

Guide to
**STORAGE
TANKS &
EQUIPMENT**

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eter, problems of plate thickness and site stress-relief tend to provide a size limitation.

A second means of support for spherical vessels is to provide a cylindrical skirt or a cup type of arrangement. This is commonly known as the "Man type" of support and is often considered as a proprietary design, available only from certain designers and suppliers.

9.3 Horizontal vessels

Above ground horizontal vessels have been used for many years for the storage of modest quantities of various products. These range in size from the simple 'gas pigs' for domestic gas supply of around 0.5 m^3 up to vessels for high pressure gas storage or for component parts of mounded storage systems of around 4000 m^3 for each vessel.

The high pressure gas vessels were a common sight at major gas works at one time in the UK. They were an early form of peak shaving for the gas network before the advent of the liquid natural gas tanks at strategic locations around the country for the same purpose. These vessels were built in groups of six or more and were up to 6 m in diameter and 100 m long. They were constructed from factory-built units at the maximum transportable length, which were site-welded together and the closing seams site stress relieved. An example of such a facility during construction is shown in Figure 9.3.

A similar facility for the storage of liquid propane is shown in Figure 9.4. This consists of six vessels, each 12 ft (3.66 m) in diameter and 120 ft (36.6 m) long.

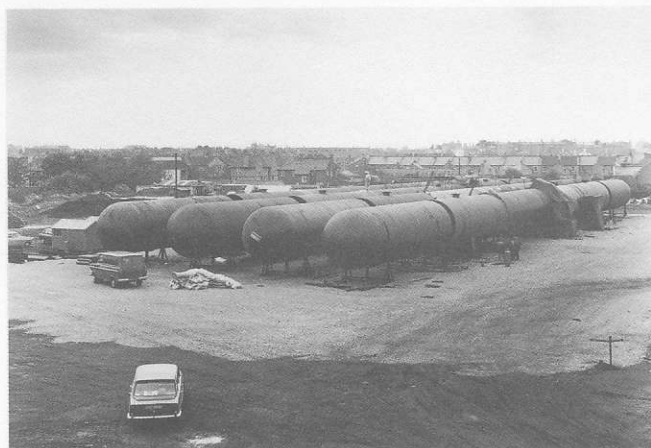


Figure 9.3 Site welding of high pressure gas vessels
Courtesy of Whessoe

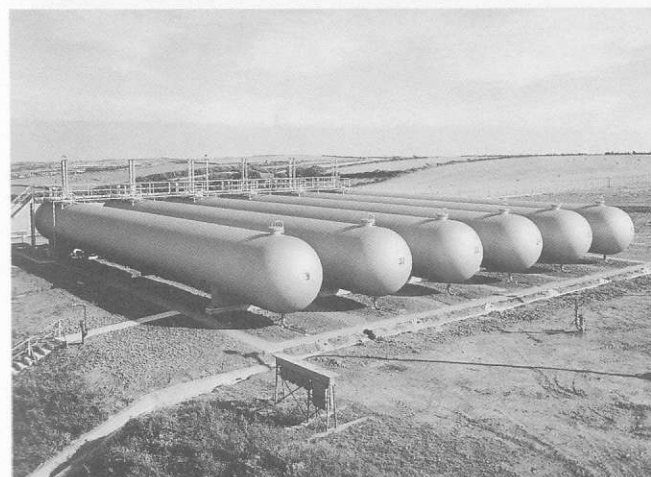


Figure 9.4 Liquid propane storage facility
Courtesy of Whessoe



Figure 9.5 Mounded storage tank system under construction
Courtesy of



Figure 9.6 Mounded storage tank being laid on prepared sand beds
Courtesy of

For safety reasons, such above ground facilities for the storage of products such as LPG have become unpopular. The current trend for the pressure storage of LPG is to use mounded storage systems. Here horizontal pressure vessels are used which are supported on a bed of sand or other suitable soil, and after construction are back-filled and buried. This arrangement provides protection from fire and missile damage. This arrangement also allows for the storage of different products or product mixes in the separate vessels which is convenient for operators of LPG terminals.

Guides to the design of mounded storage facilities are provided by the UK Health and Safety Executive and the Engineering Employers Materials Users Association, (EEMUA), (References 9.1 and 9.2). Figures 9.5 and 9.6 show a typical mounded storage tank system under construction. In this instance the vessels were 8 m in diameter and because of the remote location of the site in the Philippines, were constructed in modules from imported edge-prepared flat plate in a temporary workshop on the job site. These were then laid on the prepared sand bed and welded into the complete vessels.

In-ground horizontal cylindrical storage tanks are widely used as garage forecourt tanks for the storage of the various motor fuels. At one time these were simple steel tanks buried in the ground. Problems of corrosion and subsequent leakage of the products into the surrounding soil, and the escalating costs of remedial works and litigation has caused this area of activity to be reconsidered and modern facilities have secondary containment, leak detection and anti-corrosion measures built into them. An excellent book covering the Codes, regulations and design of these tanks from an American perspective is given in Reference 9.3.