

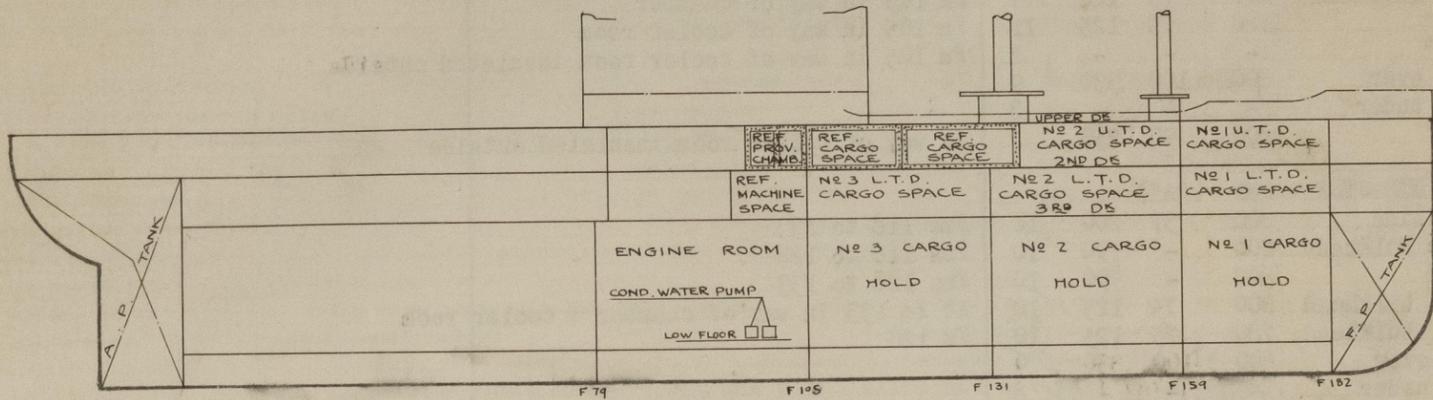
Rpt. 17 (b)

Date of writing Report 1st October, 1961 Received London Nagasaki Port No. FE-1130
Survey held at Nagasaki No. of visits 7 First date 23.6.1961 Last date 21.8.1961

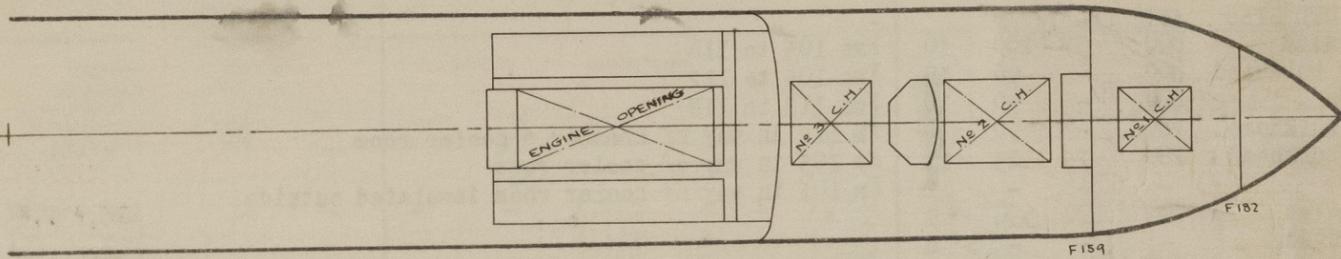
REFRIGERATED CARGO INSTALLATION—REPORT ON INSULATION WORK, ERECTION OF PLANT ON BOARD AND TESTS AFTER COMPLETION

No. in R.B. Name M.V. "Manhattan Maru" Gross tons 9556.16
Built at Nagasaki, Japan By whom Mitsubishi Zosen K. K. Yard No. 1561
Owners Daido Kaun Co. Port of Registry Tokyo
Refrigerating Machinery made by Sabroe Co. of Japan Ltd. Machine Nos. 330120, 330121, 330122 When made 1960
Insulation fitted by Mitsubishi Zosen K. K. Total No. of Chambers 4
Total refrigerated cargo capacity measured in accordance with Society's requirements 17,080 cu. ft.

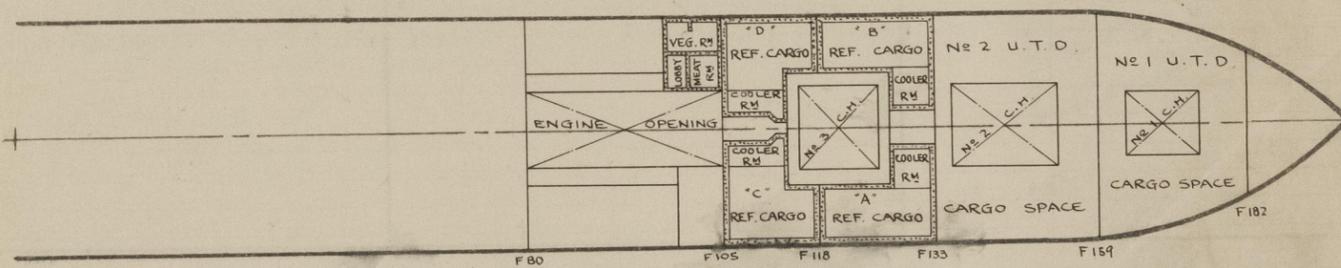
Location and boundaries in elevation and plan of each refrigerated cargo chamber, main and refrigerating machinery space(s), evaporator and brine rooms, and cooler houses to be shown by inserting decks and bulkheads in the diagrams. The frame numbers to be shown at each transverse bulkhead. The decks to be clearly marked in elevation and plan. Insulation to be shown by a line (preferably in colour) on the appropriate side or sides of decks and bulkheads. Oil storage tank tops and bulkheads adjoining refrigerated chamber(s) also to be shown. (If desired, a separately prepared diagram sheet may be attached by paste or staples provided the size is not greater than that below, all the required particulars are shown and the sheet is signed by the Surveyor.)



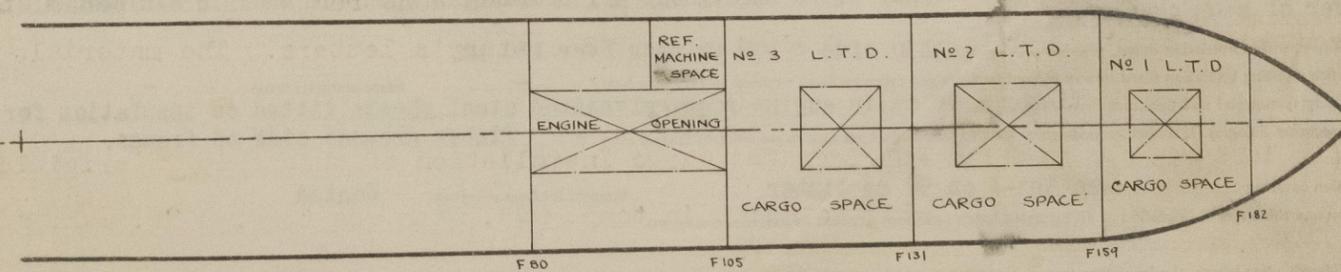
UPPER DECK



2ND DECK



3RD DECK



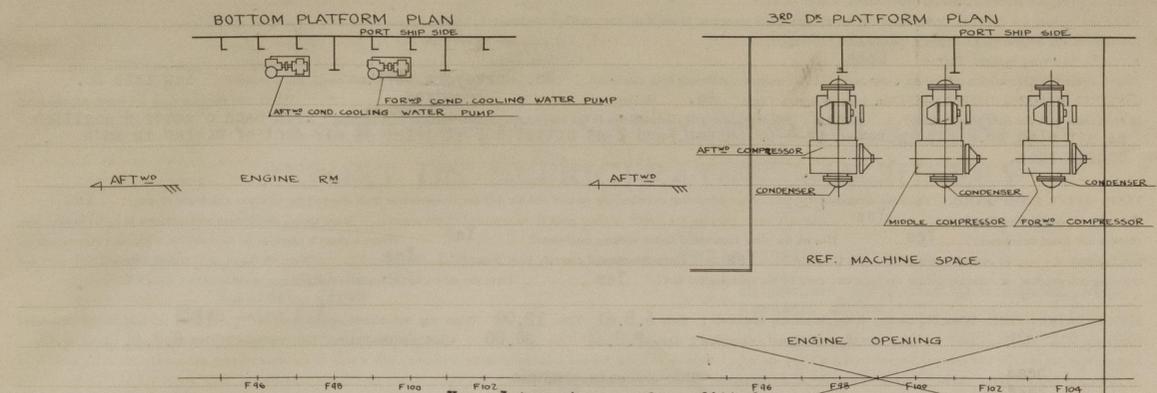
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013596-013603-0111 1/2

No. of refrigerating units **3** Can each unit operate on all chambers? **Yes.** If not, state how connected

Primary refrigerant **Dicklorodifluoromethane** Where specified in the Rules, is the machinery isolated in an efficiently ventilated compartment?
 Medium for cooling chambers **Air** For particulars of refrigerating machinery see **Kobe** Report No.
 Diagrammatic sketch sufficient to show relative position (port or starboard, for and/or aft) of each compressor, condenser, evaporator (brine cooler), condenser cooling pumps, and brine pumps



Is provision made for subcooling the liquid refrigerant (if so, state method) **Yes, Inter stage coolers fitted.**
 MOTIVE POWER supplied from (state No. of boilers or electric generators) **3 electric generators** Condenser cooling medium (if not sea water) -
 CONDENSER COOLING PUMPS No. **2** Capacity of each **533** lit./min. at head of **1.6** kg./cm². B.H.P. of driving motors **5**
 Are safety valves fitted where required by the Rules? **-** No. of sea connections **2**
A stand-by connection made to be engine cooling water system.
 BRINE PUMPS No. **-** Capacity of each **-** gal./hour at head of **-** kg./cm². B.H.P. of driving motors **-**
 No. of brine temperatures which can be circulated simultaneously **-** Brine system "open" or "closed" type **-** Are safety valves fitted where required by the Rules? **-**
 Are thermometers fitted to brine delivery and each return pipe? **-** If brine pipes and tanks are galvanized on brine side, is ventilation provided as per Rules? **-**
 Are steel brine and refrigerant pipes, cooling grids and air cooler coils galvanized externally where required by the Rules? **-**
 How are the brine and refrigerant steel pipes connected (flanges, butt welds, screw joints, etc.) **-**
 Where brine pipes are connected by screwed couplings, are the coupling and back nut threads a good fit? **-** What is the pipe thickness at the bottom of the thread? **-**
 Are the screw threads clear of the coupling coated as required by the Rules? **-** Are air cooler coils parallel to or across the air stream? **Parallel**
 Is provision made for air refreshing? **Yes.** if so, are the arrangements in accordance with the Rules? **Yes.**
 What provision is made for defrosting air cooler coils and/or cooling grids in chambers? **Hot gas circulation and hot salt water spray.**

INSULATION OF BOUNDARIES EXPOSED TO EXTERNAL CONDITIONS

In cols. (1) identify each chamber by position (e.g. No. 2 UTD PORT) with each of its exposed surfaces immediately below (e.g. ship side, overheading, etc.), where the size of frames etc., change on any surface, give frame Nos. (e.g. Fms. 102 to 109) applicable to each size, on separate lines. Depth of insulation in cols. (3) to exclude any air space, linings, etc.

(1) Chamber(s) and Boundary	(2) Frames, reverse frames, beams, stiffeners, etc., within insulation			(3) Depth of Insulation fitted	(1) Chamber(s) and Boundary	(2) Frames, reverse frames, beams, stiffeners, etc., within insulation			(3) Depth of Insulation fitted
	Pitch of face mm	Width of face mm	Depth of face mm			Pitch ins.	Width of face ins.	Depth of face ins.	
125 No. 3 UTD port	FWD	("B")							
Ship side	800	37	200	10	Fms 118 to 133				
Inner bulkhead	800	-	90	10	Fms 118 to 128				
"	800	-	90	10	Fms 128 to 133				
Fwd. bulkhead	800	75	125	10	at Mf 133 in way of chamber & cooler room				
Aft bulkhead	780	75	125	10	Fm 128				
Deck over	800	100	330	9					
Deck under	-	-	-	8					
"	800	90	250	2	In way of cooler room insulated outside.				
125 No. 3 UTD port	AFT	("D")							
Ship side	800	37	200	10	Fms 105 to 118				
Inner bulkhead	800	-	90	10	Fms 105 to 112				
"	800	-	90	10	Fms 112 to 118				
Fwd. bulkhead	780	-	90	10	Fm 112 in way of chamber & cooler room				
Aft bulkhead	800	75	125	7	Fm 105 in way of chamber				
"	780	75	125	11	Fm 105 in way of cooler room				
"	-	-	-	2	Fm 105 in way of cooler room insulated outside				
Deck over	800	100	330	9					
Deck under	-	-	-	8					
"	800	90	250	2	In way of cooler room insulated outside				
125 No. 3 UTD STBD	FWD	("A")							
Ship side	800	37	200	10	Fms 118 to 133				
Inner bulkhead	800	-	90	10	Fms 118 to 128				
"	800	-	90	10	Fms 128 to 133				
Fwd. bulkhead	800	75	125	10	At Fm 133 in way of chamber & cooler room				
Aft bulkhead	780	75	125	10	Fm 128				
Deck over	800	100	330	9					
Deck under	-	-	-	8					
"	800	90	250	2	In way of cooler room insulated outside				
125 No. 3 UTD STBD	AFT	("C")							
Ship side	800	37	200	10	Fms 105 to 118				
Inner bulkhead	800	-	90	10	Fms 105 to 112				
"	800	-	90	10	Fms 112 to 118				
Fwd. bulkhead	780	-	90	10	Fm 112 in way of chamber & cooler room				
Aft bulkhead	780	75	125	11	Fm 105 in way of cooler room				
"	-	-	-	2	Fm 105 in way of cooler room insulated outside				
Deck over	800	100	330	9					
Deck under	-	-	-	8					
"	800	90	250	2	In way of cooler room insulated outside				

Are all divisional bulkheads of steel construction in accordance with the Rule? **Yes** If not, state position and when approved

Insulating material (s) (if more than one, state where fitted) **Glass fibre throughout all boundaries and rock wool in air spaces of deck over of each chamber.**

Air space, if any, within insulation lining, position and depth **Ship side & 102 mm deck over 130 mm**

Is approved fire resisting insulation fitted in way of coal bunkers and other surfaces exposed to excessive heat? **-** State material fitted

Insulation lining(s) material and thickness **Timber & 40 mm in engine room galvanized steel sheets fitted on insulation for cooler room**

Methods of securing lining(s) (if timber grounds state whether across face, on face or on sides of frames etc.) **Timber grounds side of frames.**

Floor insulation covering **Neo tex-X on 30 mm timber** Support for floor covering **Coated**

State location and thickness of insulation of all insulated hatch coamings exposed to external conditions. **-**

Insulation ribbands state where, the insulating material, thickness, width and covering **-**

Hatch covers, type and thickness of insulation **-** Exposed loading and tonnage doors, state thickness of insulation **-**

Air ducts buried in insulation, state where **-**

Meat rail and/or grid hangers, state in which chambers **-**

State location and dimensions of all web frames, deep girders or beams within the insulation **In Fwd. P. & S. cooler rooms deep girders 400x150 x 11mm & in aft. P. & S. chamber 400 x 120 x 20 mm at Fms 107, 110, 112, 115, 121, 124, 127, 130 strong beam 330x110x13/18 INV.A.**

State how hold pillars and masts are insulated. **Yes.**

Are air ducts and insulation linings so constructed and erected as to prevent air entering insulation? **Yes.**

Where oil storage tanks adjoin refrigerated chambers, are the arrangements in accordance with the Rules? **-**

Is the insulation in way of hatchways on the tank and tunnel tops protected in accordance with the Rules? **-** Are screens fitted over cooling grids on sides of chambers? **-**

~~Are access plugs and their supporting members, air cooler and other access doors and frames; closing appliances of tonnage openings; bilge limbers and plugs, satisfactorily fitted and airtight?~~ **Yes.**

Are access plugs and/or panels provided in the insulation where required for easy access to the bilges, bilge suction roses, drains, tank manhole doors, air and sounding pipes? **-**

Are cargo battens provided in accordance with the Rules? **Yes.** Dimensions and spacing on sides, vertical surfaces and tunnel top **50 x 50 x 300 mm**

Have all ventilators and ducts passing through refrigerated chambers to other compartments been made airtight and efficiently insulated? **-**

Where ventilators are provided to refrigerated spaces, are they provided with airtight and insulated closing appliances? **-**

Are insulation linings ~~and air ducts~~ on the sides of chambers suitably stiffened to prevent crushing by cargo? **Yes.**

Are all steel bolts, nuts, hangers and fixtures which support or secure cooling appliances, insulation, ~~meat rails~~, etc., galvanized? **Yes.**

Is the insulation and air ducting in accordance with the approved plans and specification? **Yes.**

The foregoing is a correct description of the insulation and appliances.

K. Kito
NAGASAKI WORKS
 SHIP BUILDING & ENGINEERING CO. LTD.

PARTICULARS OF COOLING APPLIANCES IN EACH CHAMBER
 Identify each chamber by position (e.g. No. 2 LTD. Port, No. 3 Orlop D., No. 5 L.H. etc.)

Chamber(s)	Capacity measured in accordance with Society's requirements cu. ft.	Roof grids		Side grids		Battery coils		FANS						
		Length in ft.	No. of sections	Length in ft.	No. of sections	Length in ft.	No. of sections	Number	Maximum RPM	Minimum RPM	Cubic M of air per minute at maximum RPM	Static water gauge ins.	BHP of fan motor	Motor inside or outside insulated envelope
"B" No. 3 UTD PORT FWD.	4,321	-	-	-	-	1,153	2	1	1,800	1,200	130	1 3/4	5	Inside
"D" No. 3 UTD PORT AFT.	4,220	-	-	-	-	1,153	2	1	1,800	1,200	130	1 3/4	5	Inside
"A" No. 3 UTD STBD. FWD.	4,349	-	-	-	-	1,153	2	1	1,800	1,200	130	1 3/4	5	Inside
"C" No. 3 UTD STBD. AFT.	4,190	-	-	-	-	1,153	2	1	1,800	1,200	130	1 3/4	5	Inside

Spec figures see text sheet.

Are air cooler fans reversible? **Yes.** Is access to the refrigerating plant including air cooler fans and their motors, in accordance with the Rules? **Yes.**

Can each section of air cooler coils and chamber grids be readily isolated? **Yes.**

Where cooling pipes pass through watertight bulkheads or deckplating, are the fittings and gland packing both watertight and fire resisting? **Yes.**

PRIMARY REFRIGERANT PIPING (not fabricated at Plant Makers Works) internal diameter and thickness of each size **62.45 & 2.11, 49.75 & 2.11, 37.61 & 1.83, 25.27 & 1.65, 22.3 & 1.65, 18.93 & 1.65, 16.55 & 1.25, 13.38 & 1.25, 10.2 & 1.25, 7.03 & 1.25, 3.85 & 1.25 mm**

Material **Copper** How manufactured **Solid drawn** Pressure tests **24.5** kg./cm² hydraulic **14** kg./cm² air **14** lbs./in.²

Pressure tests after erection **7** ~~lb./in.² gas~~ Brine system pressure test on completion **-**

Do all pipes, including scupper pipes, air pipes and sounding pipes which pass through refrigerated chambers comply with, and are they erected and insulated in accordance with the Rules? **Yes**

Are air cooler trays provided in accordance with the Rules? **Yes** Are the drainage arrangements of the refrigerated chambers, cooler trays and air spaces behind insulation in accordance with the Rules? **Yes** Are liquid sealed traps provided as required by the Rules? **Yes** Has the spare gear (see Report 17(a)) been placed on board? **Yes**

Is a separate plant fitted for ships stores and/or air conditioning purposes? **Yes** Where the installation is on a ship not classed or intended to be classed with the Society, have the generator engines and electrical equipment which supply power to the refrigerating plant been examined generally and under working conditions and found sufficient and satisfactory? **Yes**

Steam or oil engines driving refrigerant compressors. Report 4c, Port **Yes** No. **Yes**

Where the machinery is driven by steam engines, is the exhaust steam connected to the main and auxiliary condensers? **Yes**

Motors over 100 BHP driving refrigerant compressors. Port **Kobe** Certificate Nos. **No. Surveyors Cert. received** Are certificates attached? **Yes Kobe No.**

Air cooler fan driving motors. Port **Kobe** Certificate Nos. **No. Surveyors Cert. received** Are certificates attached? **Yes Kobe No.**

Motors under 100 BHP driving refrigerant compressors. Have makers' certificates been obtained? **No.** Makers' **received** type **Yes** Where tube thermometers are fitted, are the tubes in accordance with the Rule requirements? **Yes** No. and position of thermometers in the cargo space and air ducts of each chamber. **2 in each chamber & position as per plan No.P 823 approved 14-4-60 London, and 1 at outlet & 1 at inlet of air duct of cooler in each cooler room.**

TESTS AFTER COMPLETION: Have the thermometers provided for measuring chamber, air suction and air delivery temperatures been checked for accuracy and found in order? **Yes**

Have the air cooler fans been tested? **Yes** (the statements showing the results of these tests to be attached to the report). Have the air distribution arrangements in each chamber been checked and found satisfactory? **Yes** Has all the plant been tested under working conditions? **Yes** Where a plant is operated by thermostatic refrigerant control, are the arrangements for manual control in accordance with the Rules? **Yes** Have the manual controls been tested? **Yes** Were all the plant electrical instruments, gauges and thermometers checked for accuracy before the commencement of the refrigeration test? **Yes** Have the air cooler defrosting arrangements been tested? **Yes**

REFRIGERATION TEST. When did cooling down chamber(s) commence? Date **6.8.61** Time **12.00** When was the desired temperature of **-18°C** attained in the chambers? Date **7.8.61** Time **24.00** When was the Balance Test completed? Date **8.8.61** Time **6.00**

Log sheets of the chamber and external temperatures, machinery operating conditions including fan and brine pump motor particulars, also a copy of the sheet showing the calculations of the estimate of the theoretical heat leakage on the average temperatures during the balance test period, to be attached to the report.

TOTAL THEORETICAL HEAT LEAKAGE DURING THE BALANCE TEST PERIOD

MEASURED HEAT LEAKAGE

Through surfaces, etc., of cargo chambers, brine rooms, cooler houses, etc. **14 237.7** kg. cal./hr
12,138.9 BTU/hr

Through refrigerant leads **478** kg. cal./hr

Total **12,616.9** kg. cal./hr
14,715.7 BTU/hr

Ratio $\frac{\text{measured heat leakage}}{\text{theoretical heat leakage}} = \frac{16,611.4}{12,616.9} = 1.32$ $\frac{17031.4}{14715.7} = 1.16$

Compressor Operating Conditions: **Fwd. compressor**

State which compressor(s) used

Average evaporator gauge **-26.1** °C

Average condensing temperature **36** °C

Compressor R.P.M. **525**

Machine output from curves **25,200** kg. cal./hr
25620 BTU/hr

Fan, brine pump etc., heat load.

Average total fan heat load **8,588.6** kg. cal./hr

Average total brine pump heat load **-** kg. cal./hr

Any other heat load such as heaters in chamber **-** kg. cal./hr

Total of above loads **8,588.6** kg. cal./hr

Total measured heat leakage load **17031.4** **16,611.4** kg. cal./hr

Maximum ratio permissible for temperature qualification desired by Owners (state head office figure).

17

If the arrangements and details are not precisely in accordance with the approved specifications and plans, have full details of deviations been forwarded with this Report? **Completed as approved Spec. & Plans.**

If the refrigerated cargo installation a duplicate of a previous case, if so, state name of vessel or Yard and Yard No. **-**

If the survey is not complete state, what arrangements have been made for its completion and what remains to be done **Completed**

Details of insulation method and materials are same as previous vessel yard No. 1532 (Brooklyn Maru).

GENERAL REMARKS. (State whether installation has been constructed under special survey in accordance with the Rules, approved plans and Secretary's letters. State quality of materials and workmanship, opinions as to class, etc.)

The Refrigerated Cargo Installation of ship has been constructed under Special Survey in accordance with the Rules, approved plans and Secretary's letters. The materials and workmanship are good.

It is submitted that the Refrigerated Cargo Installation of this ship is eligible to have the Class notation of Lloyd's RMC to maintain temp. 0°F. with sea temp. 90°F. max. 18/61 in the Register Book. For the report on survey of the Refrigerating machinery during construction, see Kobe Surveyors' Rpt.No.FE-8937 attached herewith.

PARTICULARS FOR REGISTER BOOK

MACHINERY

No. of units **3** Prime movers **Electric motor**

Total BHP of all Compressor prime movers **90**

Refrigerant **Dichlorodifluoromethane**

Makers **Sabroe Co. of Japan Ltd.** Date of Construction **1960**

Machinery particulars **3-3 cyl. SA Com. compressors 150 & 150 x 125mm x 500 RPM**
3 - S & T condenser

CARGO CHAMBERS

Total capacity in cubic feet **17,080** Total No. **4**

No. Independent **4** No. independently refrigerated **4**

Method of Cooling **Direct expansion and air**

Insulating material(s) **Glass fiber**

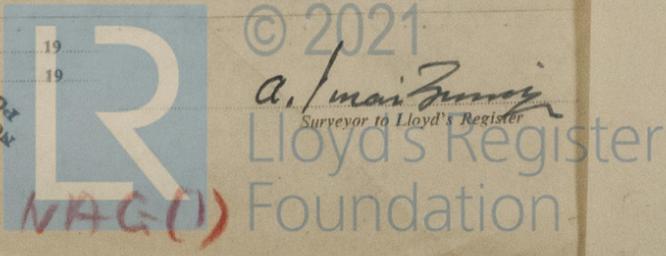
Insulation lining **Timber**

Survey Fee **£** Fee applied for, **FRIDAY 19 JAN 1962**

Travelling Expenses **£** Received by me, **£**

Date of Committee **FRIDAY 19 JAN 1962**

Class assigned **Lloyd's Rmc. 8.61**
to maintain temp. 0°F. with sea temp. 90°F. maximum.



Handwritten notes: **OK** (in red), **NOTED FOR POSTING** (in blue)