# The British Dam Society

## EVENING MEETING

**Monday 27th April 2020 at 6:00pm**

One Great George Street, London (Nearest tube: Westminster)

## Annual General Meeting followed by:

# Early Behaviour of Concretes in Large Dams

Dr. Quentin Shaw, ARQ

**For brief presenter biography see overleaf | Admission free | Teas available from 5.30pm**

This meeting will be streamed live on the internet. For more details, including enjoying the live stream as part of a group at one of our Regional Hubs around the UK, please visit the meetings page on the BDS website: www.britishdams.org
For more information please contact the ICE on 020 7665 2147 or email: societyevents@ice.org.uk

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## Synopsis

Surface gradient and mass gradient thermal effects have always substantially complicated the design and construction of large concrete dams. Despite generic rules of thumb and systems to control allowable thermal gradients being developed largely empirically during the early to middle part of the 20th century, consequential cracking was relatively common in large concrete dams.

With the development of Roller Compacted Concrete (RCC), a renewed focus was placed on the thermo-mechanical behaviour of concrete during the early hydration heat development and dissipation cycle and advances in thermal analysis systems additionally enabled improved modelling of temporal temperature distributions. The thermo-mechanical behaviour materials models often subsequently used, however, failed to replicate actual behaviour, sometimes producing a significant misinterpretation.

Through back-analysis of RCC and particularly RCC arch dams, a picture of the actual early thermo-mechanical behaviour of concrete was progressively developed, identifying different behaviour for different concrete compositions and particularly different cementitious materials and supplementary cementitious materials. The key behaviour parameter was defined as a stress-relaxation creep (SRC).

The related findings have implications across all types of large-scale mass concretes and impact the way in which we should think of concrete materials and structural composition and even how we should approach mix design for mass concrete.

In his lecture, Quentin Shaw will discuss the early behaviour patterns observed in different concretes and how these influence the consequential structural behaviour and the associated design requirements for dams. He will subsequently illustrate how this principle will influence the selection of cementitious materials and the optimal processing of aggregates, etc, to improve the behaviour and increase the predictability of mass concrete thermo-mechanical performance.

## Presenter Biography

Dr Quentin Shaw is a Director with ARQ Consulting Engineers, South Africa. Quentin has worked on over 150 dam projects in 32 countries, including 41 new dams (the highest being 275m) and the rehabilitation or raising of a further 15. Quentin's particular specialisation is concrete dams; RCC and CVC and his greatest interest lies in arch dams. Quentin has been responsible for significant pioneering work in RCC arch dams and, on a smaller scale, rubble masonry concrete arch dams.

Pursuing his interest in the early thermo-mechanical behaviour of different concrete materials, particularly in arch dams, Quentin completed a Master's degree by correspondence through the University of Brighton (UK) and subsequently, a PhD through the University of Pretoria. This work culminated in an improved understanding of the early behaviour of concretes, and particularly RCC, in dams, which has subsequently been incorporated into the latest ICOLD Bulletin on RCC dams.

Quentin currently serves as Chairman of SANCOLD, Vice-Chairman of ICOLD's Committee on Concrete Dams and was Lead Author for ICOLD Bulletin 177 on RCC dams. He is a Fellow of the Institution of Civil Engineers (UK), a Fellow of the South African Academy of Engineering and received the ICOLD Innovation Award in July 2018. Quentin has published more than 60 technical papers on dam engineering topics.