

CASE STUDY

Design of harbours, docks and canals

LOCK GATE STRUCTURES

Controlling the water level in canals and harbours is key to their efficient operation. The lock gates used in most canals and ports are derived from a design made by Leonard Da Vinci in the early 1400s and the design concept has changed little since then. However traditional materials, like the large hardwood timbers, used in construction are becoming less available. Canals both in the UK and the rest of the world are also being regenerated. As sea levels increase, lock gates to ports are increasingly under pressure. All this means lock and dock gates will continue to be critical parts of the world's waterways for the foreseeable future.

Glasgow Caledonian University has extensive expertise in the design of harbours, docks and canals. A specialist area of interest is lock gate structures, with the university holding the international patent covering the gate design used for the Park Canal in Limerick.

Martin Cullen has undertaken a range of consultancy projects including the design of replacement dock gates in Hull and Belfast and acting as an expert witness for a contractual dispute over a dock gate in Middlesbrough. He has given consultancy advice on damaged dock gates in Sunderland, the Mersey, Barrow-in-Furness, Silloth, Maryport, Grangemouth and Workington. His work on the design of canal lock gates in Limerick introduced an innovative water retaining structure. His patented watertight gate allows traditional gate structures to function effectively by resisting increased sea water level.

Cullen has also patented a flexible gate which can be used as a back-up for existing dock or lock gates or as a flood barrier. The unique aspect of the system is that it is stored below ground when not in use. The pre-made units are placed in prepared foundations and then covered. When the system is needed, it is a case of lifting up the vertical supports and then pulling up the membrane. This award-winning design for a tension membrane water retaining structure is the basis for a university spin-out company, FLD Engineering.



FURTHER INFORMATION:

www.gcal.ac.uk/bne

Martin Cullen

School of the Built and Natural Environment
Glasgow Caledonian University
Cowcaddens Road
Glasgow, G4 0BA
0141 331 3544
m.n.cullen@gcal.ac.uk

SCHOOL OF THE BUILT AND NATURAL ENVIRONMENT

The School of the Built and Natural Environment at Glasgow Caledonian University is the largest of its type in Scotland and it is committed to delivering a set of the most modern, innovative and exciting academic programmes and business consultancy relevant to the natural and built environment. Its staff offer a high level of expertise across the entire spectrum of professional fields including (but not limited to) quantity surveying, building control, property development, building surveying, leisure facilities management, environmental sciences, construction innovation and management, interior design, fire risk engineering, waste management, building services engineering and civil engineering. They use this expertise in their delivery of the educational, research and consultancy programmes of the school.

Martin Cullen, a Chartered Civil Engineer, has particular expertise on lock gate structure. He gained extensive industry experience before starting his academic career. He worked for the Sir William Arrol Strategic Business Unit of Rolls Royce, a business which had wide expertise in the design and construction of dock gates and other large steel structures. Cullen is a member of the Institution of Civil Engineers (ICE) and a fellow of the Institution of Civil Engineering Surveyors. He chaired the Geospatial Engineering Board of the ICE for two years and acts as consultant for a number of projects. His research interests are in the areas of maritime engineering, ports and harbours, geospatial engineering and structural engineering.