

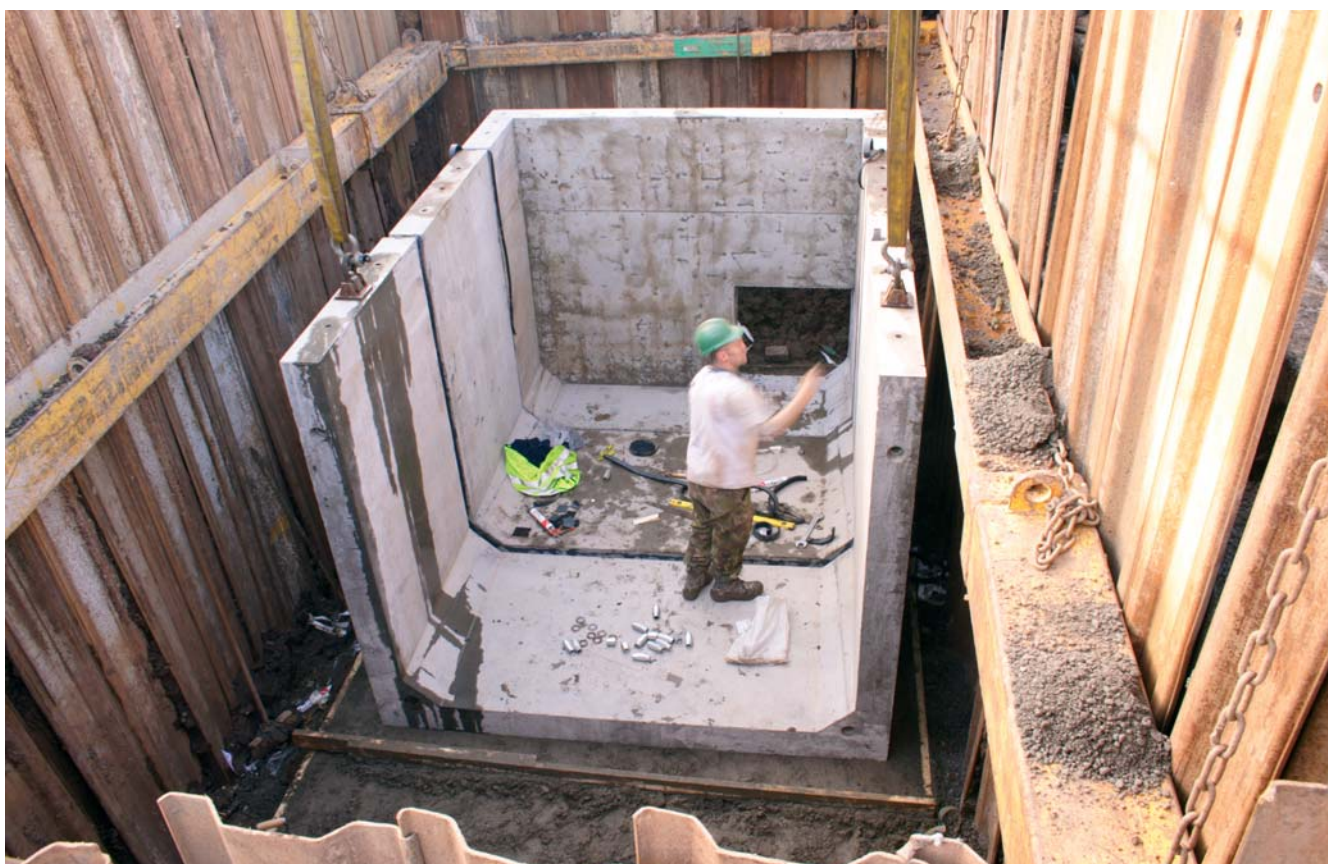
“CSO in a Box”

innovative & repeatable design - now deployed 10 times in UK

by

Robert McTaggart BE/BEng, Civil Engineering, CIWEM

“CSO in a Box” - is an innovative, off-the-shelf and easily repeatable design solution - a practical application of engineering generating environmental improvement in wastewater projects. The pre-fabricated concrete Combined Sewer Overflow, (CSO) chamber is WaPUG compliant providing a quick and flexible CSO solution from familiar and proven materials. It can be delivered and installed in one day - a fraction of the 10-15 days installation time that a traditional CSO can require, reducing overall construction periods. Overall the ‘CSO in a Box’ improves efficiency and sustainability as well as meeting the specific needs of a project. It generates Health and Safety, programme, resource and environmental impact savings as well as reducing worker time in the ground and minimising disruption to customers.



“CSO” in a Box? - innovative ‘off the shelf’ design installed in a day rather than 10 days

courtesy MWH

Creators

“CSO in a Box” was created by *MWH (UK) Ltd*; global environmental engineering consultants in conjunction with *Hanson Building Products*. The first pre-cast concrete ‘CSO in a box’ was installed in early 2006 in Darlington on the busy Geneva road in under five hours for Northumbrian Water. Currently, *Hanson* and *MWH* are busy installing and producing ‘CSOs in a Box’ for two UK water authorities and a range of other consultant engineering firms.

Since the introduction just over 12 months ago, ten ‘CSO’s in a Box’ have been installed in the UK, principally by two water utilities on several AMP4 schemes - Northumbrian Water and Southern Water. For example 4D installed the first ‘CSO in a Box’ for Southern Water at Hilden Park Pumping Station, Tonbridge, in December 2006. This was part of a £1.4 million scheme to improve the treatment of storm flows and several other units are planned to be installed during 2007.

Technical description/background

The concept was jointly developed by *MWH* engineers, Ian Lovering and Rob McTaggart, who have extensive experience of structural and sewer network design and management. During AMP3, whilst working on a series of Combined Sewer Outflow projects they looked at improving design efficiency. They realised that a high percentage of CSOs fell into four generic groups based on a number of key parameters allowing them to streamline the whole delivery process by developing core designs covering all these groups. They then created a pre-cast system around the core designs.

The final design makes use of hydraulic design ‘envelopes’ which makes the selection process simple. The clear advantage this system has over other CSO solutions is that it is extremely flexible to a client’s needs. The water industry gets a bespoke solution with the benefits of a pre-cast product.



conditions and inlet/outlet arrangements. The beauty of the design is that it comes in standardised banded parts and doesn't require a huge amount of kit to put it in the ground. This is important to contractors who like to work in the ground for as little time as possible. Indeed, going forward in AMP4 typically all contractors will have to work more quickly and safely. This design could help them work more efficiently as anything that needs to go into a pre-cast box or chamber will enable contractors to get workers out of the ground much more quickly.

Progress to date (April '07)

Three 'CSOs in a Box' have been installed at Northumbrian Water (NWL) at Geneva Road and Willington and Etherley Lane. Five sites are in **Southern Water Area** - Prior Leaze Lane, Monmouth Street, Cannon Lane, Wickham Road and Hilden Park, another two in production in the Tunbridge Wells area. There are also another five in consultation in the DCWW and another one in consultation with STW.

"CSO in a Box" offers a modular layout available in two chamber sizes. Each caters for a wide range of flows and a variety of standard screening equipment. This allows them to be customised to meet most users' operational requirements.

However, the real innovation is in how the 'box' has been put together.

It consists of standard RC elements but they can all be locked together to give a watertight seal in less than five hours. This means far less time on site and a simpler construction activity which reduces Health and Safety risk to the site staff. It also causes less disruption for local residents and communities. Full FE analysis of the structure allows efficient design of the units and reduces individual member parts thickness.

Put together all of these advantages result in a better, more sustainable solution for the environment. The wall thickness of 'CSO in a Box' is 200mm thick while still meeting a design loading of 45 units of HB loading, whereas a conventional in situ wall thickness would be 300mm+.

Installing a traditional CSO can take between 10-15 days. 'CSO in a Box' can be installed in one day, offering programme and resource savings and is particularly useful when chambers have to be sited in sensitive areas, or in roads where disruption needs to be kept to a minimum.

'CSO in a Box' has proved that its varied designs works for an array of conditions - including access arrangements, screens, loading

Key features include:

- * hydraulically designed to meet site specific needs;
- * conventional WaPUG compliant chamber design;
- * flotation stability;
- * pre-cast concrete quality;
- * modular units-same and recognisable over a range of CSO sizes;
- * derived from conventional industry products;
- * thinner concrete section sizes;
- * programme speed - fast easy installation and backfill;
- * robust joint detail;
- * cost effective;
- * PC units - manoeuvrable & low lift weight;
- * flexibility - screen type, size & roof openings;
- * design compatibility compliance check;
- * safety - screen & benching installation;
- * transportability/accessibility;
- * design for full highway loading;
- * consistent operational/maintenance chamber and access arrangements.

Note: The editor and publishers wish to thank the author Robert McTaggart, a Principal Engineer with MWH for producing the above article for publication.