ANGLES, VELOCITY AND MOVEMENT

Claims for damage caused to berthing structures in ports and terminals can present a range of different challenges. The support of an experienced marine civil engineer can often make the difference in managing the claim efficiently and cost effectively.

While berthing structures take many different forms they are damaged by the same common causes. Whether we're looking at the fenders or the berthing structure be it a dolphin, sheet pile, blockwork quay, or a suspended quay, damage is generally caused by ship navigational errors, manoeuvring errors, movement of moored vessels, excessive speed or non-parallel approaches during berthing.

In the past 40 years globalisation and the growth of world trade has resulted in ports being busier than they have ever been, and ships considerably larger. For example, the largest container vessels are now 500% bigger than they were in the early 1980's. Mixing these ingredients together, it's perhaps not surprising that we continue to experience a fairly high frequency of claims for damage to berthing structures.

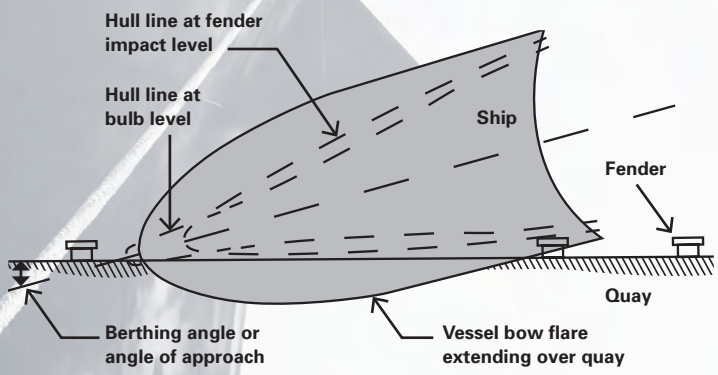
Berthing angle and velocity

Most marine structures are constructed to internationally recognised standards in many parts of the world and the standard that is applied is BS6349 (The Code of Practice for the Design of Maritime Structures). This takes account of the size and manoeuvrability of the berthing vessel to calculate the forces imparted into the berthing structure, but the fact remains that fenders should be the only point of contact with the marine structure.

There is no doubt that when the ship and berthing structure come together it's a complete mis-match. Large vessels have a huge mass, often many hundreds of thousands of tonnes, and even with the very slow speeds this leads to huge forces. Mark Ball, Marine Civil Engineer with Integra Technical Services points out that "more often than not the damage is caused by the bow of the vessel striking the berthing structure. The stem and bulbous bow are extremely strong, and high contact forces result from the small impact area."

Stern impacts generally result in a larger contact area but can involve huge forces. A large vessel may have momentum and whilst she may just 'lean' on the fender, the force involved can cause overloading and displacement of the fender system and damage to the supporting structure.

Keith Charles, Marine Civil Engineer with Integra Technical Services, suggests that "most berthing structures have individual, discrete fenders at designed spacing or locations to take account of the geometry of the vessels using the berth, the maximum angle of approach and the velocity."



Increased berthing angles expose berth to bow (and stem) flare

Generally, fenders assume a berthing angle of 5-10% which means that vessels berthing at greater angles can lead to contact with the berthing structure or its topside facilities which are necessarily close to the edge of the berth. And often the contact between the bulbous bow and the berthing structure is below water line. As Mark explains "a bulbous bow can easily penetrate a reinforced concrete blockwork or sheet pile wall, or caisson or completely detach a supporting pile, with minimal damage to the vessel itself."

The speed at which ships should approach a berthing structure is calculated using a specific formula, but generally 0.15m/s is the most common berthing velocity for large vessels berthing inside a port basin using a tug. Just to put this into perspective the average person walks at 10 times this speed. When vessels exceed the speed the potential for damage increases exponentially with the rise in velocity. Mark explains "fenders are designed to absorb some contact but when the impact exceeds these thresholds the impact energy is passed into the berthing structure."

Repair costs

Keith feels that "the extent and cost of the damage to the berthing structure frequently confounds the Shipmaster, who will often refer to normal or slight contact and little, if any, damage to the vessel." There are many reasons for this, not least that the cost of repairs to marine structures is always significantly higher than similar works on dry land. Access can be difficult, works are required to be to a higher standard to avoid corrosion and specialist marine equipment such as fenders, loading arms, etc. are expensive. And, if the damage is underwater, or the repair requires the use of floating plant, then the costs will most certainly be considerable.

The other key consideration is the loss of use, as even the smallest of damage to a berth can severely restrict operations in the port. "Most underwater repair works are technically complex, take a long time to execute and are costly to supervise. For example, underwater welding is slow and requires a dive team that has a minimum of three divers (one in the water, one fully dressed standby safety diver and one tender). However, more often, four or five divers are required by company procedures to carry out a weld that would be undertaken by one man on dry land" explains Mark.

Involve experts

All too often a claim is initially reported in a way that leads the Port's Insurer or the vessel's P&I Club to assume a low claims reserve and a local, less experienced engineer is then engaged to assess the damage and design the repairs. This, more often than not, will lead to a more expensive solution.

Keith suggests that "a Marine Civil Engineer that has experience of berthing structure damage and repair can bring pragmatism to the repair. Sometimes the Port might be looking toward a complete replacement when there are other effective and cheaper options." Also, occasionally the Shipmaster will contest that they have caused damage and having someone experienced and able to interpret VDR (Vessel Data Recording) or AIS (Automatic Identification System) data to plot the vessels path can help resolve these types of dispute.

Mark Ball and Keith Charles are part of Integra Technical Services' Marine Practice. Between them Mark and Keith have over 30 years of experience of investigating vessel damage to structures and have investigated in the order of 700 incidents worldwide.