

## London's Millennium Bridge

The dawn of the new millennium ushered in a mixture of excitement, trepidation and relief when January 1<sup>st</sup> 2000 appeared and the world remained the same. Although the fears associated with Y2K and impending millennial doom were proven to be unfounded, a sense of excitement was certainly found in major world centers such London, New York, Sydney and Montreal. Accordingly, massive building projects were undertaken to usher in the new millennium - according to the Christian calendar it should be noted, since for Jews, Muslims, Hindus and Buddhists, January 1<sup>st</sup> 2000 was a different day, year and month entirely - and London engaged in one of the largest, most impressive and arguably most controversial building projects to celebrate the new millennium. Seeking to understand the development of London's Millennium Bridge, this research paper will provide a brief description of the history and development of London's Millennium Bridge. Following this, we will provide a survey of the literature on the project, with a particular emphasis on the sustainability of the project today and into the future. A short analysis of the costs, benefits and risks associated with the project will follow and we will conclude with a broad overview of the issues studied with respect to one of the most controversial construction projects in London in recent memory, the building of the Millennium Bridge (Architects, 2000; Steves, 2006).

## **Brief History and Development**

Opening in the summer of 2000, London's Millennium Bridge was welcomed as an architectural wonder but also received its fair share of controversy in the initial days after its unveiling. As a steel suspension bridge which crosses the river Thames, London's Millennium Bridge provides a pedestrian link to the City of London and Backside. Competition for the erection of a major bridge began in earnest four years prior to the unveiling and was the subject of a competition created by the Southwark city council. With a total length of 235 meters, the winning entry was the "Blade of Light" design by architects Arup, Foster and Partners in conjunction with Sir Anthony Caro. This bridge received a fair bit of controversy, when after its unveiling the bridge reportedly rocked back and forth and scared pedestrians who were crossing it. It subsequently was nicknamed the Wobbly Bridge and was closed for two years following this unexpected occurrence. The following will chart the development of this majestic, yet controversial bridge.

Once a decision had been made as to would obtain the contract for London's Millennial Bridge, Blade of Light architects Arup, Foster and Partners in conjunction with Sir Anthony Caro began construction in earnest. While development began earlier, construction started in 1998 and continued up until

the official opening on June 2000. This was London's first new Thames crossing in more than a century and London's Millennial Bridge was built to the tune of £18m. Accordingly, nearly half of the funds were donated by the Millennium Commission. The specifications of the bridge included a total length of 330m, a width of 4m, a handrail height of 1.2m and the height above river at high tide standing at 10.8m. Created from concrete and steel piers with cables stretching 120mm of locked coil, the decking was in aluminum while the bridge's handrail was created from bead blast stainless steel (BBC, 2009). Opened by the Queen on June 10, 2000, the Millennial Bridge used

"lateral suspension" - an engineering innovation that allows suspension bridges to be built without tall supporting columns. The designers predicted it would be a "blade of light" across the Thames, "an absolute statement of our capabilities at the beginning of the 21st century". Within days they closed it to the public (BBC, 2009).

Closed for two years, the modifications undertaken between 2000 and 2002 reportedly cost a total of £5m (Hales and Gooch, 2004).

## Literature Survey

The British Broadcasting Corporation reports that after significant investment and a two year delay after the initial unveiling, London's Millennial Bridge is now open for business and sustainable for future. What happened on opening day in June 2000?

Some 80,000 people crossed the bridge on its opening day and those on the southern and central spans detected vibrations. The bridge began to sway and twist in regular oscillations. The worst of the movement occurred on the central span where the deck was moving by up to 70mm. The frequency of the oscillations increased, leaving people unnerved and unsteady (BBC, 2009).

As Dallard et al. determine in the Journal of Bridge Engineering (2001), the movement initiated on the bridge was pedestrian-induced and resulted in a lateral vibration. According to engineers Hales and Gooch, the combination of "low frequencies and low damping made the bridge susceptible to people-induced movement" (2004). While this project certainly wasn't sustainable after its initial unveiling, it appears on better footing today (Reaney, 2009).

### **Analysis of the Costs, Benefits and Risks**

From a purely financial perspective, London's Millennium Bridge cost much more than initially anticipated and had to deal with the unfortunate distinction of being referred to as the Wobbly Bridge. Closed for 2 years, two days after its first unveiling, London's Millennium Bridge ended up costing much more than initially thought. Accordingly, the adjustments made during 2000-2002 cost an additional total of £5m. Were the costs worth it? Well, London's Millennium Bridge remains an architectural marvel and remains the first bridge to cross the river Thames in more than 100 years. As a pedestrian-only suspension bridge London's Millennium Bridge was also an eco-friendly initiative which was at once warmly received by the public. The benefits to the City of London were initially overshadowed by the controversy surrounding the Wobbly Bridge. Risks were numerous and although engineers remained adamant that London's Millennium Bridge remained safe upon opening, due to public fear and misgivings, the Bridge was closed and underwent renovations for two years before eventually reopening. Despite the fact that experts argued that the risks were non-existent, an unwilling public ensured that the bridge be shut down and undergo serious modifications (Dallard et al, 2001; BBC, 2009).

### Concluding Remarks

As a major steel suspension structure created to usher in the new millennium and demonstrate the continued prowess of London and the United Kingdom on the world stage, London's Millennium Bridge was a steel suspension structure which promised to reinvigorate Bankside and provide a direct pedestrian-only connection to the city. Conceived of as "Blade of Light" slicing into the river Thames, London's Millennium Bridge turned out to be a bit of disaster despite the pomp and ceremony following its opening in June 2000. Nicknamed the Wobbly Bridge, London's Millennium Bridge will forever go down in infamy for the way in which it swayed over the Thames, overwhelmed by the thousands of feet making their way from Bankside to the city and vice-versa. As the bridge developers coyly admit on their website,

The bridge opened to the public on 10 June 2000 when an estimated 80,000 to 100,000 people crossed it. As with all bridge structures, the Millennium Bridge is subject to a degree of movement. However, when large groups of people were crossing, greater than expected sideways movements occurred. The maximum sway of the deck was approximately 70mm. In order to fully investigate and resolve this phenomenon the decision was taken to close the bridge on 12 June (Arup, 2009).

The Millennium Bridge was supposed to usher in a new era. Accordingly, the Millennium Bridge remains mired in controversy, largely due to its unfortunate introduction back at the dawn of a new millennium (Hollnagel, 2004).

## REFERENCES

- Architects of the new millennium. (2000). London: Images Publishing.
- Dallard, P. et al. (2009). London Millennium Bridge: Pedestrian-Induced Lateral Vibration, *Journal of Bridge Engineering*, 6.6, 412-417.
- Hales, C. & S. Gooch. (2004). *Managing Engineering Design*. London: Springer,
- Hollnagel, E. (2004). *Barriers and Accident Prevention*. London: Ashgate.
- Reaney, Patricia. (Nov. 6, 2005). "Why the Millennium Bridge wobbled". *New Sunday Times*, p. F20.
- Steves, R. *Great Britain*. (2006). London: Avalon Travel Publishing.
- The Millennium Bridge. (2009). *Arup.com*. Last Accessed August 22, 2009  
<http://info.arup.com/millenniumbridge>
- The Millennium Bridge. (2009). *BBC.com*. Last Accessed August 22, 2009  
[http://news.bbc.co.uk/1/hi/english/static/in\\_depth/uk/2000/millennium  
\\_bridge/default.stm](http://news.bbc.co.uk/1/hi/english/static/in_depth/uk/2000/millennium_bridge/default.stm)