THE ROYAL INSTITUTION OF NAVAL ARCHITECTS (AUSTRALIAN BRANCH)

"PLANNING & CONTROL OF SHIPS MAINTENANCE"

by

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BASIC OVERALL DESIGN PHILOSOPHY

During 1968 we were having built two containerships and on examination of the vessels and their intended schedules it was thought that maximum advantage could be taken of all time spent in port.

Modern ships require relatively few operating staff and servicing of equipment in port would therefore require a larger and more diverse force of shore based maintenance personnel.

It was accepted that no system would be able to achieve 100% reliability and that a degree of unplanned maintenance would require to be integrated into the system.

Ships staff would therefore be required to control and supervise shore labour with the assistance of a Ship Superintendent in the port and this method of operation would therefore lead the ships staff towards vocations of a more authoritative capacity.

The vessels would be operating on a "swinger" system and with the constant changeover of seagoing personnel it was considered that shore orientation of the maintenance task in a central location would be to considerable advantage.

During the design of the system the then existing method of overhaul was examined and found to possess certain inherent inefficiencies. The main one of these was the annual layup. This was usually dictated by cargo commitments, docking facilities and the amount of compulsory and necessary work. Coupled with these factors was the ever present possibility of industrial unrest during prolonged lay up periods.

For these reasons it was considered that to maximise vessel utilisation and minimise these inherent inefficiencies it would be to advantage to have the vessel under "continuous overhaul" i.e. schedule maintenance to coincide with the operating schedule of the vessel.

SYSTEM DESIGN

From the above deliberations it was agreed that the system should be designed with the following points in mind:

1. The application
2. Regulatory requirements
3. Recommended life and preventative maintenance
4. Unplanned maintenance
5. Guarantee Failures
6. Planned Work Loading
7. Completion control of scheduled work
8. Education.

1. The Application

The system although intended initially for two containerships was to be designed such that it could be utilised on any application either at sea or ashore. During the building of the vessels all drawings, manufacturers manuals and all associated data was examined and a list of items to be maintained was compiled.

Vessel and equipment identification were established in a numerical form and a computer listing of equipment was produced. The listing covering each vessel contained some 1200 items all with unique numbers to ensure that allocation to an incorrect vessel was impossible. The numbers were system grouped to allow ready manual retrieval. The listing itemised the vessel from stem to stern and truck to keel. (See appendix (1)

2. Regulatory Requirements

These requirements were preplanned to the month and submitted to the authorities, accepted and subsequently integrated into the listing above. This integration allowed for automatic advance issue of all survey requirements due in each month. Another aspect incorporated in this area of the system since 1971 has been the inclusion of the Lloyds computer survey number on the order and listing. This is of considerable assistance in the allocation of certificates and accounts and also in ensuring that our records are identical with those of Lloyds. (See appendix (2).

3. Recommended Life & Preventative Maintenance

From the manufacturers manuals maintenance frequencies were taken and inserted on the computer for each respective item. For guarantee purposes these recommendations would be adhered to but after guarantee expiry would be subject to systematic review on each item's merits with the aim of extension of or decrease in the time between overhauls.

The issue of maintenance and survey requirements were to be based on both running hours or elapsed months. Main machinery, generator sets and air compressors would be maintained on an hours run basis and the balance of the vessel on elapsed months.

In some instances where maintenance could not be readily scheduled the concept of "on condition" maintenance was employed. This concept entails inspection by ships staff and, if required, replacement. This principle is mainly confined to such items as thermocouples, therometers, gauges, light bulbs and accommodation fittings. Where maintenance was scheduled comprehensive work specifications were compiled and incorporated a job report sheet (See appendix 3)

4. Unplanned Maintenance

Having expected the presence of breakdowns it was a basic system design requirement that the planned maintenance frequency should tend to minimise the occurrence of breakdowns and at the same time be flexible enough to be able to absorb the added information. The system should also reschedule if required, planned work, if the level of rectification as a result of breakdown was comparable to the scheduled work.

The information obtained from breakdowns was to be processed into the reliability report.

5. Guarantee Failures

As a direct extension of unplanned maintenance and during guarantee periods it was further required that we should be able to document and claim costs involved in the rectification of defects.

The inclusion of this facility in the system has since proven to be of immense value. Documentation of claims as low as 2 and 3 dollars (more than likely previously overlooked) have been successfully claimed alongside claims of thousands of dollars. This aspect alone more than justified the establishment of system.

A similar integral system to the guarantee report is also used in documentation of insurance claims and has also been quite successful.

6. Planned Work Loading

The scheduling of the maintenance is such that maintenance requirements are issued two months in advance i.e. issued in July to be effected in September. This allows adequate time for the vessel to arrange and plan the months work on board.

The work as scheduled is known, estimated minimum port time is known, and labour as required is requested by radio to meet the vessel on arrival.

In cases where unplanned work essential to efficient vessel operation is known (and the ships staff are aware of this as the requirement arises on board) the least important of the scheduled work is passed over to the next port.

In these cases inbuilt system flexibility is of paramount importance.

7. Control of Completion of Scheduled Work

This aspect was given considerable thought in order to minimise that paper work which was to be carried out by ships staff. It was a known fact that on occassions considerable time lags between action and reports are often the case and to counter this an equiry sheet was designed whereby if notice of completion of scheduled work was not received within two months of the due date of completion the computer would automatically request, via the enquiry sheet, the outstanding details of completion.

8. Education

With the foregoing being a somewhat radical approach to the management of maintenance in Australia, at least as applied to sea transport, it was realised that education of those involved would definitely be required. A series of lectures supported by flow diagrams, actual documents and step by step instructions preceded the system implementation.

Within two months of the commissioning of the first vessel the system was operating quite efficiently.

1. System Operation

The three main aspects of operation are documents, input data and reports and each of these will be dealt with separately. A chart of document flow is indicated in appendix 16.

1. System Documents

There are six basic documents involved in the system and they are itemised as follows and their use is detailed below:

(i) Planned Maintenance Order

(ii) Work Specification Sheets

(iii) Enquiry Sheet

(iv) General Maintenance Order

(v) Hourly Running Sheet

(vi) Replacement Parts Requisition.

(i) The planned maintenance order comprising of six copies is issued by the computer for each item on which maintenance is due. An example of the order is shown in appendix 4.

(ii) Work specification sheets relevant to each job are attached to each order. These sheets cover such information as shutdown sequences for ships staff, step by step instruction to contractors, spare gear and special tool requirements where necessary.

Attached to this instruction sheet is a comprehensive job report section on which contractors are required to insert all details of defects found and answer specific questions asked thereon. This is then completed and returned to the Chief Engineer or Chief Officer for signature and returned to Head Office. The ships officer also returns to Head Office one copy of the order which notifies the computer of work completion. An example of a work specification is illustrated in appendix 3. The Contractor on completion of the work receives from the ships officer the official order and also a green striped copy of the order. The green striped copy is forwarded to Head Office with the invoice.

If invoices relative to maintenance are not accompanied by the required copy edits built into the system reject the invoices and they are returned to the contractor requesting compliance. Contractors have a remarkable degree of success in locating "lost" copies.

(iii) Enquiry sheets as mentioned previously "chase up" lagging maintenance. We have found their use to be very effective and their necessity is now greatly reduced. A self explanatory example of an enquiry sheet is shown in appendix 5.

(iv) The general maintenance order is used for the procurement of labour related to unplanned work, continuation of planned maintenance in another port and also for purchase of replacement parts.

It is completed and issued by the vessel direct to contractors for labour and by Head Office for supply of replacement parts.

In cases of unplanned work there are no work specifications issued although a considerable library of specifications has been built up on the vessels and can be called upon if required.

The same requirements as those for planned maintenance orders apply to both applications of the general purpose order and the green striped copy must accompany the invoice.

(v) Hourly running sheets are required to be completed each month for those items of machinery maintained on hours run. The Chief Engineer of the ship completes the form and sends it to Head Office. An example is shown in appendix 6.

(vi) Replacement parts requisitions are completed by the vessel and forwarded to Head Office for approval and order issue.

2. Input Data

The following data is processed from the aforementioned documents and the prefix numbers relate to the documents in order of previous sequence:

(i) Planned Maintenace Order (appendix 4)

(a) Order number (actually account & item number plus due date)

(b) Condition of component on completion of overhaul.

(c) Narration of work effected.

(d) Total manhours taken.

(e) Date of completion.

(f) Value of work done.

(g) Lloyds certificate received.

(h) Repairers code number.

(ii) Work specification-----no details are taken from the job report as specific input to the computer other than a brief narration of work effected.

(iii) Enquiry Sheet (appendix 5)

(a) Order/job number.

(b) Condition code.

(c) Date of completion.

(iv) General maintenance order (Unplanned Work or Parts supply)

As for planned maintenance order plus the following:

(a) Account and item numbers

(b) Guarantee claim number where applicable

(c) Insurance claim number where applicable

(d) Repair code.

The latter of these is detailed as below:

(i) UG Under guarantee

(ii) IN Insurance

(iii) AC Accident

(iv) BD Breakdown

(v) CR Crew Request

(vi) SM Survey Maintenance

(vii) PM Planned Maintenance

(viii) RP Replacement Part

(ix) MD Modification.

PM & SM are only used where work previously started in another port is progressed to completion on the vessels itinery.

(v) Hourly Running Sheet (appendix 6)

The information taken from this document is solely that related to running hours. The hours logged are used to update the computer in respects to hourly maintained equipment.

As can be seen the data input although very basic is quite extensive and its use is solely dependent on its accuracy. Built into the system are a series of intensive edits which reject incorrect or incomplete data and these edits have proven their worth. During initial stages, as was expected, some errors were apparent.

3. System Reports

The foregoing data assembled on its respective file is processed into a number of reports some of which are automatic as a result of input or are specifically requested on demand.

The reports of major importance are described below:

1. Summary Report of Breakdown Costs in Month

This report indicates on a summary basis the costs related to breakdown paid in any month for a particular vessel. The costs are grouped by vessel area e.g. Main engine, ballast tanks, accommodation etc. It provides an overall indication of breakdown cost by month. This is an automatic report and is a direct result of input of unplanned work data. (See appendix 7)

2. Itemised Breakdown Cost Report

This report is a direct expansion of (1) above and provides us with notice of the items which have failed in the particular month. Completion of previously started scheduled work is also indicated on this report. See appendix 8.

3. Cost Comparison Report

This report is automatic on receipt of planned maintenance input. Each scheduled item is separately estimated as to manhours and rate. On the basis of actual costs and rates calculated therefrom (by the computer) this report indicates variances in budgetted costs to the actual cost and can be applied to these budgets by adjustments.

This report also automatically adjusts the manhours and hourly rate and therefore tends to make the budget figures far more accurate as time progresses. Appendix 9.

4. Reliability Report

This report indicates to the user the number of times an item has failed between planned periods of overhaul. The report is automatic on receipt of feedback with planned or unplanned maintenance and provides information on which to base the review of frequency or overhaul. Appendix 10.

5. Item History Summary

This report on demand lists in total the planned and unplanned costs and manhours allocated to each item since system start. It provides a staging point from which items can be taken and studied more closely in relation to performance or lack of it. It is used in conjunction with the reliability report above and the detailed item history below. Appendix 11.

6. Detailed Item History

This report, on demand, indicates the life of each component from system start. The report is used in overhaul frequency review, equipment selection for

new tonnage, equipment replacement decisions and other areas of ship management. Its use is supported by the job report sheets manually filed but on call at all times to assist in these operations. Appendix 12.

7. Cost & Incidence Report

This report groups by month of completion the costs and incidence of the occurrence of both planned and unplanned work. This report is most useful in plotting trends from which an indication of system effectiveness can be obtained. In the appendix is a copy of this report for our M.V. Kooringa. This vessel was five years old when passing into the system and the carryover of the results of the old system can be seen in the first six months. On present indication the rate of breadown has been substantially reduced as a result of planned deliberate action in this area. See appendix 13.

8. Budgets

Since all planned work is scheduled, estimated and rated, budgets for each vessel for any period of time can be obtained.

These are of immense value in the allocation of funds. When used in conjunction with the cost and incidence report, as related to cost of unplanned work, budget allocations of an accuracy never before achieved have resulted. See appendix 14.

9. List of Item Due for Survey or Maintenance

Each month, together with the orders, is produced a list of items due for maintenance or survey. This is circulated to all ports so that on receipt of the vessels radio call suitable labour can be arranged. See appendix 15.

10. Items Failing Under Guarantee

This list is produced on receipt of feedback related to unplanned work within a guarantee period.

The record created is allocated a number which is retained by that defect until settlement is reached. This report is available on request and is used in documentation of claims. See appendix 16.

11. Numeric Listing

These listings are used on the vessels and in the ports for allocation of account and item numbers on unplanned maintenance orders. The listings contain notes related to items covered and all items are system grouped.

For example System 72 is Control equipment, 11 is Hull, 40 in main diesel machinery.

A brief explanation of a number shown in appendix (1) is as follows:

(a) 36 -- Planned maintenance

(b) 37 -- Unplanned Maintenance

(c) 54 -- Vessel code for Bogong

(d) 72 -- Control section

(e) 142D-- Throttle Position Indication.

The alpha character is what is termed a check digit and for interest sake is calculated almost instantaneously by the computer as follows:

Job & Item Number 3 6 5 4 7 2 1 4 2

Multipliers 7, 8, 9, 4, 5, 6, 7, 8, 9,

Products 21,48,45,16,35,12, 7,32,18,

Products added = 234

Using 11 as divisor = 21

Remainder = 3

Table of Check Digits	Remainder	Check Digit
	0	A
	1	B
	2	C
	3	D
	4	E
	5	F
	6	G
	7	H
	8	J
	9	K
	10	L

As can be seen the remainder is 3 and the corresponding check digit is D.

If the person issuing the order mistakenly rearranges the numbers or inserts a wrong check digit the edit stops the data from being processed.

This calculation can be effected for any rearrangement of the numbers and will not result in the check digit being "D".

In the case of using 37 on the order for unplanned work the program recognised this requirement and processes the 7 and a 6.

The above reports have been found to be most useful in the management of maintenance. The reliability of the vessels has been high, only one scheduled

departure being delayed by ship failure since the systems were applied. There have been some at sea failures of main engine by liner fracture for reasons as yet not specifically determined.

Intricate control equipment has displayed a distinctive tendency towards high reliability and a large proportion of this equipment is now being maintained "on condition".

To date we have five vessels on the system namely M.V. Kanimbla, M.V. Manoora, M.V. Kooringa, M.V. Gerringong, T.V. Bogong as well as all safety and firefighting equipment for the balance of the fleet. The inclusion of the latter equipment on the system was solely because of our requirement to maintain this most important equipment to a high degree following some basic shortcomings on some vessels some time ago.

To date we have accumulated some 16500 maintenance actions covering 320,000 hours of labour. These records have provided us with a level of information which has proven to be most useful as can be gauged from the attached sample reports.

As a management policy all new tonnage is to be included on the system and the gains will compound.

A ship is only paid for once and represents a large capital investment. It has to be maintained for up to twenty years. It is far more sound to specify stringently now and pay more once than to specify less stringently and pay more vitually forever to keep operational.

Maintenance is the largest controllable cost in ship operation. Lack of control in this area must therefore to a degree contributes to undesireable increased freight rates.

The aim of a commercial enterprise is to maintain an adequate return on capital and this is one method by which a contribution to this aim can definitely be made by those responsible for that tremendously difficult and rarely fully appreciated syndrome of maintenance.

LIST OF APPENDIXES

1. Numeric Item Listing
2. Surveys Due List
3. Work Specification & Job Report Sheet
4. Planned Maintenance Order
5. Enquiry Sheet
6. Hourly Running Sheet
7. Breakdown Summary Report
8. Itemised Breakdown Report
9. Cost Comparison Report
10. Reliability Report
11. Item History Summary Report
12. Detailed Item history Report
13. Cost & Incidence Report
14. Budget
15. Item Failing within Guarantee Period
16 Basic Flow Diagram of Documents.

ACCOUNT = PLAN. MAINT.	ACCOUNT = PLAN. MAINT.	ITEM NUMBER	ITEM DESCRIPTION	GUARANTEE EXPIRY DATE
375472	365472	120C	WINDBOX PRESSURE CONTROL.-PORT BOILER.	1 11 71
375472	365472	121A	FAN DISCHARGE PRESSURE CONTROL.-PORT BOILR	1 11 71
375472	365472	122K	OIL FUEL PRESSURE AT BURNER.-PORT BOILER.	1 11 71
375472	365472	123H	MAIN FEED WATER LINE CONTROL.	1 11 71
375472	365472	124F	AUX.FEED WATER LINE PRESSURE CONTROL.	1 11 71
375472	365472	125D	CONTROL AIR PRESSURE MONITORING & CONTROL.	1 11 71
375472	365472	126B	COMB.AIR TO FANS TEMP.CONTROL.	1 11 71
375472	365472	127L	GLADSTONE-MARSH CABINET.	1 11 71
375472	365472	134C	********** SEE NOTE BELOW **********	1 11 71
375472	365472	135A	THE FOLLOWING NUMBERS REFER TO SUBSECTIONS	1 11 71
375472	365472	136K	OF THE THROTTLE CONTROL SECTION OF THE COS	1 11 71
375472	365472	137H	PANEL & INCLUDE ALL SENSORS & CONTROLLERS	1 11 71
375472	365472	138F	IN EACH OF THE SUB-SECTIONS NAMED.	1 11 71
375472	365472	139D	**********	1 11 71
375472	365472	140H	THROTTLE CONTROL LEVER & VALVE CONTROLS.	1 11 71
375472	365472	141F	THROTTLE CONTROL LEVERS & VALVE CONTROLS.	1 11 71
375472	365472	142D	THROTTLE POSITION INDICATION.	1 11 71
375472	365472	143B	SHAFT STOPPED ALARM CIRCUIT.	1 11 71
375472	365472	145J	STEAM PUMP TO CONDENSER CONTROL&INDICATION	1 11 71
375472	365472	146G	THROTTLE & OIL FUEL TRIPS.	1 11 71
375472	365472	147E	ENGINE REVOLUTION COUNTER SYSTEM.	1 11 71
375472	365472	148C	ENGINE REVOLUTION COUNTER SYSTEM.	1 11 71
375472	365472	154H	********** SEE NOTE BELOW **********	1 11 71

=	ITEM NAME	DUE DATE	DATE SURVEYED	PORT	SURVEYO
CCF	RUDDER,PINTLES,BEARING & GLAND (L.S 1465)	24/10/74			
01C	STERN FRAME (L.S.1458)	24/10/74			
C1C	FOREMAST & FITTINGS	24/01/73			
C2E	MAINMAST & FITTINGS	24/01/73			
01L	NO 1 HATCHCOVER & COAMING	24/11/72			
C2J	NO 2 HATCHCOVER & COAMING	24/06/73			
03G	NO 3 HATCHCOVER & COAMING	24/03/73			
C4E	NO 4 HATCHCOVER & COAMING	24/03/75			
05C	NO 5 HATCHCOVER & COAMING	24/03/75			
06A	NO 6 HATCHCOVER & COAMING	24/03/75			
07K	NO 7 HATCHCOVER & COAMING	24/05/75			
08H	NO 8 HATCHCOVER & COAMING	24/02/76			
09F	NO 9 HATCHCOVER & COAMING	24/02/76			
1C	FOREPEAK TANK INTERNAL	24/03/75			
2A	FOREPEAK TANK TEST	24/05/75			
3K	NO 1 P SIDE D B TANK INTERNAL (L S 1922)	24/11/72			
4H	NO 1 P SIDE D B TANK TEST (L S 1939)	24/04/73			
5F	NO 1 S SIDE D B TANK INTERNAL (L S 1953)	24/07/73			
6C	NO 1 S SIDE D B TANK TEST (L S 1960)	24/01/73			
7B	NO 2 P SIDE D B TANK INTERNAL (L S 1984)	24/03/73			
8L	NO 2 P SIDE D B TANK TEST (L S 1991)	24/01/73			
9J	NO 2 S SIDE D B TANK INTERNAL (L S 2013)	24/11/72			
0B	NO 2 S SIDE D B TANK TEST (L S 2020)	24/07/73			
1L	NO 3 P SIDE D B TANK INTERNAL (L S 2044)	24/10/72			
2J	NO 3 P SIDE D B TANK TEST (L S 2051)	24/08/73			
3G	NO 3 S SIDE D B TANK INTERNAL (L S 2075)	24/02/73			
4E	NO 3 S SIDE D B TANK TEST (L S 2082)	24/01/73			
5C	NO 4 P SIDE D B TANK INTERNAL (L S 2101)	24/07/74			
6A	NO 4 P SIDE D B TANK TEST (L S 2118)	24/05/75			
7K	NO 4 S SIDE D B TANK INTERNAL (L S 2132)	24/05/75			
8F	NO 4 S SIDE D B TANK TEST (L S 2149)	24/03/74			
9F	NO 5 P SIDE D B TANK INTERNAL (L S 2163)	24/05/75			
0CK	NO 5 P SIDE D B TANK TEST (L S 2170)	24/07/74			
1H	NO 5 S SIDE D B TANK INTERNAL (L S 2194)	24/03/74			
2F	NO 5 S SIDE D B TANK TEST (L S 2206)	24/05/75			
3D	NO 6 P SIDE D B TANK INTERNAL (L S 2220)	24/07/74			
4B	NO 6 P SIDE D B TANK TEST (L S 2237)	24/05/75			
5L	NO 6 S SIDE D B TANK INTERNAL (L S 2251)	24/05/75			
6J	NO 6 S SIDE D B TANK TEST (L S 2268)	24/03/74			
7G	NO (P SIDE D B TANK INTERNAL (L S 2282)	24/02/76			
8E	NO 7 P SIDE D B TANK TEST (L S 2299)	24/01/73			
9C	NO 7 S SIDE D B TANK INTERNAL (L S 2318)	24/09/72			
0G	NO 7 S SIDE D B TANK TEST (L S 2325)	24/07/76			
1E	NO 8 P SIDE D B TANK INTERNAL (L S 2349)	24/11/72			
2C	NO 8 P SIDE D B TANK TEST (L S 2356)	24/07/76			
3A	NO 8 S SIDE D B TANK INTERNAL (L S 2370)	24/02/76			
4K	NO 8 S SIDE D B TANK TEST (L S 2387)	24/01/73			

ITEM =	ITEM NAME	DUE DATE	DATE SURVEYED	PORT	SURVEYO
3654221CCF	RUDDER,PINTLES,BEARING & GLAND (L.S 1465)	24/10/74			
3654221C1C	STERN FRAME (L.S.1458)	24/10/74			
3654250C1C	FOREMAST & FITTINGS	24/01/73			
3654250C2E	MAINMAST & FITTINGS	24/01/73			
3654280C1L	NO 1 HATCHCOVER & COAMING	24/11/72			
3654280C2J	NO 2 HATCHCOVER & COAMING	24/06/73			
3654280C3G	NO 3 HATCHCOVER & COAMING	24/03/73			
3654280C4E	NO 4 HATCHCOVER & COAMING	24/03/75			
3654280C5C	NO 5 HATCHCOVER & COAMING	24/03/75			
3654280C6A	NO 6 HATCHCOVER & COAMING	24/03/75			
3654280C7K	NO 7 HATCHCOVER & COAMING	24/05/75			
3654280C8H	NO 8 HATCHCOVER & COAMING	24/02/76			
3654280C9F	NO 9 HATCHCOVER & COAMING	24/02/76			
365434CC1C	FOREPEAK TANK INTERNAL	24/03/75			
365434CC2A	FOREPEAK TANK TEST	24/05/75			
365434CC3K	NO 1 P SIDE D B TANK INTERNAL (L S 1922)	24/11/72			
365434CC4H	NO 1 P SIDE D B TANK TEST (L S 1939)	24/04/73			
365434CC5F	NO 1 S SIDE D B TANK INTERNAL (L S 1953)	24/07/73			
365434CC6D	NO 1 S SIDE D B TANK TEST (L S 1960)	24/01/73			
365434CC7B	NO 2 P SIDE D B TANK INTERNAL (L S 1984)	24/03/73			
365434CC8L	NO 2 P SIDE D B TANK TEST (L S 1991)	24/01/73			
365434CC9J	NO 2 S SIDE D B TANK INTERNAL (L S 2013)	24/11/72			
365434C10B	NO 2 S SIDE D B TANK TEST (L S 2020)	24/07/73			
365434C11L	NO 3 P SIDE D B TANK INTERNAL (L S 2044)	24/10/72			
365434C12J	NO 3 P SIDE D B TANK TEST (L S 2051)	24/08/73			
365434C13G	NO 3 S SIDE D B TANK INTERNAL (L S 2075)	24/02/73			
365434C14E	NO 3 S SIDE D B TANK TEST (L S 2082)	24/01/73			
365434C15C	NO 4 P SIDE D B TANK INTERNAL (L S 2101)	24/07/74			
365434C16A	NO 4 P SIDE D B TANK TEST (L S 2118)	24/05/75			
365434C17K	NO 4 S SIDE D B TANK INTERNAL (L S 2132)	24/05/75			
365434C18H	NO 4 S SIDE D B TANK TEST (L S 2149)	24/03/74			
365434C19F	NO 5 P SIDE D B TANK INTERNAL (L S 2163)	24/05/75			
365434C2CK	NO 5 P SIDE D B TANK TEST (L S 2170)	24/07/74			
365434C21H	NO 5 S SIDE D B TANK INTERNAL (L S 2194)	24/03/74			
365434C22F	NO 5 S SIDE D B TANK TEST (L S 2206)	24/05/75			
365434C23D	NO 6 P SIDE D B TANK INTERNAL (L S 2220)	24/07/74			
365434C24B	NO 6 P SIDE D B TANK TEST (L S 2237)	24/05/75			
365434C25L	NO 6 S SIDE D B TANK INTERNAL (L S 2251)	24/05/75			
365434C26J	NO 6 S SIDE D B TANK TEST (L S 2268)	24/03/74			
365434C27G	NO 7 P SIDE D B TANK INTERNAL (L S 2282)	24/02/76			
365434C28E	NO 7 P SIDE D B TANK TEST (L S 2299)	24/01/73			
365434C29C	NO 7 S SIDE D B TANK INTERNAL (L S 2318)	24/09/72			
365434C3CG	NO 7 S SIDE D B TANK TEST (L S 2325)	24/07/76			
365434C31E	NO 8 P SIDE D B TANK INTERNAL (L S 2349)	24/11/72			
365434C32C	NO 8 P SIDE D B TANK TEST (L S 2356)	24/07/76			
365434C33A	NO 8 S SIDE D B TANK INTERNAL (L S 2370)	24/02/76			
365434C34K	NO 8 S SIDE D B TANK TEST (L S 2387)	24/01/73			

ASSOCIATED STEAMSHIPS PTY. LTD. ATTACHMENT NO. 83/01

PLANNED MAINTENANCE SHEET 1 OF 4 SHEETS

ITEM: FRESH WATER STERILIZER

SERVICE: Every 6 Months

OPERATION:

(a) Switch current off by means of switch No.4 (diagram given below). Disconnect activator No.10.

(b) Close valves No.24 and No.15, open valve No.19.

(c) Loosen ringscrews of activator lid No.14.

(d) Lift out lid with electrode.

(e) Lift out outer electrode by turning it.

(f) Clean steel cylinder by brushing lightly.

NOTE

Use no hard tools. If the deposit cannot be removed by brushing, place the parts in a 3% - 5% solution of hydrochloric acid, which will dissolve the deposit. Rinse with water.

(g) Replace the silver electrode.

(h) Assemble the activator in reverse order.

(i) Clean the contacts and inner parts of the flow switch, No.21.

(j) Inspect and clean all constituent parts of Control panel, No.1

(k) Switch on the current by means of switch No.4.

The pilot lamp No.2 will light up and the voltmeter No.6 indicates tension. Turn adjusting knob No.11 of rheostat until ammeter No.9 indicates about 80% of the prescribed value.

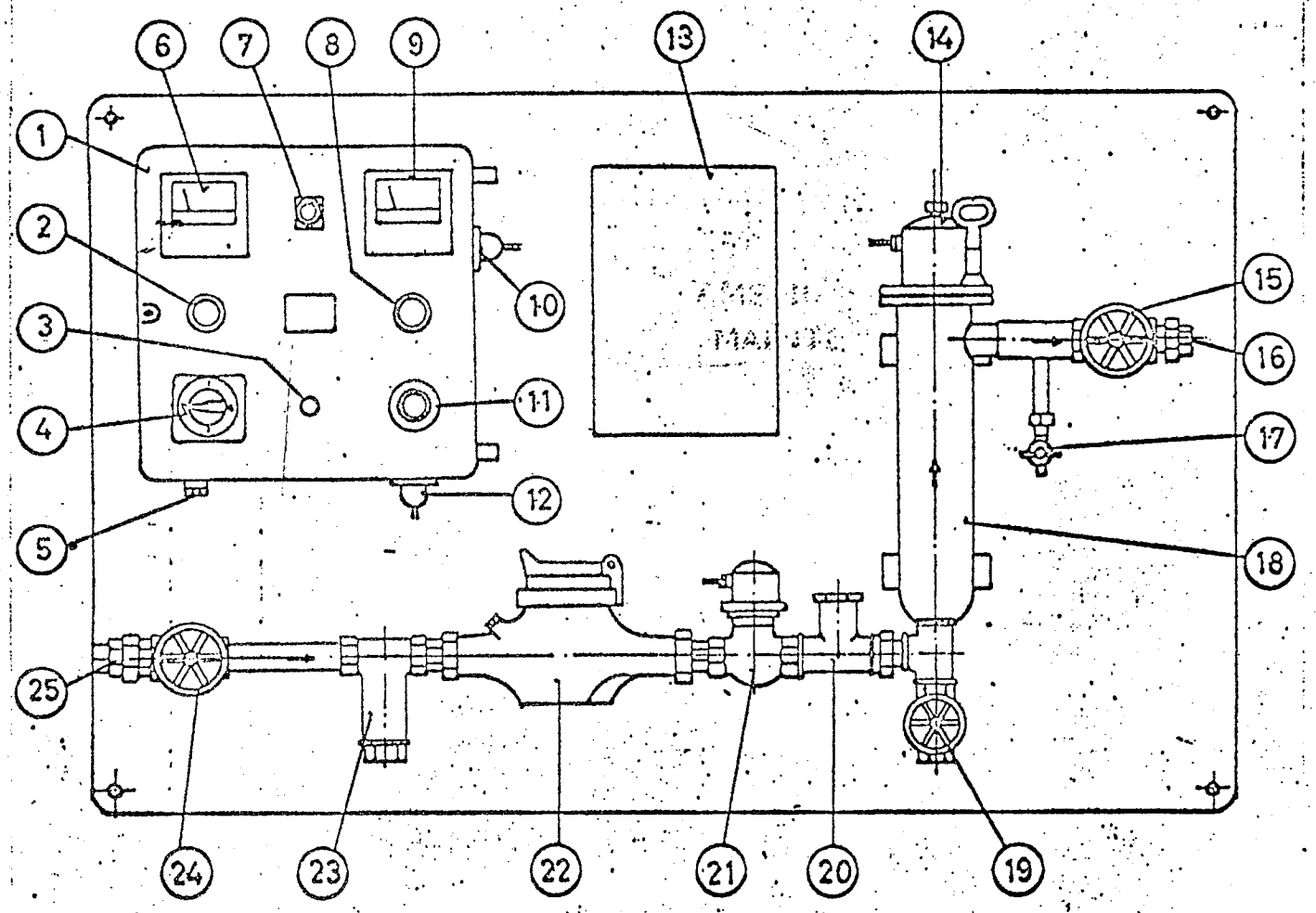
(l) Now open Control Panel,(CAUTION! PANEL UNDER CURRENT.) and turn rheostat "P" (Drawing VS7027 attached.) until alarm lamp No.8 lights up. Then slowly turn rheostat "P" back until alarm lamp No.8 goes out. This sets the alarm for the current dropping below 80%.

(m) Close Control Panel and turn the adjusting knob No.11 until the prescribed amperage is set.

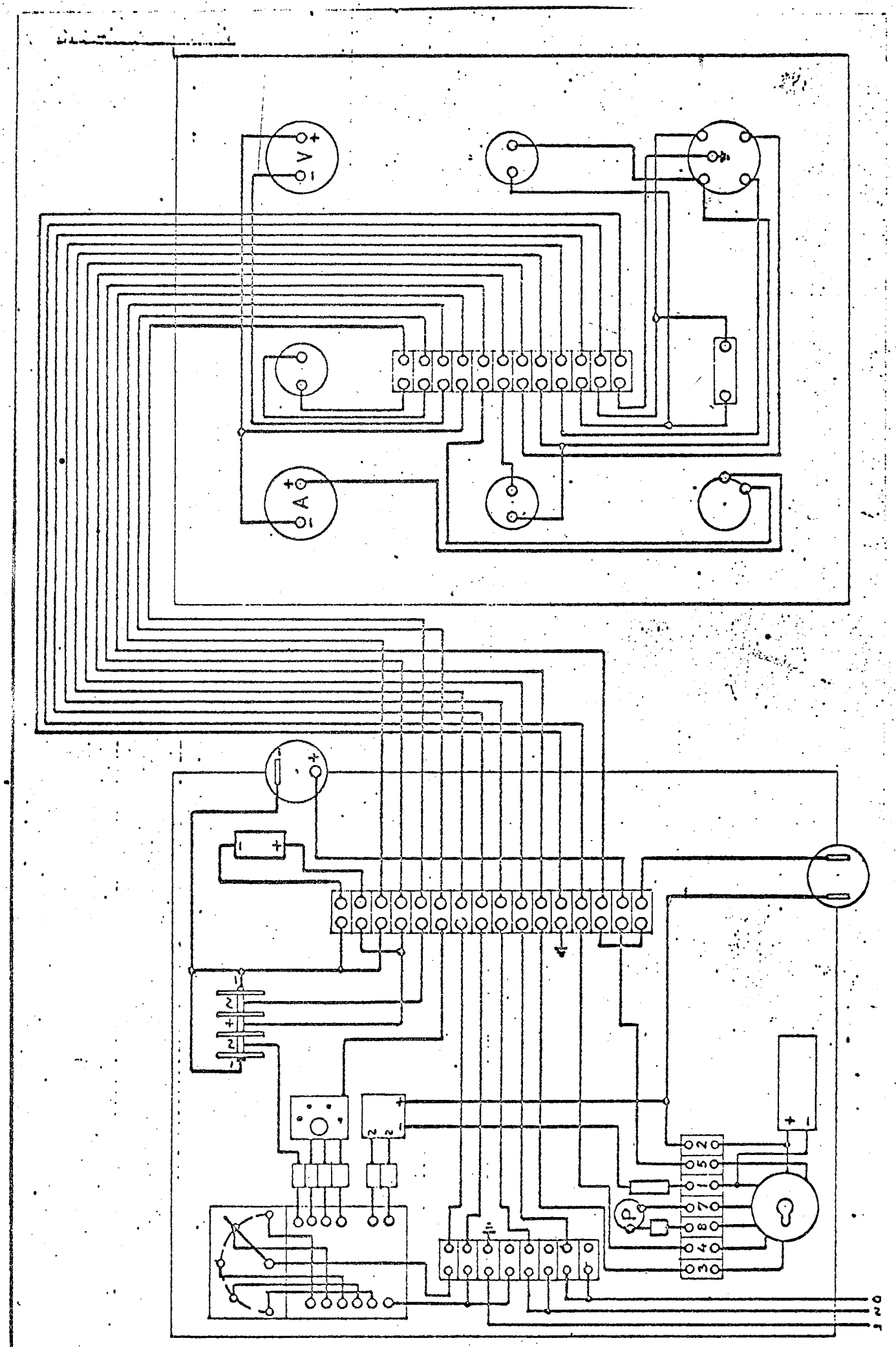
SPARE PARTS:

SPECIAL TOOLS:

ELECTRO - KATADYN - APPARATUS Typo EKN-4



1 Control Panel
2 Pilot Lamp
3 Automatic Fuse
4 Main Switch
5 Current Inlet
6 Voltmeter
7 Fine Fuse
8 Alarm Lamp
9 Ammeter
10 Plug for Activator Connection
11 Adjusting Knob of rheostat
12 Plug for Flow- or Pressure Switch Connection
13 Operating Instructions
14 Activator Lid
15 Outlet Valve
16 Water Exit
17 Tap for taking water sample
18 Activator, containing electrode
19 Drain Valve
20 Regulator T
21 Flow- or Pressure Switch
22 Water Meter
23 Dirt-Catcher Sieve
24 Inlet Valve
25 Water Inlet



KATADYN PRODUKTE AG Wallisellen | VS 7027

JOB REPORT SHEET

ITEM: FRESH WATER STERILIZER.

SERVICE: Every 6 Months.

REPORT: NOTE: If a part is replaced, write 'replaced' in the report below.

A	Condition of contacts on flow switch.	
B	Condition of Control Panel.	
C	Did any condensers require replacement?	Yes ☐ No ☐
D	Did any other items require replacement?	Yes ☐ No ☐
E	If answer was Yes for part D, specify which part(s):	

GENERAL REMARKS:

Appendix 4

1

VESSEL	ASSOCIATED STEAMSHIPS PTY. LTD.	DATE OF ISSUE
KANIMBLA	(INCORPORATED IN VICTORIA)	25/01/72
Planned Period 12	94-96 WILLIAM ST., MELBOURNE, VIC. 3000	ORDER NUMBER
Reading 9	SURVEY MAINTENANCE	362537/010H/03/72
Avge. Hrs./Month N/APP		This must be quoted on all Accounts to prevent delay on payment of A/cs.

THIS IS NOT AN OFFICIAL ORDER—COPY ONLY

ITEM WATERTIGHT DOORS — Date of Last Survey 26/03/71

Date Last Attended 03/71 By Whom 5L5936 — Previous Condition B

SURVEY MAINTENANCE TO BE CARRIED OUT IN ACCORDANCE WITH THE FOLLOWING ATTACHMENTS:

SHEET NOS 74.10

TO PREVENT DELAY IN PAYMENT THE INFORMATION BELOW MUST BE COMPLETED & THIS FORM THEN FORWARDED WITH CONTRACTOR'S INVOICE TO THE SHIP SUPT. (SEE NOTES ON REVERSE SIDE).

GENERAL CONDITION (Cross whichever applicable) See back for explanation of A., B., C., D.

No Attention — A ☐ Fair — C ☐ Please make any further remarks

Good — B ☐ Requires Attention — D ☐ on back of card.

TOTAL MAN HOURS TAKEN FOR JOB

DATE JOB COMPLETED	VALUE OF WORK DONE $	LLOYDS CERT. RECEIVED	REPAIRERS NAME	A.S.P. No.
/ /				

SIGNATURE OF SHIP'S OFFICER

SIGNATURE OF SHIP SUPERINTENDENT

ROUTING—TECH. SERVICES, FLEET, SHIP, SHIP SUPTD., CONTRACTOR, SHIP SUPTD., ACCOUNTS, TECH SERVICES, ACCOUNTS, FLEET, ACCOUNTS, E.D.P., TECH SERVICES (RETAIN).

ASP/300

Appendix 5

ASSOCIATED STEAMSHIPS PTY. LTD.

(INCORPORATED IN VICTORIA)

94-96 WILLIAM ST., MELBOURNE, VICTORIA, 3000.

PLANNED MAINTENANCE ENQUIRY SHEET.

VESSEL. KANIMBLA DATE 03/02/72

Notification has not as yet been received that the PLANNED MAINTENANCE under Job No. 362521/003H/12/71 , issued in OCT 71 , to be carried out in DECEMBER has been completed.

This is done by a ships officer signing the E.D.P. (green) copy of the Planned Maintenance Job Card and forwarding it to the Fleet Department immediately the job is completed.

If this job on WINDLASS MOTOR-GENERATOR SET has not been completed give reasons overleaf and if cancelled insert "X" in the appropriate box. If completed fill in the condition code and completion date. In all cases sign and

RETURN THIS CARD PROMPTLY TO FLEET DEPARTMENT.

4IEN Job No 362521/003H/12/71 Insert "X" here if cancelled ☐

If completed insert Condition Code ☐ and completion date / /

SIGNATURE .....

RANK .....

Appendix 6

ASSOCIATED STEAMSHIPS PTY. LTD.

RUNNING HOURS SUMMARY SHEET

VESSEL : M.V. GERRINGONG VESSEL CODE : 51

DATE : 31-05-72

This Sheet to be completed on the last day of each Month and forwarded immediately.

TO : ENGINEERING DIVISION,
ASSOCIATED STEAMSHIPS PTY. LTD.,
94 WILLIAM STREET,
MELBOURNE. 3000.

43 ASP 303/GERRINGONG

Item of Machinery	Item Number	Hours Run in Month	Hours Run to Date
MAIN ENGINE	40999C	418.	37525
PORT ALTERNATOR PRIME MOVER	50001K 50020F 50030C	56.	22216
PORT ALTERNATOR	52001L	"	
MIDSHIPS ALTERNATOR PRIME MOVER	50201B 50220J 50230F	710.	23054
MIDSHIPS ALTERNATOR	52002J	"	
STB ALTERNATOR PRIME MOVER	50301J 50320E 50330B	25.	22672
STB ALTERNATOR	52003G	"	

CHIEF ENGINEER K. O'Connell

ASSOCIATED STEAMSHIPS PTY LTD

BREAKDOWN REPORTS RECEIVED IN THE MONTH OF MARCH

VESSEL	COMPLETN DATE	M.S. CODE	MANHOURS	COST
MANOORA	09/71	50	11	92.73
		MONTHS TOTAL	11	92.73
	11/71	47	26	268.70
		72	8	67.50
		80	0	2.56
		MONTHS TOTAL	34	338.76
	12/71	40	0	9.55
		50	8	130.20
		52	2	15.56
		MONTHS TOTAL	10	155.31
	01/72	11	59	408.41
		24	4	23.02
		37	12	14.35
		43	22	104.28
		52	55	446.26
		68	14	65.79
		71	16	81.45
		72	3	21.90
		82	11	45.97
		85	50	317.01
		MONTHS TOTAL	246	1,528.44
	02/72	22	0	48.82
		65	25	253.54
		72	4	44.91
		85	23	175.24
		MONTHS TOTAL	52	522.51
	08/72	80	18	144.00
		MONTHS TOTAL	18	144.00
		VESSEL TOTAL	371	2,781.75

REPORT OF BREAKDOWN MAINTENANCE INCIDENCES USED TO UPDATE THE MASTER FILE

ITEM NUMBER	ORDER NUMBER	MAN HOURS	COST	COMPLETION DATE	CONDITION CODE	REPAIR CODE	
372611/002J	A2936	16	87.13	05/01/72	B	BD	FUMIGATE-SPDRS
372611/011H	A2950	16	119.41	27/01/72	B	MD	RMVPROPSECSTRP
372611/014B	A2953	4	20.91	28/01/72	B	MD	FITHGRPMMSTLDR
372611/030D	A2933	23	180.96	07/01/72	B	BD	SPPLYLABSANDNG
362616/001H	A2957	66	330.33	28/01/72	B	PM	LAB&EQPMNTPNTG
362617/022F	A2957	48	172.76	28/01/72	B	PM	SPRYP&DTOPROGR
372622/002J	00218	0	48.82	19/02/72		RP	CHANGED'ERSWCH
372624/001A	A2778	4	23.02	28/01/72	B	BD	SPLCESPCLTHMBL
372637/013F	A2877	12	14.35	05/01/72	B	BD	RPRFOURFLAGS
372640/004C	02181	0	0.75	22/12/71		RP	3BOXESSTRMMTCH
372640/004C	02181	0	8.80	22/12/71		RP	2TINSSTARTFILM
372643/003A	A2950	12	58.11	27/01/72	B	BD	CLEANWATERSIDE
372643/004K	A2950	10	46.17	27/01/72	B	BD	CLEANWATERSIDE
372647/014J	A4642	13	134.35	29/11/71	B	BD	NOZZLE RENEWED
372647/015G	A4642	13	134.35	29/11/71	B	BD	NOZZLE RENEWED
372650/001C	A2842	11	92.73	17/09/71	B	BD	CHECK TIMING
362650/011L	A2859	15	137.40	06/11/71	B	PM	CONT OF PM1171
372650/021H	A2879	8	130.20	12/12/71	B	BD	OHLABANKBLOWER
372652/002B	A2879	2	15.56	12/12/71	B	BD	2 FLEX HOSES
372652/003L	A2951	55	446.26	28/01/72	B	BD	SPPLY&FITCPLNG
362662/009D	A2833	11	73.23	23/09/71	B	PM	SUPPLYSEALRNGS
372665/005H	A2961	25	253.54	19/02/72	B	BD	CLRMUSLSAUXSW
372668/001A	A2951	14	65.79	28/01/72	B	BD	RPRLKMETRCNGLN
372671/010G	A2934	16	81.45	07/01/72	B	BD	RPRPSFNLFLCASG
372672/382J	A2955	4	44.91	13/02/72	B	BD	MK&SPRYCBLGLND
372672/450G	A2938	3	21.90	04/01/72	B	BD	CALIBRATNCHCKD
372672/600C	A2868	8	67.50	30/11/71	B	BD	FIT PRESS GAGE
372680/003C	A2872	0	2.56	26/11/71	B	BD	SPPLY3KYSSPRLK
372680/100E	A2428	18	144.00	01/08/72	B	BD	2YEAR CONTRACT
372682/001H	A2950	11	45.97	28/01/72	B	BD	RPRCEMENTWORK
372685/001D	A2953	14	92.54	28/01/72	B	BD	RPRSWLKINLETPP
372685/001D	A2961	23	175.24	19/02/72	B	BD	CLNWATRSDFITPP
372685/020L	A2956	8	36.90	28/01/72	B	BD	RMVDKHDTOCLNTK
372685/020L	A2950	28	187.57	28/01/72	B	BD	CLNTRKWAYOPTKS

PLANNED MAINTENANCE COST COMPARISON
LAST COMPLETE OVERHAUL

VESSEL MANOORA DATE ISSUE 30/05/72

ITEM NO	DESCRIPTION OF ITEM	ESTIMATED MANHOURS	ACTUAL MANHOURS LAST O/H	VARI.	COSTS ESTIMATED	COSTS ACTUAL LAST O/H	VARI.	CONDITION A,B,C,D	DATE OF LAST SUR OR O/HAL
362663003L	BOILER FEED PUMP STB	46	42	(4+)	$290	212.20	$77 CR	B	08/71
362663004J	BOILER FEED PUMP MOTOR STBD	4	4	(0)	$25	14.40	$10 CR	B	09/70
362663010C	HAMWORTHY PUMP LOCKING ARRANGEMENT	1	3	(2)	$6	13.64	$7	B	09/70
362665001E	BALLAST PIPES & VALVES	6	11	(5)	$57	103.88	$47	B	02/70
362665002C	BALLAST VALVES CONTROL SYSTEM.	40	10	(30+)	$275	4.64	$269 CR	B	10/71
362665006F	FIREMAIN PIPES & VALVES	10	10	(0)	$63	0.00	$62 CR	B	03/72
362666008H	M E PISTON COOLING WATER SYSTEM	12	12	(0)	$72	0.00	$71 CR	D	12/71
362667001F	HEAVY OIL FUEL PIPES & VALVES	20	20	(0)	$126	0.00	$125 CR	A	02/72
362670001B	SEWAGE PIPES & VALVES	14	12	(2+)	$88	0.00	$87 CR	B	02/72
362670002L	SEDIMENTATION & TREATMENT TANK	13	5	(8+)	$86	52.00	$33 CR	C	07/71
362671001H	MAIN SWITCHBOARD	2	5	(3)	$13	0.00	$12 CR	A	02/72
362671002F	EMERGENCY SWITCHBOARD	5	9	(4)	$32	47.78	$16	B	10/71
362671003D	SECTION SUB-DISTRIBUTION & FUSE BOARDS	7	13	(6)	$44	61.81	$18	B	11/71
362671014K	EMERGENCY LIGHTING & WIRING	4	7	(3)	$25	32.51	$7	B	10/71
362671016F	DECK MACHINERY WIRING	7	17	(10)	$57	62.99	$6	B	10/71
362672006D	SHIPS MASTER CLOCK AND COMMAND PRINTER.	3	2	(1+)	$19	14.75	$3 CR	B	01/72
362672009J	AHEAD PILOT AIR VALVE - BRIDGE	3	2	(1+)	$19	0.00	$18 CR	B	10/71
362672010B	ASTERN PILOTAIR VALVE-BRIDGE	2	2	(0)	$13	0.00	$12 CR	B	10/71
362672011L	PRESSURE CONTROL VALVE FOR SPEED SETTING.	2	1	(1+)	$14	0.00	$13 CR	B	10/71
362672015C	CHECK VALVE-BRIDGE.	1	1	(0)	$10	7.00	$2 CR	B	11/71
362672016A	AIR-LINE FILTER-BRIDGE.	2	2	(0)	$13	0.00	$12 CR	B	04/72
362672018H	SINGLE-POLE C/O.PRESSURE SWITCHES.-BRIDGE	2	2	(0)	$13	0.00	$12 CR	B	08/71
362672030G	EMERGENCY TELEGRAPH-E/R.CONSOLE RECEIVER	4	4	(0)	$25	0.00	$24 CR	B	03/72
362672035H	TELEGRAPH-OPERATED PILOTAIR VALVES.	3	3	(0)	$19	20.00	$1	B	11/71
362672036F	CONSOLE PUSH-BUTTON PILOTAIR VALVES	2	1	(1+)	$15	0.00	$14 CR	B	10/71
362672037D	STARTING LEVER PILOTAIR VALVE	1	1	(0)	$6	6.00	$0	B	11/71
362672038B	SOLENOID VALVE.-CONTROL CONSOLE.	2	2	(0)	$13	0.00	$12 CR	B	04/72
362672039L	MAIN SHUTDOWN PILOTAIR	2	1	(1+)	$13	6.00	$6 CR	B	12/70
362672040D	SPEED SETTING LEVER-REGULATING VALVE	2	1	(1+)	$13	6.00	$6 CR	B	12/70
362672041B	MAX.SPEED SETTING REGULATING VALVE	2	1	(1+)	$13	6.00	$6 CR	B	12/70
362672042L	CONTROL CONSOLE-SHUTTLE VALVE	2	1	(1+)	$20	0.00	$19 CR	B	10/71
362672044G	CONTROL CONSOLE-AIR LINE FILTER	1	1	(0)	$7	7.50	$1	B	10/71
362672053F	L.O.AFTER COOLERS-PN.TRANSMITTER (13-05-1)	7	6	(1+)	$53	0.00	$52 CR	A	04/72
362672055B	L.O.PP.DISCH.PRESS.PN.TRANSMITTER(13-01-1)	3	3	(0)	$22	0.00	$21 CR	A	05/72
362672056L	L O PP DISCH PRESS -PRESS SWITCH (13-01-2)	3	3	(0)	$26	0.00	$25 CR	B	04/72
362672057J	L.O.TO M.E.BRGS.PRESS.PN.TRANSMITTER.	3	3	(0)	$22	0.00	$21 CR	A	04/72
362672058G	L.O.TO M.E.X HDS.PRESS.-PN.TRANSMITTER.	3	3	(0)	$22	0.00	$21 CR	A	04/72
362672059E	MAIN THRUST AHD.PADS-IND'OR CONT.(13-06-2)	2	2	(0)	$14	15.10	$1	B	07/71
362672060J	L.O.DRN.TK.LEVEL-DIFF'L.TR'TTER.(13-07-1)	4	4	(0)	$28	30.25	$3	B	09/71
362672065K	RELAY AIR VALVES-PN.CABINET TOP AFT.	4	2	(2+)	$29	15.00	$13 CR	B	08/71
362672066H	RELAY AIR VALVES-PN.CABINET-TOP FWD.	6	2	(4+)	$38	15.00	$22 CR	B	10/71
362672067F	RELAY AIR VALVE-PN.CABINET-CENTRE AFT.	4	2	(2+)	$27	15.00	$11 CR	B	10/71
362672068D	RELAY AIR VALVES-PN.CABINET-CENTRE FWD.	4	2	(2+)	$27	15.00	$11 CR	B	10/71
362672069B	RELAY AIR VALVES-PN.CABINET-BOTTOM ROW AFT	2	2	(0)	$13	15.00	$2	B	09/71
362672070F	RELAY AIR VALVES PN.CABINET-BOTTOM ROW FWD	2	2	(0)	$13	15.00	$2	B	09/71
362672071D	RELAY AIR VALVE.	4	1	(3+)	$25	18.50	$6 CR	B	10/71

T.B.O. TIME BETWEEN OVERHAULS

PLANNED MAINTENANCE RELIABILITY REPORT
VESSEL MANOORA AS AT 30/05/72

ITEM NO	DESCRIPTION OF ITEM	2ND PREV COND.	FAIL	1ST PREV. COND.	FAIL	LATEST CONDITION + DATE	TIME BTWN SRVYS	DATE OF LAST SURVEY	T.B.O MNTHS/ HRS	TIME TI DATE FRI LOG
362672044G	CONTROL CONSOLE-AIR LINE FILTER	B 07/70	0	B 03/71	0	B 10/71	0	/	12M	18
362672050A	L O AFTER COOLERS -CONTROLLER (13-05-3)	B 03/70	0	B 09/70	1	B 04/72	0	/	20M	2
362672051K	L.O.AFTER COOLERS 3-WAY CONTROL VALVE.	B 07/70	0	A 12/70	0	B 04/72	0	/	10M	22
362672052H	L.O.AFTER COOLERS RECORDER(13-05-2)	B 07/70	0	B 12/70	0	B 04/72	0	/	10M	22
362672053F	L.O.AFTER COOLERS-PN.TRANSMITTER (13-05-1)	B 12/70	0	B 06/71	0	A 04/72	0	/	10M	2
362672055B	L.O.PP.DISCH.PRESS.PN.TRANSMITTER(13-01-1)	B 12/70	0	B 07/71	0	A 05/72	0	/	10M	1
362672056L	L O PP DISCH PRESS -PRESS SWITCH (13-01-2)	B 04/70	0	B 03/71	0	B 04/72	0	/	20M	1
362672057J	L.O.TO M.E.BRGS.PRESS.PN.TRANSMITTER.	B 12/70	0	B 07/71	0	A 04/72	0	/	10M	0
362672058G	L.O.TO M.E.X HDS.PRESS.-PN.TRANSMITTER.	B 12/70	0	B 07/71	0	A 04/72	0	/	10M	0
362672059E	MAIN THRUST AHD.PADS-IND'OR CONT.(13-06-2)	/	0	B 07/70	0	B 07/71	0	/	15M	11
362672060J	L.O.DRN.TK.LEVEL-DIFF'L.TR'TTER.(13-07-1)	B 07/70	0	B 12/70	1	B 09/71	0	/	10M	17
362672065K	RELAY AIR VALVES-PN.CABINET TOP AFT.	B 05/70	0	B 12/70	0	B 08/71	0	/	18M	24
362672066H	RELAY AIR VALVES-PN.CABINET-TOP FWD.	B 03/70	0	A 10/70	0	B 10/71	0	/	18M	24
362672067F	RELAY AIR VALVE-PN.CABINET-CENTRE AFT.	B 06/70	0	A 11/70	0	B 10/71	0	/	18M	24
362672068D	RELAY AIR VALVES-PN.CABINET-CENTRE FWD.	B 06/70	0	A 11/70	0	B 10/71	0	/	18M	24
362672069B	RELAY AIR VALVES-PN.CABINET-BOTTOM ROW AFT	B 07/70	0	B 12/70	0	B 09/71	0	/	18M	24
362672070F	RELAY AIR VALVES PN.CABINET-BOTTOM ROW FWD	B 12/70	0	B 04/71	0	B 09/71	0	/	18M	24
362672071D	RELAY AIR VALVE.	B 03/70	0	A 10/70	0	B 10/71	0	/	18M	24
362672075G	L O DRAIN TK LEVEL-PRESSURE SW (13-07-3)	/	0	B 05/70	0	B 05/71	0	/	20M	17
362672076E	L.O.FILTERS-DIFF.PRESS.CONVERTER(13-08-1).	B 09/70	0	B 01/71	0	B 04/72	0	/	15M	1
362672077C	L O FILTERS-DIFF PRESS SW (13-08-2)	B 05/70	0	B 05/71	0	A 03/72	0	/	15M	1
362672078A	L O BY-PASS FILTER-DIFF CONVERTER(13-10-1)	B 05/70	0	B 02/71	0	B 04/72	0	/	15M	1
362672079K	L O BY-PASS FILTER-PRESSURE SW (13-10-2)	B 05/70	0	B 05/71	0	A 03/72	0	/	15M	1
362672080C	L.O.B-P.FILTER HEATER TEMP.IND'OR(13-11-2)	/	0	B 07/70	0	A 03/72	0	/	15M	1
362672085D	QUICK RELEASE VALVES-CONN.TO PRESSURE SW.	B 07/70	0	B 12/70	0	B 09/71	0	/	18M	24
362672086B	QUICK RELEASE VALVES-CONN.TO SHUTTLES.	B 07/70	0	B 08/71	0	B 10/71	0	/	18M	24
362672087L	QUICK RELEASE VALVE-CONN.TO AIR STRAINER.	B 07/70	0	B 08/71	0	B 10/71	0	/	18M	24
362672088J	QUICK RELEASE VALVE-CONN.TO CHECK VALVE.	B 07/70	0	B 08/71	0	B 10/71	0	/	18M	24
362672089G	QUICK RELEASE VALVE-CONN.TO TIMING BOTTLE	B 03/70	0	A 10/70	0	B 09/71	0	/	18M	24
362672095A	DOUBLE CHECK VALVES-CONN.TO PRESSURE SW.	B 07/70	0	B 03/71	0	B 09/71	0	/	18M	24
362672096K	DOUBLE CHECK VALVES.	A 03/70	0	A 10/70	0	B 09/71	0	/	18M	24
362672105B	CHECK VALVE-PNEUMATIC CABINET.	B 04/70	0	B 08/71	0	B 10/71	0	/	18M	24
362672106L	AIR LINE FILTER-PNEUMATIC CABINET	B 07/70	0	B 08/71	0	B 10/71	0	/	12M	6
362672107J	AIR LINE STRAINER-PNEUMATIC CABINET.	B 04/71	0	B 10/71	0	B 04/72	0	/	6M	6
362672108G	FLOW CONTROL VALVES-PNEUMATIC CABINET.	B 09/71	0	08/71	0	B 04/72	0	/	6M	0
362672109E	PRESSURE REGULATING VALVE-PNEUM CABINET	B 07/70	0	B 12/70	0	B 11/71	0	/	12M	18
362672115K	STERNTUBE L.O.TK.LEVEL SWITCH.(13-12-1)	A 02/70	0	02/71	0	B 03/72	0	/	15M	2
362672116H	STERN TUBE BRG.TEMP.INDICATOR.(13-13-2)	/	0	B 07/70	0	B 03/72	0	/	15M	2
362672118D	L O TO NO 1 ALT -PRESSURE SWITCH (20-08-1)	D 08/70	0	A 03/71	1	B 03/72	0	/	18M	3
362672119B	L O TO NO 2 ALT -PRESSURE SWITCH (21-08-1)	D 08/70	0	A 03/71	1	B 03/72	0	/	18M	3
362672120F	L O TO NO 3 ALT -PRESSURE SWITCH (22-08-1)	D 08/70	0	A 03/71	1	B 03/72	0	/	18M	3
362672123L	SCAV AIR TRUNK TEMP -PN TRANSM'ER(18-06-1)	B 05/70	2	B 02/71	0	A 04/72	0	/	15M	0
362672124J	SCAV AIR TRUNK TEMP -CONTROLLER (18-06-3)	B 03/70	0	B 03/71	0	B 05/72	0	/	15M	0
362672125G	SCAVENGE AIR TRUNK TEMP.RECORDER.(18-06-2)	B 07/70	1	B 12/70	0	B 09/71	0	/	10M	26
362672126E	SCAV.AIR TRUNK TEMP.CONTROL VALVE(18-06-4)	B 05/70	0	A 10/70	0	B 10/71	0	/	15M	6
362672127C	EXH.GAS TEMP.STRIP-CHART RECORDER.	B 07/70	0	B 06/71	1	B 05/72	0	/	10M	0

ESSEL KANIMBLA

ITEM NO.	NAME OF ITEM	CONDITION LAST JOB	O/H INTVL. MTH/HRS.	SVY.INTVL. MTH/HRS.	PLANNED MAINTENANCE ACTUAL M/HRS.	PLANNED MAINTENANCE ACTUAL COSTS	UNPLANNED MAINTEN ACTUAL M/HRS.	UNPLANNED MAINTEN ACTUA COSTS
62572157A	NO.2 H.O.B-P.FILTER TEMP.INDICATOR(19-7-2)	B	9	0	5	35.33	0	0.
62572160A	F.V.COOLING HD.TK.OUTLET TEMP.CONTROL	B	8	0	27	211.54	0	0.
62572161K	F V COOL HD TK OUT TEMP CONT V/V (16-03-7)	A	16	0	15	120.66	0	0.
62572162H	F.V.COOL.HD.TK.OUT.TEMP.CONTROLLER(16-3-5)	B	16	0	10	68.36	0	0.
62572163F	F.V.COOL.HD.TK.OUT.TEMP.RECORDER (16-03-4)	B	16	0	20	159.75	0	0.
62572164D	F V COOL HD TK OUTLET-PRESSURE SWITCH	B	16	0	6	34.92	0	0.
62572165B	F.V.COOL.HD.TK.OUT.TEMP.TR'TTER(16-3-1)	B	16	0	10	78.64	0	0.
62572167J	F V COOL PP DISCH PRESS PN TR'TTER(16-1-1)	B	12	0	14	93.90	0	0.
62572168G	F V COOL PP DISCH PRESS SWITCH (16-01-3)	B	24	0	5	19.95	0	0.
62572169E	F.V.COOL.HD.TK.LEVEL SWITCH.(16-04-1)	A	16	0	8	13.54	0	0.
62572176H	J.C.W.TEMP.AFTER COOLER-CONT.V/V.(14-03-4)	B	15	0	84	353.76	0	0.
62572177F	J.C.W.TEMP.AFTER COOLER-CONTROLLER(14-3-3)	B	20	0	10	65.92	5	33.
62572178D	J.C.W.TEMP.AFTER COOLER-RECORDER.(14-03-2)	B	10	0	24	164.15	0	0.
62572179B	J.C.W.TEMP.AFTER COOLER-PRESS.SW.(14-03-5)	A	20	0	4	7.00	0	0.
62572180F	J.C.W.TEMP.AFTER COOLER-PN.TR'TTER(14-3-1)	A	20	0	25	173.88	0	0.
62572181D	J.C.W.AFTER COOLER-PN.TR'TTER-INLET TEMP.	B	20	0	14	88.45	0	0.
62572182B	J.C.W.TEMP.AFTER COOLER-CONTROLLER(14-3-7)	B	30	0	16	50.22	0	0.
62572183L	J.C.W.PP.PRESS.-PN.TRANSMITTER.(14-01-1).	B	8	0	17	111.48	0	0.
62572184J	J C W PP PRESS -PRESSURE SWITCH (14-01-3)	B	16	0	5	28.96	0	0.
62572185G	CYL.J.C.W.OUT.TEMPS.INDIC.CONT'ER.(14-04).	B	20	0	5	21.17	0	0.
62572186E	J.C.W.HEAD TANK-LEVEL SWITCH.(14-11-1).	A	16	0	12	26.95	0	0.
62572192K	P.C.W.TEMP.AFTER COOLER-CONT.V/V.(15-03-4)	A	10	0	65	539.82	0	0.
62572193H	P C W TEMP AFTER COOLER-CONTROLLER(15-3-3)	B	20	0	6	43.41	0	0.
62572194F	P.C.W.TEMP.AFTER COOLER-RECORDER.(15-03-2)	B	5	0	26	196.48	8	58.
62572195D	P C W.TEMP.AFTER COOLER-PRESS.SW.(15-03-5)	A	10	0	6	22.85	0	0.
62572196B	P.C.W.AFTER COOLER-PN.TR'TTER.-INLET TEMP.	B	10	0	14	117.08	0	0.
62572197L	P.C.W.TEMP.AFTER COOLER-PN.TR'TTER(15-3-1)	B	10	0	14	88.45	0	0.
62572198J	P.C.W.TEMP.AFTER COOLER-CONTROLLER(15-3-7)	B	15	0	9	68.35	0	0.
62572200D	EMERGENCY TELEGRAPH-RECEIVER ON ENGINE	B	12	0	36	134.73	2	13.
62572207A	WOODWARD SG OVERSPEED TRIP	A	9	0	7	35.00	0	0.
62572210A	STARTING LEVER CONTROL-PILOTAIR VALVES	B	12	0	22	86.25	0	0.
62572211K	TWO PILOTAIR VALVES-TELEGRAPH OPERATED	B	12	0	16	60.25	0	0.
62572212H	TELEGRAPH RELEASE - PILOTAIR VALVE	B	8	0	7	51.25	0	0.
62572213F	PNEUMATICALLY ACTUATED PILOTAIR VALVE	A	8	0	9	51.00	0	0.
62572214D	PILOTAIR VALVE-TYPE D.	B	12	0	10	42.00	0	0.
62572216L	HYDRAULIC/PNEUMATIC VALVES.	A	10	0	7	41.00	0	0.
62572218G	QUICK RELEASE VALVE-HANDGRIP LIFTING CYL.	A	10	0	5	22.00	0	0.
62572219E	QUICK RELEASE VALVE-CONNECTED TO PNEUDYNE.	B	12	0	5	34.25	0	0.
62572220J	QUICK RELEASE VALVE-PNEUMATIC STARTING CYL	B	7	0	5	32.25	0	0.
62572222E	PNEUDYNE POSITIONER	B	0	0	35	198.00	0	0.
62572224A	FLOW CONTROL VALVE.	A	10	0	5	27.00	0	0.
62572228D	PNEUMATIC REVERSING CYLINDER	A	15	0	4	24.00	0	0.
62572230F	PNEUMATIC STARTING CYLINDER.	B	12	0	12	26.00	0	0.
62572231D	PNEUMATIC HANDGRIP LIFTING CYLINDER.	B	11	0	11	18.00	0	0.
62572232B	PNEUMATIC SINGLE-ACTING CYLINDER.	B	11	0	11	18.00	0	0.

ITEM HISTORY RECORD REPORT

VESSEL KANIMBLA DATE OF ISSUE 10/07/72

ITEM NO. 362580C01C OFFICERS CABINS T.B.O. 6 MTHS T.B.S. 0

DATE	DESCRIPTION OF WORK DONE	PLANNED MAINTENANCE M/HRS.	COST	CONDITION CODE	UNPLANNED MAINTENANCE M/HRS.	COST	REPAIR CODE	U.M.O	CREDITORS NUMBER
23/11/70	SATISFACTORY	1	0.00	B					1Z9805
19/02/70	RECT PM 0470	1	0.00	D					1Z9805
03/05/69	HINGES & CLOSR	2	4.73	B					2A5857
13/05/70	PT BOXES 2 PNT	1	0.00	B					1Z9805
03/08/69	3MTHCHECKACCOM	1	0.00	B					1Z9805
14/08/70	DR HNGS STRND	1	0.00	B					1Z9805
16/12/69	2E DOOR ADJUST	2	0.00	B					1Z9805
19/02/71	DHD BHD ND CLN	1	0.00	B					1Z9805
12/05/71	CABIN RPRS	1	0.00	B					1Z9805
13/08/71	SATISFACTORY	1	0.00	B					1Z9805
06/10/71	GOOD CONDITION	1	0.00	B					1Z9805
72/04/15	ALLGOODCONDITN	1	0.00	B					1Z9805
28/02/70	REPR HINGES			B	51	242.89	UG	A2062	8E6677
28/02/70	REPAIR HINGES			B	6	27.95	UG	A2491	8D3060
24/05/69	MASTERS SAFE			B	4	0.00	UG	A0097	2K384
26/03/69	BASIN C/RM			B	7	24.49	UG	A0015	1P2099
26/03/69	MATES DESK LT			B	1	4.38	UG	A0015	1P2099
26/03/69	CADETS LIGHT			B	1	4.38	UG	A0015	1P2099
26/03/69	DRWSMASTRSCAB			B	2	9.00	CR	A0018	1U2730
02/05/69	ROLL HANGER			B	3	10.20	CR	A0075	2A5857
07/05/69	DOOR CLOSERS				0	202.20	RP	A0380	2C8512
07/05/69	SPRINGSFORVV				0	17.28	RP	A0380	2T9381
07/05/69	FLUSH V/VS				0	172.40	RP	A0380	2T9381
07/05/69	ELBOW UNION				0	34.80	RP	A0380	2T9381
21/06/69	BUSHET				0	26.40	RP	A0380	2T9381
21/06/69	NOZZLEN				0	20.40	RP	A0380	2T9381
28/02/70	PANELS				6	38.13	MD	A2064	8E6677

PLANNED MAINTENANCE INCIDENCE AND COST COMPARISON REPORT FOR VESSEL 17 KOORINGA

COMPLETION DATE		-----NUMBER OF INCIDENCES-----			----------C O S T----------		
		CODE 36	CODE 37	TOTAL	CODE 36	CODE 37	TOTAL
07/08		0	1	1			
	YEARLY TOTALS	0	1	1			
10/69		0	1	1			
12/69		1	0	1			
01/70		54	28	82			
02/70		16	35	51			
03/70		15	58	73			
04/70		39	26	65			
05/70		28	42	70			
06/70		32	52	84			
	YEARLY TOTALS	185	242	427			
07/70		63	50	113			
08/70		42	76	118			
09/70		17	34	51			
10/70		68	57	125			
11/70		73	65	138			
12/70		109	42	151			
01/71		40	53	93			
02/71	DOCKING.	228	126	354			
03/71		55	51	106			
04/71		115	45	160			
05/71		42	36	78			
06/71		78	60	138			
	YEARLY TOTALS	930	695	1,625			
07/71		70	44	114			
08/71		51	73	124			
09/71		50	29	79			
10/71		149	42	191			
11/71		74	24	98			
12/71		47	23	70			
01/72		110	16	126			
02/72		74	22	96			
03/72		53	36	89			
04/72		70	23	93			
05/72		36	7	43			
06/72		8	0	8			
	YEARLY TOTALS	792	339	1,131			

362672127C	EXH.GAS TEMP.STRIP-CHART RECORDER.	7	6.85	47.95

2 PLANNED MAINTENANCE BUDGET

ESSEL MANOORA FOR PERIOD FROM 03/72 TO 04/72

ACCOUNT NO.	DESCRIPTION	ESTIMATED MANHOURS	RATE	ESTIMATED COSTS
362672160E	F.V.COOLING HD.TK.OUTLET TEMP.CONTROL V'VE	7	7.10	49.70
362672176A	J.C.W.TEMP.AFTER COOLER-CONT.V/V.(14-03-4)	5	6.30	31.50
362672183D	J.C.W.PP.PRESS.-PN.TRANSMITTER.(14-01-1).	3	8.66	25.98
362672184B	J.C.W.PP.PRESS.-PRESSURE SWITCH.(14-01-3).	2	7.31	14.62
362672185L	CYL J C W OUT TEMPS INDIC CONT'ER (14-04)	2	7.39	14.78
362672260A	P.C.W.PUMP PRESS.-PN.TRANSMITTER.(15-01-1)	3	7.24	21.72
362672262H	CYL.P.C.W.OUT.TEMPS-RECORDER(15-04TO15-10)	7	6.45	45.15
362672271G	SAL LOG SPEED INDICATOR.(10-02-2).	3	6.55	19.65
362672274A	TACHO-GENERATOR.(3-PHASE).(10-05-3).	4	8.06	32.24
362672275K	TACHO-GEN.SET-RING GEAR & PINION.(10-05-4)	5	8.06	40.30
362672390K	F.O.CONTENTS GAUGE-PNEUMATIC SW.(40-20-2).	5	6.50	32.50
3626724621	ENG RM F W CIRC -SOLENOID VALVE (P4-10-5)	5	6.75	33.75
362672466C	M E L O -PRESSURE SWITCH (P1-01-2)	4	6.30	25.20
362672476L	M E F O BOOSTER -PRESSURE SWITCH (P1-11-2)	5	6.30	31.50
3626780038	THRUST BLOCK,SHAFT AND BEARINGS	61	6.30	384.30
3626780041	BOW THRUSTER	10	5.00	50.00
362680220F	CLEANING ALLEYWAY DECKHEADS	10	6.30	63.00
	VESSEL TOTALS	953		$ 6,196.37

ND SURVEY JOB CARDS ISSUED ON 30/05/72 FOR WORK TO BE DONE IN JULY VESSEL NAME BOGONG

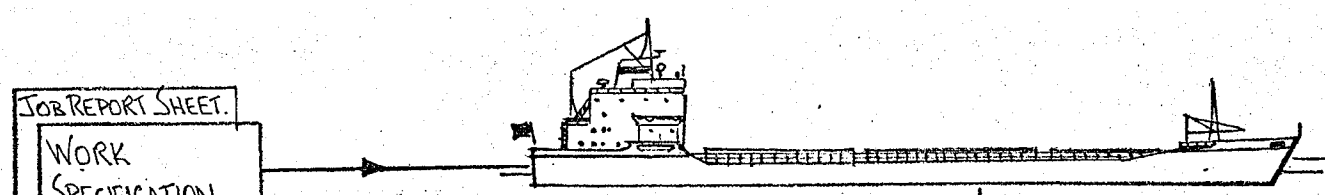
ITEM NUMBER	DESCRIPTION OF ITEM	PM OR SURVEY	PM TYPE	EST'D MANHOURS
365416/001E	PAINTING TOPSIDES PORT	P.M.	2 MONTHS	40
365416/010D	PAINTING TOPSIDES STARBOARD	P.M.	2 MONTHS	51
365417/009F	PAINT NAV BRIDGE DECK GUARDRAILS	P.M.	12 MONTHS	20
365417/023A	PAINTING NO 3 HATCH & COAMINGS	P.M.	6 MONTHS	40
365417/024K	PAINTING NO 4 HATCH & COAMINGS	P.M.	6 MONTHS	40
365417/101G	PAINTING FOREDECK WINCHES	P.M.	6 MONTHS	44
365436/050B	OPERATIONAL CHECKS & GREASING (DECK DEPT)	P.M.	2 MONTHS	56
365436/052J	OPERATIONAL CHECKS & GREASING (ENG DEPT)	P.M.	2 MONTHS	55
365437/002H	HATCHWAYS (OTHER THAN CARGO HATCHES)	P.M.	6 MONTHS	8
365437/003F	VENTILATORS	P.M.	6 MONTHS	2
365437/004D	AIR + SOUNDING PIPES INCL. PLUGS + COVERS	P.M.	6 MONTHS	2
365437/005B	SCUPPERS + DISCHARGES	P.M.	6 MONTHS	2
365437/006L	PORTS + DEADLIGHTS	P.M.	6 MONTHS	2
365437/008G	RAILS & BULWARKS	P.M.	6 MONTHS	2
365437/009E	NOTICE BOARDS + PLAN BOARDS	P.M.	6 MONTHS	6
365437/010J	HATCH MANHOLE LIDS + ACCESSES	P.M.	6 MONTHS	2
365438/012L	FAX WEATHER MACHINE.	P.M.	2 MONTHS	35
365461/016J	STBD CONDENSER AIR EXTRACTION PUMP	P.M.	20 MONTHS	20
365461/017G	STBD CONDENSER AIR EXTRACTION PUMP MOTOR	P.M.	20 MONTHS	15
365462/022J	AFT EVAPORATOR BRINE PUMP (L S 0417)	P.M.	10 MONTHS	15
365462/023G	AFT EVAPORATOR BRINE PUMP MOTOR	P.M.	20 MONTHS	15
365470/001K	PORT SEWAGE UNIT	P.M.	12 MONTHS	30
365470/002H	STARBOARD SEWAGE UNIT	P.M.	12 MONTHS	30
365472/027D	C.O.S.CABINET FILTERS.	P.M.	2 MONTHS	2
365472/087H	FUEL OIL TO STBD.BOILER.CONTROL SYSTEM.	P.M.	6 MONTHS	4
365472/088F	FEED WATER TO STBD.BOILER.CONTROL.	P.M.	12 MONTHS	8

PROGRESSIVE REPORT OF ITEM MAINTENANCE AND BREAKDOWNS AS AT JANUARY 1970

ITEM NO.	U.M.O. NO.	GUAR NO.	DESCRIPTION	COND CODE	HOURS	VALUE OF WORK	COMPLETION DATE	REPAIR CODE	CREDITORS ASP NO.	GUARANTEE EXPIRY DATE
372536013G	A1622	0145	FIRE SYST CHEC	D	2	31.00	23/06/69	UG	1W8799	10/03/70
372557001H	A0123	0148	LIMITORQUE REP	B	67	277.52	21/08/69	UG	1B8614	10/03/70
372588001G	A0122	0150	WASH MAC DRAIN	B	73	471.11	21/08/69	UG	1P2099	10/03/70
372588001G	A0122	0150	WASH MAC DRAIN	B	73	471.11	21/08/69	UG	1P2099	10/03/70
372536008L	A0158	0152	WIRING REPAIRD	B	24	152.60	1/11/69	UG	5R1234	10/03/70
37256I002H	A0136	0157	REPLACE BEARGS	B	17	80.02	19/09/69	BD	5R1234	10/03/70
372536010B	A0138	0158	RFE TRIP REPLA	B	1	43.61	19/09/69	UG	5T8571	10/03/70
372538011A	A0143	0162	REPAIR AUTOPIL	B	9	65.70	11/10/69	UG	5N1832	10/03/70
372538011A	A0143	0162	REPR AUTOPILOT	B	9	65.70	11/10/69	UG	5N1832	10/03/70
372582001D	A0090	0168	GAL STORM BARS	B	8	42.23	15/05/69	UG	5P4970	10/03/70
372580006D	A0111	0170	4TILESC/REC RM	B	4	15.50	8/07/69	UG	5F7857	10/03/70
372545009H	A0491	0171	GOV'R INVETGN	A	2	30.00	17/10/69	UG	1C6013	10/03/70
372546001H	A0145	0171	B/D AT SEA	D	96	615.00	17/10/69	UG	1C6013	10/03/70
372546001H	A0497	0171	GOV NOT SATISF	C	20	440.00	5/11/69	UG	1C6013	10/03/70
372546001H	A0634	0171	GOVNER DAMAGED	D	2	110.24	31/10/69	UG	5W7016	10/03/70
37251I001G	A0165	0172	SAFETY PLATES	B	35	204.53	15/12/69	UG	8E6677	10/03/70
372511001G	A0488	0172	SAFETY PLATES	B	7	69.38	20/10/69	UG	1B8614	10/03/70
372528022B	A0154	0172	SAFETY PLATES	B	8	84.08	1/11/69	CR	5F7857	10/03/70
372561003F	A0399	0173	SEVERE EROSION	C	16	54.08	17/10/69	UG	1P2099	10/03/70
372557001H	A0156	0174	BROKE STUB REP	B	5	45.00	1/11/69	UG	5F7857	10/03/70
372540005H	A0642	0181	CRACKED LINER	B	240	1,196.64	19/12/69	UG	5F7857	10/03/70
372540005H	A0644	0181	BP END SP LINR	B	2	38.08	18/12/69	UG	5L5936	10/03/70
372540005H	A0645	0181	SURVEY D/R LNR	B	2	68.00	22/12/69	UG	5W7016	10/03/70

DOCUMENT FLOW & REPORTS PLANNED MAINTENANCE SYSTEM.

Appendix 17



JOB REPORT SHEET.
WORK SPECIFICATION
PLANNED MAINTENANCE ORDERS.
JOB REPORT RETURNED TO COMPUTER.
CONTRACTORS INVOICE.
GREEN STRIPED COPY OF ORDER.
AUTOMATIC REVIEW OF ESTIMATES & RATES FOR BUDGET CORRECTION.
SCHEDULING OF MAINTENANCE & SURVEY REQUIREMENTS
COMPUTER
SELECTIVE & AUTOMATIC OUTPUT.
COST COMPARISON REPORT.
RELIABILITY REPORT.
REVIEW OF MAINTENANCE PERIODS (MANUAL)
SPECIFICATIONS FOR NEW TONNAGE
ITEM HISTORY REPORT USED IN SELECTION OF EQUIPMENT FOR NEW TONNAGE
REPORT OF ITEMS FAILING WITHIN GUARANTEE PERIODS
REPORT OF FAILURES RELATED TO INSURANCE CLAIMS.
CLAIMS.
BUDGETS.

A.S.P. 12.7.72.