Actual conditions

Aisle width =	2000	mm	
$\lambda = [3*k/(E*h^3)]^{1/4}$ =	0.001176		
a = Aisle width/2 =	1000	mm	
b = 5*a =	5000	mm	
$Mc = q/(2*\lambda^2)*[e^{(-\lambda*a)}*\sin(\lambda*a)-e^{(-\lambda*b)}*\sin(\lambda*b)]$ =	2.37	kNm/m	
Stress ($\sigma u1$) = $6*Mc/h^2$ =	1.420	MPa	
Stress ($\sigma u2$) = $0.031387*q/h^2*\sqrt{(E*h^3/(3*K))}$ =	1.643	MPa	
Stress (σu) = Max($\sigma u1$,$\sigma u2$) =	1.643	MPa	
Factored UDL stress ($\sigma uf = \sigma u$ / (Uk1 * Uk2)) =	2.577	MPa	
Limiting stress (f'ct.f) =	3.000	MPa	OK (0.86)