

Personal best

Michael Rogers is the President of the International Commission on Large Dams (ICOLD). Here he kicks off a new series of articles in *IWP&DC* where members of the industry list their top ten memorable projects

MY CAREER AS A dam engineer started in June 1979. Nearing the end of my freshman year in Civil Engineering at Illinois Institute of Technology (IIT) in Chicago, Illinois, US, my father quietly took me aside to explain the high cost of higher education. "I covered you during the first year," he said "but moving forward, you need to do your part. I suggest you look for a part-time or Co-Op (co-operative education) job." That is exactly what I did. The Co-Op Department at IIT sent out my brief and insignificant resume to more than 20 local engineering companies. Only one called me back - Harza Engineering Company. I had no way of knowing that this single step to help pay for my college costs would change my life forever. Harza - the company and the amazing people there - introduced me to the world of dams, which I had never even considered. I was hooked on dams! Now, nearly 40 years since my first introduction to the world of dam engineering, I offer My Top Ten Favourite Dams from my personal perspective and a very fortunate career.

Aswan (Old) Dam (Egypt)

The Old Aswan Dam was my very first overseas trip outside of the United States. The original Aswan (Low) Dam was built by the British about 1000km up-river from Cairo between



His fond memories of the Aswan Dam project would keep Michael Rogers excited about travelling the world to see dams and people from different cultures throughout his career

1899 and 1902. When completed, it was the largest masonry dam in the world designed to provide storage of annual floodwater for irrigation and water supply for the lower Nile region. Harza was studying the seismic stability of the masonry dam, so I spent three weeks in the amazing city of Aswan, Egypt. It was an eye-opening adventure and I was completely enthralled at the Egyptian culture and the warmth of its people. I fondly remember walking down the corniche in Aswan and drinking the local Karkade Tea. The fond memories of this

project would keep me excited throughout my career for opportunities to travel around the world to see dams and meet amazing people from all cultures. ●

Bear Valley (old) Dam (City of Big Bear Lake, US)

The Bear Valley (old) Dam is on my list of favorites because I was fortunate to spend 14 years as the Owner's Dam Safety Engineer for the "new" Bear Valley Dam during my time living in southern California. The 25m high Bear Valley Dam currently forms Big Bear Lake in southern California. Built in 1910 by the famous dam engineer, John Eastwood, Bear Valley Dam has provided water supply, irrigation and recreational benefits for more than 100 years. But that's not the whole story. Located 50m upstream and now submerged in Big Bear Lake is the original Bear Valley (old) Dam. Completed in 1884, the original Bear Valley Dam was an 18m high thin arch dam - the world's first arch dam. At that time, the dam was considered the "Eighth Wonder of the World" because it created the largest man-made lake in the world - and the arch dam design worked! I was always intrigued with the contrast in dam engineering shown at Big Bear where the changing times dictated two different types of dams in the exact same location. I think that if a new dam would be needed at Big Bear Lake, the modern approach in our industry would probably dictate a roller-compacted concrete dam structure. ●



Completed in 1884, the original Bear Valley Dam was the world's first arch dam



Guri Dam in Venezuela was the first dam Rogers worked on as an 18-year-old student at Harza

Daniel-Johnson Dam (Canada)

As one of the largest concrete dams in the world, the Daniel-Johnson Dam is both elegant and functional. Located on the Manicouagan River in Quebec, Canada it is on my Top Ten list because of its sheer beauty and iconic appearance. The

dam is a multiple arch and buttress structure with its engineering lineage back to the Eastwood dams in California early in the 20th Century. This 214m high dam was completed in 1970 for hydropower (2600MW) and water supply. Instantly recognisable, I like this dam because it represents the individual character of

all dams. When I talk with students and others about dams, I always make the point that each and every dam in the world is unique - they all have their individual names (like each of us) with their own appearance and character traits - both good and bad. For me, I see only good character in the Daniel-Johnson Dam. ● f



Hoover Dam - probably one of everyone's favourite dams but, the ICOLD President believes, it represents the daring nature of worldwide dam engineers

j Guri Dam (Venezuela)

Guri Dam is important to me because it was the very first dam that I worked on as an 18-year-old Co-Op student at Harza. I came into Harza with an assignment on the drafting table at a time when drawings were made with ink pen on mylar. Guri had been designed by Harza in the late 1950s as a 106m high (Stage I) concrete gravity dam with the provision to include a 56m high raise (Stage II) when additional funding would become available. With the growing domestic demand for electricity, the Guri construction moved directly from Stage I to Stage II. Dam raise projects would eventually become an important aspect of my career. My interest in dam raises can be traced back to the amazing engineering that went into what is still the largest raise of a concrete dam in the world at Guri Dam. I ended up transferring from the drafting table (I wasn't very good at drafting!) to the hydraulics engineering department at Harza and would spend the rest of my college Co-Op career working there on Guri and several other amazing dam projects from around the world. ●



The spillway incident at Oroville Dam gave Rogers the opportunity of a lifetime to be involved in one of the most amazing dam emergency response and recovery efforts in modern times

Hoover Dam (Las Vegas, US)

Hoover Dam is on my Top Ten List because it is probably one of everyone's favorite dams. Instantly recognisable, Hoover Dam is the iconic American project of the dam engineering profession. Originally known as Boulder Dam, Hoover Dam was designed by the US Bureau of Reclamation and built during a time of economic struggle in the United States by brave men and women, many of whom lost their lives. To me, Hoover Dam has come to symbolize the ingenuity of dam designers and the dedication

of dam builders. Hoover Dam represents the daring nature of the world-wide dam engineers to constantly innovate and push the profession to design ever-more creative structures to meet the needs of water supply, power and flood control for billions of people around the world. ●

Oroville Dam (California, US)

Oroville Dam is the most recent addition to my list. The spillway incident of February 2017 gave me the opportunity of a lifetime

to be involved in one of the most amazing emergency response and recovery efforts in modern times for a dam. With the loss of a majority of the main service spillway, the California Department of Water Resources was faced with the monumental task to rebuild and strengthen the Oroville spillways in less than six months in order to prepare for the rainy seasons in the following fall.

I was asked to participate with this spillway recovery effort as the lead designer for the roller-compacted concrete work. Looking back at my work in 2017 at Oroville, I've never worked so hard (with so little sleep) over such a long period of time in my career. In the end, it was the most challenging and rewarding project of my career, and it was an honor for me to work with some of the best and most dedicated engineers, scientists, constructors and regulators in the world to complete this work on time to serve and protect the people of California. ●

Proserpina Dam (Spain)

An old Roman dam near Extremadura, Spain, Proserpina was probably commissioned by Cesar Augustus dating back to the 1st century AD. It was built to provide water supply to the city of Emerita Augusta. This dam is one of my favorites because it has lasted more than 2000 years serving as a key part of the regional infrastructure to provide water to people. It shows that with proper engineering, good construction and regular maintenance, the dams that we design and build today can continue to serve people of our world for many, many generations. ●



San Vicente Dam Raise won the American Society of Civil Engineers Outstanding Civil Engineering Achievement of 2017



The ICOLD President's excitement about the Three Gorges Dam is that it represents the new age of engineering and construction for dams being led by China

San Vicente Dam (San Diego, US)

I've had many wonderful opportunities during my career at Harza/MWH/Stantec. In the 1980s, I transferred to a small group called Special Projects that specialised in dam safety work. Part of the work in safety for dams was a new approach to construction called roller-compacted concrete (RCC). My experience as a designer of RCC projects led to increasing opportunities, which culminated in the role as Project Manager for the San Vicente Dam Raise Project. As part of the massive Emergency Storage Project in San Diego, California to provide storage of an emergency supply of water in case of catastrophic earthquake, the dam raise at San Vicente Dam was designed and built using RCC. This project became the largest raise of a concrete dam in the United States and the largest raise in the world using RCC. I was very proud to work on the Emergency Storage Project work for almost 15 years with the very talented staff of the San Diego County Water Authority in San Diego. It was an amazing opportunity and when complete, the Emergency Storage Project won the American Society of Civil Engineers Outstanding Civil Engineering Achievement of 2017. ●

Teton Dam (Idaho, US)

Located on the Teton River in Idaho (US), the Teton Dam suffered a catastrophic failure on June 5, 1976 during the initial reservoir filling stage of the project. A 94m high earthen dam, the structure took nearly eight years of planning, design and construction, but only eight hours to completely release the nearly-full impounded

reservoir at a maximum discharge rate of an estimated 57,000 cubic meters per second. The failure caused the deaths of 11 people and more than \$2 billion in damage. For me, Teton Dam is important because it reminds me that our work to design and build dams comes with a high responsibility and commitment to safety. We must always keep safety as our highest priority and always respect the solemn responsibility given to us to protect lives as well as to serve lives with the structures that we design and build. The failure of Teton Dam ushered in a new era for dam safety in the United States with new laws and regulations, including massive reviews of existing dams. I have no doubt that the lessons learned from the Teton Dam collapse served to improve the safety of countless millions of people around our country. ●

Three Gorges Dam (China)

The Three Gorges Dam could easily be on my list for the incredible comprehensive project that it is, including the largest hydropower generation plant in the world (22,250MW) with flood control protecting millions downstream and a very cool ship lift that looks like something from the future. My excitement about Three Gorges Dam, however, is that it represents the new age of engineering and construction for dams being led by China. In an era of Global Climate Change concerns and driven by a need to reduce carbon emissions with a growing population of more than 1.4 billion, China has turned to its abundant natural and renewable water resources to become the world's most prolific builder of dam projects for the last 25 years. This effort has trained some of the best designers and builders of dams in the

world. China is now exporting that technology to help support growing areas of the world that are also in desperate need of dams for economical and sustainable development of power and water projects to serve their own people, including the many emerging economies in Africa and Asia. ●

About ICOLD

Michael F. Rogers is President of the International Commission on Large Dams (ICOLD), which was founded in 1928 to provide a forum for discussion and for the exchange of knowledge and experience in dam engineering for engineers and others concerned with the development of water resources. Its objectives are to encourage improvements in dam engineering in all its aspects, and in all phases of the planning, design, construction and operation of dams and associated works.

With a present total of 100 member countries, ICOLD leads the profession in ensuring that dams are built and operated safely, efficiently, economically, and with a minimum environmental impact. For more than 30 years, ICOLD has been particularly concerned to enhance the profession's awareness of the social and environmental aspects of dams and reservoirs, and to broadening its perspective in such a way that these aspects receive the same attention and conscientious treatment as the technical aspects.