The new moveable barrier system offers considerable enhancements on the original.

The shape of the Auckland Harbour Bridge and its approaches creates challenges to installing a moveable lane barrier. In most instances, moveable barriers are positioned on straight and flat sections of road. The 1020 metre bridge has a gradient of 1:20 and both its northern and southern approaches are curved. The bridge's 2.2 kilometre long barrier therefore has to have considerable flexibility to cope with this configuration.

The new barrier is made up of 2000 steel reinforced concrete blocks. At intervals along the barrier, 60 steel variable length units have been installed to absorb the geometric length changes in the barrier - not only does the barrier have to stretch or shrink as it is moved from one lane to another, the bridge itself expands and contracts with temperature changes.

Narrower than the original, and with vertical as opposed to shaped faces, the new barrier gives vehicles an extra 20 centimetres of lane space. This may not seem like much, but the lanes on the bridge are narrow and any extra width is appreciated by motorists - allowing them to travel more comfortably at speed and giving them a little more room for error.

The barrier also boasts a reactive tension system, which means less deflection upon impact. It absorbs more energy when hit, meaning less impact on the occupants of the vehicle and the barrier itself will move less into the adjacent lane when hit.

Martin Leak of Resolve Group, consultant to bridge owner NZ Transport Agency, and instigator of the original barrier 20 years ago, says the new barrier has been crash tested to both US and European standards (the European standard also includes buses). He says the new barrier, if hit by a car travelling at the speed limit of 80kph, would deflect as little as 300mm - a considerable improvement on the old barrier which would have moved around 600-700mm.

"Both the barrier and the barrier transfer machine have a much higher safety spec than the old system," he says.

The new barrier transfer machines were manufactured by Barrier Systems Inc in California, the same company that designed the original ones.

The technological improvements over the past nineteen years mean that the new machines are very sophisticated.

Like the originals, the transfer machines are fitted with a line of rollers running in an S-shape underneath the machine that pick up the barrier units, shifting them across a full lane width before placing them down on the road again.
"With the old machines, if you went too fast you'd end up with a 'bow wave' in the barrier in front of you until you got to a stage where you couldn't move forward," says Leek. "With the new machine, the transfer time has been more than halved from over 45 minutes down to 20, and we have done a transfer in just 12 minutes!"

This increase in speed is largely due to the size of the new transfer machine. At 15.5 metres they're 3.5 metres longer than the originals so the tightness of the 'S' of rollers underneath is less pronounced allowing the barrier to be moved faster.

The automatic guidance wires in the road (installed with the original barrier in 1990) allow the barrier to be placed in a consistent, accurate line. This in itself is further complicated by the shape of the bridge. Because the barrier is on a slope, when it is picked up gravity wants to pull it back down the sloping bridge deck. Electronically controlled capstan wheels on the transfer machine pull the barrier up the slope to counter gravity.

The new barrier machines are designed for flexibility and have adjustable front and rear wheels allowing them to move sideways in a crab-like fashion. This means they can perform variable-width shifts, whereas the old machines could only move the barrier one fixed width. What this means for the city of Auckland is that, in the future, the barrier and its tidal lane benefits can be extended further along the motorway, which has wider lanes than the bridge.

Other key improvements include:
- The life of the rollers has been extended from between six and nine months on the old machines to between three and five years on the new;
- Operator comfort has increased significantly as the cab is now fully insulated, reducing vibration and noise from both the engine and rollers, as well as that from adjacent traffic;
- Better quality rubber feet on the barrier improve its grip on the road surface;
- Reduced maintenance costs thanks to better hydraulics and electrical systems.

When originally installed, the life for the two barrier transfer machines was estimated to be seven to 10 years. In actuality, they have seen 19 years of shifting 20 tonnes of barrier at a time every day before, finally, the maintenance costs outweighed the expense of new machines.