

## DESIGN – STRUCTURAL CONCRETE TANKS

### CONTENTS

1. General
2. References
3. Design requirements
4. Durability

1. General

General introduction to our company.

Versatile Tank Company's is totally committed to achieving excellence in the manufacture and supply of structurally designed precast rectangular and square HDC concrete and associated products for water storage, septic, black water, oil water gas exchange systems, retention tanks, sewage and waste water disposal and storm water applications to all sectors of the construction industry.

Versatile Tanks main manufacturing base is in New South Wales. We are heavily involved in the Research and Development programs directed at concrete and structural designed reusable engineered steel moulds. Versatile Tanks produces all concrete products using HSC 50mpa concrete (reaches 71.1mpa in 28 days), using a high frequency vibration method, low water ratio, high slump enabling our concrete finishes to look and feel like glass inside and outside. This method of manufacturing has opened many optional avenues for usage of our larger 4400mm long x 2600mm high, x 2400mm wide and medium 2400mm x 2400mm x 2400mm units such as security units, storm water, black water, grey water, recycled water, glycol units, earth retaining structures, magazines for explosive storage

2. References

Unless specified otherwise, all designs shall be taken in accordance with the following:

- Australian Standard AS1170.1 part 1 Dead and live loads and load combinations
- AS1170.2 Wind Loads
- AS1170.3 Part 3 Snow Loads- live load due to weight of snow on a flat roof in addition to calculated AS1170.2
- AS1170.4 Part 4 earthquake loads - seismic performance of structure
- AS3679.2 Part 2 Welded sections- requirements for supply of welded sections

- AS1554.3 Welding of steel structures – all welding is performed on all reinforcing bars and mesh
- AS3600-2009 Section 2 Design procedures of concrete structures- all concrete work and workmanship is in accordance with AS3600
- AS4671 steel reinforcing materials – use only 500 mpa structural steel conforms to this standard.
- AS1905.1 Fire doors – fire doors supplied and installed comply with this standard, under section 5.3 steel door jamb is fixed in place as per this section. All fire doors tagged, class room lever locks to this standard
- AS1379 Specification and supply of concrete. 50 mpa HSC mix design.
- HB230-2008 is utilised for installation and ballast calculations
- AS4678 – 2002 Earth retaining structures – guidelines on installation and drainage 1302 steel reinforcing bars for concrete
- AS1303 steel reinforcing wire for concrete
- AS1304 welded wire reinforcing for concrete
- AS1012 Methods of testing concrete
- AS1379 Specification and supply of concrete
- AS3582.1 Part 1: Fly-ash
- AS3582.3 Part 3: Silica fume
- AS3972 Portland blended cement
- AS1546 On-site domestic waste water treatment units
- AS2187.1-1998 Explosive storage Units
- Exposure classification under AS3600 B2 has been used in design
- Strength grade of concrete used is now all 50mpa characteristic compressive strength at 28 days in the range of 50 -62 mpa
- Reference of AS3735 -2001 liquid retaining structures sect. 1.1.1 Scope – *This standard does not apply to the design of portable precast concrete water tanks of less than 25000 litre capacity, however Versatile Tanks Pty Ltd accessed this standard where possible.*

### 3. Design Requirements

Structural design conforms to a high level of technical competence and incorporates the most appropriate technology available.

#### 3.1 Accessibility of components

All structures are designed and constructed to provide for ease of inspection and maintenance.

#### 3.2 Hydrostatic Uplift of liquid retaining structure

Buried tanks may have a tendency to move or float when empty, especially if the ground is water charged. To avoid floating, the design engineer has referred to HB230-2008 The total weight of the tank, overburden and backfill above the tank must provide resistance to counterbalance the buoyancy of the tank. In the case of the large concrete tanks (12 ton in weight empty) ,the ballast calculated to prevent uplift of our large tanks is 19 ton Our consulting engineer has referred to section 5.16 of the HB230-2008 should there be underground water present .

A more efficient solution of installation should the Hydro calculations be borderline is to use a stabilised concrete 10 sand to 1 cement slurry mix as backfill.

#### 3.3 Concrete

Durability design for concrete structures shall be in accordance with AS1379 Specification and supply of concrete and amendments with the following additional requirements exceeding the standards.

- Dense HSC durable 50mpa concrete shall be used.
- Glyninium based agent is used to replace a large proportion of water in the mix design hence assisting in the prevention of micro shrinkage cracks. This will ensure a impermeable wall from moisture.
- AS3600 all concrete workmanship shall access this standard

#### 3.4 Steelwork

Only 500 mpa RL818 N20 and N12 reo mesh and bars welded together to form a structural cage is be used. All welding performed is in accordance with AS1554.3 Welding of steel structures and AS3679.2 Welded sections.

#### 4.0 Durability

Under AS3600 -2009 section 4.1 cover for corrosion protection the required cover is 35mm under exposure classification B2 using 50mpa strength concrete our tanks access and comply to this section. A geotech report is necessary to determine soil conditions. If soils are aggressive. A slurry concrete mix is preferred when installing tanks in ground.

If you require any further information please feel free to contact me.

Regards  
Ray Pooke