

HINZE DAM STAGE 3 PROJECT Drainage Gallery Diamond Core Drilling

OVERVIEW OF PROJECT

With a rapidly growing population and widespread drought, the pressure on water supply continues to increase. The Hinze Dam Stage 3 project has been identified as a priority to increase the dam's water storage capacity and delay the release of floodwaters onto the floodplains. This will reduce downstream flood levels and decrease the number of properties vulnerable to flooding.

For the above to be fulfilled the Hinze Dam wall will be raised by 15 meters which will consecutively double the capacity of the dam.

DRAINAGE GALLERY BREIF

The existing drainage gallery is a cavity deep in the spillway wall and measures 2.5m high by 1.2m long by 35m wide. It is accessible via a number of flights of stairs from the upper portion of the spillway, see figure 1. The purpose of this gallery was to capture leaks in the construction joints of the spillway and monitor how the dam was behaving over time.

PROBLEM

The stage 3 upgrade will share a modified version of the stage 2 gallery. To ensure that the increased hydrostatic pressures generated by the elevated height of the wall are controlled a number of pressure relief holes up to 25meters deep were to be cored in various areas of the gallery floor and walls.

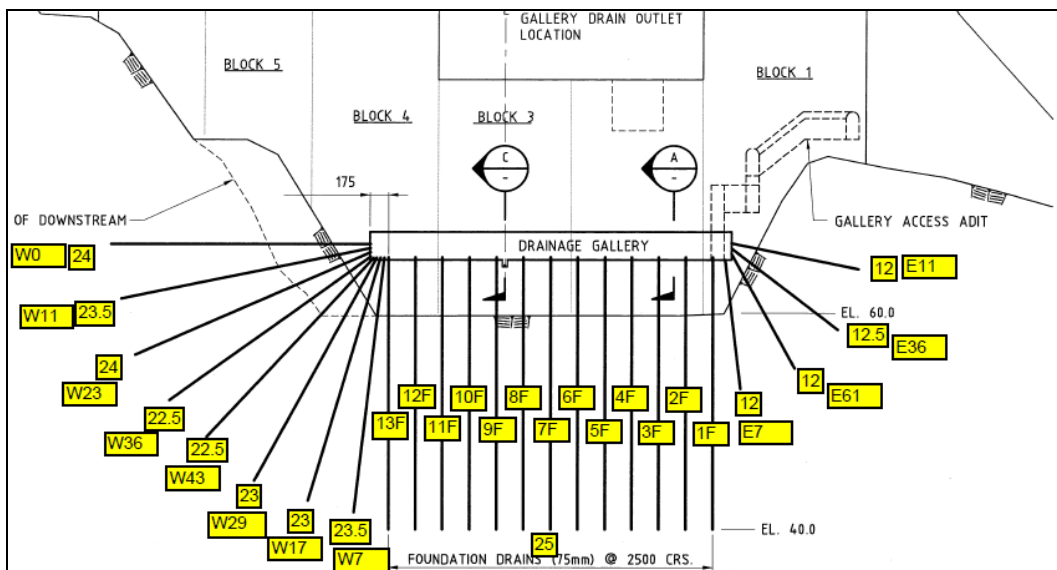


Figure 1 – Drainage Gallery Elevation showing Hole Depths and Numbering System

Demolition
Deconstruction
Concrete Repairs



ISO 4801:2001
ISO 9001:2000
ISO 14001:2004

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SOLUTION

DecoTEC have had past experience in similar projects and were therefore called upon to carry out the required works. There were a number of elements that had to be addressed before and during these works were conducted. The following photos and illustrations will explain how DecoTEC overcame these hurdles.

1. WORK IN A CONFINED SPACE

To work in a confined space all DecoTEC operators were to be confined space trained. In addition to this a spotter who was also confined space trained was to stand at the gallery entrance at all times in case of an emergency. Pneumatic powered ventilation fans, 4 point intercom system and fixed gas monitors were also installed to provided the operators with the safest possible working environment.

The required drilling equipment could not generate exhaust fumes in the enclosed area therefore hydraulic drilling gear was chosen to complete the work. This gear was exhaust free, quiet and provided powerful and efficient cutting conditions.



*Figure 2 – Left: Entrance to the Spillway Drainage Gallery
Right: Hydraulic Drilling Equipment*

2. SLURRY CONTROL & WATER SUPPLY

To ensure these works did not negatively impact on the environment all slurry generated needed to be treated for pH and disposed of in the site sediment basin. To tackle this problem DecoTEC setup an innovative slurry control system. This system consisted of a wet-vac continuously sucking in a collection pit. The wet-vac's factory tank was modified to expel the slurry into a 205 litre tank to reduce the need to attend to the slurry system. Once full these tanks were swapped out for an empty tank whilst the full ones were being stage pumped into a 3kL bin located adjacent to the gallery entrance. The slurry in this bin was then treated for pH and, with the aid of flocculent, left to settle before disposing of in the sediment basin.

Water was provided to core drills via a 3kL tank and a fire pump located outside the gallery.



*Figure 3 – Left: Gallery Floor Slurry Control System
Right: Slurry Collection Tank and Water Supply Tank*

3. PRECISION CORING WHILST MAINTAINING SAFETY

To core to the required angles and depths within an extremely small margin of error diamond core drilling was chosen to carry out the works. To stay within the clients' program two drill rigs with specially fabricated diamond core cutting heads were used. These cutter heads provided a precision cut to the desired diameter whilst maintaining the required production rates.

Due to the tight fit inside the gallery 1metre screw type core barrels were used. Every metre of cutting required a new barrel to be screwed onto the chain. To ensure the holes would stay on line with how they were initially setup reamers were used. Several of these were installed throughout the chain of barrels and provided the barrels with a tight fit inside the hole.

At the time of coring there was up to 15 meters of head in the dam. This therefore created the potential for water to backflow out of the cored holes generating a safety hazard. Even though the calculated maximum backflow pressure was only minimal DecoTEC wanted to ensure the uttermost safety for their operators therefore a backflow valve was fabricated and installed on each hole.



Figure 4 – Drilling Equipment

4. INNOVATIVE SOLUTIONS

The horizontal outbound drain hole measured 160mm in diameter and was located below the floor of the gallery. This required a cavity in the gallery floor and a recess in the downstream gallery wall to be cut out to make room for the drilling gear. Along with this tight fit DecoTEC also had to ensure that the appropriate fall was maintained along the entire 18metre length of the hole.



Figure 5 – 160mm Diameter Drain Hole