C O N T E N T S

SUMMARY

The *Melete* sailed from Dampier, Western Australia on 11 August 1991 with 27 persons on board, bound for Port Talbot, Wales with a cargo of 68902 tonnes of iron ore fines.

At 0358Z 24 August the Australian Maritime Safety Authority's Maritime Rescue Coordination Centre in Canberra received a distress call via the Inmarsat A Indian Ocean satellite from the *Melete* in position 27° 41'S 054° 13'E. The distress message said that the *Melete* was in danger of sinking with 27 crew on board. The MRCC advised the *Melete* to activate their EPIRB, shortly after which all contact with the *Melete* was lost.

Search and rescue operations were coordinated by Marine La Reunion. Aircraft and other ships arriving at the last known position of *Melete* reported sighting oil slicks and flotsam.

Two crew members of *Melete* were rescued. Continued searches failed to locate other survivors.

The Australian Marine Incident Investigation Unit, under the provisions of the Navigation (Marine Casualty) Regulations, undertook an investigation of the evidence that was available within Australia.

SOURCES OF INFORMATION

Maritime Rescue Coordination Centre, Canberra

Hamersley Iron, Dampier
Documentation and communications concerning the loading of the cargo

Australian Maritime Safety Authority, Newcastle, NSW

Under Regulation 16(3) of the Navigation (Marine Casualty) Regulations the Inspector must, where a report relates to a person's affairs to a material extent, if it is reasonable to do so, provide the person with a copy of the report or the relevant part of the report. Such a person may then provide written comments or information relating to the report.

A submission was received on behalf of the ship's Owners. This submission has been considered and the text of the report amended to incorporate the submission where appropriate.

SEQUENCE OF EVENTS

The *Melete* was a Greek registered bulk carrier, 228.05 metres in length and of 72060 tonnes summer deadweight at a draught of 14.028 metres. The ship was built in 1975 in Sunderland, United Kingdom, and was classed with Lloyds Classification Society completing its first (construction) special survey in September 1975. Built in part of higher tensile steel she was strengthened for ore cargoes and designed so that holds 1, 3, 5 and 7 could be left empty when loaded to the appropriate load line.

The *Melete* sailed from the Japanese port of Yokkachi, in ballast, for the port of Dampier, on 30 July 1991, to load a cargo of iron ore fines for Port Talbot. In order to comply with the Australian Quarantine Inspection Service guidelines concerning ballast water taken in overseas ports, ballast was changed during the period that the ship travelled between the positions 20° 42'N 132° 39'E and 06° 58'N 128° 39'E.

On 3 August 1991 the Master sent a telex to Hamersley Iron, Dampier, advising of the proposed stowage plan and the required loading sequence. The Master proposed to load alternate holds (holds 2,4,6 and 8) and a sequence comprising three runs with an allowance for trimming:

Run	Hold	Qty	Hold	Qty	Hold	Qty	Hold	Qty
1	2	5000	8	5000	6	6000	4	6000
2	8	4000	4	6000	6	6000	2	6000
3	8	4450	4	6300	6	6550	2	5500

Trimming 2000 between holds 2 and 8

This plan provided an anticipated cargo distribution of:

Hold	Quantity
2	17,500
4	18,300
6	18,550
8	14,450
Total:	68,800

On 5 August Hamersley Europe Pty Ltd sent a telexed authorisation to load the Melete containing shipment details and a "note on special conditions" "vessel to load all holds". On 7 August 1991 this information was passed by Hamersley Iron to Pilbarra Harbour Services, Agents for the *Melete.*

The *Melete* arrived off Dampier at 1120 WST 10 August 1991 and proceeded directly to the Parker Point berth, where the ship was all secure, port side alongside, at 1435. The terminal had requested an arrival draught of 5.50 metres Fwd 7.00 metres Aft. For the *Melete* to have complied with this request some of the water ballast carried in No.5 cargo hold would have had to be discharged, leaving the ballast water in that hold in a slack condition. Slack water ballast in a cargo hold should be avoided as structural damage can

occur due to the sloshing effects of the water . The *Melete* therefore kept No.5 hold full, arriving with 22,524 tonnes of ballast at a draught of 6.20 metres Fwd 6.90 metres Aft.

On arrival the Master was provided with a Declaration by the Shipper (Attachment 2), as required under Marine Orders Part 34, which gives effect to the International Maritime Organization's Code of Safe Practice for Solid Bulk Cargoes. This Declaration detailed the physical properties of the cargo to be loaded. The Master was also given a letter (Attachment 3) outlining the responsibilities of the ship with respect to the loading procedures.

The Master, as was his prerogative, disregarded the special condition of all hold loading.

Prior to loading a slight reduction was made to the pour quantities in holds 2 and 8 in the third run to provide an additional 950 tonnes for trimming purposes.

Loading commenced at 1524 10 August and, apart from three minor stoppages, proceeded according to plan until the second pour of the third run. At this point the pour quantities of 6300 and 6550 tonnes for holds 4 and 6 respectively were split into two pours each of 4300 + 2000 and 2000 + 4550 and the sequence changed slightly. Following completion of the third run the loading rate was reduced by the terminal. Also, the weightometer proved to be overweighing by some 4%, resulting in 5,500 tonnes still to be loaded at that time instead of 2,950 tonnes, necessitating a compensatory fourth run.

Loading completed at 1038 11 August, the loading rates in tonnes per hour and times from the Shiploading Report being as follows:

Pour	Hold	Quantity Tonnes	Start Time	Finish Time	Rate TPH	Corrected Rate TPH
1	2	4950	1515	1634	4242*	4078
2	8	4975	1641	1757	4326*	4159
3	6	6015	1800	1912	5013	4819
4	4	6020	1918	2023	5559	5344
5	8	4005	2029	2119	4808	4622
6	4	6005	2127	2234	5376	5168
7	6	6035	2241	2359	5029*	4834
8	2	6050	0009	0121	5042	4847
9	8	4025	0132	0214	5750	5528
10	4	4300	0223	0320	4526	4351
11	6	2025	0326	0346	6081	5846
12	4	1960	0354	0416	5341	5134
13	2	5050	0425	0518	5719	5498
14	6	4540	0527	0620	5142	4943

15	2	995	0730	0749	3139	3018
16	4	745	0753	0804	4071	3913
17	6	560	0808	0819	3060	2942
18	8	980	0823	0851	2099	2018
19	2	1050	0925	0947	2941	2827
20	8	1025	0954	1006	5125	4927
21	8	250	1022	1025	5000	4807
22	2	115	1037	1038		

*Allowance made for minor stoppage

Total cargo loaded per weightometer was 71675 tonnes with a hold distribution of:

Hold	Quantity
2	18,210
4	19,030
6	19,175
8	15,260

Cargo loaded as per draught survey was 68,902 tonnes, giving a ship/shore differential factor of 0.9613114, which applied to the hold quantities provides a corrected distribution of:

Hold	Quantity
2	17,505
4	18,294
6	18,433
8	14,670

Gross loading time was 19h 24m and the nett loading time 14h 52m, giving gross and nett loading rates of 3,552 and 4,635 tph respectively.

Draught on completion of loading, as recorded in the Draught Survey Report (Attachment 4), was:

Fwd	13.93 metres		
Aft	14.05 metres		
Mean	13.99 metres	Stern Trim	0.12 metres
Mid Port	14.01 metres		
Mid Stbd	14.05 metres		
Mid Mean	14.03 metres	Sag	0.04 metres

Ballast remaining on board on completion of loading was recorded as being 174 tonnes, although the distribution of this ballast was not recorded.

Formalities completed the *Melete* sailed from Dampier at 1155 11 August with a total of 27 persons on board, 26 crew and one officer's wife. At the time of sailing the Master declared that he had not received instructions from Charterers as to which route, either by Suez or the Cape of Good Hope, he should take.

However, shortly after sailing the Master filed a sailing plan with the Australian Maritime Safety Authority's Maritime Rescue Coordination Centre (MRCC), Canberra indicating a route across the South Indian Ocean towards the Cape of Good Hope. Thereafter the Melete continued to participate in the Australian Ship Reporting System (AUSREP), sending daily position reports to the MRCC until clearing the Australian area of responsibility at longitude 075°00'E at 0305Z 19 August, at which time the ship was in latitude 26°56'S.

On 24 August at 0358Z the MRCC Australia received a telexed distress message from the *Melete* via the Inmarsat A Indian Ocean Satellite, stating that the ship, in position 27°41'S 054°13'E was "in danger of sinking" and "water coming in the front". As the Delete was outside the Australian area of responsibility MRCC Australia relayed the distress message to MRCC South Africa, MRCC Mauritius and MRCC Etel (France) at the same time advising the Melete to activate an EPIRB. At about this time all contact with the ship was lost.

Search and Rescue operations, coordinated by Marine La Reunion, resulted in the rescue of two crew members of the Melete, all the other 25 persons on board are believed to have lost their lives. According to information provided by Marine La Reunion 25 August 1991 the ship was reported as having gone down in ten minutes, preventing the launching of the lifeboats.

C O M M E N T

The purpose of the investigation was to collect information pertinent to the Delete that was available in Australia and to analyse that information for relevance to the loss of the ship. Factors that could bear relevance, and for which information was available, included the characteristics of the previous and last cargoes, loading rate and pour quantities, general condition of the ship and possible heavy contacts during berthing or departure.

Previous Cargo

The previous cargo carried by the *Melete* had been one of coal, loaded at Newcastle, NSW and discharged at the Japanese ports of Kakogawa and Yokkachi. Coal cargoes having a high sulphur content are liable to cause quite considerable corrosion in ships' structures, especially where cargo and hull sweating takes place during the voyage. The cargo that the *Melete* loaded at Newcastle in June 1991 consisted of 26,739 tonnes of Bayswater coal (holds 3,5 & 7) with a sulphur content of 0.78% and two parcels of Saxonvale coal (totalling 42,118 tonnes) with sulphur contents of 0.95% (holds 1,2 & 8) and 0.62% (holds 4, & 6). Neither of these types of coal is likely to have unduly affected the structure of the Melete.

General Condition

Whilst at Newcastle the ship underwent an inspection under the Port State Control provisions of the IMO Conventions; no deficiencies were noted during the inspection and the surveyor conducting the inspection gained the impression that the ship was well maintained. However "Control" inspections do not involve inspection of the ship's internal structure.

The iron ore fines are loaded at varying moisture levels, depending upon shippers' requirements, as a dust supressant. The shipper's requirement for the iron ore to be discharged in Port Talbot was 4.5%. To meet a shipper's requirements water is added to the shipment of fines on the conveyor belt. The moisture content is checked at a station, located just before the loading arm, on a regular basis. A "streamlined" method of determining the moisture content allows quick analysis of the moisture content for loading purposes and whether more or less water is required. The moisture content for bill of lading purposes is determined in accordance with the IMO Code, which takes longer to complete and hence is not useful for loading purposes. Experience has shown that there is no significant difference between the moisture content as determined by the "streamlined" method and the method followed under the code.

According to the information contained in the "Declaration by Shipper", the moisture content of the cargo, between 2 and 6%, was within the moisture content limits, 0 to 16%, detailed in the International Maritime Organization (IMO) Code of Safe Practice for Solid Bulk Cargoes. The Code lists iron ore fines under Appendix C, materials which are neither liable to liquefy nor to possess chemical hazards, it is therefore unlikely that the iron ore would have shifted even if water had entered number 2 hold.

The specification for Hamersley Iron iron ore fines partical size is less than 6mm. Following the loss of the Mineral Diamond in April 1991, tests were carried out on a sample of fines, using the test detailed in the IMO code. The iron ore itself did not absorb water, but formed a surface film. It was not possible using the IMO Code criteria to obtain a constant flow moisture point. The method for determining the "Transportable Moisture Limit" in accordance with the code produced an indeterminate flow moisture point. The chemists suggest that this may be because the material does not have a flow moisture point as defined in the code.

Loading of the Cargo

The *Melete*, like many bulk carriers, was specially strengthened to carry iron ore cargoes in alternate holds. The purpose of this is to raise the centre of gravity, which reduces the accelerations and resulting stresses involved in the ship's movement in a seaway, also making the ship's movement more comfortable for the crew. The approved stability and loading manual would have included information on such types of loading and as the ship had 'maintained class' no restrictions had been placed upon the loading of the ship by the Classification Society, Lloyds Register.

According to Hamersley Iron Management the 'special instructions' for the cargo to be loaded in all holds was a requirement of the cargo receivers, for facilitating discharge rather than for safety considerations. They also stress, quite correctly, that such instructions do not override the owner's or Master's requirements. The Melete had loaded at Dampier on a previous occasion when an alternate hold loading had also been utilised. Due to these considerations a loading into all holds, as stipulated under the 'special instructions', was not discussed with the Master.

The ultimate responsibility for the safe loading of a ship rests with the Master and on the *Melete* the Master is reported to have taken full charge of the loading. The change in loading sequence during the third run was at the Master's instructions, apparently due to a concern about the trim of the ship. Any problem with the trim of the ship was probably the effect of the terminal weightometer being in error by some +4%, with the result that amounts loaded were less than requested. At the end of the third run some 5500 tonnes remained to be loaded instead of the anticipated 2950, resulting in a corrective fourth run being necessary before trimming operations commenced. As the short fall would have been reasonably uniform across all four holds being loaded it is unlikely that any dangerous stresses would have resulted.

The maximum corrected loading rate was 5,846 tph, with the bulk of the cargo being' loaded at rates of between 4,000 and 5,500 tph. These rates are normal for the Parker Point berth and are not considered to be unduly high.

The actual pour quantities of around 5800 tonnes, or a little over 8% of the deadweight, were in line with current practices, but the determination of the actual stresses induced by such quantities was beyond the scope of the investigation. However, it is considered worthy of note that on the ship's previous loading at Dampier, 7 years earlier in February 1984, loading had been conducted using pour quantities of 4000 tonnes.

Structural Damage

Whilst in the port of Dampier no reports were recorded of heavy contact with either tugs or the berth during berthing and departure operations, therefore no damage which might have lead to a failure in the hull plating is believed to have occurred whilst the Delete was at Dampier.

Ballast Water Change at Sea

Whilst on passage from Yakkachi to Dampier the ballast water taken on board in the Japanese harbours was discharged and replaced with seawater; this was in compliance with the Australian Quarantine Inspection Service guidelines for ships entering Australian ports from overseas. However, details of the ballast change operations are not known and therefore it is not known what actual stresses were involved in that operation.

Weather

The Marine Incident Investigation Unit did not conduct an analysis of the weather in the South Indian Ocean for the period from when the Melete sailed from Dampier to the time that the ship was lost. However, reports of the incident carried in Lloyd's List indicated that the ship had encountered rough weather south of Madagascar.

CONCLUSIONS

It is considered that:

1. The cargo as presented for loading was in accordance with the Code of Safe Practice for Solid Bulk Cargoes.

2. The cargo loading sequence was in accordance with the Master's instructions.

3. The loading rates were comparable with those normally carried out at the Parker Point berth and not excessive.

4. The pour quantities stipulated by the Master, as percentages of deadweight, were typical of current loading practices. However, this is a subject that requires to be investigated thoroughly.

5. There is no evidence in Australia to indicate that any structural damage may have occurred due to contact with other vessels or the berth whilst Melete was at Dampier.

ATTACHMENT 1

DETAILS OF SHIP

Name:		*Melete*
Port of Registry:		Piraeus, Greece
Type of ship:		Bulk Carrier, specially strengthed for ore cargoes
Number of holds:		8
Year of Build:		1975
Builder:		Sunderland Shipbuilders, UK
Classification Society:		Lloyds Register
Owners:		Neptune Maritime Co of Monrovia
Managing Agents:		Poseidon Shipping Co., Piraeus
Time Charterer:		Pacific Marine Inc.
Voyage Charterer:		Shinwa Kaiun Kaisha Ltd, Japan
Crew:		27 - 13 Greek, 14 Filipino
Tonnages:	Gross	35,515
	Nett	26,582
	Deadweight	72,060
Dimensions:	Length (OA)	228.OSm
	Beam	32.29m
	Moulded Depth	19.2 lm
	Max. Draught	14.028

International Safety Certificates - Expiry Dates

Safety Construction:	02.11.95
Load Line:	02.11.95
Safety Equipment:	30.09.91
Safety Radio:	02.02.92

ATTACHMENT 2

Bulk Cargoes
Declaration by Shipper

The commodity to be shipped on your vessel is IRON ORE.

The following properties have been ascertained by the use of recognized international procedures as specified in the IMCO Bulk Cargoes Code.

Physical Proportions

Transportable Moisture limit NOT APPLICABLE.

Average moisture content of shipment 2% to 6% Date of test CONTINUOUS.

The average moisture content will not be confirmed by tests carried out during the loading process.

Angle of repose 37 DEGREES determined for the commodity with an average moisture of 2% to 6%.

Stowage factor 2.35 to 2.50 tonnes/cu.metre.

This commodity is not considered to be a cargo which may liquify during the voyage.

Chemical Hazards

This commodity can present a hazard during transport due to its chemical nature and properties.

Classification	Nil
Description of hazard	Nil
Precautions to be taken	Nil
Emergency Procedures	Nil

It is certified that for the bulk cargo nominated in this certificate any relevant hazards attendant upon its marine transportation have been property described and that the information given is based upon the latest available including experience in storage prior to shipment.

ATTACHMENT 3

HAMERSLEY IRON PTY LIMITED

(INCORPORATED IN VICTORIA)
P.O. BOX 21, DAMPIER,
WESTERN AUSTRALIA 6713

TELEPHONE -DAMPIER
(091)43 6000-- DAMPIER OPERATIONS
(091)43 6077 - RAILWAY COMPLEX

TELEX - DAMPIER
99529 - DAMPIER OPERATIONS
99043. RAILWAY COMPLEX

99751 - RAILWAY COMPLEX

CABLES - "6DHAMIRON DAMPIER"

The Master
M.V. MELETE
Berthed at PARKER POINT
DAMPIER WA

Dear Captain

In the interest of safety and the correct loading of your vessel, we would like to draw your attention to the following essential points:-

1. Dampier is situated within a Summer Loadline Zone. Vessels are therefore not permitted to load beyond drafts that, with due allowance of water density, would enable them to float at the Summer loadline.

   1 a. With the alteration of the boundary of the seasonal tropical area in NW Australia certain governments will permit own flag vessels to load to tropical line marks at the Port of Dampier, between 1st May and 36th November each year. This permission is granted under Article 8 of the International Conventron of Load tines.

2. Throughout loading, a Ship's Officer must be on duty to ensure correct hatch by hatch loading.

3. A continuous check on the ship's draft must be maintained.

4. Mooring lines are to be adjusted to ensure that the vessel remains safely secured alongside and does not range.

5. The gangway must not be left unattended and adjustments made to ensure safe access is possible at all times.

6. Communications: One English speaking crew member must be available to answer the telephone so that the shiploader operator may give and receive messages promptly.

7. Tonneages indicated by shore belt weightometers are to be taken as approximate, and no reliance is to be placed on these figures for determining accurate stress loading of the vessel or final draft condrtrons.

Whilst the Company and its shiploading personnel are available to assist vessels in every way possible, we can accept no liability or responsibility whatsoever in regard to vessels loading to their correct marks.

Masters are therefore advised to ensure that their Officers maintain a continuous check on the draft throughout the loading operation and thereby obviate the very serious consequences attending an overloaded vessel.

Your attention is drawn to the contents of the ARRIVAL INFORMATION sheet and your co-operation to above is sought. (Please refer to the Hamersley Iron (Port of Dampier) Bylaws, which details the conditions of use of the Company's facilities. Your Agent has this information).

Acknowledgement of receipt of letter

.....
Signature of Master

Date: .....

Yours faithfully,
HAMERSLEY IRON PTY LIMITED

.....
MANAGER - PORT OPERATIONS

ATTACHMENT 4

MARINE SERVICES OF W.A. PTY. LTD.
~INCOAPORATED IN WESTERN AUSTRALIA)
Australian Company Number 009 209 803

DRAFT SURVEY REPORT AND CERTIFICATE OF WEIGHT

Vessel: MELETE No.: 8373 FPUK -- Date: 11/08/91 G.R.T.: 33,516
Owners: NEPTUNE MARITIME COMPANY Captain: A. MANIATIS
Port from: DAMPIER, WESTERN AUSTRALIA Port to: PORT TALBOT
Description of Cargo: HAMERSLEY HEMATITE FINE IRON ORE MINUS 6mm
Berth loaded: PARKER POINT
Date of Initial Survey: 10/08/1991 Date of Final Suvery: 1 l/08/1991
Consignee(s): BRITISH STEEL PLC
LONDON SE1 7SN UK

	INITIAL SURVEY	FINAL SURVEY
Density of seawater at the berth	1.023	1.023
Ship's draft, Fore	6.20 Metres	13.93 Metres
Ship's draft, Aft	6.90 "	14.05 "
Ship's draft, Port midship	6.60 "	14.01 "
Ship's draft, Starboard midship	6.58 "	14.05 "
Ship's draft, Mean of Means	6.58 "	14.02 "
Corresponding displacement (Corrected for density, etc)	(A) 37,23 1 Tonnes	(B) 83,775 Tonnes

ESTIMATED WEIGHTS OF FUEL AND WATER

Bunkers	2,322 Tonnes	2,319 Tonnes
Slop tanks	nil	nil
Fresh water	135	130 "
Ballast	22,534 "	174 "
Stores	350 "	350 "
TOTAL WEIGHT	(a) 25,331 Tonnes	(b) 2,973 Tonnes
	[A-a) = 11,900 Tonnes	(B-b) = 80,802 Tonnes

From above figures obtained by initial and final survey of the ship's draft, I determine that the weight of the cargo aboard the ship was at the time of the final survey or (as the case may be) the initial survey:-

When discharging: (A-a) – (b-b) =

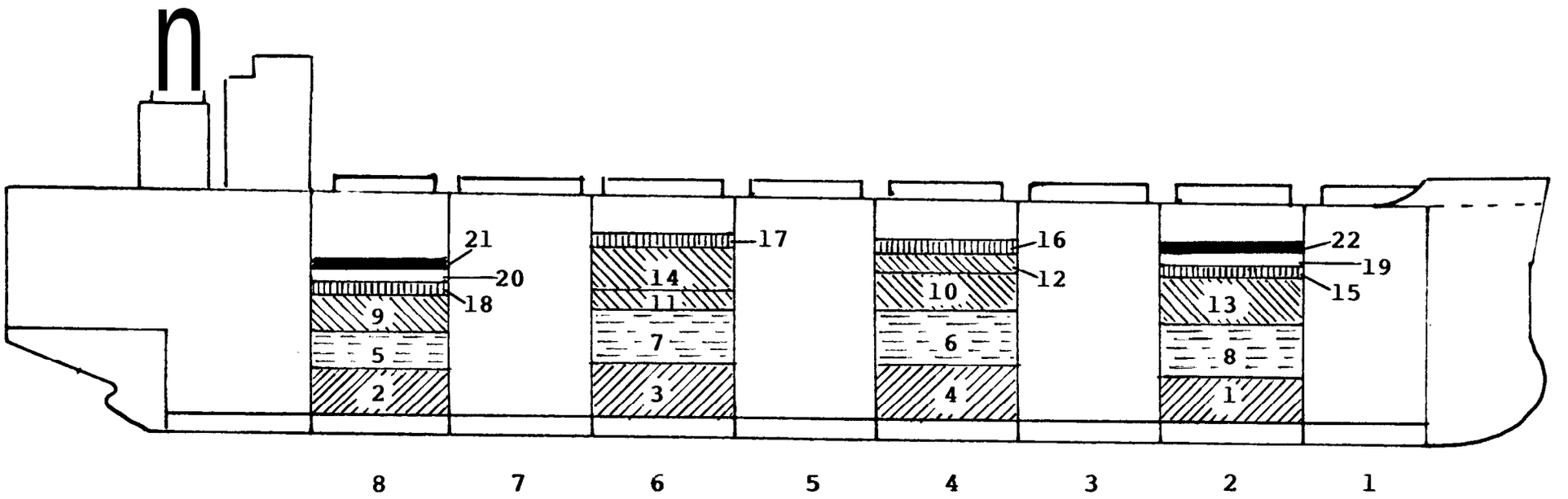
When loading: (B-b) – (A-a) = 68,902 Metric Tonnes = 14 Long Ton

That is:-

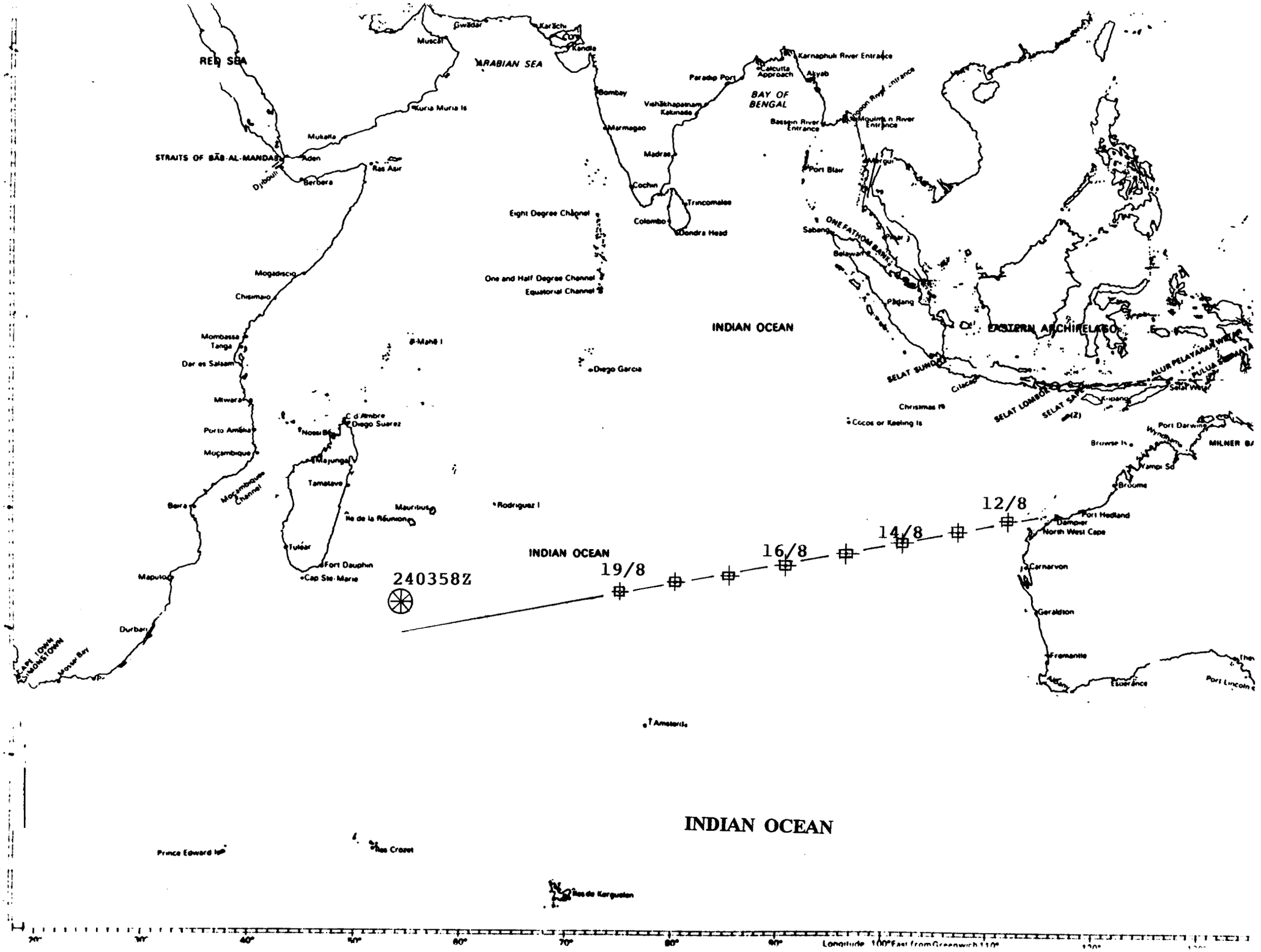
SIXTY EIGHT THOUSAND NINE THOUSAND AND TWO METRIC TONNES OF FINE IRON ORE FOR BRITISH STEEL PLC TO PORT TALBOT

(Based on the ship's scales provided on board)

Signed: _____
for Surveyor



LOADING SEQUENCE



ATTACHMENT 6

ATTACHMENT 7

GRIFFITH

INSPECTORATE GRIFFITH INTERNATIONAL

CERTIFICATE

OF

A N A L Y S I S

COMMODITY	HAMERSLY IRON ORE FINES
SAMPLE DATE	RECEIVED 17TH MAY, 1991

THIS IS TO CERTIFY:-

At the request of the Department of Transport and Communications, Griffith W.A. Services did carry out Analysis and arrange confirmation testing on an Iron Ore Fines sample received on the 17th may, 1991.

NATURE OF SAMPLE AND IMOISTURE CONTENT

The particle size and nature of this sample indicated a constant moisture of 4.3%, however, it was not possible to obtain a constant flow moisture point.

TRANSPORTABLE MOISTURE LIMIT:-

The method for TML in accordance with code of Safe Practice for Solid Bulk Cargoes produced the flow moisture point on the flow table to be indeterminate. This may be due to the material not having a flow moisture point as defined in the code.
If the material does possess a flow moisture point our tests revealed that the TML would be between 6.8% and 8.6%.

Ref: 91/A-24/5
29th May, 1991.

For and on behalf of
GRIFFITH W.A. SERVICES
P.O. BOX 2220
GERALDTON. 6530
WESTERN AUSTRALIA
Telephone (099) 21 2472
Telex 196605 GRY FYD
FAX (099) 214452