Report on the investigation

of an accident on

the general cargo vessel

Baltiyskiy-107

resulting in the death of a seaman

on the 10 September 2000

while on passage from

Riga, Latvia, to Poole, UK

Marine Accident Investigation Branch
First Floor, Carlton House
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Report No 20/2001

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.

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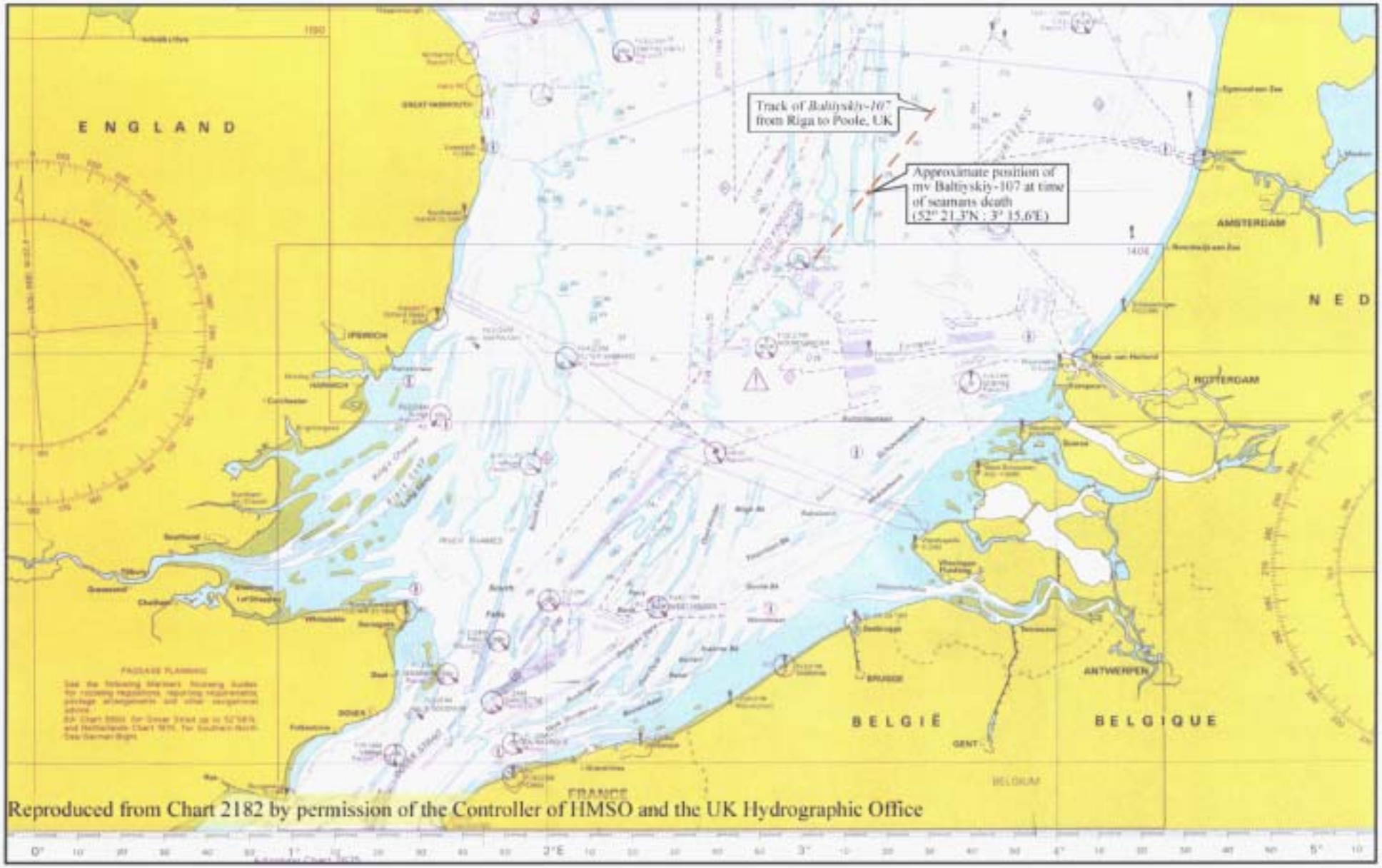
GLOSSARY OF ABBREVIATIONS AND ACRONYMS

IMO	-	International Maritime Organization
INMARSAT	-	International Marine Satellite
MAIB	-	Marine Accident Investigation Branch
PSC	-	Port State Control
Ro-Ro	-	Roll on, Roll off
SCBA	-	Self-Contained Breathing Apparatus
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency Radio

Marine Safety Agency (MSA) and The Coastguard Agency (TCA) merged in April 1998 and are now known as the Maritime and Coastguard Agency (MCA).

GLOSSARY OF TERMS

Chair lift	-	Wooden seat used with rope rigging to access high level areas - often called a bosun's chair.
Class	-	Classification Society.
Dog handles	-	Single arm metal clips used to secure hatch shut.
Dunnage	-	Materials, often timber or matting, placed among cargo to prevent damage.
Hatch coaming	-	Vertical plating which surrounds the hatch opening, providing a base for the hatch cover.
Reeve binding	-	Rope passed continuously from fastening to fastening in zig-zag fashion.



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SYNOPSIS

Baltiyskiy-107 was on passage from Riga, Latvia, to Poole UK with a cargo of sawn timber and bundles of pallet timber. At 1230 on Sunday 10 September 2000, when about 70 miles north-north-west of the Hook of Holland, a seaman who was working in the forecastle, went aft, supposedly to the toilet. About 15 to 20 minutes later, the bosun who was also working in the forecastle, went aft to see how the rest of the deck crew were getting on with their work. When he passed No 2 hold on the port side, he noticed the cargo cover lashings were undone. On closer inspection he found the hatch cover to No 2 hold access shaft wedged open, and saw the seaman's body at the bottom of the shaft. He called for assistance, and with the help of other crew members, mounted a rescue operation while wearing self-contained breathing apparatus (SCBA).

Despite resuscitation attempts, the seaman could not be revived. His body was then stripped, packed in ice, laid on the main deck outside the accommodation and covered up. Both the Russian and UK authorities were informed and *Baltiyskiy-107* continued on her passage to Poole where she was met by Dorset Police (Poole CID). They notified the Marine Accident Investigation Branch (MAIB) that day. The vessel was scheduled to arrive alongside in Poole at 1400 but, due to port congestion, had to anchor off. While anchored, the police boarded to examine the scene and to carry out a preliminary investigation, which they completed at about 2045. They then left the vessel, taking the deceased with them.

At 1000 on Tuesday 12 September, *Baltiyskiy-107* moored alongside the tanker berth in Poole Harbour with the MAIB inspector in attendance. Before unloading, atmospheric tests were taken on the access shaft to No 2 hold and showed very low levels of oxygen, together with high levels of carbon monoxide. With police, fire brigade, and HM customs in attendance, the deck cargo was removed and the holds slowly opened. Apart from a distinctive smell, there was no evidence of fire or any chemical reaction either in the access shaft or among the timber in No 2 hold.

The Poole timber was discharged and the vessel proceeded to Goole for the final discharge. A surveyor was present throughout the final discharge but again, apart from the distinctive smell in No 2 hold, nothing significant was found. On completion of discharge, the vessel sailed for St Petersburg, Russia, her home port.

Further tests carried out on a timber sample taken from the affected area showed no evidence of any unusual preservatives or chemicals.

There were no technical or ship operational reasons why the seaman chose to enter the shaft, and the evidence indicates that he had received no instructions from the bosun, or any officer on board, to do so. It seems, therefore, that it was purely a personal decision for an unknown reason.

Cause of death was most probably due to the low oxygen and high carbon monoxide levels present in the access shaft to No 2 hold at the time the victim entered the shaft.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF VESSEL AND ACCIDENT

Name	:	*Baltiyskiy-107* **(Figure 1)**
Official No	:	7612450
Port of registry	:	Sankt-Petersburg
Owners	:	NWS Twelve Balt Shipping Co Ltd, Sankt-Petersburg, Russia
Managing agents	:	North-Western Shipping
Classification society	:	Russian Society
Gross tonnage	:	1,926
Deadweight	:	2,554 tonnes
Overall length	:	95.00m
Breadth	:	13.01m
Maximum draught	:	4.001m
Year of build	:	1979
Type	:	General Cargo
No of holds	:	3
Main engine	:	SKL 6NVDS48A-2U
Propulsion	:	Twin screw fixed pitch propeller
Date and time	:	10 September 2000 at about 1320
Place of accident	:	North Sea 52° 21.3', 003° 15.6'
Injuries	:	One death
Damage	:	None

Figure 1

Baltiyskiy-107

Photograph courtesy of FotoFlite

1.2 NARRATIVE

Part 1 - all times UTC + 2

1.2.1 On 5 September 2000, while alongside in Riga, Latvia, *Baltiyskiy-107* started to to load her cargo of sawn timber for discharge in the UK. Of the 2604m^3 of bundled timber, 1700 was due for discharge in Poole, Dorset, with the remainder to be discharged in Goole, South Yorkshire. The loading was carried out by shore workers, with the mate supervising on deck and the second mate carrying out a similar duty in the holds. Although the crew were not directly involved, they attended during the loading to count and confirm the number of bundles being loaded in each hold. During the loading the mate asked why the timber was wet, and was told that it had been dipped before it was moved to the loading area. With the holds full, the hatches were closed and timber deck cargo loaded on top of all three hatches. The bundles of timber were secured in place, and then covered with waterproof tarpaulins secured to the hatch coamings by individual rope lines. No other cargo was carried.

On completion of loading, the vessel left Riga at 1725 on 7 September for the UK, passing through the Baltic and Kiel Canal before entering the North Sea at about 1600 on 9 September. When at sea, the bosun followed his normal routine of walking the deck between the hours of 0800 and 1000, checking the security of the deck cargo and the waterproof covering. The deck log records that the reeve binding of the deck cargo was checked on entering the North Sea, and was found to be secure.

1.2.2 During the next period from midnight to 1200 on 10 September, *Baltiyskiy-107* progressed as normal, with safety checks carried out as required. The weather was calm, and the vessel maintained an average speed of about 10 knots.

At midday, *Baltiyskiy-107* was in position 52° 31.6' N, 003° 25.7'E about 65 miles west of Ijmuiden, The Netherlands. As usual at this time the bridge watch changed: the third mate, A Rumyantsev handed over to the second mate, A Khlyschenko, while the seaman on watch also changed; B Vasiliev took over from L Nikolaev. At 1210 the master arrived on the bridge, and acted as the second man on watch; thus releasing seaman Vasiliev to assist the bosun in general deck work.

1.2.3 The bosun and seaman Vasiliev then went forward to the forecastle store to prepare the tools for small painting jobs around the deck. Two other seamen were also involved in general painting and preparation duties: seaman Nikolaev and Vasiliev's son, Aleksander, a cadet. Their work involved scraping paintwork from around bridge portholes which required the use of a safety belt and a chair lift. After lunch, at about 1215, Aleksander went forward to the forecastle store to get a safety belt to use on the bridge. Before he left to return to work, he saw his father getting ready to start work.

Sometime later, possibly at about 1230, Vasiliev, who was still with the bosun in the forecastle store, said that he needed to go to the toilet, so went aft towards the accommodation. The bosun does not recall on which side of the vessel he walked aft. About 15 to 20 minutes later the bosun decided to check how the other two seamen were getting on with the bridge paintwork. Walking aft down the port side of the vessel, he noticed that two of the waterproof tarpaulin ties at a point opposite the deck space between Nos 2 and 3 holds were loose and hanging. Since he had checked them earlier that day, he decided to look under the tarpaulin before re-securing them. He then saw that the lid to the access hatchway to No 2 hold was half open and held in that position by a wooden wedge. As this hatch had been closed since departure Riga, he realised that somebody had recently opened it. He shouted, but received no response, so climbed through into the deck space to check the hatchway himself. He looked down the hatch and saw the shape of a body or an object. He was conscious of a sharp unpleasant smell in the hatchway, but thought that it might have been due to the timber cargo having been sealed in the hold for a number of days. He immediately backed out and ran to the accommodation to tell the mate who was in his cabin. The time was about 1318 (Figures **2 and 3).**

Figure 2

General view of port side showing deck cargo covered in tarpaulins

Figure 3

Port side between hatches 2 & 3 showing loose tarpaulin

1.2.4 The bosun told the mate he had found seaman Vasiliev at the bottom of the access hatchway to No 2 hold, and that he needed urgent help. The mate immediately ran to the bridge to inform the master, while the bosun went to get a self-contained breathing set. The master sounded the alarm and ordered all available off watch crew to proceed to No 2 hold area. He remained on the bridge while the mate ran back down to No 2 hold access hatchway to organise a rescue. As part of the vessel's standard emergency procedure, the INMARSAT system was prepared for immediate transmission.

The bosun had, in the meantime, arrived on deck beside the deck space between Nos 2 and 3 holds, and was putting on the SCBA set. Just before the bosun entered the access hatchway, the mate looked down and saw the body at the bottom of the shaft. The bosun then entered the hatchway and climbed down, while other crew members illuminated the shaft using their torches.

1.2.5 On reaching the bottom, the bosun tried to give oxygen to Vasiliev, but it did not appear to make any difference. He shouted up to the mate that there was no pulse or breathing, and that first-aid was difficult due to the cramped conditions. The crew lowered a rope down so that Vasiliev could be pulled up, but this failed initially because the rope kept slipping off. The bosun decided that the quickest and only way was to tie the rope around Vasiliev's legs, and pull him up that way. With the bosun lifting from below, and the crew pulling from above, they managed to get Vasiliev up to the hatch and out on to the deck.

The second mate had arrived at the scene at about 1325, having been sent by the master to monitor and record the accident details, as well as to keep him informed of progress.

By 1335, Vasiliev's body had been retrieved and was laid out on the deck while attempts were made to revive him. When there was no immediate response, he was moved clear of the hatchway and brought out on to the open deck. Resuscitation recommenced, but there was no breathing or pulse; his face was a bluish colour, and his pupils did not react to light. At 1350 the master was told, despite the crew's resuscitation attempts, there were no signs of life. At 1355 the body was moved to the gym where it was completely undressed and examined for signs of any violent injuries. None were found. The body was then moved out of the accommodation on to the deck in front of the bridge where it was covered with ice, and a canvas cover placed over it.

1.2.6 The vessel continued her passage south towards the Dover Straits. The master sent a telex at 1449 to the senior controller of the company at St Petersburg giving details of the accident and seaman Vasiliev's death.

At 1700, a radio link was established with the personnel director of the owners, during which the circumstances of the accident and the results of the on-board investigation were discussed.

The vessel continued the voyage to Poole, checking in with Dover Coastguard at 2125 on 10 September before finally arriving off Poole at 1337 on 11 September. She anchored in a position some 1.27 miles off Cape Handfast and an anchor watch was set.

Part 2 - all times UTC + 1 (local UK time)

At 1945 that day the agent, harbour authorities and the police arrived on board. At 2045 Vasiliev's body was taken ashore and all shore staff left at 2050.

The vessel remained at anchor until about 0910 on 12 September when the anchor was raised and the pilot boarded. The vessel then proceeded under pilotage into Poole harbour were she secured alongside the fuel berth at 1000.

1.2.7 Once alongside, the investigation continued, with the police taking statements from the master, mate, bosun and the deceased's son. Copies of various documents were also made. An industrial chemist was appointed to check the atmosphere in the hatchway to No 2 hold before any internal inspection was carried out. The results of this test confirmed that it was too dangerous to enter without proper ventilation, as well as suggesting to the chemist and fire brigade that there might be, or had been, a smouldering fire in No 2 hold. After consultation with the agents and other interested parties, it was decided to move the vessel further along the quay to ro-ro berth No 1, and to maintain a fire watch overnight. This was carried out at 2105, with *Baltiyskiy-107* all secure at her new berth by 2130 on 12 September.

The next day the deck cargo of timber for discharge at Poole, was removed. With the fire brigade and police in attendance, the main cargo hatches were opened and a quick survey carried out of the visible timber packages. When No 2 hold was opened, there was a noticeable sharp smell, but no smoke or signs of a fire. With the main cargo hatches to No 2 hold open, the access hatch to that hold was fully opened and a police inspection of the access shaft carried out. Nothing of any significance was apparently found. HM Customs also attended, and looked at the possibility of contraband being involved. Due to port congestion, poor weather and other factors, cargo discharge was suspended and the main cargo hatches shut with work scheduled to restart the following day.

On Thursday 14 September, discharge of the Poole cargo continued. Some of the Goole cargo was removed ashore temporarily, to allow access to the area immediately next to the access shaft in which the deceased was found. The area was examined by both the police and customs, but nothing significant was found. Two empty black polythene sacks were found in the access shaft, one half way up, the other at the bottom of the shaft. Discharge of the remaining Poole cargo, sawn timber stowed in the upper section of Nos 2 and 3 holds, and the forward part of hold No 1, continued with the Goole cargo being restowed on board on Friday morning. With all cargo work completed by 1250, the vessel sailed for Goole at 1610.

1.2.8 *Baltiyskiy-107* arrived in the Humber Estuary at 1020 on Sunday 17 September and berthed in West Dock at 0050 the next day. Cargo discharge started at 0600 the same day. A cargo surveyor confirmed with the stevedores that on opening No 2 hatch a strong vaporous smell was evident. The smell was strong enough to be detected on the adjacent quayside. There was no such smell found when hatches Nos 1 and 3 were opened.

Cargo discharge was completed at 1730 later that day, with all cargo found to be in an apparent good condition. Some of the packages were in a partly wet condition with some evidence of a mould growth. This growth is attributed to wet bundles being stowed tightly together in the holds.

An inspection of the hold, following completion of the discharge, found no evidence of any chemical or oil spillage, nor any residue from previous cargoes. (The master stated that the immediate previous cargo had been stone from Rotterdam to Riga followed by two hold wash downs using salt water). The hold bilge wells were clean, although partly filled with water. Two torches were found at the bottom of the access shaft. The crew identified one of them as probably belonging to the dead man, but they did not recognise the other. Both were broken.

Following discharge, the vessel left Goole at 2030 the same day, Monday 18 September, for St Petersburg, Russia.

1.3 VESSEL CERTIFICATION

At the time of the accident, the vessel was fully in class with all statutory survey certificates valid. She was manned by experienced and certificated officers.

A port state control inspection (PSC) was last carried out on *Baltiyskiy-107* in Poland on 25 August 2000. Previous PSC inspections were carried out in Denmark (24 September 1999) and twice in the UK (9 July and 18 August 1997). Although there were a number of minor deficiencies recorded during these inspections, none were serious enough to warrant detention.

1.4 CREW PARTICULARS

The vessel was sailing with a crew of 13, all Russian nationals, consisting of master, three deck officers, four engineer officers, seaman/radio operator, bosun, one seaman, a cook and a deck cadet.

The 51 year old master, Vladimir Ivanovich Tokarev, obtained his Russian Federation Ships' Master Certificate in 1982 and first took command of *Baltiyskiy-107* in 1992. He had been master of the vessel since that time.

The 47 year old mate, Meged' Nikolai Vladimirovich, obtained his Russian Federation Chief Mate's Certificate in 1978. He has worked on a number of the company vessels since 1978 and first joined *Baltiyskiy-107* as mate on 7 July 2000.

The 55 year old bosun, Yuri Fedorovich Yasyukevich, started work at sea in 1968 after attending a sea training college. He joined *Baltiyskiy-107* in 1993 and had sailed on this vessel since then.

The casualty, Vasiliev Boris Nikolaevich, was 51 years old at the time of the accident. He had worked as a seaman for the previous six years, the last three or four of which had been on *Baltiyskiy-107*. The master had known him since about 1980.

Aleksander Vasiliev, son of the deceased, was 18 years old and on his first voyage.

1.5 DESCRIPTION OF VESSEL

1.5.1 *Baltiyskiy-107* is a steel, motor-driven general cargo vessel, with accommodation and engine room aft. She has three holds, Nos 1, 2 and 3, numbered forward to aft. Each hold fitted with a two part steel hatch cover. Each half of the cover consists of two parts, centrally hinged, which fold on themselves when opened. Each hatch cover is opened hydraulically by means of local controls. No cargo discharge gear is fitted.

She has a raised forecastle and poop deck, with accommodation over four decks aft. The forecastle contains a paint locker/bosun's store and a general storage area. Access to the forecastle is through a steel watertight door, recessed into the forecastle, on the centre line of the vessel. Just aft of the forecastle is a hatch giving access to the bow-thrust compartment.

Approximate hold sizes are:

No 1:	Breadth (mean)	=	10.0m
	Length	=	17.0m
	Depth	=	4.5m
No's 2 & 3:	Breadth (mean)	=	10.0m
	Length	=	20.0m
	Depth	=	4.5m

1.5.2 Access hatches to the holds from the deck are between Nos 1 and 2 holds, and between Nos 2 and 3 holds. There are two hatchways on or about the centre line between No 1 and 2 hatches, the starboard one giving access to No 1 hold at tank top level, while the port one gives access to the forward cofferdam.

There are three hatchways between Nos 2 and 3 holds on or about the centre line, the port one gives access to the aft cofferdam, the centre one gives access at tank top level to No 2 hold, while the starboard one gives access to No 3 hold about 2m below deck level. Each access hatchway is 800mm x 800mm in size and fitted with a hinged watertight hatch locked by means of two dog handles. A ladder is constructed on one side of the hatchway leading down to the bottom of the shaft **(Figures 4 and 5)**.

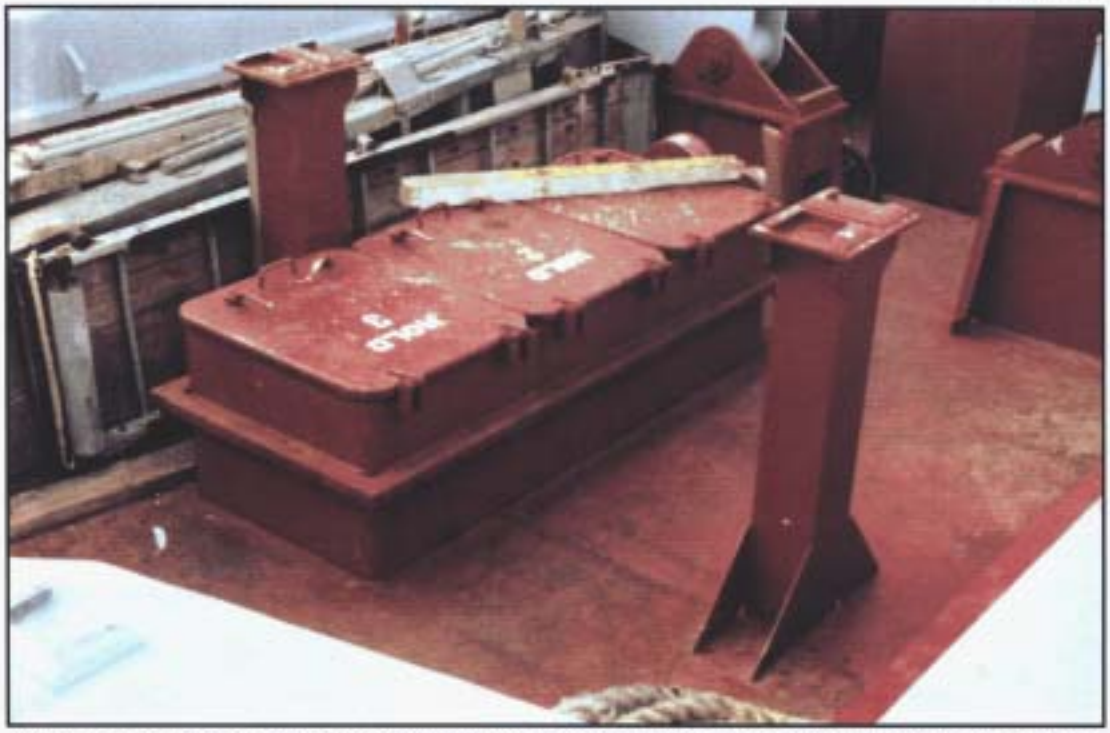
1.5.3 In the deck spaces between the hatch coamings of Nos 1, 2, and 3 holds and also alongside No 1 hold, are support stanchions for the carriage of containers on deck. The vessel is fitted out to carry 20-foot containers, 48 in the holds and 35 on deck.

None were carried on this voyage.

Figure 4

View of deck space between hatches 2 & 3 with deck cargo in place
- note limited headroom

Figure 5



View of hold access hatches between holds 2 & 3 with deck cargo removed.
Entry to No 2 hold is the middle hatch

1.6 PARTICULARS AND CARRIAGE OF CARGO

1.6.1 The cargo consisted of 2605.9m^3 of timber of which 1594.9m^3 was discharged in Poole and 1009.0m^3 in Goole.

The timber was pre-packaged and consisted of three different types:

- Spruce (Picea L.)
- Pine (Pinus L.) and
- Poplar (Populus).

The cargo which was discharged in Poole is described as sawn timber and kiln dried while that discharged at Goole is described as pallet timber. According to the *Phytosanitary Certificates* sent with the cargo and dated 4 September 2000, none of the timber had undergone any form of chemical treatment. The timber had been loaded with the Goole and Poole cargo in all three holds. The deck cargo was exclusively for Poole.

1.6.2 Apart from a Code of Safe Practice for timber deck cargoes which relates to the stowage and securing of the cargo, there are no specific requirements for the stowage of palletised or bundled timber.

The only requirements affecting the importation of timber are contained in The Plant Health (Forestry) (Great Britain) Order 1993. One requirement is that the timber is free of bark and/or kiln dried - to control the possible entry of bark beetle into the UK.

The Forestry Commission expressed concern regarding the possible use of sub-stain treatment to timber being imported from the continent, although the paperwork associated with this particular cargo stated that no treatment had been carried out.

1.6.3 What does affect the carriage of any cargo, including timber, are the regulations relating to the entry into enclosed or confined spaces. Cargo holds are defined as such. Apart from the guidance contained in the *Code of Safe Working Practices for Merchant Shipping - Chapter 17, Entering Enclosed or Confined Spaces*, there is also the Maritime Safety Card, issued by the International Maritime Organization (IMO). This gives guidance on entering cargo spaces, tanks, pumprooms, fuel tanks, cofferdams, duct keels, ballast tanks, and similar enclosed compartments. It states that enclosed spaces should only be entered if an authorised person, such as the master or a responsible officer, has carried out the appropriate safety checks. These checks are listed on the card. Under *General Precautions* it states:

The atmosphere in any enclosed space may be incapable of supporting human life. It may be lacking in oxygen content or contain flammable or toxic gases. This also applies to tanks which have been inerted.

The master or a responsible officer should ensure that it is safe to enter an enclosed space by

1. *ensuring that the space has been thoroughly ventilated by natural or mechanical means;*

2. *testing the atmosphere of the space at different levels for oxygen deficiency and harmful vapour where suitable instruments are available; and*

3. *requiring breathing apparatus to be worn by all persons entering the space where there is any doubt as to the adequacy of ventilation or testing before entry.*

1.7 DETAILS OF TESTS CARRIED OUT IN POOLE

1.7.1 Given the suspect nature of the atmosphere in the access hatchway into No 2 hold, the police decided that tests should be carried out before any entry was made. Following this decision, a local company, ATMI Systems UK, was asked to provide a qualified chemist together with the appropriate equipment to test the atmosphere in the hatchway.

The resultant test was carried out on Tuesday 12 September at about 1430, and consisted of a series of test readings taken at depths of 1m, 2m and finally 2.5m (the maximum length of the sampling tube). This last reading was repeated as a check (*). The results of this testing were as follows:

Depth from access hatch coaming	Oxygen O_2 %	Carbon Monoxide CO ppm	Hydrogen Sulphide H_2S ppm	Flammable gas Methane CH_4 0-100% LEL
1.0 metre	6.97	125-126	Less than 1%	Less than 1%
2.0 metres	1.10	235	Less than 1%	5%
2.5 metres	2.50	226-227	Less than 1%	4%
2.5 metres*	0.70	220	Less than 1%	Less than 1%
Typical normal levels	**20.8**	**0-5**	**0**	**0**

1.7.2 The results of these tests showed that the level of oxygen available within the access shaft to No 2 hold was insufficient to sustain life.

The cause of this oxygen deficiency has not been identified and could have been by a number of reactions, including chemical/biological reactions and a combustion process. An examination, after discharge had been completed at Goole, confirmed, however, that there was no evidence of any combustion process within the timber packages. This process can therefore be ruled out.

SECTION 2 - ANALYSIS

2.1 VASILIEV'S ENTRY INTO THE CARGO HOLD

2.1.1 Entry into cargo holds while a vessel is at sea is usually conducted under supervision, and with the proper precautions being taken. It certainly is not done by one person alone and without authority.

In this case it appears that, for some unexplained reason, seaman Vasiliev decided to go into No 2 hold using the deck access hatch. To do so he had to unlash a number of rope tails securing the tarpaulin covering the deck cargo on the hatch coaming, and then crawl inside. From there he had to move across the deck; crouching under the timber deck cargo which was secured on top of the main cargo hatch covers to reach the access hatch to No 2 hold. It was then necessary to release the two dog handles securing the access hatch lid shut, and to then raise it. With the timber deck cargo above, it was only possible to raise the lid some 600 mm. This would allow very restricted access to the shaft through a wedge-shaped opening. To prevent the hatch from closing, a piece of timber dunnage had been jammed across the hatch at the hinge end.

With all these obstacles preventing easy access to the hatch, there needed to be a very strong reason for Vasiliev to push ahead and gain entry. There were no technical or ship operational reasons for entry, and there is no evidence to show he had received any instructions from the bosun or any officer on board to do so. It seems it was purely a personal decision for an unknown reason.

2.1.2 Once the bosun had discovered the body, he was the one involved in the recovery. He states that apart from a torch, he found nothing on the body or in the immediate vicinity to account for Vasiliev's presence. On recovery, the scene was left as they had found it for the police.

Subsequent inspections by the police and HM Customs and Excise also failed to find anything to account for Vasiliev's presence in the shaft. There was nothing in the statements given by the crew to indicate that they were aware of anything, or anybody, in that shaft either before, or after, the accident. No evidence was found in the access shaft other than two black plastic bags and a broken torch.

2.1.3 Vasiliev would have been aware of the shipboard instructions regarding entry into the hold while at sea, both from the dangers of oxygen deficiency and the potential loss of his job. It is difficult to understand, therefore, why he went to all this trouble to gain entry to the hold; particularly as his son was on board for his first voyage, with his career likely to be affected by his father's actions.

2.2 RESCUE AND RESUSCITATION ACTIONS BY CREW

2.2.1 From the available evidence given in statements by the crew, the actions taken by the bosun, chief officer and other crew members followed the recommended procedures.

The bosun was quite correct in calling for assistance before attempting any rescue, and in donning SCBA sets before entering the shaft. Access was very limited, and the bosun did well in both getting into the shaft, and arranging for the casualty to be lifted out. It is fortunate that he completed the task before his air supply ran out - heavy demands are placed on the air supply when hard physical labour is required to lift a heavy object, such as the casualty, up a vertical ladder for a distance of about 5m.

2.2.2 The subsequent movement of the body, the removal of the clothing etc may well be standard practice for Russian Federation vessels, but it did not follow normal UK procedure. The usual practice following a rescue and a failed attempt to resuscitate, is to move the body, but to then leave it untouched for future examination by the police.

Assuming that death occurred some time between 1245 and 1330 on Sunday 10 September 2000, *Baltiyskiy-107* was in position 52° 23.9' N; 003° 16.6' E at 1300. This places the vessel in international waters, about 70 miles north-north-west of the Hook of Holland.

2.3 CARGO AND HOLD CONDITIONS

2.3.1 With all the packaged timber carried in the holds being described on the phytosanitary certificates as being free of any disinfestation or disinfection treatment, the atmosphere in the holds should not have presented any problem other than the natural smell of sawn timber. In Nos 1 and 3 holds, this was the situation when they were opened in Poole. In No 2 hold, however, there was a distinctive sharp smell noticed by both the Poole stevedores on first opening, and in Goole when the hold was re-opened after the voyage from Poole **(Figures 6 and 7)**.

As No 2 hold had been open in Poole for some hours while the death was being investigated, and some timber packages were removed temporarily, the return of the sharp smell suggested that the cause was either in the timber itself, or in the ship's bilges. The latter was discounted on completion of discharge; leaving the timber as the prime suspect.

Figure 6

General view of No 2 hold with deck cargo removed

Figure 7

Looking from port to starboard at aft end of No 2 hold

2.3.2 In a previous MAIB investigation into the cause of oxygen deficiency in the hold of a vessel carrying timber, the Timber Research Association suggested that fermentation was a possible cause. They gave three possible options:

1. A reaction involving water combined with temperature. This reaction is more likely where sapwood is involved, but it requires quite high temperatures. Under certain conditions carbon monoxide is given off.

2. A fermentation process where there is a known enzyme degradation. This is a breakdown of cellulose to possibly carbon monoxide with the reaction taking place at about 37°C. Other gases given off are hydrogen and methane. Rotting wood will also give off carbon monoxide.

3. The use of sapwood stain on the end grain of timbers. There are stringent Health and Safety Executive requirements on these, particularly in relation to the possible generation of toxic gases. There is no control of what sap treatment is applied to the timber abroad, and there exists the possibility that toxic gases could be given off from an unknown sap stain treatment.

2.3.3 To try to identify what, if any, timber treatment had been applied to the cargo despite what the paperwork stated, it was decided to obtain a sample of the cargo and subject it to various tests. A piece of wood from one of the suspect timber packages marked "ET31" was retrieved after discharge at Goole and sent to Remedial Technical Services, a company recommended by the Timber Research Association, for inspection and testing. In addition to an opinion on the wood itself, they were asked to test for the presence of several common preservatives which are known to cause irritation to skin, lungs and nasal membranes. Extracts from their report are given below:

Approximately half the surface area was coloured yellow-orange to a depth estimated to be around 0.5 mm. Other than some obvious blue paint marks the remaining surfaces were effectively clean.

Examination showed that the wood beneath the surface was not coloured and very clean.

There were no obvious distinctive odours prior to or following cutting into the sample.

Tests were then carried out in accordance with BS 5666: part 2: 1980 "Wood preservatives and treated timber; qualitative analysis". Tests for seven separate preservatives were carried out, none of which were detected. The report concluded with the comments:

The sample exhibited no distinctive odour which can sometimes be detected following treatment with some of the above timber preservatives.

None of the preservatives were detected under the conditions used for qualitative analysis.

2.3.4 With the bilges being confirmed as clear after the final discharge in Goole, and no evidence found of toxic timber treatment, the cause of low oxygen and high carbon monoxide readings in the access shaft to No 2 hold, remains speculative. The surveyor who oversaw the final discharge of the cargo in Goole stated that the smell was neither acidic nor sweet: *"it was gaseous, a bit like a garden shed that had paint, bits of timber, plant pots etc"*. One of the two broken torches has been explained as belonging to the dead crew member, presumably dropped when he became unconscious. The other might, or might not, have been significant.

Dr David Dickinson of Imperial College, London, a specialist in timber treatments etc suggested that such a smell was unlike anything he would expect from a normal timber cargo. The timber treatment chemicals used would not produce carbon monoxide, or affect the oxygen levels in the hold. Untreated and "fresh" timber might produce carbon dioxide as a by-product of enzyme degradation during the voyage, but that would not account for the distinctive smell noticed only in No 2 hold.

2.4 OWNERS' COMMENTS

When *Baltiyskiy-107* revisited Goole in early December 2000, the local receiver's agent approached the master and asked him if he had any knowledge of the Russian authorities' investigation into the death of seaman Vasiliev BN. The master said that it was his understanding that the authorities had decided that he had died as a result of entering a confined space which was heavily contaminated with fumes from an insecticide sprayed on the timber before the vessel left Riga.

On receiving this information, the MAIB contacted the vessel's owners in St Petersburg, Russia, and asked for details of the insecticide, and its possible side effects. The owners' reply was as follows:

To our great regret due to the fact we do not have any information concerning insecticide and its side effects we can not provide you any assistance in your investigation.

We would like to recommend you apply with your question to the owner (buyer) of the timber cargo. As we consider just the buyer must have all necessary exhaustive information concerning the purchased product.

2.5 SUPPLIER AND RECEIVERS' COMMENTS

2.5.1 On receipt of this advice, contact was made with all three cargo receivers to see if they were aware of any treatment that had been applied, or that they had requested, prior to shipment from Latvia.

MBM Forest Products Ltd said that the pallet timber was usually treated against staining with an accepted treatment, usually "SINSETO B" or its equivalent. Similarly, KDM International plc said that its timber imports were also anti-stain treated. Sir William Burnet & Co Ltd did not reply.

2.5.2 The timber supplier in Latvia was also asked about pre-shipment treatment and advised as follows:

Regarding your fax of accident on "Baltiyshiy 107" and used chemicals could advise that pallet wood for all three mentioned receivers were treated in "Sinesto B" (BASF Oy Wolman Division, Finland) and "Antiblue select" (Hickson Timber Products, UK) for which Quality Departm. of our company have all necessary certificates and technical documentations [sic].

Have not any knowledge abt [sic] other chemicals that might have been applied neither before the timber was delivered to our company nor during it treatment

Hickson Timber Products UK was contacted and asked to advise the MAIB inspector which chemicals were in its "Antiblu Select". It stated that it contained a mixture of disodium octoborate tetrahydrate and a quaternary ammonium compound, n-alkyl trimethyl ammonium chloride. It also contained a small proportion of 2-ethyl hexanoic acid.

All these materials were of low volatility, and the mixture was described as "environmentally friendly". It was an anti-fungal compound.

The "Sinesto B" has been confirmed as a known wood preservative, and consists of alkyl tri methyl ammonium chloride and disodium tetraborate. It was approved originally by HSE in 1992 under the Control of Pesticides Regulations 1986, HSE No 5136, with the latest approval dated 1998 (lasting until September 2001) (**See Annex 5**). The schedule attached to this chemical treatment states that its application is:

Wood preservative for industrial use: for use against wood rotting fungi and wood destroying insects.

The risk phase states that it is: "*irritating to eyes and skin*".

2.5.3 Further correspondence with the local agents on this matter drew the following final message:

Although think that treatment elsewhere and in no case with any insecticides should not take place. May be really another commodity or item which causes letal effect should be a matter of investigation [sic].

Although this could be considered as dismissing pre-treatment as a cause, and therefore not involving them, it does not offer any positive suggestion as to a cause.

2.6 OTHER POSSIBLE CAUSES

Despite the suggestion that the low level of oxygen in the access hatchway to No 2 hold was due to chemical treatment of the timber products, the MAIB has been unable to obtain any evidence to support this. All its enquiries have suggested that the timber which was discharged at Poole and Goole complied with the standard timber import requirements of the receivers.

This leaves us with the possibility that some commodity, other than timber, was stowed in the access hatchway. Whatever it was, seaman Vasiliev probably knew it was there.

As the crew were the only witnesses to the retrieval of the body and the subsequent actions, and can offer no explanation to why Vasiliev entered the hold access, it is unlikely that this theory can be supported with any evidence. If there was any other commodity within the space, it probably went overboard before arrival in the UK.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

3.1.1 *Baltiyskiy-107* was seaworthy on arrival at Poole with all certificates valid, and with an experienced crew. (Ref: 1.3)

3.1.2 The cargo consisted of two types of pre-packaged timber, sawn and palleted, and three types of wood:

Spruce (Picea L.), Pine (Pinus L.), and Poplar (Populus)

All were certified as being untreated, and loaded throughout the three holds and on deck. Sawn timber discharged in Poole, pallet timber discharged in Goole. (Ref: 1.6.1)

3.1.3 Entry to the access hatch required unlashing the deck cargo tarpaulin, crawling across to the hatch, unscrewing two securing dogs, and raising the lid as far as was possible with deck cargo above; ie 600mm. With all these obstacles preventing easy access to the hatch, there needed to be a very strong reason for Vasiliev to push ahead and gain entry. There were no technical or ship operational reasons for entry. The evidence is that he had received no instructions from the bosun or any officer on board to do so. It seems, therefore, that it was purely a personal decision for an unknown reason. (Ref: 2.1.1)

3.1.4 Between 1245 and 1330 on Sunday 10 September, the estimated period during which death occurred, *Baltiyskiy-107* was in international waters, about 70 miles north-north-west of the Hook of Holland. (Ref: 2.2.2)

3.1.5 The bosun was quite correct in calling for assistance before attempting any rescue, and in donning SCBA sets before entering the shaft. Access was very limited, and the bosun did well in both getting into the shaft and arranging for the casualty to be lifted out. (Ref: 2.2.1)

3.1.6 A series of tests carried out on the atmosphere within access shaft to No 2 hold after the vessel arrived in Poole showed that at a depth of about 2.5m, oxygen levels were 2.5% and carbon monoxide were 226-227 ppm.

The results of these tests show that the level of oxygen available within the access shaft was insufficient to sustain life. (Ref: 1.7.1 & 1.7.2)

3.1.7 In No 2 hold there was a distinctive sharp smell noticed by both the Poole stevedores on first opening, and in Goole when the hold was reopened after the voyage from Poole to Goole. As the hold had been open for some time in Poole during the police and customs and excise investigations, the return of the smell in Goole suggested it came from either the timber or the bilges. With the bilges proved clear on complete discharge, the timber remained as the source. (Ref: 2.3.1)

3.1.8 Tests were carried out in accordance with BS 5666: part 2: 1980 "Wood preservatives and treated timber; qualitative analysis", for seven separate preservatives. None were detected. (Ref: 2.3.3)

3.1.9 Details received from HSE and independent specialists confirmed that timber treatment by "Sinesto B" and "Antiblu Select", is environmentally friendly, of low volatility, but could cause irritation of eyes and skin. (Ref: 2.5.2)

3.1.10 In the absence of any identifiable chemical which would create the conditions found in the access hatch to No 2 hold, there remains the possibility that some commodity other than timber was stowed in the access space. (Ref: 2.6)

3.2 CAUSE OF DEATH

When *Baltiyskiy-107* arrived in Poole, the atmosphere within the access shaft to No 2 hold had an oxygen level varying between 0.7 and 6.97% and a carbon monoxide level varying between 125 and 235 ppm. The cause of seaman Vasiliev's death was most probably due to the adverse atmospheric conditions within the access shaft.

SECTION 4 - RECOMMENDATIONS

The Management of NWS Twelve Balt Shipping is recommended to:

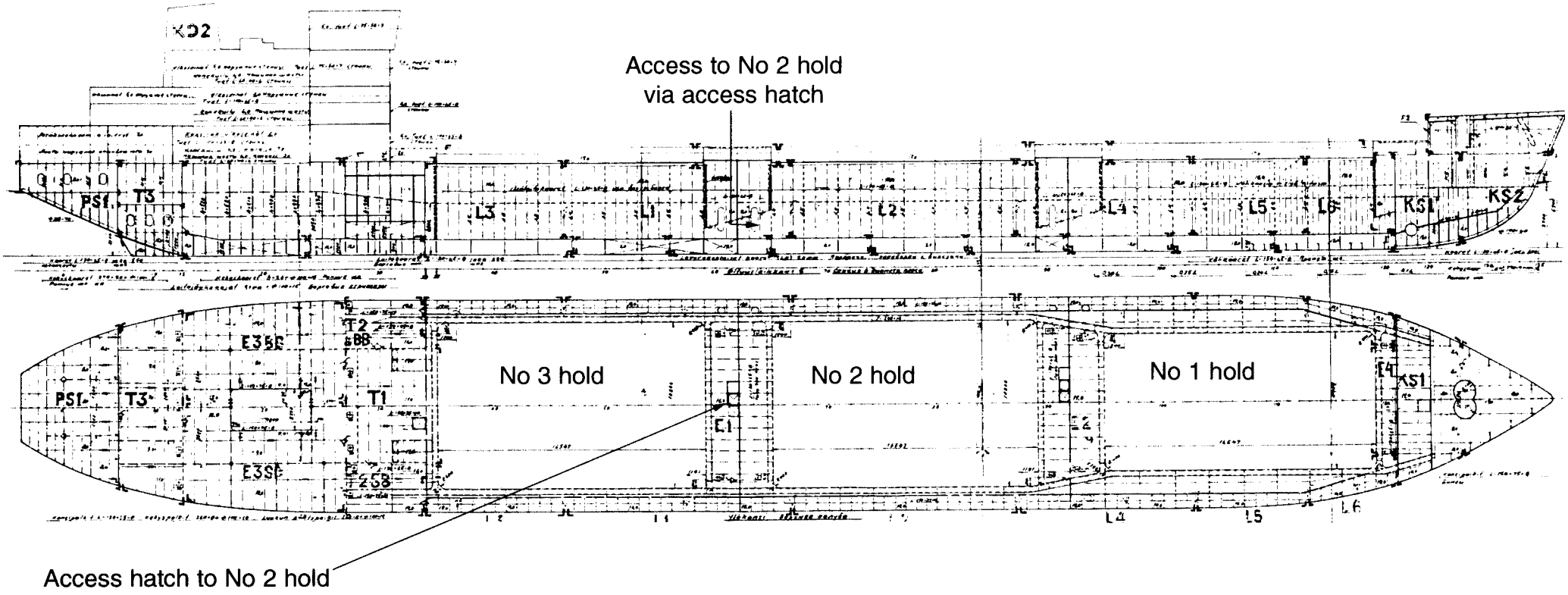
1. Impress upon the managing agents, North-Western Shipping, of the importance of ensuring that the master and crew are fully aware of the dangers of entering confined spaces, and the need to ensure that company regulations in this respect are rigorously applied.

The Management of North-Western Shipping is recommended to:

2. Ensure that the master and crew are fully aware of the requirements of entering confined spaces as given in the Maritime Safety Card issued by the International Maritime Organization (IMO).

Marine Accident Investigation Branch
May 2001

1. Outline deck arrangement of *Baltiyskiy-107*



Side elevation and plan of mv *Baltiyskiy-107*

2. Copy of extract from *Code of Safe Working Practices for Merchant Seamen on entering Enclosed or Confined Spaces*

CHAPTER 17

ENTERING ENCLOSED OR CONFINED SPACES

17.1 Introduction

17.1.1 Based on the findings of the risk assessment, appropriate control measures should be put into place to protect those who may be affected. This Chapter highlights suggested control measures for entry into enclosed or confined spaces.

17.1.2 **The atmosphere of any enclosed or confined space is potentially dangerous.** The space may be deficient in oxygen and/or contain flammable or toxic fumes, gases or vapours. Where possible, alternative means of working which avoid entering the space should be found.

17.1.3 Should there be any unexpected reduction in or loss of the means of ventilation of those spaces that are usually continuously or adequately ventilated then such spaces should also be dealt with as dangerous spaces.

17.1.4 When it is suspected that there could be a deficiency of oxygen in any space, or that toxic gases, vapours or fumes could be present, then such a space should be considered to be a dangerous space.

17.2 Precautions on Entering Dangerous Enclosed or Confined Spaces

17.2.1 The following precautions should be taken as appropriate before a potentially dangerous space is entered so as to make the space safe for entry without breathing apparatus and to ensure it remains safe whilst persons are within the space.

1. A competent person should make an assessment of the space and a responsible officer to take charge of the operation should be appointed

- see 17.3

2. The potential hazards should be identified - see 17.4
3. The space should be prepared and secured for entry - see 17.5
4. The atmosphere of the space should be tested - see 17.6
5. **A "permit-to-work" system should be used** - see 17.7
6. Procedures before and during the entry should be instituted - see 17.8 and 17.9

17.2.2 Where the procedures listed at 1 to 4 in the previous paragraph have been followed and it has been established that the atmosphere in the space is or could be unsafe then the additional requirements including the use of breathing apparatus specified in 17.11 should also be followed.

17.2.3 No one should enter any dangerous space to attempt a rescue without taking suitable precautions for his own safety since not doing so would put his own life at risk and almost certainly prevent the person he intended to rescue being brought out alive.

17.3 Duties and Responsibilities of a Competent Person and of a Responsible Officer

17.3.1 A competent person is a person capable of making an informed assessment of the likelihood of a dangerous atmosphere being present or arising subsequently in the space. This person should have sufficient theoretical knowledge and practical experience of the hazards that might be met in order to be able to assess whether precautions are necessary. This assessment should include consideration of any potential hazards associated with the particular space to be entered. It should also take into consideration dangers from neighbouring or connected spaces as well as the work that has to be done within the space.

17.3.2 A responsible officer is a person appointed to take charge of every operation where entry into a dangerous space is necessary. This officer may be the same as the competent person (see 17.3.1 above) or another officer.

Both the competent person and/or the responsible officer may be a shore-side person.

17.3.3 It is for the responsible officer to decide on the basis of the risk assessment the procedures to be followed for entry into a potentially dangerous space. These will depend on whether the assessment shows:

(a) there is a minimal risk to the life or health of a person entering the space then or at any future time;

(b) there is no immediate risk to health and life but a risk could arise during the course of work in the space; or

(c) the risk to life or health is immediate.

17.3.4 Where the assessment shows that there is no immediate risk to health or life but that a risk could arise during the course of the work in the space the precautions described in sections 17.4 to 17.9 should be taken as appropriate.

17.3.5 Where the risk to health or life is immediate then the additional requirements specified in section 17.11 are necessary.

17.3.6 For inland water vessels such as harbour craft either or both the competent person and the responsible officer may only be available from shore-based personnel. No entry into a potentially dangerous space should be made in these circumstances until such suitably qualified persons are available.

17.4 Identifying Potential Hazards

Oxygen Deficiency

17.4.1 If an empty tank or other confined space has been closed for a time the oxygen content may have been reduced owing to a number of reasons:

(a) Rusting may have occurred due to oxygen combining with steel.

(b) Oxygen absorbing chemicals may have been present.

(c) Oxygen absorbing cargoes may have been carried or gases from volatile cargoes may have displaced the oxygen in tanks.

(d) Hydrogen may have been produced in a cathodically-protected cargo tank used for ballast.

(e) Oxygen may have been displaced by the use of carbon dioxide or other fire-extinguishing or -preventing media, or inert gas in the tanks or inter-barrier spaces of tankers or gas carriers.

Toxicity of Oil Cargoes

17.4.2 Hydrocarbon gases are flammable as well as toxic and may be present in fuel or cargo tanks which have contained crude oil or its products.

17.4.3 Hydrocarbon gases or vapours may also be present in pump rooms and cofferdams, duct keels or other spaces adjacent to cargo tanks due to the leakage of cargo.

17.4.4 The components in the vapour of some oil cargoes, such as benzene and hydrogen sulphide are very toxic.

Toxicity of Other Substances

17.4.5 Cargoes carried in chemical tankers or gas carriers may be toxic.

17.4.6 There is the possibility of leakage from drums of chemicals or other packages of dangerous goods where there has been mishandling or incorrect stowage or damage due to heavy weather.

17.4.7 The trace components in inert gas such as carbon monoxide, sulphur dioxide, nitric oxide and nitrogen dioxide are very toxic.

17.4.8 The interaction of vegetable or animal oils or sewage with sea water may lead to the release of hydrogen sulphide which is very toxic.

3. Copy of IMO Safety Card

MARITIME SAFETY CARD

Entering cargo spaces, tanks, pump-rooms, fuel tanks, cofferdams, duct keels, ballast tanks and similar enclosed compartments

GENERAL PRECAUTIONS

Do not enter an enclosed space unless authorized by the master or a responsible officer and only after all the appropriate safety checks listed overleaf have been carried out.

The atmosphere in any enclosed space may be incapable of supporting human life. It may be lacking in oxygen content or contain flammable or toxic gases. This also applies to tanks which have been inerted.

The master or a responsible officer should ensure that it is safe to enter an enclosed space by:

.1 ensuring that the space has been thoroughly ventilated by natural or mechanical means;

.2 testing the atmosphere of the space at different levels for oxygen deficiency and harmful vapour where suitable instruments are available; and

.3 requiring breathing apparatus to be worn by all persons entering the space where there is any doubt as to the adequacy of ventilation or testing before entry.

WARNING

Where it is known that the atmosphere in an enclosed space is unsafe, it should only be entered when it is essential or in an emergency. All the safety checks overleaf should be carried out before entry and breathing apparatus must be worn.

Protective equipment and clothing

It is important that all those entering an enclosed space wear suitable clothing and that they make use of protective equipment which may be provided on board for their safety. Access ladders and surfaces within the space may be slippery and suitable footwear should be worn. Safety helmets protect against falling objects and, in a confined space, against bumps. Loose clothing, which is likely to catch on obstructions, should be avoided. Additional precautions are necessary where there is a risk of contact with harmful chemicals. Safety harnesses, belts and lifelines should be worn and used where there is any danger of falling from a height.

There may be additional safety instructions on board the ship – make sure that they are made known to all concerned.

Printed and published by the International Maritime Organization, 4 Albert Embankment, London SE1 7SR

SAFETY CHECK LIST

Before entering any enclosed space all the appropriate safety checks listed below must be carried out by the master or responsible officer and by the person who is to enter the space.

Section 1

To be checked ☑ by the master or responsible officer

1.1 Has the space been thoroughly ventilated and, where testing equipment is available, has the space been tested and found safe for entry? ☐

1.2 Have arrangements been made to continue ventilation during occupancy of the space and at intervals during breaks? ☐

1.3 Are rescue and resuscitation equipment available for immediate use beside the compartment entrance? ☐

1.4 Have arrangements been made for a responsible person to be in constant attendance at the entrance to the space? ☐

1.5 Has a system of communication between the person at the entrance and those in the space been agreed? ☐

1.6 Are access and illumination adequate? ☐

1.7 Are portable lights or other equipment to be used of an approved type? ☐

When the necessary safety precautions in SECTION 1 have been taken, this card should be handed to the person who is to enter the space for completion.

Section 2

To be checked ☑ by the person who is to enter the space

2.1 Have instructions or permission been given by the master or a responsible officer to enter the enclosed tank or compartment? ☐

2.2 Has SECTION 1 been completed as necessary? ☐

2.3 Are you aware you should leave the space immediately in the event of failure of the ventilation system? ☐

2.4 Do you understand the arrangements made for communication between yourself and the responsible person in attendance at the entrance to the space? ☐

Section 3

Where breathing apparatus is to be used, this section must be checked jointly by the responsible officer and the person who is to enter the space.

3.1 Are you familiar with the apparatus to be used? ☐

3.2 Has the apparatus been tested as follows? ☐
(i) Gauge and capacity of air supply
(ii) Low pressure audible alarm
(iii) Face mask – air supply and tightness

3.3 Has the means of communication been tested and emergency signals agreed? ☐

Where instructions have been given that a responsible person be in attendance at the entrance to the compartment, the person entering the space should show their completed card to that person before entering. Entry should then only be permitted provided all the appropriate questions have been correctly checked ☑.

4. Copy of MST Gas Testing Report

A T M I

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D.S. Snook
Dorset Police
Poole Police Station
Civic Centre
Poole
Dorset

Our Ref: BO/ns
13th September 2000

Dear Mr Snook

As discussed please find enclosed my official report for the Gas Testing that was carried out by myself on the M.V. Baltiski yesterday afternoon.

I trust that the report is in order, please do not hesitate to contact me should you have any questions or require further assistance.

Yours sincerely
on behalf of ATMI Systems

Robert Old.

Robert Old

Enc. Report Number: OLD/DP/000913

ATMI

complete monitoring solutions MST

	OLD/DP/000913
	The M.V. Baltiski moored at Poole Quay, in the town of Poole, Dorset
	12th September 2000
	2.30 p.m. approximately

We were requested to carry out a confirmed space entry test in the Number 2 hold of the vessel, prior to persons entering the hold.

A Neotronics Minigas-XL (Serial Number: 126MEO8543) was used. The instrument was set up, tested and calibrated for detection of the gases as listed below

The Instrument was fitted with an aspirator attachment to enable samples of the atmosphere to be taken at various levels in the hold.

Number 2 Hold Cover was unlocked and the Hold held open with a piece of timber.

The sampling tube was lowered into the Hold at various levels – 1 Metre, 2 Metres and fully extended, approximately 2.5 Metres

A copy of the test certificate for the instrument is attached to this report.

Gas	Measurement Range
O_2 Oxygen	0-25% v/v
CH_4 Methane	0-100% LEL
H_2S Hydrogen Sulphide	0-50 ppm
CO Carbon Monoxide	0-500 ppm

Gas	Instrument Reading
O_2 Oxygen	6.97 % v/v
Flammable Gas	Below detectable limit
H_2S Hydrogen Sulphide	Below detectable limit
CO Carbon Monoxide	125-126 ppm

Gas	Instrument Reading
O_2 Oxygen	1.1 % v/v
Flammable Gas	5% LEL
H_2S Hydrogen Sulphide	Below detectable limit
CO Carbon Monoxide	235 ppm

ATMI

complete monitoring solutions MST

Report on Gas Testing carried out on the M/V Baltiski for Dorset Police/ Continued...

Readings at Level 2.5 Metres into the Hold (fully extended) Two Tests were carried out

Test 1

Gas	Instrument Reading
O_2 Oxygen	2.5 % v/v
Flammable Gas	4 % LEL
H_2S Hydrogen Sulphide	Below detectable limit
CO Carbon Monoxide	226-227 ppm

Test 2

Gas	Instrument Reading
O_2 Oxygen	0.7 % v/v
Flammable Gas	Below detectable limit
H_2S Hydrogen Sulphide	Below detectable limit
CO Carbon Monoxide	220 ppm

Terms used:-

% v/v = percentage volume per volume
ppm = parts per million
LEL = lower explosive limit

Typical Normal Levels of Gases

Oxygen	20.8% v/v
Carbon Monoxide	0-5 ppm
Hydrogen Sulphide	0 ppm
Flammable Gas	0 % LEL

Discussion of Results

The lack of Oxygen can be caused by a number of reactions, including chemical/biological reaction and combustion processes. Therefore the exact cause of the Oxygen deficiency is unclear. It would <u>not</u> be normal under UK Health and Safety "Confined Space Entry" Regulations to enter this Hold without carrying out the tests as outlined in this report, and a level of 19% v/v/ should be considered as a minimum safe level according to H.S.E Guidance Note GS5. and its most recent updates.

Under the Confined Space Entry" Regulations work in confined spaces should be avoided, but were it necessary, a safe system of work is required with adequate measures for a rescue in an emergency.

The level of Carbon Monoxide would also be considered as Hazardous after a 15 minute exposure on an individual to 200 ppm and normally a 1 hour break would be taken before re-entering an area with this level of Carbon Monoxide.

Given the extremely low levels of Oxygen present, any person entering the Hold without Breathing Apparatus would rapidly lose consciousness upon entering the Hold, with death occurring shortly after.

It should be noted that the testing did not, and could not be carried out, for all other potentially hazardous chemicals that may have been used in the treatment of the Timber carried on the Vessel

Signed:	Robert Old **Robert Old** **on behalf of ATMI Systems UK**
Date	**13th September 2000**

Zellweger Analytics Ltd

Hatch Pond House, 4 Stinsford Road
Nuffield Estate, Poole, Dorset
BH17 0RZ England

Tel : +44 (0)1202 676161 direct line
Fax : +44 (0)1202 678011
Telex : 41138
Internet : http://www.zelana.com

zellweger analytics

Calibration Certificate

zellweger analytics

Model: M.GAS,OFCH **Serial Number:** 126ME08543

Test Gases Used:			Calibration Results:				
Gas	Cylinder No.	Conc	Null		Gas Span		Response
			Before	After	Before	After	
O2		Fresh Air			24.1	20%	✓
CH4	P2565171SA	22%			24	22%	✓
H2S	P73924444A	75PPm			67	75PPm	✓
CO	0E92K337A	419PPm			431	419PPm	✓

Calibration Date: 110800
Inst Gas Date: 110800
Gas Test Date: 110800
O2 Sensor mV: 22.2mV
Pump flow rate: n/a
Technician : JR

CALIBRATION CERTIFICATE

This is to certify that the instrument described above has been calibrated and found to comply with its published performance specification at the points measured. The calibration was carried out using equipment which is subject to regular periodic verifications and whose calibration is traceable to National Standards.
The calibration was carried out in accordance with the general requirements of the Company's ISO 9001 : 1994 approval.

Signed: ..... Position: T&C For and on behalf of Zellweger Analytics Ltd

Next calibration due: 11.02.01

5. Details of timber treatment

REMEDIAL TECHNICAL SERVICES

Consultancy & Laboratory Services

14, Mill Rise, Bourton, Nr Gillingham, Dorset. SP8 5DH.

Telephone (01747) 840715 email: rts@mill-rise.freeserve.co.uk

Report No. MAIB/01/12/2000 3 December, 2000

ANALYSIS OF TIMBER SAMPLE EX. MV 'BALTISKY'

REPORT

ALAN RUSHTON,
DEPARTMENT OF THE ENVIRONMENT,
TRANSPORT AND THE REGIONS,
MARINE ACCIDENT AND INVESTIGATION BRANCH,
FIRST FLOOR,
CARLTON HOUSE,
CARLTON PLACE,
SOUTHAMPTON,
HANTS
SO15 2DZ

ANALYSIS OF TIMBER SAMPLE EX. MV 'BALTISKY'

1. INTRODUCTION:

A sample of timber was received from Alan Rushton, Inspector at the Department of the Environment, Transport and the Regions, Marine Accident and Investigation Branch, First Floor, Carlton House, Carlton Place, Southampton, together with a request to determine the possible presence of timber preservatives.

Following discussion it was agreed to look for the presence of several common preservatives which have a history of causing irritation to skin, lungs and nasal membranes.

1. DESCRIPTION:

The sample as received consisted of a piece of softwood measuring 460mm x 70mm x 30mm;this was reported to be pallet.

Approximately half the surface area was coloured yellow-orange to a depth estimated to be around 0.5mm. Other than some obvious blue paint marks the remaining surfaces were effectively clean.

Examination showed that wood beneath the surface was not coloured and very clean.

There was no obvious distinctive odours prior to or following cutting into the sample.

2. ANALYSIS:

Samples of the outer 2-3mm of the coloured and colourless sections of the supplied wood were shaved off and individually extracted for two hours in 'Analar' acetone. The resultant extracts were allowed to cool and stand for 24 hours before filtering. The extracts were evaporated down to minimal volume.

10 x 2ul droplets of each concentrated extract were applied to silica and cellulose glass thin-layer chromatography plates, and the plates 'run' in the appropriate solvent system as described in BS 5666; part 2: 1980, "Wood preservatives and treated timber; qualitative analysis".

Following drying of the plates they were subject to exposure as described in the above British Standard to UV light and then challenged with the appropriate reagent.

The results are described below.

3. RESULTS:

Preservative	✓ = detected ✗ = not detected	
	Coloured fraction	**Clean fraction**
Dieldrin	✗	✗
Pentachlorophenol	✗	✗
Pentachlorophenyl laurate	✗	✗
2-phenylphenol	✗	✗
Tri-n-butyltin compounds	✗	✗
Zinc naphthenate and zinc compounds	✗	✗
Copper naphthenate	✗	✗

No further tests were carried out for other preservatives.

4. REMARKS:

The sample exhibited no distinctive odour which can sometimes be detected following treatment with some of the above timber preservatives.

None of the above preservatives were detected under the conditions used for the qualitative analysis.

G.R.Coleman. B.Sc.(Hons).,M.I.Biol.,C.Biol.,A.I.W.Sc..

HSE
Health & Safety Executive

Food and Environment Protection Act 1985: Part III
The Control of Pesticides Regulations 1986

HSE No. 5136

Notice of approval (Amendment)

To: [redacted]

Of: [redacted]

Under the Food and Environment Protection Act 1985 and Regulation 5 of The Control of Pesticides Regulations 1986, the Minister of Agriculture, Fisheries and Food, and the Secretary of State acting jointly and the Scottish Ministers (as regards Scotland) and the Welsh Assembly and the Minister of Agriculture, Fisheries and Food (acting jointly as regards Wales) have amended the conditions of

Approval No HSE 5136

granted in relation to SINESTO B

Marketed by FINNMEX CO

EXPIRY DATES HAVE BEEN AMENDED AS FOLLOWS:-

1. APPROVAL FOR SALE AND ADVERTISEMENT EXPIRES THREE YEARS FROM THE DATE OF AUTHORISED SIGNATURE.

2. APPROVAL FOR SUPPLY, STORAGE AND USE EXPIRES FIVE YEARS FROM THE DATE OF AUTHORISED SIGNATURE.

3. FOR DISPOSAL PURPOSES ONLY, THE APPROVAL FOR SALE, ADVERTISEMENT, SUPPLY AND STORAGE EXPIRES SIX YEARS FROM THE DATE OF AUTHORISED SIGNATURE.

as set out in the attached schedule.

ALL OTHER CONDITIONS REMAIN UNCHANGED.

The approval applies to England / Scotland / Wales.

Signed: [signature] Date: 22.9.00

(Authorised signatory)

Health and Safety Executive
Magdalen House
Stanley Precinct
Bootle
Merseyside
L20 3QZ

HSE
Health & Safety Executive

Food and Environment Protection Act 1985: Part III
The Control of Pesticides Regulations 1986

HSE No. 5136

Notice of approval (Amendment)

To: [redacted]

Of: [redacted]

Under the Food and Environment Protection Act 1985 and Regulation 5 of The Control of Pesticides Regulations 1986, the Minister of Agriculture, Fisheries and Food and the Secretary of State acting jointly have amended the conditions of Approval No. HSE 5136

granted in relation to SINESTO B

Marketed by FINNMEX CO

AMENDED PAGES 2 AND 5 REFLECT THE DETAILS PROVIDED ON THE PRODUCT APPLICATION FORM.

SECTION 4. ADDITIONAL CONDITIONS OF APPROVAL HAS BEEN ADDED TO THE SCHEDULE.

ALSO, APPROVAL IS EXTENDED TO 21 SEPTEMBER 2001.

ALL OTHER CONDITIONS REMAIN UNCHANGED.

as set out in the attached schedule.

Signed [signature]
(Authorised signatory)

Date 14/7/98

Health and Safety Executive
Magdalen House
Stanley Precinct
Bootle
Merseyside
L20 3QZ

EPA 22 (10/88)

Schedule:-

The following are the conditions under which approval has been granted. Any changes from those detailed in this Schedule may invalidate the approval and be in contravention of The Control of Pesticides Regulations 1986.

1. **PRODUCT NAME:** SINESTO B

2. **FORMULATION**

	Component	% w/w	g/l
(ai)	ALKYLTRIMETHYL AMMONIUM CHLORIDE	14.0	152.0
	DISODIUM TETRABORATE	5.2	56.0
	REMAINDER OF FORMULATION	80.8	

3. **CONDITIONS OF APPROVAL**

3/1 **SALE AND SUPPLY**

i **Type of formulation:** WATER BASED CONCENTRATE.

ii **Pack Size(s):** UP TO 200 LITRES AND BULK.

iii. **Labelling to include:**

a. **Applications -** WOOD PRESERVATIVE FOR INDUSTRIAL USE. FOR USE AGAINST WOOD ROTTING FUNGI AND WOOD DESTROYING INSECTS.

b. **Application Method -** IMMERSION.

c. **Application Rate -** DILUTE 1 PART OF PRODUCT WITH A MINIMUM OF 11 PARTS OF WATER (TO PRODUCE A MAXIMUM WORKING CONCENTRATION OF 1.17% w/w ALKYLTRIMETHYL AMMONIUM CHLORIDE AND 0.43% w/w DISODIUM TETRABORATE) THEN IMMERSE AS NECESSARY.

d. **EEC Classification and Hazard Symbol -** IRRITANT (ST ANDREWS CROSS).

e (i) **Restriction of use phrase -** FOR USE ONLY AS A WOOD PRESERVATIVE.

f. **Risk phrase(s) -** IRRITATING TO EYES AND SKIN.

g. **Contents Statement - contains -** ALKYLTRIMETHYL AMMONIUM CHLORIDE:
14.0% w/w (152.0 g/litre)
DISODIUM TETRABORATE:
5.2% w/w (56.0 g/litre)

Schedule:-

3/3	USE		
	i.	Applications:	WOOD PRESERVATIVE FOR INDUSTRIAL USE. FOR USE AGAINST WOOD ROTTING FUNGI AND WOOD DESTROYING INSECTS.
	ii.	Application Method:	IMMERSION.
	iii.	Application Rate:	DILUTE 1 PART OF PRODUCT WITH A MINIMUM OF 11 PARTS OF WATER (TO PRODUCE A MAXIMUM WORKING CONCENTRATION OF 1.17% w/w ALKYLTRIMETHYL AMMONIUM CHLORIDE AND 0.43% w/w DISODIUM TETRABORATE) THEN IMMERSE AS NECESSARY.
	iv.	Precautions:	USE ONLY AS DESCRIBED ON LABEL.
3/4	ADVERTISEMENT		
NO SPECIAL CONDITIONS			

4. ADDITIONAL CONDITIONS OF APPROVAL

Approval holders are under an on-going obligation to submit immediately any new information on the potentially dangerous effects of a product or of residues of an active substance contained in a product, on human or animal health, ground water or the environment.