

Innovative weir restructure awarded

A weir refurbishment downstream of Quambatook in regional Victoria has been recognised at the 2014 Institute of Public Works Engineering Australia Awards with the Innovative Practice/Service Delivery award.

The refurbishment turned a deteriorating concrete structure with manually operated gauge boards into a modern weir with a pneumatic flood gate mechanism.

The project was managed by the Gannawarra Shire Council, with the oversight of the North Central Catchment Management Authority. Its aim was to repair structural damage caused by water and floating debris in a 2011 flood event, and the project was completed in late 2013.

The council contracted the project to APCR McDonald Constructions, with local water control company AWMA selected for the gate mechanism design.

Previously, flood control was achieved with manually placed horizontal wooden gauge boards, which were difficult to operate during floods and exposed operators to physical risk.

The main objectives were to minimise ongoing management of the weir pool levels while ensuring there would be no impact on flood levels or extents, and

to minimise ongoing maintenance and operation of the structure.

The final design features a pneumatic air operated water control gate system to raise and lower the gate in a tilting lay flat design. The system is managed from a control panel on the bank, eliminating the manual handling of the gauge boards and the need to physically access the structure.

Design process

AWMA's initial concept design involved a continuous rubber water inflated bladder, which had been used in other locations to raise weir crests. However, after performing a preliminary safety in design, the design life of the rubber bladder was deemed unreliable. The failure of a bladder would be sudden and unpredictable, with catastrophic downstream results, according to AWMA.

The design brief called for a single 12m span, stating that no lifting equipment could be fitted about the gate crest, thus eliminating a more traditional lay flat weir design. Therefore, the most feasible lifting mechanism was air mounted springs along the base of hinged gate leaves, inflating air springs to raise the gate as required.

AWMA also introduced an arm at each

spring location that would lock into place when the gate was raised, transferring the hydrostatic load back into the mounting pedestal and making the air spring effectively redundant. The aim was to eliminate complications resulting from reliance on a constantly charged airbag to maintain the gate height.

The added benefit of introducing a load bearing arm was to eliminate the requirement for a constant air supply onsite, as the gate can now be operated with a common portable petrol air compressor.

The change in design also required the hinge portion of the leaf to be mounted upstream of the weir, complicating the maximum height requirements as the gate now reduced the clear opening height of the weir structure when lowered. This was resolved with 304 stainless steel, which provided the required stiffness and strength to make the gate as shallow as possible, extending the design life of the weir in excess of 25 years.

Vents were included to eliminate air pockets from developing below the gate while discharging, and additional nape breakers were introduced to limit the risk of flow induced vibration given the potential for a long unbroken crest.



Water flows over the newly refurbished Quambatook Weir for the first time. PHOTO: GANNAWARRA SHIRE COUNCIL