



## BOX CULVERTS

**Most of us take for granted the infrastructure we use everyday that takes a team of people to plan, design and construct. Building these structures is a complex process, with many parts required. In much of the infrastructure around today, precast concrete plays an integral part. There are many components you might not see as part of the construction. One of these is a reinforced precast concrete box culvert. Often used under roads, railways and runways, culverts are a fast, economical, robust and long life solution for many drainage and short-span bridging requirements.**

### **Flexibility in design**

While many authorities have their own specific structural requirements and often their own designs, the minimum standards to which box culverts are designed are contained in AS 1597 Part 1, for small culverts up to and including 1200mm span, and AS 1597 Part 2 for larger culverts from 1500 to 4200mm span.

In most instances, culvert design hinges around standard highway vehicle and rail loads as described in the Austroads Bridge Design Code. Sometimes though, construction considerations on site require that heavy equipment travels over them. This can result in loading conditions much more severe than those expected in service. In these circumstances, either the design must satisfy construction conditions or provision is made to back-prop the units during construction.

### **Applications in drainage...**

In drainage structures, culverts can cope with large flows of water where headroom is limited. For an equivalent waterway area to circular pipes, box culverts can be configured so they have less impact on upstream water levels and downstream flow velocities.

An innovative use of culverts can be seen in Fiona Stanley Hospital in Perth, where National Precast Member Humes supplied their innovative purpose-built storm water system. The system is made up of individual

precast culvert modules that can be connected into a flexible configuration to meet specific project requirements. In Fiona Stanley's case, the system's storage design included a grated side opening to allow extension and interaction of the basin with nearby bushland during high flows. It has a capacity of 3,708 cubic metres.

### ...And in bridges

Culverts are also ideal in road and rail structures, where they are designed to take heavy wheel loads with no fill required above the structure. This provides instant bridging with minimum traffic disruption.

If fill is placed over the culvert, the superimposed load lessens because the fill will distribute the load over a larger area. The fact that traffic may use such an installation immediately after placing compares favourably with any in-situ construction and most alternative materials, which require compacted fill in place before loading is applied. Further, in-situ construction, time is required for curing prior to stripping forms ready for use.

Special culvert structures have been built in Australia for spans up to seven metres. Standard combinations of spans and leg-heights - as specified in AS 1597 - are available from most culvert manufacturers.

The Wheatstone Project for Liquefied Natural Gas has seen National Precast Member PERMACAST manufacturing more than 1000 individual box (trench) culverts in its West Australian factory.

Originally the plan had been to cast the culverts insitu, but PERMACast's in-house engineers developed solutions to enable cost savings and efficiencies by manufacturing off-site. The result was 560 lineal metres of trench culverts being manufactured and lined with a perlite insulating concrete. For this project, each culvert average 19 tonnes and was cast with variable falls.



### The logical solution for difficult sites

Precast box culverts are an ideal solution where site conditions are difficult. The off-site manufacture means less disruption on site and easier installation in challenging locations including where excavation is in rock. In these cases, installation of a box culvert requires minimal excavation and backfill

**National Precast has members across the country who can supply culverts for your next project. For further information visit <http://nationalprecast.com.au/find-a-precaster-civil-elements/>.**