



RCC Dams Design & Construction

Identify the need

Dams are critical infrastructure that provides essential water supply to communities for consumption, farming and industry, they often fulfill a role in terms of flood mitigation and are an essential component of any hydro-power project.

With this continuing need for dams comes the need for efficiency and technological advancement. Concrete dams have always had a place in the dams industry, however their competitiveness against other dam types was highly influenced by the high unit cost of conventional concrete and the time associated with construction. This led to the need for a faster and more economical means for construction of mass concrete – and so emerged RCC.

Respond to the need

The RCC method of construction, essentially involves placement of concrete using earthworks techniques. This enables vast volumes of concrete to be placed in a short amount of time, which brings about significant advantages in terms of both program and cost. The sand and aggregate for RCC can commonly be entirely sourced from site. RCC also typically has a reduced cementitious content compared to conventional concrete which offers further cost advantages, and technical benefits associated with limiting the heat generated as it cures.

RCC production rates have increased as the industry has developed and peak production rates around the world are now reaching towards 250,000 m³/month.

GHD has been involved at the forefront of RCC technology since its genesis. GHD designed and oversaw construction of the second RCC dam in the world, Copperfield Dam, in 1983. This has continued to this day, which is demonstrated by our ongoing involvement in major RCC dams worldwide.

GHD employs over 70 professionals in the dams industry and has been involved in the design, peer review and/or construction of over 50 RCC dams worldwide. GHD also contributes to the development of the industry via presentation of advancements as they emerge at national and international conferences.

Service offering

GHD offers the full suite of services associated RCC dam design, construction and operation:

- Dam site selection, hydrological analysis, options studies and concept design associated with determining project feasibility
- Geotechnical investigations and design
- Hydrological analysis
- Detailed design and tender documentation
- RCC mix design
- Hydraulic design and modeling
- Structural analysis and design
- Construction phase support
- Preparation of Operation and Maintenance Manuals and Dam Safety Emergency Plans
- Dam safety inspections and monitoring and surveillance analysis

Experience

Today we have a large dedicated dams team globally and the largest such team in Australia.

GHD has worked closely with clients to respond to their needs for new dams and upgrades. We have been involved in providing solutions to a number of challenging requirements on various projects. Examples of the RCC dam projects we have been involved with are below.



Enlarged Cotter Dam – Australian Capital Territory, Australia

The Enlarged Cotter Dam is the highest RCC dam built in Australia. The project included design and construction of a new RCC dam immediately downstream of the existing Cotter Dam to increase the storage capacity from 4,000 ML to 78,000 ML. The main dam is an 87m high RCC gravity dam, with a crest length of 330 m and 380,000 m³ of RCC. GHD undertook the concept design, site investigations, detailed design, aggregate investigations and RCC mix design, spillway design including computational fluid dynamic and scale physical modelling and overseeing of the dam's construction via the alliance framework.



Kinta Dam - Malaysia

The Sg Kinta Dam project consisted of the design and construction of a new RCC dam on the Sungai Kinta with a reservoir storage volume of 29,900 ML. The dam is a 90m high RCC gravity dam, with a crest length of 980 m and an RCC volume of approximately 900,000 m³. The spillway includes a reinforced concrete roller bucket at the toe of the dam. The scope of GHD's services included feasibility study and concept design, review of hydrology, design of the dam and all associated structures, quarry development, RCC mix design, tender phase assistance and construction supervision.



Miel 1 Dam - Colombia

Miel 1 Dam was a 190 m high RCC dam that was (at the time) the highest RCC dam in the world. GHD provided design advice and review services on behalf of the dam owner. GHD was the RCC specialist on the Review Panel for over six years. The group were responsible for ensuring a safe design, high quality construction, effective use of the latest technological advances and identification of potential cost savings. GHD provided on site advice for QA and special RCC and GERCC placing techniques. The 1,750,000 m³ of RCC was placed over a period of 23 months during which over 8 m of rainfall fell at the site.



Cadiangullong Dam – New South Wales, Australia

GHD undertook detailed design and provided technical advice during construction of Cadiangullong Dam. The dam is a 43m high RCC dam with a crest length of 356 m and involved approximately 120,000 m³ of RCC. Innovations included GERCC facing on the upstream face and downstream face of the dam, which was new technology for Australia at the time.



Tannur Dam – Jordan

GHD provided design review and construction supervision services for Tannur Dam. It was the first RCC dam to be constructed in the Middle East and is situated in the desert area with extreme weather conditions and limited water supply. It is a concrete gravity dam approximately 60 m high and has a storage capacity of 16,800 ML. GHD undertook a design review, together with others on the review panel, which led to significant cost savings and improved design details. The review included a thermal structural check.



Copperfield Dam – Queensland, Australia

Copperfield Dam is a 40m high gravity dam containing 140,000 m³ of RCC and 16,800 m³ of conventional concrete. The spillway is lined with a 600mm layer of un-reinforced conventional concrete placed over the RCC. Copperfield Dam was the second RCC dam constructed in the world and included several industry innovations. The dam was designed initially as an earth rockfill structure, and redesigned in RCC to enable 18 months to be retrieved from the construction schedule.



Ralco Dam – Chile

Ralco Dam was Chile's second major RCC dam and GHD provided design guidance and construction advice on both projects. The dam is 155 m high and contains 1.5 million cubic meters of RCC. The project involved the world's first RCC vacuum chute (45 degree downslope high speed conveyor system). GHD successfully introduced GERCC to the project to serve as the impervious barrier and facing system upstream. GHD technical advice on the RCC mix design also enabled progressive cement reductions during construction with significant cost benefits.

To contact our dams service line professionals, visit www.ghd.com/dams

