



## The Wavy Walls of the Western Ring Route

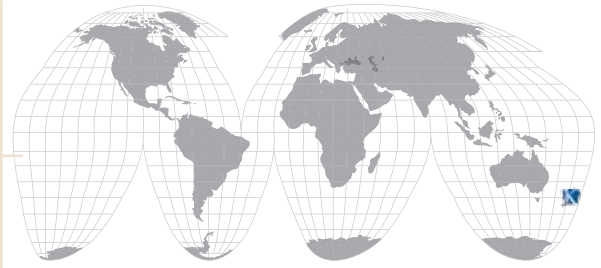
### New Zealand

When Jasmx Ltd. specified a unique, undulating face design for four structural retaining walls along a New Zealand highway project, it seemed like a tall order. But the adaptability of the Keystone Compac II and the technical expertise of the Keystone engineering and manufacturing staff turned this artistic vision into beautiful reality.

#### New Wave Design

The Western Ring Route is a 48-kilometre north-south highway project designed to ease traffic congestion and decrease travel time between the busy New Zealand cities of Manukau, Auckland, Waitakere, and North Shore. The multi-phase improvement plan was implemented to increase efficiency and support economic growth in this thriving metropolitan region.

High quality urban design has been a key emphasis of the project from the start. This includes the visual enhancement of fundamental structural elements such as bridges and retaining walls. Among the structures demonstrating this emphasis are four bridge abutments showing Keystone retaining walls in a distinctive fluid design—a pattern of continuous waves from top to bottom. This unusual design isn't your typical segmental retaining wall. In fact it's the first of its kind in the world and it took some creative engineering to pull it off.



**Project:** *Western Ring Route*

**Location:** *Waitakere, New Zealand*

**Keystone Product:** *Keystone Compac II*

**Licensed Manufacturer:** *Stevenson Keystone Ltd*

**Total Wall Area:** *3,000 square meters*

**Wall Contractor/Installer:** *ICB Construction*

**Urban Design:** *Jasmx Ltd.*





Original plans from primary contractor HEB Construction called for traditional Keystone Compac II units. Early in the project, Jasmx Ltd., Auckland, approached W. Stevenson and Sons, a Manukau, New Zealand Keystone licensed manufacturer, about the possibility of constructing the walls with an artistic undulating effect.

Jasmx provided a drawing, and Namir Asmaro, Engineer and General Manager of W. Stevenson and Sons, designed the required block modifications to match the plan in conjunction with Keystone engineering staff in the United States.

“We achieved the required result by making three different blocks, each a different shape, and by using some of the blocks upside down,” explains Asmaro.

The three blocks include one with a concave face, one with a convex face and one that forms a half-arc matching the curves of the other two blocks.

The wave pattern starts with a course that uses only the alternating concave and convex blocks. To continue the pattern, the course above uses only the half-arc blocks, with every other block placed upside down to form curves perfectly aligned with the blocks below. Wall construction continues in this way to form smooth rolling waves.

While the waves undulate continuously from the top of the wall to the bottom, the unique design of the Compac II units allows the wall to be built in a running bond pattern for maximum stability. The wavy blocks overlap to form a secure connection using Keystone patented, high-strength, fiberglass pins. This results in the continuous wave pattern in a wall with the structural integrity Keystone wall systems are known for.

The walls extend 400 meters on both sides of the two bridges. Maximum wall height is eight meters. The project used 3000 square meters of Keystone product. The walls are reinforced with Tennax HDPE geogrid and Heusker polyester geogrid.

### First of it's Kind

Producing blocks with the precise dimensions needed to meet both the look and performance requirements was a challenge, especially in the short timeframe given.

“From receiving the order to delivering the manufactured blocks, we only had ten weeks,” says Asmaro. “This included finalizing the mold design, making all the required modifications to the mold parts, having trial runs to check that the blocks could be used to get the required results, and manufacturing 3000 square meters of the three different blocks.”

Through the teamwork of W. Stevenson and Sons, Keystone engineering staff in the U.S., and Jasmx, the blocks were produced on time. Space limitations posed another challenge. “The distance between the bridge piers and the Keystone units was as little as 200 millimeters on a near vertical wall that is 8 meters high,” says Asmaro.

Despite the fact that the three-block wall design was the first of its kind, actual installation of the blocks was similar to that of other Keystone walls and therefore progressed quickly. Installer ICB Construction had no problem finishing on schedule.

The wavy wall project in New Zealand’s Western Ring Route shows that there’s a place for attractive design in even the most fundamental highway structures. It also demonstrates the almost unlimited design potential of the Keystone family of products.



For more information on the Keystone Compac II unit or other innovative Keystone products, please visit [www.keystonewalls.com](http://www.keystonewalls.com) or call 800-747-8971. Keystone Retaining Wall Systems, Inc. is a subsidiary of CONTECH Construction Products Inc.



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