

## Extra-Large Shock Absorbers Keep Ship Lock Intact Despite Collision

A wooden safety beam, which helps sailors maneuver their ships into a ship lock in the Netherlands, recently cracked after a cargo ship collided with it. But despite some splintered wood, the overall structure survived the accident—thanks to some extra-large ACE shock absorbers that had been custom-designed and installed on the lock gate as a safety measure.

Here's a look at how the oversized safety shock absorbers—capable of stopping 4,000-ton cargo ships—are key to protecting the lock gate and ensuring the safety of the ships passing through.

### Like Navigating A Tight Parking Spot

During the design phase of the ship lock system, Dutch construction and steel company Mourik Lumburg had to take into account the fact that ships may touch the safety beam while navigating into the lock. The action resembles the way a car, as its driver navigates a tight parking spot, might tap the car next to it. But with loaded vessels weighing up to 4 million kg and traveling at 0.5-m/s speeds, the gate would need to withstand a considerable amount of force. Should the gate become compromised in any way, water could rush in or out of the lock in a dangerous, uncontrolled way. Another factor to account for was the potential for water hammers, or sudden shock waves.



*More than 2-m long and weighing in at 320 kg, the special ACE shock absorber features a fixed stop and stroke of 800 mm.*

Mourik technical experts needed large, heavy-duty shock absorbers that could protect the gate—enabling it to withstand the powerful ship- and water-induced forces regularly encountered in the lock. They approached ACE Controls for a solution.

### **An Extra-Large Solution**

ACE technical experts calculated that the shock absorbers would need to withstand 500,000 Nm of energy—requiring a customized design. Weighing in at 320 kg, these special oversized shock absorbers feature a length of 2,649 mm, outer diameter of 200 mm and stroke of 800 mm. During the breaking process, the piston rod pushes into the cylindrical body. Simultaneously, hydraulic oil in the front of the piston is displaced through the throttle openings.

This deceleration process—which occurs almost instantaneously in ACE miniature shock absorbers—requires roughly 3.5 seconds to cover a 1-m stroke.



*The ship lock's safety beam after a cargo ship had collided with it.*



*ACE oversized safety shock absorbers protect the lock gate by stopping 4,000-ton vessels.*

To return to their original position, the shock absorbers work in a similar way as nitrogen-filled industrial gas springs. Collected in a gas accumulator, the oil displaced by the piston rod is returned—pushing the piston rod back to its starting position.

### **Reassembling The Ship Lock**

After the collision in the Netherlands ship lock, engineers installed a new beam on the gate—a process that required temporary disassembly of the shock absorbers. During this process, ACE technical experts were on hand to provide the repair team with all the necessary support on how to remove the dampers, empty the nitrogen from the inside and then reinstall them once the repairs were completed. Thanks to these extra-large components, the ACE and Mourik teams are confident the ship lock will continue to operate safely for many more years.

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