STRUCTURAL ENGINEERS NEW ZELAND
CONSULTING STRUCTURAL ENGINEERS

RESIDENTIAL, COMMERCIAL, INDUSTRIAL
SEISMIC, TEMPORARY WORKS

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047-001
FENCE TANKS SUPPORTS & FIXINGS
FOR FENCE TANKS LTD

FENCE TANKS SUPPORTS & FIXINGS, ANYWHERE IN NEW ZEALAND
SENZ STRUCTURAL PS1
Oct 2026

STRUCTURAL ENGINEERS NZ PS1

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** 047-001

ISSUED BY: STRUCTURAL ENGINEERS NZ LTD
(Engineering Design Firm)

TO: FENCE TANKS LTD
(Owner/Developer)

TO BE SUPPLIED TO: Any Consenting Authority
(Building Consent Authority)

IN RESPECT OF: Generic Design Of Fixing Arrangements For The Fence Tanks & Multiple Assemblies
(Description of Building Work)

AT: Fence Tanks Supports & Fixings, Anywhere In New Zealand
(Address, Town/City)

LEGAL DESCRIPTION: LOT: DP: N/A ☑

We have been engaged by the owner/developer referred to above to provide *(Extent of Engagement)* :
Structural Engineering Services As Per Attached Calculations
in respect of the requirements of the Clause(s) of the Building Code specified above for Part Only , as specified in the Schedule, of the proposed building work.

The design carried out by us has been prepared in accordance with:
- ☑ Compliance documents issued by the Ministry of Business, Innovation & Employment (Verification method/acceptable solution) B1-VM1/AS1, VM2 and/or;
- ☐ Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:
- Site verification of the following design assumptions: Schedule to and inspection schedule appended
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:
- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the CM1 level of **construction monitoring**.

I, Sadeer Kattan , am:
(Name of Engineering Design Professional)
- CPEng number 1013983
- and hold the following qualifications: BE(Hons), CMEngNZ(Structural), CPEng

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than $200,000.
The Engineering Design Firm is not a member of ACE New Zealand.

SIGNED BY: Sadeer Kattan
(Name of Engineering Design Professional)

(Signature):



ON BEHALF OF: STRUCTURAL ENGINEERS NZ LTD DATE: 22/10/2026

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2];

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional

This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance

As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase

There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1- CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1. Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2. NZIA Standard Conditions of Contract SCC 2011
3. Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4. PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

SCHEDULE TO PRODUCER STATEMENT - PS1 DESIGN

Alternative Solutions

SENZ Documentation

1) Engineering calculations for job 047-001

Design assumptions, Proprietary products and Other exclusions:

1) Site verification of the following design assumptions:

   Good ground based on NZS3604:2011 with allowance for expansive soil up to class H2

   Inspections as per SENZ schedule and all SED elements including the provision for a corresponding PS4.

2) All proprietary products meeting their performance specification requirements; in particular this Producer Statement excludes:

3) Other exclusions; this producer statement excludes all aspects of:

The Producer Statements issued should not be relied on to establish compliance with the building code clauses E1, E2, E3.
Weathertightness and waterproofing design, materials, proprietary products, construction and/or inspections are specifically excluded from these producer statements.

Job Number: 047-001 - Producer Statement PS1

To the Building Official,

Any Consenting Authority

Generic Design Of Fixing Arrangements For The Fence Tanks & Multiple Assemblies At Fence Tanks Supports & Fixings

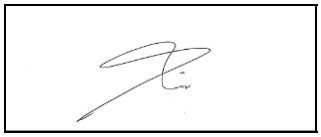
Compliance with the Building Code Clause B2 - Durability

The purpose of this letter is to demonstrate how compliance with Clause B2 (Durability) of the Building Code will be achieved for the above project. We can confirm that for specifically designed structural elements that are included within our design documentation:

Material	Means of Compliance	Details
Reinforced Concrete	B2/AS1	Concrete cover to reinforcing has been selected in accordance with NZS3101, Part 1, Section 3
Structural Timber	B2/AS1	Timber treatment has been selected in accordance with Table 1A of B2/AS1
Mild Steel Structure	Alternative Solution	Protection for mild steel has been specified in accordance with SNZ TS 3404 - Durability requirements for steel structures and components and AS/NZS2312 - Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings. This guide works on the time to first maintenance basis and assumes on-going maintenance. Refer to the attached maintenance plan (optional but recommended).

Yours faithfully,

Sadeer Kattan *Managing Director, Lead Structural Engineer*



For and on behalf of

STRUCTURAL ENGINEERS NZ LTD

Structural Maintenance Schedule

Project: Generic Design Of Fixing Arrangements For The Fence Tanks & Multiple Assemblies At Fence Tanks Supports & Fixings, Anywhere In New Zealand

This schedule of ongoing inspection and maintenance of structural elements shall be included with the Operations and Maintenance manuals and provided to the Owner/Body Corporate and building managers.

Inspection/maintenance timeframe and item	
Half-yearly	Wash down all exposed steelwork that is not in a fully interior environment including: • Veranda steelwork • Steel Carpark structure (beams, columns, braces etc) • Deck and balcony steelwork • Exposed façade steelwork, both primary and secondary structure • Plantrooms and plenums with fresh-air intakes • External structural components such as Buckling Restrained Braces, Viscous Dampers, Eccentrically Braced Frames and the like • Sub-ground floor mild-steel structures such as beams, isolation bearings etc.
(b) 5 yearly	Inspect and repair sealant that encloses structural mild-steel components and/or timber with mild-steel fixings
(c) 10 yearly	Check exposed timber fixings for corrosion, repair as required.
	Inspect/replace sealant that encloses structural mild-steel components and/or timber with mild-steel fixings. This will typically include sealants around the perimeter of precast panels. Note that 10 years is the expected useful life for many sealants
	Check exposed structural steel within plantrooms and plenums for corrosion. Repair protective coatings as required.
	Check all exposed steelwork that is not in a fully interior environment for signs of corrosion. Repair protective coatings as required.
	Audit of damage to exposed intumescent coatings. Repair as required.
(d) 25 yearly	Inspect samples of structural steel that is hidden from view but not enclosed within a vapour barrier, and repair protective coatings as necessary. A typical example is a veranda with built-in steelwork. (Such steelwork should typically have duplex protective coatings). Inspection may typically require removal of claddings and/or the drilling of holes for borescope access. Repair as required.
	Inspect all exposed, external timber. Repair as required.
	Inspect all exposed, external reinforced concrete for signs of spalling or cracking. Repair as required.
	Audit of damage to enclosed intumescent coatings. Repair as required.
Following fit-out or alterations	Audit of damage to intumescent coatings. Repair as required.
Following seismic shaking > SLS1 event	Inspections and repair as per b), c) and d) above

Construction Monitoring Schedule

Schedule of inspections for:

Address: Fence Tanks Supports & Fixings, Anywhere In New Zealand

The inspections required are also dependant on the conditions of the building consent as per local building authority requirements. We would advise checking with council when in doubt.

We confirm that SENZ have been engaged to undertake construction monitoring of the specific engineering design items to an Engineering New Zealand/ACENZ CM1 level and propose to undertake at least the following site inspections:

Inspections to be completed by:

Geotechnical Inspections		Geotech as engaged by the developer/owner	By SENZ
Site scrape	Inspection to confirm topsoil removal and subgrade/strength and/or sub/base compaction as per the geotechnical report.	☐	☐
Engineered fill or Gravel raft	Site geotextile and/or geogrid as required by design drawings and certify compaction as per design and geotechnical report.	☐	☐
Bridging parameters (if applicable)	Site geotextile and/or geogrid as required by design drawings and certify compaction as per design and geotechnical report.	☐	☐

No.	Item of inspection	Timeframe
1	Augered concrete piles	Pre-pour but reinforcing to be put in place

Notes:

a) The above items of inspection are the minimum required to enable STRUCTURAL ENGINEERS NZ LTD to issue a PS4 - Producer Statement Construction Review for the specific engineering design items.

b) The above items of inspection do not cover work constructed in accordance with NZS 3604:2011, for which inspections are to be undertaken by the Building Consent Authority.

c) The Contractor/Builder is to provide STRUCTURAL ENGINEERS NZ LTD at least 24 hours' notice of the requirement for an inspection. The above timeframes are indicative, the Engineer and Contractor are to agree the timing of inspection prior to work commencing on site.

d) A copy of this inspection schedule is to be held on site during the works, and the Contractor/Builder is to provide reasonable and safe access to enable works to be inspected according to the schedule.

e) The above schedule does not necessarily represent the actual number of inspections to be undertaken. The number of inspections will depend on the construction method, sequence of the works and whether or not unforeseen conditions or difficulties are encountered on site.

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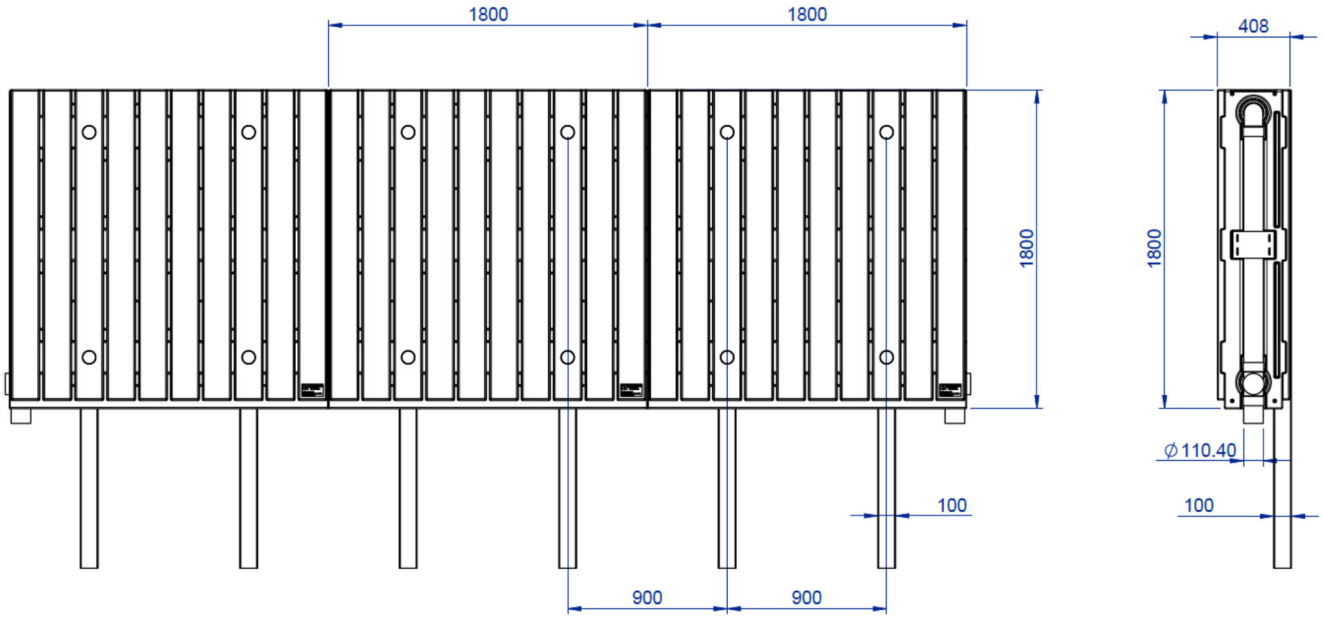
Structural Design Features Report for the Fixing Arrangements for the 1000 L Fence Tank

1 Introduction

These Structural Design Calculations are provided to our client Fence Tanks Ltd (FTL), for submission to City Councils and/or Territorial Authorities in New Zealand forming part of a Building Consent Application. They should be read in conjunction with:

- Any site-specific documentation (provided by others) showing the site location & the location of the tanks.
- The accompanying drawings numbered sheets 1 – 3, as provided by FTL.

These generic calculations demonstrate the adequacy of the support fixing arrangements for the tanks, when situated in New Zealand, within a "Very High" wind zone in accordance with NZS 3604 specifications (see below). If wind zones are higher than this, then FTL or Structural Engineers NZ Ltd should be contacted for advice. For site-specific seismic zoning, see below.



We understand that the tanks have been designed using Finite Element Analysis techniques, to demonstrate that they can safely withstand the hydrostatic pressures produced when they are filled with water. This Structural Design Features Report is only for the tank support posts and their fixings.

Each separate tank is essentially 1.8 m long × 1.8 m high × 0.4 m wide, and they can be connected together in multiple assemblies. The above sketch shows a 3-tank assembly.

These calculations are to demonstrate the adequacy of the support posts and the tanks' fixings to the posts. Any other fixing arrangement used than shown above, as designed below, is outside the scope of this PS1, and neither Structural Engineers NZ Ltd (SENZ) nor FTL can be held responsible if the below designs are not followed.

2 Design Philosophy

2.1 Introduction

The tanks are designed to be free-standing, fixed to timber posts acting as part of a boundary fence, which are embedded in concrete footings. See below for more information regarding this.

The basic design of the concrete footings assume that the ground conditions constitute “good ground” as defined by NZS 3604. There is a section contained within this report which deals with ground conditions other than “good ground”.

There are other possible fixing arrangements, and any alternative site-specific fixing arrangements must be confirmed by a qualified structural engineer. Such designs are outside the scope of this PS1 documentation.

2.2 Statement of Intent

This document provides structural engineering design calculations for the support of the tanks, and is to be submitted as part of a Building Consent Application.

It demonstrates the means of achieving Building Code Compliance via Specific Engineering Design as an Acceptable Solution.

Design is in accordance with the Building Act 2004 (reprinted 5 August 2013).
Design is in accordance with the Building Regulations 1992 (reprinted 10 April 2013).
Design is appertaining to Clause B1 – Structure, and follows the Acceptable Solutions and Verification Methods for B1.
Design is appertaining to Clause B2 – Durability, and follows the Acceptable Solutions and Verification Methods for B2.

Loadings are in accordance with:

AS/NZS 1170.0:2002	–	General principles
AS/NZS 1170.1:2002	–	Permanent, imposed and other actions.
AS/NZS 1170. 2021	–	Wind actions.
NZS 1170.5:2004	–	Earthquake actions – New Zealand

(Seismic factors are amended in accordance with the B1/VM1 Verification Method document sections 2.2.14 – 2.2.18).

Design is in accordance with the relevant AS/NZS material codes as appropriate, including but not limited to:

NZS 3101	–	Concrete
NZS 4230	–	Concrete Masonry
NZS 3404	–	Steel
NZS 3603	–	Timber
B1/VM4	–	Foundations
NZS 3604	–	Timber-Framed Buildings

The design will include accepted current practice and advice from IPENZ, SESOC, NZSEE and/or documents issued by the MBIE, as appropriate at the time of the preparation of the Structural Calculations.

2.3 General

For wind & seismic design, the tanks are classified as Importance Level 1 in accordance with AS/NZS 1170.0:2002, i.e. they are classified as “structures presenting a low degree of hazard to life and other property”.
The tanks have a designated design life of 25 years.

The tanks are all nominally 1.8 m long × 1.8 m high × 0.4 m wide, with a nominal capacity of 1000 L, and can be assembled singly, or in multiple units joined together. The tanks’ fixing restraints are designed for the following cases:

- When the tanks are empty and subject to ultimate limit state wind forces.
- When the tanks are full and subject to ultimate limit state seismic forces.
- When the tanks are full and subject to ultimate limit state wind forces.
- The tanks are also checked against sliding under the worst loading conditions.

It should be noted that the seismic zoning referred to above is an approximation of the Hazard Factor determination carried out in accordance with NZS 1170.5:2004. These calculations are for sites up to 0.4g Peak Ground Acceleration (PGA) areas e.g. Wellington. If there is any doubt regarding a particular site’s classification, the contractor must contact Structural Engineers NZ Ltd. The actual ground acceleration is also dependent upon other factors, mainly the site soils’ condition, and the worst case, class E, is taken.

Where ground conditions vary from “good ground” as defined by NZS 3604, consideration is given to the likely effects this would have upon the design of the tanks’ supporting arrangements. Refer to section 12 for further details.

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3 Loadings (all loads are for a single tank unless stated)

3.1 Dead Loads

Lightweight polyethylene tank = 75 kg = 0.75 kN
When filled with water = 1000 L = 1000 kg = 10.75 kN in total
Density of concrete base = 2400 kg/m^3

3.2 Wind Loading

3.2.1 General

From AS/NZS 1170.2:2021, a site-specific design wind speed is given by $V_{sit,\beta} = V_R M_c M_d (M_{z,cat} M_s M_t)$.
A basic wind speed of 50 m/s is in accordance with NZS 3604:2011 Table 5.4 as wind zone designation "Very High".
From AS/NZS 1170.0:2002, clause 3.4.1, Table 3.3, the annual probability of exceedance for an Importance Level 2 structure with a 50 year design working life, for both wind & seismic forces, is taken as 1/500. For an Importance Level 1 structure with a 25 year design working life, this is taken as 1/50 for both wind & seismic forces.
So $V_{sit,\beta}$ = 50 m/s but that would be for an Importance Level 2 structure with a 50 year design working life.
To equate this to an Importance Level 1 structure with a 25 year design working life, we can multiply by the ratio of the regional wind speeds as per AS/NZS 1170.2:2021, clause 3.2, Table 3.1(B), i.e. V_{50} / V_{500} = 46 / 50 = 0.92 (highest ratio for region NZ4).
Hence 50 m/s can be reduced to V_R = 50 × 0.92 = 46 m/s for an importance level 1 structure with a 25 year design working life.
For the purposes of equating wind speeds in accordance with NZS 3604, and the more specific design code AS/NZS 1170.2:2021, the wind direction multiplier (M_d), the terrain/height multiplier ($M_{z,cat}$), the shielding multiplier (M_s), the topographic multiplier (M_t), should all be set to 1.0, which means:
M_d = 1.0, $M_{z,cat}$ = 1.0, M_s = 1.0, M_t = 1.0
$V_{sit,\beta}$ = 46 × 1.0 x 1.0 = 46 m/s (for an importance level 1 structure with a 25 year design working life)
$V_{des\theta} = V_{sit,\beta}$
$p = 0.5\rho_{air} (V_{des\theta})^2 C_{shp} C_{dyn}$ Section 2.4.1

3.2.2 Wind Pressure on Tank

C_{dyn} = 1.0 (Reference clause 2.4.1)
The aerodynamic shape factor for normal net pressure on freestanding rectangular wall as specified in Section 5 is:
$C_{shp} = C_{pn} K_p$ where:
C_{pn} = net pressure coefficient acting normal to the surface, given by:
b/c = 1.0 & c/h = 1.0 then $C_{pn} = 1.3 + 0.5 (0.3 + \log_{10} (b/c)) \times (0.8 - c/h) = 1.27$
K_p = net porosity factor = 1.0
$p = 0.5 \times 1.2 \times 46^2 \times 1.27 \times 1.0 \times 1.0 / 1000$ = **1.61 kPa**

3.3 Seismic Loading Analysis

From AS/NZS 1170 part 5 :-
Elastic Site Hazard Spectrum C(T)
NF for structure = (say) 35.0 Hz
T_1 = 1 / 35 = 0.03 secs
C(T) = Ch(T) x Z x R x N(T,D)
Site soil subclass = D or E (Deep or soft soil)
Ch(T) = Spectral Shape Factor = 3.0 (table 3.1)
Z = Hazard Factor = varies for different areas, e.g. 0.4 (Wellington), 0.3 (Christchurch), 0.13 (Auckland), take Z = 0.4 maximum
R = Return Period = 0.35 (Once in 50 years for importance level 1)
N(T,D) = near-fault factor = 1.0
$C(T_1) = 3.0 \times 0.4 \times 0.35 \times 1.0 = 0.42$ (e.g. Wellington)
Horizontal Design Action Coefficient $C_d(T_1)$
$C_d(T_1) = C(T_1) \times S_p / k\mu$
μ = structural ductility factor = 3.0 max. (classification per NZS 1170:5 limited ductility)
Since T = 0.03 secs then $k\mu = ((\mu - 1) \times 0.03 / 0.7) + 1 = 1.09$
Sp = Structural Performance factor = 1.0 (for the entire structure against sliding or toppling)
$C_d(T_1)$ = Horizontal Design Action Coefficient = 0.42 x 1.0 / 1.09 = 0.39 (for the combined structure in Wellington, worst case)

4 Limit States

4.1 Ultimate Limit States for Strength Design

Sect. 4.2.2 :-

a) $E_d = 1.35G$
b) $E_d = 1.2G + 1.5Q$
d) $E_d = 1.2G + W_u + \psi_c Q$ (ψ_c = 0.4 for floors and 0 for roofs)
e) $E_d = 0.9G + W_u$
f) $E_d = G + E_u + \psi_c Q$ (ψ_c = 0.4 for floors and 0 for roofs)

4.2 Serviceability Limit States for Deflection Design

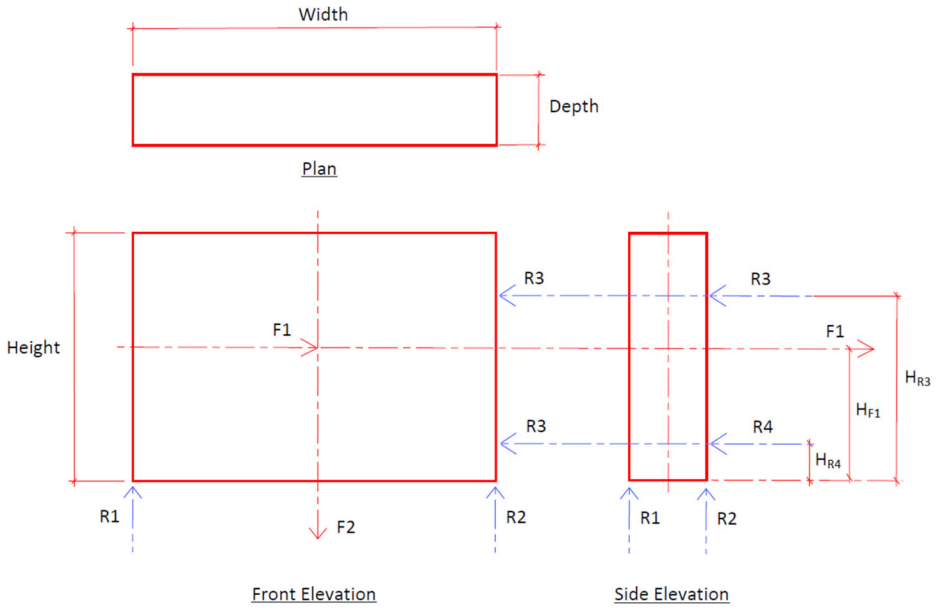
Sect. 4.3 any combination of :-

a) G
b) $\psi_s Q$ (ψ_s = 0.7)
c) $\psi_l Q$ (ψ_l = 0.4)
d) W_s
e) E_s

5 Stability of the Tanks

5.1 Loadings

The tanks are 1.8 m long × 0.4 m wide × 1.8 m high
Lightweight polyethylene tank = 75 kg = 0.75 kN
When filled with water = 1000 L = 1000 kg = 10 kN
Total mass = 10.75 kN
Consider face-on stability (worst case) and check for side-on



5.1.1 Wind Loading On Empty Tank

Area = 1.8 × 1.8 = 3.24 m^2 (face-on) or 0.41 × 1.8 = 0.74 m^2 (side-on)
$W_{U_Face} = F_{1face}$ = 3.24 × 1.61 = 5.2 kN applied at mid-height i.e. the Centre of Pressure
$W_{U_End} = F_{1side}$ = 0.74 × 1.61 = 1.2 kN applied at mid-height i.e. the Centre of Pressure
Overturning moment = 5.2 × 0.9 = 4.7 kNm (face-on) or 1.2 × 0.9 = 1.1 kNm (side-on)
Uplift/downthrust forces at edge of front/back faces for face-on wind = 4.7 / 0.4 = +/- 11.8 kN
Uplift/downthrust forces at either end for side-on wind = 1.1 / 1.8 = +/- 0.6 kN
Mass of empty tank = F_2 = 0.75 kN i.e. = 0.38 kN at either end or front & back faces resisting forces
Consider overturning about the base, for face-on wind
OTM = F_1 × 0.9 = 5.2 × 0.9 = 4.7 kNm
There are 2 × fixing bolts per post, spaced at H_{R3} = 1540 mm & H_{R4} = 280 mm and forces are per bolt
Resisting Moment = F_T × 2 × Σx^2 / x_1 = F_T x 2 × (0.28^2 + 1.54^2) / 1.54 = 2 × F_T x 2.45 = M* = 4.6 kNm
MOR of bolt group = 2 × R_3 × ΣH^2 / H_3 = 4.7 kNm
ΣH^2 / H_3 = (1.54^2 + 0.28^2) / 1.54 = 1.59
R_3 = 1.59 × 5.2 / (2 × 2.45) = 1.7 kN per bolt
R_4 = 0.28 × 5.2 / (2 × 2.45) = 0.3 kN per bolt

5.1.2 Seismic Loading On Full Tank

E_u = 10.75 × 0.39 = F_1 = 4.2 kN applied at mid-height
This is less than face-on wind, therefore wind loading governs

5.1.3 Combined Wind & Seismic

Refer to section 4.2 above, combined wind & seismic would be classified as serviceability loads, and can therefore be ignored, since this is not a design requirement for importance level 1 structures. Refer AS/NZS 1170.0:2002 Table 3.3.

5.1.4 Design Loadings Summary

When empty:
The tanks need to be restrained against sliding & overturning due to maximum ULS wind forces, in both directions.
Maximum total horizontal force (face-on) = F_1 = 5.2 kN applied at mid-height which results in an overturning moment of 4.7 kNm (face-on) or 1.1 kNm (side-on).

When full:
The tanks need to be restrained against sliding & overturning due to maximum ULS seismic forces, in both directions.
Maximum total horizontal force (either direction) = F_1 = 4.2 kN applied at mid-height which results in an overturning moment of 3.8 kNm in either direction.

Design fixing restraints & posts for face-on wind on an empty tank which is the design criterion. By inspection, side-on wind can be ignored.

6 Design of Posts

From above, the maximum ULS forces on a single post are as follows:

M* = 2.35 kNm
V* = 2.6 kN

Design for 125 deep × 100 wide timber fence posts minimum grade SG6 or No. 1 framing (appropriately treated).

DESIGN OF TIMBER MEMBER SUBJECT TO BENDING

;	Beam Span (including 1/2 bearing lengths);	S_p	= **1.540** m;
;	Beam Depth;	d	= **125** mm;
;	Beam Width;	b	= **100** mm;
	Z = b×d×d/6		= **260416.667** mm^3
	I = b×d×d×d/12		= **16276041.667** mm^4
;	k1 factor (duration of load);	k_1	= **1.000** ;
;	k4 Factor (No. Parallel Elements);	k_4	= **1.140** ;
;	k5 Factor (Normally 1.0);	k_5	= **1.000** ;
;	Effective Length Lay;	L_{ay}	= **1.540** m;
	L_{ay}/b		= **15.400**
;	k8 Factor (from graph 3.1);	k_8	= **1.000** ;
;	Strength Reduction Factor;	ϕ	= **0.800** ;
;	Characteristic Bending Stress;	f_b	= **10.000** N/mm^2;
	$\phi M_n = \phi \times k_1 \times k_4 \times k_5 \times k_8 \times f_b \times Z$		= **2.375** kNm
;	ULS Design Bending Moment;	M*	= **2.350** kNm;

Since ϕM_n > M* then post acceptable for Bending

DESIGN OF TIMBER MEMBER SUBJECT TO SHEAR

;	Beam Depth;	d	= **125** mm;
;	Beam Width;	b	= **100** mm;
	A = d×b		= **12500.000** mm^2
	A_s = 2/3×A		= **8333.333** mm^2
;	k1 factor (duration of load);	k_1	= **1.000** ;
;	k4 Factor (No. Parallel Elements);	k_4	= **1.140** ;
;	k5 Factor (Normally 1.0);	k_5	= **1.000** ;
;	Strength Reduction Factor;	ϕ	= **0.800** ;
;	Characteristic Shear Stress;	f_s	= **3.000** N/mm^2;
	$\phi V_n = \phi \times k_1 \times k_4 \times k_5 \times f_s \times A_s$		= **22.800** kN
;	ULS Design Shear Force;	V*	= **2.600** kN;

Since V*<= ϕV_n then post acceptable for Shear

Alternative design for 100 × 100 square timber fence posts minimum grade SG8 (appropriately treated).

DESIGN OF TIMBER MEMBER SUBJECT TO BENDING

;	Beam Span (including 1/2 bearing lengths);	S_p	= **1.540** m;
;	Beam Depth;	d	= **100** mm;
;	Beam Width;	b	= **100** mm;
	$Z = b \times d \times d/6$		= **166666.667** mm^3
	$I = b \times d \times d \times d/12$		= **8333333.333** mm^4
;	k1 factor (duration of load);	k_1	= **1.000** ;
;	k4 Factor (No. Parallel Elements);	k_4	= **1.140** ;
;	k5 Factor (Normally 1.0);	k_5	= **1.000** ;
;	Effective Length Lay;	L_{ay}	= **1.540** m;
	L_{ay}/b		= **15.400**
;	k8 Factor (from graph 3.1);	k_8	= **1.000** ;
;	Strength Reduction Factor;	ϕ	= **0.800** ;
;	Characteristic Bending Stress;	f_b	= **14.000** N/mm^2;
	$\phi M_n = \phi \times k_1 \times k_4 \times k_5 \times k_8 \times f_b \times Z$		= **2.128** kNm
;	ULS Design Bending Moment;	M*	= **2.350** kNm; (10% overstress – accept)

Since ϕM_n ~ M* then post acceptable for Bending

DESIGN OF TIMBER MEMBER SUBJECT TO SHEAR

;	Beam Depth;	d	= **100** mm;
;	Beam Width;	b	= **100** mm;
	$A = d \times b$		= **10000.000** mm^2
	$A_s = 2/3 \times A$		= **6666.667** mm^2
;	k1 factor (duration of load);	k_1	= **1.000** ;
;	k4 Factor (No. Parallel Elements);	k_4	= **1.140** ;
;	k5 Factor (Normally 1.0);	k_5	= **1.000** ;
;	Strength Reduction Factor;	ϕ	= **0.800** ;
;	Characteristic Shear Stress;	f_s	= **3.000** N/mm^2;
	$\phi V_n = \phi \times k_1 \times k_4 \times k_5 \times f_s \times A_s$		= **18.240** kN
;	ULS Design Shear Force;	V*	= **2.100** kN;

Since V*<= ϕV_n then post acceptable for Shear

6.1 Summary

Fence posts can either be 125 mm deep × 100 mm wide grade SG6 (No. 1 Framing) or 100 mm deep × 100 mm wide grade SG8 suitably treated timbers spaced at 900 mm centres where the tanks are to be positioned. Refer to the drawings for full details.

Refer to the design below for the depth of embedment of the posts under various soil conditions.

7 Design of Restraint Screws

Refer to the calculations above for the design of the posts. Refer also to the attached drawings. Forces are as follows:

Maximum tension in any fixing screw = 1.7 kN
Maximum shear in any fixing screw = 0.3 kN

7.1 M12 Coach Screws

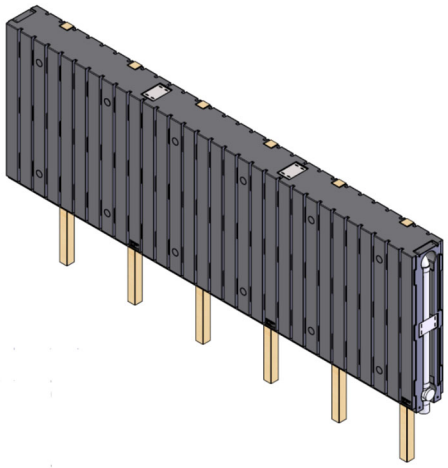
N* = 1.08 kN
N* <= ϕQ_n where:
ϕ = 0.7
$Q_n = nkpQ_k$ where:
n = 1
k = reduction factor = 0.85 (timber group J4)
p = length of penetration = 117.5 mm
Q_k = characteristic withdrawal strength = 0.147 kN/mm
$\phi Q_n = 0.7 \times 0.85 \times 117.5 \times 0.147 =$ **10.3 kN > 1.7 kN**

V* = 0.7 kN = N*
N* <= ϕQ_n where:
ϕ = 0.7
$Q_n = nk_1k_{12}k_{13}kQ_k$ where:
n = 1
k_1 = 1.0
k_{12} = 0.75 (timber group J4)
k_{13} = 1.0
k = modification factor = 1.0
Q_k = system characteristic strength = 8.0 kN
$\phi Q_n = 0.7 \times 0.75 \times 8.0 =$ **4.2 kN > 0.3 kN**

M12 galvanised mild steel or stainless steel grade 304L coach screws adequate in all locations

8 Multiple Tank Restraints

Refer to the attached drawings. When multiple tank assemblies are to be installed, the tanks are joined together with top fixing plates, as indicated below:



The joining plates are 150 mm wide × 265 mm long, made from 3 mm thick steel grade 300. They are secured with 4 × M6 stainless steel screws. Since each tank has 2 × posts, the joining plates need not be structurally designed for the purposes of the stability of the tanks – they are required only to ensure the security of internal plumbing attachments. However both SENZ and FTL Ltd strongly recommend that they are secured in accordance with the attached drawings to ensure adequate load-sharing between the supporting posts.

9 Foundation Base (Optional – See Below)

Base width for all tanks = 400 mm
Base length for a single tank = 1800 mm
Foundation base area = 0.72 m^2 per tank
Consider tank restrained, hydrostatic case
Mass of full tank = 10.75 kN
*Concrete thickness = 100 mm
Mass of concrete = 0.1 × 0.72 × 24 = 1.7 kN
Total mass bearing on soil = 12.45 kN
Ground bearing pressure = 17.3 kPa (negligible)

***A foundation base under a single tank or multiple tanks *is not required for ground-bearing*, assuming "good ground" as defined by NZS 3604, i.e. ground with a safe structural bearing capacity of 150 kPa. The contractor is however advised to supply a concrete base min 100 mm thick × the base area of the tank +100 mm, with nominal ductile mesh reinforcement. This would only be required to maintain the integrity of the tanks' internal & external plumbing fittings.**

Alternative options such as paving slabs laid on a firm compacted sand & gravel base are perfectly acceptable. Consideration should also be given to the possibility of movement/settlement of the tank under high winds or seismic loadings, causing breakage of any of the tank's fittings.

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10 Post Footings

Assume that the site subsoils are in accordance with NZS 3604 classification for "good ground".
Horizontal load applied to a single post at 0.9 m = 2.55 kN for a single tank.
Assume the restraint posts are set in a 400 mm diameter hole, with mass concrete fill.
Assume no restraint from a foundation slab, refer to the Excel calculations below:

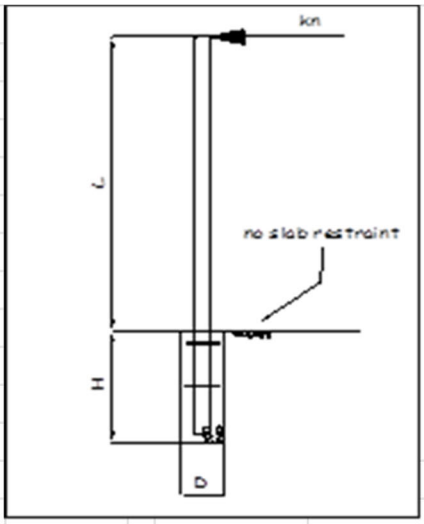
Cantilever Post Foundation Design

$H_{min} = A(1 + \sqrt{(1 + 2.18\ L/A)})$

$A = 1.17(P/SB)$

P	=	2.60	kN	(Ws = 0.65Wu)
L	=	0.90	m	
D	=	0.35	m	
Try H	=	0.6	m	

Therefore H/3 = 0.20 and from site data S = 100



$A = 1.17(P/SB)$
$= 1.17 \times (2.6\ kN / 100 \times 0.35)$
$= 0.09$

$H_{min} = A(1 + \sqrt{(1 + 2.18\ L/A)})$
$= 0.09\ (1 + sqrt(1 + 2.18\ (0.9\ m/\ 0.09))$
$= 0.52$

0.52 < 0.60 O.K

	Weight kN/m³	Cohesion C kPa	Values of S at Various depths (m)				
			0.5	1.0	1.5	2.0	2.5
Stiff clay	19.2	96	141	149	156	164	171
Firm clay	17.6	48	89	95	103	109	116
Soft clay and topsoil	16.0	24	46	52	57	62	67

	Weight kN/m³	Values of S at Various Depths (m)				
		0.5	1.0	1.5	2.0	2.5
Sandy gravel	19.2	61	123	184	246	307
Compact sand	19.2	45	90	135	181	226
Loose sand or gravel	19.2	37	75	112	150	187

The timber fence posts should be set into minimum grade 20 MPa mass concrete in 350 mm diameter holes a minimum 600 mm deep into "good ground" as defined by NZS 3604:2011.

11 Fixing the Tanks to a Wall

The tanks are specifically designed with inserts (i.e. cut-outs) in the rear face of the tank for the timber posts to be fitted, however the tanks can be fixed to ***a suitable wall**. They have manufactured slots in both ends of each individual tank, into which supplied "Z" brackets can be inserted, and screwed or bolted back to a wall. The slots are tapered, approximately 31 mm deep × 9 mm wide (at the narrowest) × 650 mm long, and the supplied Z brackets will fit snugly into these recesses. They can be slid up or down to ensure that the fixing screws or bolts are fitted into a suitable area of the wall behind.

The tanks are required to be fitted snug to the supporting wall, and the brackets are designed to pull the tanks tight to the wall, so that they are securely restrained. There can not be any gaps between the tank and the wall.

11.1 Design of Brackets

Refer to the calculations above.
Restraints are to be supplied at the top & bottom of the tank, and the fixings will be approximately at the same height as per the standard fixing details, shown in Section 7. The forces will be the same i.e. each bracket's fixings should be designed for a tensile force of 1.7 kN (from worst case wind forces). In addition to this, the bracket's fixings should be capable of withstanding 1.20 kN from seismic forces acting at 90° i.e. they will be in shear. Hence:

Fixings should be designed for V* = 1.20 kN & N_t* = 1.7 kN (these forces are not coincident)

Existing “Z” brackets are 5.0 mm thick, grade 250 galvanised steel. 4.0 mm is used and the following calculations. This
They are essentially angles, 65 mm × 60 mm, with an additional 20 mm leg which slots into the ends of the tank.
They have 4 × 6.0 mm diameter × 50 mm long slotted holes, and it is envisaged that at least 2 of these fixing locations will be utilised, although all 4 would be a more secure fixing. But the design assumes 2 × fixing screws.

Consider the 20 mm flange with screws or bolts drilled at 35 mm backmark
For a single screw, distance to stiff bearing line = 30 mm
Length of plate resisting bending = 2 × 30 / tan 30° = 104 mm
M* = 1.7 / 2 × 0.03 = 0.026 kNm
Z_{XX} = 104 × 4^2 / 6 = 277 mm^3
ϕM_n = 0.8 × 250 × 277 / 1000000 = 0.055 kNm > 0.026 kNm **adequate**

11.2 Design of Screws

Assume 4.88 mm diameter screws (10 gauge) with a pointside penetration into timber class J4 (equivalent) of 35 mm minimum
S* = 1.7 / 2 = 0.85 kN and has to be =< ϕQ_n and Q_n = nkQ_k for directly loaded joints
ϕQ_n = 0.7 × 2118 / 1000 = 1.48 kN > 0.85 kN **adequate**
N* = 1.20 / 2 = 0.60 kN and has to be =<ϕQ_n and Q_n = nkQ_k for directly loaded joints
ϕQ_n = 0.7 × 35 × 61.7 / 1000 = 1.51 kN > 0.60 kN **adequate**

“Z” brackets as supplied fitted with a minimum of 2 × 10 gauge (4.8 mm dia) stainless steel screws satisfactory

11.3 Summary

The standard Z brackets as supplied can be fixed back to a *suitable wall with a minimum of 2 × 10 gauge stainless steel screws with a minimum penetration into a suitable substrate of 35 mm. Two brackets should be fitted at either end of the tank, fixed tightly into the slots in the ends of the tank.

It should be noted that these are minimum requirements. There are 4 × holes in each bracket, and fitting these brackets with 4 × screws would provide a more secure fixing. But 2 × screws as a minimum, would be adequate.

When a multi-tank assembly is envisaged, each tank should be securely fitted with the above brackets, one-at-a-time, to ensure adequate strength is provided for multiple tanks.

The standard fixing detail (refer to section 8 above) utilises M12 coach screws into the inset timber posts. An alternative arrangement for a multi-tank assembly would be to fix through the manufactured holes in the tank at the precise locations into the wall, using timber packers as "spacers" to ensure that the tank moulding is not bent. Such an arrangement requires precise setting-out of the fixing locations into any particular wall, and is not recommended but can be considered by the client.

Refer above,***a suitable wall** is beyond the scope of this Design Report. It is the client's responsibility to determine the adequacy of any particular wall to be able to withstand the design loadings. Generally speaking, a reinforced concrete wall or a reinforced concrete blockwork wall will be adequate to support the tanks, both wind & seismic loadings for the design of the wall are likely to be the same, or higher, than those for the design of the tanks. This is because the tanks are classified as Importance Level 1 in accordance with AS/NZS 1170.0:2002, i.e. they are classified as “structures presenting a low degree of hazard to life and other property”. Reinforced concrete or reinforced concrete blockwork walls are likely to be part of structures, and therefore would usually be classified as Importance Level 2 structures, and designed to higher loadings. Standard timber-framed walls, such as those forming part of a structure, would generally be designed to resist similar wind forces as the tanks support posts, but would not necessarily be designed for similar seismic forces.

Hence it is the client's responsibility to determine the adequacy of any particular wall to withstand the design loadings. SENZ would strongly advise that the client has an independent Structural Engineer check that this is the case, prior to installing the tank or tanks. Both SENZ & Fence Tanks Ltd (FTL) cannot take any responsibility if this advice is not followed.

12 Ground Conditions Outside The Scope Of NZS 3604

12.1 Good Ground

NZS 3604:2011 – Timber-Framed Buildings is a widely-used New Zealand Standard for the design of timber-framed buildings. It provides a reference for “good ground” which is commonly used within New Zealand as a “baseline” for structural foundation designs. Currently, it does not deal with ground likely to be subject to liquefaction under seismic conditions, or expansive clay soils, and hence the definition of “good ground” remains as:

Any soil or rock capable of permanently withstanding an ultimate bearing capacity of 300 kPa (i.e. an allowable bearing pressure of 100 kPa using a factor of safety of 3.0), but excludes:

(a) Potentially compressible ground such as topsoil, soft soils such as clay which can be moulded easily in the fingers, and uncompacted loose gravel which contains obvious voids;

(b) Expansive soils being those that have a liquid limit of more than 50% when tested in accordance with NZS 4402 Test 2.2, and a linear shrinkage of more than 15% when tested from the liquid limit in accordance with NZS 4402 Test 2.6; and

(c) Any ground which could foreseeably experience movement of 25 mm greater for any reason including one or a combination of land instability, ground creep, subsidence, seasonal swelling and shrinking, frost heave, changing groundwater level, erosion, dissolution of soil in water, and effects of tree roots.

For site-specific designs where the site subsoils do not constitute “good ground”, the Contractor must investigate the site sub-soils classification, preferably taking advice from a geotechnical report produced by a qualified geotechnical engineer.

Currently within New Zealand reference is generally made to the Australian Standard AS 2870:2011 – Residential slabs and footings. The standard has 6 basic classifications for site classifications, as follows:

Class A – Most sand and rock sites with little or no ground movement from moisture changes.
Class S – Slightly reactive (expansive) clay sites which may experience only slight ground movement from moisture changes.
Class M – Moderately reactive clay sites which may experience moderate ground movement from moisture changes.
Class H1 – Highly reactive clay sites which may experience high ground movement from moisture changes.
Class H2 – Highly reactive clay sites which may experience very high ground movement from moisture changes.
Class E – Extremely reactive sites which may experience extreme ground movement from moisture changes.

Whilst there is a wide variation of subsoil types throughout New Zealand, the majority of soils within the Auckland region are likely to be clay of some type e.g. Puhoi Clay Loam, Waikare Clay, Whangaripo Clay are commonly found. Reference is made to the BRANZ Study Report number 120, published in 2003, where more information can be found regarding this.

If tanks are to be located on clay soils, the contractor should follow the following:

12.2 Expansive Clays – Class S

The Post Footing Design as above (reference section 11) should be followed, and a ground-bearing slab (reference section 10) cast integral with the footings is **strongly** recommended for these types of sites.

12.3 Expansive Clays – Class M

The Post Footing Design as above (reference section 11) should be followed, although the depth of the posts' embedment into the ground should be **increased to 700 mm**, and a ground-bearing slab (reference section 10) **must** be cast integral with the footings.

12.4 Expansive Clays – Class H1 & H2

The Post Footing Design as above (reference section 11) should be followed, although the depth of the posts' embedment into the ground should be **increased to 900 mm**, and a ground-bearing slab (reference section 10) **must** be cast integral with the footings.

For site subsoils which are not reactive i.e. "good ground" a base slab cast integral with the post footings is recommended (refer section 10).

For Clay subsoils, the contractor should follow the above. A base slab will provide additional stability against overturning under design-level wind events, or earthquakes. A slab will also help to prevent differential settlement due to seasonal moisture changes occurring in the subsoils.

Increased post footing depths will provide additional stability for sites which are more reactive (expansive).

13 Conclusions

The above designs accommodate the Fence Tanks in single or multiple combinations, in ‘‘Very High’’ wind zones, virtually anywhere in New Zealand (i.e. where the seismic base reference peak ground accelerations do not exceed 0.4g).

They assume ‘‘good ground’’ as defined by NZS 3604:2011.

If the contractor is unsure as to the wind or seismic zoning, or the site sub-soil conditions, he/she should contact Structural Engineers NZ Ltd for further advice. SENZ or FTL cannot take responsibility if this is not done.

Similarly, if the contractor proposes alternative fixing arrangements for the tanks, both SENZ and FTL should be notified and such designs agreed upon.

It should be noted that after a ULS seismic event, if ground settlement and/or liquefaction were to occur, it is likely that the tanks would require re-levelling, and this procedure should be undertaken with the tanks empty.

Finally, it should be noted that these tanks have been classified as Importance Level 1 structures in accordance with AS/NZS 1170.0:2002, i.e. they classified as *“structures presenting a low degree of hazard to life and other property”*. Should they be positioned close to habitable dwellings, or in any other way likely to affect this definition, then again both SENZ and FTL should be notified, and the tanks’ fixing designs as above may need to be verified or possibly supplemented.

14 Structural Integrity & Durability

The above calculations indicate section sizes & material grades and finishes that meet the requirements of the Acceptable Solutions and Verification Methods Document B1 Structure & B2 Durability.

Should the contractor propose to use alternative installation methods, he/she shall ensure that the structural integrity & durability implied by the above calculations, are maintained to the satisfaction of the local Territorial Authority.

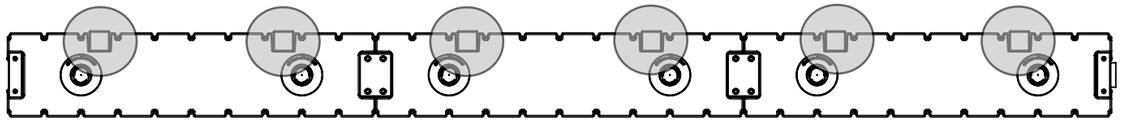
ISSUE	REVISION	BY	DATE
K	TANK GEOMETRY CHANGED TO UPDATE TOP HOLE MARKINGS	MB	10-OCT-2020
L	UPDATED TO LATEST TANK GEOMETRY	GL	15/12/2020

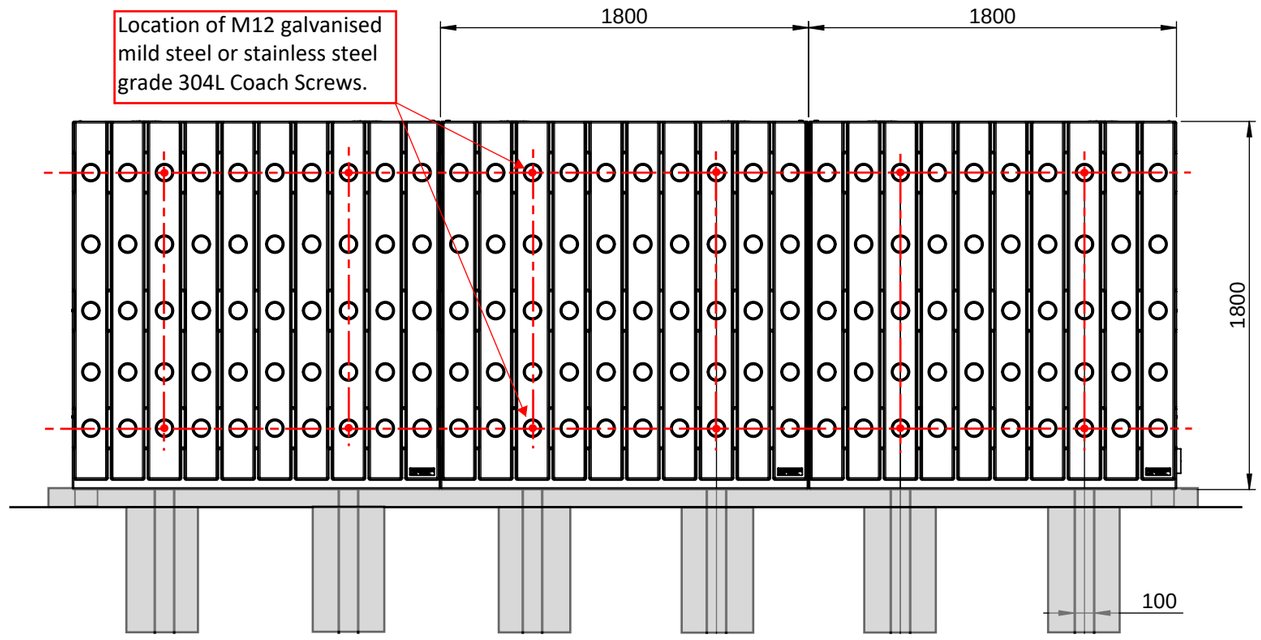
This drawing must be read in conjunction with SENZ Structural Design Features Report numbered 047-001-01 and all recommendations contained therein must be followed. Other sections include:

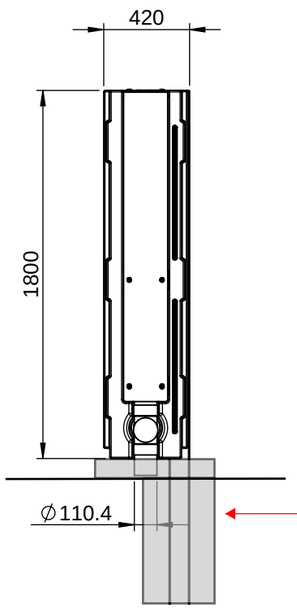
Wind & Earthquake zones and loadings.

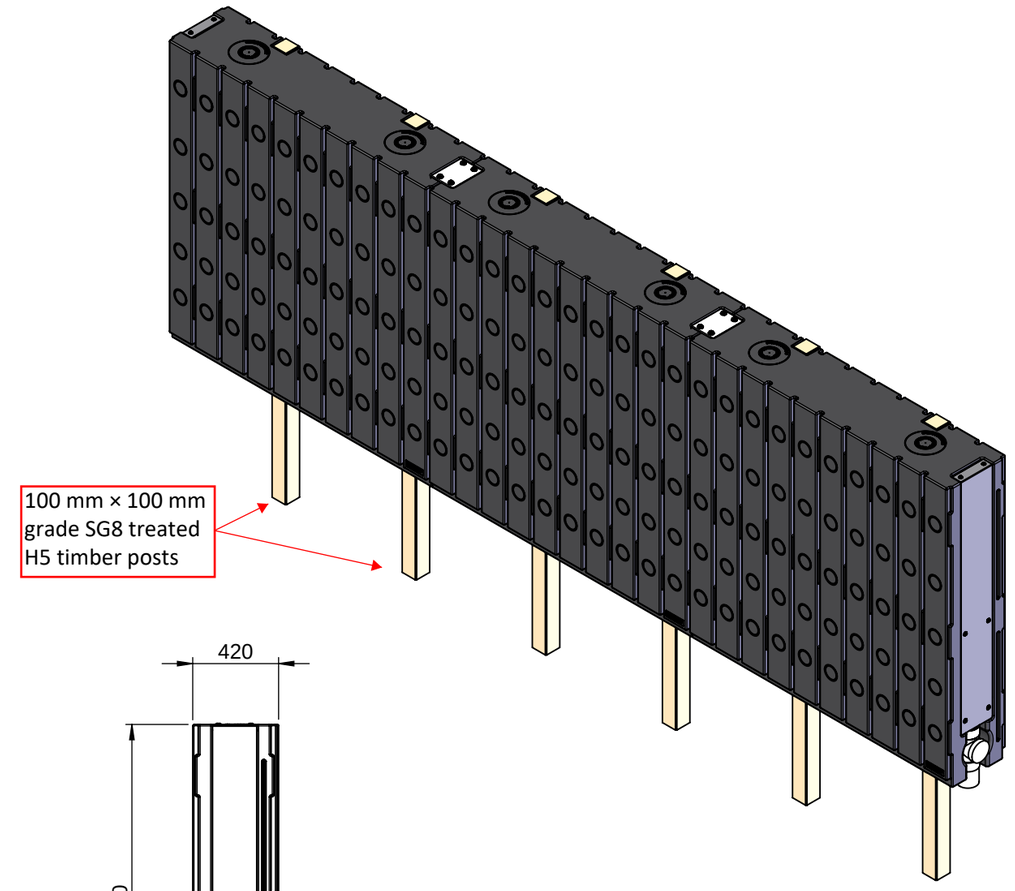
Depth of concrete footings in various ground types.

Fixing the Tanks to a Suitable Wall.









100 mm × 100 mm grade SG8 treated H5 timber posts @ 900 mm crs. set 600 mm min. into 350 mm dia. 20 MPa concrete into "good ground". A 100 mm thick concrete slab with SE62 mesh is recommended.

For clay sites, follow this advice. Set the concrete deeper, and/or install a concrete slab, as follows:

Class S - as above, but a concrete slab is strongly recommended.

Class M - increase the depth of concrete to 700 mm, a concrete slab must be installed.

Class H1 & H2 - increase the depth of the concrete to 900 mm, a concrete slab must be installed.

2D CAD FILE **FTL-114-A002 FenceTank, Multi-Assembly - L**

3D CAD FILE **FTL-114-A002 FenceTank, Multi-Assembly - L**

CHECK ISSUE & REVISION BEFORE COMMENCEMENT. DO NOT SCALE FROM DRAWING. ALL DIMENSIONS IN MILLIMETRES. PART PRODUCTION FROM 3D CAD MODEL.

FORM WORKS
www.formworksdesign.com

CLIENT **FenceTank Ltd.**
PROJECT **FenceTank**
PROJECT No. **114**
TITLE **FenceTank, 3 Units 3,000L Capacity**

PART No. **A002**
CLIENT CODE **FTL**
DRAWING No. **003**
ISSUE **L**
DATE **10/11/2022**
DRAWN **M. BETTERIDGE**

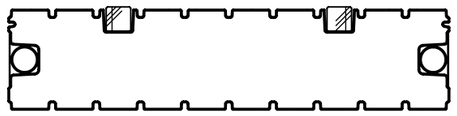
MATERIAL
FINISH
COLOUR

VOLUME
DENSITY
MASS **2270479.47 grams**

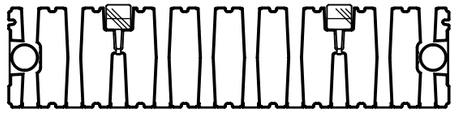
TOLERANCES UNLESS SPECIFIED
0 DECIMAL PLACE (0) ± 0.2mm
1 DECIMAL PLACE (0.X) ± 0.1mm
2 DECIMAL PLACE (0.0X) ± 0.01mm
ANGULAR ± 0.25°

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CREATED IN SOLIDWORKS
3RD ANGLE PROJECTION
SCALE **1:30**
SHEET SIZE **A3**
SHEET **1** OF **3**

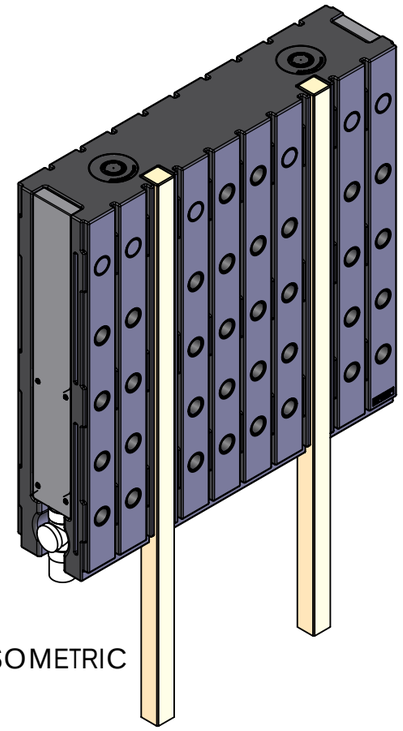


SECTION C-C

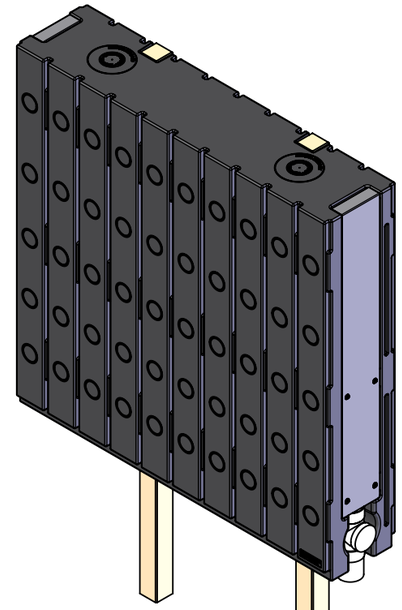


SECTION B-B

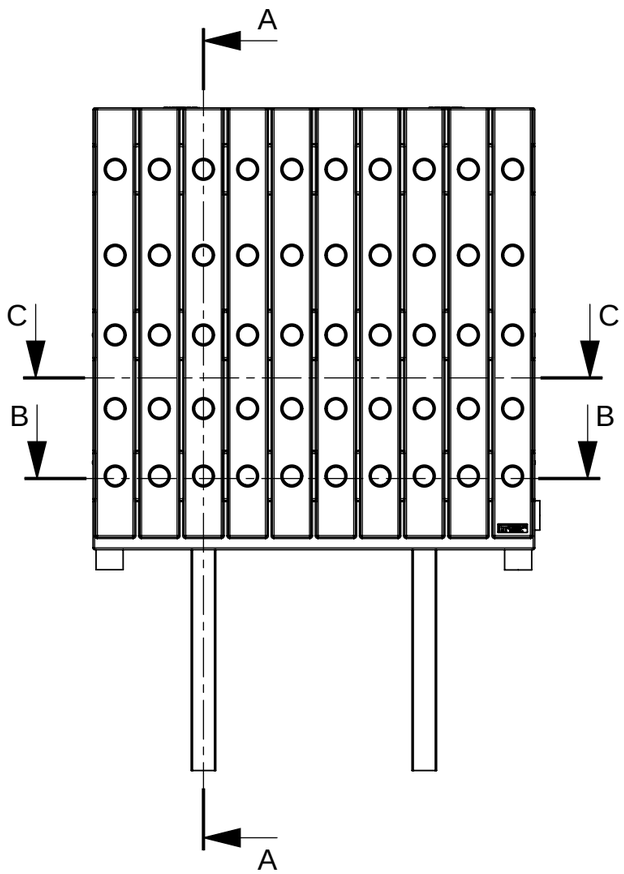
NOTE: THE TANKS MAXIMUM CAPACITY IS APPROXIMATELY 1,070L



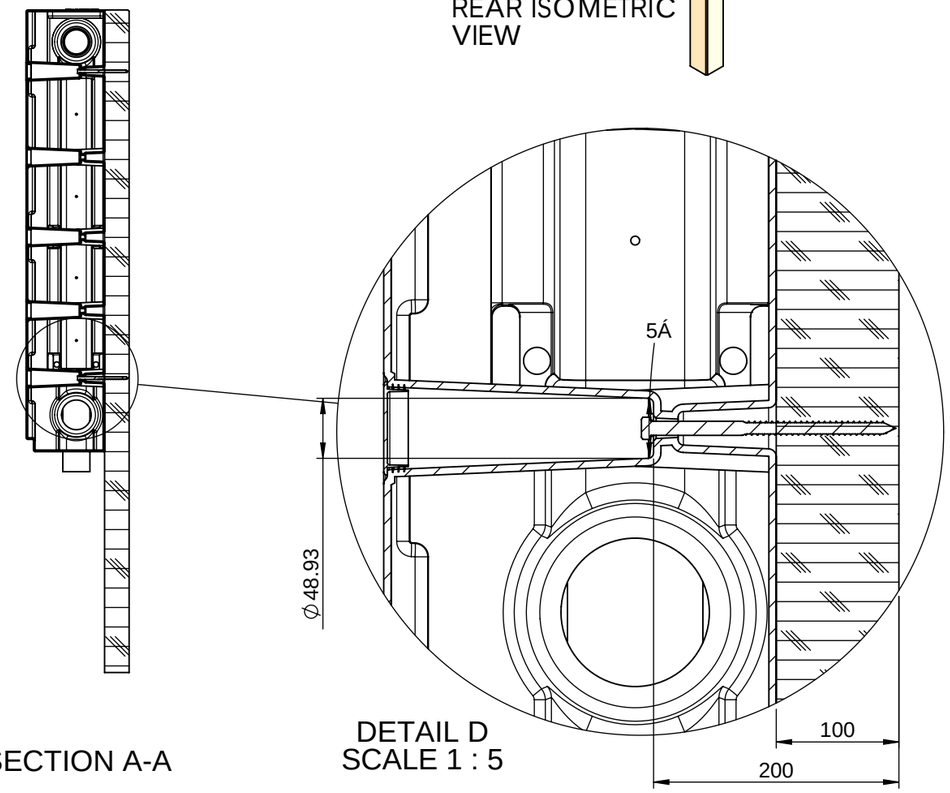
REAR ISOMETRIC VIEW



FRONT ISOMETRIC VIEW



SECTION A-A



DETAIL D
SCALE 1 : 5

2D CAD FILE **FTL-114-A002 FenceTank, Multi-Assembly - L**

3D CAD FILE **FTL-114-A002 FenceTank, Multi-Assembly - L**

CHECK ISSUE & REVISION BEFORE COMMENCEMENT. DO NOT SCALE FROM DRAWING. ALL DIMENSIONS IN MILLIMETRES. PART PRODUCTION FROM 3D CAD MODEL.

FORM WORKS
www.formworksdesign.com

CLIENT **FenceTank Ltd.**
PROJECT **FenceTank**
PROJECT No. **114**
TITLE **FenceTank, 1 Unit 1,000L Capacity**

PART No. **A001**
CLIENT CODE **FTL**
DRAWING No. **001**
ISSUE **L**
DATE **10/11/2022**
DRAWN **M. BETTERIDGE**

MATERIAL
FINISH
COLOUR

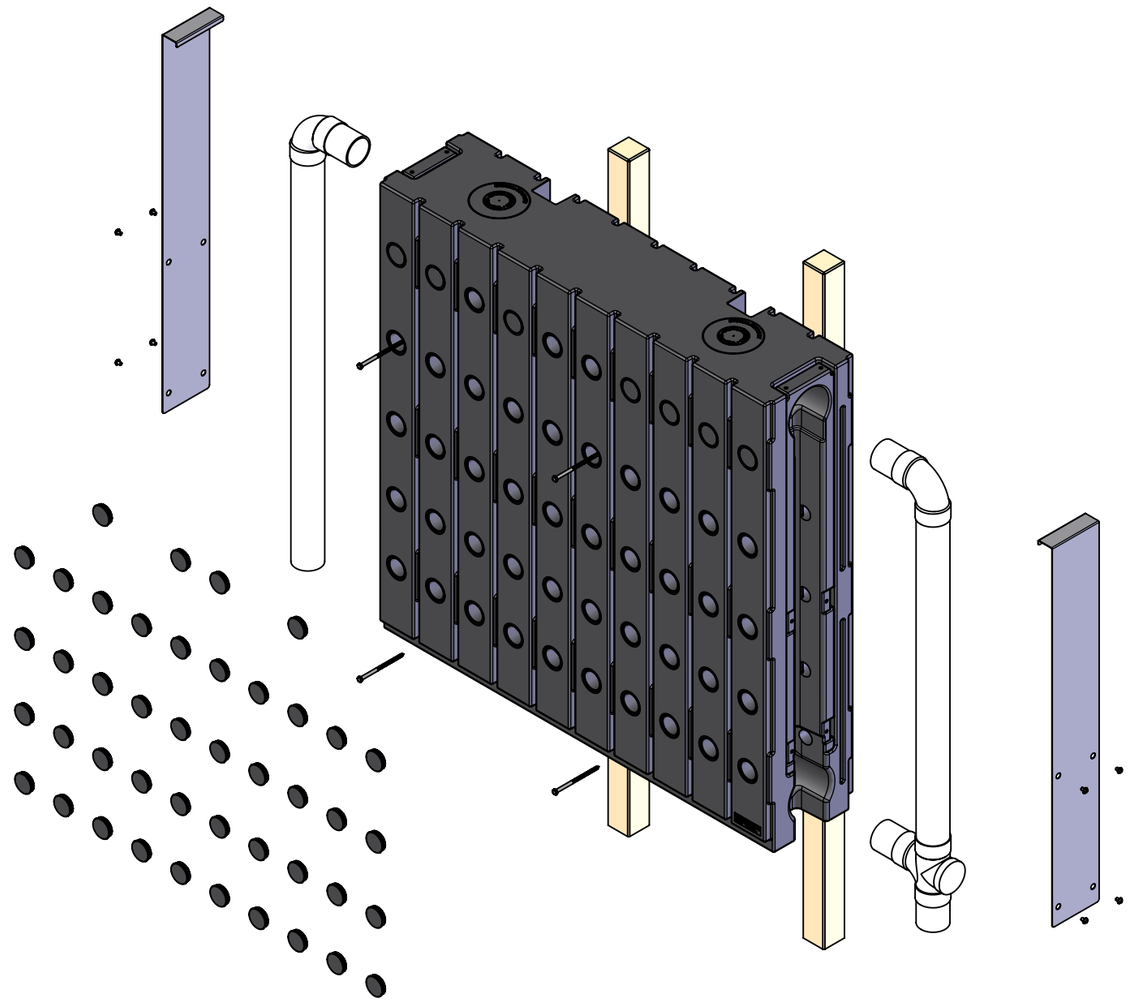
VOLUME
DENSITY
MASS **123206.39 grams**

TOLERANCES UNLESS SPECIFIED
0 DECIMAL PLACE (0) ± 0.2mm
1 DECIMAL PLACE (0.X) ± 0.1mm
2 DECIMAL PLACE (0.0X) ± 0.01mm
ANGULAR ± 0.25°

FORMWORKS DESIGN LTD. STRONGLY RECOMMENDS THE PROTOTYPING & TESTING OF ALL PARTS PRIOR TO THE COMMISSIONING OF ANY "TOOLING" OR "PRODUCTION". SHOULD THE CLIENT CHOOSE TO FOREGO THE ASSOCIATED COSTS OF "PROTOTYPING" AND "TESTING", THEN FORMWORKS ACCEPTS NO RESPONSIBILITY FOR ANY FUTURE COSTS OF MODIFYING TOOLING OR ASSOCIATED COSTS DUE TO PRODUCT FAILURE. THIS DRAWING & ANY ASSOCIATED DRAWINGS SHOULD BE "SIGNED" & "DATED" BY THE CLIENT AT THE VARIOUS STAGES DETAILED ABOVE, PRIOR TO THE COMMENCEMENT OF "TOOLING" AND OR "PRODUCTION".

CREATED IN SOLIDWORKS
3RD ANGLE PROJECTION
SCALE **1:25**
SHEET SIZE **A3**
SHEET **2** OF **3**

ITEM NO.	BOMDescription	MATERIAL	DRAWING	QTY
1	FenceTank, 1,000L	T.B.A.	FTL-114-P001	1
2	Threaded Insert, M10		Fastener	12
3	Fence Post, 125 x 100	Radiata	FTL-114-P003	2
4	Screw Cap	T.B.A	FTL-114-P002	46
5	Button Socket Head Screw, M10-16-Z	Zinc Plated	Fastener	8
6	Washer, M10-2-Z	Zinc Plated	Fastener	8



EXPLODED VIEW
SCALE 1 : 20

2D CAD FILE **FTL-114-A002 FenceTank, Multi-Assembly - L**

3D CAD FILE **FTL-114-A002 FenceTank, Multi-Assembly - L**

CHECK ISSUE & REVISION BEFORE COMMENCEMENT. DO NOT SCALE FROM DRAWING. ALL DIMENSIONS IN MILLIMETRES. PART PRODUCTION FROM 3D CAD MODEL.

FORM WORKS
www.formworksdesign.com

CLIENT **FenceTank Ltd.**
PROJECT **FenceTank**
PROJECT No. **114**
TITLE **FenceTank, 1 Unit 1,000L Capacity**

PART No. **A001**
CLIENT CODE **FTL**
DRAWING No. **001**
ISSUE **L**
DATE **10/11/2022**
DRAWN **M. BETTERIDGE**

MATERIAL
FINISH
COLOUR

VOLUME
DENSITY
MASS **123206.39 grams**

TOLERANCES UNLESS SPECIFIED
0 DECIMAL PLACE (0) ± 0.2mm
1 DECIMAL PLACE (0.X) ± 0.1mm
2 DECIMAL PLACE (0.0X) ± 0.01mm
ANGULAR ± 0.25°

FORMWORKS DESIGN LTD. STRONGLY RECOMMENDS THE PROTOTYPING & TESTING OF ALL PARTS PRIOR TO THE COMMISSIONING OF ANY "TOOLING" OR "PRODUCTION". SHOULD THE CLIENT CHOOSE TO FOREGO THE ASSOCIATED COSTS OF "PROTOTYPING" AND "TESTING", THEN FORMWORKS ACCEPTS NO RESPONSIBILITY FOR ANY FUTURE COSTS OF MODIFYING TOOLING OR ASSOCIATED COSTS DUE TO PRODUCT FAILURE. THIS DRAWING & ANY ASSOCIATED DRAWINGS SHOULD BE "SIGNED" & "DATED" BY THE CLIENT AT THE VARIOUS STAGES DETAILED ABOVE, PRIOR TO THE COMMENCEMENT OF "TOOLING" AND OR "PRODUCTION".

CREATED IN SOLIDWORKS
3RD ANGLE PROJECTION
SCALE **1:10**
SHEET SIZE **A3**
SHEET **3** OF **3**