



Rob Parker Engineering Pty. Ltd.

ACN: 003 758 156

Contractors
Civil & Structural Engineers
Project Managers

Head Office: Ramaling, Old Mandemur Road,
(P.O. Box 71), Berrima NSW Australia 2577
Phone: +61 2 4877 1320 • Fax: +61 2 4877 1180
E-mail: ramaling@ocenet.com.au

Galleries in RCC – the Excavation approach.

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An extremely simple and low cost method of constructing galleries in RCC is the excavation method.

This involves the removal of weakened RCC and gravel after it has been placed in the proposed gallery void. In Australia, this method of construction has been used previously at Lower Molonglo and Cadiangullong Dams.

The method has the following major advantages compared to formed or precast solutions:

1. The actual placement of the RCC in the layers coinciding with the gallery height is not slowed until the soffit of the gallery roof is reached, at which time the gallery is excavated and the pre-cast concrete soffits are placed.
2. The RCC between the upstream face of the dam and the gallery face is constructed more rapidly and is placed in a more uniform manner in a similar manner to the remainder of the embankment. It does not suffer from the potential for segregation, poor compaction and discontinuous production.
3. The width of the narrow zone of RCC between the upstream vertical face of the dam and the upstream wall of the gallery is not constrained by the need to fit construction plant into the available space. Frequently designers wish to move the gallery as far upstream as possible to allow the foundation drain holes to be drilled very close to the upstream face.
4. In addition, after the dam is completed and the reservoir has been impounded, the RCC can be directly inspected. The face is not masked by a veneer of precast concrete
5. A number of other associated activities are carried out while the gallery is constructed including, floor and drain construction and drain hole drilling. The ease of access means that all these activities will be constructed at a far lower cost than would be the case when operating within a gallery. At Cadiangullong Dam the gallery and associated works were constructed for approximately 35% of the cost of formed methods.

The method consists of:

1. Placement of 50mm course aggregate down the centre line of the gallery while RCC is slightly over-placed by about 0.45metres into the gallery zone. For example, if a gallery was 3.0m wide, the 50mm course aggregate would be placed 2.1 metres wide and about 300mm high. This means that 70% of the gallery void consists of 50mm aggregate and the remainder is RCC.
2. There is no contamination of the surrounding RCC with granular or un-cemented fill. The bulldozer spreads the material along the 50mm aggregate and the compaction roller runs over both the 50mm stone and the RCC
3. The faces of the gallery at each level are defined by use of the monolith plate driver forming a weakened plane joint. The removal of the RCC can be further facilitated by the use of polyethylene sheet placed horizontally in the gallery zone.



4. When the RCC reaches the top of the gallery, the entire gallery is excavated using an hydraulic excavator and the material is trucked back to the crusher for recycling. Refer *Figure 1 - Excavation of Gallery*
5. The excavation includes ripping out a void to construct a small beam on each side of the gallery. *Figure 2 - Forming of edge beams*
6. The roof panels shown on these two projects are 150mm thick hollow-core pre-tensioned panels as shown in *Figure 3 - Note pre-tensioned 150mm thick precast*. Note however that reinforced concrete panels of any type could be used. On both projects shown in these figures, the panels were subsequently drilled through by a percussion drill which was used to install the crest to gallery drain holes. The pre-tensioning strands had become redundant and the holes were patched.
7. The drain hole, floor and gallery roof are placed and RCC continues. *Figure 4 - Note truck delivering CVC to floor of gallery while excavation is proceeding*
8. Gallery Precast lids are placed and the top layer is prepared as a cold joint. *Figure 5 - Placing Precast pre-tensioned panels and Figure 6 - Top surface of gallery following installation of precast panels*
9. Finally the lighting and instrumentation is fitted to the gallery as shown in *Figure*

While the faces of the gallery are not as smooth as other methods of construction the RCC placed in the narrow zone between the upstream face and the gallery has not been subjected to the same level of disruption and its uniformity of placement and compaction is improved.



Figure 1 - Excavation of Gallery



Figure 2 - Forming of edge beams



Figure 3 - Note pre-tensioned 150mm thick precast roof panels and 3m zone to upstream face



Figure 4 - Note truck delivering CVC to floor of gallery while excavation is proceeding at the top of the photo and forming of the sides continues at the base of the image



Figure 5 - Placing Precast pre-tensioned panels



Figure 6 - Top surface of gallery following installation of precast panels



Figure 7 - Finished face of gallery with in-situ floor, drain holes and lighting fitted