Report on the Investigation

of the failure of Lifeboat Bowsing Gear on

P&OSL AQUITAINE

in Falmouth Dry-Dock

on 29 October 1999

No injuries

Marine Accident Investigation Branch
Carlton House
Carlton Place
Southampton
SO15 2DZ

Report No 15/2000

Extract from

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.

CONTENTS

		Page
GLOSSARY OF ABBREVIATIONS		
SYNOPSIS		**1**
SECTION 1 - FACTUAL INFORMATION		**2**
1.1	Particulars of vessel and incident	2
1.2	Narrative	2
1.3	Bowsing gear	3
1.4	Wire rope clamps	3
1.5	Clamp fitting instructions	3
1.6	Instructions to surveyors	4
SECTION II - ANALYSIS		**5**
2.1	Characteristics of wire clamps	5
2.2	Instructions for maintenance and use of wire clamps	5
2.3	Wire clamps on LSA	5
SECTION III - CONCLUSIONS		**7**
3.1	Findings	7
3.2	Causes	7
SECTION IV - RECOMMENDATIONS		**8**

GLOSSARY OF ABBREVIATIONS

LSA	-	Lifesaving appliances
m	-	metre
MAIB	-	Marine Accident Investigation Branch
MCA	-	Maritime and Coastguard Agency
P&OSL	-	Peninsular and Oriental Stena Line

SYNOPSIS

On 10 November 1999 the Marine Accident Investigation Branch (MAIB) was notified of an incident on board *P&OSL Aquitaine* on 29 October. Following receipt of further information, an investigation began on 23 December 1999.

The vessel was in Falmouth dry-dock, undergoing a refit. Work involved removing the separate tricing pendant and bowsing tackles from the lifeboats, and replacing them with lighter, combined tricing/bowsing gear. The lengths of these were adjusted by slackening and then re-tightening the clamps on a short length of wire rope, which was part of the bowsing gear.

As No 4 lifeboat was lowered, the clamping arrangement on the forward bowsing gear slipped, which allowed the forward end of the boat to swing out of control. Two crewmen were in the forward end of the boat. They were each wearing safety harnesses, and were unhurt.

Wire clamp manufacturers offer guidance on the precautions necessary to ensure that clamped wires maintain their ability to carry loads. However, these precautions are difficult to follow on board vessels in service, making it undesirable to use these clamps on load bearing parts of lifesaving appliances (LSA).

The Maritime and Coastguard Agency (MCA) offers no guidance on using clamped wire rope fittings. The MAIB recommends that the MCA issues clear and explicit guidance in its instructions to surveyors, on the acceptability of wire clamps on load bearing wire ropes of LSA launching systems.

The MAIB also recommends that P & O Stena Line Ltd, who are the owners of the vessel, remove from service bowsing wires which are fitted with 'U' bolt or 'Bulldog' wire clamps. These should be replaced with wires having spliced hard eyes, or arrangements of similar strength and permanence.

P&OSL Aquitaine

SECTION I - FACTUAL INFORMATION

1.1 Particulars of vessel and incident

Name of vessel	:	*P & O SL Aquitaine*
Port of registry	:	Dover
Type	:	Ro-Ro Passenger
Official number	:	7311221
Registered length	:	163.4m
Gross tonnage	:	28,833
Built	:	Belgium 1992
Owners	:	P & O Stena Line Ship Management Ltd Channel House Channel View Road Dover CT17 9TJ
Position of accident	:	Falmouth dry-dock, UK
Date	:	29 October 1999
Damage	:	None
Casualties	:	None

1.2 Narrative

P&OSL Aquitaine was in Falmouth dry-dock undergoing a refit. Part of the work involved removing the separate 'conventional' tricing pendants and bowsing tackles from the lifeboats. These were replaced with a combined bowsing/tricing gear, fitted at each end of the lifeboats (**Figure 1**).

To make final changes to the length of the new bowsing gear, an adjustable length of wire rope was employed, fitted with clamps. The wire rope was to remain part of the bowsing gear after adjustment. The clamps on the gear fitted to No 4 lifeboat were slackened, changes were made to the wires' lengths, and the clamps were re-tightened.

Crew boarded No 4 lifeboat in preparation for lowering the boat to embarkation level. The new bowsing gear was attached forward and aft. The winch brake was then used to control the lowering of the boat to embarkation level.

As load came on to the bowsing gear, the boat was correspondingly pulled into the side of the vessel. Before bowsing fully into the vessel's side, the forward bowsing gear failed, allowing the boat to swing out of position.

Both seamen at the forward end of the boat were wearing safety harnesses and did not fall out of the boat. Neither was injured.

An inspection of the failed bowsing gear showed that the wire rope in the bowsing system had pulled through its securing clamps.

1.3 Bowsing gear

The bowsing gear in use on *P&OSL Aquitaine* had just been supplied, and was designed to serve both tricing and bowsing duties. No separate tricing pendants were required. The new bowsing gear was also lighter and considered to be easier to handle than the previously fitted bowsing tackles.

1.4 Wire rope clamps

Several manufacturers produce and market clamps to form eyes at the ends of wire ropes instead of splices. Thimbles are often used to make hard eyes (**Figure 2**).

The wire rope clamps used on the bowsing gear of *Aquitaine* were of the 'U' bolt type, often referred to as 'Bulldog clips'. These rely on the operator tightening a nut on the threaded portion of each leg of the 'U' bolt to crush the clamped wire between the 'U' bolt and the saddle portion of the clamp.

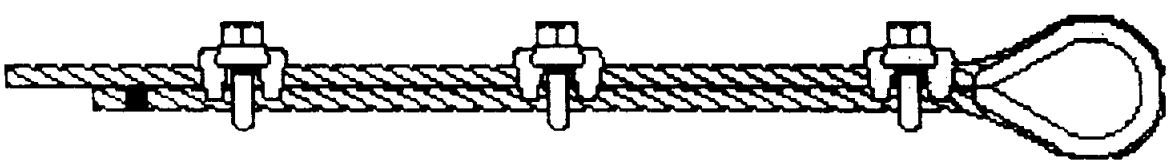

Figure 2 – Arrangement of clips and thimble

1.5 Clamp fitting instructions

An instruction issued by at least one manufacturer is that these clamps should be retightened to the recommended torque after the application of a load *equal or greater than the loads expected in use*. Another warns of the importance of retorquing nuts periodically in service.

1.6 Instructions to Surveyors

Instructions in the Maritime and Coastguard Agency's (MCA's) *Instructions for the Guidance of Surveyors* for the *Survey of Life-Saving Appliances* and Merchant Shipping Notices, offer guidance on using splices on wire rope end fittings. No MCA documentation indicates that clamps are acceptable alternatives to splices on any load bearing wires used on LSA.

SECTION II - ANALYSIS

2.1 Characteristics of wire clamps

The axial gripping forces on any wires secured by 'U' bolt wire clamps are generated largely by friction. This in turn, is a result of clamping forces between 'U' bolt, saddle and wire.

In common with any elastic material under load, a wire rope experiences a strain in the direction of any applied load. As a wire rope can tolerate only axial tensile loads, this must always be an axial strain. This results in a corresponding lateral strain, which reduces the wire's diameter, and reduces the gripping forces in any wire clamp.

The load bearing capacity of a clamped wire connection will therefore be reduced by the application of normal axial loads.

Another consequence of applying clamping forces to wire ropes is the wire strands are crushed and partially re-aligned. As this affects the wire material within the clamp, it will also reduce the gripping force on a clamped wire.

The normal loading of wire ropes fitted with these clamps, therefore, has the potential to reduce the load carrying capacity of the clamped connection.

2.2 Instruction for maintenance and use of wire clamps

Several manufacturers of wire clamps offer advice about the importance of checking the tightening of wire clamps after a load is first applied. The objective is to prevent the reduction in clamping forces caused by lateral strain in the wire.

Periodical check tightening is also advised with the wire connection in service, largely in order to compensate for the effects of crushing, creep and movement of a wire rope's strands.

For this type of connection to offer a reasonable level of safety, it is clearly necessary that careful initial and periodic tightening procedures are followed.

2.3 Wire clamps on LSA

For any wire rope connection to perform as designed, it is necessary to follow manufacturer's recommendations. This is true, whatever mechanism is used to secure the wire.

The clamp manufacturers' recommendation to re-tighten wire clamps after the wire has been loaded to, or beyond, its maximum working load, could cause practical difficulties when these clamps are used in LSA on board a vessel.

Although the application of maximum working load to a bowsing wire in service might be difficult, initial tightening could be performed in a test house at the time of

assembly. However, once installed on the vessel, difficulties might arise in ensuring that clamps are re-tightened to a pre-determined torque. This would require the use of torque wrenches by crew who would, usually, be unfamiliar with their handling and care. A reliable programme for routine re-tightening would also need to be established.

Further problems could arise if the effective length of a wire needed adjusting. This was the case on *P&OSL Aquitaine*. Wire clamps would seem to make adjustment simple, and this would be recognised by most users of the gear. However, without an understanding of the need for proper clamp tightening at working load, such an adjustment could produce a system unable to withstand the required working load. When applied to bowsing gear, it might be unable to keep the lifeboat into the side of the vessel for embarkation. An unsafe system would result.

Wherever possible it would be prudent to avoid the use of wire rope clamps on load bearing systems which are safety related, particularly when part of LSA. To this end, advice given to surveyors and the industry, in MCA's *Instructions for the Guidance of Surveyors* for the *Survey of LSA*, should be amended, to give explicit guidance on the subject.

More immediately, the owners of *P & OSL Aquitaine* should be recommended to withdraw from service the wire ropes fitted with clamps which are part of the lifeboats' bowsing gear. Alternative items, which do not have the drawbacks mentioned above, are readily available.

SECTION III - CONCLUSIONS

3.1 Findings

The tricing pendants and bowsing tackles on the lifeboats of *P&OSL Aquitaine* had been removed and replaced with a lighter combined tricing/bowsing system. [1.2]

Part of the new bowsing system was a length of wire rope fitted with clamps used to form the hard eye at one end. [1.2]

The wires' lengths were adjusted following installation. [1.2]

The wire clamps were re-tightened insufficiently to withstand the load applied. [2.3]

The bowsing gear's wire on the forward end of No 4 lifeboat slipped through its clamps as the lifeboat was being lowered to embarkation level. [1.2]

To ensure they are capable of sustaining their design load, wire ropes fitted with clamps need to have the clamps correctly tightened after the application of a load equal, or greater than, the wire's maximum working load. [2.2]

To maintain the load carrying capacity of wire ropes fitted with clamps requires them to be periodically re-tightened. [2.2]

The initial and periodic tightening regime necessary to ensure the load carrying capacity of clamped wire connections is maintained makes them undesirable on load bearing components of LSA systems. [2.3]

3.2 Causes

The bowsing gear on No 4 lifeboat failed due to a wire rope clamp fitting being unable to tolerate the applied load. [2.3]

No explicit guidance is given by MCA on the acceptability of wire rope clamp fittings being used on LSA. [2.3]

SECTION IV - RECOMMENDATIONS

P&O Stena Line Ship Management Ltd is recommended to:

1. Remove from service on the lifeboat launching arrangements of *P&OSL Aquitaine* those bowsing wires which are fitted with 'U' bolt or 'Bulldog' wire clamps, and replace them with wires having spliced hard eyes, or arrangements of similar strength and permanence.

The Maritime and Coastguard Agency is recommended to:

2. Issue clear guidance in its instructions to surveyors on the acceptability of wire clamps on load bearing wire ropes of LSA launching systems.