

# Ground Androring and Dam Strengthening

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# 5 Continents. 53 Countries.

DYWIDAG has extensive experience locally and globally delivering dam projects.

As one of Australia's largest manufacturers and suppliers of specialist ground support DYWIDAG's focus is on supplying cost competitive solutions. In Australia we have recently worked on Dumaresqu Dam, as well as Paradise Dam, Rookwood Weir, Avon Dam, Hume Dam, Rowallan Dam, Cotter Dam, Jindabyne Dam and Devils Gate Dam.

# **Our foundation**



DYWIDAG has a long history globally with dam anchoring, and monitoring systems which have been used for over 40 years. Our US GT team published papers in the Association of State Dam Safety Officials in 2015 and 2009 ASCE Geotechnical Publication 2009 on the benefits of long-term force monitoring of ground anchors used in Dam Rehabilitation Projects. DYWIDAG was part of the successful completion, incl. design detailing of the anchor program with 90-0.6 anchors length 98m at the Seven Mile Dam in Southern British Columbia Canada.



# **Manufacturing facilities**



DYWIDAG's local manufacturing facilities in Newcastle NSW, are supported by our strategically located facilities around the world and global supply chain.

Our enablers are the right locations, valuable assets, processes and maintenance regimes. DYWIDAG's Australian team are specialists in anchor fabrication with our factory based in Newcastle, Australia, or on site.

DYWIDAG is experienced in design detailing, anchor fabrication, grouting and testing procedures with experienced dedicated supervisors and QA managers. We have supplied projects with pre-grouted anchors and have conducted field fabrication of anchors in an onsite factory



#### **Strand and Threadbar Anchors**

DYWIDAG DCP strand and bar anchors are designed for 120 year life with the bar anchor having TfNSW approval – B114 and B113 while the strand anchor system is pending approval. Anchors are available in range of lengths, capacity and sizes.

# **Dumaresq Dam, Australia**

υ N I T DSI Group HQ Operations, Munich, Germany

цосатіол Nepal

TIMELINE 2019-present

sсоре Supply

OWNER Nepal Electricity Authority, Kathmandu, Nepal Dumaresq Dam was the first major water supply in Armidale NSW built on Dumaresq Creek in 1897.

The wall is a concrete gravity dam with the right abutment flanked by an earthen embankment. The dam does not meet modern day safety criteria and poses a risk to downstream properties in the event of a flood.



#### **Dam reinforcement with DYWIDAG Anchors**

This project will ensure the stability of the dam wall and ensure the dams continued use as a recreational area. The dam wall will be tied into the rock below using post tensioned reinforcing bars which will minimise any change in the appearance of this historic structure.

DYWIDAG supplied a total of 60 x 47mm WR & 57mm high tensile pre-grouted DCP Threadbar anchors up to 40m in length, to AS 4672. The DCP Threadbar anchors supplied are permanent with a design to last over 120 years.

DYWIDAG is providing 24/7 monitoring of 16 anchors (14 crest and two at the toe) which was presented on DYWIDAG's Digital twin IOT platform Infrastructure Intelligence.

### Seven Mile Dam, BC, Canada



DYWIDAG has expert experience by successfully supporting and supplying to many challenging projects, in respect of the highest safety standards.

The Pend d'Oreille River in the southeastern part of British Columbia, consists of a gravity dam (approx. 70 m high) with power intakes in the present river channel near the right bank and a spillway on the left bank.

The four unit powerhouse is located immediately downstream of the power intakes. BC Hydro planned to improve the dam to reduce dam safety risk. 90-0.6" DYWIDAG Restressable Double Corrosion Protected Multistrand Anchors (using micro-wax and extruded PE sheathing for corrosion protection of strands) with a length of 98 m each were designed, supplied, installed and successfully tensioned





# **Oroville Dam, USA**

р кор ц с т s DYWIDAG Threadbar anchors

#### UNIT DYWIDAG-Systems International USA Inc., BU Geotechnics, USA

location USA

sсоре Supply Roanoke Rapids Dam is approx. 930m long dam with 24 radial gates and a maximum height of approx. 22m and has been operational since 1955. The power plant adjacent to the dam includes four propeller type turbines generating up to 104MW.





#### Context

DYWIDAG played an integral part in the remediation of Oroville Dam in the US.

In 2017, the wettest winter in 100 years resulted in extremely high water flow resulting in erosion to the bottom of the weir and the possible collapse of the spillway gate. Issues with the spillway required an emergency response causing the evacuation of 180,000 residents.

#### **Solution**

DYWIDAG was part of the emergency recovery team. DYWIDAG produced and supplied 7096 epoxy coated DYWIDAG THREADBAR® 36mm anchors in varying lengths 4.6m – 7.6m long. DYWIDAG anchors were also used for the anchoring of the concrete slab

#### **DYWIDAG Monitoring Solutions**

From the steel in DYWIDAG's first bridge in 1903 DYWIDAG has been known for quality, safety and reliability.

Today we are continuing this legacy with our focus on infrastructure intelligence and extending the life of ageing structures.

DYWIDAG continues to support asset owners with rehabilitation and strengthening of aging assets while also providing monitoring and the presentation of this data on Infrastructure Intelligence for every phase of an asset's life.





#### Smart Anchor records changes in force, showing actual load fluctuations.

- Deliver an integrated view of the structure and connects to DYWIDAG's smart IoT system.
- Monitors live loads upon installation.
- Provides constant monitoring, detailed analytics, and reporting. alterations.



# The DYNA Force<sup>®</sup> System allows the permanent monitoring of post-tensioning forces in steel tendons.

- Using magnetic permeability of steel in a magnetic field to measure changes in the stress condition of the steel.
- Each DYNA Force<sup>®</sup> Sensor is fitted with an integrated temperature sensor in order to automatically compensate the influence of possible temperature alterations.



### Monitor your dams located anywhere, from anywhere

- Cloud-based software, accessible from any connected device
- 24/7/365 service
- · Simple and intuitive platform





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