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Report No. : **507/6066664**

Client's Reference : **Admiralty In Rem No. : HC/ADM 20/2023**

Warrant of Arrest No. : HC/WA 6/2023

Instructions : **22nd May 2026**

Date of Report : **8th June 2026**

ECO SPARK

GENERAL CONDITION REPORT

Prepared for:

Sheriff's Office
Supreme Court
1 Supreme Court Lane
Singapore 178879

Attention: Mr. Jerrald Yeo

This is to certify that at the request of the Sheriff of the Supreme Court, Singapore, we have attended on board the steel-built, specialized floating fish farm,

ECO SPARK

SINGAPORE

whilst the vessel lay afloat, spudded and laid up (cold) at Serangoon Harbour, Singapore, on 4th June 2026 for the purpose of conducting a General Condition and Appraisal of the vessel and would report as follows:

1. GENERAL PARTICULARS

Name of vessel	: **ECO SPARK** ex WINBUILD 73
Flag/ Port of Registry	: Singapore
Owners	: Aquaculture Centre of Excellence Pte Ltd
Managers	: Aquaculture Centre of Excellence Pte Ltd
Type	: Pontoon / Specialised floating fish farm
Built	: 2022
Builder	: Vallianz Shipbuilding & Engineering
Class	: Bureau Veritas BV
Service Speed	: NA
Bollard Pull	: NA

Dimensions:

Length Overall	: 70.104 m
Beam moulded	: 21.384 m

Depth moulded	: 4.267 m
Complement	: 22 men
Tonnages:	
GT	: 4,267
Capacity:	
Diesel Oil (MGO)	: 135 m^3
Fresh Water	: 3,970 m^3
Potable FW	: 333 m^3
Sludge tank	: 193 m^3
Sewage tank	: 20 m^3

2. SURVEYOR'S NOTE

In this report the following nomenclature is used to describe the condition of items and components:

Good: Condition superior in all respects or better than average, a condition unimpaired original strength and/or efficiency, no maintenance and/ or repair is required.

Satisfactory: Condition average, deficiencies of a minor nature not requiring correction: a condition of wear and tear of such an extent as not to affect original strength and/or efficiency.

Serviceable: Condition below average, condition of wear and tear found to be of such an extent as to reduce strength and/or efficiency to a degree which does not require immediate corrective measures.

Unsatisfactory: Condition below average, condition of wear and tear found to be of such an extent as to reduce strength and/or efficiency to a degree which requires immediate corrective measures, or those carrying a period of grace as granted by regulatory bodies.

Poor: Condition deteriorated in all respects, beyond economical repair, requiring renewal or replacement.

3. SURVEY

The vessel was surveyed on 4th June 2026 whilst she lay afloat, spudded at Serangoon Harbour, Singapore. At the time of our attendance, she was in a ballast condition, cold-lay-up state with an even keel draft of 3.2 m forward and aft. The vessel was manned by a single standby crew who also rotates around 3 other similar facilities.

4. HULL EXTERNAL PLATING

Port and starboard shell plating from sheer strake to light waterline level were noted in good condition and free of contact damage. The forward was fitted with an existing ramp door was permanently lowered and secured, converted to a Dining area. The transom plating was in good condition.

Hull plating paintwork on port and starboard sides was in general good condition and all symbols, plimsoll and draft marks were well visible.

5. BELOW MAIN DECK

The following are located in the Below Main Deck spaces.

1) No. 1 Pump Room
   - Seawater Inlet Pump
   - Sludge pump,
   - Diesel Oil Supply Pump
   - GS Fire Pump

2) No. 2 Pump Room
   - Sewage Unit
   - Bilge Pump
   - Ballast Pump
   - Fresh Water Generator,
   - F.W Hydrophore Set,
   - Potable Water Hydrophore
   - l Set, UV For Potable Water,
   - Filter For F.W,
   - Filter For Potable Water
3) Fresh Water Tank
4) Potable water Tank
5) Void Tank
6) Diesel Oil Tank
7) Sludge Tank
8) Sewage Tank

All the above machinery were noted to be in satisfactory and working condition. The below main deck spaces were well coated and free of corrosion. The vessel uses freshwater in its freshwater tanks as ballast.

6. MAIN DECK

Main deck plating was generally in satisfactory condition and well coated. Only regions exposed to weather were heavily corroded and blistered. Shipside bulwark and fittings were found in satisfactory condition and well painted. We note that the main deck on both starboard and port sides were extensions of the existing main deck. The main deck fittings consist mooring double bitts, roller, air and sounding pipes etc. were found intact and in satisfactory condition. However, double bitts and towing bracket foundation welding seams were found corroded.

The main deck is equipped with the following:

- Ozone Mixing Tower
- Garden Store
- Farm Store
- Store compartment and shore power station
- Staff Galley compartment
- Galley Store area
- Accommodation
- Office (not seen on barge)
- 3 Pax Room x2 (not seen on barge)
- 2 Pax Room x 1
- Ding Area Existing ramp door
- 39 x Nursery Tanks (N3)
- Flow Through System equipment
- Effluent Drum Filter x 2
- Degassing Block
- Platform for Auto pot tray

The above compartments were mostly intact. However, several compartments such as offices, dining spaces and 3-men accommodations were not seen and understood to have been emptied out/ demobilized.

The main deck houses nursery tanks for juvenile and adult fish. Nursery tanks are equipped with inlet, drain and overflow fittings with aeration valves. Hoses and PVC piping remain intact and tanks are in relatively clean condition. Accessway between tanks were mostly raised platforms constructed out of plywood boards and steel frames.

The main deck also fitted with 3 nos. spud legs (25 m each) and installed at portside (2 nos.) & starboard (1 nos.). There is no hydraulic winch included with the spud anchors and lifting them will require assistance from barge cranes. There are a total of 10 nos. mooring bitts that have been installed. 2 nos. mooring bitts are located at the main deck (fwd) for towing purposes.

7. MEZZANINE DECK

This floor is an added platform above the main deck plating and houses the fingerling nursery tanks. Nursery tanks are equipped with inlet, drain and overflow fittings with aeration valves. Hoses and PVC piping remain intact and tanks are in relatively clean condition. Accessway between tanks were mostly raised platforms constructed out of plywood boards and steel frames. The floor also houses the filtration system in the aft area. Filtration sections and water passageways were in dry condition and encrusted with marine growth.

The mezzanine deck is fitted with the following:

- Oxygen Generator Space
- Ozone Generator Room
- Drum Filter Space
- Ozone Mixing Tank
- Air Bubbling tank
- Heat Water Recirculate Tank Unit x 1
- No. 3 pump room
- Accommodation
- Flow Through System equipment
- Drum filter x 4 (nets were removed for cleaning)
- Ozone Tower x 2
- Ozone Generator x 2

- Oxygen Generator x 2
- RAS equipment for Pro Nursery for 400m3 with water changed 60mins/time
- Drum Filter 26 micron x 2 units
- Biological Filter x 2 units
- Protein Skimmer x 2 units
- UV Sterilizer x 2 units
- Sand filter x 2 units
- Air Blower (4hp) x 2 units (volume consider)
- Recirculating Pumps x 2
- BIO Filter Tank x 2 (Fiberglass Tank)
- BIO Contact Oxi-dation Tank x 4 (Fiberglass Tank)
- Post Nursery Tank (N2) x 27 nos.

8. BROODSTOCK DECK

The Broodstock deck is situated on the same level as the mezzanine deck. It is an added platform above the main deck (fwd) and houses the 4 broodstock tanks that contains the large adult, egg-laying fish. The main deck plating and pipe U-bolts were heavily rusted.

The humidity and water temperature shall be maintained constant throughout and stringent biosecurity is required. There shall be private stairway to this deck to bridge tank for top access to the four brood-stock tanks.

In addition, the same deck also houses the hatchery and live feed rooms.

- Live feed Space 66m3
- 8 x Rotifer Tanks (R1-8) each of 3m3
- 6 x Artemia Tanks (A1-6) each of 1.0m3
- 12 x LarviCulture (Hatchery HA / HB / HC / HD) Tanks - each 6m3

9. UPPER DECK

The upper deck is an added steel platform above the mezzanine deck and is equipped with the following:

- Rainwater collection Tank (70m3)
- ECR room
- Generator Room
- 2 Men room
- Aquatic Health Room
- Feed Storage (73m2)
- Pre- Nursery tank 12m3 x 28 (Fiberglass Tank)
- Electric chain hoist 2Tx 2 nos.

The upper deck is also generally covered by the added roof that covers the entire main deck. This deck houses the generator room where 2 Cummins aux. engines are located in a sound and heat insulated room. There is also a main control room that houses the main switchboards and starter panels for all machinery onboard. We note that no machinery was in operation at the time of our survey. The deck plating and plywood board catwalk access between tanks were in good condition.

10. BRIDGE DECK

The bridge deck is a added steel platform located above the upper deck and only spans about 40 m in length. The deck is generally used for guest handling and alfresco dining. The deck plating was noted to have paint blistering and slight corrosion. Half of the deck was covered with faux carpet grass for decorative purposes.

The roof was noted to be intact and no signs of leakage was noted. It comprises of 384 pieces of solar panels (this was not sighted) and polycarbonate boards that allow natural lighting into the farm space.

11. LSA & FFA

Based on the available data, we understand that portable fire extinguishers should be available onboard with the following quantities:

1. Generator area- 2x5kg / Powder
2. Oxygen Generator Room- 1x5kg / Powder
3. Pump Room Nos. 1, 2 & 3- 3x5kg / Powder
4. Accommodation Spaces- 3x5kg / Powder
5. Accommodation Spaces- 3x5kg / CO2
6. Crew Galley- 2x5kg / CO2
7. Crew Galley- 2xFire Blanket
8. Aquatic Health Room- 2x5kg / CO2
9. 2 Men Cabin- (Outside x 3) 4x5kg / CO2
10. ECR Room (Internal)- 1x5kg / CO2
11. Kitchen- 3x5kg / CO2
12. Kitchen- 2x5kg / Powder
13. Kitchen- 2xFire Blanket

The GS Pump (cap: 55 m^3/ hr) is located in the No. 1 pump room, below the main deck and 8 nos. hose reels (25 mm x 30 m) are located at forward & stern for each deck. However, the following were noted as follows:

- Most fire extinguishers were noted to be in a corroded state.
- There were several missing extinguishers in accommodation and galley and kitchen spaces as these were either abandoned or demobilised spaces.
- Fire hoses were in good condition and unused.
- There was no record of LSA and FFA inventory onboard.
- There was no fire escape plan displayed for reference.
- There were no lifebuoys around the main deck.
- Fire hydrant valves on the main deck were found corroded and seized.

12. MACHINERY SPACE

Power Plant:

2 nos. x CUMMINS Model OSNT-G1 turbocharged, 4-stroke diesel, high-speed engines with a maximum output of 325 kW at 1,500 rpm directly coupled to STAMFORD model HC 1444ES1 synchronous generators rated at 250 kVA, 400V, 60Hz, 3-phase, PF-0.8, 1,500 rpm.

At the time of our survey, the No. 1 and No. 2 auxiliary engines running hours had not been presented to us for our records.

There were no records of major overhauls or routine maintenance available for our review on board. Additionally, diesel oil bunker BDNs and oil analysis records were not available onboard for our review.

We noted that No. 1 auxiliary engine had not been started for about 1 year as it was stated to require servicing as it had starting issues.

During our survey, both engine were not operating. It was stated that the No. 2 auxiliary engine would be started momentarily at every 1 week just to ensure its operability.

Hydrophore System:

1 no. potable water system equipped with two nos. freshwater pumps and 1 no. hydrophore tank located in the pump room and all appeared to be in satisfactory condition.

1 no. domestic water supply system equipped with two nos. freshwater pumps and 1 no. hydrophore tank located in the pump room and all appeared to be in satisfactory condition.

Sewage Plant:

1 no. 50 pax. capacity sewage treatment plant with a capacity and located in the below main deck.

Main & Auxiliary Cooling Pumps:

Auxiliary system pumps including, seawater, freshwater, ballast, bilge, fire G.S., hot-water recirculating pumps were all noted in satisfactory condition with no observable signs of leakages from mechanical seals.

Main Control Room:

Main control room has the following fittings:

- Auxiliary systems 440V switchboard starter panels.
- Main switchboards for auxiliary engines including auto-battery charging and auto-synchronising panel.
- Air conditioning blower unit.

All of the above equipment were noted to be in satisfactory condition.

Machinery Space

The machinery space cleanliness is satisfactory.

13. CONSUMPTION

Vessel's aux. engine fuel and lubricating oil consumption data was not available onboard for our review.

14. SURVEY STATUS AND NOTATIONS

The vessel is classed with **BV** rules with the following notation:

I+ Hull Special Service Floating Fish Farm (SSFFF),

15. TRADING CERTIFICATES

All trading certificates were neither presented nor sighted.

16. GENERAL COMMENTS

The vessel was found in good condition except for the following:

1. Towing brackets and double bitts on the main deck forward appeared corroded in way of foundation welding seams.
2. Main deck plating accessway around the barge were found heavily rusted.
3. Spud anchors (3.nos) designed without any hydraulic means of lifting and will require external crane assistance.

4. No. 1 aux. engine requires further servicing as it has not been started for about 1-year.
5. Both Nos. 1 and 2 auxiliary engine turbochargers and exhaust manifold piping were found without proper insulation.
6. Several ventilation heads found corroded.
7. 2 nos. air-conditioning compressor units for farm office and staff accommodation were completely wasted and damaged.
8. 1 nos. ventilation flap for farm office was completely corroded.
9. Several lighting fixtures found rusted and missing.
10. Diesel oil service tank quick-closing valve in generator room found without remote activation wire.
11. Several fire extinguishers found in corroded state.
12. Vessel's statutory and classification related certificates/ documents have not been sighted.

17. PHOTOGRAPHS

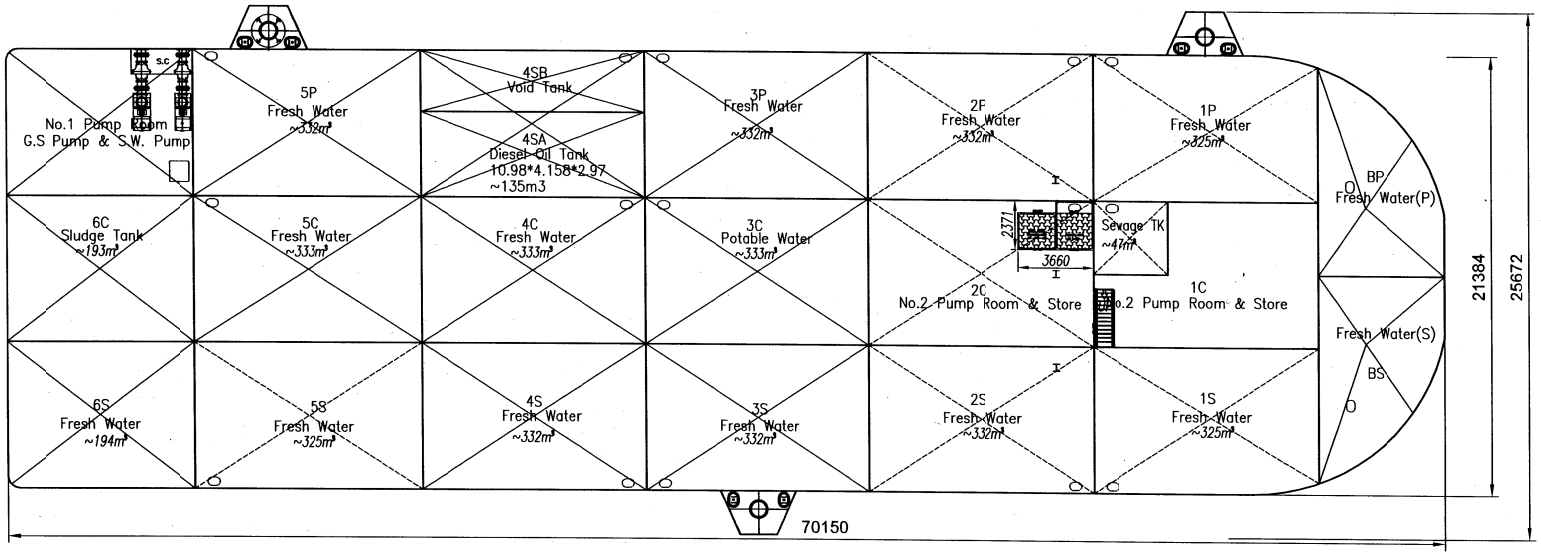
Photographs taken in the form of digital images, recorded during our attendance, are attached to and form part of this report. The undersigned confirms that the images reproduced here are a fair and reasonable representation of our findings at the time of our attendance.

MALIM ARAFFIZ

Divisional Director

18. ENCLOSURES

General Arrangement	X
Technical Specification	X
Photographs	X
SEAWISE terms and conditions	X



BELOW MAIN DECK TANK PLAN VIEW

2P	Fresh Water Tank (P)	332	4PA	Diesel Oil Tank (P)	135	5S	Fresh Water Tank (S)	332			
1S	Fresh Water Tank (S)	325	3S	Fresh Water Tank (S)	332	5C	Air Bubbling Tank	333			
1C	Pump Room & Store		3C	Potable Water Tank (C)	333	5P	Fresh Water Tank (P)	332			
1P	Fresh Water Tank (P)	325	3P	Fresh Water Tank (P)	332	4S	Fresh Water Tank (S)	332	6S	Fresh Water Tank (S)	194
BS	Fresh Water (S)	68	2S	Fresh Water Tank (S)	332	4C	Fresh Water Tank (C)	333	6C	Sludge Tank (C)	193
BP	Fresh Water (P)	68	2C	Pump Room & Store	333	4PB	Viod Tank (S)	197	6P	Pump Room	194
No.	**Tank Name**	Cap(m³)	**No.**	**Tank Name**	Cap(m³)	**No.**	**Tank Name**	Cap(m³)	**No.**	**Tank Name**	Cap(m³)

PATENTED

REV	DATE	DESCRIPTION	DWN	CHKD	APVD

REVISIONS

PROJECT:
LIFT - DOCK - HATCHERY TO KITCHEN ECO-SPARK™

OWNER: ACE

EPCIC CONTRACTOR: AME2

ENGG.CONTRACTOR: LIFT DOC® Beyond Docking

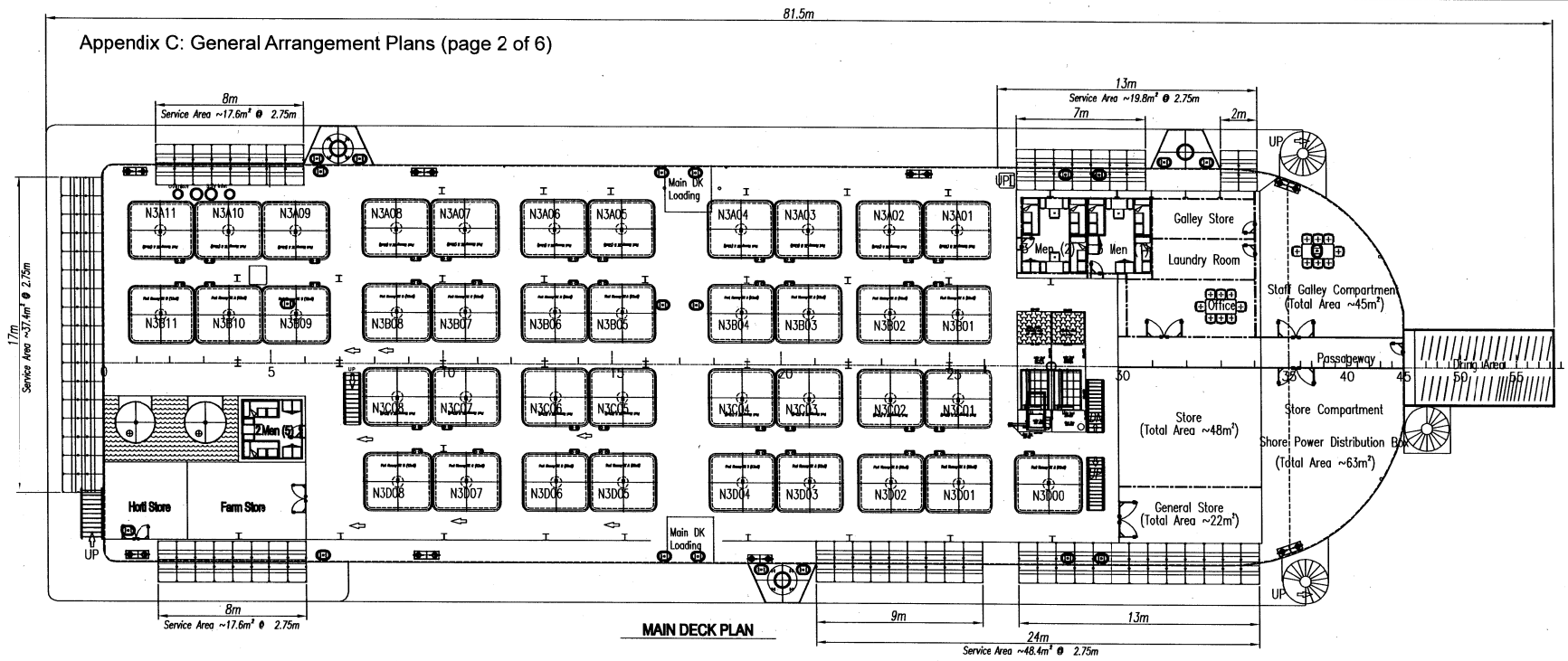
LD-H2K GENERAL_ARRANGEMENT

Drawing No. LD-H2K-G01

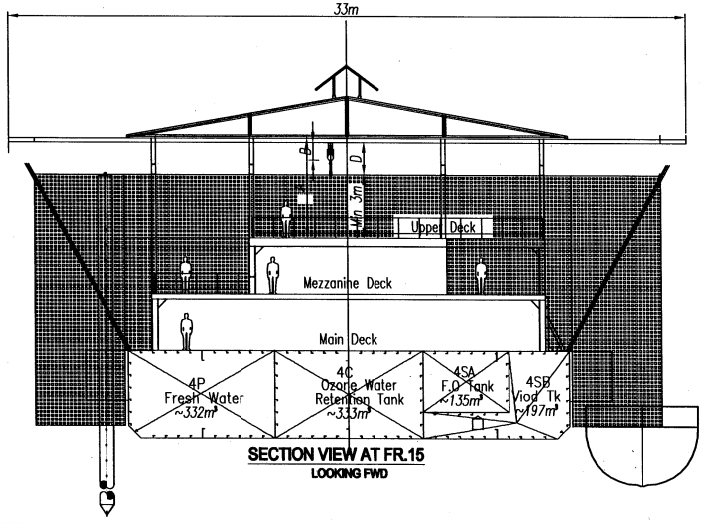
Sheet No.	Scale	Format	Rev.
1 OF 6	1 : 250	A3	0

SIZE: A3 (400X280), UPDATED ON 12/23/2020, PRINTED ON 12/29/2020 18:53:22 PM

Appendix C: General Arrangement Plans (page 2 of 6)



LENGTH O.A. (MLD HULL)	70.104 M
BREADTH MLD.	21.384 M
DEPTH MLD.	4.257 M
DRAFT (OPERATION)	3.757 M



PATENTED

REV	DATE	DESCRIPTION	DWN	CHKD	APVD

REVISIONS

PROJECT:
LIFT - DOCK - HATCHERY TO KITCHEN
ECO-SPARK(TM)

OWNER: ACE

EPCIC CONTRACTOR: AME2

ENGG.CONTRACTOR: LIFT DOC® Beyond Docking

LD-H2K GENERAL_ARRANGEMENT

Drawing No. LD-H2K-G01

Sheet No.	Scale	Format	Rev.
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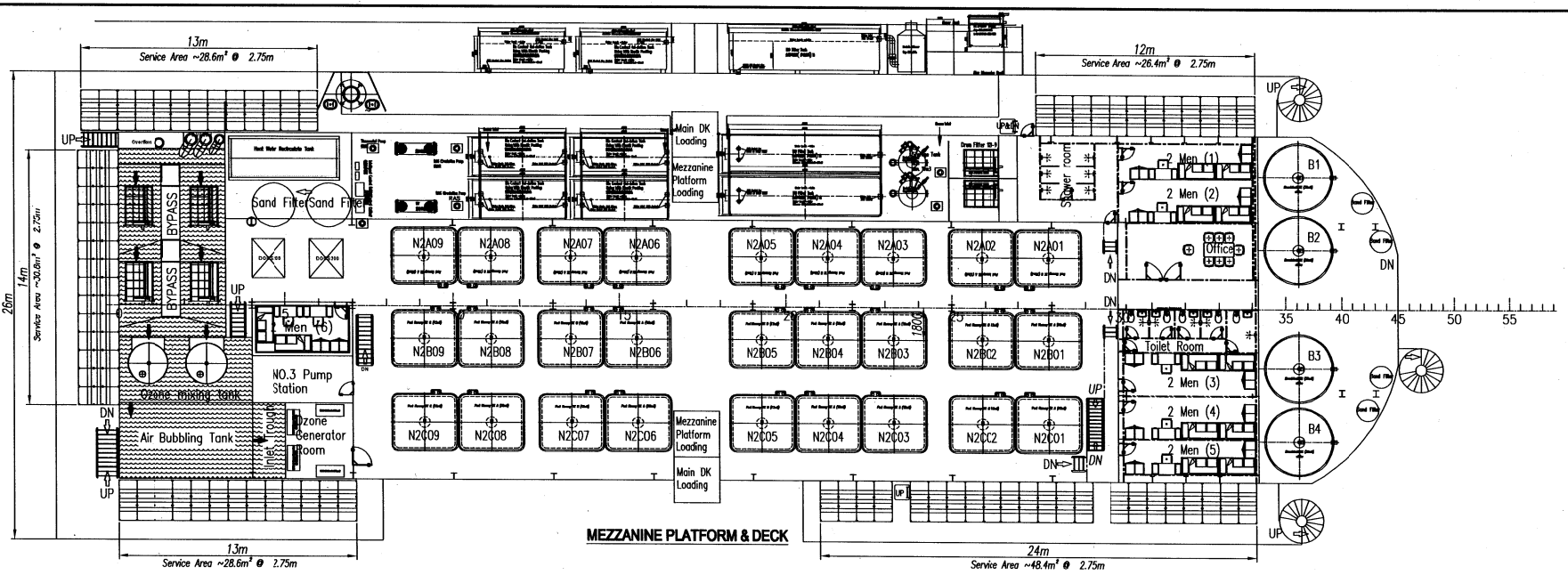
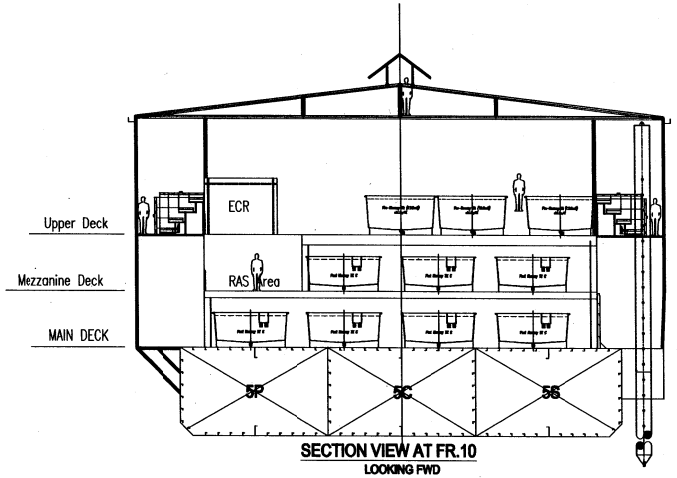
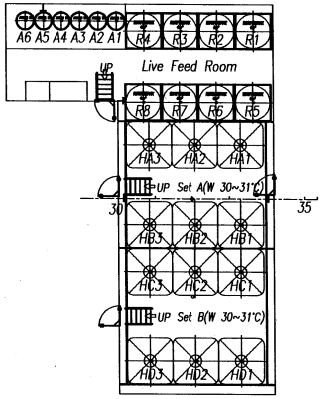


MEZZANINE PLATFORM & DECK



SECTION VIEW AT FR.10
LOOKING FWD



BROODSTOCK DECK
8270 A.BL

Appendix C: General Arrangement Plans (page 3 of 6)

REV	DATE	DESCRIPTION	DWN	CHKD	APVD

REVISIONS

PROJECT:
LIFT - DOCK - HATCHERY TO KITCHEN
ECO-SPARK™

OWNER: ACE

EPCIC CONTRACTOR: AME2

ENGG.CONTRACTOR: LIFT DOC® Beyond Docking

LD-H2K GENERAL_ARRANGEMENT

Drawing No. LD-H2K-G01

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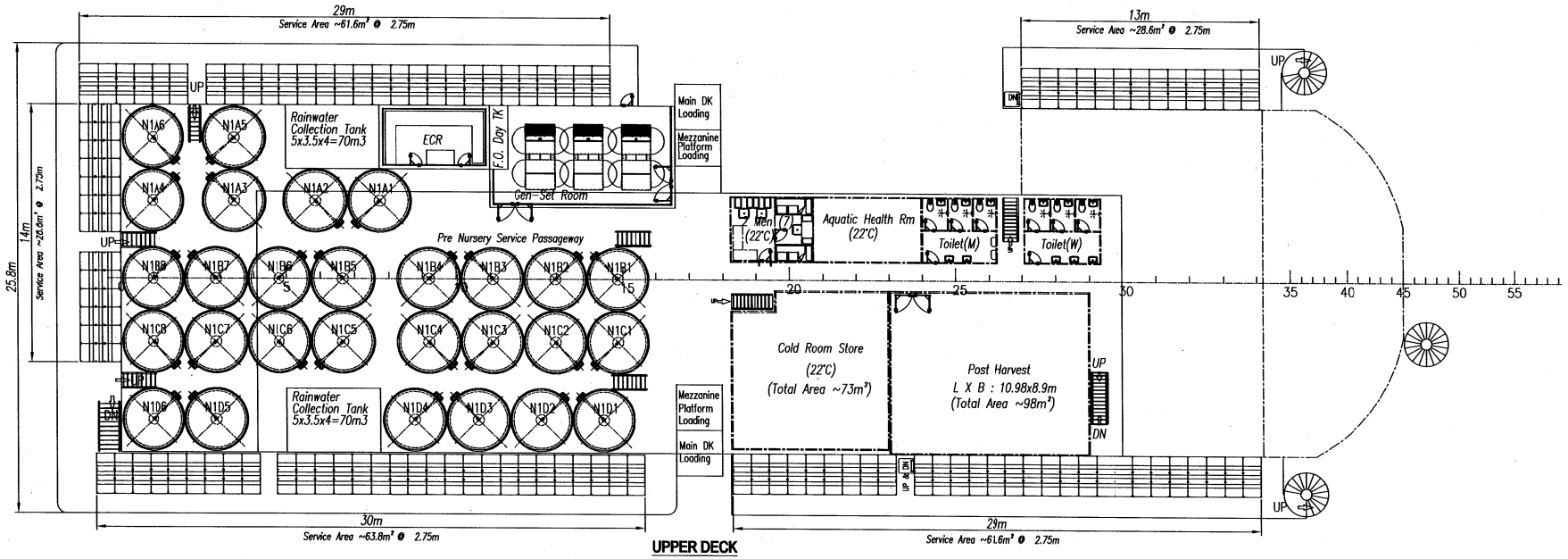

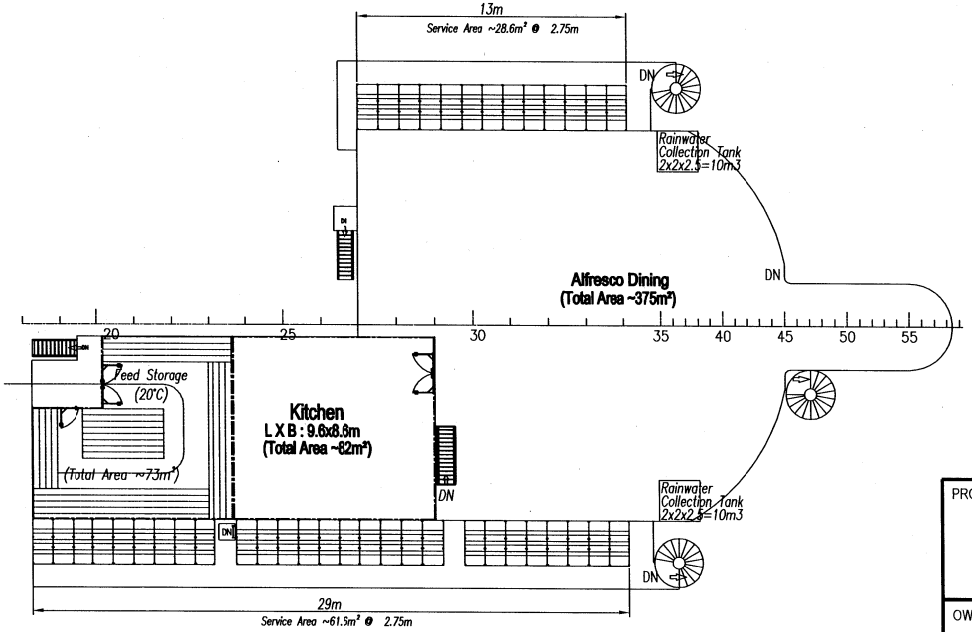

Appendix C: General Arrangement Plans (page 4 of 6)

REV	DATE	DESCRIPTION	DWN	CHKD	APVD

REVISIONS

PROJECT:

LIFT - DOCK - HATCHERY TO KITCHEN ECO-SPARK™

OWNER: ACE

EPCIC CONTRACTOR: AME2

ENGG.CONTRACTOR: LIFT DOC® Beyond Docking

LD-H2K GENERAL_ARRANGEMENT

Drawing No. LD-H2K-G01

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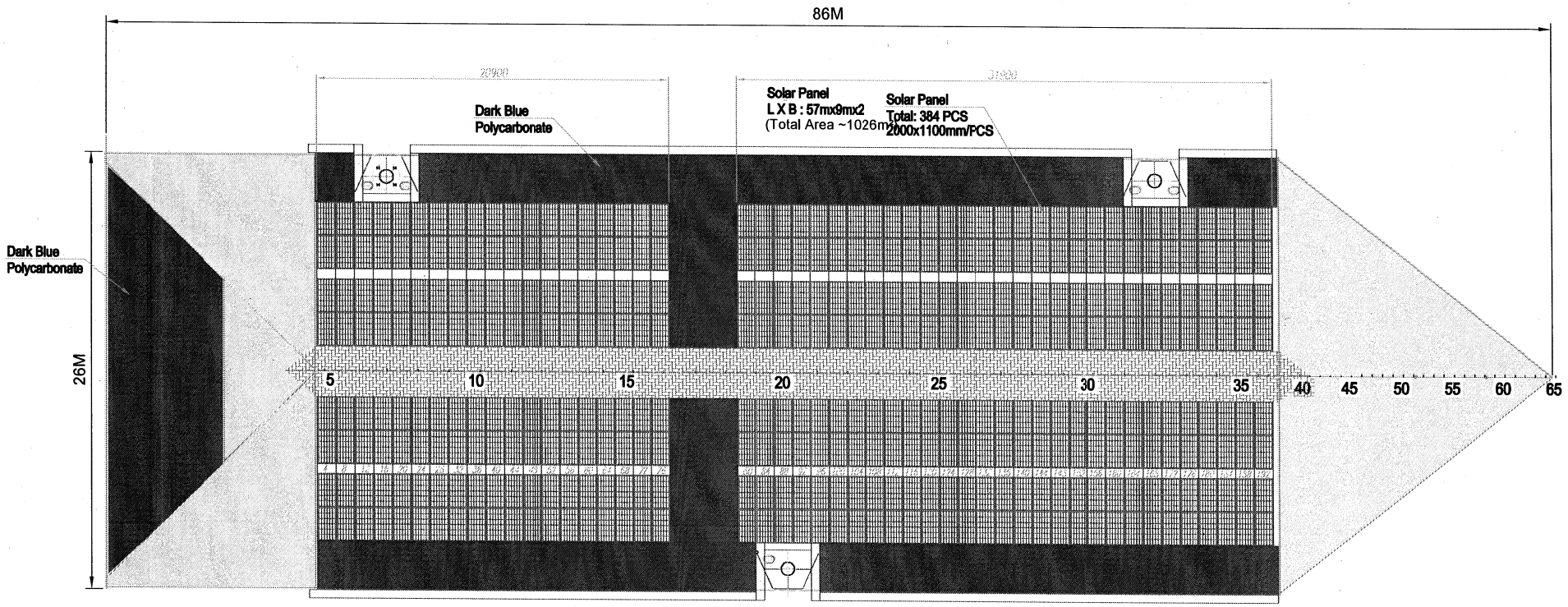

ROOF TOP PLAN

Appendix C: General Arrangement Plans (page 5 of 6)

REV	DATE	DESCRIPTION	DWN	CHKD	APVD

REVISIONS

PROJECT:

LIFT - DOCK - HATCHERY TO KITCHEN
ECO-SPARK™

OWNER: ACE

EPCIC CONTRACTOR: AME2

ENGG.CONTRACTOR: LIFT DOC® Beyond Docking

LD-H2K
GENERAL_ARRANGEMENT

Drawing No. LD-H2K-G01

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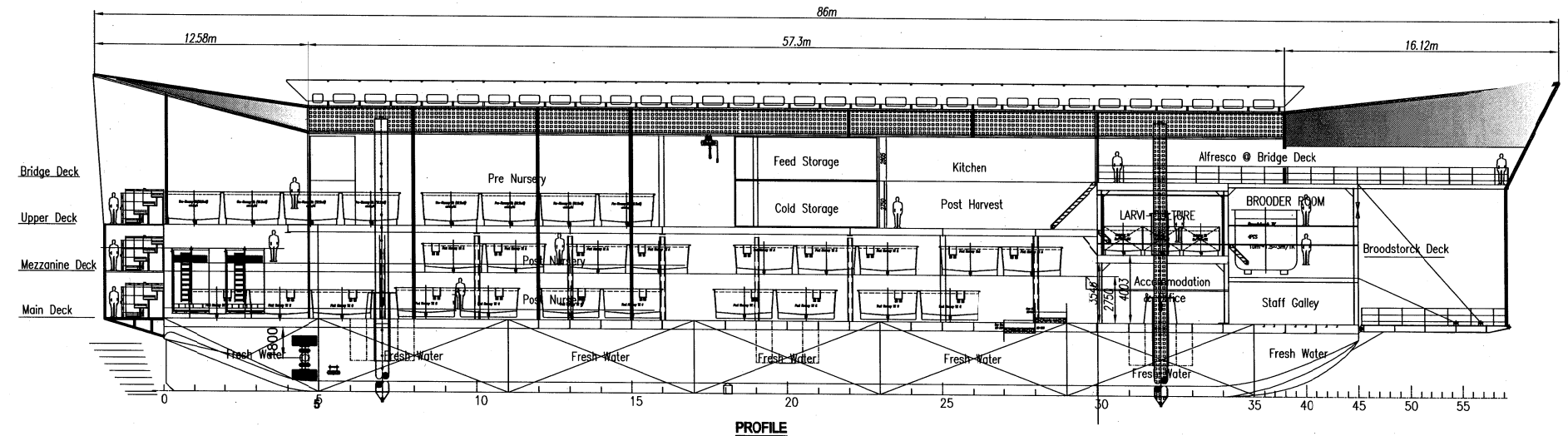

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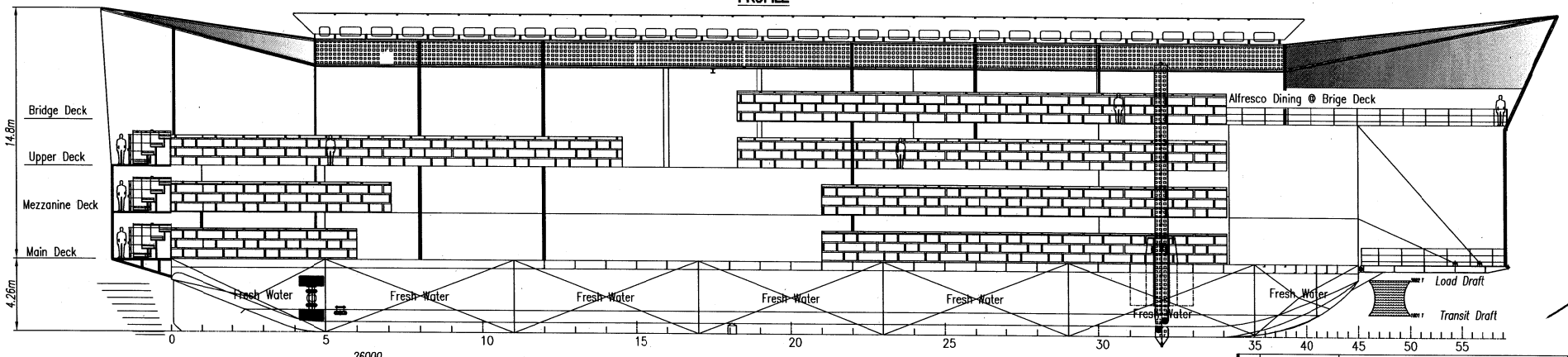

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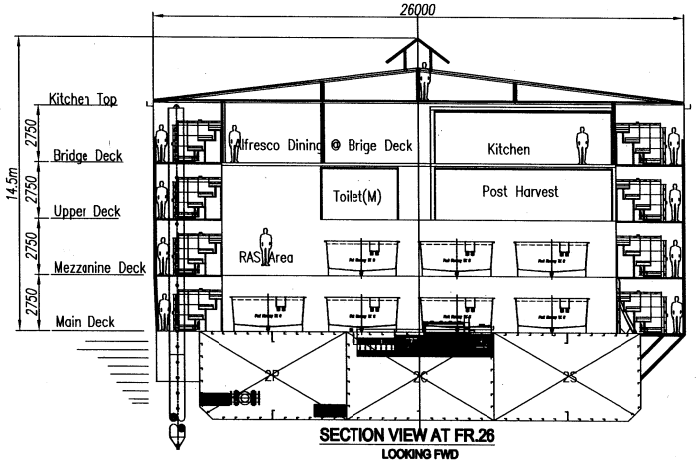


SECTION VIEW AT FR.26
LOOKING FWD

PATENTED

Appendix C: General Arrangement Plans (page 6 of 6)

REV	DATE	DESCRIPTION	DWN	CHKD	APVD

REVISIONS

PROJECT:

LIFT - DOCK - HATCHERY TO KITCHEN ECO-SPARK™

OWNER: ACE

EPCIC CONTRACTOR: AME2

ENGG.CONTRACTOR: LIFT DOC® Beyond Docking

LD-H2K GENERAL_ARRANGEMENT

Drawing No.	Sheet No.	Scale	Format	Rev.
LD-H2K-G01	6 OF 6	1 : 250	A3	0

SIZE: A3 (400X280), UPDATED ON 12/23/2020, PRINTED ON 12/29/2020 18:59:21 PM

APPENDIX 1 – TECHNICAL SPECIFICATIONS

LIFT-DOC® HATCHERY TO KITCHEN (LD-H2K)

ECO-SPARK®

86MX26M

BV Project Reference Number is 39335H

OWNER	:	**AQUACULTURE CENTRE OF EXCELLENCE PTE LTD**
CONVERSION YARD	:	**VALLIANZ SHIPYARD**
DESIGNER	:	**LIFT-DOCK PTE LTD**
TECH SPEC NO.	:	**REV H dated 29 December 2020**

CONTENTS

SECTION 11 REQUEST FOR QUOTATION (SCOPE FOR QUOTATION)

SECTION 12 OWNER FURNISHED EQUIPMENT (OFE) LIST

SECTION I - GENERAL

1.0 **Intent & Definition**

This technical specification together with General Arrangement Plan Drawing No. LD-H2K-G01 TO LD-H2K-G06 is intended to describe the specification of LIFT-DOC® HATCHERY TO KITCHEN (LD-H2K) Floating Fish Farm. This Lift-dock components including Hull Platform from a converted barge and Three-spuds come with specially-designed Spud-casing with three cylindrical round legs (the Spud).

We term this LIFT-DOC® HATCHERY TO KITCHEN (LD-H2K), the ECO-SPARK®. She shall be classed and be built under the survey of the Classification Society - Bureau Veritas and in accordance with the notation I+ Hull Special Service Floating Fish Farm (SSFFF), for operation in Coastal Area and will comply with the regulations of the Singapore Food Agency where necessary and on site installation Foreshore and Marine Development Projects (COMET) approval by ACE.

1.1 Principal Particulars

Length overall : 86.00m approx.
Beam molded : 26.00m approx.
Depth molded : 4.26m approx.
Scantling draft : 3.366m
Main Deck Strength : 10 MT/m^2
Complement : 22 Men

Tank capacity (approx.): Final Tank capacity have to base on Class approved drawings.
Refer to the Drawing No. – LD-H2K-G01 1 of 6 Sheets
Fresh Water Tank (14) :68 m^3 x2, 325m^3 x 2; 332m^3 x7; 333 m^3 x2,194 m^3 x1
Potable Tank (1) :333m^3 x 1

Void Tank (1) : 197 m^3
Diesel Oil Tank (1) : 135m^3
Sludge Tank (1) : 193 m^3
Sewage Tank (1) : 20 m^3

1.2 General Description

ECO-SPARK® will be converted from a specialised barge to be supplied by the yard and are all welded steel construction. The accommodation to be located forward on the main deck and above - mezzanine deck. The main hull will be following the existing hull to be divided by six (6) transverse WT bulkheads into the following compartments: Note: all the tank arrangements with BV Class approved for the General Arrangement drawings. The BV Project Reference Number is 39335H

1) Fresh Water Tank
2) Potable Tank
3) Void Tank
4) Diesel Oil Tank
5) Sludge Tank
6) Sewage Tank
7) Pump Room
8) Ozone Mixing Tank
9) Store and Pump Room
10) Farming Tanks
    1. 39 x Post Nursery Tanks (N3) on Main Deck – each 13m3
    2. 27 x Post-Nursery Tanks (N2) on Mezzanine Deck – each 13m3
    3. 4 x Brood-stock Tanks (B1-4) on Brood-stock Deck – each 30m3
    4. 12 x LarviCulture (Hatchery – HA / HB / HC / HD) Tanks on Brood-stock Deck – each 6m3
    5. 8 x Rotifer Tanks (R1-8) – each of 3m3
    6. 6 x Artemia Tanks (A1-6) each of 1.0m3
    7. 28 x Pre-Nursery Tanks (N1A / N1B / N1C / N1D) – each of 12.75m3
    8. 12 x Bio-Security Foot wash (each level 4units) – 600mmL x 400mmB x 30mmH

The following shall be provided below main deck: (Reference to class approved GA drawings)

1) No,1 Pump Room (Seawater Inlet Pump, Sludge pump, Diesel Oil Supply Pump, GS Fire Pump)
2) NO.2 Pump Room (Sewage Unit, Bilge Pump, Ballast Pump, Fresh Marker Generator, F.W **Hydrophore** Set, Potable Water **Hydrophore** I Set, UV For Potable Water, Filter For F.W, Filter For Potable Water)

3) Fresh Water Tank
4) Potable water Tank
5) Void Tank
6) Diesel Oil Tank
7) Sludge Tank
8) Sewage Tank

The following shall be provided on main deck: (Reference to class approved GA drawings)

1) Ozone Mixing Tower
2) Garden Store
3) Farm Store
4) Store compartment and shore power station
5) Staff Galley Room
6) Galley Store
7) Accommodation (66.6m^2)
    - Office
    - 3 Pax Room x2
    - 2 Pax Room x 1
8) Ding Area – Existing ramp door
9) 39 x Nursery Tanks (N3)
10) Flow Through System equipment
    - Effluent Drum Filter x 2
    - Degassing Block (3.6x1.7x0.3M)

11) Platform for Auto pot tray (68m x 3.4m x 1.8m(H)

<u>The following shall be provided on Mezzanine Deck: (Reference to GA drawings) –</u>

1) Oxygen Generator Space
2) Ozone Generator Room
3) Drum Filter Space
4) Ozone Mixing Tank (7.32x3.564x4.1)
5) Air Bubbling tank (7.32x4.15x1.5)
6) Heat Water Recirculate Tank Unit x 1 (Existing tank on the barge need to relocate.)
7) No.3 pump room
8) Accommodation (Base On GA)
9) Flow Through System equipment
   - Drum filter x 4
   - Ozone Tower x 2
   - Ozone Generator x 2
   - Oxygen Generator x 2
   - Root Blower x 2
10) RAS equipment for Pro Nursery for 400m^3 with water changed 60mins/time
   - Drum Filter 26 micron x 2 units
   - Biological Filter x 2 units
   - Protein Skimmer x 2 units
   - UV Sterilizer x 2 units
   - Sand filter x 2 units ;
   - Air Blower (4hp) x 2 units (volume consider)
   - Recirculating Pumps x 2
   - BIO Filter Tank x 2 (Fiberglass Tank)
   - BIO Contact Oxi-dation Tank x 4 (Fiberglass Tank)
11) Post Nursery Tank (N2) x 27 – each of 12.75m3
12) Brood stock 4 x Tank The following shall be provided on Mezzanine Deck: (Reference to GA drawings)

The humidity and water temperature shall be maintained constant throughout and stringent bio-security is required. There shall be private stairway to this deck to bridge tank for top access to the four brood-stock tanks.

NOTE:

Brood-stock Tanks (B1-4) – each 30m3

Sand Filter For Brood stock x 2

13) Auto pot tray and platform 78m x 3.4m x 1.8m(H)

The following shall be provided Brood-stock (EL 8270mm): (Reference to GA drawings)

1) Live feed Space 66m3
   - 8 x Rotifer Tanks (R1-8) – each of 3m3
   - 6 x Artemia Tanks (A1-6) each of 1.0m3

2) 12 x LarviCulture (Hatchery – HA / HB / HC / HD) Tanks on Brood-stock Deck – each 6m3

The following shall be provided on Upper deck: (Reference to GA drawings) –

1 Rainwater collection Tank (70m3)
2 ECR room
3 Generator Room
4 2 Men room
5 Aquatic Health Room
6 Feed Storage (73m^2)
7 Toilet (M) & (W)
8 Pre- Nursery tank 12m^3 x 28 (Fiberglass Tank)
9 Electric chain hoist 2Tx 2
10 Platform for Auto pot tray 126m x 3.4m x 1.8m(H)

The following shall be provided on Bridge deck: (Reference to GA drawings)

1) Alfresco @ Bridge Deck Area 375m^2
2) Kitchen 98m2

1.3 Classification

The ECO-SPARK® shall be constructed, machinery installed and spare gear provided in accordance with the latest Rules for Building & Classing of steel ECO-SPARK® of BV. with site supervision by BV Surveyor. (hereinafter referred to as classification). Only Hull will be classed under BV classification

1.4 Regulations

The ECO-SPARK® is to comply with following (where applicable):

a) International Load line Convention 1966
b) Stability as per Class requirement
c) International Tonnage Admeasurement Convention 1969
d) Maritime Laws and Regulations of the Singapore local authority (MPA & BCA).

1.5 Certificates

The following certificates shall be supplied to Owners at the time delivery of the ECO-SPARK®:

1) Asbestos Free certificate for yard supplied items
2) Classification Certificates Supplied by Owner
3) Tonnage Certification, 1969 (Class info only) Supplied by Owner
4) Loadline Certificate (Class info only) supplied by owner
5) Other Certificates required by Indonesia / Batam Authority by Yard
6) Other Certificate required by classification or Singapore Local authority (MPA & BCA), supplied by owner

1.6 Material & Workmanship

All material workmanship shall be of the good quality and marine practice. All steel plates, section, hull forging and castings shall meet classification's requirements and supplied with test certificate where required by classification. All visible steel plates shall be smooth or straight where applicable. Shipyard construction standard shall be adopted for design and construction of hull, machinery and equipment unless otherwise specially described in the specification.

1.7 Welding

ECO-SPARK® shall be of welded construction, in accordance with contract plans, specifications and classification. Automatic welding shall be used as far as possible. Welding shall be in accordance with classification requirements. All steel used shall be of good welding quality, free from laminations or other harmful defects and shall be Class approved. Electrodes shall be

selected from classification approved lists. Welding schedules shall meet Classification and Owner requirement/standard. High standards up-to-date welding practice and procedures shall be applied; structure should be pre-fabricated in assemblies and sub-assemblies to give the maximum possible amount of down hand welding. Stagger weld instead of full weld is allow for hull, structure and decks subject to classifications requirements

1.9 Inspection/Supervision

Throughout the construction period and prior delivery, the Bureau Veritas (BV) surveyor and Owners' representative shall be given free access to the builders' yard during normal working hours for supervision, inspection and testing. Shipyard shall provide permanent cleanliness during construction period. Shipyard shall provide office for Owner Representatives. All cost of BV shall be borne by Owner.

1.10 Tests

Prior to delivery, the hull, all machinery, electrical, piping, and deck fittings, domestic equipment etc. shall be thoroughly tested in the presence of Owner and/or its representative or the BV classification's attending surveyor.

1.11 Light Ship Survey

Upon completion of the ECO-SPARK®, a light ship survey shall be carried out under supervision of the Builder, witnessed by Owner and BV Class or Regulatory Authority, to ascertain the light ship weight .

1.12 Basin Trial

Upon the completion of the ECO-SPARK®, she shall be berth at wharfage with minimum water depth of 5.0m at zero tide for ballast testing and testing of the sea-water inlet pumps and all tanks and cultivation tanks under estrangement guideline and test commissioning methodology.

The following trials shall be carried out:

1) All tanks
2) All piping systems are to be fully tested, including the checking of valves name plates
3) Electrical power plants together with all lightings
4) Ventilation, refrigeration machinery
5) All deck and tanks machineries.
6) All pumps, etc.

All systems and equipment shall be subjected to function check and tested in accordance with manufacturer's requirement before ECO-SPARK®'s delivery. Yard will assist with commissioning for Owner's Supplied equipment, responsibility of the Owner' supplied equipment by Owner

Builder to assist the following: -

- All generators shall be loaded with connection to main switchboard according to Manufacturer's requirement (Note: no load test shall be carried out by Builder)
- Battery system
- Influent / effluent Drum Filters
- Oxygen / Ozonation generator with control system
- Solar Panel & Invertor system
- CCTV, PA & monitor System
- IOTs and farming management system
- Lighting system (Yard's Scope of Work)
- Others' aux. System

1.13 Delivery

Up to delivery stage, all tanks, compartments, accommodation and others apace area etc., shall be painted, cleaned and free of all damage and dirt.

1.14 Drawings

Any drawings under the responsibility of Owner shall be submitted with three (3) sets of as-built construction/engineering drawing in hard copy and CAD DWG format on CD and two (2) sets of the following drawings as approved and noted by BV classification shall be supplied to Builder.

Owner shall provide drawings as listed in Appendix 2. Below are some of the drawings to be provided by Owner

1) Outfitting Detail related to foundations
2) Others which deem to be required for construction
3) Small outfitting modification and seating details should be settled on site without drawings under builder scope but with owner instruction and within the original scope.

All the construction/schematic drawings shall be sent to Builder after BV's approval.

1.16 Manuals of Machinery & Equipment

As all Farming Equipment and Machineries will be Owner Furnished Equipment (OFE) and in the event Builder is able to supply the marine equipment with competitive price to Owner – this can be agreed and if so, three (3) sets of manuals to be provided in the English language.

1.17 Practice

Any minor items of steel/piping etc., of equipment, machineries or outfitting's which advertently are not expressly called for in the specification or drawing but necessary for the fit for purpose of the ECO-SPARK® shall be furnished and installed as the case may be without any cost to the Owner as long as the steelwork and weight does not increase from the quantity as agreed. For avoidance of doubt the above is subject to mutual agreement on the cost and time impact

1.18 Owner Furnished Equipment (OFE)

Equipment as specific in Section 12-OFE list to be supplied and delivered by the Owner at the Builder's facilities. The Builder is to allow storage space for Owner Furnished Equipment without additional cost to Owner. Builder shall ensure OFE to be stored as per vendor requirements and protected from weather and damage.

SECTION 2 – STRUCTURE

General

The Barge delivery to builder yard will be immediately upslipped to slipway to carry out the steel hull, side shell and keel plates and all the tank internal inspection. The sweep blasting and one coat top-coat painting will be applied after repaired and modified if any required by Owner / Class surveyor. All worn-out Zinc anode to be replaced at external hull and internal sea water tanks according to Owner zinc anode arrangement drawings.

Noted: Bolted type Zinc anode – External Hull

Outfitting (Exposed Area)

All the external hatches, door, air-vent, ladders, flanges, lighting and equipment seating etc. shall be of stainless-steel bolt and nut. worn-out main deck man-holes to be open – air-free to inspect all tanks. It is suggested worn out man-holes be replaced with new and worn-out studs to be replaced with stainless steel 316L and gaskets renewed.

Lashing Lugs

Total 90 nos. of 1.0 to 3.0 Ton SWL lug shall be arranged on P & S of Main deck, Mezzanine deck, pump room, generator room, Upper deck and below Roof structure. Final Location to be confirmed by Owner

Fender

Worn out and additional new Tyre Fenders required to be supplied and installed on the surrounding barge only at the embarkation and disembarkation point for loading and unloading.

Modification Works

All required modification works are listed in Section 2.

SECTION 2 STRUCTURAL SCOPE OF WORK

2.1 Main deck and Tanks

2.1.1 All existing tank to be high pressure water washdown for inspection & repairs

2.1.2 Internal tank which convert to the compartment to be blasting 2.0 and painted with 2 coats.

2.1.3 Opening for outlet drum filter area to be following drawings.

2.1.4 Ramp door – Fixed in fully opening position (180°). Ramp door frames to modify.

2.1.5 Remove Winch and compartment or relocate according to approved GA.

2.1.6 Towing brackets (2 units) to be removed

~~2.1.7 Tank vertical ladder to the tank to be renew or repair~~

2.1.8 Existing Hull bottom plate and side shell plate renew 2 location.

2.1.9 Remove or modify all Fuel Oil lines on main deck and patch up main deck plate. Existing pipes may use for water ballast line according to class approved drawings

2.1.10 One (1) Moonpool to be make from main deck to bottom plate open to the sea (as per GA)

2.1.11 Bulkheads

2.1.11.1 New Transverse Bulkhead to be added. Final location and Quantity to be following approved drawings issue by owners.

Fr. 0, -5346 OFF CL to -1782 OFF CL (3.56m) width, height: From Main deck to Mezzanine Deck+ 1350(8350 A.BL)

Fr. 4, -5346 OFF CL to -1782 OFF CL (3.56m) width, height: From Main deck to Mezzanine Deck+ 1350(8350 A.BL)

2.1.11.2 New Longitudinal Bulkhead. Final location and Quantity to be following approved drawings issue by owners.

Fr. 0 to Fr. 4, -5346 OFF CL, height: From Main deck to Mezzanine Deck+ 1350(8350 A.BL);

Fr. 0 to Fr. 4, -1782 OFF CL, height: From Main deck to Mezzanine Deck+ 1350(8350 A.BL);

2.1.11.3 Three (3) units Round shape ladder to be fabricated and installed at bow ward from main deck to bridge deck according the drawings.

2.1.11.4 Existing Spud casing partially welding seam to be rewelded after back gouging and grading.

2.1.12 Accommodation Works (refer to Section 3)

2.2 <u>Mezzanine deck</u>

The Mezzanine deck will be fabricated and installed between main deck and upper deck at EL 7010mm. According to owner provided drawings.

The deck is the existing with extension out to the Frame 45 for holding the 4 x units of 30m3 round Brood-stock tanks. Deck EL from (EL 7017 to 8270mm) There shall be a stairway (existing) leading to the new bridge deck. The modification to be following Owner provide the drawings.

2.2.3 Bulkheads

2.2.3.1 New Transverse Bulkhead to be added. Final location and Quantity to be following approved drawings issue by owners

Fr.0 From -1782 OFF CL to 9504 OFF CL (11.2m), height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);

Fr.0 From -9504 OFF CL to -5346 OFF CL (4.158m), height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);

Fr.1+620, From -650 OFF CL to 7722 OFF CL (8.372m), height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);

Fr.2-210, From -650 OFF CL to 9504 OFF CL (8.372m), height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);
Fr.3+410, From -1782 OFF CL to 9504 OFF CL (11.2m), height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);
Fr.4, From -9504 OFF CL to -5346 OFF CL (4.158m), height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);
Fr.5, From -9504 OFF CL to -5346 OFF CL (4.158m), height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);

2.2.3.2 New Longitudinal Bulkhead. Final location and Quantity to be following approved drawings issue by owners.
Fr. 0 to Fr. 5, -9504 OFF CL, height: From Mezzanine deck to Mezzanine Deck+ 1350(1350 A.BL); (Fr.0 To Fr.4 include in 2.1.11.2)
Fr. 0 to Fr. 5, -5346 OFF CL, height: From Mezzanine deck to Mezzanine Deck+ 1350(1350 A.BL);(Fr.0 To Fr.4 include in 2.1.11.2)
Fr. 0 to Fr. 3+410, 6534 OFF CL, height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);
Fr. 0 to Fr. 3+410, 7722 OFF CL, height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);
Fr. 0 to Fr. 3+410, 8604 OFF CL, height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);
Fr. 0 to Fr. 3+410, 9504 OFF CL, height: From Mezzanine deck to Mezzanine Deck+ 1550(1550 A.BL);

2.2.3.3 New Deck. Final location and Quantity to be following approved drawings issue by owners.
From Fr.34 +343mm to Fr. 45 deck plating will be longitudinally plated, to have welded butts and seams and having the following thickness
Deck plate : 6 mm
Builder shall ensure the deck are free from buckling. Intermediate stiffeners shall be added if the deck is buckled

2.3 Brood-stock Deck

There shall be Live Feed Room for Rotifer (8 units round tanks each 3m^3) and Artemia (6 units round tanks of 1.0m^3) and 12 units of hatchery tanks (larvae) of each 6.0m^3)

2.4 <u>Upper deck</u>

The Upper deck will require to add deck plating on the Aft port side Frame 0 to Frame 16 for 28 Pre-nursery tanks each tank 12.5m^3

Compartments to be made by yard:

- Cold Room Store (~73m^2) (22^{0}C)
- 2 Men Cabin
- Aquatic Health Room
- Toilets with 3 WC units and 2 hand wash basins (Man)
- Toilets with 3 WC units and 2 hand wash basins (woman)
- Post Harvest Room (~98m^2)
- Extension of aft deck plate by 6m

2.4.1 Bulkheads

2.4.1.1 New Transverse Bulkhead to be added. Final location and Quantity to be following approved drawings issue by owners

Fr.5, -9504 OFF CL to 6004 OFF CL (3.5m), height: From Upper deck to Upper Deck+ 4000;

Fr.5, 6004 OFF CL to 9504 OFF CL (3.5m), height: From Upper deck to Upper Deck+ 4000;

Fr.7+1345, -9504 OFF CL to 6004 OFF CL (3.5m), height: From Upper deck to Upper Deck+ 4000;

Fr. 7+1345, 6004 OFF CL to 9504 OFF CL (3.5m), height: From Upper deck to Upper Deck+ 4000;

2.4.1.2 New Longitudinal Bulkhead. Final location and Quantity to be following approved drawings issue by owners

Fr.5 To Fr7+1345, -9504 OFF CL, height: From Upper deck to Upper Deck+ 4000;

Fr.5 To Fr7+1345, -6004 OFF CL, height: From Upper deck to Upper Deck+ 4000;

Fr.5 To Fr7+1345, 6004 OFF CL, height: From Upper deck to Upper Deck+ 4000;

Fr.5 To Fr7+1345, 9504 OFF CL, height: From Upper deck to Upper Deck+ 4000;

2.4.1.3 Extension Deck. Final location and Quantity to be following approved drawings issue by owners.

From Fr.0 to Fr. 18 deck plating will be longitudinally plated, to have welded butts and seams and having the following thickness

Deck plate : 6 mm

Builder shall ensure the deck are free from buckling. Intermediate stiffeners shall be added if the deck is buckled

2.5 Bridge Deck

- Fabrication of this Extension deck by yard (From Fr. 18 to Fr.30 & Fr. 34. To Fr.58)
- 1 compartment to be made Kitchen (~82m^2)
- 1 Feed Storge Room (~73m^2)
- Open Area for Alfresco Dining. (~375m^2)
- Rainwater Collection Tank 2PCS x 10m^3
- Extension of deck plating with same dimension as Ramp with support from Main Deck.
- Hand Railing to surround all open areas
- Platform for Auto pot tray (36m x 3.4m x 1.8m(H)

2.6 Roof Structure

The roof structure will be fabricated with steel plate 4mm and BiPV Rooftop materials. The BIPV rooftop located at the mid-roof top and BIPV rooftop sola panel will be supplied by Owner.

2.7 Side Panel Structure

Yard to be fabricated and installation of the Side panel around the vessel from main deck to deck with solid polycarbonate sheet 4mm. colour of the polycarbonate sheet to approved by owner. Polycarbonate sheet will be Owner's Furnish

SECTION 3 - ACCOMMODATION

3.0 Accommodation

The accommodations located on Main Deck, Mezzanine Deck & Upper Deck shall be air conditioned, capable of maintaining a maximum temperature of approx. +22 degree by individual air conditioning separated unit; excluding the below mention rooms:

- ✓ General Store
- ✓ Store Compartment
- ✓ Farm Store
- ✓ Horti Store
- ✓ Post Harvest Room
- ✓ Toilet(M)-Upper Deck
- ✓ Toilet(W) -Upper Deck
- ✓ Shower room

Builder to provide accommodation outfitting and insulation B15 type (Celling, side board, flooring shall be supplied by yard) as described below.

Builder to provide HVAC for Accommodation / all the compartments

3.1 Staff Galley Room (40 m2)

- ❑ Galley room located Forward Starboard side on the main deck. The galley shall be fully furnished and equipped with the following. (To be approved by Owner)
- ❑ One (1) working table top.
- ❑ Two (2) large refrigerator @ 500L
- ❑ One (1) deep chest freezers @ 500L
- ❑ Two (2) two pieces electric induction Cooker (2 kW each) and pan fittings.
- ❑ Two (2) exhaust fan complete with louver.
- ❑ Three (3) electric rice cooker (10 persons/PCS).
- ❑ Two (2) 3 ltr. hot water boiler.
- ❑ One (1) stainless steel panrack
- ❑ One (1) dustbin
- ❑ SUS Storage facility and shelvings for loose pantry equipment.
- ❑ Air Conditioning from split AC System

3.2 Aquatic Health Room (21.0 m^2)

Aquatic Health room on the Upper deck shall be fully furnished and equipped with the following.: (To be approved by Owner)

The room shall be divided into 2 compartment (Wet & Dry)

- Four (4) working tables with chairs. ((Dry Room))
- Four (4) cabinet with facilities for housing of TV and radio installation (socket only.)((Dry Room))
- One (1) Refrigerator @ 500L (Wet Room)
- One (1) Wash Basin (Wet Room)
- Four (4) working tables with chairs. (Wet Room)
- Four (4) cabinets (Wet Room)
- Electrical Sockets 380V, 220V and Lightings
- Exhuast Fan (Wet Room)
- Air Conditioning from split AC System

3.3 Laundry Room

Laundry located at Port side on the main deck. The Laundry, shall be fully furnished and equipped with the following.

- Two (2) Washing machine (10kg)
- Two (2) Dryer (10kg)
- Eighteen (18) Lockers
- Four (4) wash basins with mirrors
- Shelves for detergents, linen, toiletries and etc.
- Exhaust Fan
- Electrical Sockets 220V and Lightings
- Air Conditioning from split AC System

3.4 Shower Room

- Six (6) Shower Compartment
- Seventeen (17) Individual Hot Water Electric Heaters
- Soap and Shampoo shelves for each individual cubicle
- Seven (7) Exhaust fan

3.5 Toilet Room

- Five (5) Toilet rooms with toilet bowls with flushing system
  Come with Bidets
  One (1) Shower room
- Five (5) Wash basin and mirror. Clothes hooks to be installed
- Soap holder
- Two (2) Exhaust fan each room

3.6 3 Men Room (2 Rooms)

Located at portside Main Deck. The cabin shall be fitted with following:

- Three (3) Single bed with drawers.
- Three (3) wardrobes. Come with Mirrors
- Two (2) Table
- Two (2) Chairs
- Clothes hooks.
- Four (4) 2 gang electrical power point.
- Air Conditioning from split AC System.

3.7 2 Men Room (8 Rooms)

The cabin shall be fitted with following:

- Two (2) Single bed with drawers.
- Two (2) wardrobes. Come with Mirrors
- One (1) Table
- One (1) Chairs
- Clothes hooks.
- Four (4) 2 gang electrical power point.
- Air Conditioning from split AC System.

3.8 Meeting Room

This room shall be fitted with the followings:

- One (1) Long Table for 10 pax
- Ten (10) Chairs

- One (1) Refrigerator @ 500L
- One (1) Pantry corner with Washing Basin.
- White Board
- Display Shelve and Cupboard
- Four (4) 2 gang electrical power point.
- Air Conditioning from split AC System.

3.9 HVAC System for Floating Fish Farm Barge

Air-condition equipment maker : MIDEA or GREE or Equal

Part A) Main Air Conditioning System for Accommodation

Our Design Criteria	**Areas**	**Heat Transfer Coefficient (W/m²xk)**
1.	Weather deck, ship side and external bulkhead not exposed to direct sun radiation.	0.9
2.	Deck/ bulkhead against engine room or non air-conditioned space.	0.8
3.	Deck/ bulkhead against boiler room.	0.7
4.	Deck against open air or weather deck exposed to sun's radiation.	0.6
5.	Window single glazing.	6.5
6.	Bulkhead against alleyway.	2.5

Summer Season (Singapore Weather)	**Outside Condition**	**Inside Condition**
Dry Bulb Temp	35°C	22°C (Accommodation)
Relative Humidity	70%	50%

Note:

1. Outside Condition is based on Singapore Weather Condition.
2. Single and Multi-Split A/C shall be provided for the following Accommodation area only.
   a. 2 Men Cabins X 8
   b. 3 Men Cabins X 2
   c. Office X 2
   d. Staff Galley
   e. ECR
   f. ***Feed Storage Rooms (Bridge Deck)***
   g. Aquatic Health Room
   h. Passageway at main deck
3. Post-Harvest Compartment Cooling System shall be removed from our scope of supply.
4. Kitchen shall be served by Ventilation System and no A/C System shall be provided.
5. Ventilation Fans Air Flow are estimated only and subjected to Final Heat Load Calculation.
6. Compartments not mentioned shall be ventilated by Natural.

Fresh Air Circulation: Not Applicable for Split Air Conditioning Systems are used.

Power Supply : 400V/3Ph/50Hz or 220V/1Ph/50Hz.
Classification : BV

Regulation : Solas 2004 with latest amendments.
Cooling Water : Seawater **Max. 32°C.**
Motors : Motors are of IP 54, Insulation Class 'F'.

Our scope of work and supply

1. Design & Documentation One (1) Lot

Engineering design for HVAC System for Fish Farm Barge, No Drawing for Class Approval is required.

2. **Feed Storage & Staff Galley Air-Cooled Single Split A/C Unit Three (3) Sets**

Three (3) Sets of Single Split Air-cooled split air conditioning unit for (Bridge & Upper Decks) and Staff Galley Compartment respectively. The Indoor Unit Wall Mount Type and the Outdoor Unit Condenser Fins shall be spray coated with 'Heresite' coating to withstand Marine environment.

Data/Each

Unit Model : 38MS024 / 40JN024
Capacity : ~24,000 Btu/Hr.
Type : Air Cooled Type (Fins Heresite Coated For Marine Use)
Voltage : 220V/1Ph/50Hz.
Indoor Unit : Wall Mount Type.
Note: Air-Cooled Units are of commercial type modify to suit Marine environment.

3. ECR and Aquatic Health Room Air-Cooled Single Split A/C Unit Two (2) Sets

Two (2) Sets of **Single Split** Air-cooled split air conditioning unit for **ECR and Aquatic Health Room** respectively. The Indoor Unit of **Wall Mount Type** and the Outdoor Unit Condenser Fins shall be spray coated with **'Heresite'** coating to withstand **Marine environment.**

Data/Each

Unit Model : 38MS018 / 40JN018
Capacity : ~18,000 Btu/Hr.
Type : Air Cooled Type **(Fins 'Heresite' Coated For Marine Use)**
Voltage : 220V/1Ph/50Hz.
Indoor Unit : Wall Mount Type.
Note: Air-Cooled Units are of commercial type modify to suit Marine environment.

4. Offices Air-Cooled Single Split A/C Unit Two (2) Sets

Two (2) Sets of **Single Split** Air-cooled split air conditioning unit for **Offices for Main Deck and Mezzanine Deck respectively.** The Indoor Unit of **Wall Mount Type** and the Outdoor Unit Condenser Fins shall be spray coated with **'Heresite'** coating to withstand **Marine environment.**

Data/Each

Unit Model : 38MS012 / 40JN012
Capacity : ~12,000 Btu/Hr.
Type : Air Cooled Type **(Fins 'Heresite' Coated For Marine Use)**
Voltage : 220V/1Ph/50Hz.
Indoor Unit : Wall Mount Type.
Note: Air-Cooled Units are of commercial type modify to suit Marine environment.

5. **1 To 2 Split Air Conditioners** **Five (5) Sets**

Five (5) Sets of **Twin Split** Air-cooled split air conditioning unit for the 2 X 3Men Cabins and 8 X 2Men Cabins respectively. The Indoor Unit of **Wall Mount Type** and the Outdoor Unit Condenser Fins shall be spray coated with **'Heresite'** coating to withstand **Marine environment.**

a. 2 X 2Men Cabin (AFT) - 1 Set
b. 2 X 3Men Cabins (Main Deck) - 1 Set
c. 6 X 2Men Cabins (Mezzanine & Upper Deck) - 3 Sets.

Data/Each Set

Unit Model : 38MS218 / 2 X 40JN018
Capacity : 2 X 9,000 Btu/Hr.
Type : Air Cooled Type **(Fins Heresite Coated For Marine Use)**
Voltage : 220V/1Ph/50Hz.
Indoor Unit : Wall Mount Type.

Note: Air-Cooled Units are of commercial type modify to suit marine environment.

6. Initial Charge Refrigerant **One (1) Lot**

One (1) lot of initial charge refrigerant adequate for the first initial charge for all the Split Air Conditioners.

7. Copper Piping Installation **One (1) Lot**

7.1. Copper pipe materials and fittings adequate for the split air conditioners mention above. The copper pipes and fittings shall be adequate for installation from the Refrigeration Condensing Unit to the Various Rooms, including the drainpipe to scupper.

(Scupper shall be furnished and installed)

7.2. Outdoor units base foundation/Seating of mild steel material construction including welding onto deck or bulkhead.

7.3. Mounting of the outdoor units and indoor fan coils in the various rooms respectively. The indoor units shall be secured by standard Manufacturer's galvanized steel mounting bracket complete with bolts and nuts. The Outdoor Units shall be mounted onto base foundation/seating.

7.4. Install the necessary copper piping, fittings, piping supports and pipe penetrations for the bulkhead. The cold piping shall be insulated with 1" thickness 'Armaflex' closed cell black insulation material. Upon completion of the copper piping work, the system shall be pressure tested and leak checked to ensure gas tight.

7.5. The system shall then be evacuated to low vacuum before charging up with our supply of new refrigerant.

8. Air Terminals (4-Way Diffusers) **One (1) Complete Set**

One (1) complete set of 4-way diffusers, return air grilles and punkah louvers suitable for Low-Pressure Ducting System **if necessary**, the quantity shall be adequate for one (1) ship set.

9. Supply & Exhaust Air Grilles **One (1) Complete Set**

One (1) complete set of Supply and Exhaust Grilles for the Mechanical Ventilation System. The quantity shall be adequate for one (1) ship set.

10. Class Type Approved Fire Damper (If Necessary) One (1) Complete Set

One (1) complete set of type approved Fire dampers complying with Class and Solas requirement in accordance with the GA. Fire Dampers are of automatic released by melting fuse in the air stream and manually operated type. **(Class Approved Certificates Shall Be Provided)**

Note: Fire Dampers shall come with wire pull handles & PVC labels.

11. Ventilation Fans for Accommodation and Machinery Spaces One (1) Complete Set

To supply one (1) set of **'AHE'** ventilation fans for the Accommodation and Machinery Spaces **(As Per Fan List Provided).** The quantity shall be adequate for one (1) Ship Set.

No	Description (Tag No)	Qty.	Capacity (m^3/hr.)	Total Press (Pa)	Fan Type	Remarks
1	Upper Deck Sanitary Exhaust Fan	1	~600	~200	Duct Fan	230V/1Ph/50Hz
2	Kitchen Exhaust Fan	1	~5,700	~350	Axial Fan	400V/3Ph/50Hz
3	**Generator Room**	**1**	**~3,000**	**~300**	**Axial Fan**	**400V/3Ph/50Hz**
4	Mezzanine Deck Sanitary Fan	1	~600	~200	Duct Fan	230V/1Ph/50Hz
5	Laundry Room Exhaust Fan	1	~300	~200	Duct Fan	230V/1Ph/50Hz
6	**Void Tank Fuel Transfer P/p Fan**	**1**	**~1,000**	**~250**	**Duct Fan**	**230V/3Ph/50Hz**
7	**Pump Room #1 Exhaust Fan**	**1**	**~1,000**	**~250**	**Duct Fan**	**230V/3Ph/50Hz**
8	**Pump Room #2 Exhaust Fan**	**1**	**~1,000**	**~250**	**Duct Fan**	**230V/1Ph/50Hz**
9	**Pump Room #3 Exhaust Fan**	**1**	**~1,000**	**~250**	**Duct Fan**	**230V/3Ph/50Hz**
10	Ozone Generator Room	1	~600	~200	Duct Fan	230V/1Ph/50Hz
11	**Live Feed Room Exhaust Fan**	**1**	**~600**	**~200**	**Duct Fan**	**230V/1Ph/50Hz**
12	**Forward Store Compt. Fan**	**1**	**~860**	**~200**	**Duct Fan**	**230V/1Ph/50Hz**
13	**Galley Store Exhaust Fan**	**1**	**~300**	**~200**	**Duct Fan**	**230V/1Ph/50Hz**
14	**Store Exhaust Fan**	**1**	**~300**	**~200**	**Duct Fan**	**230V/1Ph/50Hz**
15	**General Store Exhaust Fan**	**1**	**~300**	**~200**	**Duct Fan**	**230V/1Ph/50Hz**
16	**Farm Store Exhaust Fan**	**1**	**~300**	**~200**	**Duct Fan**	**230V/1Ph/50Hz**
17	**Horti Store Exhaust Fan**	**1**	**~300**	**~200**	**Duct Fan**	**230V/1Ph/50Hz**
18	***Waste Treatment Area Supply Fan**	1	~3,000	~300	Axial Fan	400V/3Ph/50Hz

Note: Air Flow Capacity Subjected To GA and Final Load Calculation.

Electrical Starters Shall Be Supplied By JLM or Built-In AHU Control Panel.

Pump Room Fan Capacity based on 30A/C/Hr. Fan Capacity Subject To Final Load Calculation.

Other Compartment Not Mentioned shall be by Natural Ventilation if necessary.

Comments:

1. **Shower room /Toilet need put exhaust fan**
2. *** Marked areas cannot find, please clarify.**

12. Electrical Control Panels for Fans (Optional) One (1) Complete Set

One (1) complete Set of Electrical Control Panels for the above-mentioned Mechanical Ventilation Fans of DOL individual starter type mentioned above or to be built in AHU Control Panel**. (Optional Price)**

13. Gooseneck/Mushroom Ventilators & Weather-Tight Louvers One (1) Lot

One (1) Lot of Mushroom & Gooseneck Ventilators and Weather Tight Louvers for Exhaust/Supply Fan Inlet and Outlet of mild steel material construction hot dipped galvanized or blasted and primer coated shall be provided.

Part B) Accommodation and Machinery Space HVAC System Installation Work.

1. Material, labour and tools only to fabricate only the Rectangular Duct for the Return and Exhaust Ducting System for M**achinery Space**s Ventilation System including angle bar mounting brackets and necessary supports.

2. To install only one (1) complete set of Weather-tight Louvers, Mushroom and Gooseneck Ventilators for Ventilation fans. **JLM will supply and install all Ventilators. Shipyard will Supply and**

Install the coaming, foundation, watertight duct/trunk and insulation if required.

3. Mounting of the Air Conditioning Outdoor and Indoor Units including securing of the units onto Shipyard's supplied of base foundation.

4. Material, labour, tools and necessary consumable like duct tapes, sealants and gaskets etc. to Install the complete ducting system for the Accommodation and Machinery Spaces as follows:

a. Complete Set of un-insulated spiral duct of various sizes & fittings for Toilet Exhaust System.
b. Complete Set of volume control dampers.
c. Complete Set of Rectangular ducts for **Machinery Spaces.**

5. All duct work shall be adequately supported with Duct Brackets and Supports constructed with Angle Bar Material.

6. Labour, tools and consumables to install one (1) complete set of Diffusers, Supply and Exhaust Grilles and Fire Dampers **(If Necessary, by BV Class).**

7. Labour and tools to install ventilation fans within ducting system.

8. Labour and tools to install penetration pieces only, mushroom ventilators, gooseneck ventilators **Fan Housing, Fan Coamings and Equipment Seating/Foundation shall be Supplied and Installed**

Note : Structural Ducts/Trunk to be supplied and installed

Exclusions:

1. Cold Room Store Equipment and Compartment Supply and Installation.

SECTION 4 – FARMING SYSTEM

General:

All farming tanks, equipment, sensors and IOT are owner furnished, yard to supply cables, cable trays, lightings, sockets and all PVC piping and installation.

Farming Tanks

4.1 Main Deck

- Total of 39 Post – Nursery tanks arranged in four rows on this deck. They are N3A – Tank 1 to 11; N3B – Tank 1-11; N3C – Tank 1-8 and N3D Tank 1-8. Each of the tank has 13m^3 capacity

4.2 Mezzanine Deck

- Total of 27 Post-Nursery Tanks are arranged in three rows on this deck. They are N2A – Tank 1 to 9; N2B – Tank 1-9 and N2C Tank 0,1-9 – each 13m^3
- 4 units of Broodstock Tanks (B1-4) – each 30m^3

4.3 Broodstock Deck

- 12 units of LarviCulture (Hatchery – HA1-3 / HB1-3 / HC1-3 / HD1-3) - each 6m^3
- 8 units Rotifer Tanks (R1 - 8) – each of 3m^3
- 6 units Artemia Tanks (A1-6) each of 1.0m^3

4.4 Upper Deck

- Here there are 28 units of Pre-Nursery Tanks (N1A 1-6 / N1B 1-8 / N1C 1-8 / N1D 1-6) – each of 12.75 m^3

4.5 Bio-Security and Entry Barriers

There shall be a total 12 x Bio-Security Footwash Area with Hand-wash stainless steel basin supplied by builder (each level 4units mentioned) – The size of the OFE Foot-tray 600mmL x 400mmB x 30mmH

SECTION 5 - PAINTINGS & CATHODIC PROTECTION

5.0 General

All new steel structure surfaces will be shot blasted and primed prior to fabrication. Steel surfaces to be free of grease, dust, etc. prior to painting. The welding seams and weld spatters shall be shot-blasted and primed.

Prior to application of paint, the shipyard shall submit a detailed painting specification complete with drying time to Owner's representative for approval. The generally paint life required is **60 months.** Such specification shall be developed in conjunction with the paint

supplier and shall be suitable for the area of application. Paints to be Jotun, Hempel paint or equivalent. However, for guidance, the paint specification is to be generally as follows:

Commented [TL1]: Would like to add in Hempel

5.1 Paint Scheme (Jotun / Hempel) to discuss and approved by Owner – refer to Scope of work

5.1.1 Pre-Treated Primer

All blast-clean steels are to be coated with:

1 full coat of epoxy primer	25 micron

5.1.2 External hull below waterline

The sweep blasting and one top-coat painting will be applied with colour code: Dark Red 2079

-	Anti-fouling:	150 micron

5.1.3 External Hull above Waterline (Side Shell 1m from Main deck)

The sweep blasting and one top-coat painting will be applied with colour code: Orange RAL 2009

-	Epoxy:	100 micron

5.1.4.1 Internal Tanks – 1 (C), 2 (C), 6(P)

Full blasting to SA 2.0

-	Primer:	50 micron
-	Epoxy:	100 micron
-	Epoxy:	100 micron

5.1.4.2 Internal Tanks – 3 (C) Fresh water coating

Full blasting to SA 2.0

-	Penguard Primer:	50 micron
-	Tankguard 412	200 micron

*. Note: The above paint coating excludes the new fabrication structures and compartments.

5.1.5 Fish Tank phenol epoxy/Fiberglass Coating

Coating Area:

- One (1) Ozone mixing tank @ 115 m^2
- One (1) Air Bubbling Tank @ 65 m^2
- One (1) Inlet trough @ 35m^2
- -- Total Est Coating Area: 215 m^2 (* This is an estimated area. Actual area calculation to be based on actual structural drawings)

5.2 Cathodic Protection

The external steel hull below waterline and the sea water tanks shall be protected against corrosion by means of sacrificial anodes. The number and weight of the anodes shall be sized to protect the ECO-SPARK® for a minimum of five (5) years.

- Zinc Hull Anode: Est 130 pcs (Model type: CP B12 , Cross Wt.: 15.2kg Bolt type.)

Please refer to the Cathodic Protection Arrangement. Protection Arrangement.

Anodes to be supplied by Builder.

SECTION 6 - DECK MACHINERY

6.1 Spud Mooring Systems

Existing Three (3) numbers of spud legs (25m each) has been installed at portside & starboard as show at GA Plan

6.1.1 Mooring Bitts

Existing Total ten (10) numbers of mooring bitts have been installed as show at GA Plan.

Two (2) numbers of mooring bitts to be relocated. According to drawings for towing purpose

6.2 Electric Hoist Crane

Electric hoist crane 2T to be provide 2 units.

The main purpose of this crane is to transfer the materials, feed and equipment or fish from main deck or fish tank. Owner will be providing two (2) unit of Hoist Crane set, each with lifting capacity of 2. Tons up to 14m in height.

SECTION 7 – SAFETY HEALTH ENVIRONMENTAL MANAGEMENT (SHEM) POLICY
SAFETY & LIFE SAVING EQUIPMENT & APPLIANCE

Safety & Lifesaving equipment to be provided by the builder, as shown in the table below. Eventually, comply with the number of fire protection plans approved by the classification society, and the shipowner does not bear additional costs.

7.1 Fire Fighting Appliances (Portable) / Fire Control Plan

Portable fire extinguishers should be provided by the builder, as shown in the table below. Eventually, comply with the number of fire protection plans approved by the classification society, and the shipowner does not bear additional costs.

S/no.	Location	Qty	Capacity / Type
1	Generator area	2	5kg / Powder
2	Oxygen Generator Room	1	5kg / Powder
3	Pump Room #1，#2 &#3	3	5kg / Powder
4	Accommodation Spaces	3	5kg / Powder
	Accommodation Spaces	3	5kg / CO2
5	Crew Galley	2	5kg / CO2
	Crew Galley	2	Fire Blanket
6	Aquatic Health Room	2	5kg / CO2
7	2 Men Cabin (Outside x 3)	4	5kg / CO2
8	ECR Room (Internal)	1	5kg / CO2
9	Kitchen	3	5kg / CO2
	Kitchen	2	5kg / Powder
	Kitchen	2	Fire Blanket

7.2 Fire Fighting Appliances (Fixed) / Fire Control Plan

Generally, one (1) GS Pump with the Eight (12) hose reels shall be provided as show on the fire control plan. GS Pump will be installed at pump room locate at stern (Fr. 0 to Fr. 5) below he main deck. Eight (8) hose reel will be installed at forward & stern for each deck.

- GS Pump capacity: 55 m3/h with 58m head;
- Hose reel boxes: Hose Diameter 25mm, Hose length 30m.

7.3 Life Saving Appliances

Total Twenty-two (22) life jackets to be provided by yard and will be stored at designated locations and Eight (18) life buoy shall be provided and installed on portside and Starboard (on each deck), the final number of lifesaving equipment shall be according to class requirement for lifesaving and fire control plan.

SECTION 8 – MACHINERY EQUIPMENT

8.0 Machinery General

All machinery and equipment shall be manufactured and fitted in accordance with manufactures' requirements, and where relevant Certificates shall be provided.
All items which are not conforming will be rejected and replaced with suitable and approved components.

All exposed equipment and parts posing any hazard to personnel shall be fitted with guard and/ or railing on site.

Builders to provide all foundations, materials and labour for fabrication/installation accordingly to the GA layout and equipment specifications including all OFE containers. Owner to provide foundation drawings, Please see section 1.14 item no 3 for Small outfitting modification and seating details

8.1 Main Generator Set.

Three (3) 250 ekW generator and will be installed at Aft Port on upper deck.

The Generating sets of 250 ekW each shall be skid mounted, engine driven. All gensets shall be able to run in parallel with the other farm's Genset.

8.2 Influent System Equipment

8.2.1 Sea Water Intake Pump

Three (3) Sea Water Pumps with casing will be installed in the pump room

Pumps detail:
Capacity: 2 x 650 m^3/hr @ 7.5m
1 x 450 m^3/hr @ 7.5m

8.2.2 Drum Filter (Influent)
Four (4) Drum filters will be installed at mezzanine deck as following the GA Plan.

Drum filter Detail:
Model: 40 micron (2 Units) @ 1350 m^3/h
100 micron (2 Units) @ 1350 m^3/h
400V/50Hz, 3 Phase

8.2.3 Drum Filter (Effluent)
Two (2) Drum filters will be installed at location of Tank #2 C the main deck as following the GA Plan.

Drum filter Detail:
Model: 100 micron (2 Units) @ 800 m^3/h
400V/50Hz, 3 Phase

8.2.4 Ozone Tower
Two (2) numbers of Ozone towers will be installed beside the Drum filters as per the GA Plan.

Ozone Tower Detail:
Dimension: Ø2.4m x 3.7m (height)

8.2.5 Ozone Generator Compartment
Two (2) units Ozone Generator in compartment will be installed at Aft starboard side Fr 5 to Fr 7as shown on the GA Plan.

2 units of Ozone Generator are to be installed inside this compartment

8.2.6 Oxygen Generator Space

Two (2) units Oxygen Generator Compartment will be as shown on the GA Plan.

2 unit of Oxygen Generator are to be installed inside this compartment

Working Condition: 12m^3/hr, 93%±3%, 400V/50Hz / each

8.2.7 Root Blower – Biofilter chamber – Under RAS system

Two (2) units of Root blowers will be installed on Mezzanine Deck.

Blower Detail:

Working condition: 300mB @ 1122 m^3/hr

15kw, 400V/50Hz with 2930 rpm. Noise level dB69.

8.3 Recirculating Aquaculture System (RAS)

Equipment will be installed on the Mezzanine Deck Port for the RAS.

RAS Recirculating Pump

Two (2) Units will be installed at this location as per the GA Plan.

Cap.: 200 m^3/h @ 7m

Drum Filter

Two (2) Drum filter will be installed at this location as per the GA Plan.

Drum filter Detail:

Model: 26 micron @ 200m^3/h

400V/50Hz, 3 Phase

Bio Filter Tank

Two (2) units of Bio Filters Tank 26m^3 will be installed at this location as per the GA Plan.

Bio Contact Oxi-dation Tank

Four (4) units of Bio Contact Oxi-dation Tank @ 13m^3 will be installed at this location as per the GA Plan.

Protein Skimmer

Two (2) units of Protein Skimmers @ 200m^3/h will be installed at this location as per the GA Plan.

Ultra Violet Unit

Two (2) units of Ultra Violet Units @ 200m^3/h will be installed at this location as per the GA Plan.

Sand Filter

Two (2) units with 200m^3/h

8.4 Pumps

8.4.1 No.1 & No.2 Seawater Inlet Pump (VFD)

Two (2) units Seawater Inlet Pump, will be installed with pressure gauges,
Pump capacity: 650 m^3/hr @7.5m head, Motor: 30kw 415V/3/50Hz.

8.4.2 No.3 Seawater Inlet Pump (VFD)

One (1) Seawater Inlet Pump, will be installed with pressure gauges,
Pump capacity: 450 m^3/hr @7.5m head, Motor: 18.5kw 415V/3/50Hz.

8.4.3 Ballast Pump

Two (2) units Ballast Pump, will be installed with pressure gauges,
Pump capacity: 150m^3/hr@6m head, Motor: 7.5kw 415V/3/50Hz.

8.4.4 Bilge Pump

One (1) unit Bilge Pump, will be installed with pressure gauges,
Pump capacity: 15 m^3/hr @20m head, Motor: 3kw 415V/3/50Hz.

8.4.5 GS & Fire Pump

One (1) unit GS & fire Pump, will be installed with pressure gauges,
Pump capacity: 55 m^3/hr @58m head, Motor: 30kw 415V/3/50Hz.

8.4.6 Fuel Oil Transfer Pump

Two (2) units Fuel Oil Transfer Pump, will be installed with pressure gauges,
Pump capacity: 2.6 m^3/hr @12m head, Motor: 2kw 415V/3/50Hz.

8.4.7 Sludge Pump

One (1) unit Sludge Pump, will be installed with pressure gauges,
Pump capacity: 5 m^3/hr @45m head, Motor: 3kw 415V/3/50Hz.

8.4.8 Heater & Recirculating Pump

Two (2) units Heater & Recirculating Pump, will be installed with pressure gauges,
Pump capacity: 25 m^3/hr @6m head, Motor: 1.5kw 415V/3/50Hz.

8.4.9 No,1, No.2 & No.3 New Water Supply Pump (VFD)

Three (3) units New water supply pump, will be installed with pressure gauges,
Pump capacity: 300 m^3/hr @6m head, Motor: 15kw 415V/3/50Hz.

8.4.10 No.4, No.5 & No.6 New Water Supply Pump

Three (3) units New water supply pump, will be installed with pressure gauges,
Pump capacity: 60 m^3/hr @5m head, Motor: 2.2kw 415V/3/50Hz.

8.4.11 RAS Recirculating Pump

Two (2) units RAS Recirculating Pump, will be installed with pressure gauges,
Pump capacity: 200 m^3/hr @7m head, Motor: 7.5kw 415V/3/50Hz.

8.5 Hydrophore

8.5.1 Potable Water – NanoFiltration and UV with water metering counter
One (1) unit hydrophore & Two (2) Fresh water pumps will be installed at Tank 1C.

- ✓ Hydrophore tank Two (2) units – 2m^3/tank with 7 bar

- ✓ Fresh water pump – 5m^3/hr with 50m head.
- ✓ UV @ 5m^3/h
- ✓ NanoFiltration @ 5m^3/h
- ✓ Ro Plan (80T/Day)

8.5.2 Domestic Water System for all other use other than Drinking with water meter and counter

One (1) unit hydrophore & Two (2) Fresh water pumps will be installed at Tank 1C.

- ✓ Hydrophore – 2m^3 with 7 bar
- ✓ Fresh water pump – 5m^3/hr with 50m head.

8.6 Ventilation and Exhaust Fan

Supply or exhaust Fan to be supplied and installed by yard at the following locations:

- ✓ No.1 Pump room
- ✓ No. 2 Pump room
- ✓ No. 3 pump room
- ✓ Void Tank for Fuel oil transfer pumps.
- ✓ Store Compartment
- ✓ Live Feed Room
- ✓ General Store
- ✓ Horti Store
- ✓ Farm Store
- ✓ Generator room

Natural Ventilation to be fabricated and installed as following drawings.

Accommodation

Follow location are to be installed in:

- ✓ Staff Galley
- ✓ Laundry Room
- ✓ Store (Main Deck Near Fr.30-Fr.34)
- ✓ Shower Room
- ✓ Mezzanine Deck toilet Room
- ✓ Upper Deck toilet Room (W)

- ✓ Upper Deck toilet Room (M)

8.7 Sewage Treatment Plant and Sewage Holding Tank

One (1) unit of Sewage Treatment Plant for 50 Pax and to be located inside #2 Pump Room Section of #2 pump room to be converted into a Sewage Holding tanks of 20 m^3.

SECTION 9 – PIPING SYSTEM

Yard to supply piping materials, including all the valves according to the piping system diagram provide by owner. Note: PVC grade: Class VP (AW)

The material for the various piping systems shall be in accordance with the following tables:

Pipe system	Materials.
Fuel Oil Piping System	Carbon Steel Pipe Sch. 40
Fresh Water Piping System	PVC
Pump Room & Duct Tunnel Ventilation Layout	Steel Penetration
Fish Tanks Sea Water Inlet Piping System	PVC Pipe and Steel Penetration
Fish Tanks Sea Water Outlet Piping System	PVC Pipe and Steel Penetration
Air Vent, Sounding and Filling Pipes	Galvanised Pipe Sch 40
Bilge & Fire Main System	Galvanised Pipe Sch 40
Domestic FW Supply & Discharge System	PVC Pipe and Steel Penetration
Details of Overboard Discharge (For Deck Drain to overboard)	Steel Pipe Fitting
Sludge System	Above Deck PVC. Under Deck Steel Pipe
Fish Tank Airlift Pipe System	PVC Pipe and Steel Penetration
Fish Tank Inlet Control Devices	N/A
Fish Tank Outlet Control Devices	N/A
Rain Water Collection System	PVC Pipe and Steel Penetration
Sewage System	Above Deck PVC. Under Deck Steel Pipe
Air Bubbles System	PVC Pipe
O2 System	SS316 tubings
O3 system	PVC pipes for air con and cooling system
Back Flush System for Drum Filter	PVC pipe
Protein Skimmer Removal System	PVC pipe
Ballast System	Galvanised Pipe Sch 40

New Water / Aquaculture System – PVC pipe

1. Brood-stock and LarviCulture RAS System
2. Pre-Nursery RAS System

3. Nursery and Post-Nursery Flow System

All pipes shall be of material seamless for galvanized pipework, hot dip galvanizing shall be carried in pump room or as spelt out in the above tables out only after fabrication of pipework complete with flanges, elbows etc.

9.1 Water Treatment Inlet System

Water Treatment inlet system consist of:

1) Sea Water Inlet Pump – Three (3) units
2) Drum filter – Four (4) units
3) Ozone Tower – Two (2) Units
4) Ozone Generator – One (1) Unit
5) Oxygen Generator – Two (2) Units
6) Air Blower – Two (2) Units
7) Oxygen Diffusers Ultrafine ceramic – 2 to 3 units per tank
8) Inlet trough
9) Retention tank
10) Air lift channel
11) With Piping work. All the pipes and pipe rack materials will be galvanized pipes or PVC Pipes.

9.2 Fuel Oil System

Fuel Oil System consist of: The detail as per P&ID drawing

1) Fuel oil Tank – 135m^3 – One (1)
2) Fuel oil Transfer Pump – Two (2)
3) With Piping work
4) Built-in FO Day tank – 2.0 m^3 --One (1)
5) Fuel Oil Filling Meter- One (1)
6) Fuel Oil Transfer Meter- One (1) - (After the Transfer Pump)
7) Fuel Oil Transfer Meter – Three (3) – Before Generator

9.3 Fresh Water System

Fresh Water System consist of: Potable water system and fresh water system as per P&ID drawing

- ✓ Fresh water tank & Potable water Tank
- ✓ Two (2) Hydrophore tank (2000 litre) With Two (2) FW pumps @ 5m^3/h with 5bar for fresh water system.
- ✓ Two (2) Hydrophore tank (2000 litre) With Two (2) FW pumps @ 5m^3/h with 5bar for potable water system. With filtration and UV treatment before supplying to kitchen, galley, process room, ice machine and water fountains
- ✓ Three (3) Flow Meter,
- ✓ With Piping work
- ✓ Rain water harvest system
- ✓ Rain water harvest from roof top into the fresh water tank.

9.4 Vent / Sounding System

There shall be a vent / sounding system for all the tanks to be provided. Measurement of water depth by manual type.

The pipes shall be equipped with a threaded brass cap, secured to the pipe with a chain. Piping material in ballast tank shall be hot dip galvanising.

9.5 Sanitary System

All Shower, toilets. Laundry room drains, washing machines, galley and kitchen must be connected to the Sewage Treatment Plant with by-pass connection to the sewage holding tank. Dimension of pipe to be 50mm PP. The sewage holding tank shall be installed in #2 Pump Room. The Sewage holding tanks should be fabricated by the yard. The size should be 20 m^3 .

9.6 Ballast System

Two (2) Ballast Pump to be installed in #2 Pump Room Sea Chest suction shall be fabricated by Builder.

9.7 Scupper Drain System

6" side scupper to be provided for each Deck

9.8 Sludge System

One sludge pump located at #3 Pump room to be installed by Builder.

SECTION 10 ELECTRICAL SYSTEM

Owner shall provide electrical equipment as describe in Section 12 – Owner Furnished Equipment. Throughout the construction period, Owners' electrical specialist shall be given free access to the Builders' yard for them to carry out the necessary work and commissioning. Builders' shall provide necessary assistance for commissioning of electrical system.

Builder shall follow Builder construction standard to fabricate and install electrical equipment/fittings steel foundations, HDG cable ladder, steel supports, brackets, steel cable penetration, cable conduit pulling and termination of cables.

Builder to provide electrical cable (power cable and control cables), lighting and marine type socket (400V 3 phase and 230V single phase) material/consumables for cables, cable support, cable ties, lugs, glands, marking, connectors for solar, lightings, switches, sockets, switched sockets & group switch for Navigation Lights. Builder to commission items which is supplied by Builder.

10.1 415V Main Switchboards

The 415V main switchboards located at the aft of ECO-SPARK® consist of:

INCOMER Diesel Generator
MCCB 3P 400A 36kA c/w MCH 220VAC + UVT 220VAC + Aux
MCB 3P 6A 6kA
MCB 2P 6A 6kA
Digital Power Meter "PAC3200"
Relay 2 C/O 24VDC + Base
Modul Auto Synchronizing "IG-NTC-BB" + LSM + PMS + IGAVRi
Display Intelivision 8
Automatic Battery Charger 24VDC 10A

Insulation Monitoring
Transformer Control 400V/230V/2P/100VA
CT Class 1 15VA 400/5A
Emergency Stop
Indicator Light RYB 415VAC
Indicator Light RYB 220VAC
Fuse Carrier + Fuse 6A

The switchboard incorporated into a box panel of about 2000H x 3000W x 600D free standing IP44

10.2 Shore Supply

The incomer shore supply at the aft of ECO-SPARK® consist of:

MCCB 3P 400A 36kA c/w MCH 220VAC + UVT 220VAC + Aux
MCB 2P 6A 6kA
Digital Power Meter "PAC3200"
Smart Relay Logo 24VDC
Logo IO Expansion Module
Transformer Control 400V/230V/2P/100VA
CT Class 1 15VA 400/5A
Emergency Stop
Indicator Light RYB 415VAC
Fuse Carrier + Fuse 6A

10.3 Bus Coupler

The bus coupler at the aft of ECO-SPARK® consist of:

MCCB 3P 400A 36kA c/w MCH 220VAC + UVT 220VAC + Aux
Selector Switch 1-0-2
Transformer Control 400V/230V/2P/100VA
Contactor Relay 220VAC 3NO + 1NC
Indicator Light RYB 415VAC
Fuse Carrier + Fuse 6A

10.4 Outgoing Bus A Section

The outgoing bus A section at the aft of ECO-SPARK® consist of:

- Transfer Pump DOL
- FW Hydrophore No. 1 & 2 DOL

- MSB 230V
- Electrical Hoist
- Plug Socket 3P Port Side

10.5 Outgoing Bus B Section

The outgoing bus B section at the aft of ECO-SPARK® consist of:

- Ventilation Fan No. 1, 2, 3 & 4 DOL
- Fire & GS Pump
- Main Deck Hoist
- MCC
- Plug Socket 3P STBD Side

10.6 230VAC Main Switchboards

The 230VAC main switchboards located at the aft of ECO-SPARK® consist of:

INCOMER Transformer
MCCB 3P 250A 36kA c/w Shuntrip 220VAC + Aux Contact
Insulation Monitoring
Digital Power Meter "PAC3200"
Over Current Relay
Smart Relay Logo 24VDC
Logo IO Expansion Module
Power Supply 230V/24VDC/4A
CT Class 1 15VA 250/5A
CT Class 5 P10 15VA 250/5A
Indicator Light RYB 220VAC
Fuse Carrier + Fuse 6A

The switchboard consists of 20 no. of MCB 3P 25A 10ka and 8 no. of MCB 2P 20A 10ka incorporated into a box panel of about 2000H x 750W x 600D free standing IP44

10.7 Motor Control Centre

The MCC located at the ECO-SPARK® consist of:

INCOMER
MCCB 3P 250A 36kA c/w MCH 220VAC + UVT 220VAC + Aux Con
Digital Power Meter "PAC3200"

Over Current Relay
CT Class 1 15VA 250/5A
CT Class 1 15VA 50/5A
Module Auto Hybrid PV "IM-NTC-BB"
Extension Module Analogue Input/Output "Intel AIN8/8"
Display television 8
Phase Monitoring Relay 400V
CT Transducer 0-10V / 0-20mA
Power Supply 230V/24VDC/4A
Fuse Carrier + Fuse 6A

The MCC incorporated into a box panel of about 2000H x 1850W x 600D free standing IP44.

The MCC will be interconnected to the following equipment: -

- Sea Water Pump No. 1, 2 & 3 SS
- Drum Filter No. 1, 2 & 3 DOL
- Generator No. 1 & 2 SS
- Chiller No. 1 & 2 DOL
- Roots Blower No. 1, 2 & 3 SS

10.8 Distribution Panel

The common distribution panel located at the ECO-SPARK® consist of:

- DB Light P/H
- DB Light Stbd Side
- DB Light Port Side
- DB Navigation Light 24VDC
- DB Backup 24VDC
- DB Container
- DB Shore Connection

10.9 Transformers

2 no. of transformers supplied by Owner shall be dry insulated marine type with IP22 enclosure. The transformer shall step down 415Volt to 230 Volt, 3 phase transformers, each of sufficient capacity to supply all normal loads.

10.10 Alarm Monitoring System

The Alarm Monitoring system located at the ECO-SPARK® consist of:

Precision Tower
9th Gen Intel Core i7-7500 (Quad Core 3.8Ghz Turbo,32GB (2x16GB)
3333MHz DDR4, 3.5" 1TB 7200rpm SATA HDD
Microsoft Windows 10 Professional 64-Bit OEM
Microsoft Office

SCADA Software and System
Display 24" Monitor

The alarm monitoring system is meant for: -

- Deadman alarm at Generator compartment & all Pump rooms
- Fish farm water quality
- CCTV
- Faulty of equipment

10.11 CCTV

48 unit of 2MP, 1/2.8" CMOS Sensor. 3-Inch Bubble, 4X Optical zoom, outdoor & indoor use, H.264 codec

10.11 Aquaculture Sensor

The Aquaculture Sensor located at the ECO-SPARK® consist of:

Aquaculture Sensor	Qty
Aqua TROLL 500, Non-Pressure	8
Aqua TROLL Temperature/Conductivity Sensor	2
Aqua TROLL Temperature Only	6
Aqua TROLL pH/ORP Sensor	6
Aqua TROLL RDO Sensor (includes RDO-X Cap)	2
Aqua TROLL Sensor Port Plug	12
Aqua TROLL Wiper Port Plug	5
Aqua TROLL Wiper	1
RDO Titan W/ Sensor Cap	6
Dissolved Oxygen Calibration Kit – Includes 1 Litter Di Water, 1/2 Litter Na2So3	1
pH/ORP Calibration Kit – Includes 1 Litter Each: 4, 7, 10 pH, Zobel's Solution	2
pH Storage Solution, 500 ml	1
Wireless TROLL Com for iOS, Android, and PC (Twist Lock/Cable Connect Version)	1
Comm Kit, USB	1
Conductivity Calibration Solution, 58,670µS/cm, Litter	1
RDO Titan Cable, Feet TPU, No Reel, STPD and TND, Strain Relief; 1m	1
Rugged Twist-Lock Cable, Non-Vented, TPU, SM Spool, STPD and TND, None	3
Rugged Twist-Lock Cable, Non-Vented, TPU, SM Spool, STPD and TND, None	2

Rugged Twist-Lock Cable, Non-Vented, TPU, No Reel, Twist-Lock, None; 20m	1
Aqua TROLL 500/600 Maintenance Kit Includes Calibration Sponges, O-Rings/Grease, Tools, Wiper Brush and Screws, Desiccant and Lens Cloth	5
RDO Titan Cable, Feet TPU, SM Spool, STPD and TND, Strain Relief; 60m	6

10.12 PV Rooftop System (Solar Panels)* Qty of below table for reference only final Qty have approved by owner

The Bop Rooftop system located at the ECO-SPARK® mid-roof top with outfitting structural consist of:

Bop Module HBV144 325M	432
QS1, 4-in-1 Micro - Inverter	108
ECU-R	15
Metal Zinc Cover 2100mm	590
Self-Tapping Screw	2670
AC Bus Cable 2*2.5mm with AC connector	120
Metal Zinc Cover design 1	78
Metal Zinc Cover design 2a	30
Metal Zinc Cover design 2b	54

All the Micro Inverter to be installed below jack roof platform with ladder from main deck.

SECTION 11 – SCOPE OF WORK

ITEM	DESCRIPTION
I	**SEA TRANSPORTATION**
1	Transportation of Barge form Singapore (CHG Yard) to Batam (Builder Yard)
2	Transportation of ECO-SPARK® from Batam builder yard to Singapore (S1) FC131E site and include the clearing of Batam Harbour Master and all other local Batam Authority
II	**UPSLIP BARGE FOR UNDER WATER MODIFICATION**
1	Upslip barge together with Spud Legs or not additional charge for the Spud legs remove and reinstall.
2	Launching the barge together with Spud Legs or not additional charge for the Spud legs remove and reinstall.
III	**STEEL WORKS - QUOTE STEEL WEIGHT (312MT) TO BE INCLUDED AS MENTIONED BELOW ITEMS AND NOT LIMITED. -REFER TO APPENDIX B - GENERAL ARRANGEMENT DRAWING; APPENDIX C- MTO OF STEEL WEIGHT**
1	Roof Structure
2	Mezzanine Deck to Broodstock Deck
3	Bridge Deck
4	Monkey Island
5	Accommodation- structures
6	All the compartment on Main deck/ Mezzanine Deck/ Bridge Deck
7	Pump room (below Main deck)
8	Moon Pool (Main deck to Bottom)
	Ramp Door Modification
9	Existing Manholes replacement

10	Outfitting works e.g. Platform, ladders including the weatherproof type door for pump room, generator room, O2/O3 Generator room and store room.
11	Side panel – from main deck to upper deck around the vessel excluded the laydown area, Side panel fabricated by structures and Solid Polycarbonate sheet 4mm to be installed.
IV	PIP**ING - YARD PROVIDE THE PIPING MATERIALS, FLANGES WITH GASKETS, PIPE SUPPORT AND VALVES ACCORDING TO PIPING SYSTEM DIAGRAM PROVIDED BY OWNER**
1	Fuel Oil Piping System
2	Fresh Water Piping System
3	Pump Room & Duct Tunnel Ventilation Layout
4	Fish Tanks Sea Water Inlet Piping System
5	Fish Tanks Sea Water Outlet Piping System
6	Air Vent, Sounding and Filling Pipes
7	Bilge & Fire Main System
8	Domestic FW Supply & Discharge System
9	Details of Overboard Discharge (For Deck Drain to overboard)
10	Sludge System
11	Fish Tank Airlift Pipe System
12	Rain Water Collection System
13	Sewage System
14	Air Bubbles System
15	O2 System
16	O3 system
17	Back Flush System for Drum Filter
18	Protein Skimmer Removal System
19	Ballast System
V	**ELECTRICAL - YARD SUPPLY THE CABLES, CABLE TRAY, LIGHTS PLUG AND SOCKETS ACCORDING TO THE ELECTRICAL DRAWINGS.**

1	Cable Tray fabrication and installation
2	Power cables/control cables and Switches, Plug and Sockets
3	
VI	**EQUIPMENT INSTALLATION - REFERENCE TO EQUIPMENT LIST AS ATTACHED.**
1	Fabrication of equipment seating and installation of equipment
2	Testing / Commissioning of yard supplied equipment
VII	**HULL AND INTERNAL BLASTING & PAINTING - YARD TO BE PROVIDED THE BLASTING & PAINTING FACILITIES WITH STAGING TO CARRY OUT BLASTING & PAINTING AS FOLLOWING: ALL THE PAINT SPECIFICATION TO BE APPROVED BY OWNER. ALL THE PAINT TO BE SUPPLY BY YARD.**
1	External hull - Grit Sweep blasting SA 1.0 with Finishing Coat according to painting Spec.
2	Upper deck and existing structures - Grit blasting SA1.0 with Finishing coat
3	Existing tanks which are covert to fresh water tank to be high pressure washing and cleaning.
4	Existing tanks which are covert to compartments to be grit blasting up to sa.2.0 with two coated.
5	All the structures fabricated by yard to be blasted and painted according to the painting specification.
6	Zinc Anode installation for tank internal & external Hull according to specification and Zinc Anode arrangement.
VIII	**BARGE AT SLIPWAY SCOPE OF WORK**
1	Sea Chest at pump Room (6P) x 2 units
2	Moon Pool 1.5m x 1.5m at Fr. 29 to Fr. 30 (1C)
3	Zinc anode for hull external
4	Degassing Block Structures
5	DO Tank (5C0 / Void Tank
6	Slug Tank no. 2C

7	Overboard Piping / Valves
8	Existing fuel Oil pipe Remove
9	Thank blasting or tank cleaning with high pressure water and painting
10	External Hull painting
11	Spud casing welding seam partially renew- back gouging and reweld
12	Bottom plate and side shell plates renew – two location

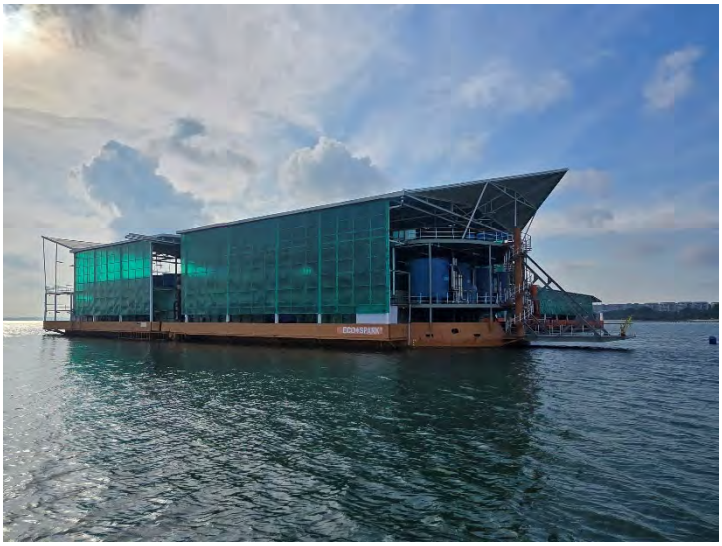
SECTION 12 - OWNER FURNISHED EQUIPMENT (OFE) LIST

S/No	Equipment	Quantity	Remarks
S3	Accommodation		
	Staff Galley		
	Water Filtration System	1	
S4	Farming System		
	Post-Nursery Tank	39	
	Post-Nursery Tank	27	
	Broodstock Tank	4	
	Larviculture Tank	12	
	Rotifer Tank	8	
	Artemia Tank	6	
	Pre-Nursery Tank	28	
	Foot-tray (Fiberglass)	12	
S6	Deck Machinery		

	Electric Chain Hoist (2 Ton) (Lifting Height 13m)	2	
S7	SHEM & LSA		
	GS Pump	1	Refer to S8
S8	Machinery Equipment		
	Main Generator Set (250kWe)	3	
	Seawater Intake Pump (650 m3/hr @ 7.5m) **VFD & Motor**	2	
	Seawater Intake Pump (450 m3/hr @ 7.5m) **VFD & Motor**	1	
	Influent Drum Filter (1350m3/hr @ 40 micron)	2	
	Influent Drum Filter (1350m3/hr @ 100 micron)	2	
	Effluent Drum Filter (800m3/hr @ 100 micron)	2	
	Ozone Tower (Diameter 2.4m x 3.7m Height)	2	
	Ozone Generator (2 x 900g/hr)	2	
	O2 Generator (12m3/hr)	2	
	Root Blower (300mB @ 1122m3/min)	2	
	Degassing Block	1 Lot	
	RAS Pump (200m3/hr @ 7m head) **VFD & Motor**	2	
	Influent Drum Filter (200m3/hr @ 26 micron) RAS	2	
	Bio Filter	4	
	Bio Filter FRP Tank	2	
	Bio Contact Oxi-dation FRP Tank	4	
	Protein Skimmer (200m3/hr)	2	
	Ultra Violet Unit (200m3/hr)	2	
	Sand Filter (200m3/hr)	2	
	Ballast Pump (150m3/hr @ 6m head)	2	
	Bilge Pump (15m3/hr @ 20m Head)	1	
	GS & Fire Pump (55m3/hr @ 58m Head)	1	
	Fuel Oil Transfer Pump (2.6m3/hr @ 12 m Head)	2	
	Sludge Pump (5m3/hr @ 45m Head)	1	
	Heater & Recirculating Pump (25m3/hr @ 6m Head)	2	
	New Water Supply Pump (300m3/hr @ 6m Head) **VFD & Motor**	3	
	New Water Supply Pump (60m3/hr @ 5m Head)	3	
	Portable Water		

	Nano Filtration		
	Ultra Violet with metering counter		
	Hydrophore Set (2 x 5m3/hr @ 50m) (Tank 2 x 2m3 @ 7 Bar)	1	
	60 - 80 Ton RO Plant	1	
	Domestic Water		
	With metering counter		
	Hydrophore Set (2 x 5m3/hr @ 50m) (Tank 2 x 2m3 @ 7 Bar)	1	
	Sewage Treatment Plant (50 Pax)	1	
S9	Piping System		
	Oxygen Diffuser (Ceramic)		
60	Polycarbonate sheet 4mm	1 lot	
61	Fuel oil transfer meters	1lot	
62	Fresh water system flowmeters	3	
S10	Electrical System		
	415V Main Switchboard		
	Shore Supply		
	Bus Coupler		
	Outgoing Bus A		
	Outgoing Bus B		
	230VAC Main Switchboard		
	Motor Control Centre		
	Distribution Panel		
	Transformers		
	Alarm Monitoring System		
	Aquaculture Sensors		
	PV Rooftop System		
	CCTV		
	SCADA System		

ECO SPARK

		**ECO SPARK** whilst she lay secured by spud anchors at Serangoon Harbour on 4th June 2026.
		Forward view of **ECO SPARK**.
		**ECO PARK** aft view.

ECO SPARK

		Starboard view.
		Starboard bow.
		Forward view of **ECO SPARK**.

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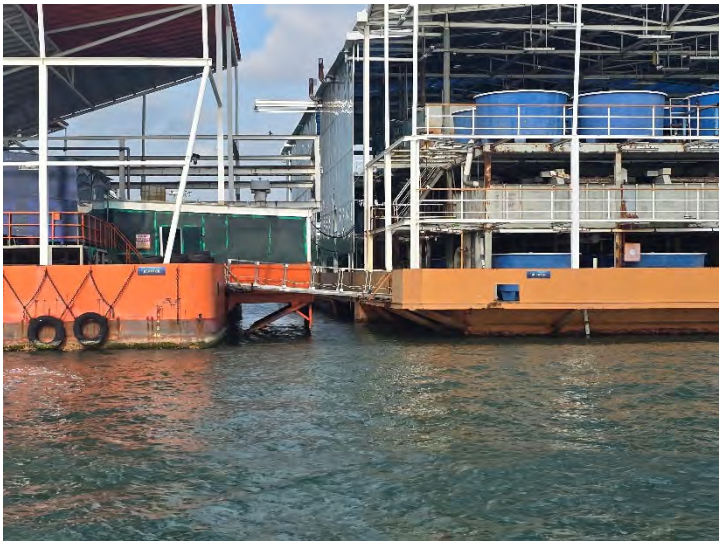
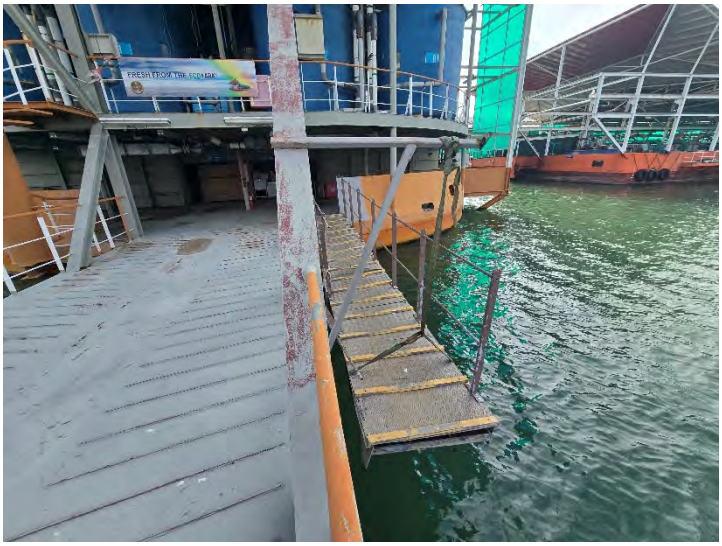
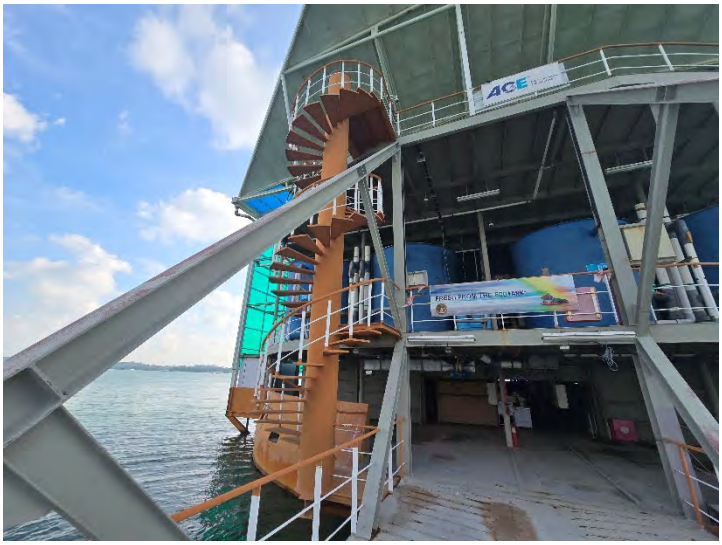
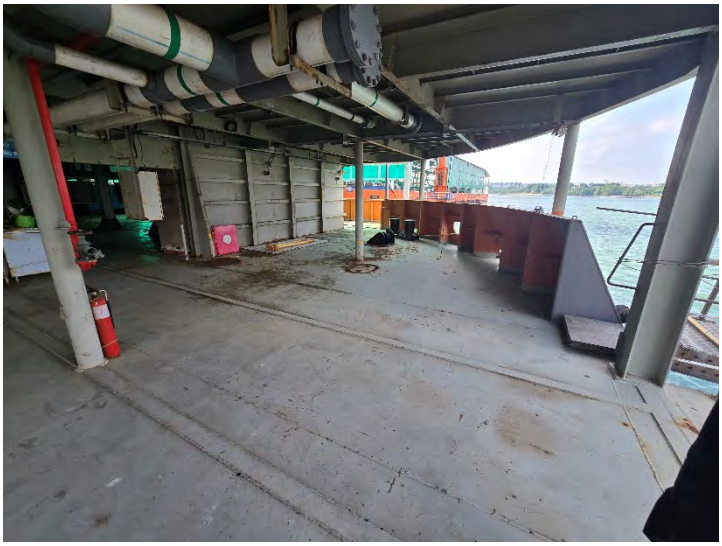
		Sister farms.
		Linkway between **ECO SPARK** and sister farm.
		Forward ramp.

ECO SPARK

		Gangway ladder.
		Spiral stairway accessing bridge deck mezzanine and main decks.
		Forward main deck (Stb).

ECO SPARK

		Forward main deck (P).
		Close up of towing bracket corroded state.
		Towing bracket and double bitt on forward deck port found with corroded foundation welding seams.

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		Towing bracket and double bitt on forward deck starboard found with corroded foundation welding seams.
		Portside spud anchor.
		FW ballast tank ventilation head corroded.

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		Starboard spud anchor.
		Air-conditioning compressors fully wasted.
		Ventilation flap for farm office wasted.

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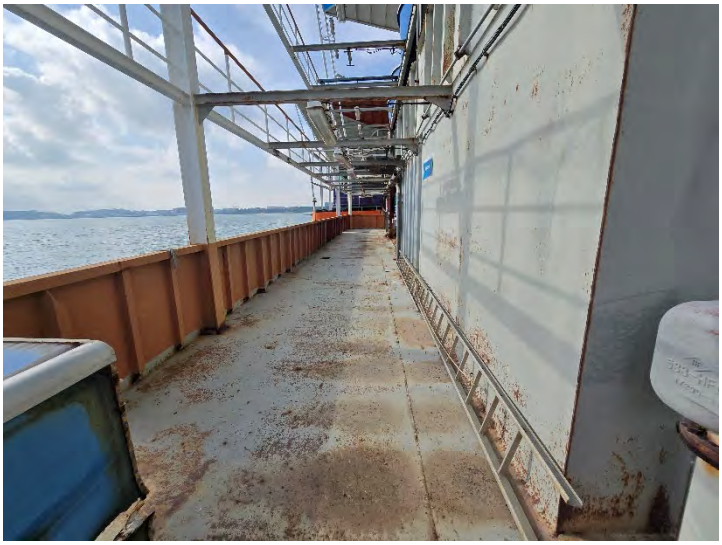
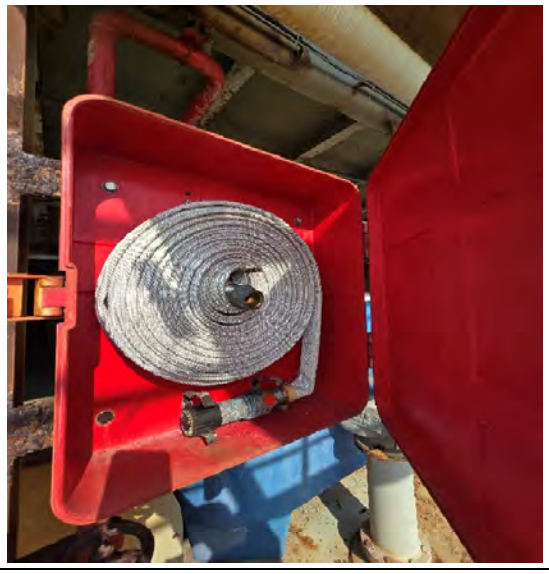
		Rusted main deck plating.
		Starboard main deck.
		Fire fighting hose in good condition.

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		Aft main deck with accessway to other facilities.
		Double bitt.
		Tunnel floor hatch cover.

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	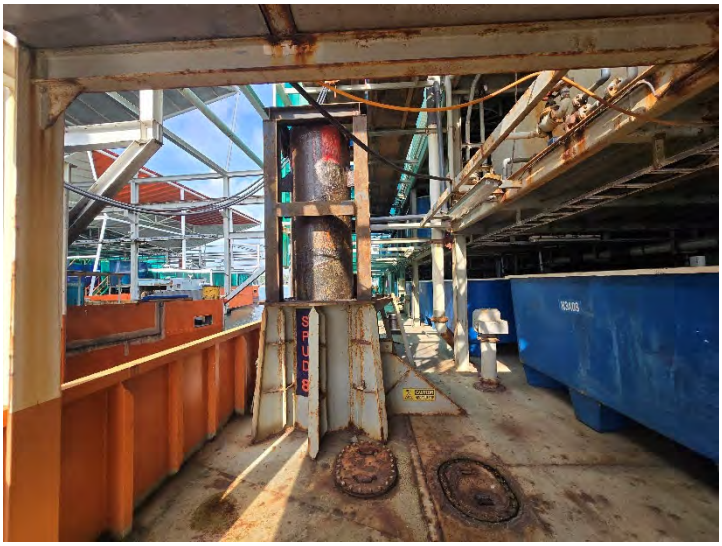	Spud anchor.
		Portside of main deck. View of other two facilities.
		Diesel oil bunkering manifold.

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	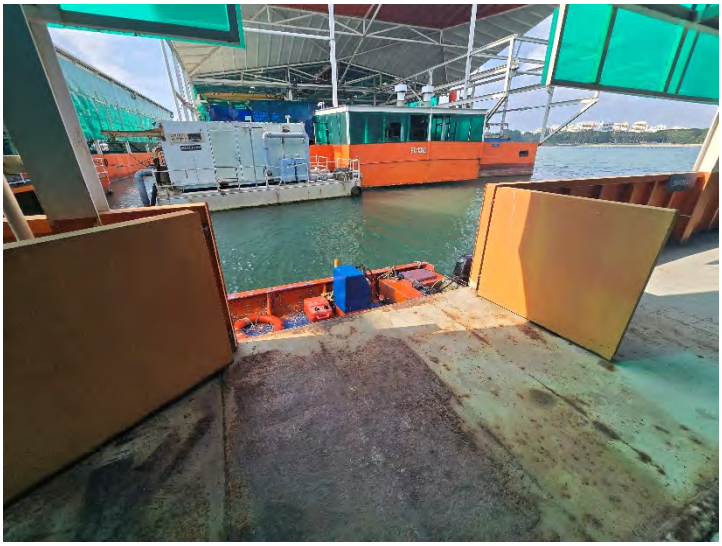	Boarding and disembarkation point.
		Juvenile and adult fish tanks.
		Inside of fibreglass rectangular tanks.

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		Drain valves for tanks.
		PVC piping appeared in good condition.
		Juvenile/ Adult fish tanks on main deck.

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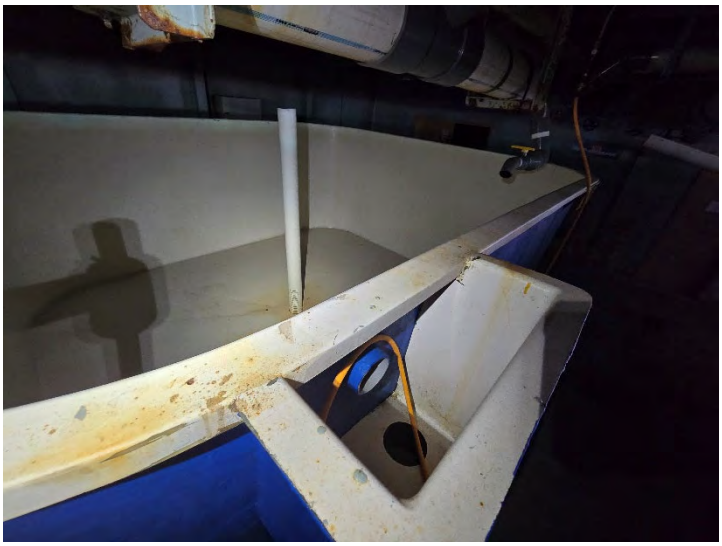
		Main deck aft.
		Fish farm office space on main deck.
		Water inlet and overflow ports on rectangular tanks.

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		Plywood boards as access between tanks.
		Rusted main deck plating.
		Staff cabin on main deck.

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	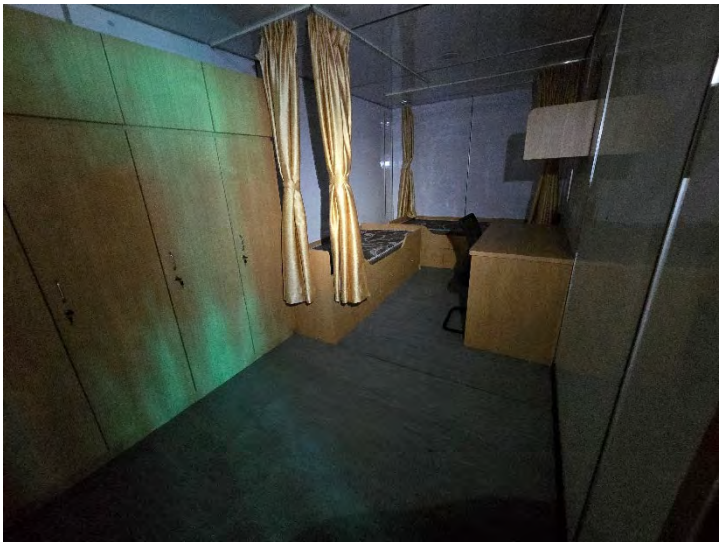	Staff cabin on mezzanine deck.
		Seawater inlet into filter unit.
		Water filter.

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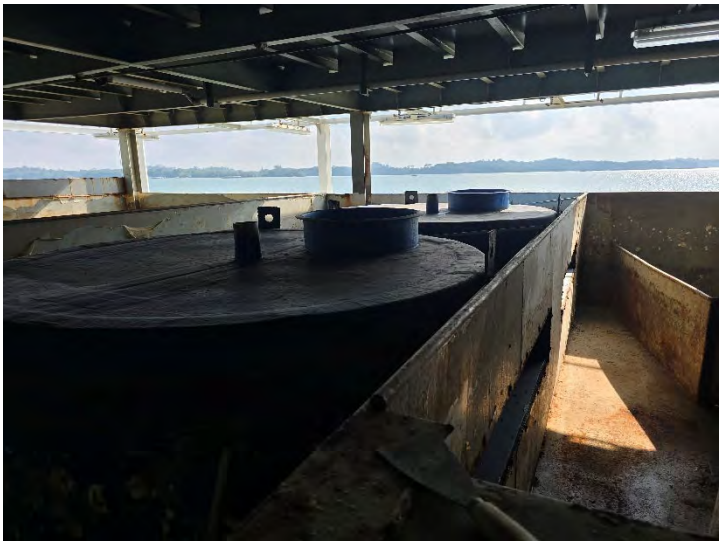
		Water filter.
		Ozone tower.
		Ozone tower.

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		Oxygen generator x 2 nos.
		Oxygen generator x 2 nos.
		Aux. engine jacket cooling tank.

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		Pump room.
		Filter unit pumps.
		Ozone room with ozone generator and master control panel.

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		Chiller unit.
		Mezzanine deck loading access starboard side.
		Mezzanine deck loading access portside.

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	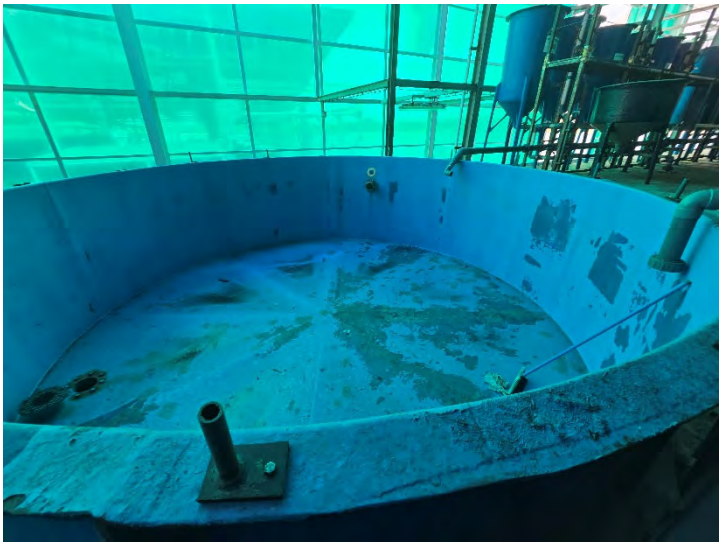	Broodstock tank.
		Artemia tanks.
		Hatchling nursery tanks.

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		Broodstock tanks.
		Broodstock tanks.
		Main deck (aft) plating corroded.

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		U-bolt corroded.
		Fingerling nursery tanks.
		Sand filter manifold.

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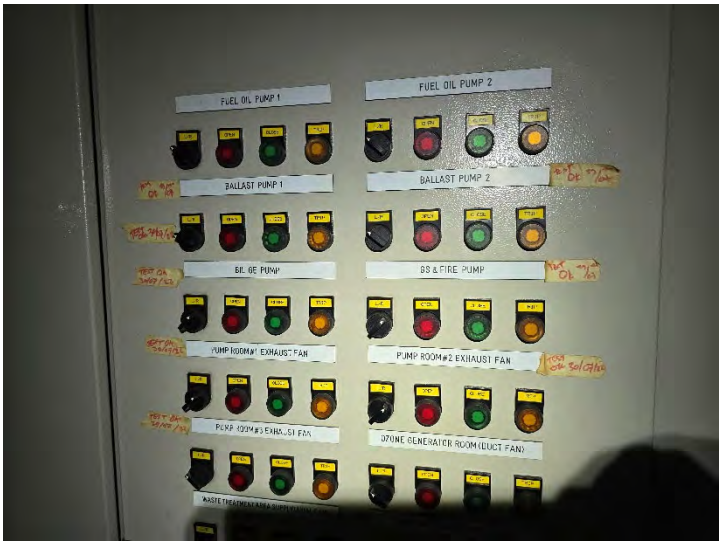
		Control room.
		Auxiliary services control panel.
		Aux engine switchboard panels.

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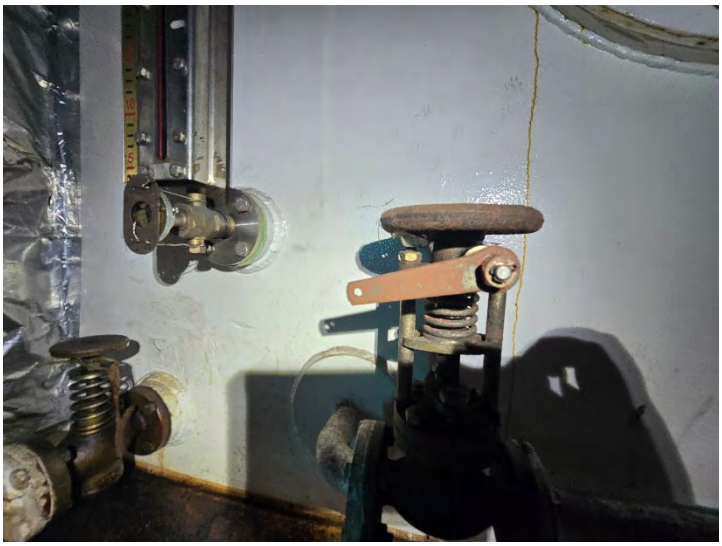
		Aux. engine room.
		Diesel oil service tank for aux. engines.
		No quick closing valve remote activation wire connected to release mechanism.

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		Aux. engine no. 1 exhaust manifold in rusted condition.
		Aux. engine no. 2 turbocharger in rusted condition.
		Aux. engine no. 1.

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		Aux. engine no. 1 exhaust manifold in rusted condition.
		Aux. engine no. 1 turbocharger in rusted condition.
		Corroded fire extinguishers.

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		O2 generator.
		Air bottle for tank aeration.
		Stairway to bridge deck.

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		Bridge deck.
		Faux grass section of the bridge deck.
		Bridge deck plating in corroded and blistered state.

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		Accessway into below main deck.
		Stairway down from main deck to below main deck.
		Freshwater hydrophore tank and pumps x 4 set.

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		Sewage treatment plant.
		Below main deck space well coated and in good condition.
		Freshwater ballast pumps.

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	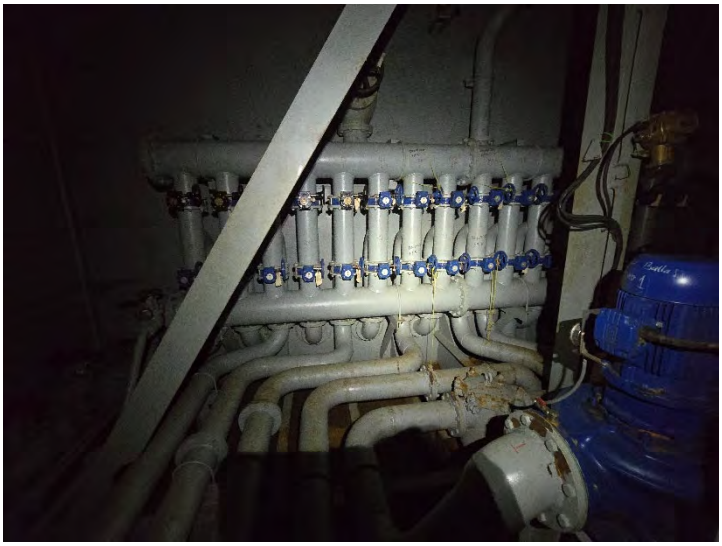	Ballast valve manifold.
		Below main deck watertight door found without door seals.