

“Braithwaite” type pressed steel water storage tank

The application

The concept of liquid storage in tanks constructed by means of a series of modular steel panels bolted together on site was originally developed and patented in 1901 by “Braithwaite” in the United Kingdom, an organisation which has continued to be active to this day.

Large storage tanks constructed to this design from pressed steel sections such as the one in this case history are generally mounted on steel towers and used extensively as in this case by municipal authorities.

Environmental conditions

South Africa is known for its many atmospheric conditions from relatively benign to extremely corrosive. Although Johannesburg has no doubt suffered from pollution from numerous sources, one such source being the old Orlando and Kelvin Power Stations (*see article in magazine No. 26*), where huge amounts of coal were burnt monthly, the atmosphere is currently relatively

benign. The area of Johannesburg currently falls into corrosion category (C1 or C2 in accordance with ISO 9223) and therefore has a zinc corrosion rate of less than 1mm per year. (*See Corrosion Category table in magazine No. 23, page 62*).

Our findings

The “Braithwaite” water tank and stand is situated on the eastern rampart of the Johannesburg Fort. The water tank steel panels have the same pressed steel form that is used to manufacture present day Braithwaite tanks. Braithwaite commenced business in 1901.

Although the coating on the fasteners has failed and are now discolouring the remaining hot dip galvanized coating on the pressed steel panels, they are still structurally sound but would shortly require over coating or replacement.

The coating on the pressed steel panels ranges from 2.7 mils (68µm) to 3.6 mils



General view of water tanks.

(91µm), which in terms of the life of the water tank, is impressive to say the least.

Should the water tank have been ordered prior to 1937 the British specification BS 729 would not have been in existence as it was first published in that year.

However, BS 729 requires that for steel thickness less than 5mm but greater and equal to 2mm a coating mass of 460 grams/m² (coating thickness – 64µm) and for steel thickness greater than 5mm a coating mass of 610 grams/m² (coating thickness – 85µm), be deposited on the steel.

As it was difficult to assess the steel thickness of these panels, we must assume that they were most probably 5 to 6mm thick, as per the local equivalents.

Conclusion

In order to establish when the water tank and structure was installed, we



Close-up of panels and bolts.



View on the roof looking north.



discussed the history of the fort with Mr Herbert Prins a Heritage Architect, who was kind enough to share some facts in trying to establish the age of the water tank. The following sequence of events is known:

- ◆ The Prison within the Rampart was built in 1893.
- ◆ The rampart (the embankment on two sides of the Fort) was built in 1896.
- ◆ Boer war commenced in 1899 and ended in 1902.
- ◆ Paul Kruger built several forts in the Johannesburg / Pretoria area at much the same time as the one in Johannesburg.
- ◆ Johannesburg surrendered in May 1900 and the Boer garrison moved out at the same time the British garrison moved in.
- ◆ After the Boer war the British garrison moved out (sometime between 1902 and 1907 when the Transvaal received responsible government).
- ◆ In 1909 the women's goal was built.
- ◆ In 1928 the Awaiting Trial prisoner block was built.

It would seem that there was a strong possibility that the Braithwaite water tanks were ordered from the United Kingdom to accommodate water for the entire goal including the Awaiting Trial prisoner block and that suggests that the tanks may have been in existence since about 1930.

Should this be correct, then the hot dip galvanizing has performed considerably well over the 76 odd years. Several coating thickness readings were taken at between 2.7 to 3.6 mils (about 68 to 91 μ m) *see photos*.

On one bolt the coating thickness read as 0.99 mils (25 μ m), but generally the fasteners were starting to corrode and are discolouring the hot dip galvanized surface of the plates. This makes sense, as they



Maximum coating thickness, 3.6mils (91 μ m) on panel.



Minimum coating thickness, 2.7mils (68 μ m) on panel.

would have had an original coating thickness of about 45 to 70 μ m and with a zinc corrosion rate of less than a micron a year, would be 70 to 80 years old.

No surface inspection was done on the inside of the tank.

The structure holding up the water tanks is fairly corroded but could, if required, be restored. The components could be abrasively blasted and hot dip galvanized and if the tanks were also re-galvanized, the tank and tank stand would provide a further 70 odd years of service free life at the site.

HDGASA 03-2006 has just recently been launched

The sequence follows two existing coating specifications, being **HDGASA 01-1990 – Code of Practice for Surface Preparation and Application of Organic Coatings** applied to New Unweathered Hot Dip Galvanized Steel (Sheet and Section) excluding In-line Coil Coating (Duplex Systems) and **HDGASA 02-1990 Specification for the Performance Requirements of Coating Systems** applied to New Unweathered Hot Dip Galvanized Steel (Sheet and Section) excluding In-line Coil Coating (Duplex Systems).

Over and above SANS 121 (ISO 1461), which addresses the hot dip galvanized coating, **HDGASA 03-2006**, briefly incorporates, Approval of the galvanizer; Quality Standards, such as Quality Control and Coating Repairs; Quality Surveillance; Data Book; Handling and Storage, which addresses Handling; Loading; Unloading; Cover and Stacking. Site coating repairs are also addressed as well as Duplex Coatings; Selection of Paint Coatings for Duplex Coatings; Quality Control and Surveillance as well as Related Documents are also incorporated.

The specification is available from the Association or the website – www.hdgasa.org.za and can easily be incorporated into specific project specifications, where necessary.

