

**Report of the Investigation
of the crushing and subsequent death
of a bargehand between the**

**tug *Willem-B sr* and the
bottom dump barge, *R8***

**at Nab Tower Dumping Grounds
on 6 June 1999**

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The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 1999

The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the causes with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame.

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ABBREVIATIONS AND ACRONYMS

BST	-	British Summer Time
CITB	-	Construction Industry Training Board
EEC	-	European Economic Commission
ETA	-	Estimated Time of Arrival
GMDSS	-	Global Maritime Distress and Safety System
GPS-DGPS	-	Global Positioning Satellite- Digital GPS
GSM autotelephone	-	Type of mobile telephone
ICSTCW 1978	-	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978
IOW	-	Isle of Wight
m	-	metre
MCA	-	Maritime & Coastguard Agency
MRCC	-	Maritime Rescue Co-ordination Centre
SI	-	Statutory Instrument
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency
VTS	-	Vessel Traffic Separation



SYNOPSIS

This accident was notified to the Marine Accident Investigation Branch (MAIB) by the Maritime Rescue Co-ordination Centre (MRCC) Solent at 0600 on Sunday 6 June 1999. The investigation started later that day.

The tug *Willem-B sr*, together with bottom dump barges *R8* and *R9*, had been engaged in dredging operations in Emsworth Harbour. The usual operation is for the barge to be loaded with dredging spoil in the yacht harbour, moved into the outer harbour, and then “hipped” on to *Willem-B sr*. The tug and barge then move out of the harbour into the Solent where the barge is released from the hipped position and towed astern of the tug. During the tow, no personnel are on board the barge. On arrival at the dumping ground, the tug moves alongside the barge and the bargeman transfers to the barge. Once on board, he makes preparations to open the bottom doors and dump the spoil.

With the barge empty, the tug comes alongside and the bargeman transfers back on to the tug for the passage back to harbour.

On this occasion, the force 3 wind and a 1½ metre swell were causing both tug and barge to roll. At about 0115 the bargeman, while waiting for a suitable opportunity to step from the rubbing strake of the tug on to the barge, was crushed between the tug and the barge. The tug deckhand immediately placed the bargeman on the deck of the barge, and shouted to the tug master what had happened. The tug master, after confirming what had happened, called the coastguard, telling them of the accident and asked for assistance.

The coastguards, after discussing with the tug master the probable extent of the injuries and the tug’s position, advised the tug to make for Bembridge where they would arrange for the lifeboat to meet them. At about 0220, the lifeboat crew boarded the barge and, after examining the casualty, arranged for a helicopter lift to hospital. The helicopter arrived on scene at about 0300, the casualty was lifted off at 0330 to Haslar Hospital in Gosport.

Once the casualty had been air lifted, the lifeboat returned to Bembridge and the tug and barge to Emsworth where they arrived at about 0530.

Despite considerable attention by both lifeboat crew and helicopter winchman; a paramedic, the casualty died on the way to hospital.

SECTION 1 - FACTUAL INFORMATION (all times British Summer Time (BST))

1.1 PARTICULARS OF VESSEL & ACCIDENT

Name	:	<i>Willem-B sr</i>	<i>R8</i>
Official No	:	2280	--
Port of Registry	:	Zierikzee Netherlands	--
IMO Number	:	--	--
Gross Tonnage	:	42	--
Overall Length	:	17.85m	26.1m
Breadth	:	5.05m	5.4m
Maximum Draught	:	2.60m	2.4m
Year of Build	:	1977	1967 Converted 1996
Type	:	Motor Tug	Bottom dump barge
Main Engines	:	CAT 3412C DI-TA 545kW	None
Propulsion	:	Single screw in Kort Nozzle	None
Owners	:	W Bouwman Schuddebeurs Holland	Herbosch- Kiere Ramsgate Kent
Classification Society	:	Bureau Veritas	None
Date and Time of Accident	:	6 June 1999, about 0145 BST	
Place of Accident	:	Nab Tower Dumping Grounds	
Injuries	:	Crush injuries to bargeman resulting in death	
Damage	:	None	

1.2 BACKGROUND

Willem-B sr is owned by W Bouwman, and is operated by the owner/master. The vessel was built in the Netherlands and operates with a crew of two; a master and a deck rating. She is licensed to operate in coastal waters and carries a Netherlands' Certificate of Seaworthiness for the restricted trading area. This certificate was issued on the 15 January 1996 and is valid until 1 February 2001.

R8 is a converted river dumb barge used to convey dredging spoil from the dredging site to the dumping ground. She is fitted with two sets of hydraulically operated, bottom dumping doors, and a diesel driven, hydraulic power pack. She has no electrical power or accommodation. She has previously been used in inshore dredging work in Lowestoft and Ramsgate Harbours.

The dredging operation was carried out under the terms of the head contract between Emsworth Yacht Harbour and Land & Water Services Ltd. This contract covered maintenance dredging in the marina and the disposal offshore of the dredge spoil. Land & Water subsequently concluded a sub-contract with Herbosch-Kiere for the transportation of the dredged materials to the dumpsite. Herbosch-Kiere concluded a contract with W Bouwman Marine Services that the tug "*Willem-B sr*" would supply the requisite tug services. Land & Water carried out all the dredging operations in Emsworth Harbour."

The normal practice is to leave the mooring buoy at Marker Point, Chichester Harbour, with a loaded barge for the spoil dumping grounds about four hours before high water. The barge is towed to the Nab Tower dumping grounds where the barge contents are discharged. The tug and barge then return to the mooring buoy, aiming to re-enter Chichester Harbour at high water.

1.3 NARRATIVE

- 1.3.1 On 5 June 1999, at 2000, *Willem-B sr* came alongside "B" berth at Northney Marina, Hayling Island, to fill the vessel's fresh water tanks. It was about 4 hours after high water with the wind about force 4 from the south-west. Three people were on board: the master, Wouter Bouwman; the mate, Djai Wilkens; and the bargeman, Leon Danton. Once alongside, Mr Danton was given permission by the master to go ashore to watch a televised football match in a local pub. He was told that he must be back on board by about 2330 as they were due to take a barge out to the dumping ground later that night.

The master, after watching football for about 30 minutes, went to bed at about 2045 setting his alarm clock for 2330. The mate also watched the football before going to bed at about 2215. At about 2335, the master, having been woken by his alarm clock, left his bed and went to the wheelhouse to start the main engines. The mate had also heard the alarm, and went on deck to wait for Mr Danton and to release the mooring ropes. Mr Danton arrived back on board at this time, changed into his working clothes and joined the mate on deck. Both men then released the mooring ropes and the tug proceeded from Northney Marina towards their

mooring buoy at Marker Point. During the passage from the marina to the buoy, both the mate and Mr Danton remained on deck discussing the football match.

As the tug rounded the corner and entered the Emsworth Channel, the master estimated that the wind speed was about 14 knots from the south-west. The sea surface was rippled and the tide was flooding.

The multi-workboat *Task One*, is usually secured to the working buoy at Marker Point with the loaded barge moored on her starboard side and the empty barge on the port side. *Willem-B sr* arrived at the buoy at 2350 and moored alongside the starboard aft side of the loaded barge.

- 1.3.2** On the way up to the buoy, the master had called the Portsmouth harbourmaster for a weather forecast and had been told that the wind outside or around Nab Tower was about 10 knots, south-south-west. Based on the wind that he was currently experiencing on the way to the buoy, he felt that this report was not entirely accurate, and so he called the master of *Task One* on Channel 17, told him of the Portsmouth harbourmaster's advice, and asked for his opinion. *Task One's* master agreed that the wind force seemed a bit low and suggested that Vessel Traffic Separation (VTS) Southampton should be consulted.

Southampton VTS said that the wind speed was 5 knots, south-westerly. With both the master of *Willem-B sr* and *Task One* still not satisfied, Solent Coastguard were called for a further check. They advised 1-2 knots, south-westerly. Although the master of *Willem-B sr* felt that the wind was stronger than that suggested by either the harbourmaster, VTS Southampton or Solent Coastguard, it was felt that the wind speed was still low enough to allow the dumping operation to go ahead as planned.

- 1.3.3** On arrival at the mooring buoy, Mr Danton had boarded the loaded barge from *Willem-B sr*, and had secured the spring, head and stern rope from the tug to the barge, ready for the hipped tow. Once this had been done, the mate went below to carry out his usual check of the tug's main engine and auxiliaries before they left the mooring buoy. This took about 15 minutes. On returning to the deck, the mate laid out the stern tow rope ready for the transfer of the barge from the hipped position to the normal stern tow position. During this period, Mr Danton remained on the barge. With the loaded barge secured alongside and the stern tow rope laid ready, *Willem-B sr* left the mooring buoy at about 2350-2355 and made her way down the Emsworth Channel to Chichester Harbour entrance and the Eastoke Beacon. On departure, the tug's draught was 2.55m aft with the barge's draught aft about 1.68m. The barge is always loaded slightly deeper aft. On arrival at Eastoke Beacon, Mr Danton, who was still on the barge, released the stern rope, the spring and finally the head rope. Once the head rope had been released, Mr Danton moved forward to the bow of the barge to wait for the tow rope. *Willem-B sr* also moved forward up the starboard side of the barge and, when her stern was level with the bow of the barge, the eye of the tow rope was passed over to Mr Danton. After this had been dropped over the forward tower bollard, Mr Danton reboarded *Willem-B sr* at her stern.

With the barge now being towed astern, both the mate and Mr Danton removed their outer working clothes and joined the master in the wheelhouse for the 1-1¼ hour passage to the Nab Tower dumping grounds.

- 1.3.4** During the passage to the Nab Tower, the wind was about 5 knots from the south-west with a swell of about 1-1½m. At about 0140, four minutes before arrival at the dumping grounds, Mr Danton and the mate went below to put their working clothes back on before going out on deck. Once dressed, with Mr Danton in an orange waterproof overall and lifejacket, both men stood on the port side, by the wheelhouse door.

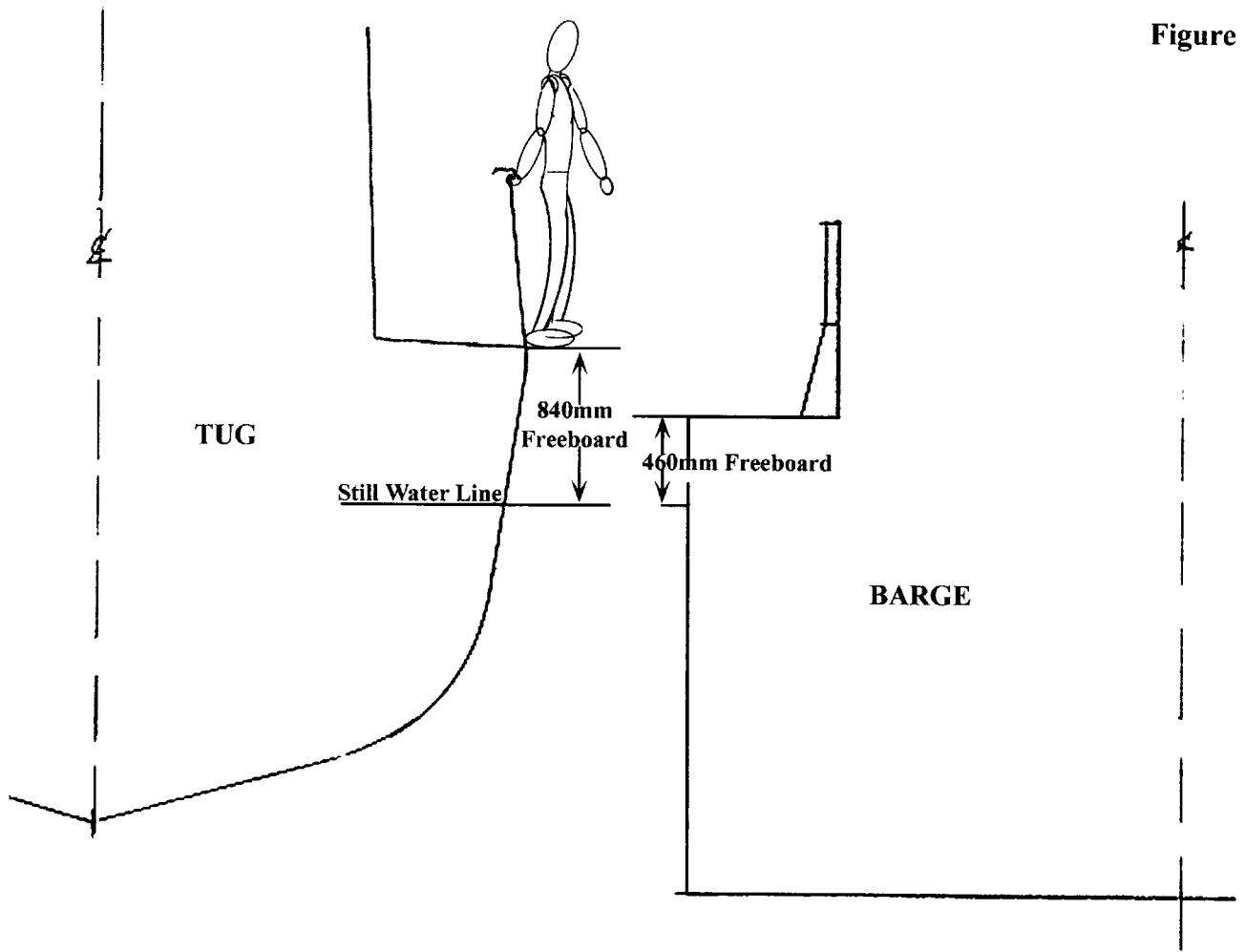
Having turned the tug and barge through 180° so that they had a following wind and sea, the master increased speed to give the barge a forward speed of about 6 knots. When the barge reached a satisfactory speed, the master stopped the tug's forward movement, gave it a touch astern, and allowed the barge to overtake him on the port side. As the barge started to overtake the tug, Mr Danton moved forward on the port side towards a boarding stanchion fitted to the gunwale, just forward of the tug's wheelhouse front. The mate moved slightly aft to watch the tow rope and to make sure that it remained clear of the tug's propeller. The tug's deck and masthead floodlights had been switched on at this point to illuminate both the tug and barge boarding area.

- 1.3.5** As *Willem-B sr* approached the barge, the master, who was in the normal steering position on the starboard side of the wheelhouse, concentrated on getting the tug into the right position for the boarding. By then Mr Danton had taken up his usual boarding position, which was standing outside the bulwark on the rubbing strake, his back to the bulwark, holding on to the boarding stanchion with his left hand while his right hand grasped the gunwale. The mate, having seen that the tow rope was clear of the propeller, moved forward and took hold of Mr Danton's lifejacket straps as a precaution against his slipping off the rubbing stake.

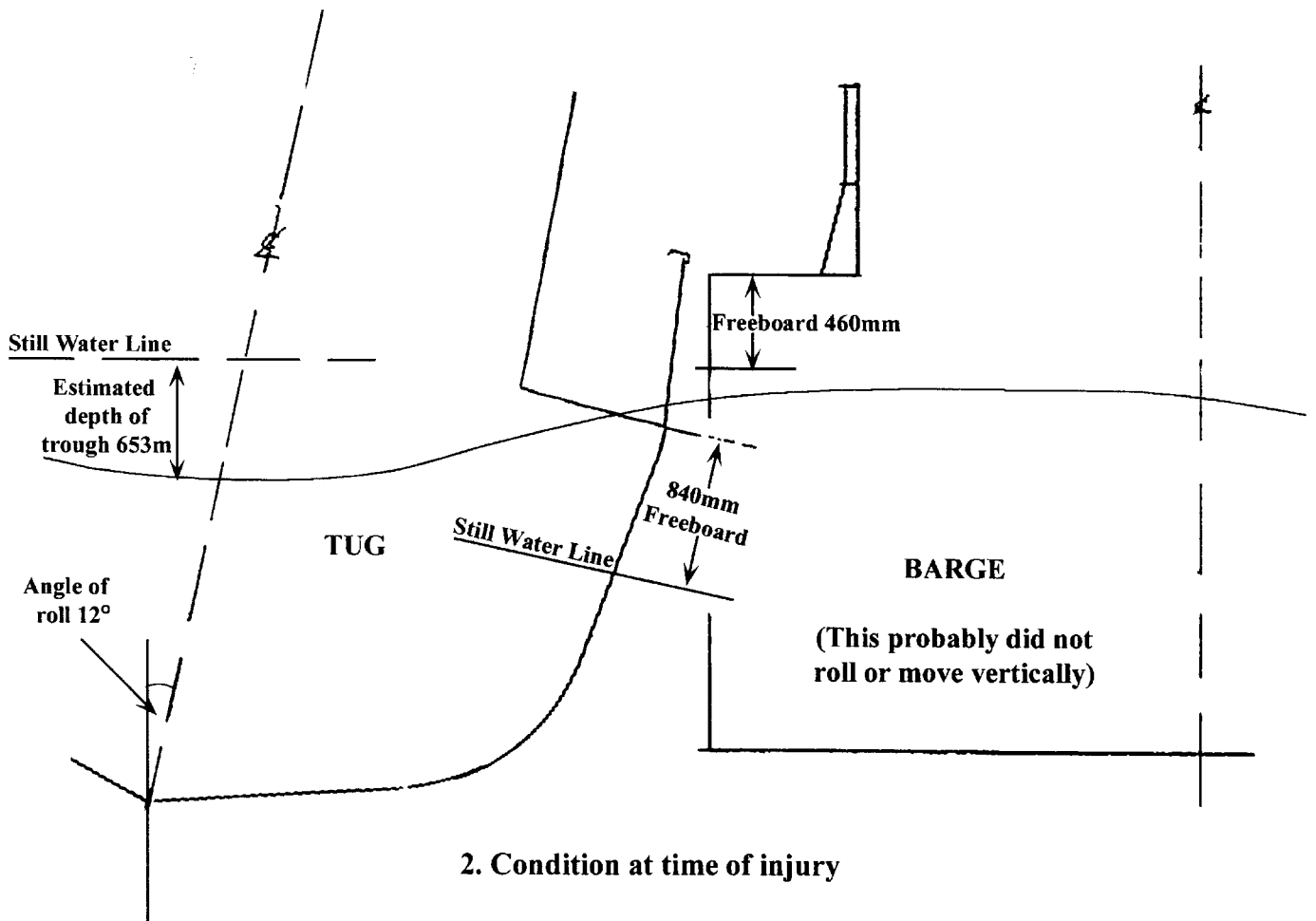
As the tug slowly moved towards the barge on a parallel course, the sea conditions made the tug roll slightly. At about 0145 the tug came within 1m of the barge. The tug dropped into the trough, simultaneously rolling towards the barge (see Fig 1). Unfortunately, Mr Danton, who was still standing outboard of the bulwark waiting for the right moment to make the transfer, was close to the point of minimum clearance. The combined downward and inward rolling movement of the tug was such that the deck edge of the barge and the gunwale of the tug's bulwark came close to touching. The mate, who was standing by Mr Danton, was not conscious of the vessels touching, but he did hear Mr Danton groan and realised that he had been crushed.

- 1.3.6** With the tug still rolling, and Mr Danton outside the tug bulwark, the mate decided that it was safer to throw Mr Danton on to the deck of the barge rather than attempt to pull him back over the bulwark. Once he had done this, he opened the port wheelhouse door, and shouted to the master that Mr Danton had been caught between the two vessels and was hurt.

Figure 1



1. Still water condition when loaded prior to transfer



2. Condition at time of injury

Although the master had felt a slight bump, he had been concentrating on maintaining the tug's position and was not aware of the accident until the mate shouted to him through the port wheelhouse door. Just at that moment, the boats moved apart and the master could see Mr Danton lying on the deck of the barge. Immediately he brought the tug back alongside and told the mate to get aboard the barge and find out how badly hurt Mr Danton was. The mate moved forward to the boarding position, and as the vessels came together, the master saw him step down on to the barge deck.

As the vessels moved apart again, the master put the main engine drive into neutral and went down on to the deck to talk to Mr Danton and the mate. At about 0147, Mr Danton said that he could not feel his legs but he had the use of his arms which he proceeded to wave. He also had difficulty in breathing. The mate covered Mr Danton up with his coat and stayed with him, continuously talking to him so that he retained consciousness. The tug by this time had drifted about 4-5m from the barge and, as the tow rope was getting underneath the tug, the master decided to winch in about 30m. Meanwhile he told the mate to open the barge bottom doors and dump the spoil. After winching in the tow rope, the master returned to the wheelhouse and, at about 0150, called Solent Coastguard on Channel 67.

- 1.3.7 The master reported that he had a seriously injured man on board who had been caught between the tug and the barge, possibly with broken ribs and unable to stand up. He asked that the man be airlifted off by helicopter as soon as possible. The coastguard asked for the wind and sea state and was told about 5 knots and a 1m swell. The master was informed that the helicopter was on night stand-by and it would take about 45 minutes for the helicopter to get airborne. He was told it would therefore be quicker to arrange for the Bembridge lifeboat to meet him off the Bembridge Ledge. At about 0202, with the tow rope now taut and the tug heading towards the Nab Tower, the master increased speed to 9 knots and altered course towards the Bembridge Ledge.

During the 30 minutes or so that the tug was heading for the meeting place, both the coastguards and the lifeboat asked for further details of the casualty's condition. The master confirmed, through Solent Coastguard, that Mr Danton couldn't walk, was having breathing difficulties and would need a stretcher. At 0222, the lifeboat met *Willem-B sr* close to the Nab Tower. The master was asked to reduce speed to about 4-5 knots, and when this was achieved, the lifeboat came alongside the starboard quarter of the barge and transferred three or four people on board together with entonox and oxygen. The master asked if he could increase speed again but was told to maintain his current speed and course.

- 1.3.8 The lifeboatmen examined Mr Danton and found that he had no feeling in his legs, was having difficulty in breathing, and was suffering severe abdominal pain. Having established that there were possible spinal as well as internal injuries, the lifeboat told Solent Coastguard via Channel 0, that the severity of the injuries required evacuation to hospital and that the helicopter should be mobilised immediately. Solent Coastguard said that the estimated time of arrival (ETA) of the helicopter was 0300.

After arranging the helicopter airlift, the lifeboat coxswain spoke to the master on Channel 67, and told him what they had organised. Following this conversation, the master increased the tug's speed to about 9-9½ knots and made for the Bembridge Ledge buoy. On arrival in the area of Bembridge harbour, the lifeboat coxswain asked the tug master to come in slowly, maintaining a north-westerly course, towards Seaview Point. This was at about 0250. The tug master set the engine controls at dead slow and continued on this course until about 0300, when he was asked to change his course to 310°.

The lifeboat increased speed and moved away from, and ahead of the tug, to pick up the helicopter winchman from the helicopter. The winchman, plus his equipment, was on board the lifeboat by about 0315 and was transferred to the barge by about 0330. Mr Danton had, by this time, deteriorated and was having increased breathing difficulties. The paramedic/winchman, plus five lifeboat crewmen, placed Mr Danton on a stretcher. He, and the winchman, were lifted up into the helicopter at about 0335 and flown direct to Haslar Hospital, arriving at about 0350.

- 1.3.9** While the lifeboat was picking up the helicopter winchman, the tug master winched in the tow rope so that the barge was 15m behind the tug. Once Mr Danton had been airlifted off, the master brought the tug alongside the barge and asked the lifeboatmen about the condition of Mr Danton and why it had been decided to call the helicopter, despite the earlier advice that the lifeboat would be quicker. He was told that the condition of Mr Danton was worse than had been thought originally, and it was that assessment which caused a change in the recovery arrangements. The lifeboatmen collected their equipment and returned to the lifeboat, leaving the barge at about 0345 and arriving back at their slipway at 0357.

The master and the mate then returned to *Willem-B sr* and continued their return passage to the mooring buoy at Marker Point, in Chichester Harbour, arriving at about 0530.

Despite the attention of the lifeboat crew, helicopter paramedic and the hospital staff, Solent Coastguard were advised at 0519 that Mr Danton had died.

1.4 CREW PARTICULARS

- 1.4.1** None of *Willem-B sr*'s crew possessed any certificate of competency issued by UK Authorities.

The master, Wouter Bouwman, is a Netherlands national, is 39 years old, and obtained his masters certificate in June 1995. This certificate, dated 13 December 1995, was issued by the Government of the Kingdom of the Netherlands under the provisions of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (ICSTCW). It states that the holder is competent to act as master on supply and tug boats with a gross tonnage less than 1000. He is restricted to trading within 30 miles of the coast and not more than 6 sailing hours from a safe anchorage. The certificate also states that he has a

restricted radio licence and can operate a Global Maritime Distress and Safety System (GMDSS). A copy of his certificate is in Annex 1.

Until January 1966, Wouter Bouwman had been involved in the operation and management of a Netherlands tug company owned by his family. At that time, he formed his own company, based on the tug *Willem-B sr*. Over the next few years he undertook various tug contracts in the UK and France, generally assisting dredgers on barge work. His current contract with Herbosch -Kiere started in March 1999.

1.4.2 The deckhand, Jocova Djai Wilkens, is a Netherlands national, is 27 years of age and has no certificate of competency. He worked on Rotterdam harbour craft for about 1½ years before going to sea in 1993. Before joining *Willem-B sr* in mid-1994, he worked on various river craft as a deckhand. His work on *Willem-B sr*, consists of handling mooring ropes, painting, cleaning and general duties as directed by the master. He has not undertaken any pre-sea training courses.

1.4.3 The bargehand, Leon Gordan Malcolm Danton, was a British national, was 22 years of age and had obtained a number of competence certificates. These were:

Coastal Skipper Course (Theory & Practical)	12.12.98
VHF Radio Course	05.12.98
CITB Safety Awareness	24.10.98
Basic Sea Survival	08.09.98
Diesel Engine Course	12.06.98
Emergency First Aid	22.12.97

He had been employed by Herbosch-Kiere since June 1997 as a deckhand on dredgers, tugs, barges and other river craft. Previously he had been working on a similar dredging and offshore dumping operation in Ramsgate.

1.5 DESCRIPTION OF TUG

1.5.1 The tug is a single screw, diesel driven vessel with a fixed pitch propeller operating in a Kort nozzle. She is fitted with a Caterpillar marine diesel developing 730 bhp (545kW) which results in a bollard pull of 10 tonne.

She is classed with Bureau Veritas and is given the designation; Tug coastal waters 13/3 (E). A copy of her Certificate of Seaworthiness and her Safe Manning Certificate are in Annex 2.

She is fitted for close coastal operation with GSM autotelephone, radar, Global Positioning Satellite - Digital GPS (GPS-DGPS), electronic chart plotter, two echo-sounders, Navtex, very high frequency (VHF) radios and bridge control of the main engine. The steering position is on the starboard side of the wheelhouse around which the navigation and radio equipment is grouped. On the starboard side of the wheelhouse are bench seats and a small table. Port and starboard, aft

facing doors provide direct entry to the wheelhouse. On the centre aft, is an entry from the wheelhouse to the galley, accommodation, engine room etc.

Deck lighting is provided from four 1000 watt floodlights mounted on the mast, two facing aft, two facing forward. There are also three 60 watt bulkhead lights; one above each of the deck to wheelhouse doors, and one above the aft winch. A hand control searchlight is fitted on the starboard side of the wheelhouse roof, above the steering position.

- 1.5.2** The basic design of the tug follows convention, with the wheelhouse two-thirds forward, a rising bow with a straight, padded stem for pushing, and a clear working space aft. A towing winch is fitted aft, together with a towing “H” bollard and two above-bulwark bitts. Forward are two pairs of above-bulwark bitts, one port and one starboard, together with central above-bulwark bitts.

The original design drawings show that the height of the bulwark gunwale from the deck, running forward to aft, is between 850 - 900mm. No bulwark opening doors are fitted. The deck line extends beyond the bulwark to provide a rubbing strake 150mm wide.

Measurements taken on site at frame 31, the approximate position at which the boarding attempt was made, gave a rubbing strake to top of gunwale height of 1300mm. The width of the rubbing strake, 150mm, agrees with the original drawings. Welded to the rubbing strake at intervals of about 1000mm, are twin brackets, to which are attached chains holding the rubber tyre fenders. These fenders are fitted from the bow aft, until just forward of the aft open deck at about frame 17.

Welded to the gunwale, just forward of the wheelhouse front, on both port and starboard sides, are vertical boarding poles. These are about 1500mm high, and about 50mm in diameter.

When towing the barge, the draught of the tug is about 2.55m aft.

1.6 DESCRIPTION OF BARGE

- 1.6.1** *R8* and *R9* are converted Netherlands steel river barges. The main body of each barge is box shaped with the forward end tapered to form a bow, while the aft is squared off to provide a tug pushing platform.

The bow and fore quarters are fitted with a low height bulwark, about 400mm high. The stern and aft quarters are similarly protected, but with the bulwarks at the stern rising to about 1200mm at the pushing sockets. There is no bulwark along the main body of the barge, but it is fitted with stanchions and rope guard rails.

The hopper hold is open topped, 3800mm wide, with the sides and ends built up to a height of about 1200mm. Internally, the hold sides are angled downwards at an angle of about 55° to cause the dredging spoil to slide towards the hold bottom.

Hydraulically operated doors are fitted on the centre line, forward to aft of the hold, with a clear gravity dumping opening of 1200mm. The maximum loaded tonnage is 190 tonne.

- 1.6.2 The barge is fitted with a towing post forward, towing bitts port and starboard, a short hinged mast, and the hydraulic motor for opening the forward hopper bottom doors. Aft, a similar arrangement of bitts is fitted, together with the hydraulic motor for the aft hopper bottom doors and a small diesel operated generator for providing power to the hydraulic power pack. For the purposes of this contract, the barge was fitted with a lifebelt and 1000 hour battery navigation lights for use while operating at night in the Solent.

While operating in Chichester Harbour, the draughts were;

Empty	-	about 2½ feet (0.762m)
Loaded	-	about 5 feet (1.524m).

Both barges were surveyed by the Maritime and Coastguard Agency (MCA) prior to their use at Emsworth Yacht Harbour and were issued with Load Line Exemption certificates, which contained eight operating conditions. A copy of these certificates is in Annex 3.

1.7 COMPANY SAFETY PROCEDURES

- 1.7.1 Details supplied by Herbosch-Kiere on how safety information is imparted to new employees using formal safety lectures and handbooks, is one that is followed by many industrial companies. Employees are required to sign that they have attended the lectures and received the appropriate safety booklets. The basic pattern is built around an initial introductory talk, followed by the safety plan and operating conditions relating to the particular site that the employee is working on. Further lectures are given if specific safety concerns arise on that site (the so called "Tool Box" talks), the contract conditions change, or the employee moves to another site. It is also company policy for the introductory safety talk and the site conditions to be repeated annually. The frequency of the site conditions' talk, apart from the annual refresher requirement, depends on how often an employee changes site during the year. A copy of the company Safety Booklet is in Annex 4.

Mr Danton followed this safety trail and copies of his attendance record have been supplied. This shows that he attended the initial induction course in June 1997. The company have said that he attended the annual introductory refresher talk sometime in January 1999 but can show no record of his attendance.

On his transfer to the new site in Emsworth in April 1999, he attended a course for Safety Awareness. This course included the Construction Health & Safety Plan issued by Land & Water Services Ltd for the duration of the dredging contract in Emsworth. Although no record exists of an introductory talk on

shipboard safety procedures and ship to ship transfer, the tug master, Wouter Bouwman, says that he did discuss these procedures with both Mr Danton and the deckhand, Mr Wilkens, when Mr Danton first arrived on board.

Copies of Mr Danton's attendance record is in Annex 5.

- 1.7.2 Land & Water Services Ltd, as the principal contractor, issued their own safety plan which, together with the Outline Health & Safety plan issued by Emsworth Yacht Harbour Ltd, formed the basis upon which site personnel and sub-contractors were to carry out the work. In that document, two sections could be said to relate directly to the question of transfer between tug and barge. These were:

Boats and Boatyards

All boats will be operated by watermen with experience of working on water and all craft will carry relevant flotation aids.

Marine Environment

Works within the marine environment are notoriously onerous, whenever staff cross from one vessel to another they must ensure the skipper of the vessel or other hand are made aware of their movements.

Emsworth Yacht Harbour Ltd, as the client, also issued an Outline Health and Safety Plan before the start of the contract. There is one comment on inter-vessel movement:

Movement

Site personnel must be particularly careful when moving between vessels and from a vessel ashore.

Copies of the health and safety plans issued by Land & Water Services Ltd and Emsworth Yacht Harbour Ltd, are in Annex 6.

- 1.7.3 During the Emsworth contract, the procedure for the transfer of staff from tug to barge, was one developed and agreed by the tug master. The original procedure involved boarding the barge from the stern but this was discontinued due to spray and the excessive movement between the two vessels. The successor and current method of boarding at the bow offered dryer conditions, and generally, less inter-vessel movement.

The procedure devised by the tug master of *Willem-B sr* for boarding the barge while at sea in the Solent, required the bargeman to stand on the rubbing strake, outboard of the gunwale, and hold on to the boarding pipe. As the tug master slowly brought the tug alongside the bow of the barge, the bargeman had to use his judgment as to when he actually made the transfer. With the tug rubbing strake 530mm higher than the barge deck in still water, the relative movements of both vessels in any sort of seaway, made this judgment crucial to a safe transfer.

To prevent the bargeman slipping off the rubbing strake due to wet conditions, the tug deckhand would provide support by holding the straps on the back of the bargeman's lifejacket.

The tug master's view of the actual boarding operation is very restricted due to his position on the starboard side of the wheelhouse and the height of the wheelhouse above the main deck. The height of the lower edge of the wheelhouse window to the main deck level is about 2m.

- 1.7.4 Mr Danton, who was transferring between tug and barge, had (at the time of the accident) done this 106 times. There are no records of any previous incidents or "near misses" although, as stated earlier, the boarding procedure was changed earlier in the contract due to sea spray and inter-vessel movement.

Similarly, there are no records of Mr Danton expressing any concern about the method of transfer, although his family have suggested that he had misgivings and raised it with both Herbosch-Kiere management and the tug master.

1.8 SOLENT COASTGUARD (all times BST)

- 1.8.1 Solent Coastguard were first notified of this incident at 0149 on Channel 67 by *Willem-B sr*. The sequence of events that followed, the times, and edited versions of the conversations, are recorded in the coastguard "Incident narrative", see Annex 7.

Extracts from that incident narrative illustrate what are considered to be the significant points in the events that followed. The first recorded conversation was as follows:

Tug boat towing mudhopper 2nm south of Nab Tower. Have injured crewman possibly broken ribs caught between barge and hopper. Conscious and breathing OK? Yes, thinks he has broken ribs. Make way towards Bembridge, Lifeboat will take crew off. WX CX?, 5kt, S win.

Following that conversation, Bembridge lifeboat was called at 0152 together with the coastguard section officer.

At 0157 the Isle of Wight Ambulance Service was informed of the incident with further details to follow when known.

A further conversation with *Willem-B sr* at 0202 is recorded as follows:

To Willem-B sr, ETA for Bembridge Ledge ? 30 mins approx, currently 0.5nm south of Nab Twr. What age and nationality of injured crewman? 22 years old and English. CX of patient ? Not sure as he is on barge with mate and in confusion left radio.

- 1.8.2** The Bembridge lifeboat was on scene at 0222, at which time a number of lifeboat crew boarded the barge to examine the injured crewman.

At 0227, the Bembridge lifeboat contacted Solent Coastguard and had the following conversation:

BEMML - cas is pretty bad, we are worried about moving him, suggest taking him off by helicopter. Intentions ? Heading towards St Helen's Roads. We R scrambling helo. From cox - we can move cas if U like but are bit worried about possible spinal injury. R crew administering any medication? affirm Entonox.

Various conversations followed between the coastguard, lifeboat, Haslar hospital and helicopter station, on intentions, etc with the next significant one occurring at 0305 when the helicopter confirmed that she was airborne.

At 0311 the lifeboat advised the coastguard that the casualty was in a critical condition and had stopped breathing. At 0317, it was confirmed that the winchman had been lowered on to the lifeboat, transferred to the barge, and was with the casualty. The helicopter carrying the casualty lifted off and was en-route to Haslar hospital at 0334 arriving at about 0350.

- 1.8.3** The tape recording of the actual conversation between the coastguard and the master of *Willem-B sr*, during the initial contact stage has been transcribed to show the importance of clear and precise communication. It also shows the degree of judgment required from the coastguard when trying to assess the seriousness of injuries and the response needed.

*Master: We are about 2 miles west, sorry south, of Nab Tower.
We have an injured person on board. We think he has a few broken ribs. Is it possible to send a helicopter to get him from board.*

*Coastguard: Stand by.
What type of vessel are you?*

Master: We are a tug boat towing a mud hopper, towing a mud hopper, we have been in the spoil ground area just outside the deep draught channel to Southampton and Portsmouth.

Coastguard: And you say you are approximately 2 miles south of the Nab Tower, is that correct?

*Master: I'll check it, one moment.
That is correct, I can give you my longitude and latitude whatever you want.*

Coastguard: Can you describe the kind of injuries the crewman has please and what happened.

Master: We normally dump the barge here and we drop the person on the barge, but he was stuck between the boat and the barge, so he was really, really - really hurt.

Coastguard: Can you tell me if the breathing is OK and is he conscious.

Master: He is still conscious but I think he broke a few ribs.

Coastguard: I think the quickest thing to do is to get him off by lifeboat into Bembridge, the Bembridge lifeboat, it will take at least 45 minutes to get the helicopter. Stand by please.

Master: In the meantime, we go heading for Chichester Harbour to also get some shelter.

Coastguard: What is the wind speed and direction?

Master: The wind speed at the moment is, I guess, about 5 knots and south-south-westerly.

Coastguard: If you can come round maybe and wait off Bembridge, Bembridge, Isle of Wight we could get the lifeboat out to you from Bembridge, it will take the crewman ashore to await the ambulance.

Master: I am heading to do that, OK.

1.9 BEMBRIDGE LIFEBOAT

1.9.1 The lifeboat was called at 0152 and was launched at 0206. The weather at the time of launch was recorded as partly cloudy, good visibility, a north-west wind, force 4, with a moderate sea state and a swell height of 1m. The lifeboat carried a crew of eight.

She was on scene at 0222 and landed a number of lifeboat crewmen on board the barge to attend the casualty while the tug and barge maintained a speed of about 5 knots. On boarding, they reported as follows:

On assessment, the injured man had clearly sustained serious injury, he was lying awkwardly, had no feeling in his legs, difficulty in breathing and severe abdominal pain. There was considered to be a probability of spinal injury.

Following this assessment, the lifeboat crewman gave the first aid to the casualty as follows:

The patient accepted entonox followed shortly thereafter by oxygen on free flow and this was continued alternately as required.

He was kept warm with blankets, made as comfortable as possible, reassured and his pulse and breathing constantly monitored.

As the helicopter winchman arrived on scene, the patient apparently stopped breathing. CPR was administered as supervised by the winchman, a qualified paramedic, at the same time the patient was moved and secured to the helicopter's stretcher by the winchman and five lifeboat crew. The patient was lucid and conscious at the time first-aid was being administered, and conversing with the lifeboat crew members.

- 1.9.2** Once the casualty had been lifted off the barge, the lifeboat crew rejoined the lifeboat and at 0343, started back to Bembridge. She arrived back at her base at 0354 and was ready for service at 0410.

1.10 CONTRACTUAL & OPERATIONAL CONDITIONS

- 1.10.1** Before the actual dredging work started in April 1999, Chichester Harbour Conservancy wrote to Land & Water Services Ltd, stipulating various conditions to be observed during the dredging operation. A copy of this document is in Annex 8. These included anchoring points, communication requirements, speed of passage in the harbour and how the barges were to be towed within the harbour limits.

Barge movements within the harbour were specified to be as follows:

When the barges are being manoeuvred out of the marina there are to be fore and aft tugs attached.

Elsewhere in the harbour the tugs are to either; conduct an alongside tow, or, fore and aft tugs are to be attached.

There was also a reminder that loaded barges were not to depart from the marina unless the predicted weather was suitable for onward transit to the Nab Tower dumping grounds.

- 1.10.2** When Herbosch-Kiere applied to MCA for a UK Load Line Exemption certificate on barges R8 R9 in March 1999, a number of conditions were imposed. These conditions were to apply not only on the voyage from Ramsgate to Emsworth, and back again, but also during the estimated six-week contract working between Emsworth Yacht Harbour and the Nab Tower dumping ground.

Among those conditions is one stating that no personnel are to be on board while being towed.

Attached to the certificate is a formal letter giving the official definition as to what constitutes "favourable weather".

During an earlier contract, working out of Ramsgate, a similar MCA certificate allowed the barge to be towed from the harbour to the dumping ground with the bargeman on board. Any variation of this procedure was to be carried out under the direction and control of the tug master.

Willem-B sr, although registered in the Netherlands and fully certificated, is required, when operating in UK waters, to comply only with Regulations 1, 2, 3, 28, 29 & 30, of The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 SI No 2962.

SECTION 2 - ANALYSIS

2.1 CAUSE OF INJURIES

The injuries suffered by Mr Danton were due to *Willem-B sr* moving in the swell and coming very close to the side of the barge, *R8 R9*. With Mr Danton standing outside the bulwark on the rubbing strake, the sudden movement of the tug into a trough and simultaneously rolling towards the barge, brought the deck edge of the barge within centimetres of the tug bulwark. Mr Danton's position between the deck edge of the barge and the tug bulwark meant that he was crushed between the two.

2.2 HERBOSCH-KIERE SAFETY CULTURE

- 2.2.1 The safety lectures given by the company to employees, and the safety procedures put into place at work sites, follow standard practice. The frequency of "Tool Box" talks (safety related talks) is dictated by need ie if there is a change of practice, a specific point of danger, or the introduction of new equipment, etc.

When Mr Danton transferred to the Emsworth site, he should have been given two lectures, an introductory talk by the site manager on general site conditions, and a talk by the master of *Willem-B sr* on safety and operation procedures while on the tug and barge.

There are records showing that he attended the new site lecture but none of him attending a formal lecture given by the tug master. Given Mr Danton's previous history of work on similar vessels and his attendance at a Coastal Skipper's Course in December 1998, his basic knowledge of shipboard safety must be considered to have been good. Nonetheless, every vessel has its own way of working and the tug master needs, and is required, to carry out an introductory safety talk. Mr Danton's father has stated that his son told him that he was given a brief talk on ship routines when he first arrived in April 1999, but nothing subsequently.

- 2.2.2 During the investigation, Mr Danton's family said that he had spoken to the company about the method of boarding, and that he was unhappy about it. Herbosch-Kiere were asked to comment on this and advised as follows:

Andy Fry (Managing Dredgemaster)

Could be regarded as Mr Danton's supervisor during the time that he was employed in dredging contracts. This included work at Emsworth. Cannot recall any time that Mr Danton questioned him about boarding or transferring between vessels.

Wouter Bouwman (Master, *Willem-B sr*)

During the works at Emsworth, Mr Bouwman spoke to Mr Danton and asked if he was happy to go out in the prevailing weather conditions. Mr Bouwman said to Mr Danton that if he was not willing to go out, they would not go, or someone else would transfer from tug to barge at the dumpsite.

Chris Packham (former Managing Director)

Mr Danton had raised his concerns about working in adverse conditions with Mr Packham. Mr Packham assured him that personal safety was paramount and that he would not be put under pressure to do anything he considered was dangerous.

Had Mr Danton refused to carry out a task that he thought was dangerous, Mr Packham told him that he would respect him more for not taking undue risks to carry out an operation.

This conversation took place “out of work” hours and occurred within the first few weeks of the work commencing at Emsworth.

Ian Bailey (company engineer/safety officer)

At no time can he remember Mr Danton questioning or even commenting on the method of transfer.

These comments confirm that Mr Danton did raise the issue of safety with Herbosch-Kiere, but although it was stated that his personal safety was paramount, no change in the boarding procedure occurred. The company had passed the responsibility for the transfer operation to *Willem-B sr*'s master, who had the final say on the safety of the transfer, basing his decision on the weather conditions at the time. Mr Danton, despite his apparent doubts as to the safety of the transfer, continued to carry out the task even though he had been advised that other staff were available if he declined.

- 2.2.3 Herbosch-Kiere, as employers of the bargeman, chose to delegate the responsibility of devising a safe method of transfer between tug and barge, to the tug master. The company safety officer, Ian Bailey, had worked with, and had been aboard *Willem-B sr* both in Ramsgate and previously, when the vessel was working in London. He had, however, not visited the vessel in Emsworth before the accident. Despite delegating this particular function, Herbosch-Kiere still retained a responsibility to its employees for ensuring that the agreed method of transfer was safe. There is no record of such risks being assessed by Herbosch-Kiere.

2.3 THE TUG MASTER'S RESPONSIBILITY

- 2.3.1 A UK registered tug, when working within UK waters and harbours, comes under certain UK Shipping Regulations, one of which is SI No 2962 The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997.

This regulation, under Part II *General Duties*, and Part III *Duties of the Company*, requires not only that the master shall ensure that the employee is not placed unnecessarily at risk, but that a risk assessment should be undertaken and that both the master and the company should jointly consider the safety of their employees. Similarly under Part V *General duties of workers*, every worker should inform his employer of any work situation which he reasonably considers to represent a serious and immediate danger to health and safety.

A further regulation with which the tug is required to comply, is EC Directive 89/391/EEC. This directive was implemented through the above SI 1997/2962 and came into force on 31 March 1998.

Article 5 (2) of this directive requires; *Where, pursuant to Article 7 (3), an employer enlists competent external services or persons, this shall not discharge him from his responsibilities in this area.*

Article 7 (3) states; *If such protective and preventive measures cannot be organised for lack of competent personnel in the undertaking and or establishment, the employer shall enlist competent external services or persons.*

Further sections of these regulations define the requirements of the competent external services or person.

A copy of this EC Directive and SI No 2962, The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997, is in Annex 9. A Marine Guidance Note, MGN 20 (M+F) is also available explaining the implementation of this EC Directive 89/391.

These regulations, together with other regulations and codes of practice relating to inter-vessel transfer, and means of access for pilots when boarding at sea, provide a general framework for safe working practices at sea. Boarding between two vessels at sea is inherently dangerous, and for that reason, the whole question of a safe and reliable transfer procedure needed to be thoroughly examined.

Willem-B sr's tug master, as an experienced seaman, when devising the transfer method, and selecting the position at which the transfer was to take place, should have appreciated the risks as outlined in the regulations above. He needed to take into account six particular features:

- The solid bulwark behind the bargeman, 1300mm high - this prevented any backward movement;
- The width of the rubbing strake - only 150mm wide;
- The high probability of the rubbing strake becoming slippery due to sea spray;
- The wheelhouse controls were on the starboard side of the tug - this meant that a boarding position on the port side, could be obscured from view;
- With the contract extending over six weeks, this boarding operation could occur twice every 24 hours, depending upon tides and progress of the dredging. On that basis, allowing 40 working days, and two round trips per day, there is a potential 160 transfers of personnel;
- The varying state of the sea, swell and tide.

2.3.2 Of these six significant safety considerations, only the rubbing strake becoming wet from sea spray appears to have been taken seriously.

The possibility of any sudden movement on the wet, slippery surface of the rubbing strake resulting in a fall between the two vessels, was addressed by instructing the mate to stand behind the bargeman and to hold on to the straps of his lifejacket in case such an event occurred.

Apart from the above, there are no records of any risk assessment of the boarding operation or the available counter measures regarding the exposed and restricted position, available.

The fitting of a bulwark door close to the wheelhouse front would have allowed the bargeman an easier and safer means of access, and allowed him to stand on the inboard side of the bulwark until he considered it safe to make the transfer.

Similarly, by carrying out the boarding manoeuvre from the starboard side of the tug, the master would have direct sight of the operation.

2.4 COMMUNICATIONS BETWEEN *WILLEM-B SR* AND SOLENT COASTGUARD

2.4.1 During the course of the investigation, the tug master asked why, during the initial stages of the emergency, the coastguards failed to appreciate the severity of Mr Danton's injuries. It was also suggested that if the helicopter had been tasked immediately the tug master asked for it, Mr Danton's life might have been saved. On the question of understanding the seriousness of the bargeman's injuries, it was only after the lifeboat crew had examined the casualty, that the extent of the injuries became apparent. The tape recording of

the master's first radio message, refers only to possible broken ribs. There was no mention of crush injuries.

Further enquiries confirmed that Mr Danton had been caught between the boat and the barge, was conscious, and that he had a few broken ribs. It was on that assessment that Solent Coastguard decided that the quickest method of getting him to hospital would be by using the Bembridge lifeboat. Then the standard emergency call-out procedures started. The significant timings of both the initial stage, using the lifeboat, and then the second stage, using the helicopter, were as follows: (all times BST)

First call from <i>Willem-B sr</i>	0149
Bembridge lifeboat called	0152
Bembridge launched	0206
Bembridge lifeboat on scene	0222
Lifeboat advises helicopter lift-off	0227
Helicopter paged	0230
Helicopter on scene	0310
Casualty in helicopter	0334

These figures show that the time from first call to first aid on scene was 41 minutes. If the helicopter had been called straightaway, the time to on scene would have been at least 50 minutes with extra time needed to agree the winchman's boarding procedure with the tug master. As the extent of the injuries would not have been known until the winchman was aboard, further delay would have occurred while additional equipment was sent down.

2.4.2 The points that come out of this are that:

- Based on the injury information given, using the Bembridge lifeboat was the quickest method of getting medical aid to the injured person. It also ensured that the patient had access to pain relieving gases at an earlier stage.
- The seriousness of Mr Danton's injuries was not appreciated, as only broken ribs were mentioned, not crush injuries.

The initial response was based on the master's perception of the seriousness of the injuries and it may be that further questioning on the circumstances of the accident might have enabled a more accurate assessment of Mr Danton's injuries. In situations like this, the assessment is not easy. The coastguard officer has to try and balance speed and type of response, with level of medical care required. Nevertheless, the loss of a few minutes in gathering information would be more than offset by being able to gauge the appropriate response needed.

Subsequently Haslar hospital advised that, in their opinion, the injuries sustained in this accident were non-recoverable. It follows therefore, that even

if the helicopter had been tasked after the initial call from *Willem-B sr*, the casualty would not have survived.

2.5 UK LOAD LINE EXEMPTION CERTIFICATE

- 2.5.1** As part of the start-up procedure for the Emsworth dredging contract, an application was made by Herbosch-Kiere to MCA for a Load Line Exemption certificate for the hopper barges, *R8 R9*. Following discussions regarding the projected use of these barges, certificates were issued subject to eight service conditions.

One of those conditions, number 4, states that no personnel are to be on board during the positioning voyages from Ramsgate to Emsworth and back, or between Emsworth Yacht Harbour and the Nab Tower dumping ground.

This latter restriction on the carriage of personnel on the barge, when under tow between the yacht harbour and the dumping ground, resulted in the requirement for the bargeman to transfer to the barge at sea off the Nab. The basis of this requirement appears to be the tow time, which was about 1½ hours with no shelter for personnel on the barge provided.

- 2.5.2** When these barges were being operated on a similar contract in Ramsgate Harbour in late 1996, no restrictions on personnel travelling on the barge were made. The operation was approved by MCA, subject to it being carried out in favourable weather conditions. These defined weather conditions were the same as those attached to the Load Line Exemption certificate issued in March 1999.

Although the same barges were involved, the travelling time between the harbour and the dump site was in the region of ½ hour.

- 2.5.3** The main point that arises from these two similar contracts is that of distance and/or time that the barge is in the open sea. If the time for the round trip is one hour or less, then the bargeman is likely to be allowed to travel on the barge. More than an hour, then it is considered that he will suffer exposure to the elements. There is nothing wrong with that arbitrary ruling, but it does create a potentially more dangerous situation because it means an inter-vessel transfer in the open sea is necessary. To reduce the level of risk at this transfer, a proper embarkation point needs to be arranged on both barge and towing vessel. MCA, when asked to issue a Load Line certificate for barges, will probably not be aware of the details of the towing vessel and therefore be unable to confirm if a proper embarkation point is available. The responsibility for ensuring that proper and safe embarkation facilities exist on the towing vessel, must therefore lie with the master of the towing vessel, the vessel's owner, and the bargeman's employer. Nevertheless, with the inherent dangers of inter-vessel transfer at sea, MCA may wish to consider including additional guidance on this subject in the existing Code of Safe Working Practices,

Chapter 6, as well as further consideration in respect of Merchant Shipping (Means of Access) Regulations 1988 SI No 1637.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

- 3.1.1** Both tug and barge were correctly registered, licensed, and manned by the required number of qualified staff.
[Ref: 1.4, 1.5, 1.6]
- 3.1.2** The tug master was qualified to carry out the duties required under the terms of the dredging contract.
[Ref: 1.4.1]
- 3.1.3** The health and safety procedure adopted by Herbosch-Kiere is one that is followed by many industrial companies. It is a combination of formal safety lectures and handbooks, with up-dates as required.
[Ref: 1.7.1, 2.2.1]
- 3.1.4** Although the master states that he did give an introductory talk on safety procedures to Mr Danton on his arrival, there is no record of the 1999 annual Herbosch-Kiere safety talk identified in their standard procedures.
[Ref: 1.7.1]
- 3.1.5** The boarding method adopted by the master of the tug did not properly take into consideration the high levels of risk that the bargeman was exposed to:
- the frequency of the operation in an exposed position;
 - the varying sea, tide and swell conditions;
 - no means of retreat;
 - a 150mm wide standing position;
 - the lack of a clear sight of the boarding position by the master;
 - a wet, slippery surface under foot.
[Ref: 1.7.3, 1.7.4, & 2.3.1]
- 3.1.6** The tug master did not consider fully the risks inherent in ship-to-ship transfer, and failed to ensure that the bargeman was not placed unnecessarily at risk when undertaking the transfer.
[Ref: 2.3]
- 3.1.7** As the bargeman's employer, Herbosch-Kiere failed to ensure that the tug master properly evaluated the risks involved in the transfer operation, and that their employee was not placed at unnecessary risk.
[Ref: 2.2.3]

- 3.1.8** The response of the tug master and mate to the accident was as quick as circumstances permitted and solely concerned with the well being of the injured bargeman.
[Ref: 1.3.6, 1.3.7]
- 3.1.9** The exchange of information between the tug master and Solent Coastguard was insufficient, in that neither side fully explored the degree of seriousness of Mr Danton's injuries. However, the extent of the injuries were such that medical opinion advises that they were not survivable.
[Ref: 1.8, 2.4.2]
- 3.1.10** Solent Coastguard reacted according to the information supplied to them by the master. The initial choice of evacuation by lifeboat rather than helicopter was based on call-out times and the perceived degree of seriousness.
[Ref: 2.4]
- 3.1.11** The quick response time of the lifeboat crew to the call out, their immediate assessment of the extent of the injuries on arrival on the barge, and their care and treatment of the casualty was of the highest standard.
(Ref: 1.9.1)

3.2 CAUSES

- 3.2.1** The cause of the accident was the dropping and rolling of the tug towards the barge as a result of a trough developing between both vessels while close alongside at sea.
- 3.2.2** A major contributory cause of the injuries, was the exposed and unsafe position used to effect an inter-vessel transfer.

SECTION 4 - RECOMMENDATIONS

Herbosch-Kiere is recommended to:

1. Ensure that in any contract requiring personnel to transfer from one marine craft to another on a regular basis, the safety of those personnel must be paramount. Both craft should be properly equipped and/or modified to allow the boarding to be undertaken without unnecessary risk.
2. Confirm that any boarding procedure is properly examined, assessed, and agreed by both the vessel's master/s and the company safety officer similar to that required under The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997, SI No 2962 Parts II and III, and Article 5 (2), and Article 7 (3) of EEC Directive 89/391/EEC.
3. Regularly up-date company safety records and confirm that company safety requirements are being complied with.

The Netherlands Shipping Inspection is recommended to:

4. Consider the actions of the tug master in respect of the death of Mr Danton and his failure to take into consideration the advice and guidance given in EEC Directive 89/391/EEC, and in particular Article 6 of that directive. The Directive requires employers and/or those who have an employment relationship with the worker and have responsibility for the undertaking, to take measures for the safety and health protection, including prevention of occupational risks and provision of information and training, as well as provision of the necessary organisation and means.

The Maritime and Coastguard Agency is recommended to:

5. Consider what additional guidance on inter-vessel transfer at sea, should be included in the existing Code of Safe Working Practices, Chapter 6, in the light of this fatal accident.
6. Consider and examine what additional safety and guidance measures should be included in Merchant Shipping (Means of Access) Regulations 1988 SI No 1637, relating specifically to transfer at sea between unsecured vessels.

SECTION 5 - HERBOSCH-KIERE

5.1 SUBSEQUENT ACTIONS

- 5.1.1** Following the accident, barges “R8” and “R9”, have been modified, such that the requirement for crew members to transfer from tug to barge will only be necessary in an emergency.

The original system required the barge bottom doors to be opened by operation of the local control system fitted on the deck of the barge. This control system has been modified so that the controls can be operated remotely from the tug.

- 5.1.2** Herbosch-Kiere will ensure that any inter-vessel transfers are discussed by the vessel’s master, the company safety officer and the contract manager/site agent before starting a new operation.

- 5.1.3** The company will also ensure that its safety records are kept up to date, accurate, and that all employees attend all necessary safety training.

GLOSSARY OF TERMS

Bulwark	-	Plating erections around outboard edge of upper deck to protect deck from entry of sea.
Rubbing strake	-	Doubled strake on outside of boat. Acts as a rubbing piece, and can be renewed when worn.
Gunwale	-	The top or upper edge of bulwark.
Bollard	-	Large and firmly secured post of circular section, used for securing hawsers, mooring ropes, etc.
Stanchion	-	Vertical steel support.
Entonox	-	Mixture of oxygen and nitrous oxide.
Kort nozzle	-	A tube or nozzle which encloses the propeller to give increased thrust at low speeds.
Bits	-	Vertical fittings of steel, securely fixed and adequately strengthened for taking ropes under stress; eg towing hawsers, mooring ropes, etc.
Navtex	-	Electronic weather forecast receiver system.
Hipped	-	Secured to aft quarter of larger vessel.