

Key Issues:

2. On 8 July P&O submitted an application for a permit to export the vessel (**Attachment A**), at the same time stating its view that the vessel was not an APO. APOs are subject to export control under the Act.
3. Objects that are APO Class A cannot generally be exported from Australia, but objects that are APO Class B can be exported with a permit issued by the Minister in certain circumstances. An object is an APO Class B if it fits into one of the categories of Class B objects listed in the National Heritage Control List (the Control List) at Schedule 1 to the *Protection of Movable Cultural Heritage Regulations 2018* (the Regulations). The Control List lists the objects that constitute the movable cultural heritage of Australia.
4. Section 10 of the Act includes particular statutory matters that the Minister must have regard to in making the decision. s42
These requirements are detailed at **Attachment C** s42.
5. The application has been assessed by two registered expert examiners, who concluded that it was an APO Class B (see **Attachments B.1 and B.2**). One expert examiner s47F recommended a permit be granted, while the second expert examiner s47F recommended a permit be refused. An unsolicited significance assessment from a party not registered under the Act was provided by the Aurora Australis Foundation which supports (in effect) a permit refusal (**Attachment D**).
6. On 28 July the application and registered expert examiner reports were considered by the Committee. The Committee agreed the vessel was an APO Class B and recommended the refusal of a permit. The Committee's recommendation and an outline of its consideration is included in Additional Information and provided at **Attachment B.3**.
7. Once the outcome of your consideration of its application is known, we will advise P&O accordingly. If you agree to grant a permit, we will provide you with a permit and notification letter to P&O for signature. If you decide you are inclined to refuse to grant a permit, we will first afford procedural fairness to P&O, and brief you further following the outcome of this.

Sensitivities: See Additional Information

Financial Implications: N/A

Background/Issues: See Additional Information

Communication/Media Activities: N/A

Consultation: P&O and Legal Services Branch – Communications and the Arts

Attachments:

Attachment A: Application, POMS covering letter, and Appendix

Attachment B: Significance Assessment 1, Significance Assessment 2, and Committee recommendation

Attachment C: Legal advice – making the decision

Attachment D: Aurora Australis Foundation commissioned significance assessment and history

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Branch: Collections and Cultural Heritage

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Cleared by:

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Instructions for MAPS: Please contact the contact officer once the Minister has considered the brief

Responsible Adviser: s47F

Distribution CC List: Simon Atkinson, s22 Pip Spence, s22

Additional Information:

The vessel is an icebreaker class cargo and passenger vessel, constructed by Carrington Slipways Pty Ltd in Newcastle, NSW, and launched in 1989. It is the only icebreaker built in Australia. The vessel is owned by P&O and was in service from 1990 to 2020 under charter to the Australian Antarctic Division (AAD), carrying cargo and passengers between Hobart and Antarctica. That charter ceased in March.

Stakeholders

On 26 June, Mr Andrew Wilkie MP, Member for Clark, wrote to you expressing concern that the vessel was about to be sold to Argentinian interests (MC20-007815). Mr Wilkie requested that you exercise the Act to “at least allow for a comprehensive heritage assessment to be completed for the vessel.” He suggested if the vessel was found to be of significant heritage value, there were a number of proposals for other uses.

While not identified in the letter, Mr Wilkie may be referring to the Aurora Australis Foundation (the Foundation), a not-for-profit organisation that has been recently established with the stated aim of: preserving and protecting the vessel as a ship of national significance; providing access to the vessel to share its story and the experience of being on board; and promoting awareness of Australia’s work in Antarctica. The Foundation would like to convert the vessel into a tourist attraction (such as a museum, and potentially a hotel), but has not secured any funding from any level of government or third parties for such purposes. It has also suggested that the Australian National Maritime Museum (ANMM) should acquire and maintain the vessel. The ANMM has advised it was separately approached by P&O and indicated it had no interest in such an acquisition. It has, however, been advising the Foundation of the likely costs of maintaining and/or converting the vessel based on its own experience with large vessels.

Application

In light of the correspondence and press reports raising similar concerns, the Office for the Arts contacted P&O on 29 June to indicate that the vessel had come to our attention as a potential APO and that an export permit may be required under the Act. On 9 July, P&O submitted an application, but at the same time stated it did not believe the vessel was an APO. The Appendix to the application includes a list of material on pages 59-66 that P&O is willing to gift or loan to a collecting institution to assist in preservation of the vessel’s cultural heritage. The material mostly consists of books, prints and plaques and would not appear to have substantial heritage value (but has not been separately assessed).

The vessel is currently berthed in Hobart in a ‘hot layup’ condition, which means it is out of service but can be mobilised at short notice. s47G

The application indicates the vessel’s current market value is s47G

The vessel has been marketed for sale globally for the past 24 months and P&O has advised since submitting the application that it remains open to any offers for the continued operation (as opposed to the scrapping) of the vessel. s47G

The Foundation has publicly suggested the Argentinean Government is a potential buyer for polar resupply operations based on some information it was forwarded from Argentina.

Significance Assessments

Following consultation with the Committee chairperson, this application was assessed by two expert examiners: s47F (Attachment B.1); and s47F (Attachment B.2).

Expert examiner s47F found that the vessel is an APO under Part 4 – Objects of Applied Science or Technology of the Regulations on the basis that it is: an object of scientific interest and an object of water transport; it is of significance to Australia; it is of Australian origin and was made in Australia at least 30 years ago; and it is not represented in at least two public collections in Australia by an object of equivalent quality.

Some of the key points of s47F assessment are as follows:

- The vessel has some significance to Australia given the importance of the work it facilitated for the AAD over thirty years.
- From a technical and engineering perspective, the vessel does not incorporate any special design or technology that is unique or significant.
- The vessel is associated with a notable activity, being Antarctic exploration. However, its activities were relatively routine and devoid of significant historical events.
- The scientific information and photographic records associated with the vessel are considerable, but may be considered as a separate detachable entity to the ship.
- With an adequate set-up and maintenance budget, the vessel could be interpreted for display. However, the cost of conversion and ongoing maintenance and preservation would be considerable and there is a significant risk that if high levels of funding could not be generated on an ongoing basis, the vessel would deteriorate and become a liability.
- Antarctic stories and themes could be interpreted more efficiently by an on-shore museum display, such as at the Maritime Museum of Tasmania, using models, samples of equipment and photographs.
- There are no similar objects to the RSV Aurora Australis in any Australian collection.

s47F recommends that a permanent export permit should be granted for this vessel as its permanent export *would not* significantly diminish the cultural heritage of Australia.

Expert examiner s47F also found that the vessel is an APO under Part 4 of the Regulations (for the same reasons as s47F). He also found that it meets the criteria under Part 9 – Objects of Historical Significance on the basis that it is: an object relating to exploration; is associated with a person, activity, event, place or business enterprise, notable in Australian history; is at least 30 years old; and is not represented in at least two public collections in Australia by an object of equivalent quality.

Some of the key points of s47F assessment are as follows:

- The vessel is rare as it is the only icebreaker built in Australia.
- It is historically significant because of the critical role it played in Australia's Antarctic research program, with over 150 research and resupply voyages. Antarctic scientists attribute much of their success over the past three decades to the capability provided by the vessel.
- As a research platform, the vessel supported activity including oceanographic research, East Antarctic Marine Census, and biological surveys identifying new species. The vessel's scientific work is evident in on-board research laboratories and krill tanks, helicopter deck and specialised equipment for trawling and collecting specimens.
- The vessel is of social significance to researchers and crew, and also to the Hobart community with its distinctive high-visibility orange having been part of the Hobart seascape for the past 30 years.
- The vessel's history, particularly events such as fires on-board and rescues, is recorded by the Australian Maritime Safety Authority. As a research vessel, extensive records are held by the AAD with detailed reports on each voyage.
- Historic vessels can be major attractions for museums. However, the scale can also present challenges. Maritime museums around the world face substantial costs to preserve vessels. On many occasions they look for other collections of objects and other ways to explore the histories those ships represent.

s47F has recommended that a permanent export permit should not be granted for the vessel as its permanent export *would* significantly diminish the cultural heritage of Australia.

National Cultural Heritage Committee

The Committee considered the application and noted:

- The vessel is an APO under both Part 4 – Objects of Applied Science or Technology and Part 9 – Objects of Historical Significance of the Regulations.
- The vessel has an extremely rich cultural heritage value arising from its contribution to advances in scientific research and to Australia's endeavours under the Antarctic Treaty.
- Although built in Australia, the vessel is not of special technical interest as a vessel. Its significance lies in its historical value and its social value for Hobart and for the people who sailed on it.
- The vessel has the potential to tell the story of the work and achievements of Australia's Antarctic Research program in a comprehensive manner.

The Committee recommended that a permanent export permit should not be granted for the vessel as its permanent export *would* significantly diminish the cultural heritage of Australia. **Attachment B.3** provides more information on the Committee's consideration of this matter.

Legal advice

Advice from Legal Services Branch – Communications and the Arts ^{s42}

is at **Attachment C**.

Additional significance assessment

Independent of the statutory process, the Foundation commissioned a significance assessment and history of the vessel. There is no legislative requirement to have regard to unsolicited information of this type, and these documents have not been considered by the Committee. The significance assessment does not address all the statutory matters that would be expected in an assessment provided by a registered expert examiner, and also makes reference to other statutory schemes which are not applicable. That said, both documents are provided for your information at **Attachment D** as they may nevertheless contain factual information of relevance.



Australian Government

Department of Infrastructure, Transport,
Regional Development and Communications
Office for the Arts

Protection of Movable Cultural Heritage Act 1986

Application for a Permit to Export a Class B Object

Guidance for Applicants

Important information for applicants

This document contains the form for the making of an application for a permit to export a Class B Object (Export Permit) under the [Protection of Movable Cultural Heritage Act 1986](#) (the Act). Your application must be completed in this form in order to be processed.

We will process your application in accordance with the Act and the [Protection of Movable Cultural Heritage Regulations 2018](#) (the Regulations). The standard timeframe for processing applications is between 8-10 weeks.

Provision of complete and accurate information will allow your application to be processed as quickly as possible. Please complete an application form for each object that you are wishing to export.

What is an Export Permit?

Australia's movable cultural heritage is protected by our laws. The Act and the Regulations protect Australia's movable cultural heritage by creating a framework for the regulation of the export of 'Australian Protected Objects' (APOs).

There are some Australian Protected Objects (APOs) that you are not permitted to export (Class A objects).

There are other APOs for which you need a permit to export the object lawfully (Class B objects). That permit may be subject to conditions contained in the permit.

The [National Cultural Heritage Control List](#) (the Control List) sets out the criteria for determining whether an object is an APO and whether something is a Class A object or a Class B object.

An Export Permit granted under the Act only authorises the export of a Class B object from Australia for the purposes of the Act. There may be other laws or restrictions which apply to the export of the object. Exporters are responsible for ensuring that they meet all other export permission requirements for private and commercial purposes.

Supporting documentation

You must provide clear colour photographs of the object(s). Further information on these requirements can be found in Part B of this application.

You may provide any further additional information to support your application, including magazine articles, valuations, and sale listings.

Privacy and use of information

An application for a permit must be in the form approved by the Minister for Communications, Cyber Safety and the Arts under the Act. In order to process your application, we need to collect some of your personal information through this form (such as your name and contact details). The Act also specifically requires a person applying for a permit to provide an address in Australia for the service of notices.

The Department of Infrastructure, Transport, Regional Development and Communications (the Department), which administers the Act, will use this information to progress and communicate with you about your application, and to otherwise administer the Act. If you do not provide the information requested, the Department may not be able to process, communicate with you about, and notify you of the outcome of, your application.

The personal information you provide may be shared with the Minister for Communications, Cyber Safety and the Arts, persons holding or occupying a number of Senior Executive Service positions in the Department, and other Departmental officers who are involved in dealing with your application.

Your application is also required under section 10 of the Act to be shared with expert examiners and the National Cultural Heritage Committee for assessment in accordance with the Act. Your personal information will be redacted prior to sharing your application with expert examiners and Committee members.

The Department will not otherwise disclose your personal information to any third parties, other than where disclosure is permitted or required by law. Do not provide personal information of any third parties, for example the owner of the object/s, without their permission and understanding.

For further information about our privacy obligations (including in relation to how to access or correct personal information or make a complaint) and our contact details for privacy matters, please see the Department's [Privacy policy](#).

All other information provided in this application form will be treated as confidential and will not be further disclosed except to the extent required in order to administer the Act or by law, a Minister or the Parliament.

False and misleading information

Giving of false or misleading information is a serious offence under the [Criminal Code Act 1995](#). Penalties may apply for the making of false or misleading statements in, or the giving of false information in connection with, your application.

You should ensure that the information included in your application and any documents you provide are complete and accurate to the best of your knowledge.

How to lodge your application

We prefer applications to be submitted by email to movable.heritage@arts.gov.au; however you may also post your application to us at GPO Box 2154 Canberra, ACT 2601.







For assistance please call 1800 819 461.

Permit to Export a Class B Object—Application Form

As approved by the Minister under s 10(2) of the Protection of Movable Cultural Heritage Act 1986 (the Act)

Part A

Applicant details

Title:  s47F
First name: 
Surname: 
Organisation: P&O Maritime Services Pty Ltd (POMS)
Address: GPO Box 88, Melbourne,
State: Vic
Postcode: 3000
Country: (see note below) Australia
Telephone:  s47F
Mobile: 
Email: (see note below) 

Relationship to the object:

- ☒ Owner
☐ Authorised agent
☐ Potential buyer

If you are *not* the Owner, please confirm that you have authority to apply for this Export Permit:

- ☒ Yes
☐ No, please provide reason _____

If you are *not* the Owner, please provide details of the Owner if known:

Title: N/A
First name: N/A
Surname: N/A
Organisation:
Address:
State:
Postcode:
Country: (see note below)
Telephone:
Mobile:
Email: (see note below)

Note: Section 13A of the Act requires the provision of an address in Australia for the service of notices. You may update this address at any time by giving notice in writing in the same manner as you submitted this application.

Note: The Department will correspond with you in relation to your application, including providing the outcome of your application and any reasons for decision, via the email address included in your application form, unless you indicate another preference.

If your application is approved, who should the Export Permit be issued to?

(For example; John Smith, or John Smith's Auction House)

s47F

Part B

Object details

Description of the object

What is the name of the object?	<u>Aurora Australis</u>
What is it? (For example, a painting or a stamp)	<u>Icebreaker class cargo and passenger vessel</u>
What size is it?	<u>94.80 metres LOA</u>
	<u>20.30 metres Maximum Beam</u>
	<u>10.45 metres Moulded depth amidships</u>
What age is it?	<u>31 years old</u>
When was it made or found?	<u>1989</u>
Who made or found it?	<u>Carrington Slipways Pty Ltd</u>
What is the current market value?	s47

Origins of the object

Where was it made or found? It was constructed in Newcastle, New South Wales
 If it was not made or found in Australia, what year did it come to Australia? N/A

Give details of any publications in which it has been listed or photographed (if applicable)

We set out below a brief list of some of the publications in which the Aurora Australis has been listed or photographed.

Through Fire and Ice by former Deputy Voyage Leader and scientist, Sarah Laverick.

Sophie Scott Goes South by Alison Lester

Breaking the Ice by Tim Bowden

History of Aurora Australis by the Aurora Australis Foundation

Photographic requirements

See attached appendix A

- You must provide clear colour photographs of the object. The object should be clearly visible and identifiable.
- Where the object has a serial, chassis or engine number, photos of this identification must be included. If the number is not accessible an alternative method of identification such as a pencil rubbing of the compliance plate is acceptable.
- A clear scan of a photograph of the object published in a book or catalogue is acceptable.
- For natural science objects, a photo of the actual specimen, or in the case of a collection, a representative sample must be included.
- For very large collections, a photo of the most significant object as well as a photo of a representative example of the collection must be included. Large collections may be inspected.
- The department may request further information, including additional photographs, or access to view the object, in order to accurately assess the significance of the object.

History and provenance of the object

Does it have any distinguishing marks or numbers?

(For example; permanently fixed accession number, serial or consignment number, or engine number, indelible manufacturer's name, mark or model, engraved name, signature, visible damage and/or repair).

IMO Number 8717283

Named Aurora Australis

Lloyds Register Ice Class 1A Super Icebreaker 100A1 LMC UMS DP (CM)

Engine capacity

Single transverse bow and 2 retractable azimuth stern thrusters

Main: 1 x Wartsila 12V32D 4500kW / 6000HP
1 x Wartsila 16V32D 5500kW / 7400HP
Auxiliaries: 2 x Wartsila 6R22 900kW
1 x Wartsila 4R22 600kW

Please outline all details of the history and provenance of the object within your knowledge

(For example; details of the object's provenance and who may have owned the object(s) before you or its association with a significant Australian person, place, activity, business or event).

The vessel was commissioned P&O Polar Australia Pty Ltd and constructed by Carrington Slipways Pty Ltd in Newcastle, New South Wales.

The vessel was launched in 1989 and was in continuous service between 1990 and March 2020 under a charter to the AAD. During this period, the vessel has performed in excess of 140 voyages carrying cargo and passengers between Hobart and the Commonwealth's manned and unmanned assets in the Southern Ocean and Antarctica.

The vessel has a crew complement of 24 and the capacity to carry up to 51 TEU containers and a total cargo weight of 1900 tonnes of cargo weight (including up to 1.10 mega litres of cargo fuel) and 116 passengers.

The vessel is currently berthed in Hobart and maintained by POMS in "hot layup" condition which is a term to describe the situation where a ship is out of service but can be mobilised into service at short notice. s47G

s47G

Please provide any other information which may be relevant to assessing the importance of the object to Australia's cultural heritage

(For example; its rarity, importance, or extent to which similar objects are already represented in Australian public collections)

Whilst the Aurora Australis is the only ice breaker class vessel built in Australia, the essential elements of its design are not remarkable nor does the vessel provide a *"discernible differentiation between present knowledge of cultural heritage and that which would exist if measured hypothetically, such an object was not present or available to the public"*.

The vessel was designed by Wartsila Marine Industries Inc of Finland in collaboration with P&O Australia Ltd.

The hull design and ice breaking capability are typical of a vessel of this type and were not the subject of any awards or specific recognition.

The vessel was fitted out for the specific requirements of the AAD (with respect to the carriage of cargo and passengers), which chartered the vessel from shortly after its completion in 1990 until March 2020. See page 67 of the Appendix for the vessel specifications.

Permit history of object

Have you ever previously applied for an Export Permit under the Act for this particular object?

- ☐ Yes – Permanent Export Permit
- ☐ Yes – Temporary Export Permit
- ☒ No

Has an Export Permit for this object ever previously been applied for by anybody else?

- ☐ Yes
- ☒ No
- ☐ Unknown

If you answered 'Yes' to either question above, was a permit granted?

- ☐ Yes
- ☐ No – a Letter of Clearance was issued
- ☐ No – the application was withdrawn
- ☐ No – it was refused

If you responded with 'Yes' please provide the Export Permit reference number:

If you responded with 'No – a Letter of Clearance was issued' please provide date it was issued:

If you responded with 'No—application was withdrawn' please provide the date of withdrawal:

If you responded with 'No – it was refused' please provide the date it was refused:

Part C

Complete this part if you wish to export the object permanently.

Why do you want to export the object permanently?

- ☐ Object sold to a person overseas
- ☒ Proposed for overseas sale
- ☐ Gift / bequest to a person or institution overseas
- ☐ Owner is relocating overseas
- ☐ Other

Please provide more information: **s47G**

If your application is approved, what is your planned export date?

Month: July_____

Year: 2020_____

Is there anything else you would like to advise us about the planned export date, for example is there an upcoming auction date?

The AA is a commercial vessel that provided a service to the AAD under a long term charter and is to be replaced the RSV Nuyina which has been described as "*Australia's new state-of-the-art icebreaker*". The commercial basis for POMS' procurement of the AA came to end with the conclusion of the charter to the AAD.

As noted already, since being redelivered by the AAD, the Aurora Australis has been maintained in "hot layup" by POMS s47G [REDACTED]

The vessel has been marketed for sale globally via shipping networks and shipbrokering channels over the past 24 months. s47 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

When expert examiners, the National Cultural Heritage Committee and the Minister or the delegate consider your application, they are required to have regard to any ethnological, archaeological, historical, literary, artistic, scientific or technological reasons why your object is of importance to Australia, or to a particular part of Australia.

The Minister or the delegate are not able to grant an export permit for the permanent export of the object if they are satisfied that the object is of such importance to Australia, or a part of Australia, for those reasons, that its loss to Australia would significantly diminish the cultural heritage of Australia.

Please outline any reasons why you think the permit should be granted taking into account these considerations:

Without wishing to trivialise the value of the services that the Aurora Australis has provided during its 30 years on charter to the AAD, it is a commercial vessel that carried cargo and passengers to and from Antarctica and may continue to operate commercially. In our submission, it is the work of the scientists that the Aurora Australis carried rather than the vessel itself that is "significant to understanding Australian national heritage",

We also refer to the attached letter received on 8 July 2020 from the Honourable Peter Gutwein, Premier of Tasmania in which he notes, among other things, that "Since the earliest days of Antarctic shipping, many icebreakers have visited Hobart and the Australian Antarctic program has operated a range of vessels for its supply and scientific voyages" and it is not his "role to interfere in your commercial activities and to halt your plans for your assets".

A further reason why the export of the Aurora Australis will not diminish the cultural heritage of Australia is because the vessel's owner is willing to gift and loan an array of material that has been removed from the vessel before its export. We have included at page 59 in the Appendix to this application a list of material that P&O Maritime is willing to gift or loan to a "Collecting Institution" to assist in any preservation of cultural heritage that the vessel may have.

Please sign and date this form on the last page at Part E.

Part D

Complete this part if you wish to export the object temporarily and then return it to Australia.

Why do you want to export the object temporarily?

- ☐ Appraisal or valuation
- ☐ Owner temporarily relocating overseas
- ☐ Repair, restoration or conservation
- ☐ Research
- ☐ Exhibition
- ☐ Other

Please provide more information: _____

If your application is approved, what is your planned export date?

Month:

Year:

If your application is approved, when is the object expected to return to Australia?

Month: July

Year: 2020

Unknown

When expert examiners, the National Cultural Heritage Committee and the Minister or the delegate considers your application, they are required to have regard to any ethnological, archaeological, historical, literary, artistic, scientific or technological reasons why your object is of importance to Australia, or to a particular part of Australia.

Please outline any reasons why you think the permit should be granted taking into account these considerations:

We refer to the matters raised in Parts B and C above. _____

Part E

Your statement

I understand and agree that:

- if an Export Permit is granted, that permit may be relied on only for the export of the object(s) or collection described in the permit;
- if an Export Permit is granted, it does not provide authority to export the object otherwise than under the Act;
- where an Export Permit is refused, the name of the object(s), any unique identifiers such as serial numbers, and the reasons for refusing export, will be entered into the [Prohibited Exports Register](#). The department may also seek your agreement to include any photographs that you have provided.

I declare that all information given in this application is correct.

Signed:

s47F



Date: 8 July 2020



P&O Maritime Services Pty Ltd
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Level 4, 70 City Road
Southbank Vic 3006
GPO Box 88
Melbourne Vic 3001

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www.pomaritime.com

s22

Director
Cultural Property / Collections and Cultural Heritage Branch
Office for the Arts
Department of Infrastructure, Transport, Regional Development and Communications
2 Phillip Law Street,
Canberra, ACT 2601

8 July 2020

Dear s22

Proposed sale and export of "Aurora Australis"

We write to you in respect of P&O Maritime Services Pty Ltd (**POMS**) proposed sale of the research vessel "Aurora Australis" (IMO: 8717283) (**AA**) and in this regard refer to your emails dated 29 June 2020 and 1 July 2020 concerning the potential for the AA being an Australian Protected Object (**APO**).

We also refer to our informative and helpful teleconference on 2 July 2020.

Background to proposed sale and export of Aurora Australis

As we explain in greater detail below, the AA is an ice breaker class cargo and passenger vessel that was constructed in 1989 and commenced service under a charter with the Commonwealth's Australian Antarctic Division (**AAD**) in 1990.

In March 2020, the AAD's charter of the AA concluded. Since being redelivered by the AAD, the AA has been maintained in "hot layup" by POMS s47G

The vessel has been marketed for sale globally via shipping networks and ship brokering channels over the past 24 months and we remain open to any offers that would be made for the ship. s47

Aurora Australis is not an APO

Notwithstanding that the AA is:

- i. over 30 years old;
- ii. an object of the kind mentioned in clause 4.4 of the *Protection of Movable Cultural Heritage Regulations 2018* (Cth) (**Regulations**); and
- iii. was constructed in Australia,¹

¹ Specifically at the Carrington Slipways in Tomago, New South Wales

we respectfully submit that the AA does not meet the "*significance to Australia*" test as it is not an object of a kind that is of "*importance to Australia ... that its loss to Australia would significantly diminish the cultural heritage of Australia*".²

Without wishing to trivialise the value of the services that the AA has provided during its 30 years on charter to the AAD, it is a commercial vessel that carried cargo and passengers to and from Antarctica. In our submission, it is the work of the scientists and other Antarctic expeditioners that the AA carried rather than the vessel itself that is "*significant to understanding Australian national heritage*".³

We note that upon receipt of an application to export an APO, an Expert Examiner will be appointed under section 23 of the Act to report to the National Cultural Heritage Committee (**NCHC**) for the purpose of assisting the NCHC and the Minister or his delegate in determining whether or not the object is "of significance to Australia".

The information provided below is directed at assisting the Expert Examiner and the Minister in their consideration of the AA's status.

For the sake of completeness, please note that aspects of the information and material referred to below and the contents of the accompanying application contain commercially sensitive details and should be treated on a commercial-in-confidence basis.

Construction of Aurora Australis

The AA was constructed by Carrington Slipways Pty Ltd's shipyard in Newcastle.

Carrington Slipways constructed various classes of vessels including the Lady - Class Ferry and First Fleet - Class ferry, and various naval vessels, none of which to our knowledge have been classified to be an APO.

The AA's keel was laid on 28 October 1988 and the vessel received its certificate of registration in 1990.⁴

The vessel was constructed off the back of a long term charter to the AAD for the carriage of cargo⁵ and passengers⁶ to the Commonwealth's manned and unmanned assets in the Southern Ocean and Antarctica.⁷

The vessel was also fitted with research laboratories for the work performed by scientist passengers.

Aurora Australis' design and construction

The AA is an ice breaking class vessel that was designed by Wartsila Marine Industries Inc of Finland in collaboration with P&O Australia Ltd.

The hull design and ice breaking capability are typical of a vessel of this type and were not the subject of any awards or specific recognition.

² Section 10(6) of the Act

³ Paragraph 2.2 of Guidelines for expert examiners under the *Protection of Movable Cultural Heritage Act 1986* (Cth)

⁴ See enclosed Certificate of Registration and International Tonnage Certificate

⁵ Up to 51 TEU containers, a total cargo weight of 1900 tonnes, including up to 1.10 Mega litres of cargo fuel

⁶ 24 Crew and 116 passengers

⁷ Davis Station, Macquarie Island Station, Casey Station, Mawson Station and Macquarie Island Station which represents Australia's manned assets in the Southern Ocean and Antarctica.

The vessel was fitted out for the specific requirements of the AAD (with respect to the carriage of cargo and passengers), which chartered the vessel from shortly after its completion in 1990 until March 2020.

The AA is 88.26 metres in length, has a beam of 20.30 metres and a moulded depth amidships to the upper deck of 10.45 metres.

The vessel's gross registered tonnage is 6,574 tonnes and a deadweight tonnage of 3,911 tonnes.

Aurora Australis' current maintenance costs

The AA is currently in "hot layup" which is a term to describe the situation where a ship is out of service but can be mobilised into service at short notice.

s47 and 47G

Aurora Australis is not of "significance to Australia" for the purposes of the Act and Regulations

Regulation 2(1) of the Regulations defines "significance to Australia" as:

significance to Australia, for an object, means the object is of Australian origin, has substantial Australian content, or has been used in Australia, and:

- (a) is associated with a person, activity, event, place or business enterprise, notable in history; or*
- (b) has received a national or international award or has a significant association with an international event; or*
- (c) represents significant technological or social progress for its time; or*
- (d) is an object of scientific or archaeological interest.*

In our submission, AA does not meet any of the criteria listed in Regulation 2(1).

s47G

When considering the concept of "significance to Australia", the Administrative Appeals Tribunal (AAT) has looked in part to the object's economic impact and also the relative "importance" of the object.

In *Re Hooper and Minister, Dept of Environment and Heritage*⁹ which concerned an application to export a 19th century McLaren Steam Traction Engine which had been denied by the Minister, the AAT considered the concept of "significance" in some detail stating that:

"... significance must be taken to mean the quality of having importance in the current context. It may be described as how unusual or remarkable the object is. The criterion for determining whether an object is "significant" might be viewed in terms of the degree to which it departs from what is common knowledge. It is what informs people of national historical development and which is not otherwise obtainable. "Significant" also implies a discernible differentiation between present knowledge of cultural heritage and that which would exist if measured hypothetically, such an object was not present or available to the public."

In our submission, the AA is not significant in the manner applied in *Re Hopper*.

Whilst the AA is the only ice breaker class vessel built in Australia, the essential elements of its design are not remarkable nor does the vessel provide a *"discernible differentiation between present knowledge of cultural heritage and that which would exist if measured hypothetically, such an object was not present or available to the public"*.

The AA is a commercial vessel that provided a service to the AAD under a long term charter and is to be replaced the RSV *Nuyina* which has been described as *"Australia's new state-of-the-art icebreaker"*.¹⁰ The commercial basis for POMS' procurement of the AA came to end with the conclusion of the charter to the AAD.

As noted already, POMS has the opportunity to transfer the AA to another operator that intends to continue to operate the vessel and it should not be denied the entitlement to dispose of its commercial asset, s47G

We also note the following reference to Australia II in Guidelines for expert examiners:

AUSTRALIA II

In 1983 Australia II became the first non-United States challenger to win the 132-year old America's Cup race off Rhode Island. Australia II's victory was great public euphoria at home and the yacht became an object of national pride. The success of Australia II, with its innovative winged keel designed by Ben Lexcen, has not faded from Australian memory.

Australia II has social significance as the winner of a famous yachting victory, representing the sporting triumph of Australia over the United States in 1983. It was also the first time the cup had left the United States. Its significance for the Australian community was demonstrated by public support for its purchase by the Australian Government. The yacht also has historic significance as a specimen of the most advanced design of its time.

The above is a summary taken from Heritage Collections Council 2001 p.33.

In our submission, none of the above qualities attributed to Australia II apply to AA.

We also note that the Department's Movable Cultural Heritage Prohibited Exports Register includes a luxury motor vessel constructed in 1900 which we understand is berthed at the Australian National

⁹ [2005] AATA 735

¹⁰ <https://www.antarctica.gov.au/news/2018/aurora-australis-contract-extended/>

Maritime Museum in Sydney, and that the most recent objects on the Register that fall under Part 4 of the Regulations is a World War II Japanese fighter aeroplane, located off Cape York Peninsula, Queensland and a pair of wings from a WWII P47 Thunderbolt aircraft located at Duyfken Point, Queensland.

These objects are clearly very different from the AA and based on our research there does not appear to be a commercial vessel or commercial object of applied science or technology constructed in the past 75 years on the Register.

We also refer to the attached letter received on 8 July 2020 from the Honourable Peter Gutwein, Premier of Tasmania in which he notes, among other things, that *"Since the earliest days of Antarctic shipping, many icebreakers have visited Hobart and the Australian Antarctic program has operated a range of vessels for its supply and scientific voyages"* and it is not his *"role to interfere in your commercial activities and to halt your plans for your assets"*.¹¹

Aurora Australis memorabilia

POMS has an extensive catalogue of photos and other memorabilia that cover the AA's 30 years of service to the AAD and is prepared donate or lend certain of these items. These are set out the Appendix to this letter and include a picture of the Aurora Australis II.¹² Aurora Australis II (AAII) is a small workboat that was built to work with AA and support Antarctic cargo operations. AAIL is 9.81m long and has beam width of 3.6m.

s47G



In our submission a historic record of the vessel and its service can be more adequately preserved and accessed by this material.

It also should be noted that that the Australian National Maritime Museum, which is considered the only institution capable of looking after a ship like AA, is not interested in taking it on.

Conclusion

For the reasons set out in the letter and the accompanying application we submit that the AA is not an APO. However, should the Minister disagree and determine that it is, we request that an export permit should be granted.

Should you have any queries arising from the matters we have addressed above, or require any additional information please do not hesitate to contact us.

Yours faithfully

s47F



P&O Maritime Services

¹¹ See page 57 of Appendix 1.

¹² See page 58 of Appendix 1.



21 Marine Walk Street, Hythe, Kent, CT21 5NW, UK
Tel: +44 (0) 1303 261868 Fax: +44 (0) 870 442 5293 Email: info@centurymar.com
Website: www.centurymarineservices.com

P&O Maritime Services Pty Ltd
GPO Box 1720
Hobart TAS 7001
Australia

15th June 2020

Dear Sirs

“AURORA AUSTRALIS”

Polar Research and Supply Vessel

Built: Australia 1990

Classed Lloyds Register Ice Class 1A Super Icebreaker +100A1 + LMC UMS DP(CM)

LOA: 94.91m x Beam: 20.35m

2 x Wartsila Medium Speed Diesel Engines totaling 13400 HP coupled
to a single CPP

Thank you for your instructions to value the above vessel.

After due consideration, we are of the opinion, as brokers, that the open market value of the above vessel on the basis of an assumed prompt ‘as is, where is’ charter free delivery between a willing buyer and a willing seller in Hobart Tasmania as of today is around:

s47

A large rectangular area of the document is redacted with a solid grey fill, obscuring the valuation figure.

This Valuation is provided to you subject to our Terms & Conditions provided overleaf.

Signed:

s47F

A rectangular area of the document is redacted with a solid grey fill, obscuring the signature.

Tug & Offshore Vessel Brokers and Valuers

Registered in England No. 4302821
Registered Office: 495 Green Lanes, Palmers Green, London, N13 4BS, UK
VAT No. 788479840

CENTURY MARINE SERVICES LTD - TERMS & CONDITIONS

1. Definitions

The following definitions apply to these Terms & Conditions:

<i>"Client"</i>	The party commissioning the Valuation.
<i>"Contractor"</i>	Century Marine Services Ltd, its servants, agents and any parties contracted by Century Marine Services Ltd in connection with the Services.
<i>"Loss"</i>	Loss or damage in contract, or tort under statute or otherwise, suffered by the Client (or any other party) howsoever arising from or in connection with the Services, the Valuation or these Terms & Conditions.
<i>"Services"</i>	All activities relating to the production of the Valuation.
<i>"Valuation"</i>	Figure provided by the Contractor, subject to Clause 4.

2. Applicability

These Terms & Conditions are applicable to any provision of Services to the Client by the Contractor

3. Services

The Contractor will carry out all activities to the best of its knowledge and ability and in accordance with professional standards.

4. The Valuation

Any advice, opinion, statement of expectation, forecast or recommendation, including the Valuation, supplied by the Contractor shall not amount to any form of guarantee of that figure and is supplied solely for the Client's benefit and for information only.

The Valuation relates solely to the date upon which it was issued.

The Valuation is not to be relied upon by any third party without the Contractor's prior written approval. Reliance by any third party is subject to these Terms & Conditions.

5. Inspection

If the Client or any third party (as agreed under Clause 4) relying upon this Valuation intends to act upon this Valuation then this party should first satisfy itself by inspection of the vessel(s) or otherwise as to the correctness of the particulars given.

6. Information

All particulars used by the Contractor are sourced from information provided to the Contractor and such other information as the Contractor may have compiled from sources that the Contractor reasonably believes to be accurate and reliable at the date of the Valuation. The Contractor does not accept responsibility for the accuracy of this information. Clients are reminded that Contractors have not undertaken to carry out physical inspection of the vessel(s) or their class records.

7. Permission to Transmit

This Valuation may not be sent or otherwise transmitted to any third party without prior written permission of Contractor and in the event such permission is given it shall be given on the strict understanding that the Valuation be treated as illustrative only and not otherwise relied upon.

8. Liability

NOTE: THE BELOW CLAUSES LIMIT THE CONTRACTOR'S LIABILITY TO THE CLIENT

If an error is made as a result of the Client providing incorrect or incomplete information, the Contractor is not liable for any resulting Loss.

The Contractor's aggregate liability for Loss, howsoever the Loss is caused, including if caused by the Contractor's negligence (but not if caused by the Contractor's willful misconduct) is fully excluded. Without prejudice to the foregoing, in no event shall be the Contractor's liability for Loss be larger than ten times the fee paid by the Client for these Services.

9. Scope of Services

The Contractor does not provide, nor should this Valuation be considered as, investment advice. For the avoidance of doubt, the Valuation and these Services are not to be construed as legal, tax or accounting advice nor to be relied upon or otherwise used for the purposes of raising debt or equity.

10. Time for Suit

Any claim from the Client or any other party in respect of Loss suffered as a result of, arising from or in connection with the Services or these Terms & Conditions, must be made within two years of the date of the Valuation giving rise to the claim.

For the purposes of this clause, a claim shall be made when court proceedings are commenced.

11. Indemnity of Contractor against Third Party claims

If there is any claim made or threatened against the Contractor by a third party as a result of, arising from or in connection with the Valuation or these Services, the Client agrees to fully indemnify and hold harmless the Contractor against any Loss.

12. Third Party Rights

A third party who is not a party to these Terms & Conditions shall not have any rights under the Contracts (Rights of Third Parties) Act 1999 to enforce any term of this agreement.

13. Severability

Each clause or term of these Terms & Conditions constitutes a separate and independent provision. If any provisions of these Terms & Conditions are judged by the relevant courts to be void or unenforceable, the remaining provisions shall continue in full force and effect.

14. Entire Agreement

These Terms & Conditions set out the entire agreement and understanding between the parties in connection with the Services.

15. Law and Jurisdiction

These Terms & Conditions shall in all respects be subject to and governed by English law and all disputes arising on any basis from or under the Terms & Conditions shall be subject to the exclusive jurisdiction of the English courts, to the express exclusion of all other courts and jurisdictions

APPENDIX A

Index to Documents in Appendix A

Page	Document Description	Date of document
3-4	Registration Certificate (General Register)	4 January 2018
5-6	International Tonnage Certificate	29 January 1990
7-8	Photo of model of Aurora Australis	Undated
9	Photo of Aurora Australis II	Undated
10- 56	Photos of additional equipment on the Aurora Australis	10 June 2020
57	General Arrangement Plan of Aurora Australis	Undated
58	Letter from the Premier of Tasmania	8 July 2020
59-66	List of material removed from on board the Aurora Australis and willing to be loaned	Undated
67-258	Vessel Specifications for Aurora Australis	Undated



REGISTRATION CERTIFICATE GENERAL REGISTER

Shipping Registration Act 1981, Section 19

Official number 851245	IMO number 8717283	Name of ship AURORA AUSTRALIS
----------------------------------	------------------------------	---

General Particulars

Home port Hobart	Call sign VNAA	Year of registration 1990	Year of completion 1989
Type Supply	Build Carvel	Stem Raked	Stern Transom
Rigging None	No. of decks 3	No. of bulkheads 9	No. of masts 1
Principal build material Steel	Length overall 94.80 m	Maximum breadth 20.30 m	Moulded depth amidships 10.45 m
Total brake power 10000 kW	Total indicated power	Total shaft power	Estimated speed 13.00 kn
Place of construction Tomago, New South Wales			

Particulars of Propulsion

Method of propulsion Motor	Power transmission Single screw
Number and type of engines One 12 cylinder diesel Wartsila Vasa 12V32. Serial Number: 4572 One 16 cylinder diesel Wartsila Vasa 16V32. Serial Number: 4573	
Number and type of boilers None	

Particulars of Tonnage

Type of tonnage certificate International	Gross tonnage 6574	Net tonnage 1971	Alternative tonnage
---	------------------------------	----------------------------	---------------------

Certification

I, **Peter BAKER, Acting Registrar of Ships**, certify that the ship described in this certificate is registered under the *Shipping Registration Act 1981* and that the particulars in this certificate accord with the entry in the Register for the ship.



Certificate RC17513 granted 4 January 2018

Particulars of Registered Agent

Name of registered agent

P&O MARITIME SERVICES PTY LTD

Address

Level 4, 70 City Road, Southbank, Victoria, 3006, Australia

Particulars of Ownership

No. of Shares

Name of the owner

Address

Nationality/Country of Incorporation

64

P&O MARITIME SERVICES
PTY LTD

Level 4, 70 City Road,
Southbank, Victoria, 3006,
Australia

Australia

Important Notes

1. A Registration Certificate is required to be carried for the lawful navigation of any ship proceeding on overseas voyages and on the occasions must be produced to a Customs officer.
2. A Registration Certificate is not a title document. A search of the Register will reveal the current registered ownership and caveats.
3. It is an offence for a person to use a Registration Certificate which contains entries not made by or endorsed by the Registrar or Deputy Registrar of Ships or by a delegate of the Registrar (Section 25).
4. Upon transfer of ownership of a registered ship:
 - This Certificate must be handed to the new owner, or to the Registrar upon request.
 - The new owner must forward the Certificate together with the prescribed documentation evidencing the transfer to the Registrar within 14 days of the transfer.
5. Should the ship be lost, broken up or sold to foreigners the Registrar must be notified immediately and the Certificate, if existing, given to the Registrar. Changes of ownership, address or other registered particulars should be notified to the Registrar within 14 days.
6. The ship's name, home port, official number, IMO number, and net tonnage (or length overall) must be marked according to law or the ship at all times. It is an offence to change any markings on a registered ship without the Registrar's authorisation.
7. For further information, contact the:

Registrar of Ships
Australian Shipping Registration Office
GPO Box 2181
CANBERRA ACT 2601
Australia

Telephone: (02) 6279 5925
Facsimile: (02) 6279 5922
E-mail: sro@amsa.gov.au
Web: www.amsa.gov.au

Issued under the provisions of the International Convention on Tonnage Measurement of Ships, 1969, under the authority of the Government of the Commonwealth of Australia for which the Convention came into force on the twenty-second day of August 1982, by the Minister.

Name of Ship	Distinctive Number or Letters	Port of Registry	* Date
AURORA AUSTRALIS	851245	HOBART	28-10-88

**Date on which the keel was laid or the ship was at a similar stage of construction (Article 2(6)), or date on which the ship underwent alterations or modifications of a major character (Article 3(2)(b)), as appropriate.*

MAIN DIMENSIONS

Length (Article 2(8))	Breadth (Regulation 2(3))	Moulded Depth amidships to Upper Deck (Regulation 2(2))
88.26 M	20.30 M	10.45 M

THE TONNAGES OF THE SHIP ARE:

GROSS TONNAGE 6574

NET TONNAGE 1971

This is to certify that the tonnages of this ship have been determined in accordance with the provisions of the International Convention on Tonnage Measurement of Ships, 1969.

Issued at NEWCASTLE N.S.W. 29 JANUARY 19.90
Place of issue of certificate *Date of issue*

The undersigned declares that he is duly authorized by the said Government to issue this certificate.

Signature 

SPACES INCLUDED IN TONNAGE

GROSS TONNAGE

NET TONNAGE

Name of Space	Location	Length	Name of Space	Location	Length
Underdeck		93.00			
BREAK	105-142	22.20	NO.1 HOLD	103-115	7.20
* 2ND DECK	23.8-105	57.40	NO.2 HOLD	87-103	9.60
UPPER DECK	27-126	68.20	TWEEN DECK	87-115	16.80
1ST BRIDGE	44-87	34.40			
2ND BRIDGE	44-87	34.00			
WHEELHOUSE	51-86	28.00			
FUNNEL	61-72	7.70			
CRANES	FWD & AFT				
			NUMBER OF PASSENGERS (Regulation 4(1))		
			Number of passengers in cabins with not more than 8 berths109.....		
			Number of other passengersNIL.....		
EXCLUDED SPACES (Regulation 2(5))			MOULDED DRAUGHT (Regulation 4(2))		
(1) MOORING SPACE FWD (UPPER DECK TO 1 ST BRIDGE)			7.85 METRES		
* (2) SECOND DECK AFT (AFT TO FRAME 27)					
An asterisk (*) should be added to those spaces listed above which comprise both enclosed and excluded spaces.					

Date and place of original measurement 1 DECEMBER 1989

Date and place of last previous remeasurement

REMARKS



RESEARCH and SUPPLY EXPEDITION ICEBREAKER
RSV "AURORA AUSTRALIS"
for
P & O AUSTRALIA LTD

MAIN PARTICULARS	
LENGTH	94.91 M
BREADTH	20.30 M
DRAUGHT	7.86 M
GROSS TONNAGE	6574 T
DISPLACEMENT TONNAGE	8178 T
SPEED, max	17.0 KNOTS
ICEBREAKING	1.25 M @ 3 KNOTS

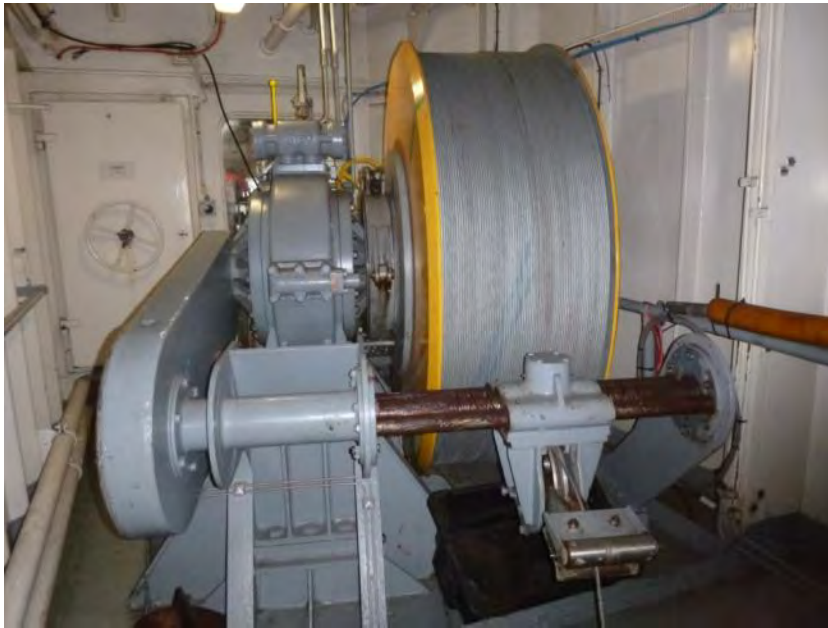
Scale 1 : 100





Additional Equipment on the Aurora Australis as of 10/06/2020

AFT CTD Winch with approximately 5kms of 6.7mm data cable



FWD CTD Winch with approximately 5kms of 6.7mm data cable



Fast Rescue Craft 7.5 meter Norsafe Magnum



Inflatable Rubber Boat BRIG Model C8



Trawl Deck, Net drum and 2 tugger winches



Trawl deck Oceanographic winch with approximately 880m of evry old 12mm wire



Stbd Trawl winch with 3933 meters of 22mm RHOL wire



Port Trawl winch with 3927 meters of 22mm RHOL wire



Spare anodes



Spare anodes onboard the vessel

129 of CCE type 1025 Al Anodes with CCE type M clamps and bolts



Shaft spare on board the vessel.



4 propeller blades onboard the vessel



Two Spare anchors onboard the vessel., 3540 kg each.



Spare steel plate and bulb bar approximately 35 tonne



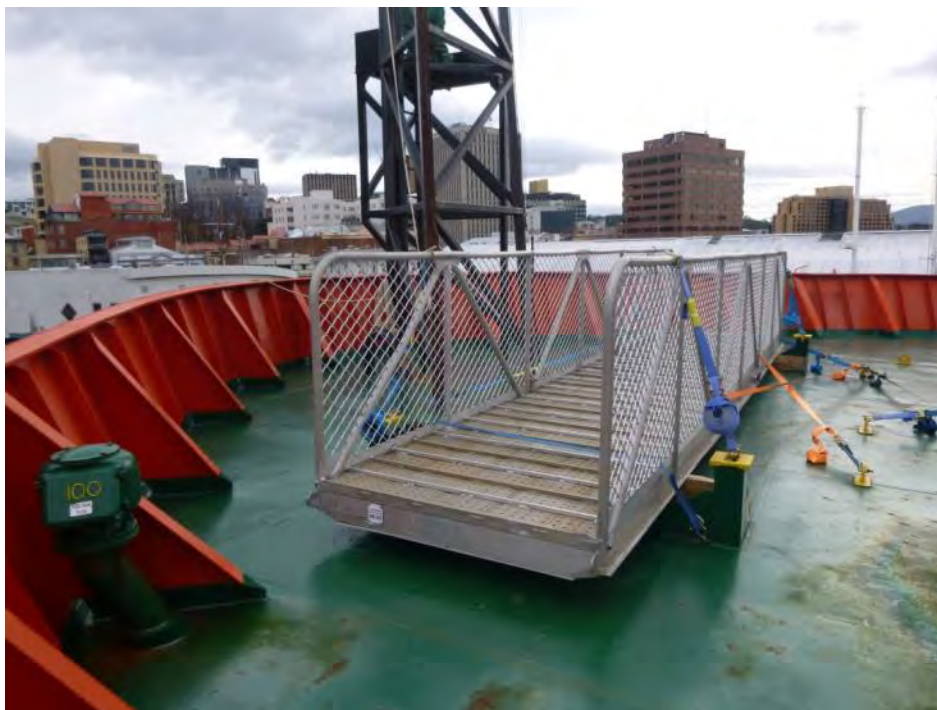
Spare wires for the cranes. 2tonne, 5 tonne, 25/32 tonne, FRC davit, Gangway and Stern gantry wire.



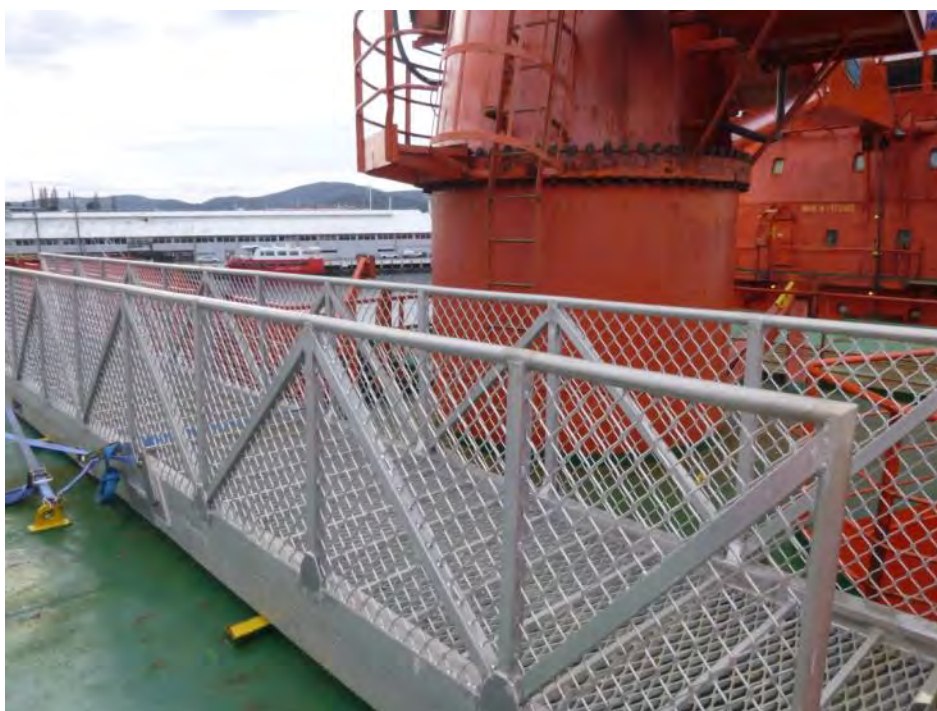
Hydraulic power pack. Able to run the 25 tonne or the 7 tonne crane in the event of a failure there.



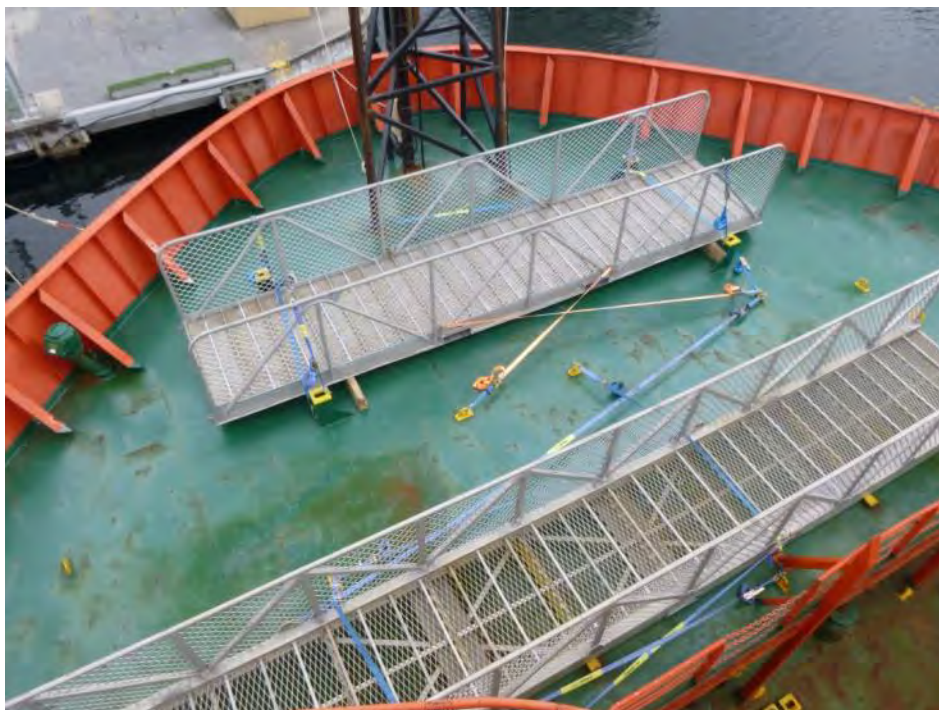
Spare brow for the bunker door. 8 meters



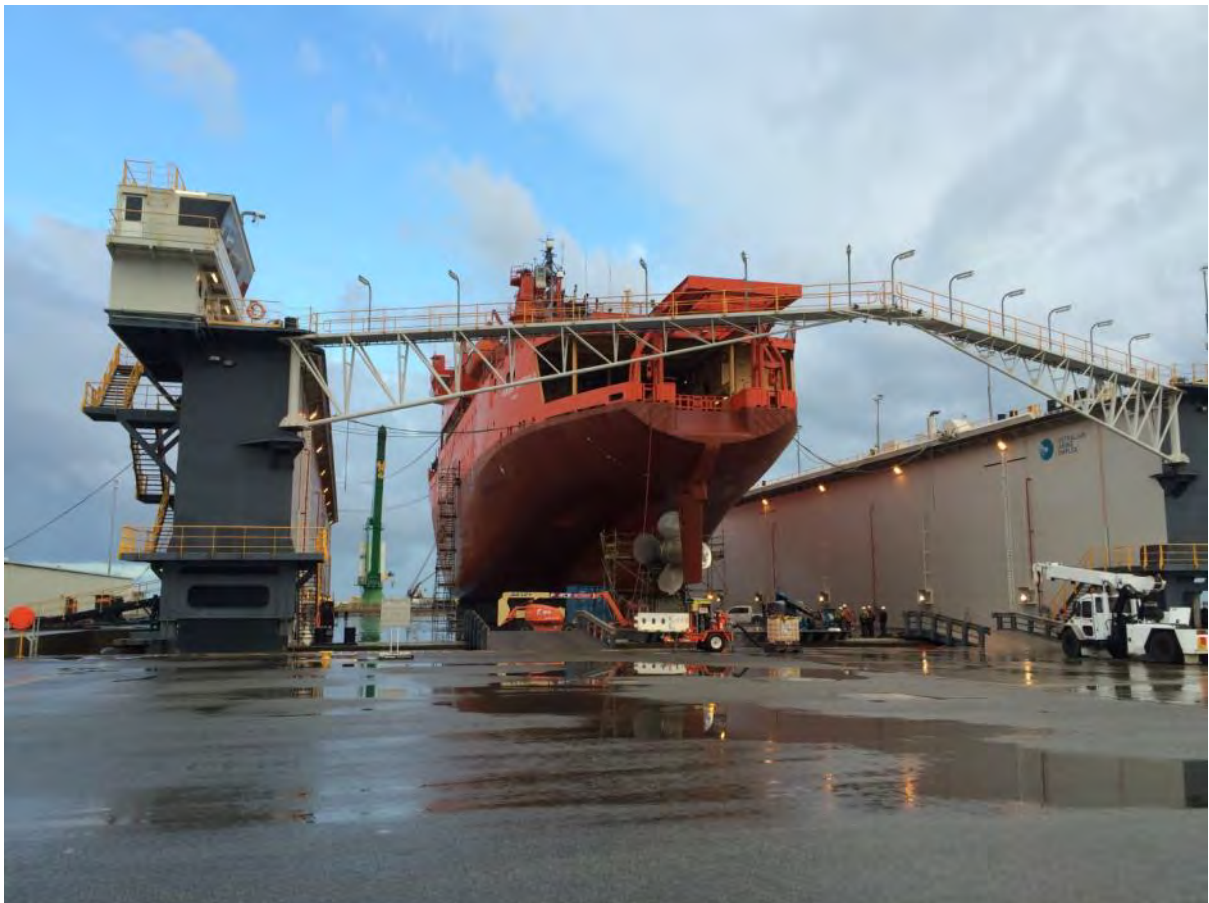
Spare brow for the ice door 14 meters



Spare brows from above



























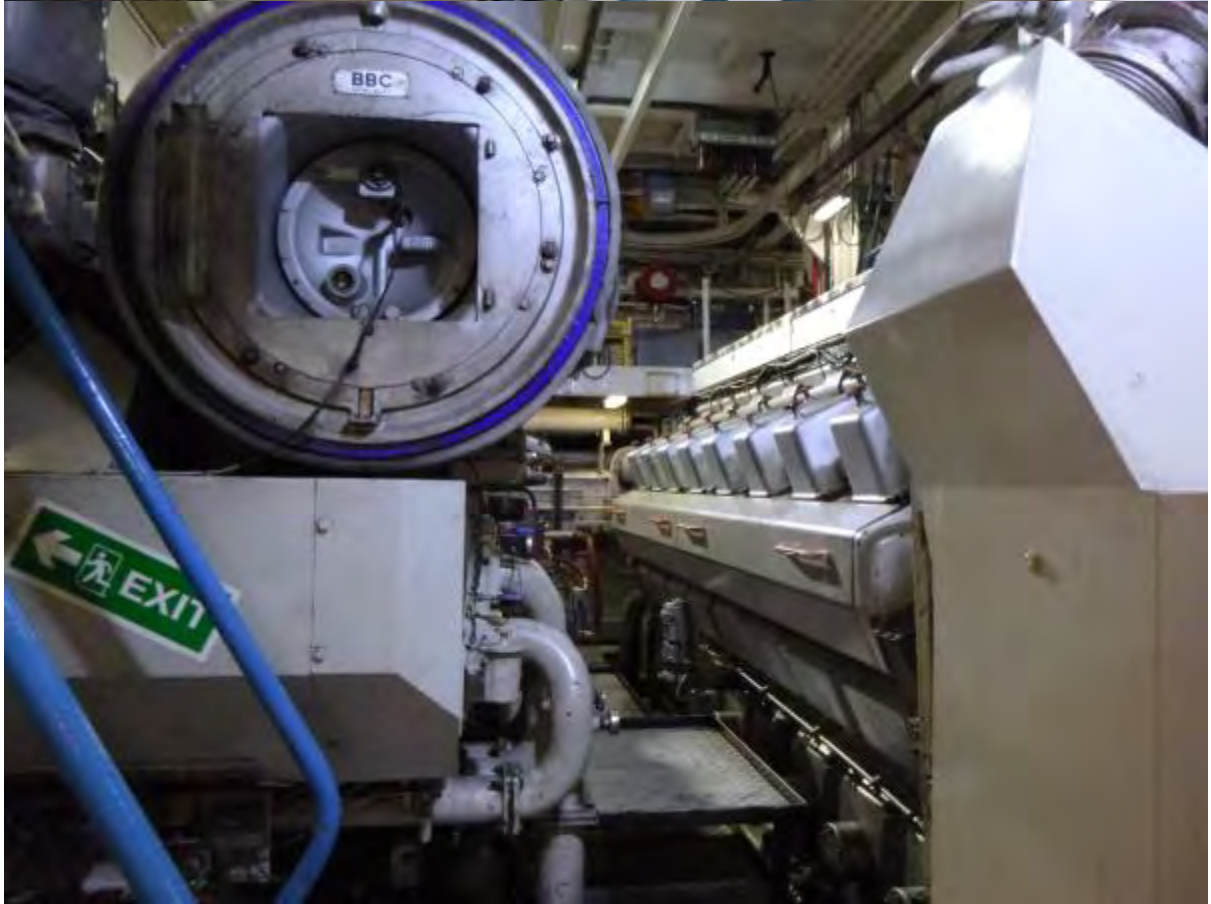








































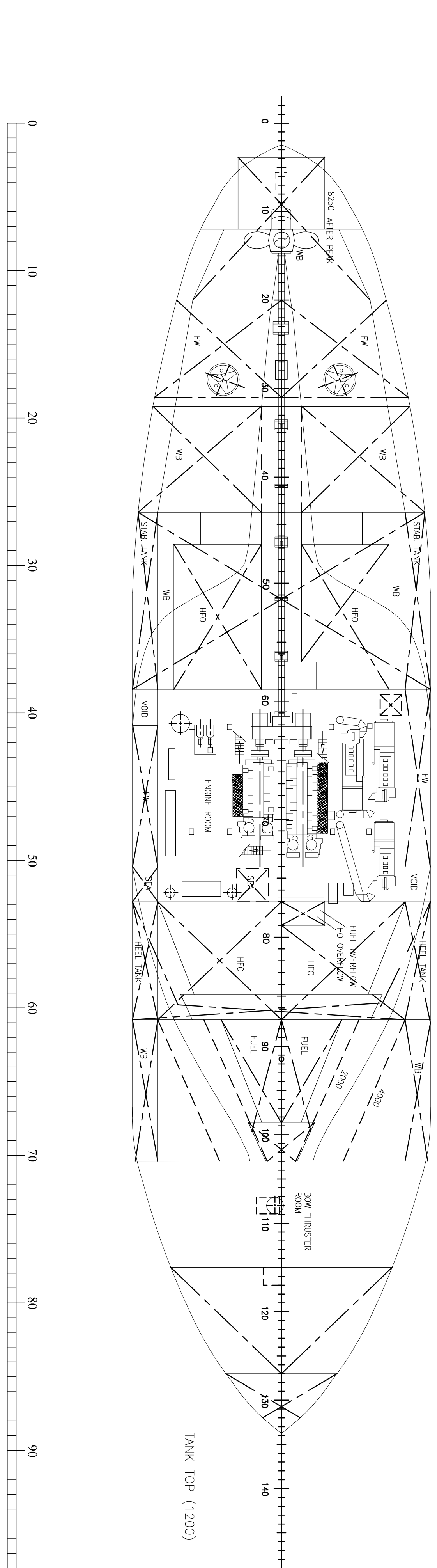
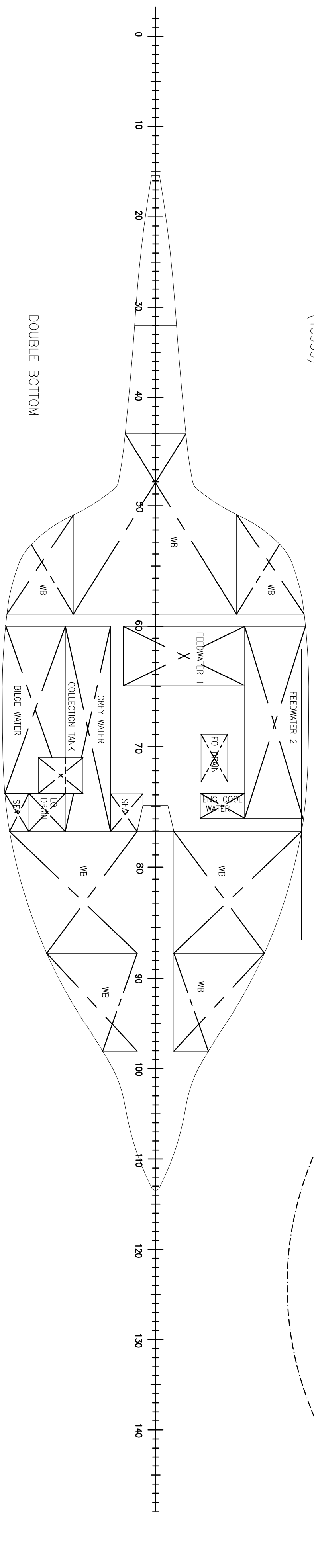
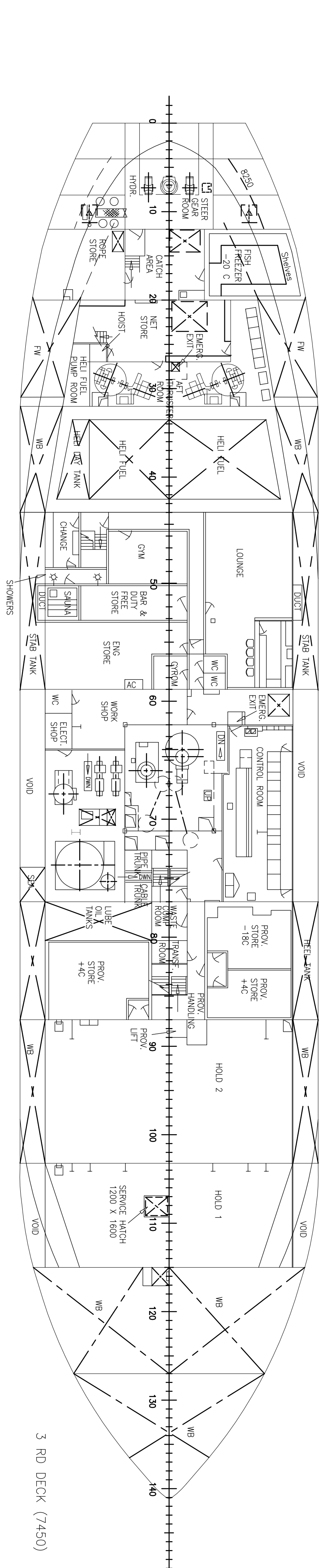
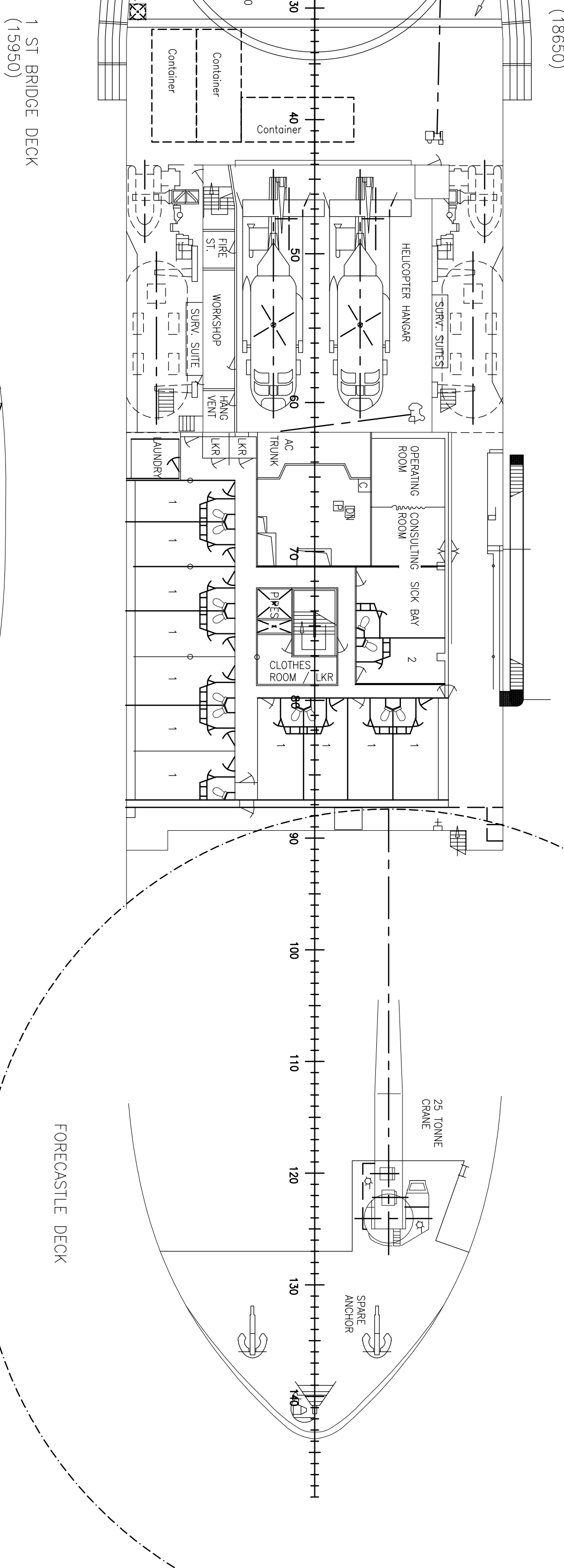
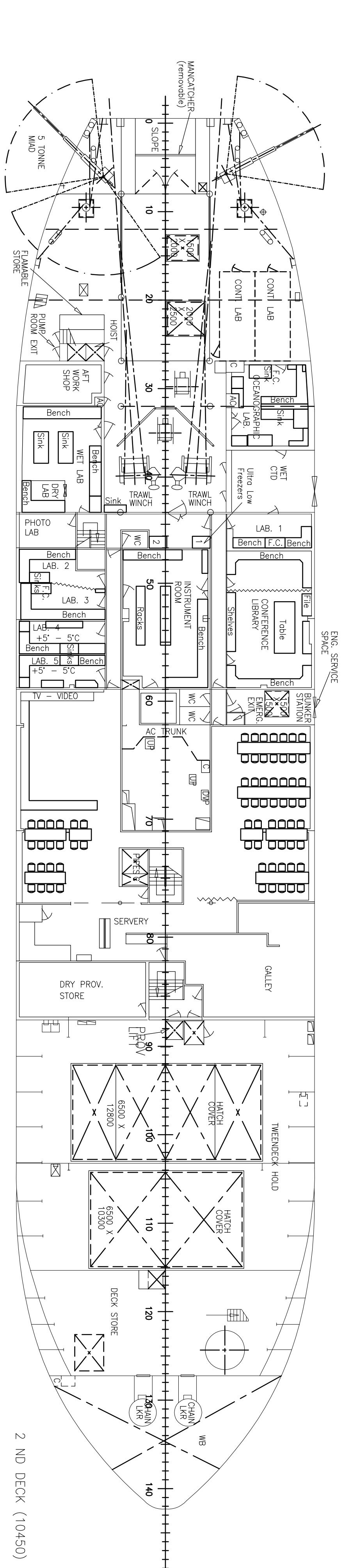
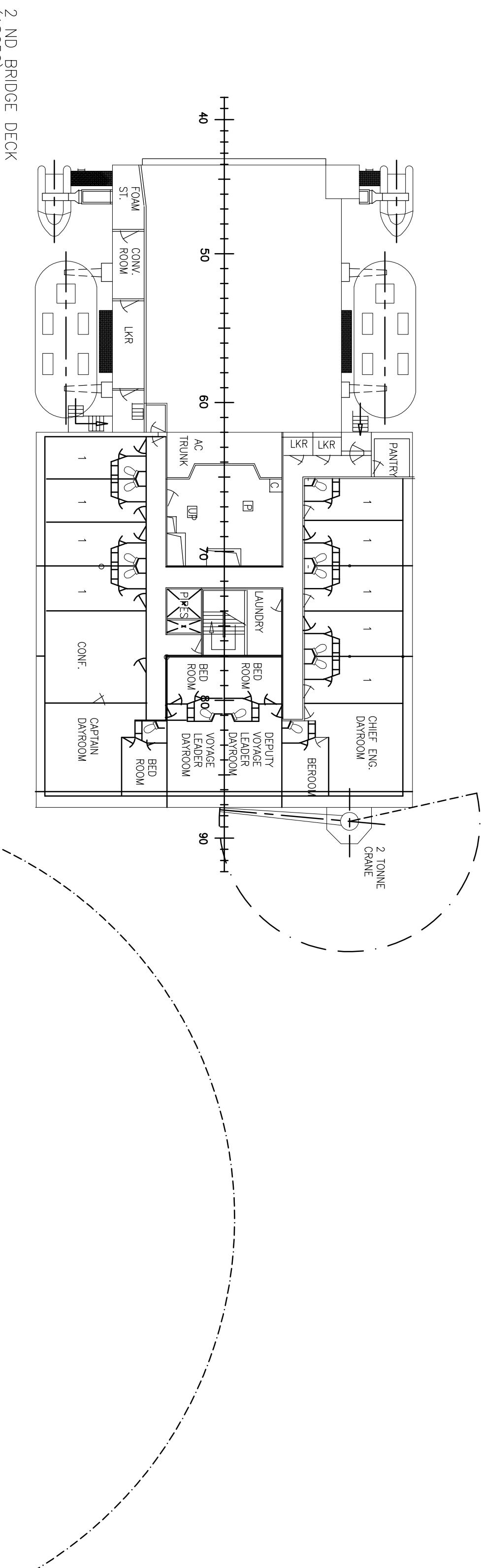
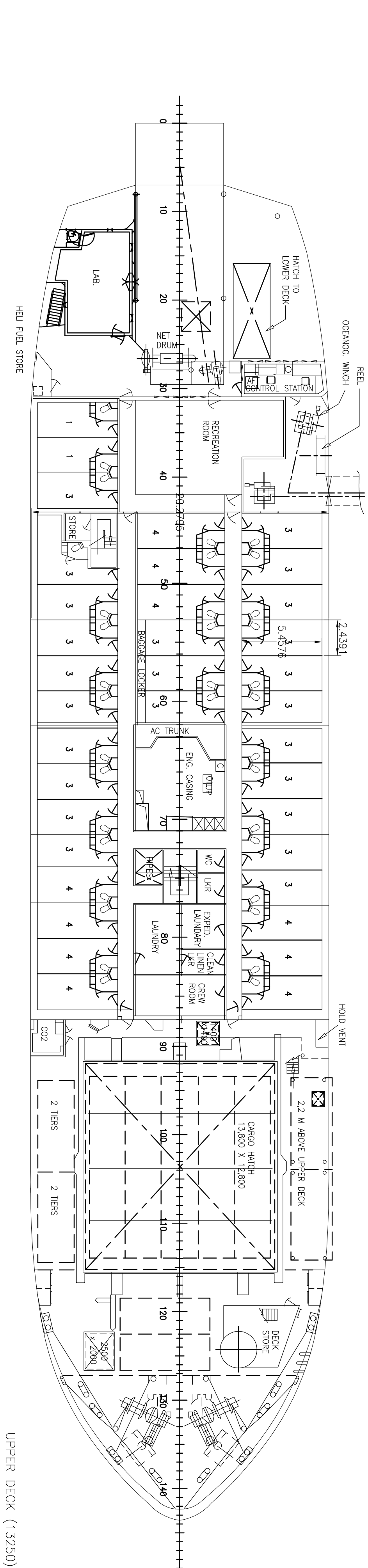
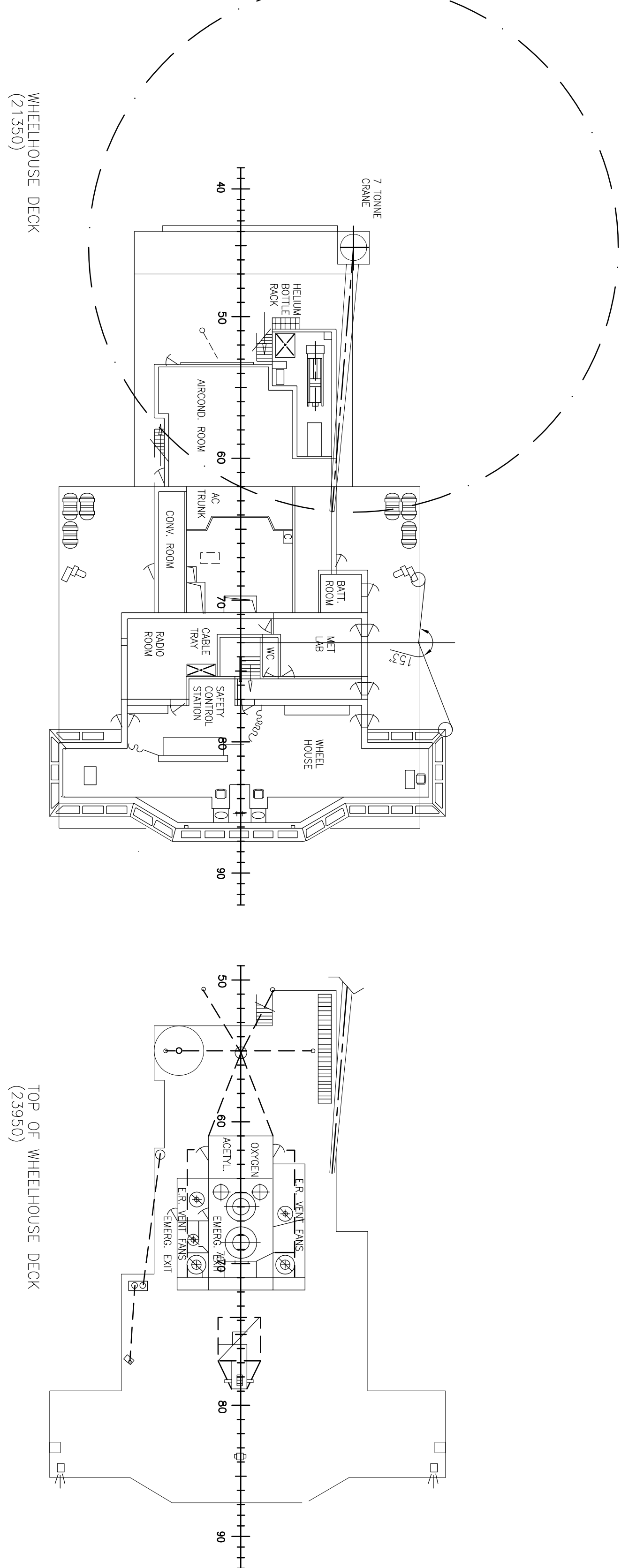
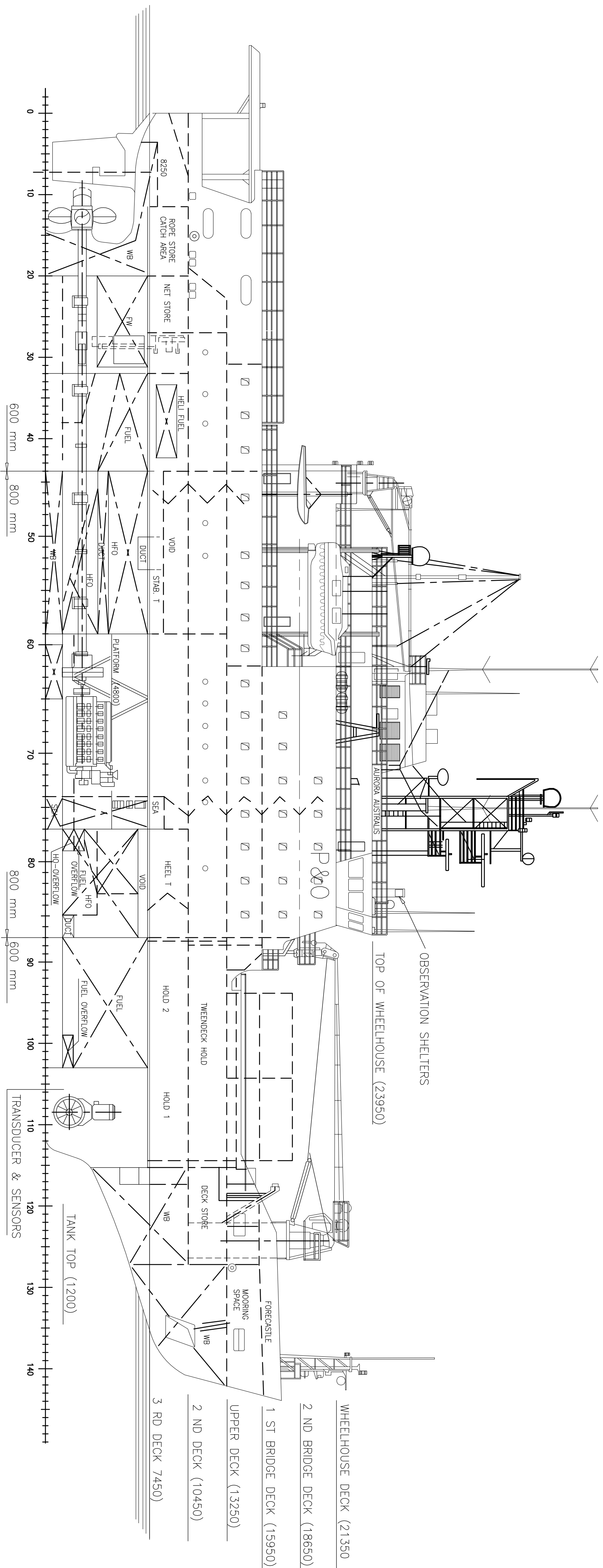




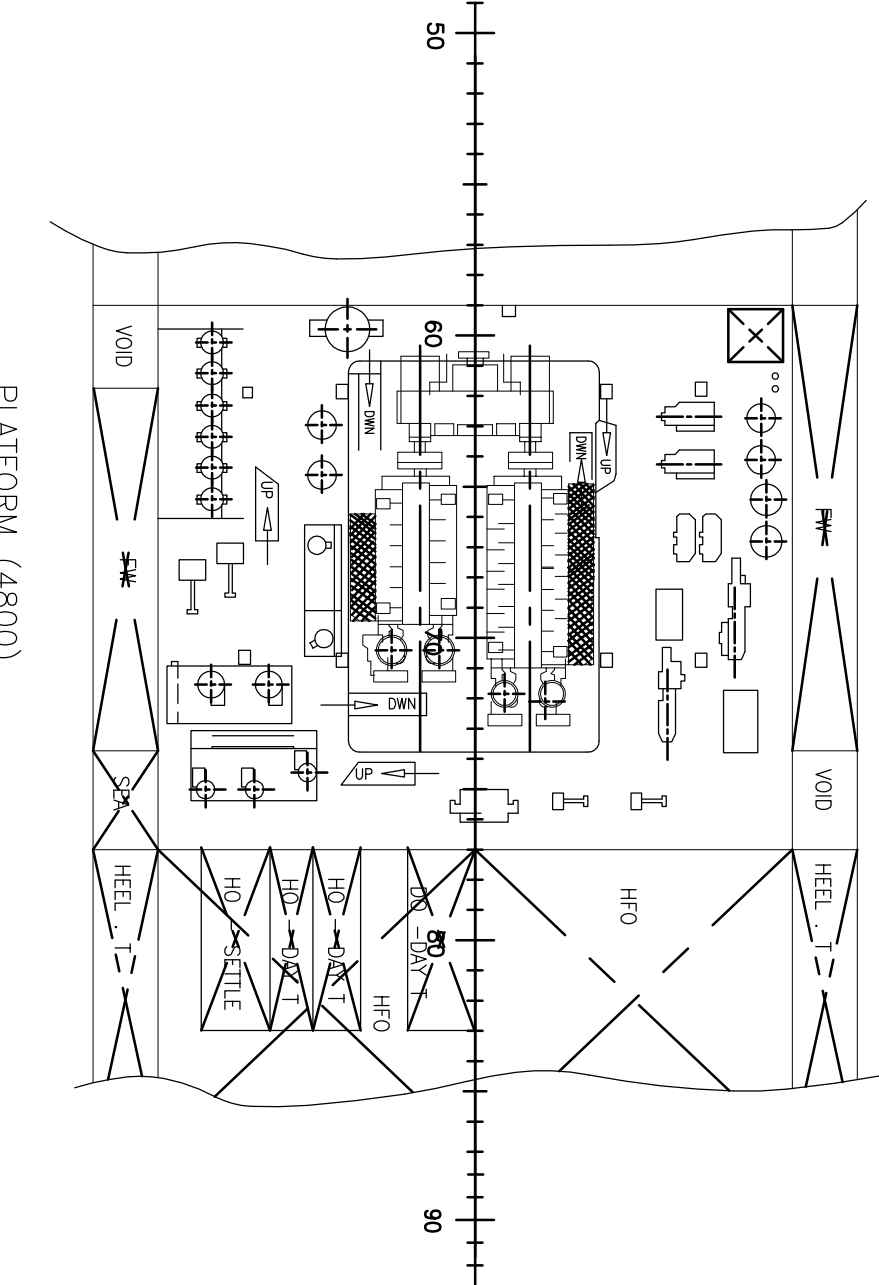








RSV AURORA AUSTRALIS
MAIN PARTICULARS
LENGTH O.A. 94.91M
LENGTH D.W.L. 88.40M
BREADTH MOULDED 20.30M
DRAUGHT 7.86
HEIGHT TO UPPER DECK 13.25M
DISPLACEMENT 8,158 T



Note:- This is a working Drawing subject to regular updates
please check revisions.

REV	DESCRIPTION	DATE
B	AFT DECK LAB ADDITION ADDED & GENERAL CHECK	31.03.2008
A	CARRIED TWO FROM DWG 035A01A	31.03.2008

SCALE 1:200



PREMIER OF TASMANIA

9 JUL 2020

s47F

Head of Australian Business
P&O Maritime
Email: s47F

Dear s47F

Today I am writing to you in relation to a letter I received from Mr Andrew Wilkie, MHR on the subject of the RSV Aurora Australis, and her future use.

Mr Wilkie has informed me that he has received several proposals by constituents for the future of the Aurora Australis and its potential use as a cultural and tourist asset or in continuing maritime service. For this purpose he has asked that I request a delay in your company's plans to potentially scrap the vessel if it cannot be sold.

However, this request did not include any details of such proposals nor does it appear to be backed by any contracts between your company and such proponents, any heritage listing of the vessel, any funding for such a project or key stakeholder support.

Since the earliest days of Antarctic shipping, many icebreakers have visited Hobart and the Australian Antarctic program has operated a range of vessels for its supply and science voyages, including your vessel, the RSV Aurora Australis. Many people in Hobart and many former Antarctic expeditioners have grown fond of your ship, as they have of other icebreakers in the past, including your other previous icebreaker, the RSV L'Astrolabe.

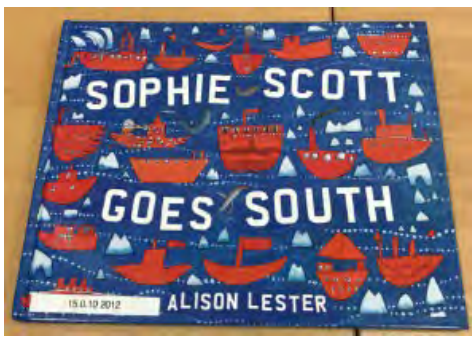



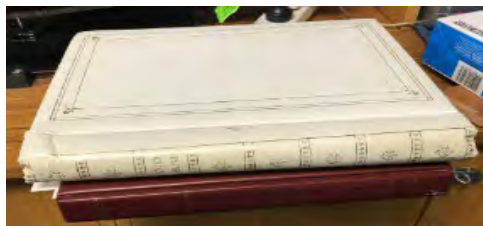







As the Aurora Australis is owned by your company, and in the absence of any clear proposal, it is not my role to interfere in your commercial activities and to halt your plans for your assets.





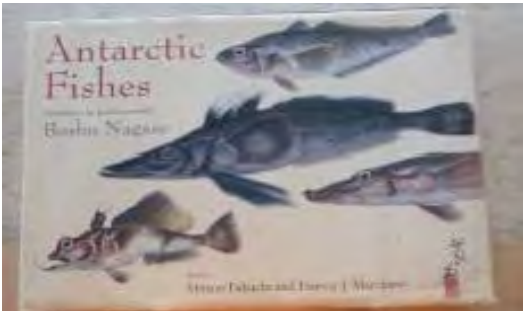







P&O Maritime has always been welcome as an operator in Tasmania and I wish your company well for its future endeavors.


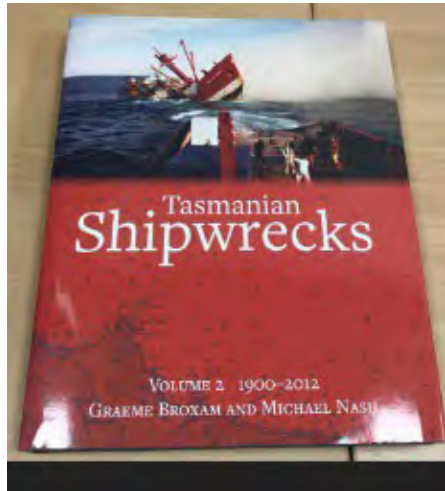

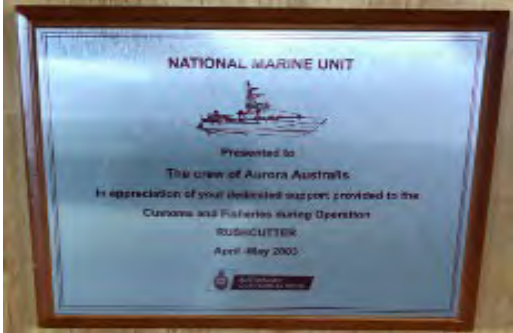



Yours sincerely











Peter Gutwein MP
Premier




P&O Maritime Logistics
Aurora Australis Memorabilia

POHC ID	PHOTO	DESCRIPTION	ORIGINAL LOCATION	POHC Comments	POML Comments	ITEM PICK UP LOCATION	DELIVERY DESTINATION
TBD		Book: Sophie Scott goes South signed by author Alison Lester 295mm x 235mm	Hobart Office Bookshelf	Keep to display with print		P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. The Marine Board of Hobart May 1990 150mm x 200mm x 30mm	Bridge	Presented to ship 1990 in maiden season		P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		3/50 print by Alison Lester Arts Fellow on one voyage. <i>This print has some monetary value.</i> 620mm x 470mm x 20mm	8 Deck Stairwell			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Scarf From Japanese Expedition. 900mm x 900mm Scarf Folded : 300mm x 100mm x 30mm	8 Deck In capt cabin			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Photo Albums 2x Books Est. 300mm x 250mm x 100mm	8 Deck In capt cabin			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Book 1990-91 Australian Antarctic Program 175mm x 245mm x 20mm	Hobart Office Bookshelf			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML/ OSSA P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Book Antarctic Treaty Exchange Information 1990-91 175mm x 245mm x 20mm	Hobart Office Bookshelf			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML/ OSSA P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBC		Barometer 250mm x 250mm x 100mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Sextant Cassens & Plath GMBH 11293 Closed Box: 170mm x 320mm x 320mm	Bridge (cupboard)			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Penguin Made by Doug Hawes 80mm x 70mm x 70mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Recognition of evacuation of 52 passengers from Russian vessel, Akademik Skokalskiy on 2 nd January 2014 150mm x 200mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		J.G McRedie oil painting <i>This painting has some monetary value.</i> 920mm x 770mm x 30mm	8 Deck UCR			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006











TBD		Clinometer est . 300mm x 250mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Framed Photo Mawson 305mm x 220mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Framed Photo Accom vessel for Malampaya Rig in Philippines 2000 305mm x 220mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Frame Image from Article Framed extract of article featuring Master, Capt Les Morrow 225mm x 170mm x 30mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Book Antarctic Fishes Presented to the vessel by the author. 360mm x 260mm x 30mm	B Deck In capt cabin			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Photo Huskies and Sled 440mm x 520mm x 30mm	E Deck Mess Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Framed photo and Plaque "Me and my Dog" 320mm x 460mm x 30mm	F Deck Rec Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift Photo 280mm x 320mm x 30mm	F Deck Rec Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Canvas Print Vessel: L'astrolabe 500mm x 400mm x 35mm	Hobart Office			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Canvas Print Aurora Australis 1010mm x 750mm	Hobart Office			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Canvas Print Aurora Australis 1010mm x 760mm x 40mm	Hobart Office			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Framed Photo Aurora Australis 560mm x 405mm	Hobart Office		POML to allocate - contact Master	P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006



TBD		Framed Photo Aurora Australis 860mm x 650mm	Hobart Office			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Book Tasmanian Shipwrecks Volume 2 1900 – 2012 Graeme Broxam and Michael Nash 245mm x 310mm	Hobart Office			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Book Tasmania, The Antarctic and the Sub Antarctic Record of proceedings held by Govt of Tasmania on 17-18 Sept 1996 175mm x 250mm	Hobart Office			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Book Tasmania, The Antarctic and the Sub Antarctic Records of proceedings of 2 forums held by Govt of Tasmania on 18-19 Nov 1999 and 4-5 May 2000 210mm x 290mm	Hobart Office			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift Plaque / Certificate International Year of Volunteers 2001 Certificate signed by former Prime Minister John Howard 370mm x 280mm x 30mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Australian Customs Service National Marine Unit for support provided to Customs and Fisheries during Operation RUSHCUTTER Apr-May 2003 250mm x 200mm x 30mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque Australian Customs Operation Alee Southern Ocean Maritime Patrol and Response Unit 180mm x 210mm x 30mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Presented to AA by Australian Fisheries Management Authority 12 May 2003 170mm x 200mm x 30mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. University Sans Malaysia 190mm x 160mm x 30mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Swedarp 180mm x 290mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006

TBD		Gift plaque from another organisation. DS Shirase Captain Peter Pearson Dec 1998 240mm x 300mm x 30mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Tasmania Parks and Wildlife Service 245mm x 245mm x 30mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. National Institute of Polar Research, Japan Dec 2008 – Jan 2009 220mm x 300mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Pacific Sky 150mm x 175mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Bureau of Meteorology March 2002 200mm x 300mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Ekspedisi Antartika 2002 160mm x 145mm x 50mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Creswell Est. 150mm x 200mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Albatross Est. 150mm x 200mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Royal Australian Navy Recruit School Est. 150mm x 200mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. 539 Assault Squadron Royal Marines Est. 150mm x 200mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006

TBD		Gift plaque from another organisation. Creswell Est. 150mm x 200mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque from another organisation. Albatross Est. 150mm x 200mm x 20mm	Bridge			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Framed Photo/ Poster Aerial ice photo 450mm x 540mm x 20mm	B Deck In Capt Cabin			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Print 545mm x 440mm x 20mm	B Deck Captain's Cabin			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Framed Photo Aurora Australis 820mm x 520mm x 20mm	B Deck In Capt cabin			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Photo Penguins 820mm x 570mm x 20mm	B Deck In Capt cabin			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD	 Sample Image: 	Framed Print "Bailed Up" By Tom Roberts 1895 950mm x 770mm	B Deck In capt cabin			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Framed Photo Aurora Australis Est. 650mm x 480mm	B Deck Ch mate cabin			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Photo Aurora Australis 305mm x 220mm	B Deck Door of mates cabin 1 st Officer B1			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006

TBD		Photo Aurora Australis 450mm x 485mm	B Deck Alleyway			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque Australian Peace Committee Acknowledgement 360mm x 470mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque Aurora Australis Circular Quay July 1990 250mm x 330mm x 30mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque Chung Sing Wholesale merchants 130mm x 190mm x 30mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque MT Australia Sky Melbourne 1989 140mm x 180mm x 30mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque The Maritime Services Board of NSW 160mm x 210mm x 30mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque City of Hobart 140mm x 160mm x 30mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque Adelaide 130mm x 100mm x 30mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque Tasmania Fire Service 120mm x 175mm x 20mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque The Army Maritime School 13 July 1990 140mm x 255mm x 20mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006

TBD		Plaque Hydrographic Service RAN 1700mm x 185mm x 20mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque Indonesian Antarctic Expedition 1996 (double copy on Bridge) 190mm x 240mm x 30mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque ANARE Club 30 April 1990 240mm x 305mm x 30mm	D Deck Cinema			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Framed Certificate Craziest Dressed Sled Team 2007 Royal Tasmanian Botannical Gardens 230mm x 320mm x 20mm	E Deck Mess Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Photo « Two Aurorae » Davis Voyage 1, Sept 1994 590mm x 410mm x 20mm	E Deck Library			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift Plaque The Magic Canoe Win Canoe Organisation of AAD 9 July 2013 1330mm x 530mm x 50mm	E Deck Mess Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Frame News Article The Huskies of Mawson – How they got there 220mm x 500mm x 20mm	F Deck Rec Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Photo Vessel : Xue Long 305mm x 240mm x 20mm	F Deck Rec Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Gift plaque Christmas Greetings from Davis '90 Winters 530mm x 420mm x 20mm	F Deck Rec Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Plaque ANARE Jubilee 1997 350mm x 520mm x 30mm	F Deck Rec Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006

TBD		Gift Plaque/ Photo From MV Greenpeace 26/12/1991 360mm x 340mm x 20mm	F Deck Rec Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006
TBD		Photo MV Greenpeace Crew 325mm x 340mm x 20mm	F Deck Rec Room			P&O Maritime Hobart Office Ground Floor, 9 Castray Esplanade Salamanca, TAS 7004 Australia	POML P&O Maritime Level 4, 70 City Road Southbank VIC 3006

ANTARCTIC RESEARCH SUPPLY VESSEL

for

P & O POLAR AUSTRALIA PTY.LTD.

WARTSILA MARINE INDUSTRIES INC.

PROJECT NO. 16261

for

CARRINGTON SLIPWAYS HULL NO. N-207

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1 GENERAL INFORMATION, RULES AND REGULATIONS

11 GENERAL

This specification and accompanying General Arrangement drawing describe and set forth the design, material, construction and equipment of the research and resupply vessel "R.S.V. Aurora Australis".

The vessel is intended for the transportation of scientific and support personnel to and from stations in the Australian Antarctic and Subantarctic territories, deploying and recovering field research parties, resupply of stations with dry cargo and fuel and Marine Research, including

- commercial scale trawling and finer net sampling
- deployment of towed instrument packages
- oceanographic studies
- marine chemistry
- acoustic surveys for marine biomass studies
- hydrographic surveys
- environmental monitoring
- meteorology.

Design Criteria, General Description

The vessel was designed around the proven hull lines of ice breaking ships with consideration to seakeeping and manoeuvrability. The hull form was proven by tank testing.

Details in design, fabrication, installation, inspection and workmanship not covered by the specification and approved plans were performed according to Japanese Shipbuilding Quality Standards.

If not otherwise stated, the systems of the ship are dimensioned for the following ambient temperatures:

- | | |
|---------------------|------|
| - sea water, min. | - 2C |
| - sea water, max. | +32C |
| - air outside, min. | -35C |
| - air outside, max. | +45C |

The vessel is capable of carrying abt. 1600 m³ general bale cargo, abt. 1000 m³ fuel oil in bulk and abt. 120 m³ aviation fuel in bulk.

Container carrying capacity is 19 TEU's under deck and 18 TEU's on deck with 24 t unit load.

The vessel is of double-skin construction and has three continuous decks as per General Arrangement. The double bottom extends from After Peak Bulkhead to frame 103. The vessel has one cargo hold, engine room, deckhouse with accommodation for 133 persons, and wheelhouse on top. Poop deck aft houses a helicopter deck for medium-lift helicopter loaded operations and a hangar for two helicopters of the type Sea Hawk.

The form of the vessel's hull incorporates icebreaking features, such as:

- a well raked heavily reinforced stem
- a bow rake angle of abt. 18 degrees
- a heavily reinforced stern with adequate rake and flare at the waterline. An ice knife is fitted on the centre line to protect the rudder when manoeuvring astern.

An active stabilizing/heeling tank system is provided.

One crane of 31 t/25 t and one of 2 t capacity for holds and a 14/7 t crane for helideck are provided.

A clearway is arranged on the port side at the helideck level for transferring fly-off cargo from the forward holds to the helicopter deck.

For research operations the ship's design incorporates :

- dedicated and multipurpose laboratories
- aft deck / stern design and equipment to enable commercial scale trawling operations
- side door / gantry and equipment to enable water column analysing and sampling
- hull form and propulsion systems to enable effective acoustic and hydrographic surveys
- data logging, processing and producing instrumentation systems.
- capability to effectively perform hydroacoustic surveys for hydrographic and marine biomass research in the following propulsion modes, (a) main propulsion system at 8 - 10 knots, (b) azimuth propulsion system at 0 - 5 knots.

The main propulsion machinery consists of two medium speed diesel engines coupled to a reduction gear driving one controllable pitch propeller. One bow tunnel thruster and two stern thrusters are incorporated to enable accurate slow speed operations from zero to five knots in up to Beaufort force six conditions. The maneuverability of the vessel is enhanced through a manual joystick facility.

6112 REDUCTION GEAR, CLUTCHES

/1 1 reduction gear

The gear with helical toothed gear wheels is of twin-input single-output and low-noise type. Thrust bearing is incorporated in the gear and of Michell type.

The gearbox is rigidly mounted to the foundation on cast iron chocks.

The gearbox is fitted with an independent lubricating oil system with gearbox driven circulating pumps. The oil system is of internal type with oil sump in the gearbox. Stand-by electric driven pumps will be provided with automatic start on low L.O. pressure and automatic shut down on working pressure from gear driven pumps. The gearbox will also be equipped with built on oil filter with magnetic case and fresh water cooled oil cooler from central cooling system.

Pitch control mechanism, see 6321.

/2-3 2 elastic clutches

The diesel engines are coupled to the reduction gear with elastic clutches, or alternatively with separate clutches and elastic couplings.

Clutches are capable and of sufficient size and strength so that one main may be engaged at full speed and with the line shaft idle/stopped.

A control and safeguard system is arranged to prevent misconnection of the clutches. Connection and disconnection is controlled from the bridge aft control station, machinery control room, and locally.

6113 SILENCERS

/1-2 Both main engines are equipped with silencers of absorption type. Silencers are equipped with spark arrester and provided with soot collector, water drain and cleaning openings. The noise attenuation is about 35 dB(A) together for exhaust gas economizer and silencer.

62 AUXILIARY EQUIPMENT FOR PROPULSION MACHINERY

G e n e r a l

Pumps

Horizontal pumps have common bedplates with their driving motor.

Rotary and reciprocating pumps are provided with a relief valve capable of passing full pump capacity at suitable pressure, to prevent damage to the discharge pipe line or overloading of its driving motor.

Centrifugal Pumps

Each electric motor for driving centrifugal pumps has sufficient power rating to drive the pump without overloading under positive head in suction of 3m to the designing discharge head for all services at sea and in port.

Castings of pumps (except smaller sizes) are split on the horizontal or vertical centre line so that the impeller may be removed without dismantling pipe connections.

Smaller size pumps may be of the side inlet type with inlet coverbolted onto a one piece volute casing.

In general, shaft packing is of mechanical gland type, but if submerged type pump, shaft packing is of ring packing type.

Rotary Pumps

Rotary pumps are of screw or gear type. Shaft packing is of mechanical seal. Materials of gear and screw pumps is generally according to manufacturer's standard and to owner's approval.

Heat Exchangers

Each heat exchanger is provided, if required by the service, with relief valve, vent valve, drain valve, pressure gauge and thermometer.

Cleanliness factor of heat exchanger, is to be 85 % except for those supplied with other equipment, which should be in accordance with the manufacturer's standard.

Heaters to be fitted with automatic temperature control.

621 STARTING DEVICES

6211 STARTING AIR COMPRESSORS

/1-2 2 starting air compressors

The compressors supply starting air for the main and auxiliary engines.

Type:	piston
Capacity:	60 Nm ³ /h
Working pressure:	30 bar

The compressor aggregates are resiliently mounted.

The compressors are two stage, fresh water cooled from aux.engine central cooling system, electric-motor driven and equipped with automatic start and stop. Automatic stop by too high cooling water temperature or too low oil pressure.

Compressors are fitted with unloader, safety valve, inlet air strainer, water and oil separator, pressure gauge, air cooler, drain cock, automatic drain trip device and alarm switches for low lubricating oil pressure and high temperature or non flow of cooling water and other necessary fittings, according to the manufacturer's standard. Automatic open/shut valve for cooling water to be provided with each main air compressor. Automatic pre-selected start/stop devices for the main air compressors are provided and are activated by the air pressure in the receivers.

6213 AIR RECEIVERS

/1-2 2 main air receivers

Material:	steel
Capacity:	1000 l
Working pressure:	30 bar

The air receivers are provided with water drain and safety devices all to Class rules. The air receivers are of vertical type and installed in the engine room.

622 WATER PUMPS AND HEATING OF THE ENGINES

6221 SEA-WATER COOLING PUMPS

/1-3 3 electrically driven sea-water cooling pumps for main engine central coolers

Type:	centrifugal max. 1500 rpm
Material:	housing and impeller of bronze, shaft of stainless steel
Capacity:	about 270 m ³ /h, 2.3 bar

One of the pumps is stand-by and equipped with automatic start.

The pumps are installed in the engine room, and to be located close to sea water main in order to minimize the length of pumps suction pipes. The pumps are installed as low as possible above double bottom noting that good valve access is possible and that electric motor is located above engine room floor level.

6222 FRESH-WATER COOLING PUMPS

/1-6 6 fresh-water cooling pumps, 3 for main engine low-temperature cooling water system and 3 for high-temperature cooling water system.

Type: centrifugal, max. 1500 RPM
 Material: housing of cast iron, impeller of bronze, shaft of stainless steel, mechanical sealing
 Capacity: about 192 m³/h, 2.5 bar for V16 engine

Two (1 + 1) of the pumps are stand-by and equipped with automatic start.

The pumps are installed in the engine room, preliminary on platform deck adjacent to the main engine central coolers.

6225 HEATING OF THE ENGINES

/1-2 2 electrical preheating units for main engines one for each M.E.

The unit consists of one electrical heater and one circulation pump, electrically driven. The preheating units are manually or thermostat selected.

Heater capacity 36 kW for V16 engine
 27 kW for V12 engine

Pump capacity 4.8 m³/h, 1.2 bar for V16 engine
 3.6 m³/h, 1.2 bar for V12 engine

The main engine heating system is installed in the engine room.

6226 COOLING WATER TRANSFER PUMP

/1 1 cooling water transfer pump

Type: piston
 Materials: housing of cast iron, valves of stainless steel, piston of bronze
 Capacity: 2.5 m³/h, 2.5 bar

The cooling water transfer pump is installed in the engine room. The pump is arranged with suction connection from engine cooling water tank, and discharges to the main and aux. engines cooling water systems.

The pump is locally controlled.

623 LUBRICATION OIL PUMPS AND STRAINERS

6231 CIRCULATION LUBRICATION OIL PUMPS

/1-2 2 circulation lubrication stand-by oil pumps for main engines

Type: screw, 1500 RPM for V16 engine
1000 PRM for V12 engine
Material: housing of cast iron, screw of steel
Capacity: 118 m³/h, 5.0 bar for V16 engine
98 m³/h, 5.0 bar for V12 engine

One pump for each ME.

The pumps are installed in the engine room.

6232 CIRCULATION LUBRICATION OIL STRAINERS

/1-2 The built-on engine driven Lub.oil circulation pumps have wet sump type suction piping which includes the suction strainers.

/5-6 2 suction strainers are installed in front of circulation stand-by oil pumps for main engines.

6233 LUBRICATION OIL PUMPS AND FILTERS FOR REDUCTION GEARS

/1 1 electrically driven stand-by lubrication oil pump with automatic start-up on loss of pressure and shut-down on return of pressure.

Type: screw
Material: housing of cast iron and screw of steel
Capacity: 920 litres per minute

The stand by lub oil pump is installed close to the reduction gear. The stand by pump has suction connection from the reduction gear sump and delivery to the reduction gear lub oil system.

/2 1 suction strainer for reduction gear stand-by lub. oil pump

624 FUEL OIL BOOSTER PUMPS AND FILTERS, VISCOSIMETERS

6241 FUEL OIL PUMPS

/1-2 2 ME fuel oil booster pumps

Type: screw
Material: housing of cast iron, screw of steel
Capacity: 2.7 m³/h

/3-4 2 ME fuel circulating pumps

Type: screw
 Material: housing of cast iron, screw of steel
 Capacity: 7.8 m³/h

One of the pumps is stand-by and equipped with automatic start.

/5-6 2 ME fuel oil feed pumps

Pumps are electrically driven.

Type: screw
 Material: housing on cast iron, screw of steel
 Capacity: 2.2 m³/h for V16 engine
 1.9 m³/h for V12 engine

6242 FUEL OIL FILTERS

/1 1 ME fuel oil suction strainer in front of fuel oil booster pumps.

Type: duplex, with heating jacket
 Capacity: 3.0 m³/h
 Fineness: 0.5 mm

/3 1 automatic fuel oil filter for ME

Type: automatically self-cleaning
 Capacity: 6.3 m³/h
 Fineness: 34 microns

6243 FUEL OIL PREHEATER

/1-2 2 ME fuel oil preheaters of tube type.

Plate material: steel
 Capacity: 120 kW
 Heating medium: steam

6244 MISCELLANEOUS EQUIPMENT FOR FUEL OIL SYSTEM

/1 1 fuel consumption meter

The fuel oil consumption meter is provided between the booster pumps and the de-aeration tank. Digital fuel consumption display in machinery control room and in the wheelhouse.

/2 1 viscosity controller

The viscosity of the heavy fuel oil fed to the main engines is controlled by an electric controller.

The fuel pumps, strainers, preheaters, consumption meter and viscosimeter to be built as an aggregate and to be installed on double bottom level adjacent to fuel oil service tanks.

626 HEAT EXCHANGERS

6263 LUBRICATING OIL COOLERS

/1-2 2 lubricating oil coolers for main engines.

Type: plate
 Material: stainless steel
 Capacity: abt. 740 kW for V16 engine
 abt. 560 kW for V12 engine
 Cooling medium: engine L.T. cooling water

The separate lub oil coolers for main engines are installed adjacent to stand by lub oil pumps and automatic lub oil filters on double bottom level in the engine room.

6265 COOLER FOR REDUCTION GEAR

1 cooler for lub. oil of the gear, built on the gear, cooled by A.E. L.T. cooling system.

6266 MAIN ENGINE CENTRAL COOLERS

/1-2 2 central coolers for main engines

Type: plate
 Material: plates of stainless steel
 Capacity: 718 + 538 kW

Main engine central coolers are installed in engine room.

627 SPECIAL EQUIPMENT

6274 OIL MIST DETECTORS

/1-2 2 ME oil mist detectors

For the detection of explosive conditions in the crankcase of the main engines an oil mist detector is fitted on each engine.

63 PROPELLER SHAFTING AND PROPELLERS

631 PROPELLER SHAFTLINES

6312 PROPELLER SHAFT AND INTERMEDIATE SHAFTS

/1 1 propeller shaft with a flange suitable for classification ten year survey.

The propeller shaft is of steel with forged flange to fasten the propeller and hydraulic sleeve coupling on the forward end of the propeller shaft to allow dismantling in the outward direction.

/2 1 intermediate shaft

The intermediate shaft is of steel with forged flange in the forward end and it is designed for connection to the propeller shaft by a sleeve coupling in the aft end.

Shields are to be arranged above connection flanges.

/3-4 2 intermediate shafts

Two intermediate shafts of steel with forged flanges in both ends.

/5 1 hydraulic sleeve coupling

The propeller shaft is connected to the intermediate shaft by a hydraulic sleeve coupling. Tools for installing the sleeve coupling are supplied.

6313 SHAFT BEARINGS

/1-4 The bearings are of self-levelling type. The aftermost bearing housing is of cast steel, others of cast iron, all bearings with top and bottom Tin-based white metal lined shells.

The bearings are provided with self-acting lubrication of ring type. The lubricating system is cooled by L.T. cooling water.

6314 BULKHEAD PACKING BOXES

/1 1 bulkhead seal

Seals are patent type face seal. (Deep Sea Seal type MANESAFE ND)

6315 STERN TUBE AND BEARINGS

/1 The sterntube is of steel and welded onto the ship hull.

/2 Sterntube bearing of tin-based white-metal type is located in the spheroidal graphite cast iron bushes. The bearing is oil-lubricated.

6316 PROPELLER SHAFT SEALS

/1-2 The inboard and outboard sterntube seals are of face seal type:

Outboard :	MANEBRACE MN 710
Inboard :	MANEBRACE ML 530

The outboard seal is protected by a steel cover and a rope cutter.

6317 TURNING GEAR

6318 SPARE PROPELLER SHAFT

/1 1 spare propeller shaft is stored ashore.

632 PROPELLER

6321 PROPELLER EQUIPMENT

/1 1 CP propeller

The propeller is a four-bladed controllable-pitch propeller made of stainless steel. The manufacturing tolerances for casting and finishing according to ISO 484/1 Class II. The propeller diameter is about 5.11 metres. Propeller blades are capable of being replaced in water without loss of oil.

/2 1 oil distribution box

One oil distribution box for pitch adjusting is mounted on the forward end of the gearbox.

The oil distribution box is equipped with emergency hydraulic connections for pitch setting and with mechanical indicator for actual pitch position.

/3-4 2 hydraulic oil pumps

Two electrically driven hydraulic oil pumps for fully automatic operation of the propeller. One of the pumps is stand-by and equipped with automatic start.

6322 SPARE BLADES FOR PROPELLERS

/1-4 4 propeller blades

Four blades are stored ashore.

633 SPECIAL EQUIPMENT FOR THE PROPELLER SHAFTING

In the event of CP hydraulic failure, propeller pitch will remain in the last position.

6333 EARTHING EQUIPMENT

/1 The shaftlines are earthed to the hull by means of a slip ring arrangement.

6334 TORSION METER

/1 Torsion meter is installed with torque and S.H.P. readout in control room and torque readout in wheelhouse.

The auxiliary machinery consists of three medium-speed diesel engine generators.

The machinery is designed for a maximum fuel viscosity of 180 cSt/50C CIMAC 6. The auxiliary engines are designed for the same fuel as main engines.

111 GENERAL ARRANGEMENT, MAIN DIMENSIONS, POWER AND SPEED

The vessel has:

- two diesel engines of combined 10000 kW
- one reduction gear
- one propeller
- one rudder
- accommodations amidships
- cargo hold in foreship
- research facilities aft
- two cranes forward, 1 of 25 tonnes, 1 of 2 tonnes
- one crane aft, 7 tonnes
- one 4 tonne SWL gantry aft
- two Hiab type cranes aft
- one side door with gantry crane
- possibility to carry containerised laboratories, storage containers and reefer containers
- a helicopter deck and helicopter hangar
- a station keeping system consisting of three thrusters integrated with main engines, propeller and steering gear
- active tank stabilizer and icebreaker heeling system.

1111 GENERAL ARRANGEMENT

The general arrangement is in accordance with the drawing 0.16261.1111.11.001.

1112 MAIN PARTICULARS

Length, overall	abt.	94.81	m
Length, dwl		88.40	m
Breadth, mld.		20.28	m
Depth to the 2nd deck		10.43	m
Draft, dwl		7.65	m
Block coefficient	abt.	0.56	
Deadweight at draft of 7.85m		3 940	tonnes
Number of screws		one	
Main engines	abt.	10000	kW
Side thrust unit, forward	abt.	800	kW
Azimuth thrusters, aft	abt.	2 x 400	kW
Generators	two	960	kW
	one	640	kW
Draft. Scantling		7.85	m

1113 POWER AND SPEED

Maximum continuous combined power of the main engines in free running conditions is 7,900 KW and 10,000 KW in ice breaking conditions.

112 CAPACITIES

1121 DEADWEIGHT

At the summer load draft, the deadweight is 3,940 metric tons in sea water with a density of 1.025 tonnes/m³.

The lightweight and deadweight were calculated according to DOT Marine Orders Part 13.

In practice, the deadweight can be distributed as follows:

- crew and passengers with baggage	10 tonnes
- provisions	30 "
- stores	30 "
- fresh water	250 "
- dry cargo	550 "
- fuel oil	850 "
- aviation fuel	95 "
- heavy fuel oil	950 "
- lub. oil	32 "
- stabilising tanks	300 "
- scientific stores and containers	30 "
- misc. stores	35 "
- reserve	778 "

Total 3940 tonnes

The endurance of the vessel is 90 days based on the provisions and fresh water production capacity for the ship's complement of 133.

1122 CARGO CAPACITY

Cargo holds:

- Hold No. 1	abt.	300 m ³
- Hold No. 2	"	400 "
- Tween deck hold	"	900 "

Total volume abt. 1600 m³

Cargo hold is intended for transporting hazardous cargo in accordance with the relevant regulations and certificates.

Container carrying capacity at maximum 24 t per unit:

- 19 TEU's under deck
- 18 TEU's on deck.

1124 SHIP'S PERSONNEL ACCOMMODATION

	Cabins	Berths
Senior Staff		
- suite: living room, bedroom, WC + shower	4	4
Crew		
- single cabin, WC + shower	22	22
Expeditioners		
- triple cabin, WC + shower	31	93
- double cabin, WC + shower	1	2
- single cabin, WC + shower	3	12
Total	62	133

Public spaces:

- Restaurant
- Lounge
- Gymnasium
- Recreation room

Research related spaces:

- Oceanographic laboratory
- Wet laboratory
- Multipurpose laboratories (5 pcs)
- Photographic laboratory
- Instrument Room
- Word processing room
- Conference room/Library
- Meteorological laboratory
- Net store
- Catch processing area

Hospital and Surgery Department:

- Consulting room/dispensary
- Surgery
- Sick bay
- WC/bath/shower room

Sanitary Spaces:

- Sauna
- Two working clothes rooms
- Three laundries
- Linen stores

Galley Department:

- Provision stores
- Galley
- Servery
- Scullery
- Pantries

Ship Management Spaces:

- Conference Room
- Office

1125 TANK CAPACITIES

Arrangement according to the General Arrangement.

Total filling volumes

Heavy fuel oil, storage	c.	1250 m ³
Supply fuel	c.	1000 "
Lubricating oil, storage tanks	c.	35 "
Fresh water	c.	500 "
Ballast water	c.	1900 "
Feed water	c.	90 "
HFO settling tank	c.	30 "
HFO day tanks total	c.	40 "
Aviation fuel	c.	120 "
Stabilizer and heeling tanks	c.	600 "
Overflow oil tanks	c.	14 "
Sludge	c.	4 "
C.P. oil	c.	3 "
Holding tank (24 h capacity) for grey and treated black water		

113 CLASSIFICATION, CONSTRUCTION

1131 RULES AND REGULATIONS

The vessel is constructed in accordance with the rules of Lloyd's Register of Shipping, +100A1, Ice Class 1A Super, + LMC, "UMS", DP (CM) when not operating in ice, with descriptive note CASPPR Ice Class 2 Midships/CASPPR Ice Class 3 strength only at ends. The ice strengthening of the hull and propulsion machinery was based on the experience of Wärtsilä Marine as builder of icebreakers.

The vessel is registered in the port of Hobart as a Research & Supply vessel in compliance with the Special Purpose Ship regulations.

The vessel complies with the Australian Authorities, Department of Transport, IMO regulations with latest amendments.

The following rules and regulations are applied in force:

- IMO, International Convention for the Safety of Life at Sea, 1974 (SOLAS 1974)
- IMO, Protocol of 1978 Relating to the International Convention for the Safety of Life at Sea, 1974 (SOLAS PROT 1978)
- IMO, Amendments to the International Convention for the Safety of Life at Sea 1974, adopted by the MSC of IMO at its 45th session 1981
- IMO, Amendments to the International Convention for the Safety of Life at Sea, 1974, adopted by the MSC of IMO at its 48th session 1983
- IMO, International Convention on Load Lines, 1966 (LL 1966)
- IMO, Supplement relating to the International Convention on Load Lines, 1966
- IMO, International Convention on Tonnage Measurement of Ships, 1969
- IMO, Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREG 1972)
- IMO, International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL 1973)
- IMO Resolution A 534 (XIII) - Code of safety for special purpose ships
- IMO, Noise Levels on Board Ships, Resolutions A 468 (XII) and A 343 (IX)
- Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL PROT 1978)
- International Telecommunications and Radio Regulations, 1982

- IEC, Publications and Recommendations of the International Electrotechnical Commission as mentioned in the Classification Rules
- Rules of Navigation of the Panama Canal and Adjacent Waters and Tonnage Measurement Regulations of the Panama Canal Authority
- Rules of Navigation of the Suez Canal and Tonnage Measurement Regulations of the Suez Canal Authority
- International Chamber of Shipping Guide to Helicopter/Ship Operations.

1132 MATERIALS

All steel used in the hull and internal constructions is shipbuilding quality steel, certified by the Classification Society.

Only gritblasted and primed steel was used.

All steel which was to be painted was gritblasted prior to construction to grey/white metal, equivalent to SA 2.5 of the Swedish scale and immediately after rust removal primed with approved primer prior to further processing. In areas where Hempadur paint was used, paint manufacturer inspected and advised on preparation of steel.

All material was new and of first class quality well suited for a vessel of this type. The material was delivered with certificates to the extent required by class. All cast parts were of good quality without defects and approved by Class and Owners.

1133 WORKMANSHIP

All scantlings and welding are in accordance with the rules of the Classification Society except where additional strength was required by Owners or Designers as mentioned in specification or relevant drawings.

Frame distances are shown on class approved drawings. Strengthening and support is arranged where necessary in the vicinity of propellers, hawsepipes, deck machinery, fairleads and other places where external forces and vibration, wear etc. will occur.

All plate work was done according to J.S.Q.S. standards.

The hull, superstructures and deckhouses are of welded construction. The welding was done according to the rules of Lloyd's Register of Shipping.

114 HYDROSTATICS

1142 TRIM AND STABILITY

The vessel has adequate positive stability in all normal loading conditions. Consumption of stores can be compensated with ballasting.

The stability and watertight sub-division criteria are in accordance with the requirements of IMO Resolution A 534 (XIII) for Special Purpose Ships and Marine Orders Part.

The vessel does not trim by the head in any normal loading condition nor excessively trim by the stern.

Trim and stability book contains basic loading conditions such as light ship, ballast condition and combination of cargo, fuel oil, potable and ballast water and other cargo according to Australian Dept. of Transport Requirements.

The vessel is capable of being dry docked with 50 % deadweight on board.

115 HYDRODYNAMICS

1151 RESISTANCE, PROPULSION

The following model tests were included in the design procedure:

- Open-water tests:
 - resistance and propulsion tests
 - wake survey
 - flow visualisation test
 - seakeeping tests
 - manoeuvring tests
 - cavitation tests.
- Tests in ice:
 - resistance and propulsion tests at various speeds in level ice of two thicknesses
 - tests in floe ice of two ice thickness, the coverage of which is about 90%
 - tests in rubble ice fields
 - tests with alternative propeller protection devices.

1152 MANOEUVERING

The vessel has good manoeuvrability at all speeds, particularly at slow speeds.

The vessel has a joy-stick operated positioning system. The position reference is obtained from the navigation systems.

118 CALCULATIONS

1181 CALCULATIONS OF NOISE AND VIBRATION

The vessel fulfills noise requirements specified in IMO Resolutions A-468 (XII) and A-343 (IX) and vibration requirements specified by the Classification Society.

The vessel is designed and constructed so that all parts are free from such vibration which may be harmful to either the structural integrity of the vessel, machinery or equipment or to the health, comfort and efficiency of the crew.

Accelerations do not exceed the 8 hour exposure limited defined in ISO 263; 1978 (E).

13 SUPERVISION, CERTIFICATES AND DOCUMENTS

132 SUPERVISION

The vessel was built under supervision of Lloyd's Register of shipping and the Owner's representative, P&O Technical Services.

133 CERTIFICATES

All relevant certificates from the Classification Society, National Authorities and Australian Authorities were obtained by the Builder.

Original and one photocopy of certificates regarding the vessel's hull, machinery and equipment were delivered to the Owner.

134 DOCUMENTS

Drawings:

All drawings, gauges, name plates, notice board etc. are written in English letters and Arabic numerals.

Plan approval:

Four copies of all major construction and arrangement drawings as mutually agreed were submitted to the Owner for approval. Approval time was seven working days from receipt of drawings to despatch of drawings. All drawings were acknowledged on receipt by telex and advance advice of modifications was by telex.

Principal drawings concerning pipe systems and foundations for the main engines gear boxes and alternator seatings, auxiliary engines and winches shall be approved by the makers and submitted to the Owners.

Finished Plans:

Three fully corrected copies of all "As Finished" drawings and all instruction books in English were provided. In addition one complete set of reproducible copies of all major drawings as mutually agreed were delivered to the Owner.

Progress Photographs:

The Builder took progress photographs illustrating progress of work from start of construction until and including trials and delivery. The pictures show selected views which best depict the progress made.

At launching and thereafter, photographs included progress made in the various interior spaces such as engine room, auxiliary machinery rooms, control rooms, shops, stores, accommodations and offices.

Twelve sets of colour photographs and negatives of the completed Vessel were submitted to the Owner. These included at least four (4)) views of the Vessel's exterior, one or more views of machinery spaces, research spaces, quarters, galley and mess, stores, workshops and control rooms.

14 EXAMINATIONS, TESTS AND TRIALS

143 HULL, SUPERSTRUCTURE AND DECKHOUSE EXAMINATIONS

1431 X-RAY EXAMINATION

The welds in the hull were examined by X-ray. X-ray examinations were made primarily in respect of the shell plating and the strength deck.

The X-ray pictures were taken according to an X-ray examination drawing, which was drawn up by the Designer together with the Classification Society.

The pictures complied with the requirements to Mark 3, green, of IIW's "Collection of Reference Radiographs of Welds".

Any defective welds were opened. The opened weld was rewelded so that exceptionally high stresses did not arise in the plates.

1432 WATERTIGHTNESS TESTS

The tank constructions and their tightness were tested by means of air or water pressure.

The shell, watertight bulkheads, decks, and other structures that had to be watertight were hose or air tested before the wall linings were inserted.

The seawater inlets were pressure-tested like the tanks.

144 TESTS AND TRIALS

The vessel and its systems and equipment were tested in accordance with agreed procedures.

The test results are recorded in the Commissions Test Records and the Trial Reports prepared by Ship Technology Unit, as builder's consultant.

17 DELIVERY OF VESSEL ETC.

178 DELIVERY

When the ship was completed and all tests had been carried out with satisfactory results, the ship was delivered to the Owner.

The ship was delivered to the Owner in a seaworthy condition with lub. oil, hydraulic oil and fresh water in all systems.

HULL, SUPERSTRUCTURES, DECKHOUSES, CASINGS AND FUNNEL

General Steel Work and Design

All steel material was delivered with certificates issued by Lloyd's Register of Shipping. The shell plates in the ice belt and the areas below are made of RAEX Polar-type high tensile steel which has high notch toughness and low temperature characteristics and high corrosion resistance.

The ice strengthening was designed according to Wärtsilä Marine's experience in the construction of ships sailing in Arctic and Antarctic regions.

The scantlings and arrangements are in accordance with the requirements of the Classification Society notation 1A Super and in addition comply with the Arctic Shipping Pollution Prevention Regulations for Arctic Class 2, with Class 3 hull strength in bow and stern.

Structures were analyzed to avoid harmful vibrations originated from engine or propeller impulses. Girders, transversals, beams and plate panels were checked to avoid resonance with critical impulses.

The vessel was electrically welded throughout in accordance with Class requirements and with Class approved Builder's standard. Automatic electric welding was used where applicable. All electrodes were class approved and appropriate for the material being welded. Welding was continuous in general, but intermittent welding was accepted in Dry Spaces. As submitted to, and approved by owner. X-ray examination of welding was carried out according to Classification Society Requirements and good Shipbuilding Practice Requirements, and Owners reasonable request.

Local reinforcing was provided around hawse pipes and anchor pockets, sea chests, and decks in way of deck machinery and fittings. This reinforcement was provided by the use of heavy insert plates, no doublers were used in the vessel except for name and draft marks.

Deformation due to welding which could be injurious to strength or function were corrected by spot or line heating methods to meet Classification Society approval.

All plate work and repairing work was done according to J.S.Q.S. standards.

21 HULL

211 AFTERBODY

The stern frame is of welded plate construction. Behind the rudder an ice knife of welded plate construction is fitted.

The shaft bossings are of welded construction. The aft end of the boring is supported by an end casting welded to the structure.

Necessary eye plates for lifting of propeller and rudder are fitted to shell structures. Screwed plates/eyes stowed on board, and screwed S.S. plugs fitted.

212 FOREBODY

The lower part of the stem is made of steel casting into a V-shape. The upper part of the stem is built of plates and shaped as a soft nose. The stem is supported by brackets and diaphragms.

The forebody contains forepeak, stores room, chain lockers, and bow thruster compartment.

Chain Lockers

Chain lockers are constructed with all stiffening on the outside. Perforated false bottoms are fitted to the chain lockers with bilge suction fitted to drain the space beneath the perforated plates. Chain lockers are of sufficient volume to accommodate anchor cable and are self stowing.

End of chain cable is fastened to chain locker side in Deck Store. An access hatch to the chain lockers is provided in the deck store and suitable recessed foot/hand holds fitted. Anchor pockets are arranged forward, port and starboard.

213 BOTTOM CONSTRUCTION

The vessel has a complete cellular double bottom with tanks suitably fitted as appropriate for the carriage of water ballast. No permanent oil storage tanks are installed in the double bottom.

Particular attention was directed to the hull structure in machinery spaces. Floors and longitudinal girders in the double bottom are of extra heavy scantlings and welded together to form a rigid cross-braced structure.

Tanks in the double bottom and deep tanks are arranged as per the General Arrangement. All floors and girders inside tanks are arranged for easy flow of liquids to the suction boxes.

214

BULKHEADS

The ship is provided with watertight bulkheads according to the General Arrangement, subdividing her below 2nd deck into watertight compartments.

Transverse and fore and aft bulkheads are provided and positioned to meet the statutory requirements.

Longitudinal structure continuity is maintained where possible. Where this is not practicable, suitable compensation is provided.

Vertical continuity of structural members is maintained. The superstructure and deckhouses are adequately supported by a series of continuous webs and bulkheads.

The accommodation bulkheads are made of steel where necessary for strength or fire-safety reasons. Secondary bulkheads are; in places stiffened by corrugating.

215

DECKS

All inside decks are without camber.

The helicopter, upper deck and 1st Bridge Deck are stiffened longitudinally, decks below have transverse stiffening. The helicopter deck landing area is dimensioned for loaded medium lift helicopter, e.g. Sea Hawk operations.

Decks are strengthened locally where necessary to carry loads which are in excess of those of the Classification Society.

Solid bulwark of steel plate is built on the 2nd and upper deck and on the forecastle deck.

216

SHELL PLATING AND FRAMES

The frame spacing is 600 mm in aftbody to frame 44, 800 mm amidships and 600 mm in forebody from frame 87 forward. The side frames are supported by a system of web frames and stringers.

The ice belt is provided with intermediate frames, spacing 300 or 400 mm.

Reinforcements are provided in way of the hawse pipes.

22 SUPERSTRUCTURES

Superstructure is arranged as per GA.

Superstructure decks have transverse beams with longitudinal girders supported on pillars and bulkheads.

221 LARGE DECKHOUSES

Accommodation decks are built without camber or sheer.

The weather decks are provided with a fall at deck sides, 20 mm/1000 mm.

The accommodation bulkheads are stiffened by corrugation or with stiffeners where necessary for structural strength. Minimum plate thickness 4.0 mm.

223 FUNNEL

The funnel is made of shipbuilding steel.

Inside the upper part of the funnel there is a cover.

Outside the upper part of the funnel is a water flume.

The funnel is equipped with necessary openings and ladders.

23 SEATINGS

Structures under seatings are strengthened.

Seatings are provided with necessary openings for drainage, service and piping.

231 MAIN ENGINE AND REDUCTION GEAR SEATINGS

The two main engines and the reduction gear are placed upon the same seating on the tank top.

The seatings were approved by the engine manufacturer.

232 AUXILIARY ENGINES AND APPARATUS SEATINGS

Each auxiliary diesel engine and its generator are placed upon a common base plate, which is resiliently mounted on the hull seating.

Large noise-emitting auxiliaries, i.e. compressors and pumps, are resiliently mounted.

233

DECK MACHINE AND DECK APPARATUS SEATINGS

Deck machinery and deck apparatus seatings were dimensioned according to the biggest static and dynamic forces.

3 HULL AND DECK EQUIPMENT

General

All deck machinery and mooring parts are capable of operating in temperatures of -35 degrees centigrade, excluding the deck machinery which was supplied by A/S Hydraulik Brattvaag which is capable of operating in temperatures of -20 degrees centigrade.

31 HULL EQUIPMENT

310 CARGO HOLD

The cargo hold is arranged as per G.A.

The hold is designed for storage of 9 (nine) 6.1 m long 2.6 m high containers in lower hold and 10 (ten) on tween deck, unit load of 24 tonnes. (3rd deck loading is 5.0 tonnes per square metre) 3rd deck and tween deck are suitable strengthened for fork lift truck operations of 5 tonnes load capacity.

Flush connection boxes to enable connecting to 4 container laboratories to supply hot and cold fresh water and salt water, compressed air, stabilized 240 V power and telephone system.

The cargo hold is certified for storage of dangerous goods including jet fuel with 38 deg. C flash point in drums as per relevant regulations and certificates.

The cargo hold is fitted with flush lashing points.

311 HATCH COVERS

3111 STEEL HATCHES

All hatches are watertight or weathertight to class/DOT requirements and to Builder's standard with Owner approval. All bolted hatches will be secured with stainless steel studs and brass nuts or equivalent. All hinged hatch covers have counterweights, and all flush hatch covers have lifting arrangements and sealing of approved type.

Hatches are arranged as per G.A.

The weather deck cargo hold hatch covers are of end-folding type, weathertight and hydraulically operated. The covers are equipped with steel coamings Mac Gregor-Navire type.

The tween deck hatch covers are of pontoon type. Tween deck and weather deck hatch cover is 2.5 tonnes per square metre loading. Container unit load is 24 tonnes.

C a r g o H o l d H a t c h C o v e r s

- /1 One hatch cover on upper deck to tweendeck hold, with a clear opening of abt. 13.8 x 12.8 m.
- /2-5 Six pontoon type hatch covers on 2nd Deck to lower holds 1 and 2 with clear openings of abt. 6.5x 10.3 m and 6.5 x 12.8 m.

Hatch covers of pontoon type to be capable of being removed from vessel and used as pontoon bridge or floating platform.

S t o r e H a t c h C o v e r s

- /6 One hinged hatch cover on upper deck to provision store, clear opening abt. 1.4 x 1.4 m. The provision hatch has doors to tween deck hold on 2nd deck and provision handling spaces on 2nd and 3rd decks.
- /7 One hinged hatch cover to deck store at bow, clear opening about 2.5 x 2.0 m.
- /8 One flush hatch cover on helicopter deck, clear opening abt. 2.0 x 2.0 m.
- /9-10 Two flush hatch covers on 2nd deck aft, one clear opening abt. 2.0 x 1.5 m and one 2.0 x 2.5 m, hydraulically operated.
- /11 One flush hatch cover on helicopter deck, clear opening abt. 6.3 x 2.6 m
- /12 One hatch cover on 2nd deck, port side, in engine service space, clear opening abt. 1.5 x 1.5 m
- /13 One flush hatch cover on 3rd deck for service of thruster clear opening abt. 1.2 x 1.6 m.

312 RAMPS

3124 STERN SLOPE

A stern slope of about 4.0 metre width is arranged at the stern. Bulwarks around its perimeter. The stern slope is suitable for stern trawling.

313 ACCESS AND SERVICE HATCHES

3133 ACCESS HATCHES

Access hatches are fitted where necessary. The hatches have appropriate closing and opening outfit and sealing. The installation is flush where necessary. The clear openings are 600 x 600 mm or 800 x 800 mm or as appropriate. Escape hatches are installed according to the relevant regulations.

3134 MANHOLES

Each hull tank has manholes with bolted covers, mounted in the tank top or bulkhead. The manhole gaskets are of oil-resistant rubber. Covers on the bulkhead are hinged. Handles are mounted as needed. The opening is 600 x 400 mm or as appropriate.

3135 VENTILATION GRIDS

Ventilation grids of painted steel, with steel covers or louvre type shutters were fitted according to Builder's standard.

3136 SERVICE HATCHES

Service hatch types and sizes were fitted according to the Builder's standards to fulfil maintenance and service requirements. In the machinery spaces they enable removal of vital parts of machinery and equipment.

3137 DRAIN PLUGS

All shell tanks are fitted with recessed screwed plugs for draining purposes. The plugs are made of stainless steel in accordance with Builder's standard. The drain plugs are supplied with two special keys.

Drain plugs were fitted away from the keel strake to avoid keel blocks in dry dock.

314 STEEL DOORS

The sizes of the doors were chosen according to the Builder's standard. The doors are fitted with welded steel hinges with pins of stainless steel.

3142 HINGED WEATHERTIGHT AND SPLASHTIGHT DOORS

Exterior doors on the upper deck and 2nd deck leading to accommodation and engine spaces are weathertight. The doors are fitted with oil-resistant rubber gaskets and centrally operated wedge latches. The door openings are provided with an L-bar frame. Sill height according to the relevant regulations.

Exterior doors leading to the wet and oceanographic laboratories compartment and the superstructure from the 2nd deck aft are weathertight with portable coamings. The doors are fitted with oil-resistant rubber gaskets.

The doors to wet lab and oceanographic lab are abt 1200 mm wide.

Interior composition doors with windows and self-closing devices are fitted inside each of these access doors.

The doors on the forward exposed decks are fitted with lobbies.

Water sheds are fitted over all doors which open to the weather. Width of external doors including wheelhouse are abt 760 mm.

External doors with sills are provided with steps and internal hand holds.

3143 INTERIOR STEEL DOORS

The doors of the engine, apparatus and machinery storage compartments in the unlined inner bulkheads are light hinged doors of steel. The light flatbar frame is fitted with antislamming edges of rubber.

The doors are provided with a light rim lock.

315 WATERTIGHT SLIDING DOORS

3151 SLIDING DOORS

Watertight bulkhead doors are installed in accordance with the General Arrangement and the Rules.

/1-4 4 doors in machinery spaces, clear opening 1750 x 760 mm

The doors are horizontally sliding.

3152 DOOR MACHINERY, CONTROL AND ALARM EQUIPMENT

Each door has its own hand-hydraulic actuating mechanism.

The doors can be opened and closed hydraulically and electrically from both sides of the bulkhead and from the wheelhouse.

There are position indication lights locally and in the wheelhouse.

Beside the door there is an alarm bell, which gives a sound signal when the door moves.

316 WINDOWS

Two spare window glasses with sets of packing of each window type are provided if there are five or more windows of the type in question. Otherwise one spare window with set of packing is provided.

3161 SIDE SCUTTLES

The side scuttles are of fixed heavy type with recessed steel frame welded onto the sides and bulkheads. The light opening has a diameter of 400 mm.

The scuttles are provided with deadlights, the glasses have rubber sealings and they are fitted with aluminium frames, which are screwed onto the window frames.

3162 DECKHOUSE WINDOWS

The windows are of openable type with recessed steel frame welded onto the sides and bulkheads, light opening is 400 x 600 mm, glass thickness 10 mm. The glasses have rubber sealings and they are fitted with aluminium frames, which are screwed onto the window frames.

Window boxes are made of glass fibre.

3163 WHEELHOUSE WINDOWS

Special care was taken with the wheelhouse to ensure good visibility.

The windows have a light opening of 1000 x 1100 mm or as appropriate and welded steel frame. Glass thickness 15 mm.

Top of window openings is abt 1900 mm from top of finished deck.

The wheelhouse windows are sufficiently equipped with wipers, heaters and a hot water-wash system, which is manually operated from the wheelhouse. Heating air ducts cover windows.

3164 AFT CONTROL STATION WINDOWS

Four windows have wipers, heaters and hot water-wash system which is manually operated from the aft control station.

317 STAIRWAYS, LADDERS, PLATFORMS

3171 STAIRWAYS

All stairways are of steel and welded to their place, the width of the stairways is at least 700 mm. The maximum angle of inclination is 45 degrees.

The interior stairs have stringers and closed steps of steel plate. The interior stairs are coated with vinyl carpet and fitted with non-slip strips of stainless steel.

The door and the ladder to the net store have a clear width of 1000 mm.

3175 LADDERS

Ladders and rails are in general 50 degrees to horizontal and in a forward and aft direction where possible.

Steel companion ladders are abt 800 mm wide with runners of flat bar and step of chequered plate. Companion ladders on open deck were galvanized.

Vertical ladders are abt 350 mm wide with runners of flat bar and rungs of square bar.

Steel guard rails are of four-course steel pipe with stanchions of flat bar, stayed at every second stanchion or as appropriate.

3176 PLATFORMS

Where the service and control of the deck equipment so require, small platforms are installed. The platforms are made of grill plate; the smaller ones are fixed, the bigger ones fastened with screws.

318 BULWARKS AND RAILINGS

3181 STEEL BULWARKS AND RAILINGS

Solid bulwark of steel plate is built on the 2nd and upper deck and on the forecastle deck, and the whole fore deck is covered by a steel structure to protect the mooring and anchoring equipment.

Around the outer decks a pipe railing is installed, height c. 1060 mm. The top rail is of galvanized steel tube and additionally 3 intermediate rods of thinner galvanized tube. The stanchions are of flat bar.

3184 STORMRAILS AND WASHING BERTHS

Storm rails of galvanized steel tube, 42.4 x 3.25 mm, are welded to the deckhouse bulkheads where needed.

3187 RAILING ON HELICOPTER DECK

A railing consisting of hinged sections with safety nets, width min. 1.5 m, is fitted around the deck perimeter. The net is made of wire mesh and is stretched between stanchions of galvanized steel tube. At the perimeter of the net there is a 5-mm galvanized steel rope.

319 OTHER HULL EQUIPMENT

3194 FASTENING OF CARGO

In the cargo holds, fastening ears and eyes for the cargo are mounted according to an arrangement approved by owners.

On 2nd deck aft, threaded 24 mm lashing holes are arranged with 1 m diameter spacing. 20 eye bolts and 120% screwed caps are provided.

The upper deck forward and 2nd deck aft have suitable lashing eye arrangements (along bulwark and hatch coamings) for securing of deck cargo.

3195 FASTENING OF HELICOPTERS

The helideck and hangar are covered by an efficient system of lashing points on the decks and hangar bulkheads for the lashing of helicopters.

3196 OTHER FASTENING DEVICES

The shell plating is provided with sockets for detachable lifting eyes for lifting of the rudder, propeller blades and propeller shaft.

32 ANCHOR EQUIPMENT

321 NORMAL ANCHOR EQUIPMENT

3211 WINDLASSES

/1-2 Two electro-hydraulic anchor windlasses with warping head and mooring drum are placed on the covered upper deck.

Remote control for the brake; length and speed indicators for the cables are installed in the wheelhouse.

3212 BOW ANCHORS

/1-3 4 Hall type stockless anchors, of weight 3540 kg. The two spare anchors are stored on the fore deck.

3213 ANCHOR CHAIN FOR BOW ANCHORS

The anchor chain is of high-tensile steel (U 3), 9 shackles on port/side and 10 on starboard. The chain is connected to the anchor with a swivel shackle; joining shackles are of "Kenter" type. The chain cable is self stowing in chain locker.

3214 CHAIN STOPPERS

/1-2 The mouths of the hawse pipes are equipped with chain stoppers with integral roller.

Lashing arrangements are provided for securing the anchors.

3215 HAWSE PIPES

Chain pipes leading from the windlasses to the chain lockers are made of steel plate. Rounded stiffening rings are welded to the lower part of the pipes.

The hawse pipes provide ample clearances for chain and anchor. The hawse pipes are provided with substantial chafing lips at shell.

The upper ends of the hawse pipes are fitted with covers.

The hawse pipes are fitted with sea-water washing.

33 MOORING AND TOWING EQUIPMENT

331 MOORING EQUIPMENT

3311 CAPSTAN

/1-2 Two electro-hydraulic capstans on the 2nd deck aft.

The local control stand is mounted on the deck.

3312 BOLLARDS

/1-8 Bollards are of welded construction and are installed in accordance with the approved mooring arrangement drawing.

- 8 bollards, size ND 350

Provision is made for mooring of lighter craft alongside both sides of the ship by recessed securing points.

3315 PANAMA BOWS

/1-7 Panama bows are made of cast steel. They are welded to the bulwark or fitted on the decks as follows:

- on the upper deck forward:
 - 2 bows, opening 300 x 250 mm
 - 1 bow for towing, opening 350 x 250 mm
- on 2nd deck aft:
 - 4 bows, opening 300 x 250 mm

3316 ROLLER FAIRLEADS

/1-2 Two fairleads in the fore bulwark. The rollers are made of cast steel.

/3-4 Two fairleads, placed on 2nd deck aft. The rollers are made of cast steel.

3317 MOORING ROPES

/1-10 10 polypropylene ropes

- length: 220 m
- breaking load: 250 kN

Both ends of the ropes are fitted with eyes.

/11 1 wire rope

- length: 220 m
- breaking load: 250 kN

/12 1 wire rope on spool in deck store forward

- length: 1000 m
- diameter: 8 mm

333 TOWING EQUIPMENT

3337 TOWING WIRES

/1 1 Smit-type towing bracket.

/2 1 towing wire, forward

- length: 200 m
- construction: 6 x 36 strands
- breaking load: 691.4 kN

Both ends of the rope are fitted with an eye.

/3 1 towing chain, with shackle for fastening of towing wire to Smit-bracket

- length: 5 m
- breaking load: 691.4 kN

/4 - towing bridle of minimum 50T SWL designed for securing to the 4 aft bollards fitted. Stowed in aft rope store.

34 STEERING EQUIPMENT

341 RUDDER

3411 RUDDER BLADE

/1 One partially balanced semi-spade rudder is installed.

The rudder blade is of streamlined all-welded double-plate type. The local strength of the rudder blade corresponds to that of the afterbody at the same height.

The rudder is equipped with stainless steel plugs at top and bottom. The rudder was pressure tested and preserved on the inside with rust preventing composition.

The rudder is protected against ice loads when going astern by an ice knife.

3413 RUDDER STOCK

/1 The rudder stock is manufactured of forged steel.

The rudder stock and steering gear are connected without key. In way of the pack box the stock is covered with stainless steel.

3414 RUDDER BEARINGS

/1-2 A grease-lubricated carrier bearing with a pack box is mounted on top of the rudder trunk. The pack box can be surveyed from the steering gear room.

A water-lubricated neck bearing is mounted at the bottom of the rudder horn. The bearing is of steel and lined with bronze or equal.

The conical rudder pintle of stainless steel is secured with a nut.

342 STEERING MACHINERY AND ITS CONTROL

3421 STEERING GEAR

/1 1 steering gear

The ship is equipped with one electro-hydraulic rotary vane system.

The steering gear is of automatic fail-safe type fulfilling the requirements of the first set of amendments to SOLAS-74. The steering gear has automatic centering of the rudder when astern pitch is activated (with override) when using the joystick system.

The steering gear comprises two identical, independent and separate power units with auto start up upon first system failure.

Each unit consists basically of

- one hydraulic pump connected to electric motor
- hydraulic oil tank
- hydraulic cooler

M a i n P a r t i c u l a r s

Normal rudder angle	2 x 35
Rudder angle to mech. limit of machinery	2 x 37

Turning time of rudders with the ship running at full speed:

+35 - 30 with one pump unit	under 20 sec.
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P o w e r S u p p l y

Two separate feeder cables are arranged; one directly from main switchboard and one through the emergency switchboard.

Two separate control systems from the bridge are arranged. Power circuits, control systems and the associated components, cables and pipes are separated as far as practicable throughout their length.

Steering gear pumps are capable of being locally started, and remotely started and stopped from the bridge.

Alarms on the bridge and in the engine control room for and for low level in hydraulic oil tanks.

M o d e s o f O p e r a t i o n

- Electric follow-up steering from the centre wheelhouse consol.
- Electric non-follow-up steering from the bridge wings, aft control station and starboard side of centre consol.
- Local control of rudder in steering gear room is done by pushing the ends of the solenoid valves manually
- Automatic pilot steering
- Joystick control interface.

3424 RUDDER ANGLE INDICATORS

Besides a mechanical angle indicator on the steering gear, an electric rudder angle indicator system with seven repeaters with illumination is provided:

- one in wheelhouse of 3-way ceiling type, with dimmer
- two on bridgewings, with dimmer
- one in engine control room
- one in steering gear room
- one in aft control station
- one in helmsman's position

343 SPECIAL STEERING EQUIPMENT

3431 THRUSTERS

Particular care was taken in the installation of all thrusters in order to minimize noise and vibration being transmitted to superstructure areas.

Thruster motors are rated for continuous operation and to have I.P 23 S enclosure.

The thrusters are controlled and started & stopped from the bridge, and the bow thruster from the aft control station. Automatic overload protection is provided. Aluminium sacrificial anodes are fitted in the propeller tunnels.

- /1 An electric-motor-driven side thrust unit of 800 kW with controllable pitch is installed at the forward end of the ship.

The pitch in the thruster propeller is actuated hydraulically.

The system consists of the following components:

- gravity oil tank
- hand-operated draining tank
- hydraulic power pack

- /2-3 Two retractable azimuth type thrust units of 400 kW each are installed in the aft part of the vessel capable of each producing six tonne thrust at 5 knots in Beaufort force six weather conditions. The thrust units are rotatable 360 degrees, and they have fixed pitch propeller in the nozzle.

The drive is DC electric motor with thyristor controls. The propeller speed is fully controllable from 0 rpm to maximum rpm.

3432 JOYSTICK SYSTEM

- /1 One joystick system to control rudder, CPP, bow thruster and two azimuth thrusters is installed. The main consol panel is fitted to the centre consol with slave panels on the bridge wings and the aft control station console. The system has interfaces and software for wind compensation.

35 RIGGING

351 CRANES

3513 DECK CRANES

- /1 One electro-hydraulic deck crane is installed forward on upper deck. The crane is designed to serve the cargo hold.

Particulars:

- lifting capacity 25 t @ 21m, 30t @ 17.5m
- max. outreach 21 m
- min. outreach 3 m
- hoisting speed 22 m/min stepless
- slewing speed 1.2 rpm
- max. initial heeling 5
- max. initial trim 2
- heated cabin, window wipers and defrosters and AC power outlet
- ancillary single whip 5 tonne S.W.L. winch.

- /2 One electro-hydraulic low-profile deck crane is installed on top of the helicopter hangar to serve the helicopter deck.

Particulars:

- lifting capacity 7 t @15 m, 14t @ 7.5m
- max. outreach 15 m
- hoisting speed 20 m/min
- slewing speed 1.2 rpm
- max. initial heeling 5
- max. initial trim 2

The crane is equipped with a control station at an open platform and a remote portable panel control.

- /3 One electro-hydraulic deck crane is installed in front of deckhouse on the 2nd bridge deck. The crane is able to serve the aft parts of cargo hold, provision hatch and over port side of ship

Particulars:

- lifting capacity 2 t
- max. outreach 7 m
- hoisting speed abt. 20-30 m/min
- slewing speed abt. 1.5 rpm
- max. initial heeling 5
- max. initial trim 2

This crane is equipped with a local platform control and a remote portable panel control.

3514 SPECIAL LIFTING DEVICES

/1 1 gantry traversing lifting beam in the stern.

Particulars:

- lifting capacity 4 t
- lifting height 5 m
- outreach 4 m over transom, inboard to frame 27
- width 6000 mm
- Local control from a portable consol panel and remote control from the aft control room.

/2 1 combined side door / gantry crane

The CTD courtyard is fitted with a hydraulically operated vertically hinged side door. The door has an integral gantry rail which allows the oceanographic winch deployment pulley to be driven from the courtyard directly out under the open door. There is a removable rail in way of the opening. There is a hero platform provided aft of the beam.

The side door/gantry crane is used for launching of the CTD instrument and other scientific equipment.

Particulars:

- lifting capacity 2 t
- door size abt. 2000 x 3500 mm

353 MASTS, FLAGSTAFFS

3531 MASTS

S i g n a l & R a d a r M a s t s

A self supported signal and radar mast is mounted on top of the wheelhouse. Provision is made for all required lights and sound signals. The two radar antennas are mounted on this mast. Access for servicing the above equipment is provided. Blocks and halyards for flags and signals are provided. A video camera is mounted at the top of the mast.

F o r e m a s t

A foremast of welded steel construction with flag lines, navigation lights, deck lights and searchlight for ice navigation is arranged as far forward as possible on fore castle.

36 BOAT EQUIPMENT

All life saving equipment, 133 persons, is fitted in accordance with SOLAS-74, including Amendments from 1981 and 1983 and in compliance with D.O.T.C. requirements.

361 LIFEBOAT EQUIPMENT

3611 LIFEBOATS

/1-2 2 enclosed lifeboats

Material: fibre glass
 Speed: 6 knots
 Capacity: 70 persons

3612 BOAT DAVITS

/1-2 2 sets of gravity davits with electric winch for hoisting of lifeboats lowering by gravity.

Davits, davit motors, davit wire and wire drums as well as davit manoeuvre stations are manufactured, tested and arranged in compliance with the IMO rules.

362 LIFE RAFT EQUIPMENT

3621 LIFE RAFTS

/1-6 6 inflatable life rafts, each for 25 persons, are placed in fibre glass containers.

Life rafts are of davit launched type and equipped according to IMO rules.

3622 LIFE RAFT STANDS

Stands for 6 life rafts are provided.

363 SPECIAL BOAT EQUIPMENT

3631 RESCUE BOATS

/1-2 2 rescue boats of inflatable Zodiac type are fitted.

364 GANGWAYS

3641 ACCOMMODATION LADDERS

/1 1 ladder of abt. 12 m, free width 600 mm, with collapsible side stanchions and rope rails.

/2-3 2 pilot access rope ladders, complying with DOT requirements.

/4 One 6 m gangway is supplied.

365 MISCELLANEOUS DAVITS

3651 LIFE RAFT DAVITS

/1-2 2 single-arm life raft davits are placed one on each side. The davits have fixed slew position and manual outreach and they are equipped with built-on hand winches and automatic release hooks.

3652 RESCUE BOAT DAVITS

/1-2 Rescue boat davits are electrically operated. Lifting speed for fully equipped boat with 6 persons is about 18 m/min. Lowering speed is estimated 47 m/min. Quick release/reconnection to be utilized. Davit brake control also from boat.

3653 ACCOMMODATION LADDER DAVITS

/1 One davit with its own electrically driven winch with is fitted for gangway.

37 NAVIGATION AND RADIO EQUIPMENT

371 ELECTRIC NAVIGATION EQUIPMENT

3711 GYROCOMPASS

/1 1 navigation gyro compass with outputs to radars, satellite navigation system, five repeaters and additional outputs to owners approval. The two wing repeaters are equipped with azimuth rings.

/2 1 (back up) gyro to be fitted.

3712 AUTOPILOT

/1 One autopilot

One Adaptive auto pilot with control and indication unit installed in the steering console in the wheelhouse. Feedback unit in the steering gear room. Input from gyro compass, magnetic compass and satnavs for auto way point navigation.

3713 RADARS

/1 One 10-cm radar, 30-kW transmitter

/2 One 3-cm radar, 25-kW transmitter

/3 One 16" "ARPA" raster scan type display unit in the wheelhouse. The unit will be fitted with electronic bearing and variable range marker, rollball for marker positioning, automatic target acquisition and tracking of up to 40 targets in ARPA part, readout of target data, video mapping facilities for fairways etc.

- /4 One 16" "RM" raster scan type display unit in the wheelhouse.
- /5 One slave display for either radars unit at aft control station.
- /6 One interswitch unit for radars and display units.
- 3714 ECHO SOUNDER
 - /1 1 navigation echo sounder with graphic and digital display.
- 3715 LOGS
 - /1 One electro-magnetic speed log with analogue read out at console in wheelhouse, bridge wings and aft control station with input to satellite navigator, radars and data logging system.
- 3716 RADIO DIRECTION FINDER
 - /1 1 UHF radio direction finder.
 - /2 1 M/HF radio direction finder. One loop antenna included.
- 3717 RADIO NAVIGATION EQUIPMENT
 - /1 Satellite navigator including: speed and heading interface, interfaces for computer and remote displays. GPS and dual channel transit capability with battery back-up included.
 - /4 1 distance measuring equipment for helicopter operations.
 - /5 1 non-directional beacon for helicopter support.
- 3718 DRAFT INDICATORS
 - /1-2 2 electric draft indicators are installed, one in stem and one in stern.

Indicators scaled in metres are in the wheelhouse.
- 372 MECHANICAL NAVIGATION EQUIPMENT
- 3721 MAGNETIC COMPASS
 - /1 Magnetic compass, projector type with one spare bowl. Binnacle mounted on wheelhouse top, with periscope in way of steering position and dimmable illumination and auxiliary auto pilot feed.

373 SIGNALLING EQUIPMENT

3731 NAVIGATION LIGHTS

Navigation lights are provided in compliance with National & International requirements. Two sets both electric 240 volt and powered by separate means according to the Rules.

The following twin-type navigation lights are firmly mounted:

- /1 1 SB side light
- /2 1 PS side light
- /3 1 forward mast light
- /4 1 aft mast light
- /5 1 stern light
- /6 1 anchor light, stern
- /7 1 anchor light, aft
- /8-11 4 lights, red
- /12-13 2 lights, white
- /14 1 towing light
- /15-16 For control of the navigation lights, there is 2 navigation light control panels

3732 SIGNAL LIGHTS

- /1 1 manoeuvring light is mounted on the radar mast
- /2 1 daylight signalling lamp, in ready use rack and power point (P & S) plus portable emergency battery
- /3 1 set of helicopter landing lights
- /4 1 Panama Canal light
- /5 1 set of Suez Canal signal lights

3733 SEARCHLIGHTS

- /1-2 2 searchlights with xenon lamps, c. 1000 W, mounted on wheelhouse top. Remote control from wheelhouse.
- /3 1 searchlight with xenon lamps, c. 1000 W, mounted foremast. Remote control from wheelhouse. Electric focusing and rhodium reflector.

3734 WHISTLES

- /1 1 air whistle, 130 - 150 Hz
- /2 1 air whistle, 250 - 330 Hz
- /3 1 automatic whistle and signal light control.

3735 SHIP'S BELLS

- /1 1 ship's bell of bronze, 15" diameter.

374 SPECIAL EQUIPMENT FOR NAVIGATION

3742 WEATHER FACSIMILE AND SATELLITE RECEIVERS

- /1 1 automatic MF/HF weather satellite receiver/recorder, including video display, hard copy printer and grid generator.
- /2 1 automatic facsimile receiver/recorder.

375 RADIO EQUIPMENT FOR NAVIGATION

3751 RADIO STATION

- /1-2 Main and reserve MF/HF radio stations including telegraph and telex. Auto keyer provided. 1,6 MHz...30 MHz (all bands).
- /3 1 watch receiver for 500 kHz distress frequency
- /4 1 watch receiver for 2182 kHz distress frequency
- /6-7 2 EPIRB's - transmitting frequency 12.5 MHz.

3752 RADIO TELEPHONE SYSTEMS

- /1-5 5 VHF radio telephones, 25 W.

LOCATIONS:

- 1 in wheelhouse
- 1 in radio station
- 1 in voyage leader's cabin
- 1 in captain's cabin
- 1 in aft control station

- /6 1 UHF transceiver 1.5 ... 1.6 GHz for Inmarsat communication. Telefax, data transfer and ship's telephone net connection included. One 'Inmarsat' telephone extension in Wheelhouse Console.
- /7 1 aviation frequency transceiver for communication to aircraft.
- /8 1 VHF for helicopter operations.

3753 ANTENNAS

- /1 1 wire antenna.
- /2 1 self-supporting antenna, 15 m, for 1 kW transmission.
- /3-4 2 vertical monopole antennas for VHF/FM transmission in 156...162 MHz range.
- /5 1 UHF parabolic antenna with heated dome, for 1.5 ... 1.6 GHz transmission (Inmarsat).
- /7 1 antenna for 500 kHz watch receiver.
- /8 1 antenna for 2182 kHz watch receiver.
- /9 1 antenna for weather satellite receiver.
- /10 1 antenna for facsimile receiver.

3754 EMERGENCY TRANSMITTER FOR LIFEBOATS

- /1-2 2 emergency MF/HF transceivers for 500 and 2184 kHz for lifeboats.

3755 PORTABLE TRANSMITTERS

- /1-8 8 portable VHF/ transceivers (walkie-talkies)
- /9-15 6 UHF transceivers (walkie-talkies) with chargers.

376 INTERNAL COMMUNICATIONS

3762 SOUND-POWERED TELEPHONE SYSTEM

A sound-powered telephone plant is provided, with telephone sets in the following spaces:

- bridge
- aft control station
- captain's cabin
- chief engineer's cabin
- machinery control room
- engine room
- emergency generator room
- steering gear room
- CO2 room

3763 TALK-BACK SYSTEM

1 Talk-back intercom system is provided, as an integral part of the telephone system.

3764 AUTOMATIC TELEPHONE PLANT

A fully automatic telephone plant is installed with sufficient lines capable of 20 simultaneous conversations.

The following telephone sets are installed:

- flush-mounted sets in engine control console, aft control console and bridge control console
- watertight wall-mounted sets for deck store, emergency generator room and galley
- non-watertight wall-mounted or desk sets for accommodation, office and mess rooms, laboratories, public spaces, workshops and steering gear room
- wall mounted telephone with headphones in machinery spaces
- plug-in portable unit for bunker stations
- input to public address system

377 CENTRAL RADIO, CENTRAL ANTENNAS, CENTRAL CLOCK, TV EQUIPMENT

3771 PUBLIC ADDRESSING AND TRANSMITTING PLANT

An integrated public address and entertainment system is incorporated into the telephone system.

Central amplifier system is installed, consisting of:

- 1 central amplifier rack with
 - 1 FM/AM radio
 - 1 CD-player
 - 1 cassette recorder

3772 CENTRAL ANTENNA NETWORK

A common antenna for TV and radio is fitted on the wheelhouse top.

Outlets for radio in wheelhouse, research areas, messroom, public rooms and all cabins.

Outlets for TV in messroom, cabins and public rooms.

Receivers see Item 4633.

3773 CENTRAL CLOCK

2 main quartz-run clocks with analoge repeaters in

- crew cabins
- recreation rooms
- laboratories
- galley
- control rooms
- voyage leader's cabin.

3774 STEREO SYSTEM

1 stereo system is installed in the lounge, capable of

- cassette
- radio
- CD playing

3775 MONITORING SYSTEM

The ship is fitted with a monitoring system with three cameras positioned for coverage of the helideck, aft deck, and the third camera on the top of the radar mast. Electric cabling is installed for retrofitting of an additional 2 cameras in the engine room.

The cameras have:

- X/Y axis control
- auto focus
- heated covers
- lens washing/wiping

The cameras are controlled from the display monitors which are located in the wheelhouse, aft control room, voyage leader and captains cabins.

The monitors are also interfaced to the satellite navigation system so as to display the ship's position.

378 ALARM EQUIPMENT

3781 GENERAL AND FIRE ALARM

G e n e r a l S h i p ' s A l a r m

In compliance with the rules, general alarms are arranged all over the ship, well audible, by means of alarm bells.

The system is fed from the 240V emergency network, and the alarm is released from the bridge.

The general alarm is also used for the fire alarm system.

F i r e - d e t e c t i n g P l a n t

Fire alarm and detecting plant is installed according to the rules as follows:

- The central unit is arranged in the wheelhouse.
- Thermocontacts are arranged all over the ship according to the rules. (All cabins, saloons, messrooms, etc.).
- Thermocontacts and ion-smoke detectors in helicopter hangar, engine room, etc., according to the rules.
- Manual alarm push buttons behind glass in the alleyways according to the rules.
- The panel in the wheelhouse shows clearly and readably each deck of the vessel and all groups of fire detectors and manual fire alarms.

- Engine room fans stop automatically on halon discharge.
- Feeding from a separate 24V alkaline battery.

Fire Doors, Alarm and Indication System

All fire doors which have open restraining devices, are equipped with electromagnetic door holders strong enough to secure that the doors do not close by the ship's movements.

At each door push buttons are placed to release the door.

In the wheelhouse is a light tableau equipped with control lights indicating the open and closed position of each door, and a switch to release all the doors simultaneously.

The system is fed from the emergency network.

3782 GAS ALARM

Gas detection system for the helicopter hangar spaces with detectors and a central panel in the wheelhouse and alarm indication also in the engine control room is installed.

38 SPECIAL EQUIPMENT

383 SPECIAL CARGO LASHING DEVICES

3833 CONTAINER LASHING EQUIPMENT

Flush type twistlock pockets are provided for 20 ft ISO C type containers as follows:

- lower holds	9 containers
- tween deck	10 "
- upper deck, fwd	2 "
- upper deck, hatch cover	10 "
- 2nd deck aft	2 "
- helideck	2 "
- upper deck sides	4 "

385 LIFTS

3853 CARGO LIFTS

/1-2 Two electric lifts are installed, one for provision stores and one for net store/2nd deck, each having:

- load 100 kg
- speed 0.4 m/s
- hinged doors

Inside dimensions of the car are 800 x 800 mm. 124

386 SPECIAL EQUIPMENT IN DECKHOUSES

3862 OUTFIT FOR HELICOPTERS

/1 Helipad

Aft of deckhouse is a helipad approved for Sea Hawk rotor diameter operations. Helipad is strengthened for operations by Seahawk helicopters.

Helipad is equipped for night operations as per the Australian regulations and refuelling and securing of one helicopter at a time.

Folding railing see Item 3187.

The helideck is covered by a system of flush lashing points which are of 5 tonne SWL.

/2 Hangar

Hangar for two sea hawk helicopters is situated forward of helipad. Mechanically operated door, free height of a minimum of 5 metres, dimensioning for 80 knots wind when closed, 50 knots during operation. The door is supported in the closed position to prevent flexing. Personnel door at side.

The hangar is outfitted with:

- air heating
- ventilation
- lighting
- compressed air/fresh hot and cold water supply
- fire indicators/fire fighting equipment
- fixing points and guides for bringing helicopter into hangar
- working table with vice and two cabinets
- Lashing system of flush points on deck and bulkheads.

/3 Helicopter winching system

Two-winch system with one controller for bringing the helicopter into the hangar. The system to be able to work at 2 degrees trim and +5 degrees rolling.

/4 Helicopter refuelling system

See separate description.

387 STABILIZERS

3872 STABILIZER - HEELING SYSTEM

Intering stabilizer-heeling system with one pair of stabilizer/heeling tanks and one pair of heeling tanks are provided. The tanks are connected by water cross ducts and the stabilizer tanks also by air ducts. 125

The total stabilizing moment obtained is abt. 850 tm and the heeling moment abt. 1700 tm. The system is able to produce a static heel of abt. 4 deg. using one tank pair and abt. 7.5 using two tank pairs. The efficiency range in the stabilizing mode covers roll periods from 10 to 20 seconds. The time needed to shift the heel from 7.5 to one side to 7.5 to the other side is about 180 seconds.

/1-2 Blower units

Air for the heeling mode is taken from two blower units.

Compressed air consumption (working pressure of control air 10 bar) will be supplied from the starting air system through a reduction valve.

/3 Valve group

A valve group, placed near the blower units, controls the heeling mode.

/4-19 Stabilizer valves

Totally sixteen stabilizer valves are placed in the stabilizer tank air ducts, to control the stabilizing mode.

/20 Control unit

The control unit will control the stabilizing heeling system automatically. The heeling may also be controlled manually.

On the front doors of the control unit is installed a control panel with a mimic diagram indicating the working position of valves and blowers. The control unit is placed in the machinery space with remote control on the bridge.

388 RESEARCH EQUIPMENT

3881 RESEARCH WINCH SYSTEMS

The following winches are supplied:

- /1-2 - 2 x trawl winches
- main drum 325 x 1400 x 800 mm capable of accommodating 4,000 M of 22 mm dia. wire.
- spooling / tension

- /3 - 1 x net drum
- drum 470 x 770 x 1640 x 2430 mm.
- capacity of 4.2 cubic metres.
- outfitted with wires to connect to trawl sweep lines.

- /4-5 - 2 x oceanographic winches
 - 1 capable of 7000 m of single core 6 mm conducting cable
 - 1 capable of 6000 m of 6 mm wire
 - spooling/tension
- /6 - towing winch
 - capable of 4000 m of 10 mm 1 core conducting cable
 - spooling/tension
- /7-8 - 2 x Gilson winches
 - capable of approx. 40 m wire length
- /1 - towed body winch with deployment beam
- /12 - trawl sonar winch

Central control for all winches with remote readout of major winches statistics. Both oceanographic winches have dual station remote controls.

The system is controlled by the Hydraulic Brattvaag trawl control systems Synchro 1000 and Data Synchro.

A f t d e c k s p e c i f i c a t i o n

(1) Gantry

The aft deck has an electrically driven gantry about 6000 mm long, which can traverse from frame 27 to 4 m over transom. The gantry is of a shape to allow blocks to be fastened and of 4 tonne safe working load. Wandering lead and Aft control room control.

(2) The trawl slope has a clear width of 4000 mm and is designed for efficient commercial scale stern trawling operations.

(3) Fixed stern gallows designed for stern trawl warp blocks are fitted port and starboard.

(4) Two HIAB type cranes are installed on the stern quarters with safe working loads of 0.6 tonnes at 12.5 metres and 5 tonnes at 2.1 metres.

(5) The aft deck has a system of flush threaded sockets for lashings at 1 m diameters. 20 eye bolts and 110 % screw caps are supplied. The Bulwarks have lashing eyes arranged.

Miscellaneous outfit

Included in the scope of supply were necessary snatch and trawl blocks, wires and other miscellaneous items which were required for the operation of the research deployment/retrieval systems.

Specifically the following wires were required:

- 2 x 4,000 metres of 22 mm dia. wire installed on the trawl winches.
- 1 x 7,000 metres of 6 mm dia. Rochester type 1-H 255 installed on Oceanographic winch 1.
- 1 x 6,000 metres of 6 mm dia. wire installed on Oceanographic winch 2.
- 1 x 4,000 metres of 10 mm dia. Rochester type 7-H-374 installed on the towing winch.

3882 RESEARCH RELATED OUTFIT

GENERAL

All laboratories have

- linings and furniture of high quality maritime materials suitable for wet areas
- benches have securing rails front and back
- benches have cupboards and shelves above, with wire storage racks below.
- wet laboratory areas have non slip type tiles, suitably drained to allow hosing of deck space.
- power, double outlets for 240 V/50 Hz every 2 metres of bench space.
- sufficient stabilised/ups power.
- air - 2 outlets with adjustable pressure
- water - hot and cold fresh water and salt water in each sink plus hose facilities in wet areas
- lighting - fluorescent lighting with high intensity over sorting bench areas. Independent lamps positioned every 2 meters over benches.
- communications - telephone.
- ventilation - forced natural and exhaust, air conditioning
- wastes - drainage to holding tank.
- cable trays - all labs have inter connected by open cable trays at deck head level with provision for post delivery running of additional cables. This provision also applies to lab/wheel house, lab/computer room, lab/transducer spaces.

- salt water supply to research spaces via an independent uncontaminated system.

ADDITIONAL SPECIFIC REQUIREMENTS

W e t l a b o r a t o r y

Area is subdivided into a dry and wet section by a clear partition. Dry section has bench, shelf space and provision for installation of monitors and computer terminals.

Benches of stainless steel in wet area.

One fume cupboard.

One standard sink.

One shallow sorting sink abt. 1400 x 1400 to be provided with removable dividers and covers.

One preserving sink abt. 1400 x 900, covered by a fume hood canopy. Fitted with removable covers. The central 400 mm straddled by a rack 700 mm above sink designed for liquid containers.

One lift to net store area, 100 kg capacity.

O c e a n o g r a p h i c l a b .

The oceanographic lab is subdivided into a C.T.D. court yard area and an analysis laboratory.

The court yard has a vertically outboard swinging side door with an over head gantry of 2 tonne SWL. Local control of oceanographic winches. Securing positions for 2 CTD/Rosette apparatus. Separate racks for empty and full water sample bottoms. The full rack is over a sink with a manifold hose arrangement which allows water samples to be bottled in a sink area in the analysis section.

The analysis section has

- 1 Fume Cupboard
- 1 Fridge
- 1 Freezer
- 1 x growth cabinet
- sink area for bottling water samples
- bench are for chemistry analysis adjacent a bench area for general instruments.
- a door to one of the Porta lab positions.

P h o t o l a b .

Fitted with

- 1 sink
- dimmer lights
- developing lights
- warning light outside

L a b 1 .

Fitted with

- 1 sink
- 1 fume cupboard
- door to CTD court yard

L a b 2 + 3

- 1 sink
- 1 fume cupboard
- sliding partition between labs.

L a b 4 + 5

- 1 sink
- dimmer and timer control on lights
- temperature control in range of -5 to +5 deg. C.

C o m p u t e r r o o m

Is designed for the efficient installation of the central data logging system, processing system, and instrumentation system.

M e t l a b

Is fitted with

- 2 desks/chairs
- 1 bench with beneath surface illumination

H e l i u m b o t t l e r a c k

A rack for securing helium bottles is to be provided on aft of wheelhouse deck.

Container laboratories

Provision for the securing and connection of 8 container labs is provided as follows.

- 4 in tween deck
- 2 on heli deck
- 2 on aft deck

There is flush junction boxes to enable the connection of the following ship services to the container labs:

Hot and cold fresh water
Salt water
Compressed air
Power
Telephone

A f t d e c k w o r k s h o p

The aft deck workshop is designed as a workshop for deck equipment maintenance.

FISH FREEZER

A 38 cubic meter capacity freezer for the freezing and storage of fish catches is installed in the catch processing area aft on the 3rd deck.

3885 R E S E A R C H I N S T R U M E N T A T I O N S Y S T E M

The vessel is fitted with an extensive hydroacoustic, oceanographic & meteorological instrumentation system as per the following.

1 SYSTEM CONFIGURATION / OVERVIEW

TRANSIT/GPS NAVIGATION GPS	MAGNAVOX MX-1107
TIME STANDARD	AUSTRON 8110
ACOUSTIC SYSTEM	SIMRAD
XBT	SIPPICAN
THERMOSALINOGRAPH	APPLIED MICROSYSTEMS
CTD	NEIL BROWN Mk. 111
SURFACE CHLOROPHYLL	TURNER DESIGNS TD-10
MOTION SENSOR	MDL TRIM CUBE
METEOROLOGICAL	STEEDMAN SYSTEM
DATA LOGGING SYSTEM (DLS)	HEWLETT PACKARD
DATA PROCESSING SYSTEM (DPS)	DIGITAL EQUIPMENT CORPORATION

1.1 TRANSIT/GPS NAV.

Description

Magnavox
Dual Channel satellite Survey Navigator
Model M-1107

Function

This unit is to determine the position of the ship using the transit and/or GPS satellite systems.

Interfacing to DLS and/or other devices

The MX-1107 is interfaced to the ships log and gyro to compensate for ships motion during transit readings and allow independent operation of the systems.

The MX-1107 is also interfaced to the DLS to allow logging of the positional data. This interfacing is by means of the RS-232 printer/data ports available on the MX-1107s.

The Navigation MX-1107 installed in the wheelhouse is also interfaced to DLS.

Integration to DLS

The MX-1107 data is read by the DLS and is used to compute the position of the vessel in real world terms.

The positional data is logged for later post processing.

The design of the MX-1107 is such that the operation of the unit is via a user keypad on the front panel. The MX-1107 requires little or no user interaction during operation.

1.2 GPS NAVIGATION

Description

TRIMBLE 4000SX
GPS satellite receiver

Function

The system is fitted for but not with the Trimble 4000SX.

At a future date this unit may be fitted to the system, however a series of work-ups and test procedures must be carried out.

Integration to DLS

The Trimble 4000SX data is read by the DLS and is used to compute the position of the vessel in real world terms.

The positional data is logged for later post processing.

The design of the Trimble 4000SX is such that the unit is operated via a user keypad on the front panel. The Trimble 4000SX requires little operator interaction during its operation, the level of interaction required is consistent with that generally expected to be required for navigation systems.

The system will allow the printing of satellite predictions as determined from the satellite system data or as determined by the DLS system. This will allow the operators to monitor the usage window on a regular basis.

1.3 TIME STANDARD

Description

Austron 8110
WWV Synchroniser
B 13 Oscillator
E25 Calendar

Function

The time standard is to supply time reference to the DLS system

Interfacing to DLS and/or other devices

This unit is interfaced to the DLs.

Integration to DLS

The time reference is sent to the DLS and is used to control the real time of DLS.

The design of the time standard is such that it is autonomous in operation. The few operator inputs required are carried out via switches on the unit.

1.4 ACOUSTIC SYSTEM

Description

SIMRAD SUBSEA A/S

Precision depth sounder

EA 200 12 kHz and 710 kHz
 external 12 kHz, 8 kW transmitter
 transducer 76 BA
 transducer 710-36
 digital remote display

Scientific sounder

EK 400 38 kHz
 extra transmitter 2500 W
 test panel
 transducer 38 - 29
 Arctic transducer tank

Scientific sounder

EK 400 120 kHz ad 200 kHz
 test panel
 transducer 120 - 25
 transducer 200 - 28
 Arctic transducer tank

Scientific echo sounder

QD two frequency, sequence programme
 data terminal

Towed body transducer

VD 280 transducer 120 - 25 up
 transducer 120 - 25 down
 transducer 200 - 28
 Relay switching for one of each or one pair
 170 m tow cable

Trawl surveillance sonar

FS 3300 extra colour monitor
 interface for video recorder
 3,000 m tow cable

Scientific echo sounder, integrator and target strength analyser

EK 500 120 kHz transreceiver and integrator
 two colour printers
 transducer 120 - 25
 two transducers ES 120 split beam, one hull mounted
 and one portable
 Arctic transducer tank

Sonar
 SL 490 colour printer
 true motion
 interface for video monitor

Monitors colour monitors with EQ 100 electronics (5)

Test and calibration instruments

Tektronic oscilloscope 2236

Calibration spheres (4)

Simrad Micro-computer for data logging and data transfer to DLS

Function

The acoustic system is to measure the acoustic properties of the biomass by means of a series of echo sounders,, measure water depth accurately to 6000m by means of an echo sounder, determine location of physical objects and biomass by means of a scanning sonar and quantitatively measure the biomass return signal.

The biomass sounding equipment is two SIMRAD EK-400 echo-sounders interfaced to the SIMRAD QD integrator and a SIMRAD EK-500 echo sounder. Both EK-400's and the EK-500 have chart recorders and colour displays. There is a series of hull mounted transducers and three transducers mounted in a towed body. The EK-400, EK500 and the QD are interfaced to the DLS through the SIMRAD micro-computer which allows logging of the data and status information by DLS.

The interfacing of the integrator and the EK-500 via the Simrad micro-computer allows for the control of the echo sounders and the QD for transmission and reception of commands at both the micro-computer and the host computer (DLS).

The SIMRAD Micro-computer also has an autonomous logging capability of all SIMRAD data generated by the EK-400/500 subsystem. Data and status information from the EK-400's, QDs and EK-500 are transmitted to DLS by the SIMRAD micro-computer in ASCII serial RS-232 from.

Furthermore, annotation of all the chart recorders in the total SIMRAD system is carried out by the SIMRAD Micro-computer based on information sent to this micro-computer from the DLS through a ASCII serial RS-232 link.

All data and status information from the EA-200 precision depth sounder is transmitted directly to DLS using the ADCII serial RS-232 link.

The trawl monitor is a SIMRAD FS-3300 and comes with a colour display.

The scanning sonar is a SIMRAD SL-490 and comes with a colour display.

Interfacing to DLS and/or other devices

The acoustic system is interfaced to DLS by means of a series of connections which are to receive data, supply an annotation string, supply date/time and parameters on start-up and supply a level of command/control to the acoustic system.

The EK and EK-500 sub systems are interfaced via a SIMRAD micro-computer to DLS. The interface between this micro-computer and DLS is a single ASCII, serial, RS-232, bi-directional line.

The EA-200 echo sounder is interfaced to DLS by means of a ASCII, serial, RS-232, bi-directional line. The interface accepts all data and status available on that line.

Annotation is supplied to the total acoustic sub-system in the conventional, form of a ASCII, serial, RS-232 interface to the SIMRAD micro-computer which distributes that information to the Simrad system as required. The data string sent from DLS contains all the required details to be annotated.

Fix marks are supplied by DLS by means of a contact closure to the SIMRAD acoustic system. The SIMRAD system distributes the fix mark to the acoustic system as required to fix mark all required chart recorders and screens.

The Trawl monitor sub-system is not interfaced to DLS.

The scanning sonar sub-system is not interfaced to DLS.

Integration to DLS

The QD integrator and the EK-500 are integrated to DLS by means of a SIMRAD micro-computer which is the central control point of the EK-400 and EK-500 sub-systems. This micro-computer is integrated to DLS via the serial data line to allow logging of data at DLS and allow a level of control to be exercised by DLS.

DLS allows a user selected alarm level to be set and on this level being exceeded, an alarm is triggered which will be visible on the monitors attached to the DLS (i.e. 17 monitors).

The deep water echo sounder is integrated to allow logging of data by DLS. The level of integration allows the appropriate level of control to be exercised by DLS. The table of sound velocity set by the user allows DLS to set the value of sound velocity depending on the depth reading on the sounder. DLS allows the general parameters of the sounder to be set via a menu. Any status data sent to DLS by the sounder is logged.

Annotation consists of a date/time string and is sent to the SIMRAD micro-computer every specified interval.

1.5 XBTDescription

SLIPPICAN Ocean Systems
 MK-9 Oceanographic Data System
 R-1197 (XBT))
 Inc. Micro-computer
 IBM-PC Compatible MS-DOS software for M-9
 Hull mounted launcher
 Hand held launcher

Function

The Sippican XBT produces a record of the temperature versus depth by means of an expendable probe. This is achieved by means of logging data on the unit and logging data on the DLS.

Interfacing to DLS and/or other devices

This unit is interfaced to the DLS, via a micro-computer, and allows the logging of the data at the micro-computer or at the DLS.

Integration to DLS (Further details outstanding)

The data is logged by DLS and summarised on the XBT information display available on DLS monitors. Data is transferred to the DLS via the Micro-computer

1.6 THERMOSALINOGRAPH

Description

APPLIED MICROSYSTEMS

Shipboard Salinity Module

Model 814

(Thermosalinograph)

Inc. Micro-computer

IBM-PC Compatible MS-DOS software for SAIL 814

Function

The Applied Microsystems thermosalinograph is to measure the temperature and salinity of the water at the surface by means of a sensor in the scientific water supply.

Interfacing to DLS and/or other devices

This unit is interfaced to the DLS via a micro-computer and allows the logging of data at the micro-computer or at the DLS at specified intervals.

Integration to DLS

The data is logged by DLS and shown on the summary information display available on DLS monitors.

The design of the Thermosalinograph is such that the device requires no control from DLS.

1.7 CTDDescription

NEIL BROWN

MARK III CTD System

inc. Mk IIIB Underwater Unit
 1401 deck Unit
 Micro-computer
 IBM-PC Compatible MS-DOS software
 Li-Cor sensor
 Compact 12 bottle Rosette (without bottles)

Function

This is functionally to measure the conductivity, temperature, depth and ambient light and take water samples by means of a probe lowered into the water.

Interfacing to DLS and/or other devices

The Neil Brown/EG & G Mark III CTD consists of the Mk IIIB Underwater unit which samples temperature, salinity and depth, and the 1401 Deck unit which collects the digital data transmitted from the Underwater unit.

The 1401 Deck unit has three serial ports. The first has connected an IBM compatible PC and is used as a display and command entry terminal. The second port will connect to DLS and allow for transfer of data at either 9600 or 19200 BAUD.

The 1401 can be set up to configure automatically at power on to recognise the above devices. The operator may issue commands from the PC to the 1401 or he may issue a limited number of commands from DLS.

Logging of CTD data is undertaken by the micro-computer.

There is an additional slave monitor to allow the winch operator to view the same information as is displayed on the micro-computer screen.

Integration to DLS

The integration of the CTD allows the logged data to be transferred from the PC to the Data Processor.

A summary of the data appears on the CTD information display available on DLS monitors.

The data recorded allows the user to create (interactive) a table of sound velocity against depth for use with the deep water sounder.

1.8 SURFACE CHLOROPHYLL

Description

TURNER DESIGNS

Model 10 series Fluorometer

Model TUD-10-000R

inc. Chlorophyll accessory kit TUD-040

Function

This is functionally to measure the chlorophyll content of the water at the surface by means of a sensor in the uncontaminated water supply.

Interfacing to DLS and/or other devices

This unit is interfaced to the DLS and allows the logging of data at specified intervals.

Integration to DLS

The integration of the TD-10 will allow data to be logged by DLS.

The data is shown on the summary information display available on DLS monitors.

The design of the TD-10 is such that the unit is autonomous in operation with any user selections being made via switches on the unit.

1.9 MOTION SENSOR

Description

Measurement Devices Limited
Telemetric Remote Inclination Monitor
(M.D.L. TRIM CUBE)

Function

The unit is to measure the tilt (pitch and roll) of the vessel in two axis for the purpose of recording general vessel attitude.

Interfacing to DLS and/or other devices

This unit is interfaced to the DLS and allows logging of the data on the DLS.

Integration to DLS

The integration allows the data to be logged by DLS.

The data is shown on a summary information display available on the DLS monitors.

The Trim Cube is designed for autonomous operation and no user commands are available.

1.10 METEOROLOGICAL

Description

Steedman Meteorological System
 inc. Micro-computer with additional display and printer
 Sensor plug in board
 dual air temperature sensor
 dual relative humidity sensor
 wind speed and direction sensor (heated)
 Li-Cor sensor
 water temperature sensor
 atmospheric pressure sensor
 connection to ships gyro
 connection to ships speed log

Function

The Meteorological system measures wind speed, wind direction, air temperature, water temperature, atmospheric pressure,, relative humidity and ambient light by means of a series of sensors.

This data is available in numeric form on the screen of the micro-computer.

There is an additional slave monitor which allows the bridge to view the same data as is on the display of the micro-computer.

This system is fitted for but not with dual solar radiation sensors (no sensors or mounts supplied), should these sensors be fitted at a future date there is a series of work-ups and tests that will need to be carried out.

Interfacing to DLS and/or other devices

The unit is interfaced to the ships log and gyro which enables the system to determine true and apparent wind speed and direction as well as allow independent operation of the system.

The unit is interfaced to the DLS via a micro-computer and allows logging of the data at specified intervals on the micro-computer and the DLS.

Integration to DLS

The integration of the meteorological system is such that it allows the data to be logged by DLS at specified intervals.

The data is shown on a summary information display available on the DLS monitors.

The Meteorological system will run automatically (and autonomously) and will generally require no operator interaction, if however any operator intervention is required, it is carried out on the micro-computer.

1.11 DATA LOGGING SYSTEM

Description

Qubit TRAC series data logging system

Hewlett Packard series 9000 computer system
 inc. 12" colour graphics user terminal
 Bridge data entry terminal
 130 MByte fixed disc
 3.5" micro disc
 1600 CPI 1/2" tape drive
 1600 CPI 1/2" tape drive
 Draftmaster AO plotter
 Impact Dot Matrix printer

Colour Graphics monitor (17 off)

Video Switch system

Location of Terminals and Monitors

1. DLS Terminals: (2)
 Computer Room
 Wheel House
2. DLS Monitors: (17)
 Lab 1
 Lab 2
 Lab 3
 Lab 4
 Lab 5
 Wet Lab
 Oceanographic Lab
 Conference Library
 Computer Room
 Wheel House
 Winch Control
 Recreation Room
 Mess Area
 Meteorological Lab
 Captains Day Room
 Voyage leader Room
 Deputy Voyage Leader Room

Function

This is functionally to monitor and schedule the logging of data and provide navigational and other information displays to the operators.

The system is based around a H.P. computer and has a series of interfaces for the sensors to be logged. The system includes tape drives, winchester disc drives, printer, plotter and a user terminal (colour graphics) in the computer room.

There are 17 colour monitors at locations around the ship which can view any one of four independent information displays generated by the system (channels).

The operating system is the Qubit TRAC application system which controls the computer functions by means of a series of operator menus and displays and generates a series of graphic displays which contain a variety of raw and processed information. TRAC carries out all logging functions to 9-track tape and allows for implementation of data transfer to DPS.

1.11 DATA PROCESSING SYSTEM

Description

Qubit CHART series data processing system

D.E.C. MicroVax 3600
inc. TK-70 tape
RA82 622 MByte fixed disc

D.E.C. MicroVax 2000
RD53 71 MByte fixed disc
TK-50 tape

D.E.C. RA60-CD 205 MByte removable disc
" LGO2-EA printer
" LNO3-AZ printer
" VT-340 colour graphics terminal
" VT-330 monochrome terminal (13 off)
" DSRVB-AB terminal server (3 off)
" TU-81E-SB tape drive
" TU-81E-SB tape drive

HP Draftmaster AO Plotter

Location of Terminals

DPS Terminals: (14)

Lab 1
Lab 2
Lab 3
Wet Lab
Oceanographic Lab
Word processing area (x2)
Conference Library
Computer Room (x3)
Wheel House
Meteorological Lab
Dpty Voyage leader Room

System fitted for but not with additional terminals in recreation area, Voyage Leaders room, conference library (x2) and word processing area to a total of five terminals.

Function

The system is based around a DEC microVAX computer and includes tape drives, winchester disc drives and printers. There are 13 monochrome terminals at various locations throughout the ship and 1 colour graphics terminal in the computer room.

The system includes a LAN to access the terminals at remote locations to the computer room.

The operating system is the Qubit CHART application which receives and pre-processes the logged information obtained from TRAC in discrete bundles and records it for further post processing by CHART or other applications. CHART allows the recorded position, depth or other information to be edited and plotted. CHART allows for other functions such as plotting track, location, other data for presentation or report production.

3886 PERSONAL COMPUTERS

6 personal computers are installed with 40 MB hard discs, colour monitors, MS DOS, software for word processing, spread sheets, data base and communications. Installed in Captain, Chief Engineer, ships office, 2 in 2nd bridge deck conference room and radio room.

389 AFT CONTROL STATION

- The aft control station is positioned on the upper deck port side aft.
- It is designed with 2 captain chairs around 2 consoles, 1 for ship control and 1 for winch control.
- The winch consol is designed for remote control of all research winches and display of read outs.
- The ship control console is designed for independent maneuvering of the ship.

Equipment included is:

- slave radar
- VHF and internal communications
- P.A. system
- aft deck lighting control
- video camera monitor/control
- joy stick control
- gyro repeater
- rudder angle indicator

39 HULL AND DECK INVENTORIES

391 MISCELLANEOUS NAUTICAL EQUIPMENT

The following equipment is supplied and fitted

- three pairs 7 x 50 binoculars
- two hand leads, 3.2 kg each with 46 m line
- one deep sea lead 12.7 kg with 230 m line
- two sextants, Plath or similar
- one barograph
- two sets wet and dry bulb thermometers
- one set of signal flags
- chronometer
- one aneroid barometer
- six country flags
- six Australian flags

392 LIFESAVING APPLIANCES

Lifebuoys, lifejackets, immersion suits, embarkation ladders etc. according to 1983 amendments to SOLAS 1974 and DOT Marine Orders, except for number of immersion suits which is for full complement, 133.

394 FIRE FIGHTING EQUIPMENT

The Vessel is equipped to comply with Classification society and D.O.T. Requirements for Fire Fighting pumps, monitors, deck hydrants, Fireman outfits, breathing apparatus and compressors.

Foam monitor system also covers forward hatch cover.

396 SPECIAL HULL AND DECK INVENTORIES

- /1 One 5T SWL LPG forklift with side shift and catalytic converter fitted.
- 2 One 2T SWL LPG forklift with side shift and catalytic converter fitted.
- /3 Portable steam lance washing system.

4 ACCOMMODATION, DECK COATINGS. INSULATION. LININGS.
FURNISHING, EQUIPMENT IN ACCOMMODATION. PAINTING

41 CARGO SPACES

411 DECK COATINGS

4112 DECK COATINGS IN CARGO SPACES

Decks in cargo holds are painted as the outer decks, see item 4731.

412 INSULATION, LININGS AND FURNISHING

All insulation material is asbestos free and Australian DOT approved.

43 COATINGS OF OUTER DECKS, FURNISHING AND OUTFIT IN DECK
STORES, FIXED DECK FURNISHING

431 COATINGS OF OUTER DECKS

4312 PAINTED OUTER DECKS

The exposed decks are painted with non-slip compound.

432 FURNISHING AND OUTFIT IN DECK STORES AND WORKING SPACES

4321 FURNISHING IN DECK STORES AND DECK MACHINERY SPACES

F u r n i s h i n g

The steering gear room, battery room and store rooms are provided with necessary painted steel shelves.

4322 FURNISHING IN DECK WORKSHOPS

F u r n i s h i n g

All furniture is of standard construction. Steel parts are painted.

The stores have shelves with storm rails. The workshops are provided with working tables, shelves and lockers.

4323 OUTFIT IN DECK STORES AND WORKING SPACES

The deck store is provided with the following special equipment:

- bench, lockers, shelves
- wooden grating on deck

433 FIXED DECK EQUIPMENT

4332 LOCKERS ON OUTER DECKS

On all outer decks there are cabinets for fire hoses. Lockers are provided for emergency equipment on 1st bridge deck.

4333 LINING OF ANCHOR CHAIN LOCKERS

Chain lockers are of steel without lining. Coating, see item 4741.

Perforated steel plates are placed on the bottom of the lockers.

44 SUPPORTS, INSULATION, LININGS, INNER DOORS, STAIRWAYS AND FIRE INSULATION IN ACCOMMODATION

441 SUPPORTS

Supports for linings are made according to lining material manufacturer's recommendations.

442 INSULATION AND LININGS OF BULKHEADS IN ACCOMMODATION AND SERVICE SPACES

4421 LININGS IN CABIN AREAS

The linings consist of wall panels which are made of 0.7-mm steel sheet. Behind the sheet a mineral wool₃ plate is glued (min 20 mm thick, specific weight 150 kg/m³). The surface of the steel sheet is pre-coated and the visible surface is coated with PVC foil.

Cabin dividing bulkheads and bulkheads between cabins and corridors are doubled wall panels or 50 mm thick panels. Against steel bulkhead and sides single wall panels are used.

4423 LININGS IN PUBLIC SPACES AND LABORATORIES

The linings consist of wall panels which are made of 0.7-mm steel sheet. Behind the sheet a mineral wool₃ plate is glued (min 20 mm thick, specific weight 150 kg/m³). The surface of the steel sheet is pre-coated and visible surface is coated with PVC foil.

4424 LININGS IN GALLEY AND DRY PROVISION STORES

The linings of the dry provision stores are of steel. Linings of refrigerated provision stores are stainless steel.

The linings of the galley and catering area are of stainless steel sheet. Seams in lining are caulked with silicon.

4425 LININGS IN SANITARY AND SIMILAR SPACES

Private sanitary spaces, see item 4511.

Public sanitary spaces, see item 4421.

Gym and washing rooms, see item 4421.

Sauna, see item 446.

Laundries and clothes rooms, see item 4421.

Seams in linings of wet spaces are caulked with silicon.

4426 INSULATION OF BULKHEADS

Cold bulkheads are insulated with 100-mm glass wool to meet temperature requirements. The insulation is fastened by welded steel pins and speed clips.

Between the insulation and the linings a water flute is provided.

443 INSULATION AND CEILINGS OF DECKS IN ACCOMMODATION SPACES

Headroom in living quarters, between top of deck covering & lowest installation point of piping, ducts, ceilings and insulation of structure is generally a minimum of 2100 mm.

4431 CEILINGS IN CABIN AREAS

The ceilings consist of ceiling panels which are made of 0.7 mm steel sheet. Behind the sheet a mineral wool₃ plate is glued (min 20 mm thick, specific weight 150 kg/m³). The surface of the steel sheet is pre-coated and the visible surface is coated with PVC foil.

4433 CEILINGS IN PUBLIC SPACES AND LABORATORIES

The ceilings consist of ceiling panels which are made of 0.7 mm steel sheet. Behind the sheet a mineral wool₃ plate is glued (min 20 mm thick, specific weight 150 kg/m³). The surface of the steel sheet is pre-coated and the visible surface is coated with PVC foil.

4434 CEILINGS IN GALLEY AND DRY PROVISION STORES

The ceilings of the refrigerated provision stores are of stainless steel sheet.

The ceilings of the galley and catering area are of stainless steel sheet.

4435 CEILINGS IN SANITARY AND SIMILAR SPACES

Private sanitary spaces, see item 4511.

Public sanitary spaces, see item 4431.

Gym and washing rooms, see item 4431.

Sauna, see item 446.

Laundries and clothes rooms, see item 4431.

4436 INSULATION OF DECKS

The underside of cold decks are insulated with 100-mm glass wool to meet temperature requirements, which is glued to the deck and fastened by welded steel pins and speed clips.

Bulkheads ending against cold structures are insulated abt. 500 mm inwards.

444 DECK COATINGS IN ACCOMMODATION AND SERVICE SPACES

4442 UNDERLAY COMPOSITION

The following spaces have an underlay of cement with an inclination of 1:100, max. thickness 75 mm, min. 25 mm:

- public sanitary spaces
- galley department
- laundry departments
- sauna department, including changing room
- wet labs

The following spaces have an underlay deck composition, thickness 6 mm, of epoxy mass or equivalent:

- cabins and corridors
- public spaces
- stairways
- hospital department
- messroom
- bar
- servery
- wheelhouse
- offices
- research equipment spaces
- laboratories except wet labs.

In all other spaces the deck is painted.

4443 GLUED DECK COATINGS

In the following spaces vinyl is glued on to the underlay composition:

- messroom
- lounge
- servery
- corridors
- stairways
- ship's office
- hospital department
- research equipment spaces
- laboratories except wet labs
- wheelhouse, chartroom radio room
- gym
- clothes rooms.

4444 WALL-TO-WALL CARPETS

In the following spaces a wall-to-wall approved carpet is fitted onto the underlay composition:

- cabins
- conference rooms
- word processing room
- recreation room

4445 TILES

The instrument room has special deck tiles fitted.

4446 CERAMIC DECK COVERINGS

In the following spaces ceramic tiles are laid on the underlay composition:

- galley department
- laundry department
- public sanitary spaces
- sauna department

4447 FLOATING FLOORS

Floating floors are utilised on the 2nd and Upper decks above the machinery space and in the Lounge.

445 CONSTRUCTION OF THE REFRIGERATED STORES

4451 SUPPORTS AND INSULATION

The refrigerated stores are made of prefabricated elements with polyurethane foam insulation, 100 mm thick in deep freeze rooms and 65-80 mm in cold rooms.

4452 LININGS AND CEILINGS

The inside lining of the prefabricated elements is of stainless steel sheet.

4453 FLOORS

The floor elements are covered with plywood, topped by a minimum of 3 mm studded aluminum with silicon-caulked seams.

4454 DOORS

The doors are of the same construction as the walls and they have rigid hinges and locks which can be opened from both sides. Doors are fitted with alarm as per regulation.

4455 FURNISHING

Shelves and racks are made of stainless steel, supports of galvanized steel.

446 CONSTRUCTION OF THE SAUNA

4461 WALLS AND CEILINGS

The walls are insulated by 150-mm-thick (100mm + 50mm) glass wool covered with abt. 3-mm-thick fibreboard and an aluminium foil with taped seams. In ceilings the insulation is 200 mm thick (100mm + 100mm).

The linings are of resin-free good quality wood boards.

4462 DECK INSULATION AND COATING

See items 4442 and 4446.

4462 FURNISHING

Benches with the back boarding and stairs are made from planed "abachi" boards or equivalent.

The railing around the heater is made from "abachi" boards or equivalent.

Heater, see item 4565.

447 DOORS OF ACCOMMODATION SPACES

G e n e r a l

The sizes of the doors according to Builder's standard fulfilling the requirements of Chapter 1.

Cabin doors, doors leading to public spaces, stores, etc. and doors which the Authorities allow to be locked, are provided with serial locks, type Abloy or equivalent, included in a locking system.

For every lock two keys are delivered. The central key cabinet to be divided between deck office and conference room.

Steel doors, see Chapter 314.

4471 OUTER DOORS

Outer doors from accommodation spaces are made of composite material and fitted with door closers. See also item 3142.

4474 INNER DOORS

Inner doors are made of 0.75 mm steel sheet, covered with a PVC foil. The doors are insulated with mineral wool and fulfil the B-15 fire class requirements.

The doors are about 650 mm wide and provided with locks, adjustable ventilation grids, and self-closing devices, where necessary.

All cabin doors have kick-out panels according to D.O.T. requirements.

All cabin doors are provided with identification.

4477 A-CLASS FIRE DOORS

The A-class fire doors are insulated steel doors fulfilling the requirements of the Rules.

The doors are provided with locks. The doors that are normally open are equipped with magnetic holders for keeping them open. The magnetic holders may be released from a control station. All doors are provided with self-closing devices. The width of the doors is about 800 mm.

448 INTERIOR STAIRS AND HANDRAILS

G e n e r a l

The stairs are made of steel.

Structural specification, see item 3171.

In corridors, halls and other places where needed the handrails are of aluminium.

Rails on one side of the stairways, and in all accommodation corridors.

449 FIRE INSULATION

The insulation material is mineral wool.

The mineral wool is fastened to the bulkhead and deck by welded pins and speed clips.

Interior lining or ceiling panels together with heat insulation and steel bulkhead or deck are regarded as fire insulation, if accepted by Authorities.

45 FURNISHING AND EQUIPMENT IN ACCOMMODATION AND SERVICE SPACES

451 FURNISHING IN THE PERSONNEL ACCOMMODATION

4511 EXPEDITIONERS' QUARTERS

The furniture is not of restricted fire risk.

Sofa bed:

- convertible from sofa to bed
- made of plastic-laminated wood framing
- dimensioned to hold mattresses sized 2000 x 800 x 150

Pullman Bed:

- dimensioned to hold mattresses sized 2000 x 800 x 150

Wardrobe:

- measures 500 x 500 x 2000
- made of wood. The sides coated with plastic laminate and the door coated with plastic laminate.
- life-jacket box
- hat shelf
- clothes rail with hooks
- 4 drawers
- lock.

Writing desk with drawer unit:

- table top measures about 700 x 1000
- table top wood plastic laminated
- drawer unit of plastic-laminated wood, lockable, under desk top.

Table between sofa/beds:

- table top wood plastic laminated, collapsable

Book shelf:

- measures about 1000 x 330 x 760
- made of plastic laminated wood.

Clothes rack:

Chair with armrests; see fastened

Prefabricated Shower Modules

The prefabricated WC-shower modules are fibreglass construction.

The doorleaf is of PVC-foiled steel plate, frames painted steel.

Equipment:

- 1 shower with mixing valve
- 1 wash-basin with hot and cold fresh water taps
- 1 toilet bowl with seat and cover with latch
- shower pan, water trap
- 1 toilet cabinet with mirror
- 2 paper towel holder
- 1 glass holder for three glasses
- towel rails
- 3/4 hooks for towels
- 1 shower curtain with curtain rail and glides
- 1 light fitting with shaving socket
- 1 soap dish
- 2 storm grips
- 2 hooks inside the door
- 1 clothes line
- 1 waste bin

All pipes and connections to the armatures and electric fittings from service area.

Dimensions: 1.2 m x 1.8 m

Expeditioner Single Cabin

Furniture standard for expeditioner single cabin as in crew cabins, see Item 4512.

- 1 bed with 3 drawers
- 1 sofa
- 1 wardrobe
- 1 wardrobe with shelves
- 1 writing desk with drawer unit
- 1 bookshelf
- 1 clothes rack
- 1 chair
- 1 chair with armrests
- WC-shower module.

E x p e d i t i o n e r D o u b l e C a b i n

- 1 sofa/bed
- 1 pullman
- 2 wardrobes
- 1 writing desk with drawer unit
- 1 bookshelf
- 1 clothes rack
- 1 chair with armrests
- WC-shower module.

E x p e d i t i o n e r T r i p l e C a b i n

- 1 pullman bed
- 2 sofa/beds
- 3 wardrobes
- 1 bookshelf
- 1 writing desk with drawer unit
- 1 clothes rack
- 1 chair with armrests
- WC-shower module.

4512 CREW QUARTERS AND SUITES

The furniture is not of restricted fire risk.

Bed:

- made of wood-veneer with wood framing
- dimensioned to hold mattress sized 2000 x 900 x 150
- two drawer units. Drawers have lift-to-remove stoppers and glide rails
- lee board.

Wardrobe:

- measures about 440 x 620 x 2000
- life-jacket box
- hat shelf
- clothes rail
- 4 drawers
- lock.

Wardrobe with shelves:

- measures about 440 x 620 x 2000
- laminate.
- life-jacket box
- hat shelf
- clothes rail
- shoe stand
- lock.

Writing desk with drawer units:

- table top, measuring about 800 x 1200, wood-veneer
- drawer unit fitted with lock.

Sofa:

- frame of wood, visible parts wood veneer
- seat and backrest of plywood upholstered with polyether plastic foam, cover of fabric
- size 1900 x 800.

Bookshelf:

- measures about 1000 x 330 x 760
- made of plastic laminated or wood veneered wood.

Clothes rack:

Chair

Chair with armrests; (2 off)

Sofatable:

Prefabricated Shower Module

Single Cabin for Crew

- 1 bed with 2 drawers
- 1 sofa
- 1 wardrobe
- 1 wardrobe with shelves
- 1 writing table with drawer unit
- 1 bookshelf
- 1 clothes rack
- 1 chair
- WC-shower module.

Large Cabin with Bedroom
for Master, Chief Engineer,
Voyage and Deputy Voyage
Leader.

Dayroom:

- 1 sofa
- 1 writing table, 800 x 1800 mm, with two drawer units
- 1 bookcase
- 1 sofa table
- 2 chairs

- /1-4
- 1 refrigerator, 80 l
 - 1 writing chair with armrests
 - 1 safe 60 l (master only)
 - 1 pinboard
 - additional cupboards/shelves as allowed by design.

Bedroom:

- 1 bed
- 1 wardrobe
- 1 mirror, 1200 x 400 mm
- 1 bedside table
- 1 wardrobe with shelves
- 1 clothes rack.

1 WC-shower module

4513 NAVIGATION ROOMS

Design approved by Owner.

The furniture is not of restricted fire risk.

R a d i o R o o m

- 2 spinning office chairs
- 1 safe box
- 1 writing board
- necessary shelves and cabinets for the instruments

W h e e l h o u s e , C h a r t R o o m

- 1 navigation table with chart drawers and shelves
- racks for the equipment
- flag lockers
- lockers for binoculars, morse lights, etc.
- 3 "officer's chairs"
- 4 clothes hooks
- storm rails
- 4 fixed ashtrays
- consoles

The navigation table is provided with black-out curtains.

4514 HOSPITAL DEPARTMENT

Hospital meets classification and DOT regulations and is approved by Owners.

Hospital:

All space exploited for shelves and racks with lashing hooks for Owner-supplied equipment.

Sick bay:

- 2 beds
- 2 bedside tables
- 1 WC. module

Surgery and consulting room:

- 1 chair
- 1 wash-basin
- 1 bookshelf
- /1 - 1 multipurpose operating/dentist's chair
- 1 writing desk
- /4 - 1 refrigerator
- /5 - sterilizing equipment
- power supply and brackets for Owner-supplied X-ray equipment.
- medicine cabinet
- instrument cabinet

453 FURNISHING IN PUBLIC SPACES

The furniture is not of restricted fire risk.

4531 LOUNGE

The design is such that the lounge working area has easy access to the dry store. Sufficient fridges and shelves are included in the design.

The lounge room is designed with bar stools and tables and chairs in a way to best exploit the area but still leaving a clear floor area in the centre.

Furnishing:

- bar stools
- round tables
- fabric covered chairs
- 2 lockable bar type refrigerators
- /1 - 1 ice-making machine
- /2 - 1 glass washing machine
- 1 storage rack for glass trays
- 1 bottle rack in lockable cabinet
- 1 double sink with hot and cold water

4532 RESTAURANT

Crew, officers and expeditioners use the same restaurant.

The design allows efficient servicing and seating of 100 persons.

Furnishing:

- chairs with seafastening
- Tables with top of burn proof plastic laminate. Each table is provided with condiment storage rack and fiddles.
- 1 wall cabinet for stereo, TV and library
- 3 large-size whiteboards/screens
- Cafeteria service line with utensil and plate dispensers, chilled and heated display cabinets.
- Stewards locker with sluice and broom cupboard
- night pantry area with fridge, microwave, toasters, griller and urn.

4535 RECREATION ROOM

- 1 cabinet for stereo/TV/video equipment and tapes etc.
- cupboards, shelves
- furniture designed around 6-8 people per table using sofas or chairs

4536 SHIP OFFICES

Conference room

- extensive shelves and cupboards, where all ship plans etc. are stored
- 2 working desks designed for computer terminals
- 1 conference table with 2 sides of divan seating and 3 chairs
- 1 fridge (90 l) and small bar in a lockable.

Ship's office

- 3 lockers
- extensive shelves and cupboards
- 3 chairs/desks
- filing cabinet

4537 CONFERENCE ,LIBRARY and WORD PROCESSING ROOM

Conference room

- desk for three computer terminals
- conference table for 10 persons
- extensive shelving for library combined with cabinet for TV/ video/ radio etc
- cupboards as possible

Word processing room

- tables for 3 computer terminals
- shelving and cupboards

454 FURNISHING OF GALLEY, PANTRIES AND PROVISION STORES

4541 FURNISHING IN CATERING AREAS

Galley

- stainless steel benches with cupboards and drawers
- 1 deep tub
- 2 sinks

Servery

- drawers, benches, shelves designed for serving application.

Scullery

- drawers, benches, shelves
- twin wash basin.

4542 FURNISHING IN DRY PROVISION STORES

The provision stores have stainless steel shelves with galvanised frames.

For refrigerated stores, see item 445.

455 FURNISHING OF SANITARY SPACES

4551 GYMNASIUM AND SAUNA

Gymnasium:

- 1 multistation exercise machine
- 2 physical exercise machines (bicycle type)
- 1 locker for first-aid supplies
- 1 seat box cupboard

Sauna:

There is one sauna with a 10.5-kw heater.

- 2 showers
- 2 storm handles
- 2 soap holders
- 2 curtains of plastic.

Changing room:

- bench
- shelf with clothes hooks
- mirror.

4552 LAVATORIES ETC.

Lavatories:

- 1 wash basin with hot and cold fresh water taps
- 1 toilet bowl
- 1 mirror
- 1 shelf
- 1 paper holder
- 1 hook for clothes

Working Clothes Rooms:

- wardrobes with locks, made of steel plate
- benches made of steel, seat made of wood
- clothes hooks
- mirror

4553 FURNISHING IN THE LAUNDRY DEPARTMENT

Shelves, tables, benches, ironing boards and racks for dirty and clean linen are arranged.

Wash-basins of stainless steel are arranged in the laundry.

4554 LINEN STORES

The linen stores have shelvings.

456 MACHINES IN GALLEYS, PANTRIES AND LAUNDRY

4561 GALLEY DEPARTMENT

G a l l e y

- 2 four-plate stoves with oven
- 1 deep fryer with 2 x 20-l double-basket sink
- 1 refrigerators, 250
- 1 freezer 250 l
- 1 potato peeler
- 1 chopping block
- 1 slicer
- 4 meat cutting boards
- 1 combination type mix master
- 1 convection oven
- 1 solomander
- 1 bain marie
- 1 cold press
- 1 robo coupe
- 1 automatic hot-water urn
- 2 bread cutting boards
- 1 bratpan

/18

4562 CATERING AREAS

Servery

- 4 pcs. 4-slice toasters
- 2 automatic hot-water urn, 20 l
- 1 refrigerator, 500 l with 25 % freezing
- 4-slice sandwich griller
- 1 microwave oven
- 1 cold press with refrigerator under
- 1 plate dispenser

Scullery

- 1 pot washer
- 1 dishwasher

4564 LAUNDRY AND IRONING

Expeditioner laundry

- 3 heavy-duty washing machines, s/steel drums and incorporating a spin dryer
- 3 tumble dryers

Ships laundry

- 1 high capacity washing machine
- 1 high capacity tumble dryer

2nd Bridge deck laundry

- 1 washing machine
- 1 tumble dryer

1st Bridge deck laundry

- 2 washing machines
- 1 tumble dryer

4565 SAUNA

/1 1 electrical heater, abt. 10 kW.

The heating elements are water resistant and covered with stones.

The heater is thermostat-controlled with overheating guard.

457 CURTAINS, BLINDS, BEDSPREADS, REMOVABLE CARPETS

All windows except wheelhouse windows and sidelights are provided with curtains of fireproof materials.

4573 BLINDS

The windows in all cabins, mess, dayroom, the hospital department, Conference Room and the Conference/Library Room have blinds.

46 SUNDRIES IN ACCOMMODATION, PUBLIC AND SERVICE SPACES

461 BED CLOTHES AND LINEN

4611 BED CLOTHES

- 150-mm-thick mattresses or equivalent for all beds are furnished.

462 GALLEY AND TABLE SERVICE SUNDRIES

4621 GALLEY AND PANTRY SUNDRIES

The following baskets for clean and dirty tableware are provided:

- 10 baskets for plates and trays
- 4 baskets for forks, knives etc.
- 4 baskets for cups
- 4 baskets for glasses.

463 SUNDRIES IN CABIN AND PUBLIC SPACES

4633 TV AND RADIO RECEIVERS ETC.

/1-6 6 colour TV receivers

/7-12 6 video cassette recorder/payers

/13-18 6 LV, SW, AM and FM radio receivers each with cassette recorder and CD-players

The above receivers are installed in Master's, Chief Engineer's and Voyage Leader's suites and in Stb Messroom, Conference/Library Room and Recreation Room.

47 PAINTING

G e n e r a l

Pretreatment of steel surfaces before painting to grades according to the Swedish standard SIS 055900.

Details are in accordance with Hempels paint specification.

471 SHOT-BLASTING AND SHOP-PRIMER

4711 SHOT-BLASTING AND SHOP-PRIMER

All steel plates and profiles are grit-blasted and treated with shopprimer.

4713 INTERNAL STEEL SURFACES BEHIND LINING, PANELLING ETC.

Pretreatment: C ST 2

Painting: 1 x bitumen compound

Coat thickness: 150 microns

472 OUTSIDE PAINTING OF THE HULL

4721 BOTTOM TO WATERLINE

Pretreatment: SA 2,5
 Painting: 1 x solvent-free epoxy
 Coat thickness: 500 microns

Hempadar coating from top of ice belt to keel.

4722 TOP SIDE

Pretreatment: C ST 2
 Painting: 2 x primer
 1 x finish
 Coat thickness: 160 microns

473 PAINTING OF WEATHER DECKS, SUPERSTRUCTURE AND DECK EQUIPMENT

4731 WEATHER DECKS

Pretreatment: C ST 2
 Painting: 2 x primer
 1 x deck paint
 Coat thickness: 160 microns

The working areas on the 2nd, Upper and 1st Bridge decks have non slip surface. The helicopter deck is coated with Hempadar.

732 OUTSIDE OF SUPERSTRUCTURE

Pretreatment: C ST 2
 Painting: 2 x primer
 1 x finish
 Coat thickness: 160 microns

4733 DECK EQUIPMENT

Pretreated and painted by supplier.

Touch-up and finishing paint by the Builder.

474 INSIDE PAINTING OF HULL AND SUPERSTRUCTURE

4741 TANKS

- Fuel and Lubricating Oil Tanks:

Treated with oil after cleaning.

- Ballast Water, Fresh Water and Trim Tanks, Sea Chests, Bilge Wells, Chain Lockers:

Pretreatment: C ST 2
 Painting: 2 x coal-tar epoxy
 Coat thickness: 220 microns

- Drinking Water Tank, Tank for Helicopter Fuel:

Pretreatment: SA 2,5
 Painting: 2 x epoxy
 Coat thickness: 220 microns

475 PAINTING OF ACCOMMODATION

4745 STEEL SURFACES WITHOUT LINING SUCH AS CARGO HOLDS, STORES, AIR CONDITIONING CENTRES AND SIMILAR

Pretreatment: C St 2
 Painting: 2 x primer
 1 x finish
 Coat thickness: 100 microns

476 PAINTING OF MACHINERY SPACES

4761 TANK TOP, STEELWORK UNDER FLOOR PLATES

Pretreatment: C St 2
 Painting: 1 x primer
 1 x finish
 Coat thickness: 100 microns

4762 BULKHEADS IN ENGINE AND PUMP ROOMS ETC.

Pretreatment: C St 2
 Painting: 1 x primer
 1 x finish
 Coat thickness: 100 microns

4763 ENGINES, MACHINERY AND OTHER EQUIPMENT

Pretreated and painted by the supplier. If necessary touch-up and finishing paint by the Builder: machinery enamel.

477 SIGNS OF THE SHIP

4771 NAME OF THE SHIP, DRAUGHT MARKS ETC.

The name of the ship is painted fore and aft on both sides. The letter contours are marked by plate letters.

A teak board on which the name of the ship is painted with is placed on both sides of the upper wheelhouse deck.

The P & O Logo is marked on both sides of the 2nd bridge deck superstructure.

The draught marks are made of plate steel and placed at the stern, amidships and the bow. Metric spacing is used.

49 CORROSION PROTECTION DEVICES

491 ELECTROLYTIC CORROSION PROTECTION

4911 EXTERNAL CORROSION PROTECTION

Aluminium alloy sacrificial anodes were fitted to under-water shell in way of stern and in sea-water inlets and bow thruster and azimuth thruster housings. Anodes have steel wedges welded to hull forward of anode to prevent damage due to ice.

5 SCUPPERS, WATER, HEATING, FIRE PROTECTION AND AIR
CONDITIONING SYSTEMS, REFRIGERATING PLANTS. GARBAGE
HANDLING PLANTS

51 SCUPPERS

GENERAL

Efficient scuppering is arranged throughout the vessel to ensure that all low points are properly drained. In principle all deck areas have adequate scupper arrangement at suitable positions for the general trim condition of the vessel.

511 SCUPPERS FROM SUPERSTRUCTURE DECKS

Scuppers from all open superstructure decks are led to the following lower deck. Scuppers to discharge over board on the lowest open deck. Scuppers are made of hot-galvanized steel pipe ND 80.

512 SCUPPERS FROM UPPER DECK

Scuppers from upper deck and 2nd deck aft, are made of hot-galvanized steel pipe ND 100.

513 SCUPPERS IN REFRIGERATED PROVISION STORES

Scuppers in refrigerated provision stores are equipped with electric heating and are led to the gray water collecting tank.

514 INTERIOR DECK AND LINING DRAINAGE SYSTEM

Scuppers shall be fitted in all wet spaces such as galley, lavatories, wash rooms, laundries etc. Interior scuppers are led to the gray water collecting tank or overboard. Scuppers are of approved type and have provision for cleaning out. Arrangement for draining of linings where condensate may accumulate is provided. Linings are drained by means of pipes at suitable places which are led to lower decks.

Threaded drain plugs of bronze or stainless steel are installed at easily accessible locations for draining of condensate to open deck.

PVC plastic pipes were used where permitted by Class and D.O.T. regulations.

52 WATER, SEWAGE AND HEATING SYSTEMS

521 FRESH AND SEA WATER EQUIPMENT

5212 SANITARY PUMPS

/1-2 2 fresh-water Grundfoss pumps

Type: centrifugal
 Material: casing and impeller of bronze, shaft
 of stainless steel
 Capacity: 10 m³/h, 4 bar

One pump working and one pump stand-by.

/3-4 2 sea-water Grundfoss pumps

Type: centrifugal
 Material: shaft of stainless steel
 Capacity: abt. 2-3 m³/h, 4 bar

One pump working and one pump stand-by.

/5-6 2 hot-water circulation pumps

Type: centrifugal
 Material: casing and impeller of bronze, shaft
 of stainless steel
 Capacity: 1.0 m³/h, 1.0 bar

One pump working and one stand-by.

5213 FILTERS

/1 1 mechanical filter for fresh water

Material: bronze
 Capacity: 10 m³/h, 4 bar, mesh 0.5 mm

/2 1 mechanical filter for sea water

Material: bronze
 Capacity: 2-3 m³/h, 4 bar, mesh 0.5 mm

5214 WATER CALORIFIERS

/1-2 2 hot water calorifiers for fresh water

Material: Inconel
 Volume: 0.8 m³
 Capacity: 30 kW electric heating each

Warm water temperature is at least 45C.
 The calorifiers are insulated with abt. 50-75 mm rock
 wool and covered with abt. 0.5 mm thick galvanized
 steel plating.

5215 CHLORINATORS

/2 1 chlorination injection system is installed.

5216 SANITARY FIXTURES AND EQUIPMENT

All hand basins have spring loaded Pillar Cocks, of the water saving type.

Mixing valves for showers are of one-hand-grip, water-saving thermostatic type.

All fixtures are of bronze, chrome-plated, with shut-off valves of ball type for each individual compartment.

Small shut-off valves up to ND32 are generally ball-type valves of bronze. Sizes ND40 and larger are gate or globe valves of bronze.

Toilet bowls:	porcelain
Wash-basins:	porcelain
Sinks:	stainless steel

522 FRESH-WATER AND SEA-WATER SYSTEMS

F r e s h W a t e r S y s t e m

Fresh water tanks are filled either from shore connection through the fresh water bunker station, or from the evaporator, or the reverse osmosis plant.

The chlorinator is to be installed in the pipe line to the fresh water storage tanks, on a pass system, so that water from either of the producers, or from the shore supply can be optionally chlorinated prior to storage.

The fresh water supply pumps have suction connections to all fresh water tanks and discharge through the mechanical filter to a supply main.

One pump is arranged for continuous operation, with the second pump as an automatic back-up unit, on failure of the working pump.

Cold fresh water is taken from the supply main to all cold water consumers such as all wash basins, showers, galleys, pantries, laundries, sinks, laboratories, washing machines, toilet flushing, bridge window washing etc. Engine room consumers have one separate main pipe connected to the fresh supply main through a non-return valve.

A separate line is taken from the cold fresh water main to the hot water calorifiers. Hot water circulating pumps keep the hot water circulating in the hot water main pipes. The calorifiers are thermostatically controlled to prevent the hot water temperature from dropping below a chosen set point. Hot water is led to all consumers as listed in the cold fresh water section. Hot water distribution pipes are installed as a closed loop with return to calorifiers and circulating pumps.

E v a p o r a t e d W a t e r S y s t e m

The evaporator is arranged to supply water to either the feed water tanks or to the fresh water storage tanks. The feed water tanks will only be filled with water produced by the evaporator.

The reverse osmosis plant is arranged to supply water to the fresh water storage tanks only.

The evaporator and reverse osmosis S.W. pumps are arranged to draw water from the sea main, with alternative connections to the Ballast main and Central Cooling system S.W. overboard pipe line.

S E A W A T E R S Y S T E M

Sea water service pumps have an independent sea suction, one pump working and one pump stand by. The system is designed to minimise temperature fluctuations of the water prior to instruments and contamination.

Sea water from the system passes through mechanical filter to research and other laboratories, scientific containers and other consumers.

P i p i n g M a t e r i a l s

Cold-water main pipes are of copper or PVC. Connections up to ND32 are made with screw couplings, and larger ones with "Viking Johnson" couplings or flange connections.

Warm-water pipes are of copper. Connections up to ND32 are made with brazing or "Cuterlite" press connection couplings, and the larger ones with flange connections.

The valves and fittings of the cold-water and warm-water systems are of gun metal brass.

The warm-water pipes are insulated according to Builder's standard. Cold water pipes in accommodation are insulated where condensation may occur.

SEWAGE SYSTEMS

The sewage system is divided into two parts.

1. Grey sewage water system of gravity type, to which are connected:

- wash-basins
- scuppers from showers, WC's
- scuppers from laundry, galley and pantry
- scientific containers
- laboratory sinks and equipment

Grey water outlets from all toilet modules, wash basins, sinks, laundries, pantries etc. are connected to main branches generally below the deck on which they are located. Sufficient number of main branch pipes are connected together where possible and are laid as straight as possible avoiding unnecessary pipe bends. Sufficient number of cleaning plugs are installed.

The grey water collecting tank located in the double bottom is equipped with necessary inlet and outlet connections, air pipe and sounding pipes and manholes.

The grey water discharge pump has suction connection from collection tank and discharge to sewage treatment plant, shore connection or over board.

Grey water from galley passes through one fat filter before entering the grey water tank.

2. Black sewage water system

A vacuum type sewage system is installed and is of sufficient capacity to provide for the waste from all toilets. The system is suitable for use with fresh water. The system is connected to all closet bowls, hospital scuppers and basins. Discharge from hospital is led separately direct to the vacuum sewage plant according to regulations.

SEWAGE PIPES

Grey and black water pipes are of PVC plastic above the bulkhead deck. Connections are made by PVC Solvent joints, unfastening screw couplings and flanges as appropriate. Under the bulkhead deck the pipes are hot-zincd steel pipes. Connections are made by "Viking Johnson" couplings or flange connections.

Sufficient number of cleaning plugs are installed according to supplier's standard and instructions.

5232 SEWAGE TANKS AND PUMPS

/1 1 grey water sewage collecting double bottom tank

Material: steel
Volume: 40 m³

/2 1 grey water discharge pump.

Capacity: abt. 5 m³/h, 2.5 bar

/3 1 defat filter for galley

Material: steel
Volume: 150 l

/4-5 Sewage ejector pumps; mounted on black sewage collection tank unit.

/6-7 Sewage ejectors; mounted on treatment plant black-water inlet section.

The vacuum is created and maintained in the piping by a water ejector. The ejector is powered by a centrifugal

pump, which circulates the contents of the inlet section

through the ejector and back into the inlet section.

The tank itself is under normal atmospheric pressure.

The tank is isolated from the vacuum piping by means of a check valve in the ejector which opens only when the ejector is operating.

The vacuum-maintaining function of the ejector is controlled by a pressure switch, which gives a starting signal to the pump whenever the vacuum level in the piping falls too much. The switch turns the pump off as soon as the vacuum level is sufficient.

Possibility to discharge treatment plant contents to shore is arranged.

5233 TREATMENT OF SEWAGE AND WASTE WATER

/1 1 sewage treatment plant.

The plant is dimensioned to purify the black sewage of 133 people and the galley waste disposal discharge. The treatment meets IMO regulations for normal conditions.

The treatment system is of biological type. The operation of the unit is automatic.

524 HEATING SYSTEMS

The heating is dimensioned to keep the following indoor temperatures at an ambient temperature of -35C:

- +24C in the living spaces and laboratories
- +16C in corridors and workshops
- +10C in engine rooms
- +16C in helicopter hangar, fish processing and net storage areas

5244 ELECTRICAL HEATING

The Instrument Room is equipped with electrical heating.

5245 STEAM HEATING

Six steam outlets are provided on open decks: 2 on helideck, 2 on aft 2nd deck, 2 on fwd upper deck.

Steam is used for heating of the following spaces:

- air condition heating
- helicopter hangar heating
- thruster room heating
- steering gear room
- deck and other stores below forecastle deck
- engine room

Heating is arranged with steam radiators or hot air blowing fans.

Pipes:

- Black steel pipe with flanged connections, insulated according to Builder's standard

Valves:

- Steel valves, seat type with stainless steel or bronze internal.

53 FIRE PROTECTION

531 WATER FIRE EXTINGUISHING SYSTEM

5311 FIRE MAIN AND DECK WASHING

The vessel is equipped with a water fire extinguishing system.

The fire main is fed by three fire pumps (item 7413). Capacity of each is 90 m³/h, 8 bar. The fire pumps have remote start from the wheelhouse and control room.

Two fire pumps are installed in the engine room and one fire pump in the bow thruster room.

The pumps in the engine room take suction from the sea main and discharge the water into the common fire main and deck wash pipe system. The pipe system is made in sections, separated by valves. The valves are normally open, but can be closed to separate damaged pipes. The pipes are made of hot-zinced steel.

Hose stations are arranged in engine room(s), deck house, on open decks, helicopter area, in hangar, etc.

Each hose station is equipped with:

Fire hydrant with quick-acting coupling

Fire hose

Hose lengths:

in engine rooms: abt. 18 m

in interior spaces: abt. 12 m

Fire hoses are provided with quick-acting couplings.

Spray nozzle with full jet / spray / shut-off.

Nozzle diameters:

in engine room(s), open deck: 19 mm

in interior spaces: 12 mm

Hose stations:

in engine room(s): type open basket

in interior spaces: type flush wall mounted

on open deck: wall or rack-mounted fire locker

Two international shore connections are fitted with quick-acting couplings of the same type as ship hydrants.

Materials:

Fire hydrants and couplings: all bronze

Nozzles: aluminium or bronze

Hoses: synthetic material, rubber-lined of approved type

Fire lockers in interior spaces: steel

Fire lockers on open decks: fibreglass reinforced plastic with hinges and locks in stainless steel

Fire main is installed avoiding water pockets which in case of frost may freeze. Sufficient number of drain plugs is installed to prevent water from freezing in fire main.

Hydrants on open decks are so placed that they cannot freeze and they are provided with covers. All hydrants are of 50 mm bore and are of approved type.

An independent sea suction is provided for the emergency fire pump. Possibility to take suction from a peak tank in the case of ice blocking the independent sea suction is also provided.

Fire pumps are used as deck washing pump.

Fixed cable washing with three spray jets/hawse pipe, supply of water from fire/deck wash line.

Fresh water connections on each deck to serve all open deck areas. Water supply from fresh water hydrophore plant.

533 CHEMICAL FIRE EXTINGUISHING SYSTEM

5331 CO2 AND HALON GAS SYSTEM SYSTEM

CO2 F i r e E x t i n g u i s h i n g S y s t e m

The cargo holds are protected by a separate CO2 system,

The system consists of:

/1-10 Bottles of high pressure CO2 as per rules,

- pipes with nozzles for the protected space

A separate CO2 release station is located on the Upper deck.

H a l o n S y s t e m

The following spaces are protected with a fixed Halon 1301 total flooding system:

- main engine room

- instrument room

/11-30 The system includes bottles as per rules.

The system is controlled manually from a release box or station located outside the protected area or compartment.

Safety measures with release delays and alarm signals for Halon systems are all in accordance with the D.O.T. rules.

5333 FOAM EXTINGUISHING

/1 A foam fire fighting system is installed to D.O.T. regulations to cover the helicopter deck and additionally the forward hatch area by portable monitor system.

54 VENTILATION AND AIR CONDITIONING

541 VENTILATION OF CARGO SPACES

Mechanical supply ventilation with natural exhaust to be provided for the cargo hold.

Cargo hold to has 10 air changes per hour. The fans are of axial type and the construction is explosion proof.

All ventilation openings on the weather deck and above are protected by weathertight closing covers.

542 VENTILATION OF DECK STORES AND DECK MACHINERY SPACES

5421 VENTILATION DUCTS, TORPEDO VALVES

The ventilation ducts are made of steel sheeting with necessary flange connections. Air intake chambers and distributing openings with regulating dampers are provided where necessary.

Air ducts are dimensioned for air velocities below 10 m/s.

5422 FANS FOR FORCED VENTILATION

The following spaces have forced ventilation:

Ventilated space			Volume flow supply m ³ /h	Volume flow exhaust, m ³ /h
/1-2	Helicopter hangar	S, E, ex, H	10000	10000
/3	Accumulator room	E, ex		500
/4-5	Side thruster room, bow	S, E	2000	2000
/6-7	Side thruster room, aft	S, E	2000	2000
/8-9	Steering gear room	S, E	2000	2000
/10-11	Baggage store	S, E	200	200
/12	Emerg. gen. room	S	2000	
/13-14	Helicopter fuel distribution room	S, E, ex	500	500
/15	CO ₂ room	E		500
/16	Cargo hold 1	S, E, ex	4000	
/17	Cargo hold 2	S, E, ex	6000	
/18	Tweendeck holds	S, E, ex	12000	
/19	Deck store	E		2000
/20-21	Net store/fish processing	S, E, H	2000	2000

S = supply
E = exhaust
ex = explosion proof
H = heated

Mechanical ventilation fans are fitted with silencers for sound attenuation as necessary to meet the specified noise standards. Compartments which give off heat, odour or gas are in general exhaust ventilated. Pressure differences are avoided by provision of supply and exhaust.

Ventilation systems function correctly when weather doors are closed.

543 AIR CONDITIONING AND VENTILATION IN ACCOMMODATION

A i r C o n d i t i o n i n g

All living spaces, including cabins, public rooms, hospital department, offices, pantries, laboratories, wheelhouse, radio room, working spaces, radar room, etc., are air-conditioned.

Separate air conditioning for instrument room and for engine control room and engine workshop is provided. The oceanographic and wet labs are independently spot cooled, heated and mechanically ventilated.

The cabin spaces are air-conditioned by single-duct high-velocity systems. The high-velocity air-conditioning system consists of a central unit connected to preinsulated ducts of thin-walled, coiled and zinc-coated steel. The ducts lead the air into pan type diffusers in individual cabins and punkah louvres in spot cooling spaces. The temperature in cabin sections port and starboard can be controlled by trunking in line steam heating units with thermostatic control to re heat air. The maximum number of air changes in private cabins is ten (10) per hour, minimum 2.5 changes/h fresh air.

Public spaces are air-conditioned by low-velocity central units with individual reheating for separate zones. The maximum number of air changes for public spaces is twelve (12) per hour. Air conditioning complies with Australian D.O.T.

The galley and laundry departments are air-conditioned by normal low-velocity central systems.

Canopy with grease filter and fire damper is fitted over the cooking range in the galley, through which air to be exhausted. The galley is provided with exhaust fan (with 40 changes per hour). Sanitary spaces to have a separate exhaust ventilation (15 changes per hour).

Design conditions:

- Heating to 24 deg. C with ambient temperature of minus 35 deg C.
- Cooling to 27 deg. C with 60 % R.H. with ambient temperature of 35 deg. C, 90 % R.H.

For the galley and laundry only spot cooling or hot air supply is applied and the conditions given above do not concern these spaces.

Wheelhouse trunking is fitted with isolation damper for use when the doors are open.

During heating period the temperature of supply air is controlled manually by means of a control valve in the central unit room.

During cooling period the temperature of supply air is approximately constant.

In mild climates when neither cooling nor heating is required, the system to serve as mechanical ventilation for the accommodation, supplying fresh air only.

Necessary dampers are fitted in main branches at suitable locations.

Provisions are made in cabins, public rooms, offices, etc., to exhaust the air into passageways by louvres on doors.

V e n t i l a t i o n o f G a l l e y , L a u n d r y a n d P r o v i s i o n S t o r e s

Separate low-velocity supply and exhaust system is installed.

Continuous ventilation of about 5 times/day is arranged only for provision stores with temperature over + 0C.

A C U n i t s a n d E x h a u s t a n d S u p p l y F a n s

No.	Type	Space Served
/1	AC 1	Air-cond. unit
/2	AC 2	"
/3	AC 3	"
/4	HV 1	Heating unit
/5	HV 2	"
/6	HV 3	"
/7	E1	Exhaust fan
/8	E2	"
/9	E3	"
/10	E4	"
/11	E5	"
/12	S1	Supply fan
/13	S2	"
/14	S3	"

The AC unit is composed of a number of sections for the filtering, preheating/cooling, humidification, reheating and distribution of air and is designed to ensure no carry-over of condensate.

Each cooling unit is to be of double section type and each for 100 % capacity and supplied separately from compressor unit.

The heating and ventilation unit consists of air filter, heating section and centrifugal fan.

Rubber isolation for air conditioning plant and sound attenuation box for pan type diffuser is provided as necessary to meet the specified noise standards.

The exhaust fans are of centrifugal type.
All fans are mounted on anti-vibration pads.

T r u n k s a n d D u c t s

Circular or rectangular ducts of galvanized steel plate are insulated where necessary to prevent sweating and heat loss. Sound proofing of ducts, equipment, intakes and discharges is provided in way of accommodation.

Access doors of adequate size are provided in ducts adjacent to the motor end of axial flow and propeller fans, to allow complete inspection and servicing of the motors.

N a t u r a l v e n t i l a t i o n

Natural ventilation is provided for:

- stores
- battery spaces as necessary
- internal lockers through vents in doors.

Central alarm system includes air conditioning plant malfunction alarm.

5432 C O O L I N G M A C H I N E R Y

Direct expansion cooling system with R 22.

/1-2 2 compressor units for refrigerating AC air. One of the compressors is stand-by. The compressors are cooled by sea water from separate pumps which are to start prior to compressor starting.

The compressors are of reciprocating type, electric motor driven with automatic start and stop and with automatic capacity regulation. Each compressor capable of 100% capacity.

Central alarm system includes air-conditioning cooling plant malfunction alarm.

2 AC compressor cooling water pumps see 7211/3-4

Each compressor is a totally independent gas system with cooling units/evaporators separated.

Separate independent temperature control systems are provided for laboratories Nos. 4 and 5. Each system has capacity enough to maintain the desired temperature of -5 deg. C to +5 deg. C. These rooms are suitably insulated.

55 REFRIGERATED SPACES, PLANTS AND FITTINGS

551 MACHINERY AND EQUIPMENT FOR REFRIGERATED PROVISION STORES

5511 REFRIGERATING MACHINERY

The refrigerating machinery is designed for automatic operation with R 22 as refrigerant and is to cool:

Frozen meat and fish store	-18C
Milk products	+4C
Vegetable store	+4C

/1-2 Two compressors, each with condenser, for refrigerated provision rooms. One of the compressors is stand-by.

The plant has ample capacity for maintaining these temperatures at a sea water temperature of max. +32C, ambient air temperature of max. +45C, and relative humidity of 80%.

Under the above-mentioned conditions one compressor unit runs for abt. 18 hours out of 24.

Each compressor is provided with suction and discharge stop valves, electric motor, dual high-low pressostat, safety relief valve, and all necessary fittings for automatic and manual operation. Expansion valves are fitted with bypass facility incorporating isolating valves.

Each unit is installed so as to serve interchangeably for the chambers and maintain the required condition. Full instructions for stop and starting procedures to be prominently displayed.

Air coolers of the ceiling suspension type are installed, consisting of an air cooler of copper tubes with copper plate fins, drip pan and casing, adjustable louvres, propeller fan connected to a totally enclosed motor.

Outside thermometers for all refrigerated stores are fitted in the corridor.

Central alarm system includes refrigerating plant malfunction alarm.

Reserve R-22 refrigerant is provided equivalent to 2 complete recharges of the refrigerant and air conditioning system in suitable pressure bottles complete with test certificates. Bottles are suitably mounted adjacent to the system to facilitate recharging.

- 56 GARBAGE HANDLING PLANTS
- 561 GARBAGE DISPOSAL
- 5612 GARBAGE DISPOSAL EQUIPMENT

/1 1 incinerator.

The incinerator can burn waste oil as well as solid waste. The incinerator is air-cooled.

Waste oil burning capacity approx. 15 kg/h
Solid waste " " 20 kg/h

The incinerator's exhaust pipe is led to the funnel.

The incinerator is started with diesel oil. Bilge oil is fed from the mixing tank. Dirty and combustible sludge oil is fed to mixing tank by means of pump 7416/1. The mixing tank is equipped with heating by steam.

- /2 Bilge oil feed pump
 - /3 Burning air fan
 - /4 Diesel oil pump
 - /5 Burner
 - /6 Galley waste grinder
 - /7 Incinerator mixing tank
 - /8 Flue gas fan
 - 5613 Waste compactor
- 1 Waste compactor is fitted

6 MAIN MACHINERY

G e n e r a l

The machinery plant is designed for world-wide operation according to the following ambient conditions:

- outdoor air temperature -35C...+35C
- sea water temperature -2C...+32C

The machinery is built to comply with the rules and regulations of Lloyd's Register of Shipping and CASPPR Class II with additional strengthening for the actual specified ice conditions.

The engine plant is designed for operation on heavy fuel oil up to 180 cSt/50C CIMAC-6.

All pressures are marked in bar or kg/cm², temp. in degrees C and all tank gauges are calibrated in the metric system.

61 PROPULSION MACHINERY

G e n e r a l

The main machinery consists of two diesel engines arranged as a pair, driving a controllable-pitch propeller through flexible couplings, clutches and a reduction gear.

The propeller pitch and the revolutions of the diesel engines are simultaneously controlled by means of the electronic combinator control system with a single lever on the bridge. Each bridge wing and aft control station is equipped with a slave manoeuvring stand.

There is an electronic load control system integrated to the remote control system keeping the load of the engines at a desired value.

In the machinery control room there are stands for separate control of propeller pitch and engine revolutions. Changeover from bridge manoeuvring to the engine control room and vice versa takes place from the engine control room.

Arrangement is provided for local manoeuvring of the propeller pitch on the oil distribution box in case of emergency.

When operating at slow speed, propulsion is by retractable azimuth type thrusters situated aft and off centerline. These thrusters are driven by DC motors from an SCR system.

The shaftline, propeller and reduction gear are dimensioned according to Wärtsilä Marine experience of ice-going vessels which satisfies or exceeds Class requirements.

Torsional vibration calculations for propulsion system including main engine, gear, shaft line, propeller and elastic couplings were submitted for approval of the Classification Society.

Main Engines are installed on Resin Chocks. Reduction Gearbox installed on Cast Iron Chocks.

611 MAIN DIESEL ENGINES AND SYSTEM EQUIPMENT

6111 MAIN DIESEL ENGINES

/1-2 1 Wärtsilä Vasa 16V 32 and 1 Wärtsilä Vasa 12V 32 diesel engine.

The diesel engines are medium-speed, four-stroke, non-reversible, trunk piston, turbo charged and intercooled engines with direct fuel injection.

The engines are started by means of compressed air and cooled by fresh water through a load-dependent temperature control system, built on the engines. This includes the charge air and lube oil.

Technical Data

Engine 16 V 32 / Engine 12 V 32:

- Number of cylinders	16/12
- Cylinder bore	320 mm
- Piston stroke	350 mm
- Maximum continuous rating (MCR)	5500/4500 kW
- Corresponding speed	750 rpm
- Fuel oil consumption	189 g/kWh + 5%

The fuel consumptions are based on the following conditions:

- ISO 3046/1
- without engine driven pumps
- test bed
- lower calorific value of 42700 kJ/kg (10200 kcal/kg)
- MCR

The main engines operate on fuel oil up to 180 cSt/50C, CIMAC-6.

Both main engines are set up for optimum fuel consumption at reduced power for cruise running approx. 2700 kW and RPM to suit optimum propeller efficiency at 13 knots.

Lubricating oil consumption at maximum continuous power is about 1.2 g/kWh.

The engines are provided with standard equipment and wet oil sump.

Lubrication oil pumps are engine-driven, electrically driven stand-by pumps are mounted separately.

The engines are started with direct injection of air.

D e s c r i p t i o n o f t h e e n g i n e

Engine block:

- The engine block is cast in one piece for all cylinder numbers. It incorporates the jacket water manifold, the camshaft bearings and the charge air receiver. In the V-engine the charge air receiver is located between the cylinder banks. The crankshaft is mounted in the engine block in an underslung way. The bearing caps are fixed from below by two hydraulically tensioned screws.

The fixing bolts are hydraulically tightened in order to facilitate the engine fixation to the foundation.

Crankshaft:

- The crankshaft is forged in one piece.

To counteract eccentric masses loading the main bearings, the crankshafts are provided with counterweights.

Connecting rod:

- The connecting rods are forged and machined with round sections of alloy steel. The big end is split diagonally. The two connecting rod bolts are hydraulically tightened.

Main bearings and big end bearings:

- The main bearings and big end bearings are of trimetal design with steel back, lead-bronze lining and a soft running layer.

Cylinder liner:

- The cylinder liners are centrifugally cast of special cast iron. The top collar of the cylinder liner is provided with bore cooling.

Piston:

- The piston is of composite type with steel top and nodular cast iron skirt. The top piston is cooled by means of cocktail shaker effect. The piston ring grooves are hardened.

Piston rings:

- The piston ring set consists of two chromium-plated compression rings, one combined compression/oil scraper ring, and one spring-loaded oil scraper ring with chromium-plated edges.

Cylinder head:

- The cylinder head is made of grey cast iron. The flame plate is relatively thin and is cooled by cooling water.

The exhaust valve seats are water cooled through separate cooling. The inlet and exhaust valves are interchangeable. Each head is fitted with two inlet valves, two exhaust valves, one injection valve and relief valve. In addition the heads - in the V-type the heads of one cylinder bank - are fitted with starting valves.

Camshaft and valve mechanism:

- The cams are integrated in the drop forged shaft material. The camshaft bearings are installed and removed by means of a hydraulic tool.

The camshafts are driven by the crankshaft through a gear train.

Turbo charging and charge air cooling:

- The turbo chargers have axial turbines, roller bearings and built-in lube oil system. The V-engine has one charger per cylinder bank. For cleaning of the turbocharger during operation there is a water washing device.

Injection equipment:

- The injection pumps are one-cylinder pumps with built-in tappets. The injection pipe between the injection pump and the high pressure connection is protected by the injection pump covers.

Exhaust pipes:

- The exhaust pipes are cast of nodular iron. The complete exhaust system is enclosed in an insulating box.

7 AUXILIARY MACHINERY AND ANCILLARY EQUIPMENT

71 MACHINERY FOR GENERATING ELECTRIC POWER

General

Three auxiliary engine driven generators, 2 off 975 kW and 1 off 620 kW are installed for generating electric power to supply the electrical requirements for the vessel. They are arranged for selected automatic start-up and connection in the event of power failure.

The engine plant is designed for operation on heavy fuel oil, up to 180 cSt/50 C, CIMAC 6, fuel supply from main engine fuel module. There is a common central cooling system for the auxiliary engines.

711 DIESEL GENERATORS

7111 AUXILIARY DIESEL ENGINES

/1-3 2 off Wärtsilä Vasa 6R22 diesel engines and 1 off Wärtsilä Vasa 4R22.

The diesel engines are medium-speed, four-stroke, non-reversible, trunk piston, turbo charged and intercooled engines with direct fuel injection. The engines are started by means of direct injection of compressed air and cooled by fresh water with load dependant temperature control system.

The diesel engines have built on HT and LT cooling water pumps, lub-oil circulation pump and lub-oil cooler.

Each engine is connected directly to its own AC generator.

Technical Data for 6R22

- Number of cylinders	6
- Cylinder bore	220 mm
- Piston stroke	240 mm
- Maximum continuous rating (MCR)	960 kW
- Engine speed	1000 RPM
- Fuel consumption	195 g/kWh + 5%

Technical Data for 4R22

- Number of cylinders	4
- Cylinder bore	220 mm
- Piston stroke	240 mm
- Maximum continuous rating (MCR)	640 kW
- Engine speed	1000 RPM
- Fuel consumption	200 g/kWh + 5%

The fuel consumption is based on the following conditions:

- ISO 3046/1
- without engine-driven pumps
- test bed
- lower calorific value of 42700 kJ/kg (10200 kcal/kg)
- MCR

The engines are provided with standard equipment and wet sump.

The engines are connected to the fresh water cooling system of the auxiliary engines.

The diesel engine and the generator are mounted on a common bottom frame, elastically attached to the hull of the ship. Pipes are elastically connected.

D e s c r i p t i o n o f t h e E n g i n e

Engine block:

- The engine block is cast in one piece for all cylinder numbers. It supports the underslung crankshaft and incorporates the jacket water manifold, the camshaft bearings and the charge air receiver.
- The wet oil sump comprises, in addition to the suction pipe to the lubricating oil pump, also suction and return connections for the separator.

Crankshaft:

- The crankshaft is forged in one piece.

To counteract the eccentric masses loading the main bearings, the crankshafts are provided with counterweights.

Connecting rod:

- The connecting rods are forged and machined with round sections of alloy steel. The big end is split diagonally. The two connecting rod bolts are hydraulically tightened.

Main bearings and big end bearings:

- The main bearings and big end bearings are made of steel, lead-bronze or steel light metal and are galvanized with a soft sliding coat.

Cylinder liner:

- The cylinder liners are centrifugally cast of special cast iron.

Piston:

- The piston is of monoblock design in nodular cast iron. Piston cooling operates according to the cocktailshaker principle. The piston ring grooves in the piston top are induction hardened and ground.

Piston rings:

- The piston ring set includes three compression rings, the two top rings of which are chromium-plated and round-honed.

The oil scraper ring is spring-loaded and conformable and has chromium-plated scrape edges. All rings are situated above the gudgeon pin.

Cylinder head:

- The cylinder head is made of grey cast iron. The flame plate is relatively thin and is cooled by cooling water.

The exhaust valve seats are water cooled through separate cooling. The inlet and exhaust valves are interchangeable. Each head is fitted with two inlet valves, two exhaust valves, one injection valve and relief valve. In addition the heads are fitted with starting valves.

Camshaft and valve mechanism:

- The cams are integrated in the drop forged shaft material. The camshaft bearings are installed and removed by means of a hydraulic tool.

The camshafts are driven by the crankshaft through a gear train.

Turbo-charging and charge air cooling:

- The turbo-chargers have axial turbines. For cleaning of the turbocharger during operation there is a water washing device.

Injection equipment:

- The injection pumps are one-cylinder pumps with built-in tappets.

The injection pipe between the injection pump and the high pressure connection is well protected inside the hot box.

Exhaust pipes:

- The exhaust pipes are cast of nodular iron. The complete exhaust system is enclosed in an insulating box.

7112 AUXILIARY GENERATORS

/1-2 2 three-phase synchronous generators.

D e s c r i p t i o n

Self-regulated, self-excited, self-ventilated, brushless, electronic voltage regulator, star connected with the star led out to an accessible terminal box.

Output:	1180 kVA, cos phi 0.8
Frequency:	50 Hz
Speed:	1000 r/min
Voltage:	415 volts
Form of construction:	IM 1305 or 1001 according to IEC Publ.34-7
Bearing:	One end shield sleeve bearings
Type of enclosure:	IP 23 S/IP 55 according to IEC Publ.34-5

Insulation:	To class "F", insulation with special protection against moisture, oil and tropical conditions
Temperature rise class:	F
Temperature control:	Temperature sensors in the stator windings 2/phase. Capillary thermometer with alarm/release for the bearings
Ambient temperature:	45 deg. C
Accessories:	One current transformer for reactive load compensation and three for short circuit excitation

The AC exciter with rotating rectifier is located on the generator shaft. Regulation power is supplied from the stator terminals of the generator. Initial excitation is endured by means of the permanent magnet pole located in the stator of the exciter. The electronic voltage regulator is a separate unit mounted in the main switch-board.

The generators are provided with shaft-mounted fan and air intake dust filter, and anti-condensation heater 240 V, 400 W. The generator is of two-bearing type. Spherically seated bearings are lubricated with a lubrication system connected to that of the driving engine. It isn't necessary to shut down oil flood when the generator is not in use.

- /3 1 three-phase synchronous generator, 750 kVA; star-connected, with the star led out to an accessible terminal box.

D e s c r i p t i o n

Self-regulated, self-excited, self-ventilated, brushless, electronic voltage regulator mounted in the switchboard.

Output:	750 kVA, cosphi 0.8
Frequency:	50 Hz
Speed:	1000 r/min
Voltage:	415 volts
Form of construction:	IM 1305 or 1001 according to IEC Publ.34-7
Bearing:	One end shield sleeve bearings
Type of enclosure:	IP 23 S according to IEC Publ. 34-5
Insulation:	To class "F", insulation with special protection against moisture, oil and tropical condition
Temperature control:	Temperature sensors in the stator windings, and one/two sensor(s) in the bearing(s)

The generator is provided with shaft-mounted fan and air intake dust filter, and anti-condensation heater.

The generator is of two-bearing type if a flexible coupling is necessary between the engine and the generator. Generator bearings are lubricated with a lubrication system connected to that of the driving engine.

7114 SILENCERS FOR AUXILIARY ENGINES

- /1-3 3 silencers for auxiliary engines.

The auxiliary engines are equipped with silencers of absorption type. Silencers are equipped with spark arrester and provided with soot collector, water drain and cleaning openings. The attenuation of noise is abt. 25 dB(A).

7116 AUTOMATIC CONTROL SYSTEM FOR DIESEL GENERATORS

The system is suitable for long time automatic parallel operation with three auxiliary generators. Manual ship to shore connection with a short time black-out.

The three auxiliary generators are arranged for selected automatic start-up and connection in the event of power supply overload or failure. In the event of power failure the emergency generator will start and provide emergency service.

The automatic system for the diesel generators has the following functions:

- Remote start/stop of diesel generators from main switchboard
- Manual/automatic synchronization of generators
- MASTER/STAND-BY SELECTION; Each aux. diesel generator can be selected as Master or Stand-by
- AUTOMATIC START/STOP of diesel engines; black-out start, load dependant start and safety start. Automatic stop function including load depending stop and safety stop. Automatic preference trip if start or synchronization is not obtained within specified time.
- BLACK-OUT START; a black-out sequence is carried out by the absence of the bus-bar voltage. If short circuit is detected generator breaker operations are so blocked. During black-out signal the aux. diesel engines receives an automatic start signal and when the generator voltage is present initiates generator breaker.
- LOAD DEPENDENT START; automatic start of stand-by engine, when the available power is less than 20 % of the capacity of the running one. Stop is by manual control.
- SAFETY START/STOP; automatic start of stand-by engine in the event of high load, alarm condition of lubricating oil inlet pressure very low, coolant outlet temperature very high, and over-speed or after black-out of diesel generator in operation.
- BLOCKING OF HEAVY CONSUMERS; start request of heavy consumers and reservation of available power, start acknowledge to the consumer when the available power exceeds the requested power.
- ASYMMETRIC LOAD SHARING; one generator acts as base load, the other one as a topping-up.

The diesel engine has the following accessories for controlling and alarming:

- solenoid valve for engine start
- shut-down solenoid for engine stopping
- speed regulator
- electronic tachometer system
- sensors for automatic stopping
- sensors for alarm.

Following failure alarms on alternators are provided:

- generator winding temperature - high
- voltage - high/low
- frequency fluctuation - high/delay
- bearing temperature - high.

When generators are loaded with 90% of rated load, non-essential provided consumers are switched off with time delay and an alarm to the central alarm system. The non-essential consumers are:

- heating
- galley
- accommodation ventilation (excluding ventilation of ex-areas)
- air-conditioning compressor

Interlocks are provided to prevent parallel operation between the ship alternators, shore supply and emergency generator.

Switching provisions are made to allow power to be fed to the ship services from the emergency generator for starting up from dead ship conditions and harbour/lay-up service.

714 EMERGENCY AND HARBOUR GENERATORS

7142 EMERGENCY DIESEL GENERATOR

/1 EMERGENCY DIESEL ENGINE

1 emergency diesel engine, 1500 rpm. Output 210 kVA

The engine is a radiator air-cooled four-stroke diesel engine. Alternator and engine are resiliently mounted on a common base plate.

Automatic starting and local manual control are provided. The unit is battery-started, with back-up starting system.

In case of total mains power failure the emergency engine starts automatically. The emergency set is stopped manually.

/2 EMERGENCY GENERATOR

1 three-phase synchronous emergency generator, 187 kVA; star-connected, with the star led out to an accessible terminal box.

D e s c r i p t i o n

Self-regulated, self-excited, self-ventilated, brushless, electronic voltage regulator mounted in the switchboard.

Output:	187 kVA, cosphi 0.8
Frequency:	50 Hz
Speed:	1500 r/min
Voltage:	415 volts
Form of construction:	IM 1305 or 1001 according to IEC Publ.34-7
Bearing:	One or two end shield sleeve bearings
Type of enclosure:	IP 23 S according to IEC Publ. 34-5
Insulation:	To class "F", insulation with special protection against moisture, oil and tropical condition
Temperature control:	Temperature sensors in the stator windings, and one/two sensor(s) in the bearing(s)

This generator serves the ship in harbour and lay-up when no shore supply is available.

7146 SILENCERS

/1 1 silencer for emergency diesel.

72 MACHINERY AND EQUIPMENT BELONGING TO THE AUXILIARY MACHINERY

721 AUXILIARY AGGREGATES OF THE AUXILIARY ENGINES

7211 SEA-WATER COOLING PUMPS FOR AUXILIARY ENGINES

/1-2 2 electrically driven sea-water cooling pumps for auxiliary engine/machinery central coolers.

Type:	centrifugal, max 1500 rpm
Material:	housing and impeller of bronze, shaft of stainless steel

One of the pumps is stand-by and equipped with automatic start.

The pumps are installed in the engine room, and to be located close to sea water main in order to minimize the length of pump suction pipes. Further more the pumps to be installed as low as possible above double bottom level noting that good valve access is possible.

- /3-4 2 electrically driven sea water cooling pumps for air cond. compressor.

Type: centrifugal max 1500 rpm
Material: housing and impeller of bronze, shaft of stainless steel
Capacity: 87m³/h

One of the pumps is stand-by and equipped with automatic start.

- /5-6 2 electrically driven sea water cooling pumps for provision refrig. compressors. One of the pumps is in reserve.

Type: centrifugal, max 1500 rpm
Material: housing and impeller of bronze, shaft of stainless steel
Capacity: 13m³/h

7212 FRESH WATER COOLING PUMPS FOR AUXILIARY DIESEL ENGINES

- /1-6 6 fresh water cooling pumps for auxiliary diesel engines. The pumps are built on the engines. One HT- and one LT-cooling pump/engine.

Type: centrifugal, max 1500 rpm
Material: housing of cast iron, impeller of bronze, shaft of stainless steel, mechanical sealing
Capacity: abt 33 m³/h, 3.0 bar for 6R22 engine
abt 22 m³/h, 3.0 bar for 4R22 engine

- /7-8 2 fresh water cooling pumps for auxiliary machinery. Pumps are connected to auxiliary engine/machinery central cooling low temperature circuit. The pumps are electrically driven. One of the pumps is stand-by and equipped with automatic start.

Type: centrifugal, max 1500 rpm
Material: housing of cast iron, impeller of bronze, shaft of stainless steel, mechanical sealing

They are installed in engine room.

7213 AUXILIARY ENGINE CENTRAL COOLERS

/1-2 2 central coolers for auxiliary engines

Type: plate
 Material: plates of titanium

The aux engine/machinery central coolers are installed in engine room.

7214 FUEL OIL BOOSTER PUMPS AND FILTERS, VISCOSIMETERS

/1-2 2 AE fuel oil booster pumps

Type: screw
 Material: housing of cast iron, screw of steel
 Capacity: 2.5 m³/h, 4.0 bar

/3-5 3 AE fuel oil feed pumps

Pumps are built on the engines and are electrically driven. One pump/engine.

Type: screw
 Material: housing of cast iron screw of steel
 Capacity: 0.7 m³/h, 6.0 bar - 6R22 engine
 0.5 m³/h, 6.0 bar - 4R22 engine

/7 1 AE fuel oil suction strainer in front of fuel oil booster pumps.

Type: duplex
 Capacity: 2.6 m³/h
 Fineness: 0.5 mm

7216 HEATING OF THE ENGINES

/1-3 3 electrical preheat units for aux. engines, one unit for each A.E. The unit consist of one electrical heater and one circulation pump, electrically driven. Preheating units are manually or thermostat selected.

Heater capacity: 12 kW for 6R22 engine,
 8 kW for 4R22 engine

Pump capacity: 1.8 m³/h for 6R22 engine,
 1.2 m³/h for 4R22 engine

722 AUXILIARY BOILER SYSTEM AND ANCILLARY EQUIPMENT

7222 STEAM BOILER / HEAT EXCHANGER

/1 1 oil fired boiler

Capacity 3,500 Kg/Hr saturated steam
 Working pressure 7 Bar (gauge)
 Type Spanner

Suitable for use with H.F.O. having viscosity of 180
 c.s.t. @ 50 deg. C.

Complete with :

fully automatic high/low flame oil burner
 forced draught fan
 main fuel oil pump
 circulating pump with filter
 controls and safety devices including low water
 level shut down and smoke detection.

The boiler is fitted with safety valves, valves, water
 level gauges and pressure gauge. Non-return stop valves
 are fitted to connect the economiser outlets and the
 economiser circulating water pump inlet.

/2 1 fully automatic steam generator

Capacity abt. 3,900 Kg/Hr @ 7 Bar
 (gauge)saturated steam

Type Clayton EH0301M-2

Suitable for use with H.F.O. with viscosity of 180
 c.s.t. @ 50 deg. C.

The generator is complete with fuel burning equipment and
 water feed equipment together with control panel and
 safety equipment. Fitted with steam receiver and
 discharge into the same steam main as the oil - fired
 boiler.

7223 EXHAUST GAS ECONOMISER

/1 1 dual exhaust gas economizer

Economizer capacity	16V	12V
Kg/Hr Approx. 100% MCR	1,037	1,052
Kg/Hr Approx. 75% MCR	800	800
Working Pressure:	7.0 bar	

Economiser is water tube type with one steam sootblower per economiser.

The economiser is installed in the engine room casing complete with inlet and outlet transitions and expansion bellows at both inlets and outlets.

Complete unit is insulated and fitted with safety valves, air release valves, pressure gauges and inlet and outlet header isolation valves.

Necessary platforms are installed to obtain good access to all necessary valves and equipment.

7224 FEED PUMPS AND STEAM SPACE HEATERS

/1-2 2 feed pumps, one working and one stand-by.

/3-4 2 economiser circulating pumps

Type	centrifugal
Material	pump casing and impeller of modular cast iron and shaft of stainless steel

One of the pumps is standby and equipped with automatic start.

/5 Hot filling pump

Capacity: abt. 7 m³/h, 2.0 bar

/7 1 Economiser circulating spare pump

/8 1 Steam generator feed water booster pump.
Steam space heaters (hot air fans with radiators):

7227 CONDENSATE, FEED WATER AND OBSERVATION TANKS

/1 1 hotwell tank, volume abt. 3 m³

/2 1 condensate observation tank, volume abt. 0.5 m³

/3 1 oil contamination tracing device for condensate return from oil heating.

/4 2 feed water tanks in double bottoms

/5 1 Feed water salinometer

7228 AUXILIARY BOILER FUEL OIL SYSTEM

The fuel oil circulating pumps provided with the boiler and the steam generator take the fuel oil from the fuel oil day or from the diesel oil system through a filter and discharge through to the burners. Part of the oil circulates back to the pump suction side.

/1 1 fuel oil filter for the circulating pumps

Type: duplex

/2-3 2 fuel oil circulating pumps for boiler and steam generator

Type: screw

/4-5 2 preheaters for boiler fuel oil

Equipment for boiler fuel oil system to be built on to the equipment. A circulating system to be provided from the ship's day tanks.

/6 1 Steam generator auxiliary fuel oil pump

/7 1 Steam generator fuel oil heater (electric)

/8 1 Steam generator fuel oil heater (steam)

/9 1 Steam generator diesel oil pilot pump

/10-11 2 Boiler fuel oil booster pumps with built on suction strainers.

723 FUEL OIL PURIFIERS

7231 FUEL OIL SEPARATORS

/1-2 2 heavy fuel oil separators, Alcap or equal

The separators are self-cleaning, equipped with separate feed pumps.

Type: automatically self-cleaning

Capacity: 1500 l/h

The separators are controlled with a common electronic program unit.

/3 1 diesel oil separator.

The separator is self-cleaning, equipped with a separate feed pump.

Type: automatically self-cleaning

Capacity: 1500 l/h

7233 PREHEATERS FOR FUEL OIL SEPARATORS

/1-2 2 preheaters for heavy fuel oil separators

Type: tube, thermostatically controlled
 Material: steel
 Capacity: abt. 40 kW
 Heating medium: steam

/3 1 preheater for diesel oil separators

Type: tube, thermostatically controlled
 Material: steel
 Capacity: abt. 19 kW
 Heating medium: steam

7234 PUMPS FOR SEPARATORS

/1-2 2 HFO separator feed pumps

Type: screw
 Capacity: 1500 l/h, 4.0 bar

/3 1 DO separator feed pump

Type: screw
 Capacity: 1500 l/h, 2.5 bar

Separators, preheaters starting and control equipment to be built as an aggregate and installed on engine room platform deck. Separator pumps are installed at double bottom level adjacent to fuel oil tanks.

724 LUBRICATING OIL PURIFIERS

7241 LUBRICATING OIL SEPARATORS

/1-2 2 lubricating oil separators.

The separators are self-cleaning, equipped with separate feed pump.

Type: automatically self-cleaning
 Capacity: 1500 l/h each

One separator for each ME. Both separators can be used for AE lubrication oil separation.

7243 PREHEATERS

/1-2 2 preheaters for lubricating oil separators

Type: tube heat exchangers, thermostatically controlled
 Material: steel
 Capacity: abt. 40 kW
 Heating medium: steam

7244 SEPARATOR PUMPS

/1-2 2 lubrication oil separator feed pumps

Type: screw
 Capacity: 1500 l/h, 4.0 bar

Separators, preheaters starting and control equipment are as an aggregate and installed on engine room platform deck aft. Separator pumps are installed at double bottom level as close as practical to ME lub. oil sump.

73 VENTILATION OF ENGINE SPACES

General

The volume flows for engine room ventilation are dimensioned on the basis of existing heat radiation in the space in question. If the heat radiation is low, the volume flow is based on the minimum number of air changes.

731 EQUIPMENT FOR THE VENTILATION OF ENGINE ROOMS

7311 FANS FOR THE ENGINE SPACES

	Ventilated Space		Volume flow supply, m ³ /h	Volume flow exhaust, m ³ /h
/1-4	Main engine and boiler room	S,E	2 x 40000	2 x 35000
/6	Separator area	E,ex	10000	10000
/9-10	Pump room for aviation fuel	S,E,ex	5000	5000
/11	Transformer room	S	2000	

S = supply
 E = exhaust
 ex = explosion proof

Steering gear rooms, forward and aft thruster rooms and emergency generator room have supply and/or exhaust ventilation.

7314 AIR CONDITIONING IN MACHINERY SPACES

Ventilation of Engine Control Room and Engine Workshop

- /1 Engine control room is air conditioned by two unit coolers; each with one cooling compressor and with electrical supply from main. The cooling capacity of each unit is 60% of total cooling requirement.
- /2 Engine room workshop to be air conditioned by one self-contained unit.

7320 AIR INTAKE CHAMBERS

The air intake chambers are provided with sound traps. Air to engine spaces is taken through the air inlet chambers in the deckhouse. The air velocity is so low that water droplets and snow are separated from the air.

Air velocity in the grids does not exceed 3.5 m/s.

During cold weather engine and boiler room exhaust fans must be stopped and air is mixed with the air in the corresponding space. Heaters and/or two-speed fans are provided for ducts where this cannot be done.

The main air ducts in the engine spaces are made of 2.0 mm steel sheeting and have necessary flange connections. Air ducts are dimensioned for air velocities below 10 m/s.

7322 VENTILATION DUCTS IN THE MAIN ENGINE ROOM

The air inlet ducts are in the main engine room divided into several branches to distribute the air. Ducts are also laid under the floor plates.

The distributing openings have regulating dampers. Surplus air is led out of the engine room through the funnel casing.

7324 VENTILATION DUCTS IN THE SEPARATE ENGINE SPACES

The control room has a ventilation air fan which takes air from outside. The return air is led through a separate duct to the engine room.

The machine shop is provided with pressure fans. The ducts are divided into several branches. The exhaust air is led to the engine room.

7326 INSULATION OF THE AIR DUCTS

The air ducts are insulated in places where risks of condensation or noise occur.

74 PUMPS AND SYSTEMS OF THE HULL PIPINGS

741 EQUIPMENT FOR DRAINAGE, EMPTYING AND FILLING OF TANKS

7411 DISCHARGE PUMPS AND EJECTORS

/1-2 2 bilge pumps, one in bow thruster room, one in engine room

Type: self-priming centrifugal
 Material: housing and impeller of bronze, shaft of stainless steel
 Capacity: 85 m³/h, 2.0 bar

The bilge pumps can be used as ballast pumps.

/3-4 2 discharge ejectors for chain lockers and cargo hold (dangerous cargo)

Material: bronze
 Capacity: 10 m³/h, 1.0 bar

The water to the discharge ejector is supplied from the fire main, and the ejector to discharge directly overboard through separate overboard valve.

7412 BALLAST PUMP

/1 1 ballast / general service pump

Type: self-priming centrifugal
 Material: housing and impeller of bronze, shaft of stainless steel
 Capacity: 100 m³/h, 2.0 bar

Ballast pump is installed in engine room.

7413 FIRE PUMPS

/1-3 3 fire pumps of which two are installed in engine room.

Type: non-self-priming centrifugal
 Material: housing and impeller of bronze, shaft of stainless steel
 Capacity: 90 m³/h, 8 bar

One of the pumps is installed in bow thruster room and is connected to the emergency switchboard.

7416 SLUDGE OIL PUMP

/1 1 sludge oil pump in engine room

Type: eccentric screw
 Material: housing of cast iron, screw of steel
 Capacity: 5 m³/h, 3 bar

7417 FUEL OIL TRANSFER PUMPS

/1 1 fuel oil transfer pump

Type: screw
 Material: housing of cast iron, screw of steel
 Capacity: 45 m³/h, 5 bar

/2-3 2 diesel oil transfer pumps

Type: screw
 Material: housing of cast iron, screw of steel
 Capacity: 45 m³/h, 5 bar one each
 10 m³/h, 5 bar one each

The fuel oil can be pumped ashore with these transfer pumps. The fuel oil transfer pumps are installed at double bottom level adjacent to fuel oil tanks in the engine room.

7417/7 1 diesel oil cargo boost pump

Type: screw
 Material: Housing of cast iron, screw of steel
 Capacity: 30 m³/h, 15 bar

Pump located in deck store, forward

7418 LUB. OIL TRANSFER PUMPS

/1 1 clean lub. oil transfer pump in engine room

Type: screw
 Material: housing of cast iron, screw of steel
 Capacity: 5 m³/h, 3 bar

7419 BILGE WATER TREATMENT UNIT

/1 1 bilge water separator unit with pump

Capacity: 2.5 m³/h
 Oil-in-water overboard: in compliance with the IMO requirements

/2 1 automatic oil-in-water analyzer

The analyzer stops the discharge at fluid contents exceeding 15 ppm oil.

742 FRESH-WATER GENERATOR SYSTEM

7421 FRESH-WATER GENERATORS AND PUMPS

/1 1 evaporator

The evaporator is a vacuum type distillate unit, supplied with heating from the main engine HT cooling water system and supplementary steam heating.

The unit is equipped with necessary auxiliary outfit for proper working performance.

Capacity: 15 m³/day
Distillate purity: below 10 ppm of total dissolved solids

/2 1 reverse osmosis fresh water generator

The reverse osmosis fresh water generator is fed from a sea water feed pump having suction from sea, ballast or central cooling SW outlet.

The unit is equipped with necessary auxiliary outfit for proper working performance.

Capacity: 30 m³/day
Water purity: below 300 ppm of total dissolved solids

The evaporator and reverse osmosis plant are installed on engine room platform deck.

/3 1 sea-water feed pump for evaporator

Type: centrifugal
Material: casing and impeller of bronze, shaft of stainless steel
Capacity: about 40 m³/h, 1.5 bar

/4 1 sea water feed pump for reverse osmosis plant

Type: centrifugal
Material: housing and impeller of bronze, shaft of stainless steel
Capacity: 7.8m³/h

Evaporator and reverse osmosis plant sea water pumps are installed at double bottom level adjacent to sea water main.

743 HELICOPTER FUEL OIL TRANSFER SYSTEM

7431 PUMPS AND FILTERS

The system is designed for helicopter fuel with anti-freezing agent.

/1-2 2 refuelling pumps

Material: stainless, Ex-proof
Capacity: 2 x 3 m³/h
Location: in helicopter fuel pump room

/3 1 filter/water separator dimensioned for a helicopter refueling flow of 6 m³/h; free water 15 ppm, mesh 5 microns

/4 1 filter monitor

/5 1 flow meter

/6 1 hose reel

/7 1 air/gas separator

/8-9 Suction strainers for refuelling pump

/9 1 grounding wire reel

STORAGE TANK FILLING

One deck connection for filling of storage tanks from shore is provided. Deck connection is equipped with stop valve and valve assembly for fuel sampling and strainer.

Filling pipe size ND 80 led to storage tanks with end 200 mm from the tank bottom. Any deflector is fitted to the ends of the filling pipes inside the tanks. Filling lines are fitted with closing valves.

One air pipe, size ABT ND 100 is lead from each storage tank to one common manifold and one air vent pipe is lead from the manifold to a location on open deck. One pressure/vacuum valve is installed at the air vent pipe end. One air vent pipe from fuel storage tank cofferdam, size ABT ND 50 is lead to a location on open deck.

Sounding pipes for storage tanks are installed at the lower end of tank, and are fitted with striking plates.

Upper end of sounding pipes are located on 2nd deck. A screw cap to be installed for closing the top of the sounding pipe when not in use.

Remote sounding arrangement of approved type is installed with remote reading at filling station.

FUEL OIL PUMPING ARRANGEMENT

Two suction connections are installed in each fuel oil storage tank. One of the suctions is mounted at a level of ABT 380 mm above the tank bottom and is ABT ND 65 in size. Suction pipe is fitted with one closing valve. One suction is installed below the lowest part of the storage tank to ensure complete emptying of the storage tank, size ABT ND 50 and fitted with one closing valve.

Two suction strainers are fitted in refueling pump suction lines. Strainers are equipped with draining arrangements for service and overhaul. Closing valves are installed before and after strainers. Closing valves are fitted after each refueling pump.

Refueling pumps are equipped with adjustable over flow valves to prevent pressure rise above preset level. Flow from overflow is led to the pump suction side. Local reading pressure gauges are installed before and after refueling pumps.

From the refueling pumps one common discharge pipe is led to the refueling station on 1st bridge deck, size ABT ND 50.

REFUELING STATION

Refueling station consists of one air/gas separator, one water separation filter, one flow meter with local reading, one valve assembly for taking fuel sample, one hose reel with bonded refueling hose of approved type, size abt. 2". Hose is equipped with refueling connection to fit helicopter refueling connection and with bowser type adapter. One grounding wire reel with clamp is installed at refueling station.

The air/gas separator and water separation filter are equipped with draining arrangements for service and overhaul. From refueling station one recirculation pipe is led back to the storage tanks to provide circulation of the helicopter fuel before helicopter refueling. The return pipe to storage tank ends abt. 200 mm above the tank bottom and is installed as far apart from filling and suction pipes as possible inside the storage tank. Closing valves are installed at tank connections and refueling station.

TRANSFERRING OF HELICOPTER FUEL OIL TO SHORE

One pipe connection with closing valve on refueling pump discharge pipe is provided. This pipe is led to the filling station and fitted with closing valve and hose connection, Kamlock type shore connection size ND 50.

76

MACHINERY MONITORING AND REMOTE CONTROL OF TRANSFER SYSTEMS

G e n e r a l

The extent and construction of the monitoring and control systems fulfil Lloyd's Register requirements for the class notation "UMS" to enable 24-hour operation with uncrewed machinery spaces.

Local instrumentation is installed in a way to allow local control of the machinery in case of emergency and to complete the remote monitoring equipment.

Separate remote indicating instruments are installed in the control room for the indication of the speeds of main diesel engines with turbo-chargers, and the speed of propeller shaft.

On the bridge there are instruments for the indication of speed and pitch of the propellers.

The machinery plants are generally monitored with an integrated alarm and measuring system installed in the control room.

Storage tanks for fuel oil, ballast water and fresh water systems have remote gauging instruments.

Valves in the frequently operated transport systems for fuel oil and bilge, ballast are remote-controlled.

The control and monitoring equipment is arranged in a console in the engine control room together with the monitoring apparatus of the auxiliary diesel engines, other auxiliaries and the controls of the pumps serving their systems. There will be two TV-monitors to the alarm and control system placed in the control room desk.

The control system for transport of liquids has mimic piping diagrams, which also include remote controls of the pumps and valves serving these systems, and the remote tank level gauging, together with indication valve of position open and closed.

761 REMOTE GAUGING, ALARM AND CONTROL EQUIPMENT

7614 REMOTE INDICATION OF SPEED

The main control console in the engine control room includes the following remote tachometers:

- | | |
|---|--------|
| - propeller shafts | 1 item |
| - main diesel engines | 2 " |
| - turbo-chargers of main diesel engines | 4 " |

3 tachometers for propeller speed are installed in the control stands on the bridge and 1 in aft control station.

7616 MACHINERY ALARM AND REMOTE MEASURING SYSTEM

The operating of the machinery is continuously monitored by an integrated alarm and measuring system.

In the case of any one of the monitored parameters deviating beyond the permitted tolerance, the system will give an acoustic and optical alarm in the control room and machinery spaces. During unmanned operation group alarms are connected to eight locations in the engineers' living spaces and in the wheelhouse and to a paging system.

The measuring values of important parameters can be displayed digitally.

The transmitters of this system can be analog, with a signal proportional to the instantaneous value of the measured parameter, or on-off switches. Analog transmitters comprise e.g. thermoelements, resistance elements, and pressure transducers with current output.

On-off switches can be pressure switches, thermostats, level switches or alarm switches or relays located in the various parts of machinery.

A measuring value of a parameter can only be obtained from channels equipped with an analog transmitter.

The alarm functions have a cut-out to prevent the parameters of nonoperating parts of the machinery from causing alarms.

The points monitored by the system and their way of display are specified in the following table. The letter "A" stands for alarm function and "M" for measuring function. Following list is not exhaustive.

/1

Main Diesel Engines Including Systems

		A	M	
Temperat.	exhaust gas from cylinder	28	28	pts
"	heavy fuel to separator	1	1	"
"	diesel oil to separator	1	1	"
"	lub.oil to engine	2	2	"
"	lub. oil to separator	2	2	"
"	fresh c.w. from engines	2	2	"
"	nozzle circ. oil from engine	2	2	"
"	sea c.w. to coolers	2	2	"
"	scavenging air in receiver	2	2	"
"	main bearing pockets	18	18	"
Pressure	fuel oil to engine	1	1	pts
"	lubricating oil to engine	2	2	"
"	fresh c.w. to engine	2	2	"
"	nozzle coolant to engine	4	4	"
"	sea c.w. to coolers	2	2	"
"	starting air in main line	1	1	"
"	instrument air in main line	1	1	"
"	lub. oil filter pressure drop	1		"
Level	heavy fuel oil in settling tank	2	hl/11	pts
"	heavy fuel oil in service tank	2	hl/11	"
"	heavy fuel oil in storage tank	2		"
"	heavy fuel oil in overflow tank	1		"
"	diesel oil in service tank	2	hl/11	"
"	diesel oil in storage tank	2	hl/11	"
"	diesel oil in overflow tank	1		"
"	lub. oil in circulating tank	2		"
"	fresh c.w. in expansion tank	2	hl/11	"
Failure	fuel oil viscosity	1		pts
"	heavy fuel oil separator	2		"
"	diesel oil separator	1		"
"	oil mist density in crankcase	2		"
"	oil mist detector	1		"
"	lubricating oil separator	2		"
"	start of stand-by pump	2		"
"	automatic stop of engine	2		"
"	control voltage	1		"

/2

Clutches, Gears, Propellers

		A	M	
Temperat.	gear bearing			
				pts
"	thrust bearing	1	1	"
"	lubricating oil to gear	1	1	"
"	servo oil from propeller	1	1	"
"	shaft bearing	2	2	"
"	sterntube bearing	2	2	"
Pressure	control air to clutches	1	1	pts
"	lubricating oil to gear	1	1	"
"	servo oil to propeller	1	1	"
"	control air to propeller servo	1	1	"
"	cooling water to coolers	1	1	"
Level	prop. servo oil in circ. tanks	1		pts
"	sterntube lub. oil in level tank	1		"
Failure	autom. disengagement of clutch	2		pts
"	start of stand-by pump	2		"

/3

Auxiliary and Harbour Diesel Engines

		A	M	
Temperat.	lubricating oil to engine	3	3	pts
"	lubricating oil to separator	1	1	"
"	fresh cooling water from engine	3	2	"
"	sea cooling water to coolers	2	2	"
Pressure	lubricating oil to engine	3	3	"
"	fresh cooling water to engine	3	3	"
Level	fresh cooling water in exp. tank	1		pts
"	lubricating oil in sump	3		"
Failure	start of stand-by pump	1		pts
"	fuel oil viscosity	1		"

/4

Generators Power Distribution

		A	M	
Temperat.	generator bearings	6	6	pts
Failure	temperat. in generator windings	3		pts
"	generator automatics failure	3		"
"	automatic disengagement of shaft			
"	auxiliary net voltage	1		"
"	auxiliary net frequency	1		"
"	preference trip	1		"
"	isolation resistance	3		"

/5

Auxiliary Boilers

		A	M	
Temperat.	fuel to boiler	1		pts
"	steam oil in boiler	2		
				2(+)pts
Pressure	fuel oil boiler	1		pts
"	combustion air	2		"
Level	water in boiler	2		pts
"	feed water tank	1		"
Failure	burner flame and ignition	2		"

/6

Miscellaneous

		A	M	
Level	water in bilge wells	6		pts
"	sludge tank	1		"
Failure	hydrophore systems	1		pts
"	vacuum sewage system	1		"
"	sewage treatment plant	2		"
"	steering gear	1		"
"	emergency diesel generator	1		"
"	bow thruster	2		"
"	stern thrusters	4		"

762 REMOTE LEVEL GAUGING

7621 PNEUMATIC GAUGING OF TANK LEVELS

Storage tanks of fuel oil, ballast and fresh water are equipped with pneumatic hydrostatic instruments for remote gauging of tank levels. The instruments are common for each category of tanks and have selector valves and an instrument engraved in metres level and cubic metre volume of tank contents.

Instruments are installed as follows:

- fuel oil storage tanks	6 items
- fuel oil settling tank	1 "
- fuel oil service tanks	2 "
- helicopter fuel oil tank	3 "
- sludge tank	1 "
- overflow tanks	2 "
- ballast water tanks	13 "
- fresh water tanks	4 "
- feed water tanks	2 "
- light fuel oil tanks	4 "
- heeling / stabilising	4 "
- bilge water	1 "

Stabilising tanks have indication on the bridge.

The instrument panels are mounted adjacent to the valve control panels in the control room.

Air supply is from the instrument air system.

763 REMOTE CONTROL OF VALVES ETC.

7634 REMOTE CONTROL OF VALVES

In the piping systems the valves that are frequently operated and the valves that have to be operated when the ship is damaged, are equipped with remote control.

Remote-controlled valves are in the following systems:

- bilge suction system
- ballast system, including trim and heeling tanks
- fuel oil system
- sea water inlet valves

The remote control of the valves is electro-pneumatic with electric indication of valve position, local and remote.

The valves are operated from the control room.

Air supply is from the instrument air system.

765 CONSOLES

7651 MACHINERY CONTROL CONSOLE

The remote control and monitoring apparatus of the main propulsion machinery and its auxiliaries are in a console in the engine control room.

The console is built of steel. Maintenance doors are provided on both sides.

Telephones and other communication apparatus are mounted in the control desk.

7652 CONTROL PANELS OF VALVE SYSTEMS

The control of fuel oil and ballast systems is contained in the control console in the control room.

The panel is built up of steel cabinets, ceiling and equipped with maintenance door on the front side. Simplified piping schemes, where the control switches and indicators of the valves are mounted, are fitted on the doors.

77 FLOOR PLATES, GRATINGS AND LADDERS IN MACHINERY SPACES. MACHINE SHOPS, EQUIPMENT. INSULATION AND FURNISHINGS. SEPARATE TANKS.

771 FLOOR PLATES, LADDERS AND GUARD PLATES

The floor plates in the engine room are abt 5 mm thick aluminium "Treadmaster" Plates fastened with screws. The framework is partly removable. The floor plates are edged with foot-edges.

Flywheels and other dangerous parts are covered with removable guard plates.

Gratings and ladders for inspection and service of all machinery are installed in the engine room. All gratings and ladders have handrails. Gratings and ladders are of steel.

Anti-slip covering is used in stairs where necessary.

772 LIFTING DEVICES

Lifting beams are mounted above both main diesel engines. The beams are provided with a runner for 1.5 tonne lifting capacity.

Above each aux. engine there is a lifting beam with a runner for 0.5 tonne lifting capacity.

Lifting beams are also mounted above the separators, capacity 0.5 tonnes.

/1-2 Electric hoists for main engines; capacity 1.5 tonnes.

/3-6 Hand-operated chain hoist for aux. engines and separators. Lifting pad eyes are fitted above all major equipment.

/7 A lifting beam with runner and electric hoist of 2.0 tonnes is installed in engine service space.

773 MACHINE TOOLS AND EQUIPMENT IN THE WORKSHOP

7731 LATHE

- /1 - 1 Lathe
- 1 Combined Drilling/Milling machine
- 1 Shaper

7733 GRINDING MACHINES

- /1 1 pedestal grinding machine

7735 WORKING AND INSTRUMENT AIR EQUIPMENT

Working air is supplied to engine rooms, helideck, fwd deck, aft deck, deck workshop, tween deck, workshops, laboratories, hangar and hydrophores. Compressors, air dryers and air receivers are installed in the engine room. Reserve supply to the instrument air system is also provided.

- /1 1 working air compressor (general service)

Air cooled automatically working compressor of piston type.

Pressure: 8 bar
Capacity: 80 Nm³/h

- /2 1 working air receiver
- Volume: 1 m³
Pressure: 8 bar
- /3 1 air dryer for working air, absorption type
- /4-5 2 instrument air compressors. Compressors are air cooled of piston type equipment with air after cooler.
- Pressure: 7-8 bar
Capacity: abt 45 m³/h
- One working and one as stand-by.
- /6 1 instrument air receiver
- Volume: 1 m³
Pressure: 7-8 bar
- /7 1 refrigeration type instrument air dryer, automatically operated and equipped with necessary pre- and re filters.
- Capacity: abt 43 m³/h
Pressure: 7-8 bar
- Working and instrument air compressors have automatic start and stop by pressure switches in the receivers.
- 7736 TEST APPARATUS
- /1-2 2 nozzle test sets are installed.
- 7737 CLEANING CABINET
- /1 Cleaning cabinet for engine parts. 3224f Cycloblast Unit.
- 774 MISCELLANEOUS WORKSHOP EQUIPMENT
- 7743 WELDING EQUIPMENT
- /1 Electric welding equipment
- Electric welding equipment 250 A with 50 m welding cable, 10 m connecting cable and standard tools.
- /2 Gas welding equipment:
- 2 acetylene gas bottles 40 l
 - 4 oxygen gas bottles 40 l
 - 1 set of gas welding tools, hose length 50 m

- /3 1 portable gas welding set type "CIG"
- Acetylene and oxygen gas bottles are stored on Wheelhouse Top deck with permanent piping to engine room workshop where one outlet station is installed.

7745 AIRCRAFT MECHANICAL WORKSHOP

Equipment:

- /1 - 1 bench grinder
 /2 - 1 portable 3/8" drill, with vertical bench support
 /3 - 1 4" vise

775 ELECTRICIAN'S WORKSHOP EQUIPMENT

7751 MACHINE TOOLS

- /1 1 bench drill
 - Max. drill diameter 13 mm.
- /2 1 grinding machine, bench model
- /3 1 testing board for all voltages used on board. See par 9129
- /4 1 universal tester

776 INSULATION, COVERING AND FURNISHINGS IN THE MACHINERY SPACES

7761 WORKSHOPS AND ENGINE ROOMS

The workshops are insulated with mineral wool with linings of galvanized steel sheet or fibreglass fabric. Smoke suction fan from the welding desk with flexible hose. The engine room workshop is air-conditioned.

The electrician's workshop is equipped with shelves and lockers for spare parts.

7762 MACHINERY STORES

The store rooms are fitted with drawers and shelves of adjustable type.

7763 CONTROL ROOM

Sound insulation is provided by floating floor and insulated ceiling and bulkheads.

The machinery control room is air-conditioned.

7766 FIRE INSULATION OF MACHINERY SPACES AND CASINGS

The insulation is made with rockwool according to the Rules and linings of 0.7 mm galvanized steel sheets where risk of wearing is apparent.

777 SEPARATE STORAGE AND OTHER TANKS

All tanks are of steel. Hull tanks are not included.

7771 FUEL OIL TANKS

/1 1 daily service tank for emergency diesel
Capacity: 2000 l

/2 1 ME fuel oil de-aeration tank
Capacity: 100 l

/3 1 fuel oil tank for incinerator
Capacity: 1000 l

7772 LUBRICATION OIL TANKS

/1 1 storage tank for sterntube lub. oil
Capacity: 1000 l

/2 1 header tank for sterntube oil system
Capacity: 150 l

/3 1 storage tank for reduction gear lub.oil
Capacity: abt. 2000 l

/4 1 storage tank for cleaning fluid
Capacity: 200 l

/5 1 storage tank for main and aux engine lub. oil.
Capacity: one complete change of main and aux engine lub. oil system abt. 14 m³

/6 1 main engine lub.oil storage tank with capacity to take complete charge of oil, approx. 11 m³.

7773 DIRTY LUB. OIL TANKS

/1 Separating tank for dirty AE lub. oil
Capacity: 1500 l

/2 Separating tank for clean AE lub. oil
Capacity: 1500 l

7774 HYDRAULIC OIL TANKS

- /1 1 storage tank for clean hydraulic oil
Capacity: 1500 l

7775 COOLING WATER TANKS

- /1 1 expansion tank for ME fresh water cooling system
Capacity: abt. 1000 l

- /2 1 expansion tank for AE fresh water cooling system
Capacity: abt. 500 l

8 PIPING SYSTEMS FOR THE MACHINERY

81 PIPING SYSTEM FOR COOLING WATER

811 SEA-WATER PIPING

See Diagram 16261.8110.1.

G e n e r a l

There are two sea chests for cooling systems. The following sea-water piping is installed:

- cooling system for the central coolers of the propulsion machinery
- cooling system for the central coolers of the auxiliary engines/machinery
- cooling system for the AC and provision refrigeration compressor coolers
- ship's service water supply provisions to use ballast water for main and auxiliary engine cooling

The construction of the sea chests and the seawater cooling systems safeguards the operation of the vessel under conditions specified in Chapter 1 of this Specification. The water intake from the chests is controlled by remote-controlled valves. Thermostatically controlled valves regulate the return flow to the sea chests, thus keeping the temperature of the incoming water constant.

Two sea water strainers are installed. One strainer for each sea chest.

The strainer is made of steel and hot galvanized. The strainer element is made of perforated stainless steel plate with a hole diam. of 8 mm. The strainer is equipped with venting valve and drain plug.

The pipe dimensions in the sea water system are based on the following maximum water velocities:

pressure pipe - 2.5 m/s
suction pipe - 1.5 m/s

The inlet to be used is chosen from the control room by means of remotecontrolled valves. The valves on the sea chests are normally open.

Service water is supplied to:

- fire pumps
- ballast pumps
- evaporator and reverse osmosis plant
- bilge water separator

M a t e r i a l s

The pipes are hot galvanized steel pipes; inlet valves of bronze, others of rubber lined cast iron, butterfly or diaphragm types.

812 FRESH-WATER COOLING SYSTEMS

8121 COOLING SYSTEMS FOR MAIN ENGINES

G e n e r a l

Main engines 6111/1-2 have a common fresh-water cooling system.

The cooling water system comprises a low-temperature (LT) circuit and a high-temperature (HT) circuit. The LT circuit includes the charge air and lube oil coolers, while the HT circuit includes the cylinders and turbochargers and charge air as per conditions required under low load and temp. conditions.

The temperature in each circuit is controlled by thermostat valves.

The built-on thermostat valves of the LT circuits control the outlet temperature of the circuit. It has two set points, one for the low load range and one for the high load range. The set point is automatically changed when the load changes between low and high, i.e. at abt. 35% load. Thus the LT system is provided with a load-dependent temperature control.

The outlet temperature of the HT circuits is also controlled by built-on thermostat valves and provided with a load dependent temperature control.

The main engine cooling water pumps 6222/1-6 feed LT and HT cooling water through the engine. The temperature is controlled by two thermostatic mixing valves, mixing recirculated HT water and water from the LT system. The LT water is led through the central coolers 6266/1-2.

The waste heat of the HT circuit is used for fresh water production. One HT thermostat valve is installed to prevent undercooling of the engine.

When the engines are not running, they can be heated by means of a preheater unit with built in temp. control 6225/1-2. The pump draws from the HT system and discharge through the preheater back to the HT system. The units are manually or thermostat selected.

The systems are refilled from the fresh-water system.

Both circuits have a common expansion tank 7775/1 with internal sub division to prevent total loss due to one failure.

On top of the expansion tank there is a connection for adding corrosion inhibitors.

The vent pipe of each engine is led to the tank separately, continuously rising. The outlets of the venting pipes are below water level in tank.

A tank of abt. 10 m³ volume is arranged for draining the main engines. Necessary pump and pipes are installed.

The piping of the main engines is connected to the heating system of the fresh-water generator.

M a t e r i a l s

The pipes are of black steel; valves of cast iron or brass, butterfly or diaphragm types.

8124 COOLING SYSTEMS FOR AUXILIARY ENGINES

G e n e r a l

Auxiliary engines 7111/1-3 have a common fresh-water cooling system.

The cooling water system comprises a low-temperature (LT) circuit and a high-temperature (HT) circuit. The LT circuit includes the charge air and lube oil coolers, while the HT circuit includes the cylinders and turbocharger.

The temperature in each circuit is controlled by thermostat valves.

The built-on thermostat valves of the LT circuits control the outlet temperature of the circuit. It has two set points, one for the low load range and one for the high load range. The set point is automatically changed when the load changes between low and high, i.e. at abt. 35% load. Thus the LT system is provided with a load-dependent temperature control.

The outlet temperature of the HT circuits is also controlled by built-on thermostat valves and provided with load dependent temperature control.

The auxiliary diesel engines built on cooling water pumps 7212/1-6 circulates LT and HT cooling water through the engines when engines are running.

One thermostatic mixing valve, mixing recirculated HT water and water from the LT system. The LT water is led through the central coolers 7213/1-2.

When the engines are not running, they can be heated by means of a preheater unit with built in temp. control 7216/1-3. The pump can draw from the HT system and discharge through the preheater back to the HT system. The units are manually or thermostat selected.

The systems are refilled from the fresh-water hydrophore system.

Both circuits have a common expansion tank 7775/2 with internal sub division to prevent total loss or system due to one failure.

On top of the expansion tank there is a connection for adding corrosion inhibitors.

Auxiliary engines are arranged with drain connections to the main engine cooling water drain tank.

M a t e r i a l s

The pipes are of black steel; valves of cast iron or brass, rubber lined butterfly or diaphragm types.

8126 CENTRAL COOLING SYSTEM

Two central cooling systems are installed, one for main engine systems and the other for auxiliary engine/machinery systems.

The fresh cooling water in both systems circulates through the central coolers where it is cooled by sea water.

Both central cooling systems have two central coolers. Both central cooling systems are provided with thermostatically controlled valves in the HT-cooling water system to regulate the flow of HT-cooling water through the coolers, keeping the return water temperature constant.

For aux machinery there are two cooling water pumps 7212/7-8 to serve gear LO cooler starting air compressors, provision refr. compressors, hydraulic aggregates etc. The cooling of aux machinery is connected to the aux diesel engine central cooling system.

Sea cooling water to main engine central cooling system is supplied by main sea water pumps 6221/1-3 and for the auxiliary central cooling system by aux sea water pumps 7211/1-2.

For research operation and ice condition there is a closed sea water circulation system for the auxiliary and main engine central cooling systems incorporating two forward ballast tanks.

The sea water pump sucks from the two forward ballast water tanks and discharges through the central coolers back to the tanks.

Lub. oil and charge air cooling system of main engines:

Charge air cooling systems are built on.

Main engine Lub oil coolers are cooled by main engine LT-cooling water.

Lub. oil and charge air cooling system of auxiliary engines:

Each auxiliary diesel engine has a built on cooling system for charge air and Lub oil.

Starting air compressors (6211/1-2):

Each compressor is provided with a built-on cooling water pump, connected to aux engine LT-cooling water system.

Gear:

The reduction gear box is provided with a built-on lub. oil pump and cooler. Cooling water is supplied from aux engine LT cooling water system.

M a t e r i a l s

The pipes are of black steel.

Butterfly valves are used all over, where practical, rubberlined cast iron body and stainless steel internals.

The valves and fittings are of cast iron, valves of ND 50 or smaller are either of gun metal brass or diaphragm valves with a cast iron casing.

82 PIPING SYSTEMS FOR OIL

821 LUBRICATING OIL PIPING

8211 PIPING SYSTEMS FOR LUBRICATING OIL OF PROPULSION MACHINERY

G e n e r a l

Each main engine has a separate lub. oil circulation system. There is one storage tank common to the main and auxiliary engines.

The storage tank can be filled from the midship bunker station of the ship. The oil in this tank can be pumped to the deck by means of the pump 7418/1.

There are two M.E. lub. oil tanks, one for clean oil and one for dirty oil.

The engine lub. oil sumps and separation tanks can be filled with the same pump 7418/1 and drained by the pump 7416/1 to the deck or to the dirty oil tank.

The built-on lubrication oil circulating pump of each engine draws through suction strainers 6232/1-2 from the engine oil sump and discharges through the filter 6232/3-4, fine filter 6232/5-6 and, through the cooler 6263/1-2, to the engine, from which the oil flows back to the engine oil sump.

In addition the standby L.O. pumps 6231/1-2 of each M.E. draws through a suction strainer 6232/7-8 from the engine or sump and discharges through the same filter 6232/3-4. The cooler is provided with a by-pass valve and a thermostatically controlled three-way valve. The three-way valve regulates the flow through the cooler, thus keeping the oil temperature constant.

The circulating oil system of each main engine has one centrifugal separator 7241/1-2.

The pump of the separator 7241/1-2 draws from the engine sump and discharges through the thermostatically controlled heater 7243/1-2 and the separator 7241/1-2 to the engine sump.

Both separators are able to draw from the aux. engine separation tank and discharge to the tank for separated oil.

The separator is self-cleaning. During the cleaning period a three-way valve passes the oil by the separator direct to the lube oil tank, the sludge is led to the sludge tank.

Possibility to fill main engine lub oil sump from storage tank through LO-separators is arranged.

M a t e r i a l s

The pipes are of steel; valves of cast iron or steel, butterfly or ball types, no plug cocks are to be used.

S y s t e m s

Piping systems for lubricating oil of reduction gear:

The reduction gear has a separate built-on lub. oil circulation system.

The built-on lub. oil pump draws from the reduction gear sump and discharges through the filter and the cooler to the gear. The control valve regulates the temperature of the oil.

The gear sump can be filled from gear lub oil storage tank by gravity or pump 7418/1 and drained to the deck by sludge oil pump 7416/1.

The sterntube bearing is lubricated by means of natural circulation.

The system is consisting of one header tank with necessary piping arrangement. One stern tube lub oil storage tank is provided.

Filling of sterntube lub oil system by pump 7418/1 from storage tank. Draining of sterntube lub oil system by pump 7416/1 to sludge tank or to shore.

8213 LUBRICATING OIL SYSTEM OF THE AUXILIARY ENGINES

G e n e r a l

Each aux. engine has a lub. oil system built on the engines with wet lub. oil sump.

The storage tank is common to the main engines, and can be filled from the deck on port side.

The oil sump of the engines is filled either from the storage tank or the tank for separated oil with the transfer pump 7418/1. The sump can be drained either to the separating tank or to the dirty oil tank with the sludge oil pump 7416/1.

The separators 7241/1 and 7241/2 are able to draw from the separating tank and discharge to the tank for separated oil.

M a t e r i a l s

The pipes are made of steel; valves of cast iron or steel, butterfly or ball types.

822 FUEL OIL PIPING

8221 FILLING AND TRANSFER PIPING FOR FUEL OILS

G e n e r a l

Filling:

The filling and discharging can be done at bow and portside.

Transferring:

There are two transfer systems separate from each other, one for heavy fuel, the other for diesel oil. One pump for HFO and one for MDO is provided. The pumps, 7417/1-2, are interchangeable.

The storage tanks are connected to suction and delivery lines so that heavy fuel oil or diesel oil may be pumped with transfer pumps from one tank to another, up to the deck, and heavy fuel oil also to a settling tank.

The bunker stations have a socket for connection of a telephone and stop/start and control of transfer pumps.

The settling tank is provided with low and high-level controls, which automatically start and stop the pump 7417/1. The tanks are provided with remote sounding devices, with reading in the control room.

M a t e r i a l s

The pipes are of steel, fittings of steel or cast iron; heavy fuel oil pipes have steam tracing and insulation.

8222 FUEL OIL SEPARATION AND FEED

General

Operating in series with separator 7231/2, the separator 7231/1 draws heavy fuel oil from the settling tank and discharges to the daily service tank. The separator works continuously. The surplus oil flows from the daily service tank through an overflow pipe to the settling tank.

The separator 7231/3 draws diesel oil from the storage tank and discharges to the daily service tank. The separator 7231/3 can be used as a spare separator for heavy fuel oil.

The separators are automatically self-cleaning. During the cleaning period a three-way valve bypasses the separator and leads it to the suction side of the separator pump.

Overflow:

Each fuel storage tank is provided with an overflow line to the overflow tank.

The overflow pipes from the heavy fuel oil settling tank are led separately to the overflow tank. The overflow tank is provided with a contents level alarm.

The two main engines have a common pressurized fuel oil system.

A fuel booster pump (the other is stand-by) sucks through a suction strainer 6242/1 from the heavy fuel oil day tank or the diesel oil day tank and discharges through a prefilter 6242/1 and a fuel consumption meter 6244/1 to the deaeration tank 7771/2.

A fuel circulating pump 6241/3-4 (the other is stand-by) sucks from the deaeration tank and feeds the engine through the heaters 6243/1-2, fine filters 6243/3 and viscosity control system 6244/2. A return pipe leads return oil back to the deaeration tank.

When warm, the engine will normally be started with heavy fuel oil.

Before being stopped for longer times the engines should be flushed with diesel oil.

The change-over valves HFO/MDO are controlled from the control room.

There is one common fuel oil feed system for the auxiliary diesel engines.

M a t e r i a l s

The pipes are of high precision pipe steel; also the fittings are of steel. The pipes are joined with flanges and screw couplings.

8223 DIESEL OIL PIPING OF EMERGENCY DIESEL ENGINE

The transfer pump 7417/3 draws from the diesel oil day tank and discharges to the day service tank 7771/1 of the emergency diesel engine. Overflow and drain from the service tank is led to the day tank of ME and AE. Pipes and fittings as for the main engines. Service tank shall be provided with a deck filling connection from ashore and from light fuel oil tank system.

83 PIPING SYSTEMS FOR COMPRESSED AIR

831 COMPRESSED AIR PIPING

8311 STARTING AIR SYSTEM

G e n e r a l

The main starting air compressors 6211/1-2 deliver compressed air to the receivers 6213/1-2.

The starting air lines to the main and aux. engines are connected to both receivers.

Provision to supply air to instrument air system through pressure reducing station from both main starting air receivers is provided as an emergency.

M a t e r i a l s

The pipes are of steel, pipes larger than ND 40 are connected with flanges and smaller with high-pressure couplings. Fittings are of steel or bronze.

8312 WORKING AIR SYSTEM

G e n e r a l

The working air compressor 7735/1 delivers compressed air via an aftercooler to the receiver 7735/2. A separate pipe system with valves and necessary couplings for 1" hoses is installed in the engine rooms, in workshops and 15 mm pipe on upper decks.

M a t e r i a l s

Pipes are of galvanized steel, fittings of cast iron or bronze.

8313 INSTRUMENTATION AIR SYSTEM

The instrument air compressors 7735/4-5 delivers compr. air to the receiver 7735/6. Air from the receiver passes through the refrigeration air dryer 7735/7 to the instrument air consumers as instrumentation, valve remote control etc.

M a t e r i a l s

Pipes of Steel or precision steel pipes, small sizes copper. Fittings as far as possible ball type valves of gun metal brass.

84 EXHAUST GAS PIPING

841 EXHAUST GAS PIPING OF THE PROPULSION MACHINERY

8411 EXHAUST GAS PIPES OF MAIN DIESEL ENGINES

The exhaust gas pipes of the main diesel engines are drawn as straight as possible through the silencers and economizers to the stack.

The pipes are of steel and insulated. In the engine room they are covered with a sheeting of galvanized steel. The necessary compensators are installed.

The exhaust gas pipes and silencers are mounted elastically to diminish the sound level in spaces adjacent to the engine casing. The silencers are equipped with drain tubes.

842 EXHAUST GAS PIPING OF THE AUXILIARY MACHINERY

8421 EXHAUST GAS PIPES OF BOILERS

The boilers are equipped with exhaust gas pipes of their own, drawn to the stack.

The pipes are of steel and insulated; in engine rooms they are covered with a galvanized steel sheeting.

8422 EXHAUST GAS PIPES OF AUXILIARY ENGINES

Each auxiliary engine has a separate exhaust gas pipe, which is drawn as straight as possible through the silencers to the stack.

Otherwise as item 8411.

8423 EXHAUST GAS PIPE OF EMERGENCY DIESEL ENGINE

The exhaust gas pipe is drawn to open air with silencer.

8424 EXHAUST GAS PIPE OF INCINERATOR

The exhaust gas pipe is drawn to the stack and insulated.

85 TRANSFER PIPING

851 BILGE, BALLAST, AIR AND SOUNDING PIPING

The bilge system conforms to Classification rule requirements, plus any other compartment or space where water can collect to be adequately drained or incorporated into the bilge system.

8511 BILGE PIPES

Bilge pumps 7411/1-2 and ballast pump 7412/1 draw from bilge main and discharge to the sea or to the bilge water tank.

Bilge pump 7411/1 is connected to the ballast system.

Independent bilge suction in engine rooms is connected to the oily bilge pump 7419/1. Discharge to deck for discharge ashore is provided. Bilge main suction are installed for engine room, forward and aft thruster rooms, steering gear room and cargo holds.

Bilge water from forward chain locker and forward stores are discharged with an ejector system.

Bilge water from cargo hold is alternatively discharged with an ejector system direct over board. Operating water for ejector is taken from fire main with detachable pipe/hose connection.

The bilge service pump 7411/1 is fitted with an engine room direct bilge suction.

Emergency bilge suction from the engine room is lead to one of the cooling sea water pumps 6221/1-2.

Bilge high level alarms are provided for: engine room (P&S), forward and aft thruster rooms, steering gear room (P&S), any other working space below the water line, and cargo hold.

The pumps and valves of the bilge system are remote-controlled from engine control room.

B i l g e W a t e r S e p a r a t i n g P i p e s

The sludge pump 7416/1 draws from the sludge tank, from bilge water tank and from the main bilge line. The pump discharges to the deck, to the bilge water tank or to the sludge tank or incinerator mixing tank.

The bilge water separator 7419/1 draws from the bilge water tank and delivers through the separator, from which the purified water is led overboard. Separated oil is led to the sludge tank.

The bilge water pump is connected to the sea water service line for maintenance purposes.

M a t e r i a l s

The pipes are of hot-galvanized steel. Butterfly valves are of rubber-lined cast iron. The valves are of globe or butterfly type with remote-controlled actuators.

8512 B A L L A S T W A T E R P I P E S

G e n e r a l

The main ballast system is controlled from a central remote panel sited in the engine control room in conjunction with a mimic diagram of the system and content gauges.

A remote control ballast system is provided to facilitate the above mentioned ballast movements. This includes remote control of ballast control valves including overboard discharges with valve position indication, ballast pumps stop/start, ammeters and remote reading tank level gauges and flow.

Pressure and vacuum gauges for ballast pumps are provided.

The pumps draw water from ballast tanks and from the sea, and discharge overboard and to tanks also perform all functions of the bilge pumps.

The ballast water pump 7412/1 and the bilge pump 7411/1 are connected to the ballast water system. Both pumps are able to draw water from the sea, any ballast water tank or trimming tanks and to discharge to ballast water tank forward to aft to forward or to the sea. Materials as for bilge system 8511.

8515 HEELING PIPES

G e n e r a l

The heeling system is of integrated stabilizer/heeling type. Transversal water and air ducts are built between heeling/stabilizer tank pairs.

M a t e r i a l s

All ducts are of steel. Valves and blower, see item 3872.

8516 AIR AND SOUNDING PIPES

Air escape pipes for double bottom tanks, and other structural tanks are led to open air and provided with removable heads and equipped with venting valves of approved type.

Air pipes for fuel oil tanks are fitted with anti flash stainless steel mesh.

Air pipes from lubricating oil tanks are led to engine room/engine casing where approved.

All tanks are equipped with steel sounding pipes as necessary, sounding pipes on upper deck are fitted with non-removal brass caps on rule height stand pipes or are flush in main cargo area where necessary. Sounding caps in the machinery space to engine room double bottoms are of the lever weighted self closing type.

Sounding pipes, where not fitted with striking plates at their ends have striking plates of not less than 10 mm thickness welded to the shell or tank bottom.

A remote sounding/plant is arranged for all fuel oil tanks, fresh water tanks, ballast tanks and fuel tanks. Small tanks have manual sounding from engine room. Sounding control is arranged in engine control room.

Air and sounding pipes for oil tanks are of ordinary steel.

Air and sounding pipes for ballast and other water tanks are of galvanized steel.

852 FUEL OIL PIPING

All fuel oil tanks are connected to suction and delivery lines so that fuel oil may be pumped with transfer pumps from one tank to another, up to the deck.

M a t e r i a l s

The pipes are of steel; the fittings of steel or cast iron.

86 FEED WATER, STEAM AND HOT WATER PIPING SYSTEMS

862 STEAM PIPING SYSTEMS

8622 STEAM PIPING SYSTEMS FOR MACHINERY

Steam piping is laid up for all steam consumers with special attention paid to pipe expansions and movements. Where necessary consumers are equipped with temperature control valves.

The circulation pumps circulate water through the economizers back to the oil-fired boiler.

All condensate returns from oil heating systems to have water traps and are lead to an observation tank and filter. Oil contamination indication alarm is fitted.

A condensor is fitted of 700 kg/h capacity.

Pipes:

- Black steel pipe with flanged connections, insulated according to Builder's standard.

Valves:

- Steel valves seat type valves with bronze or stainless steel internals.

8624 HEATING COILS IN TANKS

The following tanks are provided with heating coils:

- lub. oil storage tanks
- bilge water tank
- ballast water tanks reaching above waterline
- sludge tanks
- heavy fuel oil tanks
- leakage oil tank
- heavy fuel oil settling and day tank
- incinerator mixing tank
- FW calorifier
- FW evaporator

The coils are made of seamless steel pipes and connected by welding.

8626 STEAM TRACING PIPING

Heavy fuel oil suction, separation and feeding pipes are provided with tracing piping.

88 AUXILIARY PIPING SYSTEMS

883 INSULATION

All surfaces having high operating temperature are insulated.

886 SPECIAL FUEL SYSTEMS

8861 HELICOPTER REFUELLING SYSTEM

Intended for f.o. flashpoint not less than +43C. Pressure refuelling about 200 l/min. All discharge pipework of stainless steel. Storage tanks 105 m3. Day tank 15 m3.

ELECTRICAL DISTRIBUTION AND LIGHTING SYSTEMS

General

Electrical installations are designed and installed according to Class requirements and Builder's practice as well as to rules mentioned in the general part of this specification, and as per the final electrical load balance. IEC-publications 92, 363 and 533 noted.

Electric generation is to be made by alternators as specified in para 7112 and 7142. The automation system of electric power plant, is as per para 7116.

All electric equipment selected to operate satisfactorily under conditions likely to be experienced in service in Antarctic waters, in particular external air temperatures down to -35 C and shock conditions when ramming in the ice.

Voltage and Switchboards

The electrical distribution system will be arranged as a three wire system with insulated neutral.

The installations are carried out as follows:

- | | |
|----------------|---|
| - 415 V, 50 Hz | MAIN SWITCHBOARD MS1, from which power is fed for transformers of MS2, emergency switchboard ES1, bow and stern thrusters, hydraulic pumps for deck machinery, ballast/fire pump, f.w. discharge pumps, f.o. discharge pumps, other large electric motors, big consumers in galley and laundry, heating, etc. |
| - 240 V, 50 Hz | MAIN SWITCHBOARD MS2, from which power is fed for lighting distribution boards, small electric motors, heating, and small consumers. |
| - 415 V, 50 Hz | EMERGENCY SWITCHBOARD ES1, from which power is fed for emergency consumers. |
| - 240 V, 50 Hz | EMERGENCY SWITCHBOARD ES2, from which power is fed for emergency consumers. |

- 24 V, DC EMERGENCY SWITCHBOARD ES3, from which power is fed for emergency lighting and WT door indications.
- 24 V, DC separate systems backed up by batteries and/or emergency switchboard (ES3), such as emergency energy source for radio and navigation equipment.
- 240 V, 50 Hz 30 kVa stabilised U.P.S., power for supply to scientific research systems in computer room and outlets in scientific laboratories. (Refer Clause 9113) The system regulation from zero to full load is plus or minus 1%. ()
Bypass transfer time is 1-mins. The equipment is located in the U.P.S. room Fr.60 (foreward of computer room) 2nd Deck.
Manufacturer of the U.P.S. is Intervech and it is a Type 7 Alamo (static)

91 APPARATUS

911 TRANSFORMERS AND BATTERIES

9111 TRANSFORMERS

The 240-volt lighting and small-consumer system is supplied by two 3-phase transformers, 415 V/240 V, 50 Hz, rated power appr.140 kVA. The transformers are air-cooled, dripproof, double-wound and insulated to class "B", IP23, connection Dyn 11.

The lighting transformers are located near the lighting distribution switchboards in the electric equipment rooms.

One 415/220 V, 50 Hz, appr. 40 kVA transformer for emergency consumers is placed near the emergency switchboard, otherwise as above.

One transformer for the rectifier of ES3.

Good ventilation is arranged for all transformers.

9113 UNINTERRUPTABLE POWER SUPPLY

An uninterruptable power supply is provided for the scientific instrumentation computer systems and scientific laboratory stabilised outlets. The system is capable of supplying 30 kVa for 30 minutes. In the event of power failure the system will bypass the ships supply and a bank of 120 lead acid cells will provide power to the scientific/computer equipment.

9114 BATTERY CHARGING DEVICES

For each accumulating battery one rectifier with high rate and trickle charging facility of constant-voltage type is provided and installed near to the batteries, additional unit for fork lift truck charging.

The batteries are permanently connected to their charging devices.

Feeding to all battery-charging devices is 415 V/50 Hz from the emergency switchboard ES1.

Each rectifier has following accessories:

- ammeter and voltmeter at the output
- mains isolator switch and indication light
- high rate charging switch and indication light
- charging automation
- rectifier failure alarm
- battery low voltage alarm
- high rate charge contact output
- remote control for high rate charge

9115 BATTERIES

All batteries are heavy-duty low maintenance accumulating batteries.

The following batteries are provided:

- 1/ - one 24 V lead battery for emergency light, stand-by navigation light and instruments is placed outside the wheelhouse in a suitable locker.
- 2/ - one 24 V lead battery system for radio plant is placed in a suitable locker outside the wheelhouse.
- 3/ - 24 V batteries are provided for fire protection and fire & general alarm systems according to system manufacturer's standard.
- 4/ - 24 V batteries of adequate capacity are provided for integrated engine room monitoring and warning system according to system manufacturer's standard.

- 5/ - one 24 V Ni-Cd battery for engine room safety and automation systems.
- 6/ - one 24 V lead start battery for the emergency diesel generator start and automation.

912 MAIN SWITCHBOARDS, DISTRIBUTION BOARDS AND MOTOR STARTERS

Main and emergency switchboards with required instruments for control of generators and outgoing circuits are installed.

They are of dead front, self standing steel structural and panel constructed type. Maintenance of switchboards are from front. They are self ventilated and installed on rubber chocks.

Bus-bars are made of electrolytic copper and dimensioned for most severe short circuit currents.

All incoming and outgoing feeders have automatic moulded case circuit breakers or automatic air circuit breakers draw-out type for generators and large consumers and plug-in type for other.

About 10 % spare connections in each switch- and distribution board. Each outgoing circuit can be earthed.

Conductors are flame retardent according to IEC-publications 92-331 and 92-332.

Measuring instruments are class 1, size 9696 mm, black figures. The scale is marked with red line to indicate rated value.

Name plates of plastic identify all panels, instruments, circuit breakers etc.

For alternators, see 7112 and 7142 and automatic system of diesel generators, see 7116.

9122 415 V MAIN SWITCHBOARD MS1

Main switchboard is located in engine control room.

Generators and outgoing feeders are to be connected to the busbars as symmetrically as possible.

The switchboard is arranged so as to ensure that heavy occasional users (such as thrusters) do not interfere with steady supply to other areas. Switchboard has adequate division for this purpose.

The switchboard includes the following panels:

3 diesel generator panels:

- 3-poled generator automatic circuit breaker, motor-and hand-operated. Electronic protection relay for overload, short circuit, under voltage and reverse power trip
- 1 voltmeter with phase selector switch
- 3 ammeters
- generator running hour counter
- generator heater switch with indicating lamp
- start/stop buttons for the auxiliary diesel engines
- accessories for generator voltage regulation, magnetization and diesel engine automation

1 synchronizing panel:

- Synchronizing of generator breakers is manually controlled from this panel, which is equipped with:
 - generator breaker on/off indicating lamps
 - generator overload indicating lamps
 - on/off push buttons for generator breakers
 - speed control switches
 - synchronizing lamps
 - one double voltmeter
 - one double frequency meter
 - kW meters for three diesel generators
 - on/off push buttons and indication lamps for bustie breaker
 - earth leakage indicator for 415 V network
 - other necessary equipment for diesel generator automation as specified in 7116.

2 panels for the following consumers, bow thruster and azimuth thrusters:

- 1 ammeter with selector switch
- hand and motor-operated automatic circuit breaker, "draw-out" type with electronic protection relay for under voltage, overload and short circuit
- on/off push buttons and indication lamps for breaker
- selector switch with indicating lamp "heating on/off".

1 shore connection panel:

- In the shore connection panel are installed shore connection breaker, voltmeter, ammeter with selector switch and kW-meter, current flow direction indicator, and protecting device for phase breaking. The panel also has an indicator light for the position of the shore connection breaker and for the emergency diesel generator.

Consumer panels:

- The essential and biggest consumers and transformers for MS2 are supplied direct from the main switchboard.
- Outgoing circuits from the main switchboard are protected by three-pole moulded case automatic circuit breakers.
- Each consumer panel is equipped with ammeters with selector switches, so that each essential consumer can be measured.

Preference-trip system:

- Preference-trip system in one step is provided, see 7116.
- disconnection by non-voltage solenoid of consumers automatic circuit breaker
- reconnection to the system is manual

9123 240-V MAIN SWITCHBOARD MS2

Construction similar to MS1.

MS2 is divided into two parts. MS2 is provided with earth leakage indicator and consists of the two consumer panels mentioned above.

Generally, the outgoing circuits from MS2 are protected by three pole moulded case, automatic plug-in type circuit breakers.

Each panel has one voltmeter and one ammeter, both with phase selector switch.

9124 EMERGENCY SWITCHBOARD ES 1, ES 2 AND ES 3

The emergency switchboard is mounted in the emergency diesel room.

Normally the switchboard is supplied by the switchboard MS1, but in an emergency or during a generator failure the emergency set starts automatically and supplies the essential service.

Automatic circuit breakers for the emergency generators and connection to the main switchboard, interlocking between the two circuit breakers.

The switchboard comprises three distribution sections:

- | | | |
|------|-------------|--|
| ES1: | 415 volts | - supplies power to essential auxiliaries. |
| ES2: | 240 volts | - supplies power to essential services. |
| ES3: | 24 volts DC | - supplies emergency lighting, w.t. door indication, etc. The emergency battery supplies this section during power failure and prior to the start-up of the emergency set. |

The emergency switchboard supplies:

- steering gear (2nd feed)
- navigation equipment (2nd feed)
- automation and control plant (2nd feed)
- battery charging
- emergency fire pump
- bow thruster room fire pump
- aux. diesel engine booster pump
- central computers
- air compressor.
- ECR air conditioning unit

Essential navigation equipment is fed from the switchboard or from emergency batteries.

The emergency switchboard is provided with:

- ammeter and voltmeter with selector switch, frequency meter, kW-meter and necessary protection device for the emergency generator (section ES1)
- voltmeter and ammeter with selectors for the 240-volt ES2 section
- voltmeter and charging and discharging ammeter for the 24-volt ES3 section
- earth failure indication device for each section

The automatic start and stop equipment for the emergency diesel generator is placed in the emergency switchboard. The automatic charging devices for the starting battery are located near the emergency switchboard.

Indication is provided in the machinery control room for emergency generator running and emergency battery discharging.

9125 POWER DISTRIBUTION BOARDS

Power distribution boards are furnished with fixed type moulded case automatic circuit breakers, mounted in a steel box of dead front type, with hinged lockable door.

R e f r i g e r a t e d C o n t a i n e r
O u t l e t s

Watertight outlets (415 V, 50 Hz, 3 ph) for supply to refrigerated containers are fitted as follows:

- 5 in the upper cargo hold
- 5 on Upper deck forward
- 2 on helideck
- 2 on after deck

Outlets for laboratory containers (240 V, 50 Hz, 1 ph) rated 5 kVA

- 5 in tween deck
- 2 helideck.
- 2 aft deck

9126 LIGHTING DISTRIBUTION BOARDS

Lighting distribution boards are 3-phase with two-pole single-phase circuit breaker for each 240 V outgoing circuit with overload and short circuit trip.

The boards are of steel construction, dead front type, with hinged lockable doors.

Where possible, distribution boards in accommodation and similar spaces are recessed so that front doors are level with surrounding bulkheads.

9127 SHORE CONNECTION

One connection box 400 A, 415 V, 50 Hz, on port side.

Following instruments and indicators are provided:

- 1 circuit breaker
- 1 voltmeter
- 1 ammeter
- push buttons for on/off
- indicating lamp for on/off
- 1 phase sequence indicator
- phase sequence switch

9128 MOTORS AND STARTERS

M o t o r s

Electric motors are 3-phased, totally enclosed, fan cooled, suitable for 415 V, 3-phase 50 Hz operation, marine type, with class "F" insulation. Where possible, squirrel-cage motors are used, preferably with direct on-line starters.

The motor enclosures are on the weather deck IP 56 and in the machinery rooms IP 44.

All motors on the weather decks and the steering gear motors and motors over 5 HP (3.73 kW) are equipped with standstill heating.

S t a r t e r s

Generally the electrical motors are provided with direct on-line starters and equipped with:

- contactor with thermal relay
- start-stop push buttons
- indicating lamp "RUNNING ON"
- lockable isolating switch

Large motors are provided with star-delta reduced-voltage start to ensure starting without excessive voltage drop. Starter control circuits to be 415 V AC, except for control circuits with remote control, which are 240 V AC.

Group starter boards for machinery room consumers are fitted in the engine control room.

Start/stop selector switch and hand/auto selector switch with means to prevent operation of motor from engine control room, and start indicating lamp, are fitted close to the motor having the starter in engine control room.

Selector switches with indication lamps "aut. ready" and "running on" are provided for stand-by lub. oil system pumps Nos. 1 and 2 in the engine control console.

Local start/stop with lockable safety switch and running light is provided for each motor if starter is not local or automatic.

Motor protection switches can be used as starters for motors of less than 0.5 kW which have only local control.

Overload protection for the steering gear pumps, fire pumps and propeller oil pumps operates on alarm only.

EMERGENCY STOP OF MOTORS

Remote stop switches are fitted near the machinery control room to stop the fuel oil system, engine room ventilation and accommodation fans in accordance with the requirements.

The pumps and fans are grouped as follows:

- Group 1:
 - all fuel oil pumps
 - all fuel oil separators
 - boilers
 - incinerator
- Group 2:
 - all ventilation fans for all engine rooms
- Group 3:
 - all ventilation fans for accommodation spaces

In the wheelhouse remote stop switches are fitted for groups 2 and 3.

At the discharge station a remote emergency stop for fuel oil transfer pumps is provided.

Automatic emergency stop activated by fire detection system:

Group 1:	Cargo hold ventilation.
Group 2:	Ventilation in accommodation
Group 3:	Ventilation at helicopter area

9129 TESTING BOARD

One testing board of the wall-mounted type is provided for testing lamps, fuses, and other small electric appliances in electrician's workshop.

The board includes test terminals for 24 V DC, 240 V AC, and 415 V AC, for testing galley equipment, etc., pilot lamps, switches, a fuse checker, incandescent lamp check sockets and sockets for testing all types of fluorescent lamps used on the vessel.

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LIGHTING

General

A maximum of 18 lighting points is fitted to each lighting group; the number is smaller if the current exceeds 10 A.

In general, lighting fixtures and accessories for machinery spaces, public lavatories, galley, store rooms, refrigerated spaces, and exposed areas are drip proof or waterproof, and those in the wheelhouse and living quarters are nonwaterproof.

General lighting:	240 V AC
Emergency lighting:	240 V AC / 24 V DC

Flood lighting is fitted to adequately illuminate all open deck working areas.

The helicopter deck is lit as per the Australian regulations for night helicopter operations. Provision is included for retrofitting of horizon bar and glide slope indicator.

Engine room bilges, wells and open cofferdams have waterproof lighting.

All walkways and passageways above and below deck are adequately illuminated.

Fluorescent lighting, 20 or 40 W, is used throughout the accommodation and machinery spaces.

Engine room and control room have complete strip lighting.

Alternate groups of lights within machinery spaces are arranged so that the failure of any one circuit will not leave the space in darkness.

Ten portable 60 W hand lamps are provided for use in machinery spaces.

One 15 W fluorescent berth light with self-contained switch is provided over each berth.

One light is provided for each desk.

Chart tables are equipped with two angle poise lights with dimmers.

Mirrors over wash basins are lit by one 15 W fluorescent mirror light with self-contained switch and electric razor socket (of the approved current limiting transformer type).

Lighting of lifeboat and raft embarkation area, accommodation ladders, and pilot access is provided.

Lighting in laboratories is generally fluorescent but with additional spot lighting over bench spaces.

The computer room is to have incandescent lighting as well as fluorescent illumination. The incandescent lighting is to be complete with dimmer for variable intensity.

Searchlights, see item 3733.

E m e r g e n c y L i g h t i n g

Emergency lighting is provided to comply with the regulations and includes the following: accommodation alleyways, stairways, exits, mess room, engine room, engine control room, steering gear room, wheelhouse, captain's and chief engineer's cabins, and emergency generator room.

Emergency lights are automatically energized by 24 V storage batteries on failure of main power supply. Selfcharging lights with integral battery are used in the accommodation and in machinery spaces.

S w i t c h e s a n d S o c k e t O u t l e t s

Watertight sockets with self-contained switches for portable hand lamps, etc. are provided for machinery spaces, store rooms, wheelhouse and deck machinery.

One double socket for small miscellaneous portable appliances is provided in each cabin and a suitable number in public spaces.

Plugs and sockets are of the triple-pin Australian type. Control switches in lighting circuits are of the doublepole type. Non-waterproof sockets and switches are of the surface-mounting type or flush-mounting type as required by their surroundings.

Hard wiring is used where possible.

Laboratories have one double socket every 2 metres of bench space plus sufficient to cover all working spaces.

U.P.S. outlets are identified by RED colour.

93 CABLING

G e n e r a l

Power network:

- 3 conductor systems

Lighting and socket network:

- 2 conductors plus protecting conductor.
- The protecting conductors are connected to the hull in the subdistribution board.

932 CABLES FOR POWER AND LIGHTING

All cables are laid easily accessible, where possible. In accommodation they are laid behind removable panels or behind cover profiles to suit surrounding bulkheads, etc.

All cables are laid in well protected locations, whenever possible. Where necessary, they are protected by steel plates or similar.

Cables passing through deck are provided with steel cable duct with noninflammable packing.

The watertight passages and A-60 penetrations are made with MCT to the authorities' approval.

For individual cables passing through watertight bulkheads ordinary cable glands are used.

Cable passages in other bulkheads or in girders, etc. are carefully covered to avoid mechanical damage to the cables.

The cable trays are made of perforated, painted plate or are steel ladders.

The cables are fastened by means of hot-galvanized PVCcoated steel bands, fixed with screws, steel stripes or plastic bands.

The instrument room is designed for cable trays under the floor.

Temporary cable trays between all of the lab spaces, bridge, computer rooms and transducer spaces are installed to permit running of temporary and additional new cables.

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CABLES

All cables are of high quality in accordance with the Rules of the Classification Society and IEC Publ. 92, 332-1 and 332-2. Special cables for radio equipment and similar are used according to the manufacturers' requirements.

Cables are marked in both ends with a cable mark according to cable diagrams. The system mark itself (item No.) according to equipment tables. In the engine alarm system the transducer cable is marked with the corresponding alarm point number. Cable shoes or equivalent means of protection are used at cable ends only in such connections where the strands might otherwise be damaged. The cables for lighting installations are junctioned without cable shoes or soldering.

Cables of 415 and 240 V AC are to be separated from low voltage and instrumentation cables to prevent induction. All instrument cables to be screened.



Australian Government

Department of Infrastructure, Transport,
Regional Development and Communications
Office for the Arts

Protection of Movable Cultural Heritage Act 1986

Significance Assessment

July 2020

Applicant information

Application reference PMC3005

Application type:

- ☐ Temporary export permit application
- ☒ Permanent export permit application

Object

Object name or short description Research Vessel *Aurora Australis*

National Cultural Heritage Control List

The National Cultural Heritage Control List (the Control List) is at Schedule 1 of the [Protection of Movable Cultural Heritage Regulations 2018](#). The Control List outlines the categories of objects that constitute the movable cultural heritage of Australia and are Australian Protected Objects (APOs) under the [Protection of Movable Cultural Heritage Act 1986](#) (the Act).

Does the object meet all the APO criteria of at least one Part of the Control List?

- ☒ Yes ☐ No

Please confirm which Parts/s:

- ☐ Part 1 - Objects of Australian Aboriginal and Torres Strait Islander Heritage
- ☐ Part 2 - Archaeological Objects
- ☐ Part 3 - Natural Science Objects
- ☒ Part 4 - Objects of Applied Science or Technology
- ☐ Part 5 - Objects of Fine or Decorative Art
- ☐ Part 6 - Objects of Documentary Heritage
- ☐ Part 7 - Numismatic Objects
- ☐ Part 8 - Philatelic Objects
- ☐ Part 9 - Objects of Historical Significance

The Object is:

☐ Class A ☒ Class B ☐ Not an APO

Note: Under the Act, a Class A object that is in Australia **cannot** be exported from Australia. Class B objects may be exported from Australia if a permit or certificate is granted under the Act in relation to the object(s).

Summary

Provide a brief statement explaining how the object *does* or *does not* meet the criteria for being an APO. For example: The object is a Class B APO under Part 4, clauses 4.3(a), 4.3(b)(i) 4.3(c) 4.3(d),4.4(a)(i). It is a tractor that is of significance to Australia, is of Australian origin and is not represented in at least 2 public collections in Australia by an object of equivalent quality.

Aurora Australia (AA) meets all of the requirements of Part 4 of the Control List, having

- 1) some significance to Australia,
- 2) it was made in Australia over 30 (31) years ago,
- 3) it is an object of Water Transport, and
- 4) it (or a vessel of similar qualities) is not represented in any public collection in Australia.

A large number of vessels in Australia may meet the Control List criteria 2) to 4) above, and some degree of significance may be attached to all of them. AA is no exception, as it does have some significance to Australia, given the importance of the work it facilitated for the Australian Antarctic Division, and its familiarity as a feature of the Hobart landscape when alongside.

The determining consideration is whether the AA is of such significance that an export permit should be denied.

In my opinion, AA is a Class B Object, as it has some significance, but this significance not sufficient to warrant classification as a Class A object. While the vessel facilitated important scientific work, its activities were relatively routine and devoid of significant historical events. From a technical and engineering perspective, the vessel is of a typical design, and the equipment fitted is relatively standard.

How was the object examined?

A brief description, e.g. from photographs, consultation with other experts, archival documents, etc.*

The object was examined by reviewing the vessel's technical specifications, photographs and submissions provided by the owners by the Department.

s47F

Export permit

Would the permanent export of this APO significantly diminish the cultural heritage of Australia?

☐ Yes ☒ No ☐ N/A

Provide a brief statement demonstrating how the permanent export *will* or *will not* significantly diminish the cultural heritage of Australia.

On a personal level, I would be sad to see AA go if no gainful employment could be found for it in Australian waters, but I do not believe that the permanent export of the AA will significantly diminish the cultural heritage of Australia.

The vessel itself is of standard design for its purpose, and has no particular technical uniqueness or significance.

While there will always be a degree of loyalty and affection expressed by crews and members of the local community for particular ships, I do not think this has sufficient bearing on Australia's cultural heritage to justify retaining the vessel in Australia. While the AA's appearance is striking, the AA's replacement RSV Nuyina will be similarly striking and arguably more impressive as a statement of Australia's historical and ongoing commitment to Antarctica.

In my considerations, I have tried not to conflate the cultural heritage of Australia with other sub-issues.

The first of these sub- issues is the preservation of the vessel itself to prevent its scrapping. The proposal for AA to become a museum ship would prevent scrapping in the immediate term, but the cost of conversion to a "dumb barge" and its ongoing maintenance and preservation would be prohibitive. s47G The requirement to tow AA to mainland dockyards for underwater maintenance periodically would also be a significant cost factor. Once AA is converted to a dumb barge and has spent a long time out of Survey, it is difficult to see any way back to it becoming an operational asset again. There is a significant risk that if high levels of funding could not be generated on an ongoing basis, the vessel would deteriorate and become an ongoing liability that is only ultimately resolvable by scrapping. While I am not privy to the business case for retaining AA as a museum ship, I would consider that there is a high risk that significant financial intervention by Government would be required in the long term.

If preserving the vessel is the main aim, then keeping it working is the best and most cost effective solution. If an Australian buyer cannot be found to operate the vessel (preferably out of Hobart), then a foreign buyer would be the only realistic alternative.

The second sub- issue is that AA is claimed to be a Hobart landmark, and as such, its retention on its current wharf would be required. This would make the AA visible as a feature from the Salamanca Markets, as well vessel tour numbers benefiting from the passing foot trade. From a landmark perspective, RSV Nuyina may have been just as effective, but due to its larger size, it will

have to berth on more remote and less visible wharves. That said, extended periods of AA's operational life were spent away from Hobart, so its presence was always transient and its level of 'permanence' in the Hobart landscape is debatable.

The third issue is the viability of AA as a museum ship. In summary, I believe that the AA operated in this capacity may have limited local and tourist interest, but not to the level of national cultural significance. Worldwide, there are many attempts to preserve retired vessels with varying degrees of historical interest. In most instances these attempts result in a museum ship owned by a non-government entity to run tours, where the museum operation is funded by visitor entry fees to support the vessel's staffing and maintenance. To be successful, these ventures require a robust and accurate business case and high visitor volumes. Failure leaves the operating entity with unmanageable maintenance costs, a deteriorating vessel unfit & unsafe for display, and eventually the liabilities associated with the vessel's disposal. It is an inescapable fact that steel vessels in sea water will require expensive ongoing maintenance. The predicament of the ex-HMAS Otama at Hastings in Victoria is a salient example. The proponents of the museum ship future for AA propose a daily visitation rate of 100 people per day. If accurate, this may achieve almost \$0.75m per annum at \$20 per ticket, but maintenance costs and other overheads will likely well exceed this amount over a 5 year maintenance docking cycle. If Government funding for a vessel such as AA were available, I would submit that other more worthy projects to Australia's maritime heritage, such as the recovery of HMVS Cerberus, might be considered.

Would the temporary export of this APO significantly diminish the cultural heritage of Australia?

☐ Yes ☐ No ☒ N/A

Provide a brief statement demonstrating how the temporary export *will* or *will not* significantly diminish the cultural heritage of Australia.

See comments pertaining to "Permanent Export"

Do you recommend an export permit be granted?

☒ Yes ☐ No

If the only alternative for saving the ship in an operational condition is export to a foreign owner, I would recommend it as being preferable to having an underfunded and likely deteriorating static exhibit in Hobart.

Significance Values

Provide detailed information under the following categories, to help express how and why the object is significant to Australia's cultural heritage.

If a category is not relevant to the object, respond with a brief statement indicating why the object is not significant under that criteria.

Historic significance

This criteria is relevant to all categories under the Act. Consider if the object is associated with any notable person, group, event, place or activity in Australia's history. What does it contribute to understanding of a historic theme, process or pattern of life? How does it contribute to understanding a period, place, activity, industry, person or event?

AA was a workhorse of the AAD. It was not associated with any notable person, group, event or place. It may be associated with a notable activity, being Antarctic exploration, but this activity is being continued with a more capable vessel. We have not as a matter of routine retained and preserved every Antarctic research vessel operated by the AAD.

Aesthetic significance

This criterion is most relevant to works of art, craft, design and decorative arts, but may also apply to items of technology, mineral specimens or folk art. Consider if the object is well designed, crafted or made. Is it a good example of a style, design, artistic movement or an artist's work? Is it original or innovative in design? Is it beautiful, pleasing, or well-proportioned? Does it show a high degree of creative or technical accomplishment? Does it depict a subject, person, place, activity or event of interest or national significance?

AA's aesthetic is associated with its striking appearance, being a large orange block like structure. This is quite utilitarian, but this aesthetic will be continued with the new vessel RSV Nuyina.

Scientific, technical or research significance

This criterion applies to items or collections of current scientific value, or with research potential such as archives, natural history or archaeological collections, or objects that are excellent examples of technological innovation. Other objects including works of art may also have research significance. Does the object have research potential, and in what way? Do researchers have an active interest in studying the object, or do you consider it likely the object will be of interest to researchers in the future? What things constitute its scientific or research interest and research value? How is it an example of technological excellence and what has its impact been?

AA is a typical icebreaker that does not incorporate any special technology that is unique or significant.

Although AA was a platform that facilitated the AAD's research over the past 30 years, I would consider the contents of the on-board laboratories as potentially more significant than the ship itself. I am not aware of the nature of the equipment in the AA's laboratories, nor the disposition of these contents. Efficient use of Public Moneys would almost certainly require that any useful equipment in AA's laboratories should be recovered for continued use or cost recovery.

Social or spiritual significance

Social or spiritual significance is always specific to a particular, identified group of people. This type of significance applies to objects and collections where there is a demonstrated contemporary relationship between the object and a group or community. Is it of particular value to a community or group today? Why is it important to them? How is this demonstrated? How is the item kept in the public eye, or how is its meaning kept alive for a group? Has the community been consulted about its importance for them? Is it of spiritual significance for a particular group? Is this spiritual significance found in the present? Does it embody beliefs, ideas, customs, traditions, practices or stories that are important for a particular group?

Vessels, despite being inanimate objects, invariably strike up the affection and loyalty of their crews, especially where the vessel is used in a positive context. While the affection of the ship's scientists and members of the Hobart community for the ship is acknowledged, is this sufficient justification for a large amount of public money to be expended on its retention as a museum vessel in a "dumb barge" capacity? This consideration should also be made in the broader context of other Heritage vessel projects that are arguably more deserving.

Although there is affection for the vessel, I do not believe that AA has any spiritual significance.

Comparative analysis

Four comparative criteria are used to evaluate an APO's degree of significance. They interact with the criteria above and may increase or decrease significance. If the item is well documented it will generally be more significant. If it is in poor or incomplete condition, it will generally be of lower significance. Objects or collections must be significant under one or more of the Significance Values criteria above.

Provenance

Is the object well documented or recorded for its class or type? Is there a permanently fixed accession number, serial or consignment number, engine number, indelible manufacturer's name, mark or model, engraved name or signature? Who created, made, owned or used the object? Is its place of origin well documented? Is there a chain of ownership? Is the provenance reliable? How does the provenance shape the significance of the object?

Provenance is well documented and all vessel serial numbers and registration numbers are within the ship's operating and survey documentation. The amount of scientific information and photographic records associated with the vessel would be considerable, but this may be considered as a separate detachable entity to the ship. While interpretation of some of the research material and methods may benefit from being displayed in the shipboard context, I do not consider that such a display (that could be mounted elsewhere) elevates AA's significance to the extent that export should be denied.

Representative or rarity

In some cases objects may be both rare and representative. An object that is only representative is unlikely to be significant. Does the object have unusual qualities that distinguish it from other objects in the same class or category? Is it a good example of its type or class? Is it typical or characteristic? Is it unusual or a particularly fine example of its type? Is it singular, unique or endangered? Is it particularly well documented for its class or group?

Icebreakers are not an especially common variety of vessel in the first instance, but they are not considered to be rare. As a vessel type, they will always be in demand and are in no danger of becoming 'extinct' due to replacement by a substantially different type of vessel. AA is a fairly standard example of the type with no unusual qualities. AA's representative nature does not add to its significance.

Condition, completeness or intactness

In general, an object in original condition is more significant than one that has been restored. Based on your research and the information and images provided, is it in good condition for its type? Is it intact or complete? Does it show repairs, alterations or evidence of the way it was used? Is it still working? Is it in original, unrestored condition?

Having just completed its service life with the AAD, AA is in good original condition, and is intact and complete as far as the vessel itself is concerned. I am not aware as to whether the contents of the laboratories are intact, or whether they have been taken ashore for use, storage or transfer to RSV Nuyina. As previously indicated, the laboratories would be a key consideration with respect to the significance of the vessel and its use as a museum. Even if the laboratories were intact, I would not be convinced that the vessel's significance is greatly increased.

Interpretive potential

What stories does the object tell? What themes would it contribute to and how would the object be significant to a collecting institution? Does it have any other relationships to objects already held in collecting institutions? Does it help to interpret aspects of its place or context?

The object itself gives an indication of the conditions under which the AAD scientists and logisticians worked, and it could tell the story of Australia's research in the Antarctic. With a large volunteer guide staff and an adequate set-up and maintenance budget, the vessel could be interpreted for display. However, the considerable cost is likely to well exceed the benefit and incoming funding when compared with other interpretation options.

The Antarctic stories and themes could be interpreted much more efficiently by an on-shore museum display, such as at the Maritime Museum of Tasmania, using a large scale model, samples of equipment and photographs.

List details of any other comparable objects

Provide a list of comparable objects in Australian public collections, including images where possible. Comparable includes the same or similar object or content.*

There are no similar objects to the AA in any Australian collection.

Include images of comparable objects here or on a separate sheet.

Please size images to fit a maximum of three to a page with a clear resolution suitable for printing. In addition, please label and caption images with the name/description of the object and where it is held.

We ask that you do not provide links to images without the image itself.

Significance to Australia

A brief statement clearly articulating the level of significance of the object(s) to Australia's national cultural heritage.

If you are recommending an export permit be denied, you must *specifically* state how the export will diminish Australia's cultural heritage.

A comparatively small number of Australians have a heartfelt affection and familiarity with the AA, but I do not believe that the vessel has the status of a national icon. AA's standing in the national consciousness is not, in my opinion, substantial enough to deny an export permit. Accordingly, I would not recommend that the permanent export of the AA be denied. Indeed, from the perspective of preserving the ongoing material integrity of the ship, its sale to another operator who must properly maintain it would be a reasonable option.

Value of object

Provide an estimated value for the object. If your estimate differs from valuations provided by the Applicant, state the reasons for your valuation.

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July 2020

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References

Reference all sources used to determine the object's significance and acknowledge any other contributions using a recognised referencing format.

Apart from media reports s47F the cultural or technical significance of the AA is not documented in any authoritative way as far as I can determine.

s47F

Please confirm your contact details

We protect your privacy in accordance with the *Australian Privacy Principles (APPs) and the Privacy Act 1988 (Cth)*.

Title: s47F First name: s47F Surname: s47F

Institution: s47F

Position: s47F

Postal address: s47F

Suburb s47F State s47F Postcode s47F

Phone s47F Email s47F

Declaration

I certify that:

- ☒ I will not disclose the application details to any other parties.
- ☒ the information provided in this Significance Assessment and attached documentation is, to the best of my knowledge, true and correct at the time of signing.
- ☒ in assessing this application I have no known conflict of interest.

Expert Exam s47F Date 16 July 2020



July 2020

Please return completed the completed form by email or post:

Cultural Property Section

Department of Communications and the Arts

GPO Box 2154

Canberra ACT 2601

Email: movable.heritage@arts.gov.au | Phone: 1800 819 461

Expert Examiner Assessment Explanatory Notes

The form will guide you through the statutory requirements in assessing Australian heritage objects. For help, contact the Cultural Property Section on 1800 819 461.

Determining if the object is an Australian Protected Object

- Does the object meet all the criteria of at least one Part of the Control List identified within the Regulations? Note: an object may meet the criteria of more than one Part.
- For objects under **Parts 2, 3, 4, 6, 7 and 8**, 'significance to Australia' is a criterion that must be demonstrated for the object to be classed as an APO. The Regulations define 'significance to Australia' as follows:

'the object is of Australian origin, has substantial Australian content, or has been used in Australia, and:

- (a) is associated with a person, activity, event, place or business enterprise, notable in history; or
- (b) has received a national or international award or has a significant association with an international event; or
- (c) represents significant technological or social progress for its time; or
- (d) is an object of scientific or archaeological interest.'

If the object does not meet all the criteria of at least one Part of the Control List, it is not an APO. Objects that are not an APO do not require a permit to be exported.

Assessing if an object should be exported

For export permit applications, the test that must be met to recommend *against* an export is whether the export of the object would significantly diminish the cultural heritage of Australia. Two aspects must be considered to meet this test:

- the importance of the object itself; and
- the importance of the object in the context of Australia's cultural heritage.

If, following your research, you consider that while the object is an APO it is not so important in its own right or for reasons of context (e.g. there are better representations publically available), that you would recommend granting export permit; or because it is being exported temporarily and you do not believe that Australia's cultural heritage would be diminished by its temporary export then you should recommend an export permit be granted.

If, after considering all the relevant cultural heritage factors, you believe that the export of the object would significantly diminish the cultural heritage of Australia, you should recommend against export.

Provide a detailed assessment to support your recommendation. The assessment must consider the significance of the object, the associated values in the context of Australia's cultural heritage, and

specifically how Australia's cultural heritage will be diminished by the object's export. For reference, the Administrative Appeals Tribunal has accepted that a 'significant diminution' is a notable or important diminution not an irreparable one.

Useful links

Legislation

- [*Protection of Movable Cultural Heritage Act 1986*](#)
- [*Protection of Movable Cultural Heritage Regulations 2018*](#)



Australian Government

Department of Infrastructure, Transport,
Regional Development and Communications
Office for the Arts

Protection of Movable Cultural Heritage Act 1986

Significance Assessment

July 2020

Applicant information

Application reference

Application type:

- ☐ Temporary export permit application
- ☒ Permanent export permit application

Object

Object name or short description **Antarctic research and supply vessel *Aurora Australis***

National Cultural Heritage Control List

The National Cultural Heritage Control List (the Control List) is at Schedule 1 of the [Protection of Movable Cultural Heritage Regulations 2018](#). The Control List outlines the categories of objects that constitute the movable cultural heritage of Australia and are Australian Protected Objects (APOs) under the [Protection of Movable Cultural Heritage Act 1986](#) (the Act).

Does the object meet all the APO criteria of at least one Part of the Control List?

☒ Yes ☐ No

Please confirm which Parts/s:

- ☐ Part 1 - Objects of Australian Aboriginal and Torres Strait Islander Heritage
- ☐ Part 2 - Archaeological Objects
- ☐ Part 3 - Natural Science Objects
- ☒ Part 4 - Objects of Applied Science or Technology
- ☐ Part 5 - Objects of Fine or Decorative Art
- ☐ Part 6 - Objects of Documentary Heritage
- ☐ Part 7 - Numismatic Objects
- ☐ Part 8 - Philatelic Objects
- ☒ Part 9 - Objects of Historical Significance

The Object is:

☐ Class A ☒ Class B ☐ Not an APO

Note: Under the Act, a Class A object that is in Australia **cannot** be exported from Australia. Class B objects may be exported from Australia if a permit or certificate is granted under the Act in relation to the object(s).

Summary

Provide a brief statement explaining how the object *does* or *does not* meet the criteria for being an APO. For example: The object is a Class B APO under Part 4, clauses 4.3(a), 4.3(b)(i) 4.3(c) 4.3(d),4.4(a)(i). It is a tractor that is of significance to Australia, is of Australian origin and is not represented in at least 2 public collections in Australia by an object of equivalent quality.

The *Aurora Australis* is the first and only icebreaker to be built in Australia. It was registered in Hobart and carried an Australian crew. Under charter, it was the research and supply vessel for the Australian Antarctic Division for 31 years.

It was the platform for scientific research and the lifeline that carried supplies and crews to Australia's four Antarctic stations: Mawson, Davis, Casey, Macquarie Island. It completed more than 150 voyages and carried 10,000 scientists and support personnel to Australia's Antarctic and subantarctic bases.

The *Aurora Australis* provided a platform to support Australia's obligations under the Antarctic Treaty System. It supported research for the conservation of the Antarctic environment. It provided a resource for joint research programs with other Antarctic nations and at times it was called to the aid of vessels in distress.

Australia holds a reputation as a world leader in Antarctic marine science and has played a major role in the history of Antarctica since the Australian Antarctic Expedition of 1911-14, led by Douglas Mawson. Antarctic scientists attribute much of their success in breaking new ground in Antarctic research over the past three decades to the capability provided by the *Aurora Australis*.

The vessel is historically significant because it played a critical role in that national research program for 31 years.

The RSV *Aurora Australis* meets the criteria under Part 9 – Objects of historical significance. It is an object of the kind mentioned in clause 9.4.(K). It is an object of historical significance relating to the history of exploration, specifically to the history of Antarctic exploration. It is also associated with an activity that is notable in Australian history, in this case Antarctic exploration which is notable because of the public interest it attracts, the attention it is given as a national research program, and the role it has representing Australia under the Antarctic Treaty System. The vessel was completed in 1989 meaning it is more than 30 years old [9.2(b)(ii)]. As the only icebreaker built in Australia and as an Antarctic research vessel the *Aurora Australis* is a type of object that is not represented in two public collections [9.2(b)(iii)]. Consequently, the *Aurora Australis* is a Class B object.

The RSV *Aurora Australis* also meets the criteria under Part 4 – Objects of applied science or technology. The *Aurora Australis* is of significance to Australia [4.3(a)]. It is an object of Australian

origin because it was built at Carrington Slipways in Newcastle [4.3(b)(i)]. It was made more than 30 years ago as its build was completed in 1989. The *Auroa Australis* is an object of the kind mentioned in item 4.4 and [4.3(d)]. As the only icebreaker built in Australia and an Antarctic research vessel it is a type of object that is not represented in at least two public collections in Australia by an object of equivalent quality. Objects in this category are Class B objects, and include: [4.4(g)(i)] any object of water transport, including a power driven vessel such as the RSV *Aurora Australis*.

How was the object examined?

A brief description, e.g. from photographs, consultation with other experts, archival documents, etc.*

I have not inspected the ship. This assessment is based on research into the history of the ship along with descriptions of the ship provided by plans, photographs and specifications in its registration certificate and international tonnage certificate. The large package of information provided by the Applicant was very helpful.

Export permit

Would the permanent export of this APO significantly diminish the cultural heritage of Australia?

☒ Yes ☐ No ☐ N/A

Provide a brief statement demonstrating how the permanent export *will* or *will not* significantly diminish the cultural heritage of Australia.

The export of the research and supply vessel *Aurora Australis* will significantly diminish the cultural heritage of Australia.

It will mean the loss of a vessel that filled a major role in the history of Australia's Antarctic territories.

The *Aurora Australis* provided critical support for Australia's four Antarctic bases. It provided a platform to support Australia's obligations under the Antarctic Treaty System. It provided a new capability that opened-up new possibilities for research and Antarctic scientists attribute much of Australia's leadership in Antarctic marine science over the past 30 years to the capacity provided by the *Aurora Australis*.

The ship now stands as a record of that history. It is evident in its robust build and high-visibility orange colour scheme and its array of equipment all built to stand against the dangers of Antarctic voyaging. Its scientific work is evident in the ship's onboard research laboratories and krill tanks, helicopter deck and specialised equipment for trawling and collecting specimens. Its crew accommodation, Husky Bar, lifeboats and emergency hospital room all evoke life onboard for the *Aurora Australis*' community of researchers and crew.

Would the temporary export of this APO significantly diminish the cultural heritage of Australia?

☐ Yes ☐ No ☒ N/A

Provide a brief statement demonstrating how the temporary export *will* or *will not* significantly diminish the cultural heritage of Australia.

Do you recommend an export permit be granted?

☐ Yes ☒ No

Significance Values

Provide detailed information under the following categories, to help express how and why the object is significant to Australia's cultural heritage.

If a category is not relevant to the object, respond with a brief statement indicating why the object is not significant under that criteria.

Historic significance

This criteria is relevant to all categories under the Act. Consider if the object is associated with any notable person, group, event, place or activity in Australia's history. What does it contribute to understanding of a historic theme, process or pattern of life? How does it contribute to understanding a period, place, activity, industry, person or event?

The *Aurora Australis* was purpose-built by Carrington Slipways at Newcastle for P&O Marine as an Antarctic research and supply vessel that would be chartered by the Australian Antarctic Division. Completed in 1989 it is the first and only icebreaker to be built in Australia. Through its working life of 31 years it has been owned by P&O Marine, registered in Hobart as an Australian ship and it carried an Australian crew.

The *Aurora Australis* is associated with an activity notable in Australian history. It was the principal vessel of the Australian Antarctic Division for 31 years. It was the platform for scientific research and the lifeline that carried supplies and crews to Australia's four Antarctic stations: Mawson, Davis, Casey, Macquarie Island. It completed more than 150 voyages and carried 10,000 scientists and support personnel to Australia's Antarctic and subantarctic bases.

The *Aurora Australis* provided a platform to support Australia's obligations under the Antarctic Treaty System. It supported research for the conservation of the Antarctic environment; it provided a resource for joint research programs with other Antarctic nations and at times it was called to the aid of vessels in distress.

From its inception the ship was a focus of national pride. It was named *Aurora Australis* when launched by Ms Hazel Hawke wife of the Prime Minister and the name was chosen after a national competition launched by Prime Minister Bob Hawke.

The *Aurora* brought a new capability to Australian research in Antarctica and that capability is evident in the design and fabrication of the ship. Sarah Laverick is a biologist and deputy voyage leader who worked through five voyages on the *Aurora Australis* and has now written a history of the vessel. She believes

"Australia's current reputation as a world leader in Antarctic marine science is directly attributable to the Aurora Australis. Her ice breaking capabilities and state-of-the-art facilities expanded the reach of scientists and opened worlds never before explored in Antarctica and the Southern Ocean. Together the Aurora and her scientists and crew surveyed vast swathes of Antarctica and, in the midst of the untempered Southern Ocean and the treacherous realm of sea ice, they discovered new species and communities and uncovered surprising oceanographic secrets of the deep."

(Sarah Laverick *Through Fire and Ice: The Adventures, Science and People Behind Australia's Famous Icebreaker Aurora Australis* Macmillan 2020 p. 306)

The ship was able to work in big seas, withstand storms and cut through pack ice; all characteristics that enabled scientists to work in conditions and places that were previously inaccessible. It carried two helicopters, was equipped with onboard laboratories, tanks for holding specimens such as krill and it carried equipment to trawl and film the Antarctic seafloor, collect specimens ranging from microscopic organisms to fish, and conduct post mortems on marine mammals.

Some of the scientific achievements based on the *Aurora Australis* include:

- **First assessment of fish stocks**
- On the *Aurora Australis*' first voyage to the Antarctic researchers set up 85 trawl stations to study the biology of fish and 96 CTD units to measure the conductivity, temperature and depth of water columns in the waters around Heard Island. Importantly, that work was the first time anywhere that fish stocks were assessed before any commercial fishing had taken place. *"And the Aurora, with her commercial trawling capability and impressive sea going abilities, had made it possible."* (Laverick p.74)
- **First study of an active polynya in an Antarctic winter**
- From August 1999 the *Aurora Australis* spent four weeks in the Mertz Glacier polynya. A polynya is an area of ocean surrounded by sea ice and they are of particular ecological significance when they recur at the same time and place each year. The *Aurora*'s 1999 voyage

was the first time a ship had worked in an active polynya in an Antarctic winter and the work brought new insights. *"Their research revealed that sea ice can form within this polynya at rates of about four to eight centimetres of thickness per day, and that the salt shed by the freezing water helps to form dense shelf water, which sinks, eventually forming Antarctic bottom water; a deep cold current that traverses whole ocean basins and is crucial to global oceanographic circulation."*

- The work also showed that there was little life in the polynya and it overturned a previous theory that polynya were winter havens for wildlife. (Laverick pp. 199-200)
- **Surveyed 1.5 million square kilometres of East Antarctica**
- Researchers aboard the *Aurora Australis* in 1999 completed a survey of 1.5 million square kilometres of East Antarctica between Australia's Mawson Station and France's base Dumont d'Urville. That area represents almost one quarter of the entire circumpolar region. The work required the two onboard helicopters to fly 6,000 km and the *Aurora Australis* to beat its way through more than 3000 km of pack ice. (Laverick p. 200)
- **Biological survey**
- A five-year program to track seals with satellite tags produced *"the most robust estimates of crabeater seal abundance in East Antarctica in history."* The project is important in understanding seals. But more than that, because seals comprise one third of the total predator biomass of the Southern Ocean, the survey's estimate of approximately 950,000 seals provided the basis for estimating how much krill the seals would need to survive. That information is critical to the conservation commission in managing the Antarctic krill fishery. (Laverick p. 200)
- **Oceanographic research**
- The Antarctic Circumpolar Current is the largest current on the planet and the only one that circulates around the globe uninterrupted by land. *"Through their work on the Aurora, scientists learned how strong the ACC really was, and how it could vary with time and location. In addition, they came to better understand how the 'overturning circulation' in Antarctica worked: that is, how water at depth moved from south to north and also mixed in the interior of the Southern Ocean. And importantly, the long term studies on the Aurora Australis also showed how these two major components of the Southern Ocean Circulation – the ACC and overturning circulation – were linked. Scientists began to examine how these currents could be affected by climate change, and how these changes in the Southern Ocean in turn further effect environmental change."* (Laverick pp. 208-09)
- **Identifying new species**
- During the International Polar Year 2007 the *Aurora* and the Australian Antarctic Division worked with France, Belgium and Japan on a Collaborative East Antarctic Marine Census. The *Aurora* focused on the sea floor trawling it with massive sleds. *"The results of these trawls were*

beyond expectation with species pulled up that had never before been documented; many with the characteristic Antarctic feature of gigantism, with sea insects that would normally be less than a centimetre long in Australian waters appearing in the Aurora's nets at over five times their usual size."

- The research produced other surprises. The international team was amazed by the abundance of life filmed on the sea floor. Voyage Leader Martin Riddle described the abundance of life as like the Great Barrier Reef. *"The sea-bed was 100% covered with living material – colourful branching coralline species and gorgonians forming the major lower-storey structure and large branching sponges the upper storey. Amongst this were numerous sea-stars, sea-cucumbers, crustacea and fish of types as yet unseen."* (Laverick p.213)
- That marine census resulted in two areas of the Southern Ocean being declared Vulnerable Marine Ecosystems and given international protection from fishing.

Those scientific advances were made possible by the technical capabilities of the *Aurora Australis*. Today, the ship contributes to our understanding of the history of Antarctic science. The work it supported is evident in its robust build and safety-orange colour both chosen to stand against the dangers of Antarctic voyaging. Its scientific work is also evident in the ship's onboard research laboratories, helicopter deck and equipment for trawling and collecting specimens.

Charlton Clark General Manager Operations at the Australian Antarctic Expedition said *"The Aurora Australis has been the backbone of the Australian Antarctic Program for more than three decades, so the vessel has a special place in our history. Over its lifetime, the icebreaker has carried more than 14,000 expeditioners across the Southern Ocean on over 150 research and resupply voyages."*

Alexandra Alvaro *Aurora Australis saluted as Antarctic icebreaker begins final voyage* ABC News posted 10 Mar 2020

Aesthetic significance

This criterion is most relevant to works of art, craft, design and decorative arts, but may also apply to items of technology, mineral specimens or folk art. Consider if the object is well designed, crafted or made. Is it a good example of a style, design, artistic movement or an artist's work? Is it original or innovative in design? Is it beautiful, pleasing, or well-proportioned? Does it show a high degree of creative or technical accomplishment? Does it depict a subject, person, place, activity or event of interest or national significance?

Scientific, technical or research significance

This criterion applies to items or collections of current scientific value, or with research potential such as archives, natural history or archaeological collections, or objects that are excellent examples of technological innovation. Other objects including works of art may also have research significance. Does the object have research potential, and in what way? Do researchers have an active interest in studying the object, or do you consider it likely the object will be of interest to researchers in the future? What things constitute its scientific or research interest and research value? How is it an example of technological excellence and what has its impact been?

Social or spiritual significance

Social or spiritual significance is always specific to a particular, identified group of people. This type of significance applies to objects and collections where there is a demonstrated contemporary relationship between the object and a group or community. Is it of particular value to a community or group today? Why is it important to them? How is this demonstrated? How is the item kept in the public eye, or how is its meaning kept alive for a group? Has the community been consulted about its importance for them? Is it of spiritual significance for a particular group? Is this spiritual significance found in the present? Does it embody beliefs, ideas, customs, traditions, practices or stories that are important for a particular group?

The ship is of social significance to the researchers and the crew who have made voyages to Antarctica on the *Aurora Australis*. On long and hazardous voyages, the *Aurora* was the expeditioners' home and their safe-haven in a stunning but dangerous environment and expeditioners developed strong bonds for their fellow expeditioners and for the ship.

Gerry O'Doherty was Chief Mate and Master on the *Aurora Australis*, having started onboard 20 years earlier as an integrated rating (able seafarer). Interviewed by the Guardian newspaper he spoke of the crew's affection for the ship. *"I think everybody's apprehensive. We're all very attached to the ship and to the work it does. The ship is like a second home, and the people are like a second family. Saying goodbye to that will be difficult. It's like our own micro-community sometimes, with people from all over the world. It's a tiny melting pot of humanity isolated in the Southern Ocean."*

Ruth Dawkin *Au revoir Aurora Australis* The Guardian Monday 7 October 2019

Dr Kim Ellis Director of the Australian Antarctic Division also spoke of expeditioners' love for the ship. *'In March we bade farewell to our much-loved icebreaker, Aurora Australis. This was an important milestone for the Australian Antarctic Program after 30 years of Antarctic service, however the pandemic scuppered our plans for a series of farewell events. The Aurora will live on in the hearts and minds of those who sailed on her...'*

Australian Antarctic Magazine Issue 38 June 2020

There is also evidence that the ship is socially significant to the Hobart community. The *Aurora Australis* has been part of the Hobart seascape for the past 30 years and is certainly distinctive in its high-visibility orange paint motoring up the River Derwent and berthed in port. Tasmanian Member of Parliament Mr Andrew Wilke said *"Every winter, it's been down there defining our sense of place. It really is an iconic part of the city. In Hobart we have the mountain, we have the river and we have the Aurora Australis."* A not-for-profit organisation, the Aurora Australis Foundation, was formed recently, in Hobart in early June 2020 with the goal of acquiring and preserving the ship.

Ros Lehman *Last Ditch Bid to Secure Aurora Australis for Floating Museum* ABC News posted 6 June 2020

The Premier of Tasmania Mr Peter Gutwien MP wrote to P@O Maritime about the future of the *Aurora Australis* in July 2020 and the Applicant has included that letter in their application. My reading of that letter is that it largely focuses on the practicalities of preserving the ship which are considerations that sit outside the question of its significance. Mr Gutwien does write *"Since the earliest days of Antarctic shipping, many icebreakers have visited Hobart and the Australian Antarctic program has operated a range of vessels for its supply and science voyages, including your vessel, The RSV Aurora Australis. Many people in Hobart and many former Antarctic expeditioners have grown fond of your ship, as they have of other icebreakers in the past, including your previous icebreaker, the RSV L'Astrolabe."*

Premier Peter Gutwein MP to Mr John Connor July 2020

Comparative analysis

Four comparative criteria are used to evaluate an APO's degree of significance. They interact with the criteria above and may increase or decrease significance. If the item is well documented it will generally be more significant. If it is in poor or incomplete condition, it will generally be of lower significance. Objects or collections must be significant under one of more of the Significance Values criteria above.

Provenance

Is the object well documented or recorded for its class or type? Is there a permanently fixed accession number, serial or consignment number, engine number, indelible manufacturer's name, mark or model, engraved name or signature? Who created, made, owned or used the object? Is its place of origin well documented? Is there a chain of ownership? Is the provenance reliable? How does the provenance shape the significance of the object?

The provenance of the *Aurora Australis* is very well documented. It was built by Carrington Slipways at Newcastle NSW for P&O Marine. P&O registered the vessel in Hobart and chartered it to the Australian Antarctic Division over 31 years. The ownership of the vessel is listed on the Australian Shipping Register (851245) and the International Maritime Organization (8717283).

As an Australian registered ship, a great deal of the *Aurora Australis*' history, particularly events such as fires onboard and rescues have been recorded by the Australian Maritime Safety Authority.

As a research vessel, the history of the *Aurora Australis* has been recorded in extensive detail by the Australian Antarctic Division with detailed reports on each voyage and scientific reports based on research onboard the ship.

In addition, researchers and crew developed an affection for the ship that has led to a number of news articles, radio broadcasts, crew interviews and a book documenting the history of the ship. The substantial level of documentation is unusual. It flows from the social significance of the ship and contributes to it.

Representative or rarity

In some cases objects may be both rare and representative. An object that is only representative is unlikely to be significant. Does the object have unusual qualities that distinguish it from other objects in the same class or category? Is it a good example of its type or class? Is it typical or characteristic? Is it unusual or a particularly fine example of its type? Is it singular, unique or endangered? Is it particularly well documented for its class or group?

The *Aurora Australis* is rare. It is the first and only ice breaker to be built in Australia. It was designed and built as a platform for Antarctic research and a supply ship to support Australia's Antarctic bases. That rarity is not just interesting; it is at the heart of the purpose of the ship. The *Aurora Australis* was fitted with specialist scientific equipment such as onboard laboratories, tanks for holding marine specimens including krill and facilities for trawling the Antarctic sea floor for specimens. It carried two helicopters and accommodation for teams of researchers as well as crew and its hull was designed with the strength and shape to cut through pack ice.

Condition, completeness or intactness

In general, an object in original condition is more significant than one that has been restored. Based on your research and the information and images provided, is it in good condition for its type? Is it intact or complete? Does it show repairs, alterations or evidence of the way it was used? Is it still working? Is it in original, unrestored condition?

I have not inspected the ship. The *Aurora Australis* was in commercial survey in March 2020, four months ago. That means it met standards set by the Australian Maritime Safety Authority and passed inspections to check the condition of the ship and the equipment it carried. Vessel owners P&O describe the ship as being in 'hot layup' at a Hobart wharf, meaning it is currently out-of-survey but can be mobilised into survey at short notice.

Interpretive potential

What stories does the object tell? What themes would it contribute to and how would the object be significant to a collecting institution? Does it have any other relationships to objects already held in collecting institutions? Does it help to interpret aspects of its place or context?

The ship is evocative of 31 years of Antarctic research and Antarctic voyages. Its robust hull, high-visibility orange colour scheme, array of equipment and helipad all identify it as a highly unusual vessel, built to withstand extreme conditions. Its onboard laboratories and specimen tanks offer a platform to explore scientific research in the Antarctic. Its crew accommodation, emergency hospital room and Husky Bar all evoke something of life onboard for the community of researchers and crew.

The vessel could certainly connect with Antarctic collections in Hobart and the ongoing presence of the Australian Antarctic Division. There are also significant Antarctic collections in Adelaide and Sydney.

Historic vessels can be major attractions for museums and there are many wonderful examples of ship interpreted with soundscapes, guides, lighting effects and digital interactives. Historic ships can be immersive, exciting and truly evocative. However, the scale of historic ships can also present challenges. Maritime museums around the world face the substantial costs of preserving ships. On many occasions they look for other collections of objects and other ways to explore the histories those ships represent.

List details of any other comparable objects

Provide a list of comparable objects in Australian public collections, including images where possible. Comparable includes the same or similar object or content.*

The *Aurora Australis* is unique. It is the only ice breaker built in Australia. Museum collections hold some small craft such as canvas and timber kayaks used in Antarctica but nothing of the scale of the *Aurora Australis*.

Include images of comparable objects here or on a separate sheet.

Please size images to fit a maximum of three to a page with a clear resolution suitable for printing. In addition, please label and caption images with the name/description of the object and where it is held.

We ask that you do not provide links to images without the image itself.

Significance to Australia

A brief statement clearly articulating the level of significance of the object(s) to Australia's national cultural heritage.

If you are recommending an export permit be denied, you must *specifically* state how the export will diminish Australia's cultural heritage.

The export of the *Aurora Australis* will significantly diminish Australia's cultural heritage. It will remove a vessel that stands as a record of Australia's scientific achievements in Antarctic research. The *Aurora Australis* brought new technical capabilities that enabled advances in biology, oceanography and glaciology. That work advanced human understanding of the behaviour of ice and currents and the marine biology of Antarctica.

That work stands in a long history of Australian research in Antarctica that extends to Douglas Mawson's research in the Australian Antarctic Expedition of 1911-14.

The export of the vessel would also mean the loss of a ship that is of particular social significance to the community of Hobart and the crew and researchers who voyaged on the ship.

Value of object

S47

References

Reference all sources used to determine the object's significance and acknowledge any other contributions using a recognised referencing format.

Ros Lehman *Last Ditch Bid to Secure Aurora Australis for Floating Museum* ABC News posted 6 June 2020

Alexandra Alvaro *Aurora Australis saluted as Antarctic icebreaker begins final voyage* ABC News posted 10 Mar 2020

Australian Antarctic Magazine Issue 38 June 2020 published by Australian Antarctic Division

Australian Register of Historic Vessels <https://www.sea.museum/discover/arhv>

Ruth Dawkin *Au revoir Aurora Australis* The Guardian Monday 7 October 2019

Premier Peter Gutwein MP letter to Mr John Connor July 2020

Sarah Laverick *Through Fire and Ice: The Adventures, Science and People Behind Australia's Famous Icebreaker* Macmillan, Sydney, 2019

Information package provided by Applicant including registration certificate, tonnage certificate, photographs, plans and vessel specifications

Please confirm your contact details

We protect your privacy in accordance with the *Australian Privacy Principles (APPs) and the Privacy Act 1988 (Cth)*.

Title s47F First name s47F Surname s47F
Institution s47F
Position s47F
s47F
Suburb State Postcode
Phone s47F Email s47F

Declaration

I certify that:

- ☒ I will not disclose the application details to any other parties.
- ☒ the information provided in this Significance Assessment and attached documentation is, to the best of my knowledge, true and correct at the time of signing.
- ☒ in assessing this application I have no known conflict of interest.

Expert Examiner signature
Date 24 July 2020

s47F

Please return completed the completed form by email or post:

Cultural Property Section
Department of Communications and the Arts
GPO Box 2154
Canberra ACT 2601
Email: movable.heritage@arts.gov.au | Phone: 1800 819 461

Expert Examiner Assessment Explanatory Notes

The form will guide you through the statutory requirements in assessing Australian heritage objects. For help, contact the Cultural Property Section on 1800 819 461.

Determining if the object is an Australian Protected Object

- Does the object meet all the criteria of at least one Part of the Control List identified within the Regulations? Note: an object may meet the criteria of more than one Part.
- For objects under **Parts 2, 3, 4, 6, 7 and 8**, 'significance to Australia' is a criterion that must be demonstrated for the object to be classed as an APO. The Regulations define 'significance to Australia' as follows:

'the object is of Australian origin, has substantial Australian content, or has been used in Australia, and:

- (a) is associated with a person, activity, event, place or business enterprise, notable in history; or
- (b) has received a national or international award or has a significant association with an international event; or
- (c) represents significant technological or social progress for its time; or
- (d) is an object of scientific or archaeological interest.'

If the object does not meet all the criteria of at least one Part of the Control List, it is not an APO. Objects that are not an APO do not require a permit to be exported.

Assessing if an object should be exported

For export permit applications, the test that must be met to recommend *against* an export is whether the export of the object would significantly diminish the cultural heritage of Australia. Two aspects must be considered to meet this test:

- the importance of the object itself; and
- the importance of the object in the context of Australia's cultural heritage.

If, following your research, you consider that while the object is an APO it is not so important in its own right or for reasons of context (e.g. there are better representations publically available), that you would recommend granting export permit; or because it is being exported temporarily and you do not believe that Australia's cultural heritage would be diminished by its temporary export then you should recommend an export permit be granted.

If, after considering all the relevant cultural heritage factors, you believe that the export of the object would significantly diminish the cultural heritage of Australia, you should recommend against export.

Provide a detailed assessment to support your recommendation. The assessment must consider the significance of the object, the associated values in the context of Australia's cultural heritage, and

specifically how Australia's cultural heritage will be diminished by the object's export. For reference, the Administrative Appeals Tribunal has accepted that a 'significant diminution' is a notable or important diminution not an irreparable one.

Useful links

Legislation

- [*Protection of Movable Cultural Heritage Act 1986*](#)
- [*Protection of Movable Cultural Heritage Regulations 2018*](#)

Matters for recommendation to the Minister

5. Export Permit applications

Part 4 – Objects of applied science or technology

a) PMC3005 – *RSV Aurora Australis* icebreaker

1. Is the object an Australian Protected Object?	Yes	✓	No	
2. Confirm which Part/s of the National Cultural Heritage Control List the object/s sit under:				
Part 1 Objects of Australian Aboriginal and Torres Strait Islander Heritage				
Part 2 Archaeological Objects				
Part 3 Natural Science Objects				
Part 4 Objects of Applied Science or Technology	✓			
Part 5 Objects of Fine or Decorative Art				
Part 6 Objects of Documentary Heritage				
Part 7 Numismatic Objects				
Part 8 Philatelic Objects				
Part 9 Objects of Historical Significance	✓			
3. Reasons for the recommendation:				
<p>The Committee noted that two Expert Examiners have provided Significance Assessments with conflicting recommendations for this application. The Secretariat advised that in submitting its application, P&O Maritime Services maintains that the vessel is not an Australian Protected Object. s47</p> <p>and as such the Applicant has requested that the application progress to the Committee for a recommendation. While the Minister has delegated powers under Section 10 of the <i>Protection of Movable Cultural Heritage Act 1986</i> to senior departmental officers with responsibility for Arts functions, in this instance the decision to grant or refuse a permit will be made by the Minister.</p> <p>The Committee noted that the <i>RSV Aurora Australis</i> was made in Newcastle, New South Wales, in 1989 and has been in continuous service under charter to the Australian Antarctic Division for 31 years. Although the vessel was built in Australia, it is not of special technical interest.</p> <p>The Committee considered that the vessel's significance lies in its historical and social value, that recent media interest in the fate of the vessel is evidence of extensive public interest. The vessel's rich cultural heritage value arises from its contributions to advances in scientific research and to Australia's endeavours under the Antarctic Treaty. The <i>RSV Aurora Australis</i> made more than 150 research and resupply voyages to the Antarctic, supporting 14,000 expeditioners and important scientific research. Its significance value lies not only in the scientific research work supported and made possible by the vessel, and connected to Australia's obligations under the Antarctic Treaty, but also in the vessel's aesthetic significance visually and culturally for the Hobart and Tasmanian community.</p> <p>s47</p> <p>Members discussed the relevance of the fate of the vessel, should a permanent export permit be granted, and considered that whether or not the export presents an opportunity for the vessel to continue working is irrelevant. Members considered the Committee's consideration must be to the vessel's significance to Australia and whether its permanent export would significantly diminish the cultural heritage of Australia.</p>				

The Committee noted that there is significant material associated with the vessel, including plans, photographic and scientific records and memorabilia. However, Members considered that the *RSV Aurora Australis* holds great potential to tell the story of the work and achievements of Australia's Antarctic research program in a comprehensive manner, and that the loss of the vessel would be detrimental to the capacity to tell that Australian heritage story. The records and other material would not sufficiently ameliorate the loss of the vessel.

The Committee noted that, should an export permit not be granted, the vessel would require significant investment in order to be preserved in Australia. The Secretariat confirmed that the Australian National Maritime Museum is not interested in acquiring the vessel, although it has provided information to the Aurora Australis Foundation about what would be required as part of a business plan to preserve it. Approaches by the Aurora Australis Foundation to the Australian and Tasmanian governments, seeking support to preserve the *RSV Aurora Australis* in Australia, have been unsuccessful at this stage. The Foundation has not demonstrated the capacity to acquire, maintain and preserve the vessel. Contrary to some media reports, the proposed sale is not a recent announcement, and the vessel has been on the market and advertised for sale for 24 months.

Members discussed the pragmatic issues associated with refusing an export permit, and acknowledged that the costs of keeping the vessel in Australia are significant both for the current owner and any potential new owner that may seek to preserve the vessel.

The Committee confirmed that the *RSV Aurora Australis* is an Australian protected object under both Part 4 – Objects of applied science or technology and Part 9 – Objects of historical significance of the *Protection of Movable Cultural Heritage Regulations 2018*.

The Committee supports the recommendation of Expert Examiner s47F .

4. Recommendation:

(a) That a permit should be granted	
(b) That a permit should not be granted	✓
(c) Request an additional Significance Assessment	
(d) Further consultation/consideration required out-of-session	
(e) The object is not an Australian Protected Object and a Letter of Clearance may be issued	

5. Conditions of the recommendation: Nil

6. Feedback for the Expert Examiner/s: Nil

Proposed by: s47F

Seconded by:

Summary: The Secretariat confirmed this recommendation with the Committee following the discussion, on 28 July 2020. The Committee confirmed that the object is an Australian Protected Object. For the reasons outlined above the Committee considers that, by reason of its scientific, historical and cultural heritage value, the object is of such importance to Australia that its loss **would** significantly diminish the cultural heritage of Australia, and therefore recommends **that a permit should not be granted**.



