THE ENGINEERING OF WATER FEATURES

BY STEPHANE LLORCA

As cities are growing and transforming all over the world, the ambience of public areas is becoming important from the perspective of planners and residents alike. Water features and fountains make our cities more enjoyable. They introduce a sense of nature into the urban environment, providing people with a stronger connection to climate, natural cycles and personal fundamental needs. They enhance existing settings (such as parks, city squares) for social interaction, acting as a focal point that brings people into contact with one another and that sparks human connections, which are becoming increasingly rare in today's urban environments. Water feature designers develop new concepts and incorporate cutting edge technology to provide unique delights for citizens in the urban environment.

Water lies at the heart of society. When urbanization started on the banks of the Tigris-Euphrates river system some 3.300 years BC, it was soon clear that the control of water was a powerful tool that could accelerate development and was a strong symbol of civilization. Since then, our ability to control water has been constantly evolving and expanding.

Water feature designers utilise the fundamentals of fluid dynamics, set by early hydraulic engineers such as Darcy, Bazin and Manning, whilst adding some spice to these empirical calculations by way of the artist's poetic touch and the architectural understanding of spatial experience. Water feature design is an unusual field as it lies between hydraulic engineering, architecture and art. Each project is a

Figure 1. Le miroir d'eau of Bordeaux. Photograph Haut relief.

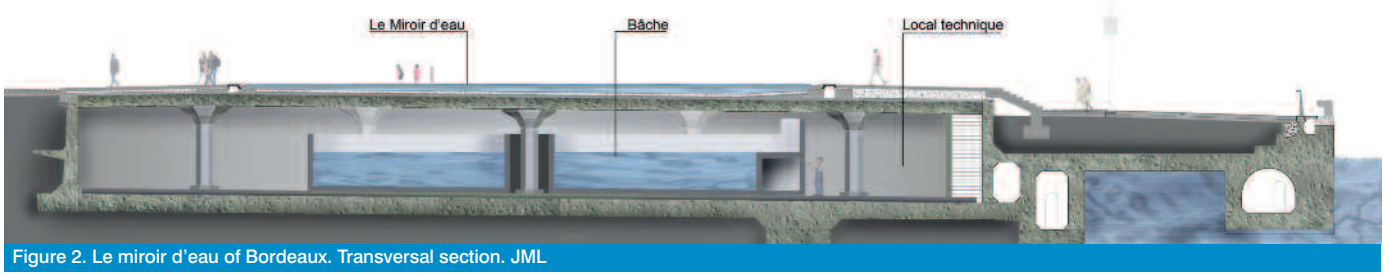

Figure 2. Le miroir d'eau of Bordeaux. Transversal section. JML

Figure 3. BHP Billiton water park, Perth . ARM/TCL/JML

comprehensive integration of ideas, design and techniques that may require complex technologies and computerized programing to create a water choreography, or it may take a more minimal approach and simply rely on the natural luminous and reflective characteristics of water.

Water feature design and installation in an urban environment faces a number of challenges:

- **Resilience:** A city environment can sometimes be harsh, and water features must be designed to weather these urban conditions, such as high levels of dirt, pollution and vandalism. For example, polluted water can damage even the most resistant materials by erosion or corrosion. Designers are continuously compelled to innovate, anticipate new problems and develop robust engineering processes.
- **Safety:** The system must be safe for users and operational staff. Children are naturally fascinated with water and tend to play near such systems and, from time to time, sample some of the water for drinking. For this reason, the majority of fountains are filled with potable water, whilst water treatment and filtration systems are also incorporated in order to constantly maintain a good water balance. The maintenance and cleaning of these features is crucial for long term operation. Special spaces must be designed to accommodate all the necessary mechanical & electrical systems and allow for regular cleaning and replacement.

Figure 4. Return pipes. Photograph JML

- **Sustainability:** Climate change is indisputably impacting our societies.
  Methods and strategies for saving water must be implemented in fountain systems and, although the water consumption of fountains when compared to a city's overall consumption is negligible, their visibility means they have a strong impact on the public perception of a city's water consumption and conservation.

As our cities and societies are constantly changing over time, so are fountains. A new generation of fountain has emerged over the last two decades; today's fountains are more interactive than the ornamental fountains of the past and the public is invited to engage, play and refresh. New dry-deck fountains mean that visible pools are no longer necessary, with the water jets surging directly out of the ground and the water gathered and recirculated in a closed circuit. The water is stored, when not in use, in an underground or hidden reservoir. This type of system offers greater flexibility for the use of public areas, or plazas as the space becomes available for other uses when the fountain is off.

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JML is one of the world's most dynamic water feature design companies, lauded for innovation, artistry and technical excellence.
Stéphane and his team are collaborating with the most prominent architects worldwide, always pushing boundaries and creating bespoke experiences.

The latest trend is now the so-called "miroir d'eau". Completed in 2006, the extraordinary water feature at Place de la Bourse in Bordeaux, France became a worldwide reference. The concept consists of reproducing a natural flood and was inspired by the San Marco "aqua alta" condition in Venice. In less than 5 minutes, the 3,000 m^2 of the Plaza is covered with a thin layer of water. This radically changes the perception and use of the Plaza, creating beautiful new perspectives by reflecting the surrounding classical architecture.
Soon after, the water disappears and is succeeded by an ephemeral cloud of fine mist that forms in the middle of the square, morphing and shifting in the wind, radically shifting the ambience of the square (Figure 1).
Water is stored in a large underground reservoir (Figure 2). It is brought to the surface using pumps to fill hundred small channels laid out underneath the flagstone before overflowing through the joints to spread over the entire surface of the plaza. Water quality is constantly monitored and the system includes an automatic water treatment and filtration system.

The project of Bordeaux has been a great success and is now being reproduced at different scales at various locations around the world. For example, in Perth, Australia, the recent transformation of Elisabeth Quays included a similar feature which adds more complexity as water depths can vary from 0 to 40 mm (Figure 3). This creates the possibility for a large variety of sequences and experiences, whilst a series of return pipes (Figure 4) with motorized valves can drain the feature in a matter of seconds. ■