
# The Importance of Structure in our Industry

**Presented by Simon Lytollis**
**Clenz Wastewater Management**

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# Who is Clenz?

Simply we're all about helping New Zealand keep our waterways pure.

We believe that our beautiful pristine waterways are one of New Zealand’s most precious resources and its our responsibility to caretake them for our future generations.

We pride ourselves on providing quality long-lasting wastewater solutions that are sustainable, environmentally-friendly, and designed to minimise our environmental footprint and impact.

# Tank Structure & Standards

Britannica.com defines a structural system, in building construction as

*“The particular method of assembling and constructing structural elements of a building so that they support and transmit applied loads safely to the ground without exceeding the allowable stresses in the members. “*

Lets simplify that “ Constructing Structural Elements so they support and transmit applied loads safely. “

Without realising we rely on structure every day, from the structure supporting the front door we walk out of to the car we drive and even the building’s we work in.

We ask many industries to certify there work from  plumbing, drain laying, steel work timber quality… We use QUU for many sizing application’s, we reference Australia Design but what are our industry standards?

# Tank Quality

**Britannica Dictionary definition of QUALITY**

**1** [noncount] **:** how good or bad something is

- Pollution affects air/water *quality*.
- The restaurant serves food of high *quality*. [=the food at the restaurant is very good]
- The dress material is of poor *quality*. [=the dress material is not good]

There are many ”suppliers” entering our market with little thought beyond producing a product they deem fit for purpose.

In some cases they are poorly designed units with assumptions around internal flows but no testing data,

It is my opinion that our industry needs to have quality products with proven design and readily available testing data.

# Current Industry Weaknesses

## Unlined Concrete Grease Traps

# Current Industry Weaknesses

## Unlined Concrete Grease Traps cont,

In 2017 NZTIWF produced the Grease Trap Guidelines for NZ Trade Waste Officers.

”*The breakdown of fatty acids captured in the grease traps commonly results in mildly acidic conditions leading to dissolution/erosion of the lime in concrete and corrosion of steel. “*

As part of the guidelines there is a recommendation

“*The Tap Testing Rod is used to lightly tap the base or walls of the trap aiming to feel for rough or uneven sections of concrete and or holes.”*

So our industry led guideline has identified the internal corrosion that occurs within a concrete grease trap.

We have identified the issue yet we still see the approval and installation of concrete traps?

# Current Industry Weaknesses

**Flat Walled Tanks**

Some flat walled tanks can be installed under ground if they are surrounded by appropriate backfill.

We have found some can hold structure/integrity with a 4-1 sand and cement mixture but again they rely on the concrete to hold the walls in place.

Some of the flat walled grease traps available have multiple issues

- Flat sheets don't have the material thickness to handle constant heat above 65 Degrees
- If they are exposed to constant heat the temperature can cause sagging of the material
- The upper surface are detailed as non load bearing so if that surface can't bear a load how does the side wall?

Should anyone be able to build a tank and call it a trade waste device with out appropriate engineering?

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# Where to from here?

Certified Product - AS/NZS 1546.1
Global-Mark.com.au®
ID Number: 100896

Currently there is no applicable general or national standard for grease traps, the most relevant certification is AS/NZS 1546.1 – On-site domestic wastewater treatment units – Septic tanks and Holding Wells.

This standard references desired performance in the Building code so it is the closest Certified standard we can align our industries tanks with.

In clause B1 – Structure

B1.2 Functional Requirement

*Buildings, building elements and sitework shall withstand the combination of loads that they are likely to experience during construction or alteration and throughout their lives.*

B1.3.1 Performance

*Buildings, building elements and sitework shall have a low probability of rupturing, becoming unstable, losing equilibrium, or collapsing during construction or alteration and throughout their lives.*

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# Where to cont.

Under the current building code

“facilities for the storage treatment and disposal of industrial liquid waste must be constructed from materials that are impervious both to the waste which disposal is required and to water.”

So, if a concrete tank is absorbing grease, which leads to it starting to corrode and breakdown it begs an important question

Do unlined concrete traps meet the building code??

**Clause G14—Industrial liquid waste**

**Provisions**

**Objective**

**G14.1** The objective of this provision is to safeguard people from injury or illness caused by infection or contamination resulting from industrial liquid waste.

**Functional requirement**

**G14.2** *Buildings*, in which industrial liquid waste is generated shall be provided with *adequate* spaces and facilities for the safe and hygienic collection, holding, treatment and disposal of the waste.

**Performance**

**G14.3.1** Industrial liquid waste shall be conveyed to storage containers and within disposal systems in a way which will:

(a) transfer wastes from *buildings* safely and hygienically,
(b) avoid the likelihood of blockage and leakage,
(c) avoid the likelihood of foul air and gases entering *buildings*, and
(d) provide reasonable access for clearing of blockages.

**G14.3.2** Facilities for the storage, treatment, and disposal of industrial liquid waste must be constructed—

(a) with *adequate* capacity for the volume of waste and the frequency of disposal; and
(b) with *adequate* vehicle access for collection if required; and
(c) to avoid the likelihood of contamination of any potable water supplies in compliance with Clause G12 **Water supplies**; and
(d) to avoid the likelihood of contamination of soils, ground water, and waterways except as permitted under the Resource Management Act 1991; and
(e) from materials that are impervious both to the waste for which disposal is required, and to water; and
(f) to avoid the likelihood of blockage and leakage; and
(g) to avoid the likelihood of foul air and gases accumulating within or entering into *buildings*; and
(h) to avoid the likelihood of unauthorised access by people;

# A Certified Approach

As I mentioned earlier there is no applicable general or national standard for grease traps,

The most relevant certification is AS/NZS 1546.1 – On-site domestic wastewater treatment units – Septic tanks and Holding Wells.

**Short Term vs Long term performance**


AS/NZS1546 provides guidance for structural design by engineers, using appropriate design methodologies and relevant standards.

# How is the certification achieved?

To achieve the correct loading for certification there is many considerations including

- Short Term vs Long Term Performance of Materials
- Materials such as polymers
  - Polymers can cope with high stress for short periods of time,
  - or Polymers can cope with low stress for long periods of time.
- When a load is applied above a critical value the polymer will ultimately fail (fracture).

Creep Data ASTM2990
Hoop Design Stress ASTM2837



Tensile Strength ASTM638

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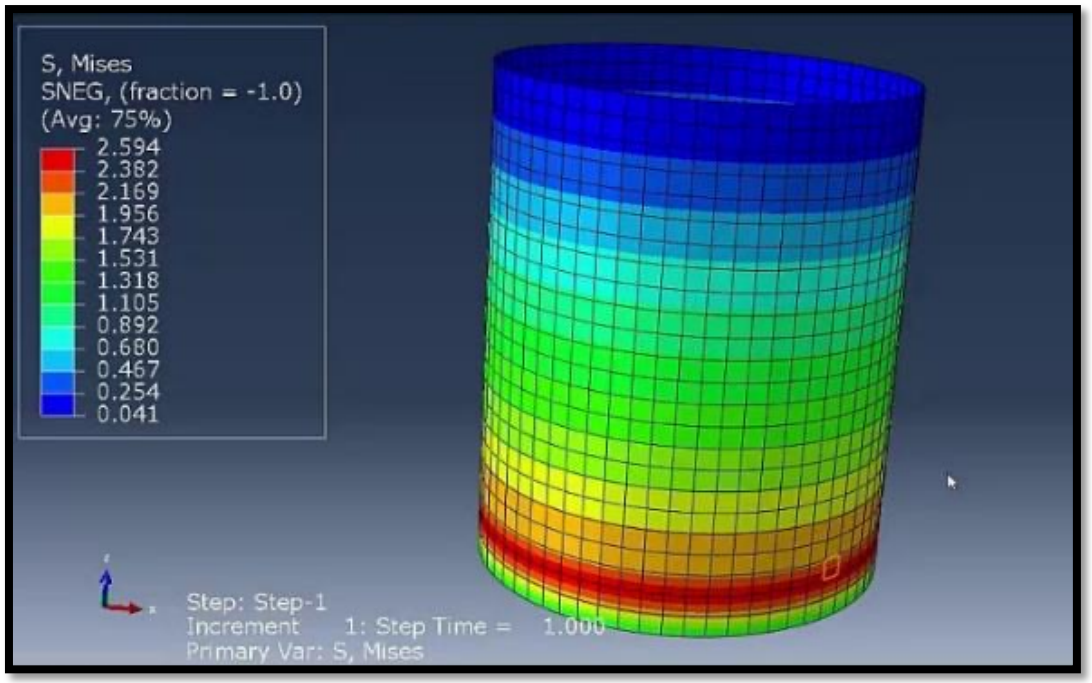
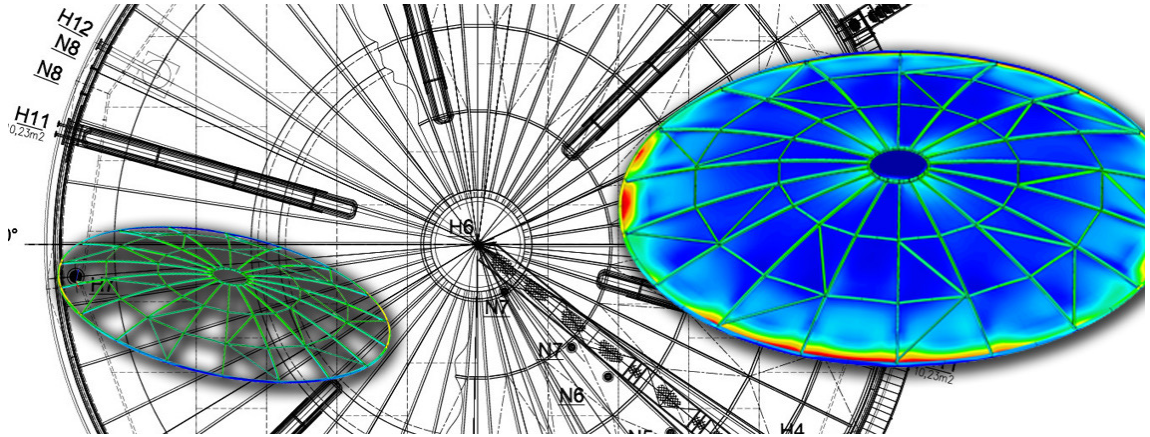
# Finite Element Analysis (FEA)

Above Ground Round Tanks tend to spread the stress equally around the tank circumference Increasing the stress towards the bottom of the tank. You can calculate wall thickness & performance using pen & paper.

Below ground tanks have different stresses coming from different directions around the tank circumference so you cannot calculate all stresses & displacements using a calculator.

You need **FEA** to design products & predict their long-term performance

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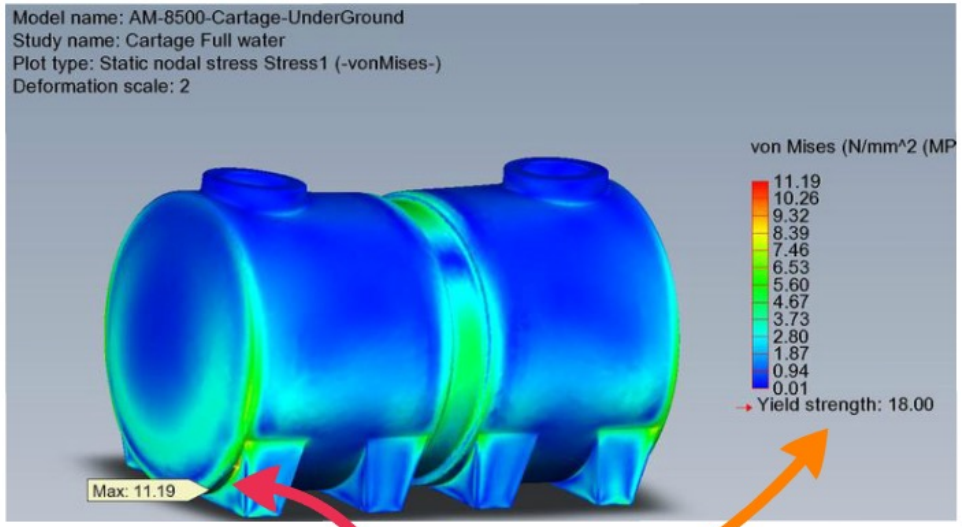
# Design and Testing leading to Failure

In order to achieve this certification you need to undertake a detailed design and testing process including failure & redesign.

***Tensile Strength***
***Short term properties 18MPa versus Long term HDS properties 4.32MPa***




***Max stress 11.2MPa***
***Tensile Yield 18.0MPa***



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# Design and Testing Setting the Standard

# What Does this certification mean?


**AS | NZS 1546.1 Certification**

Certification is an important step in assuring that customers continue to receive the very best in quality through an independently certified and measure process.

The Benefits to working with certification include

- Systems and process performance controls
- Products must be tracked and tested via batch certification
- Planned and implemented staff training and development
- Independently audited manufacturing and processing systems means the highest quality products for end-to-end solutions.

There is no hiding of any steps, there is no smoke and mirrors or false statements, everything is reviewed in detail and the product is independently certified

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# New Australian Standard in Draft

Certified Product - AS/NZS 1546.1
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2.1 General
Passive grease arrestors and associated fittings shall —
(a) be constructed of durable materials;
(b) be watertight;
(c) have smooth internal surfaces; and
(d) be capable of withstanding loads imposed during transport, installation, handling, maintenance and service.

2.2 Serviceable life
Passive grease arrestors and their associated components shall have a design serviceable life of 20 years.
The design serviceable life shall be determined in accordance with finite element analysis (FEA) in accordance with Clause 2.5.1.1.

2.5 Structural design,

The structural integrity of an in-ground grease arrestor shall be designed by a qualified professional engineer using FEA and take into account —
(a) structural integrity during handling, transport and installation;
(b) hydrostatic uplift;
(c) lateral loads, inclusive of any risers; and
(d) top loads.

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# New Australian Standards cont

3.1 Materials

Grease arrestors and associated components shall be made of materials that conform to the material requirements of AS/NZS 1546.1. This includes some or all of the following:

(a) Unreinforced concrete.

(b) Fibre or steel reinforced concrete.

(c) Glass fibre reinforced plastic.

(d) Plastic.

(e) Polymeric materials.

(f) Stainless steel.

8.1 Operational performance — Oil and grease discharge

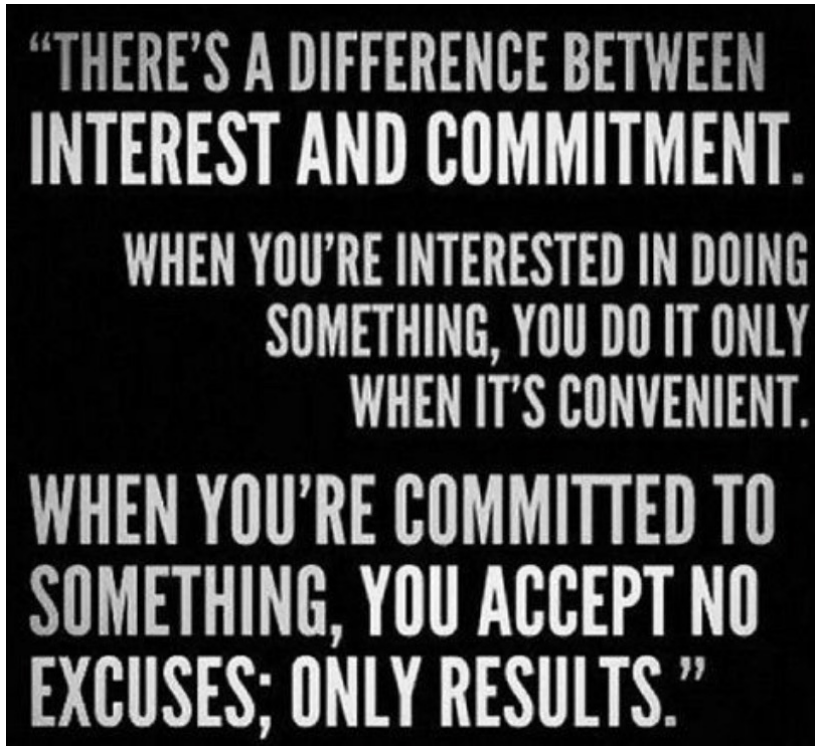
8.1.1 General

When sampled and tested in accordance with the methods outlined in Clause 4.2, a grease arrestor operating within the scope of this document shall achieve the following:

(a) For non-emulsified total oil and grease — an operational (in situ) discharge concentration not greater than 200 mg/L.

(b) For suspended solids — an operational (in situ) discharge concentration not greater than 600 mg/L.

# What's our commitment?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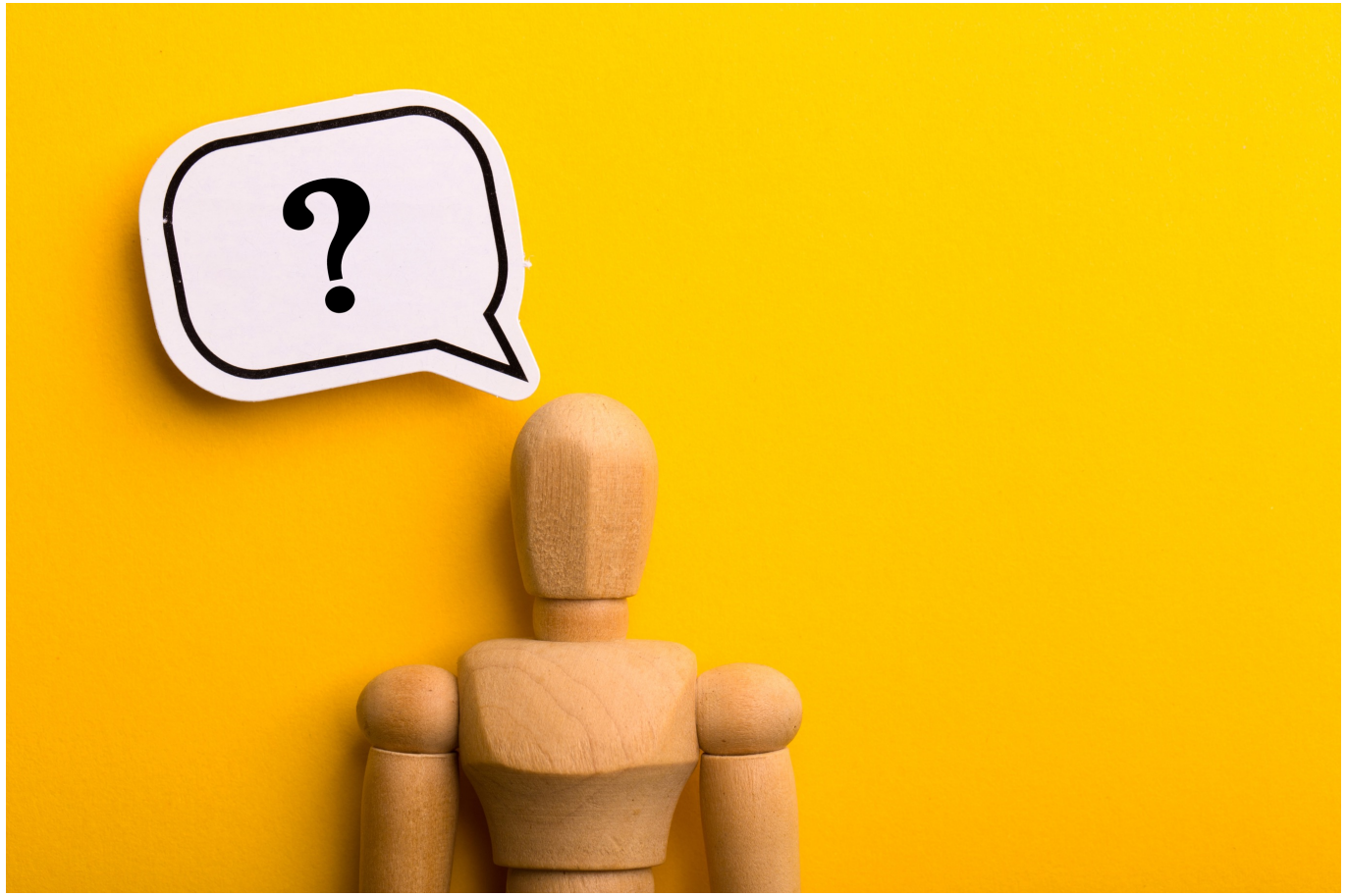
# Questions



# Reference Data

*Inside a passive grease trap,* oxygen-rich churning water, combines with food solids and free-fatty acids to create the right conditions to create form hydrogen sulfide gas,
Its these same conditions also creates Thiobacillus concretivorous which eats hydrogen sulfide gas and turns it into sulfuric acid and it's this acid that eats concrete Once this acid forms it begins to erode the trap undermining structural Integrity.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