Code of Practice for Aquaculture Vessels 1.21.005

Final Guidance

The Blue Economy CRC is funded in part under the Australian Government's CRC Program, administered by the Department of Industry, Science, Energy and Resources.

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BLUE ECONOMY COOPERATIVE RESEARCH CENTRE

Australian Government Department of Industry, Science, Energy and Resources | AusIndustry Cooperative Research Centres Program

Table of Contents

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FOREWORD

The Australian *Code of Practice for Aquaculture Vessels* has been formulated to provide guidance for the planning, building, surveying, and operation of aquaculture vessels in Australian waters. This code serves as a resource for individuals engaged in the design, construction, production, ownership, or operation of aquaculture vessels. Its central objective is to facilitate the certification, commencement, and safe operation of these vessels, thereby fostering the efficient and secure provision of aquaculture services. Specifically tailored to domestic commercial vessels exclusively operating within Australia's Exclusive Economic Zone, the code addresses the unique challenges associated with aquaculture operations.

Aquaculture stands out as one of the most hazardous industries worldwide. Operating within this sector exposes individuals to harsh weather conditions, including winds, currents, and waves that lead to significant vessel motion. Additionally, technical, operational, and geographical challenges vary based on the farmed species and location. Given that most aquaculture vessels are categorized as small vessels, and with a lack of specific Work Health and Safety (WHS) procedures for aquaculture operations in Australia, there is a pressing need for comprehensive guidelines to address these multifaceted challenges in design, operation, and safety.

The formulation of an offshore aquaculture service vessels Code of Practice aligns with ongoing efforts in the shipping industry. This Code of Practice underscores the necessity of producing a guideline with broad adoption across both the industry and government spheres. Accordingly, it draws significant contributions from all segments of the aquaculture industry. The code's objectives encompass improving design, enhancing safety measures, and elevating animal welfare. These goals were pursued through a series of steps:

1. A comprehensive review of existing rules and regulations was conducted to gauge regulatory considerations. The review concentrated on regulations pertinent to aquaculture vessels within the National Standard for Commercial Vessels (NSCV), publications of the Australian Maritime Safety Authority (AMSA), guidelines from classification societies, the IMO-developed Special Purpose Ships (SPS) Code, and the developments of the Norwegian research centre for exposed aquaculture operations.
2. Stakeholders were engaged through interviews to gather feedback on prevailing aquaculture practices and guidance standards. Conversations delved into the existing regulatory landscape and aquaculture requirements, involving pertinent authorities, industries, and companies engaged in offshore aquaculture vessel operations. This dialogue aimed to extract insights on gaps identified through literature review and was conducted between September 2022 and January 2023. The interviewees, totalling 11 individuals, spanned four aquaculture sectors (research, authority, designer, and operator), ensuring diverse viewpoints. The interview questions encompassed five categories: design and operation, regulation, human safety, training and qualifications, and food safety management systems and live animal health and welfare during transport.
3. During this phase, interview findings were categorized into five themes, each highlighting challenges and potential solutions:
   (a) Design and Operation: The foremost concern was stability, with catamarans emerging as the preferred choice due to their stability in sea motions. Notably, challenges encompassed material handling and mooring complexities. Diverse hurdles across industry sectors were noted, accompanied by potential solutions such as multi-purpose vessels and dynamic positioning.
   (b) Regulations: A critical issue was the service notation, causing vessels to be classified as fishing vessels, leading to compliance and safety complications. The absence of specific regulations

for aquaculture vessels was evident. Suggestions from participants revolved around segregating fishing and aquaculture operations to enhance safety and efficiency.

(c) Human Safety, Training, and Qualifications: Safety challenges within this category revolved around transitioning to offshore locations. Participants emphasized the need for enhanced training and work practices. Addressing challenges involved initiatives such as aquaculture management courses, effective management of asset contact, and tackling health and safety concerns, notably slips, trips, and falls.

(d) Food Safety Management Systems: Ensuring the integrity of the cool chain for aquaculture products took precedence, demanding vessels to incorporate specific features to avert contamination. Challenges encompassed leveraging blockchain technology for traceability, as well as adhering to food safety standards and certifications. Notably, distinct roles within this aspect were attributed to the authority, operator, and designer sectors.

(e) Live Animal Health and Welfare During Transport: This area presented challenges that involved delicate handling to mitigate stress, along with the imperative of monitoring water quality parameters. Essential parameters, including oxygen levels, temperature, ammonia concentration, carbon dioxide levels, salinity, and ozone, required continuous monitoring during the transport process to ensure the well-being and health of transported animal.

4. Developing the Code of Practice for aquaculture vessels based on regulatory review and stakeholder input. The code's formulation was a pivotal step in ensuring safe and sustainable vessel operation. By incorporating the feedback and focusing on the key areas identified, the draft of the Code of Practice was designed to be accessible to stakeholders across the spectrum. Iterative refinement, informed by additional stakeholder input, ensures the code's practicality and relevance.

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Participating Organizations for Interviews and Consultation Activities

In alphabetic order

AEXGroup (Chile)	DNV (Australia and Norway)
AMC Search (Australia)	Green Aqua (Chile)
AMSA (Australia)	Oysters Tasmania (Australia)
BMT (United Kingdom)	Tassal (Australia)

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1. General

1.1. Application and Scope

(1) The Code of Practice has the status of a voluntary guideline.

(2) This Code of Practice outlines the regulatory requirements for commercial vessels, including Recreational Activity Vessels (RAVs) and Domestic Commercial Vessels (DCVs), operating within Australian waters. It is imperative that all such vessels adhere to the necessary certification and standards to operate legally.

(3) AMSA, hereinafter referred to as "the Authority," emphasizes that this Code of Practice should not be regarded as a substitute for the statutory standards prescribed by legislation. Compliance with the applicable laws, associated Marine Orders, and relevant international conventions remains the primary obligation.

(4) All commercial vessels, including RAVs and DCVs, must initiate the certification process by ensuring full compliance with the provisions of applicable legislation and associated Marine Orders. Compliance with all relevant international conventions is also mandatory.

(5) In the event that compliance with the aforementioned requirements cannot be immediately achieved, vessel operators shall submit applications for exemption, equivalence, or waiver as per the provisions of the Authority's established exemption pathways.

(6) The Authority acknowledges the existence of exemption pathways for cases where strict compliance with regulatory standards is challenging. Operators may apply for exemptions in accordance with the procedures specified by the Authority.

(7) In the event of seeking certification or other approval to operate in Australian waters, including an exemption from the requirements, compliance with the Code of Practice may provide support. Alternatively, the vessel must adhere to the standards set forth in the law.

(8) This guide pertains to self-propelled vessels and unpowered barges intended for unrestricted service, with a primary focus on those engaged in aquaculture operations.

(9) Commercial vessels engaged in unrestricted operations must adhere to specific certification requirements in line with the regulations outlined in the Navigation Act 2012.

(10) Compliance with the certification standards for RAVs is predicated on internationally recognized conventions and agreements, including but not limited to: The Convention for the Safety of Life at Sea (SOLAS) and the 1966 International Convention on Load Lines.

(11) Vessels equipped with refrigerated holds are mandated to comply with the requirements for refrigerated vessels.

(12) The Code of Practice is applicable to aquatic animals, including fish, molluscs, and crustaceans. While it can also offer guidance for aquatic plants such as seaweed, their specific needs have not been addressed in this document.

1.1.1. Aquaculture Operations

(1) The Code of Practice has been specifically designed for vessels that operate in aquaculture sites. This includes:

(a) service vessel.

(b) feed carriers.

(c) wellboats (live fish carriers).

(d) Any vessel that serves aquaculture sites and is involved in activities such as placing moorings, net changing, stock cleaning, grading, harvesting, feeding, inspection, maintenance and repair of aquaculture installations, delousing and treatment, transportation and distribution of pellets, transportation of live animal, harvesting, and/or processing.

1.1.2. Commercial Vessels

(1) The Code of Practice has been primarily developed for commercial vessels operating within Australia, Domestic Commercial Vessels (DCVs), including those operated for government purposes.

(2) However, the Code of Practice is not applicable to domestic commercial vessels that qualify as fast craft according to the National Standard for Commercial Vessels (NSCV).

(3) The Code of Practice can serve as a source of information for the design, construction, and operation of a commercial vessel operating internationally (beyond Australia's Exclusive Economic Zone), including both Australian and foreign vessels that are subject to regulation.

(4) This Code of Practice has been formulated to meet modified domestic commercial vessel requirements and standards, such as those established by the NSCV. Requirements for Regulated Australian Vessels (RAVs) and foreign vessels are based on international conventions such as the Convention for the Safety of Life at Sea (SOLAS), for which the NSCV is generally not applicable. As a result, the sections of this code that apply the NSCV or other DCV standards and requirements may not be appropriate for regulated Australian and foreign vessels.

(5) Modifications to the requirements and standards must be formally submitted to the Authority, including comprehensive documentation justifying the necessity for change, potential impact assessment, and proposed alternative solutions.

1.1.3. Design, Construction, Survey and Operation

(1) The Code of Practice provides recommendations for the design, construction, survey, and operation of commercial vessels that operate within Australia.

(2) Domestic commercial vessels intending to operate in Australian waters must obtain a certificate, approval, or exemption that allows them to do so. When evaluating an application for a certificate, approval, or exemption, the regulator may take into account compliance with the Code of Practice. However, depending on the vessel and its intended operation, additional requirements beyond the scope of the Code of Practice may also be necessary to ensure compliance.

NOTE To confirm the requirements for a specific vessel and operation, applicants such as the designer, builder, or operator should contact AMSA. For more information, please refer to Contact (amsa.gov.au).

(3) All commercial vessels must possess the appropriate certification for their intended operations. When pursuing such certification, the initial step should be to ensure compliance with the applicable legislation, associated Marine Orders, and all relevant international conventions. If full compliance with these requirements cannot be achieved, applications for exemption,

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equivalence, or waivers will be necessary and may only be granted upon the receipt of satisfactory supporting documentation.

(4) Elements of the International Convention for the Prevention of Pollution from Ships (MARPOL) apply to domestic commercial vessels. All aquaculture vessels must comply with State/Territory and/or Commonwealth legislation that implements MARPOL and other environmental protection requirements that are applicable to the vessel. As these obligations apply irrespective of this Code of Practice does not address the requirement for vessels to comply with environmental standards and conventions.

NOTE For more information on MARPOL and other environmental protection requirements, please refer to Marine pollution (amsa.gov.au).

NOTE State waterway management obligations may also be applicable.

1.2. Definitions

(1) *Aquaculture vessel.* Vessels intended to be primarily engaged in aquaculture operations include farm support vessels, feed carriers and live animal carriers.

(2) *Feed carrier.* A vessel used primarily for the transportation of feed, such as pellets or other manufactured feed products, to aquaculture facilities or farms.

(3) *Industrial personnel*. All persons who are transported or accommodated on board for the purpose of offshore industrial activities performed on board other vessels and/or other offshore facilities. See *IMO RESOLUTION MSC.418(97)*.

NOTE Industrial personnel are not defined under the National Law. See 'special personnel' under NSCV Part B.

(4) *Service vessel.* A multi-purpose vessel predominantly involved in aquaculture operations such as offering maintenance and repair services to aquaculture installations, delousing, transportation of feed pellets, harvesting, and/or conducting inspections and monitoring of aquaculture facilities, encompassing water quality assessments and animal health surveillance.

(5) *Unpowered barge*. As per AMSA definition, a vessel that is not propelled by mechanical means and is navigated by a powered vessel that moves it by pushing or towing. An unpowered barge may have propulsion that allows it to stay in a fixed position in the water at a work location or assist while being towed to or from a work location.

   (a) *Feed barge*. An unpowered barge serves primarily as a feeding station and storage facility for aquatic animal feed.

(6) *Wellboat* (*live fish carrier*). A vessel that is used for the transportation of live fish.

(7) *Harvest vessel, refrigerated carrier, slaughter/processing vessel or factory vessel.* Fishing vessel, processing vessel, or mother ship of a fishing fleet, which is provided with facilities for freezing and products.

(8) For terms used, but not defined in this Code of Practice, the definitions as given in the references under section 1.5 shall apply.

1.3. Classification and Notation

(1) The requirements for classification conditions are contained in the *NSCV Part B Chapter 2*.

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(2) For vessels designed, constructed and surveyed by a recognised organisation, refer to the *NSCV Part B Chapter 3.1*.

(3) For vessel identifiers exemptions, see *AMSA EX01*.

(4) For vessels designed under ABS, see *Guide for Building and Classing Aquaculture Service Vessels* Section 2 (see section 1.5, No. 5).

(5) A vessel can be defined as a light craft if its displacement complies with DNV *Rules for classification: High speed and light craft* section 2.2.1 (see section 1.5, No. 6).

(6) Vessels with displacements less or equal of the above requirement can follow the requirements to strength and watertight integrity of a light craft.

(7) Vessels with displacements in excess of the above requirement shall be classified in accordance with additional requirements for strength and watertight integrity as stipulated for each ship type notation.

(8) If a vessel is not maintained in class, meaning it falls outside the classification of a Recognized Organization, it is obligated to adhere to the NSCV (for new vessels) or, more broadly, to the USL Code if it is an existing or transitional vessel. The NSCV acknowledges Lloyds Class Rules, Australian standards, or ISO standards as solutions deemed to satisfy construction requirements. If other class rules are utilized, an exemption or equivalence must be obtained from AMSA.

(9) It is highly recommended to utilize specialized vessels for any specialized operations rather than relying on multipurpose and general workboats.

(10) It is recommended that the purpose of the vessel is determined before the design is commenced. For example, an explicit understanding of the operational concept that considers the context of use.

1.4. Novel Features

(1) For all novel features see AMSA's policy on Novel vessels.

(2) Risk evaluations may be necessary to justify alternative arrangements or novel features in the aquaculture vessel. These evaluations can be applied to the vessel as a whole or to individual systems, subsystems, equipment, or components.

(3) For vessels intended to use alternative fuels or to reduce emissions see *IMO RESOLUTION MEPC.377(80)* (see section 1.5, No. 5b).

(4) For autonomous vessels see *Australian Code of Practice for the Design, Construction, Survey, and Operation of Autonomous and Remotely Operated Vessels* (see section 1.5, No. 12).

1.5. References

(1) National Standard for Commercial Vessels (NSCV):

- (a) Part C1: Design and Construction (Arrangement, Accommodation and Personal Safety)
- (b) Part C2: Design and Construction (Watertight and Weathertight Integrity)
- (c) Part C3: Design and Construction (Construction)
- (d) Part C4: Design and Construction (Fire Safety)

(e) Part C5A: Design and Construction (Engineering – Machinery)

(f) Part C5B: Design and Construction (Engineering – Electrical)

(g) Part C6A: Design and Construction (Stability - Intact Stability Requirements)

(h) Part C6B: Design and Construction (Stability - Buoyancy and Stability After Flooding)

(i) Part C6C: Design and Construction (Stability - Stability Tests and Stability Information)

(j) Part C7A: Design and Construction (Equipment - Safety Equipment)

(k) Part C7B: Design and Construction (Equipment - Communications Equipment)

(l) Part C7C: Design and Construction (Equipment - Navigation Equipment)

(m) Part C7D: Design and Construction (Equipment - Anchoring Systems)

(2) Commonwealth Legislation Marine Orders:

(a) Marine Order 12 – Construction - subdivision and stability, machinery and electrical installations

(b) Marine Order 15 - Construction - fire protection, fire detection and fire extinction

(c) Marine Order 21 - Safety and emergency arrangements

(d) Marine Order 25 - Equipment — lifesaving

(e) Marine Order 27 - Safety of navigation and radio equipment

(f) Marine Order 28 - Operations standards and procedures

(g) Marine Order 32 - Cargo Handling Equipment

(h) Marine Order 42 - Carriage, Stowage and Securing of Cargoes and Containers

(i) Marine order 503 - Certificates of survey

(j) Marine order 504 - Certificates of operation and operation requirements

(k) Marine Order 505 - Certificates of competency

(3) National Law Exemptions:

(a) AMSA EX01 — Marine Safety (Vessel identifiers) Exemption

(b) AMSA EX02 — Marine Safety (Certificates of survey) Exemption

(c) AMSA EX03 — Marine Safety (Certificates of operation) Exemption

(d) AMSA EX06 — Marine Safety (Periodic survey, equipment certification and compass adjustment)

(e) AMSA EX07 — Marine Safety (Temporary operations) Exemption

(f) AMSA EX10 — Marine Safety (Operation of fishing vessels)

(g) AMSA EX23 — Marine Safety (Masters or crew without certificates) Exemption

(h) AMSA EX40 — Marine Safety (Class C restricted operations) Exemption

(i) AMSA EX41 — Marine Safety (Unpowered barges) Exemption

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(j) AMSA EX44 — Marine Safety (Domestic commercial vessels – EIAPP certificate)

(k) AMSA EX45 — Marine Safety (General Purpose Hand) Exemption

(l) AMSA EX46 — Marine Safety (Coxswain Grade 3) Exemption

(4) The Uniform Shipping Laws (USL) code:

(a) Section 5D: Watertight subdivision of class 2 and class 3 vessels

(b) Section 5F: Structural fire protection

(c) Section 6: Crew accommodation

(d) Section 8: Stability

(e) Section 9: Engineering

(f) Section 10: Lifesaving appliances

(g) Section 11: Fire appliances

(h) Section 12: Radio equipment

(i) Section 14: Surveys and certificates of survey

(j) Section 15: Emergency procedures and safety of navigation

NOTE The NSCV has predominantly taken the place of the USL code for newly constructed domestic commercial vessels.

(5) International Maritime Organization (IMO) Resolutions:

(a) MSC.418(97): Interim Recommendations on the Safe Carriage of More Than 12 Industrial Personnel on Board Vessels Engaged on International Voyages.

(b) MEPC.377(80) Strategy on Reduction of GHG Emissions from Ships.

(c) Code of Safety for Fishermen and Fishing Vessels (STCW-F).

(d) International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code).

(6) American Bureau of Shipping (ABS), Guide for Building and Classing Aquaculture Service Vessels.

(7) Det Norske Veritas (DNV), Rules for classification: High speed and light craft.

(8) The Shipowners' Club, Tugs and Tows - A Practical Safety and Operations Guide.

(9) Energy Institute, G+/DROPS: Reliable securing booklet for offshore wind.

(10) International Marine Contractors Association (IMCA), M187: Guidelines for lifting operations.

(11) International Association of Oil and Gas Producers (IOGP), RP 376: Lifting and hoisting safety recommended practice.

(12) Trusted Autonomous Systems, Australian Code of Practice for the Design, Construction, Survey, and Operation of Autonomous and Remotely Operated Vessels.

(13) International Labour Organization, Maritime Labour Convention 2006 (MLC 2006).

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(14) Food Standards Australia New Zealand, Safe Food Australia: A Guide to the Food Safety Standards.

(15) Best Aquaculture Practice (BAP):

(a) Farm Standard
(b) Feed Mills
(c) Hatchery Standard
(d) Mollusc Farm Standard
(e) Salmon Farm Standard
(f) Seafood Processing Standard (SPS)

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2. Structures and Stability

2.1. General

(1) The hull structure and machinery of the vessel must be sufficiently robust to ensure safe operation under all anticipated conditions, including the required draught, power, and expected sea and weather conditions.

(2) It is crucial to provide special attention to the structural design that aligns with the vessel's intended purpose.

(3) A vessel will be deemed acceptable if its structure, including the hull, decks, and bulkheads, is well-maintained and adequate for its intended service. The structure must be structurally sound, watertight, and devoid of significant damage and corrosion.

(4) The vessel's structure must meet the construction standards and criteria outlined in Marine Order 503, Exemption 2, or Exemption 40, where applicable.

(5) All recesses in weather decks must be equipped with drainage systems to ensure effective water drainage under typical trim conditions. These systems should also function efficiently when the vessel is inclined at a 10-degree heel.

(6) All doorways providing access to spaces below the deck must have a permanent coaming with a minimum height of 300 mm, or a portable coaming securely fixed in guide channels to achieve a minimum height of 300 mm.

(7) Access or loading/unloading hatchways on the weather deck must have raised coamings of sturdy construction with a minimum height of 300 mm. If this is not feasible, the coaming height can be reduced or omitted, but the hatch must still be securely sealed against adverse weather conditions.

(8) Windows should not be fitted below the weather deck. If they are fitted, they must be of sound construction, provide watertight integrity, and be of strength compatible with their size. Portable blanking plates must be provided to cover at least 50% of the windows in the event of glazing breakage. These plates must be stored in a readily accessible position.

(9) Exposed air pipes serving fuel oil, hydraulic oil, and lubricating oil tanks must be fitted with anti-flash gauze diaphragms.

(10) Inlet or discharge openings must be fitted with a valve or seacock at the hull connection, which is readily accessible for operation in an emergency. If such valves are inaccessible in an emergency, they should be fitted with a remote means of operation.

(11) Openings serving as discharges from engine cooling water, bilge and general service pumps, galley and toilet drains, etc., must be fitted with an automatic non-return valve adjacent to the closing valve, or a screw down non-return type valve.

(12) Valves, pipes, and fittings serving as sea inlets and discharges attached directly to the hull of the vessel below the load waterline must be of steel, bronze, or other equivalent and compatible material.

(13) Where the sea inlet valve or fitting is connected to the hull by means of a tube or distance piece, the tube or distance piece must be of a material that is compatible with the hull and valve.

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(14) The vessel must have means to clear entrapped water on deck. This may be achieved by using freeing ports, permanent openings in the bulwarks, apertures in and under bulwark or stern ramp doors, or deck scuppers where the discharge is above the load waterline.

(15) The total area of the water freeing arrangements must be at least 3% of the area of the fixed bulwarks enclosing the deck or space under consideration.

(16) Any freeing port or slot in the bulwark must have the bottom edge as close to the deck as possible. Freeing ports greater than 230 mm in depth and wider than 500 mm must be fitted with bars.

(17) Where freeing ports are fitted with hinged flaps or shutters, there must be sufficient clearance to prevent jamming, and the hinges must be fitted with pins of non-corrodible material.

(18) The freeing ports must be arranged throughout the length of the bulwark or well to give maximum drainage under all normal conditions of trim.

(19) Care must be taken that deck pounds, machinery, and net or gear stowage do not impede the free flow of trapped water to the freeing ports or slots.

(20) Lift-up closing appliances fitted to freeing ports must be so arranged that they are secure in the open position and will not float off from the stowed positions.

(21) The freeing ports must be regularly inspected and maintained to ensure that they are free of obstructions and in good working order.

(22) The crew should be familiar with the operation of the freeing ports and other water freeing arrangements on the vessel.

(23) If the vessel is designed to transport hazardous and noxious liquid substances (HNSL), or dangerous goods regulated by the International Maritime Dangerous Goods (IMDG) Code, it must comply with the following regulations:

i. NSCV C4, which applies to dynamic craft vessels (DCVs)

ii. Marine Order 504, which covers dangerous goods operations

iii. International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code)

(24) The structural design of cargo tanks intended for partial water filling must minimize internal load effects, particularly from sloshing loads. Integral and standalone tanks must meet the design criteria outlined in the NSCV or USL Code.

2.2. Hull Structures

2.2.1. Materials

(1) The materials utilized in vessel construction shall be appropriate for the marine environment, as outlined in *NSCV Part C3, Chapter 4*.

(2) If the vessel is classed, the material must be certified by the originating class society.

(3) Vessels should be constructed using the following materials or a suitable combination thereof. They may comply with the relevant standards specified below or be made of materials accepted by a recognised Classification Society.

(a) Steel complying with *AS/NZS 3678* or *AS/NZS 3679.1*

(b) Aluminium complying with *AS/NZS 1734* or *AS/NZS 1866*

(c) Fibre reinforced plastic (FRP) complying with *AS 3572.7*

(d) Wood complying with *AS 1720.1* or *AS 5604*

(e) Plywood complying with *AS/NZS 2272*

(f) HDPE

2.3. Arrangements

(1) The vessel's arrangement must comply with the requirements stated in *NSCV Part C1* and *USL Section 6 and 9*.

(2) Exemptions in accordance with *AMSA EX41* may apply for unpowered barges.

(3) NSCV C2 or USL Codes 5C or 5D apply. Load line may apply depending on the definition of "fishing vessel."

(4) Accommodation and working spaces should be kept clear and, as much as possible, shielded from the sea, providing adequate protection for the crew against falls on the vessel or falling overboard.

(5) To minimise the entry of seawater into the vessel, it should be designed and constructed with a weathertight structure that has a minimal number of openings. These openings should be equipped with reliable closing and securing mechanisms.

(6) The location, construction, and insulation of the vessel should offer protection against the sea, weather conditions, as well as excessive heat or cold.

(7) For vessels intended to be at sea regularly for more than 24 hours, an adequate number of bunks should be provided onboard.

(8) Facilities for cooking and supplying hot water, along with sufficient space for food preparation and storage, should be provided. Ample ventilation should also be available.

(9) Whenever space permits, facilities should be available to allow the crew to rest and eat during non-working hours according to *MLC 2006, Title 3.*

(10) MLC does not apply to DCVs.

(11) If dry cargo tanks for pellets are installed, they must be separated from machinery spaces, accommodation spaces, and service spaces by watertight bulkheads and decks.

2.4. Refrigerated Cargo Spaces

(1) The vessel's refrigerated cargo spaces must comply with the requirements stated in NSCV C5A.

(2) Equipment and fittings are to be suitably protected to prevent damage during loading and unloading of cargo.

2.5. Intact Stability

(1) Aquaculture vessels must comply with *NSCV PART C6A*, *C6C*, and *C2* and Existing and transitional vessels may comply with USL Section 8.

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(2) Sufficient margins of freeboard and stability should be provided to ensure the safe operation of the vessel.

(3) Special attention must be dedicated to the freeboard when facilitating the transfer of the crew between the vessel and the floating collar. The freeboard of the vessel should match that of the collar, ensuring a smooth and level transfer, or at the very least, a transfer that is as close to level as possible.

(4) In cases where large and heavy equipment or structures are intended to be stowed on deck, the stability analysis should consider the estimated weight and height of the centre of gravity in the worst-case scenario.

(5) The Trim and Stability Booklet of the vessel should include loading conditions for departure and arrival in full load, ballast conditions, as well as anticipated operational or intermediate conditions onsite. It also must include the dynamic load chart for each crane, which should also be prominently displayed at the crane operator's station for easy visibility.

(6) The stability of the vessel must consider the presence of deck cargo on board, taking into account the following:

(a) The loading conditions should encompass the entire range of operating configurations, from no deck cargo to the maximum design deck load on board.

(b) The projected area of the deck cargo should be included in the calculations to ensure compliance with the Severe Wind and Rolling Criteria.

(c) If the vessel is designed to carry deck cargoes that may accumulate water, such as open cargo bins, the appropriate free surface correction should be applied to all conditions.

(7) The International Maritime Organization (IMO) recognises the importance of providing masters of small vessels with instructions for a simplified determination of initial stability. The IMO has developed a standard for the performance of rolling period tests, which can be used to approximately determine the initial stability of small vessels when approved loading conditions or other stability information is not readily available or as a supplement to such information.

(8) Alternatively, USL Code and NSCV have simplified stability criteria. A stability notice is required for vessels that have used simplified stability.

(9) When estimating intact stability, careful consideration must be given to the vessel's onboard operations. The vessel's rolling motion should not impede operations. It is recommended to adopt the Human-Centred Approach, as described in *Lloyd's Register's The Human-Centred Approach - A Best Practice Guide for Ship Designers*, to enhance the operability of the vessel.

(10) The IMO Second Generation Intact Stability Criteria (SGISC) guideline considers five dynamic stability failure modes in waves may be considered in the design since ships vary widely in type, size, operational profile and associated environmental conditions. SGISC may be used by administrations to assess and approve ship designs which deviate from conventional concepts.

2.6. Damage Stability

(1) Aquaculture vessels must comply with *NSCV PART C6B,* USL Code and *Marine Order 12 (not DCV)* for damage stability.

(2) Exemptions in accordance with *AMSA EX41* may apply for unpowered barges.

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(3) Extent of damage is also outlined in NSCV C6B and USL.

(4) As per *ABS guideline*, in aquaculture service vessels, piping that serves tanks and dry spaces located within zones of assumed damage under damage stability conditions should be considered as potentially damaged. However, any damage to such piping should not result in the progressive flooding of spaces that are not assumed to be damaged. If it is not feasible to route the piping outside the zone of assumed damage, measures must be implemented to prevent progressive flooding. For instance, one possible measure is the installation of a remotely operated valve in the affected piping. Alternatively, intact spaces that are susceptible to flooding should be assumed to be flooded in the event of damage stability conditions.

(5) Furthermore, in cases where open-ended piping systems are situated below the bulkhead deck and pass through watertight subdivision bulkheads, mechanisms that can be operated from above the bulkhead deck should be provided to prevent progressive flooding through those intact piping systems following damage to the vessel.

2.7. Subdivision

(1) The subdivision of aquaculture vessels must adhere to the requirements outlined in *Marine Order 12*. NSCV and USL Code also have subdivision requirements.

2.8. Safe Operation to Avoid Stability Issues

(6) Arrange the towing blocks or other attachment to the vessel as low as possible and near to the centreline. This will help to reduce the vessel's roll and make it more stable.

(7) If towed gear comes fast on a seabed or other obstruction, reduce engine power immediately. This will help to prevent the vessel from capsizing.

(8) If possible, handle heavy lifts near the vessel's centreline at bow or stern. This will help to keep the vessel stable.

(9) Do not lift pots (creels), nets, cod ends, etc. from unnecessarily high points. This will help to reduce the risk of the vessel capsizing.

(10) It is advisable to avoid operating a vessel with a list. A list can make the vessel more unstable and increase the risk of capsize.

(11) Vessels engaged in bulk fishing should be loaded carefully to ensure that they have adequate reserves of stability and freeboard. Overloading can increase the risk of capsize.

(12) When a vessel is altered to suit a different mode of fishing, the stability and freeboard should be verified for suitability. This will help to ensure that the vessel is safe to operate.

(13) Safe limits of loading should be made available to masters in a readily understandable form. This will help masters to avoid overloading their vessels and ensure the safety of their crew and passengers.

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3. Systems and Components

3.1. Operation Equipment

(1) Aquaculture vessels must be equipped with complete anchors and chains that comply with the requirements stated in *NSCV PART C7D*, *Marine Orders 32*, and *42*.

(2) Exemptions in accordance with *AMSA EX41* may apply for unpowered barges.

3.2. Refrigeration Systems

(1) All refrigeration systems on aquaculture vessels must comply with the requirements outlined in NSCV C5A and each state Work, Health and Safety (WHS) requirements.

(2) Generally, refrigeration units and associated equipment that contain toxic refrigerants should be placed in a dedicated space. However, if separate spaces for toxic refrigerants are not feasible, the refrigerating machinery may be installed in the machinery spaces, provided that the following conditions are met:

(a) Leak detection and water spray systems are installed.

(b) Adequate ventilation arrangements are in place, along with appropriate gas detectors, to ensure proper operations.

(c) Measures are taken to protect the refrigeration machinery from damage.

3.3. Specialised Items and Systems

(1) Provisions should be made to assess the liquid levels in live animal tanks. If permanent sounding arrangements are in place, remote level indicators should be installed in the tank control room or navigation bridge.

(2) The air pumping system should be designed to ensure that the air remains uncontaminated by the lubricant used in the air pump.

(3) Bilge wells are to be provided in each live animal tank.

3.4. Systems and Machinery

(1) All equipment on aquaculture vessels must comply with the requirements outlined in *NSCV C5A, USL Section 9* and *Marine Order 12 and 97*.

(2) Exemptions in accordance with *AMSA EX44* may be applicable.

(3) Access routes for individuals to machinery spaces must be designed to avoid any contact with moving or heated surfaces, and the latter must be adequately insulated. Exposed moving parts, such as shafts, drive pulleys, and belts, must be effectively guarded. Access ladders should be securely fixed to the vessel's permanent structure. Special caution should be exercised when accessing the bilge area while shafts are in rotation.

3.5. Piping Systems

(1) A dedicated live animal loading and unloading system must be installed.

(2) Each tank should be equipped with a minimum of two pumps capable of drawing suction from it.

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3.6. Fire Safety

(1) Fire safety on aquaculture vessels must comply with the requirements outlined in *NSCV Part C4*, and *Marine Order 15*.

(2) Exemptions in accordance with *AMSA EX41* may apply for unpowered barges.

(3) All firefighting equipment should be regularly maintained in accordance with legal requirements and kept in a state of readiness for immediate use.

(4) Fire prevention measures should align with the applicable requirements of the Flag Administration or Classification Society, as appropriate.

3.7. Safety Equipment

(1) Safety equipment on aquaculture vessels must comply with the requirements specified in *NSCV Part C7A*, *Marine Order 21*, and *25*.

(2) Exemptions in accordance with *AMSA EX41* may apply for unpowered barges.

(3) For vessels carrying Special Personnel safety measures should adhere to the standards outlined in NSCV and USL Code.

(4) For vessels carrying Industrial Personnel, safety measures should adhere to the standards outlined in *IMO RESOLUTION MSC.418(97)*.

(5) Lifesaving appliances should meet the requirements of the *NSCV C7A* for DCVs and *IMO International Life-saving Appliance (LSA) Code* and they should carry the appropriate SOLAS approval where applicable. A vessel specific LSA manual should be readily available.

(6) The vessel should be equipped with life rafts having a capacity of 200% of the maximum permitted number of persons on board. Duplication is generally not required on smaller DCV's

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4. Aquaculture Operations

4.1. Towing

(1) It is highly recommended that tugging, towing, and bollard designs are conducted in accordance with the guidelines *Shipowners Tugs and Tows - A Practical Safety and Operations Guide.*

(2) ASD tugs are equipped with a towing point either just forward or aft of amidships, allowing them to effectively tow from the stern or bow. Their low relative draught makes them particularly suited for operations in shallow waters.

(3) To operate ASD tugs safely, several considerations should be taken into account:

i. Have two azimuth thrusters in nozzles at the stern and with bow tunnel thrusters.

ii. Have a towing point just forward or just aft of amidships and can pull effectively over the stern or bow.

iii. Be aware of the risk of girting/girding when towing over the stern. Use a proper towing bridle and carefully position the tow line during towing operations.

iv. Be familiar with the vessel's manoeuvring characteristics in different conditions. ASD tugs have a small turning circle and can respond quickly to engine movements.

v. Be aware of the vessel's limitations. ASD tugs have a lower bollard pull than some other types of tugs, so they may not be suitable for all towing operations.

vi. Receive proper training on the safe operation of ASD tugs.

(4) Tractor tugs feature fully turning controllable pitch blades or azimuthing fixed or controllable pitched propellers, making them highly manoeuvrable in confined sea spaces. With full power available in all directions, they can effectively tow vessels in any orientation.

(5) Operating tractor tugs safely involves:

i. Be aware of the reduced manoeuvrability of tractor tugs when towing from forward at higher speeds.

ii. Be familiar with the vessel's manoeuvring characteristics in different conditions. Tractor tugs can respond quickly to engine movements, so it is important to be smooth and precise with your inputs.

iii. Be aware of the vessel's limitations. Tractor tugs typically have a lower bollard pull than some other types of tugs, so they may not be suitable for all towing operations.

iv. Receive proper training on the safe operation of tractor tugs.

(6) Rotor tugs, a patented design, feature three azimuthing thrusters arranged in a triangular configuration, making them well-suited for operations in confined spaces.

(7) Safety measures for operating rotor tugs encompass:

i. Have good towing performance over the stern and bow, with 100% bollard pull ahead and astern, 65% of bollard pull athwartships, and good residual redundancy in engine failure.

ii. Require additional tug master training.

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iii. Receive proper training on the safe operation of rotor tugs.

4.1.1. Responsibilities

(1) It is the responsibility of the owner/operator to ensure that the tug is manned with adequately certified and experienced personnel for the voyage, even when the STCW Code is not applicable. Inexperienced personnel must not be exposed without training and supervision to carry out high risk tasks, such as hooking up or releasing the tow. All crew members should receive training on the specific dangers and safe practices associated with towage operations. Training should be frequent and recorded in ship's logbooks.

4.1.2. Planning

(1) Proper planning is essential to avoid incidents in towage operations by:

i. Inform Local Authorities:

- Notify the local port authority ahead of towage operations to receive crucial traffic information.

ii. Risk Assessment: Conduct a thorough risk assessment to reduce potential harm to personnel, environmental damage, and property loss.

iii. Tow Planning: Before commencing a tow, consider:

- Assessing vessel size and type.
- Confirming tug suitability in terms of size, manning, and equipment.
- Ensuring tow wire and equipment are suitable.
- Planning the route, considering navigational challenges, weather forecasts, and safe transit times.

iv. On-Board Tug Preparations: Conduct essential checks on the tug, including:

- Ensuring water and weathertight openings are secure.
- Verifying operational lifesaving and fire-fighting appliances.
- Confirming the functionality of critical machinery.
- Ensuring crew familiarity with the towage plan.

v. Towed Vessel Inspection: Ensure a competent party inspects the towed vessel, covering:

- Condition of towing arrangements and anchoring equipment.
- Watertight integrity, checking for signs of damage.
- Cargo stowage and securing arrangements verification.

vi. Weather Preparedness: Consider the effects of rough water and take measures such as delaying departure, reducing speed, or altering course to minimize potential incidents.

vii. Passage Planning: Develop a comprehensive passage plan considering:

- Intended route plotted on appropriate charts.
- Reference to relevant publications and local information.

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- Towing draughts, traffic density, and navigational constraints.
- Current, tidal, and weather information.

viii. Bridge Equipment Check: Ensure all critical bridge equipment is in good working order before starting any operation.

ix. The tug and tow must always adhere to local navigation rules and/or the International Regulations for Preventing Collisions at Sea 1972 (COLREGs), including displaying the required lights and shapes.

x. Navigation Basics: Whether in open waters or navigating through confined spaces like narrows and between bridges, the fundamental principles of navigation apply. Despite advanced electronic equipment, maintaining a constant lookout remains essential.

xi. Confined Space Challenges: Challenges intensify for tugs and tows in restricted areas. As sea room diminishes, bridge structures can create eddies and currents. Tows approaching bridges must be under precise control, with the option to adjust tow lines for manoeuvrability.

xii. Emergency Planning:

- Comprehensive Towing Plan: Preparation for unforeseen events is vital. Formal plans for specific contingencies and/or training are recommended.
- Personnel and Equipment Transfer: Wear lifejackets and use communication equipment and portable lights during emergency transfers. Safety takes precedence; transfers should be avoided if deemed too hazardous.
- Contingency Plans: Address potential scenarios such as: girting situations, tow wire or gob wire failures, grounding of the tug or tow, loss of hull integrity in either vessel, collision or contact with fixed objects, loss of main propulsion or electrical power, failure of steering and/or critical control systems, man overboard, bridge, accommodation, or engine room fires and actions to take in unexpected poor weather.

4.1.3. Stability

(1) Efficient towage operations rely on a comprehensive understanding and effective management of the stability of both the tug and the towed unit. This involves careful consideration of various factors, as outlined below:

(2) The stability of a tug is directly influenced by heeling moments originating from towline forces, tug actions, and water ingress. Maintaining horizontal equilibrium is crucial, with thruster forces and drag forces playing essential roles.

(3) Transverse stability moments are determined by factors like the centre of gravity (KG), buoyancy force, and righting lever (G'Z stability lever). Traditional tug criteria emphasize the need for ample stability, especially in situations involving girting.

(4) Girting situations pose a serious risk of capsizing, with contributing factors including small freeboard and poor stability curves. To mitigate these risks, safety measures should include well-designed towing gear, reliable quick-release mechanisms, regular maintenance, and closed openings during towing.

(5) For towed units, such as barges used for container carriage, stability considerations encompass factors like positive metacentric height (GM), accounting for free surface effects, and meeting dynamic stability requirements.

(6) It is imperative to ensure that stability information for both the tug and the towed vessel is up to date. Adhering to guidelines, such as Maritime New Zealand's 'Barge Stability Guidelines,' and confirming essential details before commencing towage is essential for safe operations.

4.1.4. Bollard Pull

(1) Bollard pull (BP) plays a crucial role in towage operations, and several considerations must be taken into account to ensure effective and safe towing.

(2) Chartering parties require a thorough understanding of a tug's BP for successful towage operations. BP certificates, issued by competent authorities, serve as essential documentation for charterers.

(3) Recognizing that the efficiency of main engines and equipment may decrease with a tug's age is vital, as it directly impacts its actual BP. For tugs with BP certificates older than 10 years, a yearly reduction of 1% beyond the 10th year should be considered.

(4) Addressing recorded incidents that highlight disparities between calculated and operational BP is crucial. Tug masters should diligently balance commercial demands with ensuring the tug's operational capability, emphasizing safety.

(5) Understanding that older tugs may demonstrate higher BP than initially recorded due to unfavourable testing conditions is important. Factors such as insufficient depth or damaged load cells can contribute to unexpected outcomes.

(6) Acknowledging various factors, including age, hull growth, propeller condition, and sea water temperatures, is essential as they can influence tug efficiency. It is important to note that using a shaft alternator during towing reduces the main engine output and, consequently, BP.

(7) Utilizing the BP calculation formula, which takes into account towed vessel displacement, dimensions, tow speed, and potential weather conditions, is critical. Additionally, factoring in to adjust estimated BP based on weather conditions enhances accuracy.

(8) Emphasizing the importance of understanding the pivot point for tug masters during towing aids in safe manoeuvring. Being aware of how the pivot point changes based on factors like speed, draught, and external forces contributes to overall operational safety.

4.1.5. Pivot Point

(1) The positioning of a tug during vessel assistance is a critical aspect influenced by various factors such as size, pivot point, speed, water depth, and weather conditions. Tug manoeuvres, particularly in close proximity to larger vessels, carry significant risks, especially in confined or shallow waters where documented cases of capsizing exist. The interaction between a tug and a swiftly moving vessel, particularly when making fast with a towline, intensifies suction and pressure forces around the hull, particularly at higher speeds.

4.1.6. Tug Positioning and Interactions

(1) When assisting vessels or barges, multiple factors must be considered for safe tug positioning, including size, pivot point, speed, water depth, available room, currents, and winds. Awareness

of risks is crucial, especially during fast approaches with a towline, particularly in adverse weather conditions.

(2) Acknowledging the interaction phenomenon is essential, especially in close proximity to larger, faster-moving vessels. Heightened danger exists in confined and shallow waters, where documented capsizing incidents involving tugs and smaller vessels have occurred.

(3) Understanding the impact of suction and pressure forces when a tug approaches a vessel moving at speed is crucial. Recognition of varying effects based on the tug's position relative to the vessel's pivot point, and how forces increase around the stern and quarters, is important.

(4) Highlighting the risks associated with a tug approaching the side of a vessel underscores the importance of quick reactions and skilled manoeuvring. Emphasizing potential dangers at specific positions urges vigilance and effective use of rudder and engine controls.

(5) Addressing the considerable suction effect when a tug approaches the aft end of a vessel emphasizes the dependence on proximity, speed, and hull form. Risks of damage to the tug and the potential for capsizing if dragged beneath the ship's counter or toward the propellers are highlighted.

(6) Recognizing the consequences of hydrodynamic interaction, particularly when vessels of different sizes are involved, is crucial. Increased risks in shallow waters, reduced rudder effectiveness, enhanced squat effects, and changes in manoeuvring characteristics should be emphasized.

(7) Encouraging proactive measures, such as maintaining safe distances, especially in challenging conditions, is essential. Advocating for the use of advanced tug types, like tractor and ASD tugs, can help mitigate the risks associated with hydrodynamic interaction.

4.1.7. Girting

(1) Girting, also known as girding or tripping (GGT), is a critical situation for tugs, often leading to capsizing and fatalities. This phenomenon occurs when a tug, typically single-screw ones, is towed broadside and unable to manoeuvre out of this position. It poses a severe risk, particularly when towing in confined areas or at high speeds. Prevention measures include using gob wires, careful planning, and vigilance. Girting can happen due to abrupt turns of the assisted vessel, excessive speed, or the tug being out of position. Addressing the dangers of girting is essential, considering design factors, hull form, and propulsion arrangements. Case studies underscore the importance of quick releases, gob wires, and the need for proper closure of vents and openings during operations to enhance tug safety in girting situations.

(2) Enhance the stability of conventional tug and mitigate the risk of girting by implementing effective Gob/Gog wire or rope practices.

4.1.8. Gob/Gog Wire

(1) Gob/Gog wire, also known as a guest rope or bridle, is a short wire or rope attached to the towline at the after end of a tug. Its purpose is to shift the towing point aft, providing better control and manoeuvrability, especially when the tug is acting as a stern tug.

(2) There are two main methods for rigging gob/gog wire.

i. Method 1: Secure a length of wire to the tug, passing through a fairlead or bollard on the work deck. A large shackle at the wire's end attaches around the towline, allowing it to slide along. This keeps the towing point aft when the towline moves toward the tug's beam.

ii. Method 2: Use a separate gob wire winch with the wire leading through a swivel positioned at the centreline of the tug's aft end. A shackle slides along the towline, and the winch adjusts the gob wire's length.

(3) Several considerations should be taken into account for gob/gog wire systems. For single wire or chain systems, the connection point should be on the centreline, and the length should not exceed half the distance to protection rails or side bulwarks. Additionally, using certified shackles and wires in good condition is crucial for ensuring safety. Fixed towing pods should align with the centreline and the towing winch drum, maintaining a bend radius at least ten times the tow wire diameter.

(4) In addition to gob/gog wire, other methods can be employed to prevent towing wire movement onto the tug's beam. Stop or tow pins positioned on each quarter can serve as effective measures.

(5) Most tugs are equipped with emergency quick release systems capable of remotely tripping the hook or releasing the brake on towing winches. It is essential for crew members to be familiar with ship-specific arrangements and manual override options in case of remote-control failure.

(6) Adjustments or releases of bridles or gobs should be carried out under the direct supervision of the tug master during towing operations to ensure proper and safe handling.

4.1.9. Environment Effects

(1) The impact of wind on towing operations is paramount, with severe consequences for neglecting its effects. Failure to appreciate the wind's influence can lead to collisions, groundings, towline failures, injuries, and girting incidents. The wind alters headings, accelerates speeds, and induces drift in the towed craft.

(2) Understanding and accounting for the impact of currents is crucial for safe and effective manoeuvring during towing operations. The effects of currents are especially pronounced in confined waters, where unpredictability and varying speeds pose significant challenges.

(3) Current effects are more substantial in confined waters, emphasizing the importance of awareness, especially in busy waterways or rivers.

i. Current speed and direction are unpredictable, influenced by factors like tidal changes, rainfall, ice melt, and geographical constraints such as narrows, reefs, and breakwaters.

ii. Shallow water intensifies the impact of squat, particularly concerning for large barges with flat hull forms.

iii. Current direction is influenced by bends in rivers, channel configurations, shallow areas, man-made structures, bridges, industrial outlets, and geographical obstructions like islands.

iv. Currents can aid manoeuvring by controlling speed during berthing, facilitating lateral movement for the tug and tow, and assisting in turns.

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v. River tugs operate in areas with strong and variable currents. The strength of the current may differ across the river width, impacting the manoeuvrability of both the tug and tow.

vi. The downstream effect on a river bend demonstrates how the vessel or tow is influenced, emphasizing the potential for sudden turning moments and the need for cautious navigation.

vii. When towing upstream, the asymmetrical influence of the current on the tow can lead to unexpected strains on the tow wire, demanding vigilant towing practices.

viii. Berthing strategies must account for the prevailing current direction, allowing for effective use of the current in the berthing process.

ix. Approaching a berth bow into the current provides higher water flow over the rudders, enhancing steerage and control. It also aids in slowing the tow when alongside the berth.

x. Berthing in a following current is challenging, requiring careful control of the tow's sternway through the water. An approach into the current is recommended for safer berthing.

(4) Wash effect occurs when the wash (turbulent water movement) diminishes the pulling effectiveness of the towed object or barge due to small under keel clearance of the assisted unit, hull form of the assisted unit, length of the towline or area of operation, with confined areas intensifying the wash effect.

(5) Small under keel clearance increases the propeller wash effect, reducing the tug's pulling effectiveness. Pulling an object effectively aground or stuck in mud elevates tension in the towline. Suction effect during such situations can pose unexpected dangers as the object may suddenly become free. Tug crews should be vigilant about the potential risks associated with reduced under keel clearance, standing in designated places of safety.

(6) Squat effect, commonly associated with ships, can impact any moving craft through water due to speed significantly amplifies the effects of squat, operating in confined waters may increase the squat effect. Squat effect can result in changes to the vessel's headings and increased risk of towline shearing, especially in confined waterways.

4.1.10. Towline Length

(1) The length of the towing line is very important. The amount of water under the keel directly affects the power required by the tug. Longer towlines can mitigate the wash effect, reducing turbulence during towing operations.

(2) A short towline in confined areas can generate a significant wash effect. Tractor tugs (pulling over the stern) and ASD tugs (pulling over the bow) can minimize the wash effect due to the propellers' increased distance from the towed unit's hull.

(3) The master has discretion in deciding the tow wire's length based on prevailing conditions. Shortening the tow is advisable in restricted sea rooms for better barge control.

(4) Shortening Preferably done in deep water and favourable weather conditions and executed well before entering congested or restricted waters is crucial.

(5) Caution against excessively short tow lengths to maintain manoeuvrability. Immediate assistance should be sought if the tug encounters difficulties in controlling the barge on a short wire.

(6) In severe weather, consider delaying tow shortening but prioritize safety. Shortening in deep water minimizes wear and tear on the tow wire compared to dragging on the seabed. Shorten the tow before transiting pirate-infested waters for enhanced vigilance. Allows the tug's crew to closely monitor the barge, raising the alarm in case of any intrusion.

4.1.11. Emergency Planning

(1) Planning for emergencies involves specific actions in adverse weather, hove to arrangements, identifying safe anchorages, and access to sheltered ports. Rigging an effective bridle recovery system is crucial for safe recovery operations.

(2) Recommended method is to utilize a winch and recovery line capable of lifting 100% of the bridle, wire, and attachments' weight. Ensure power availability on large barges; smaller barges may require alternative, manually operated recovery systems. The breaking load of the recovery wire should be a minimum of six times the weight of the recovery gear.

(3) For Pre-Departure Preparation, establish emergency arrangements before embarking on a voyage, including a towing connection through a centre closed fairlead.

(4) Equip with a length of wire matching the main tow wire's breaking strength, extending beyond the barge, and a high-visibility pick-up buoy with a self-activating light.

(5) Lead the emergency towline over the main tow bridle, securing it to the barge side with soft lashings. Implement precautions to prevent chafing of wire ropes. Ensure availability of spare re-connection gear on the barge.

(6) Emergency Towline Usage:

i. Main Towing Arrangement Failure: Retrieve the balance of the broken towing wire on board to avoid fouling the tug's propulsion systems. Attempt to retrieve the towing bridle on board, if possible, or consider disconnecting and sinking it to the seabed.

ii. Float Line Retrieval: Approach the barge's stern at a safe distance to retrieve the float line. Use a boat hook if necessary to assist in float line retrieval. Haul in the float line with the winch, breaking soft clips securing the towing pennant on the barge's deck.

iii. Emergency Towing Initiation: Once the pennant eye is on board the tug, secure it to the towing hook. Gradually take weight on the towing pennant and commence emergency towing to a nearby safe location.

iv. Limitation of Emergency System: Acknowledge that emergency towing systems are not designed for ocean passages but for towing the barge to nearby safety, such as holding areas or ports of refuge.

(7) Before each towing operation, conduct a thorough visual inspection and testing of towing gear to ensure its readiness. All towing equipment, including hooks and fittings, must be robust enough to withstand the loads imposed during the tow, with up-to-date certifications verifying their strength. Ideally, towing hooks or towlines should feature release mechanisms operable in all conditions, complemented by both remote and local controls. Additionally, maintain

functional navigation lights throughout the voyage, with shapes available for daylight navigation.

(8) Implementing an effective Planned Maintenance System (PMS) is critical. This can be either computer-based or paper-based, involving regular monitoring and recording of critical equipment maintenance. Towing hooks, quick release systems, hydraulic systems, towing winches, bollards, fairleads, sheaves, ropes, wires, and ancillary equipment should be integral components of the PMS structure. Establish a structured inspection routine for equipment, considering intervals based on criticality and usage. This includes a visual inspection before each towing operation and a formal annual inspection by a competent person. Furthermore, adhere to testing and recertification guidelines, with tests performed every five years or after significant repairs.

(9) Guidelines stipulate that new lifting and towing equipment should be accompanied by approved test certificates. Keeping track of wires and shackles with their certificates through the PMS is crucial. In the unfortunate event of accidents, proving the gear's good condition with proper certification and tests is essential for legal defence.

(10) Promptly isolate and remove damaged equipment from operation. Ensure that competent persons handle the repair of damaged equipment, or if irreparable, condemn and discard it. Under no circumstances should damaged equipment be used in towing operations.

4.1.12. Towing Equipment

(1) Towing winches, varying in design and size, play a pivotal role in towing operations. Understanding their workings is essential for those utilizing them. It is imperative to have the manufacturer's manual on board for reference, including any additional secondary winches in the Planned Maintenance System (PMS). Clear operating instructions, in the appropriate language, should be accessible near all manual and emergency controls, especially for the winch emergency release system (ERS). Checks on the Towing Winch:

   i. Confirm effective operation of the braking system.
   ii. Inspect winch power and hydraulic systems.
   iii. Examine for signs of corrosion or fractures on holding bolts, welds, and the supporting deck.
   iv. Ensure the emergency release system is effective both from the wheelhouse and the local activation point.
   v. Verify the spooling mechanisms' effectiveness.
   vi. The connection end of the towline should be fixed with a force of less than 15% of the breaking load of the towline.
   vii. Towing winch brakes should provide a static holding capacity of at least 1.1 times the breaking load of the towline.

(2) Tug crews should be aware of the operating limitations of the ERSs on board. Testing older types of manual ERSs is crucial to understanding their parameters. If identified, precautions such as taking weight off the tow line before emergency release activation should be prominently communicated.

(3) Include the maintenance of the towing hook in the PMS, subjecting it to regular visual inspections before each tow. Test and record the towing hook release mechanisms to ensure proper functionality. Any damage to the towing hook must be reported and rectified before use. It's generally discouraged to utilize towing hooks for ocean passages.

(4) Routine checks and maintenance are paramount for towlines to prevent failures leading to contact with other vessels and shore infrastructures. Key points for care and maintenance include:

i. Inspecting pennants before every use, annually, and testing after a suitable period or five years.

ii. 'End for end' inspection of the main tow wire every year, replacing when appropriate.

iii. Physical inspection of the main tow wire every month and/or before each tow.

iv. Inspection after every deployment for damage and abrasions caused by UV exposure, wear, broken or cut strands, overstretched ropes, and improper stowage.

v. The importance of routine checks cannot be underestimated, with the Club witnessing numerous claims due to tow line failures, emphasizing the need for effective maintenance and testing.

(5) General towing equipment, encompassing winches, hooks, drums, fairleads, towing pins, and gear, must undergo visual inspection and testing before each towing operation. Essential considerations for safety include:

i. Ensuring the strength of towing equipment and gear, towing hooks, and fittings, certified with up-to-date tests.

ii. Implementing a Planned Maintenance System (PMS) to monitor and record critical equipment maintenance.

iii. Adhering to testing and recertification guidelines, with tests performed every five years or after significant repairs.

(6) Emergency planning should encompass actions in bad weather, hove-to arrangements, available anchorages, safe ports for shelter, and emergency towline rigging or bridle recovery. A bridle recovery system should be rigged for effective and safe recovery, with a winch capable of lifting 100% of the bridle's weight. An emergency tow wire should be rigged in the event of a towline or bridle failure, ensuring readiness for unforeseen circumstances.

(7) These protocols, ranging from winch safety and towline integrity to emergency preparedness, collectively contribute to ensuring the safety and effectiveness of towing operations. Regular inspections, adherence to maintenance systems, and a proactive approach to potential risks are integral to a successful and secure towing environment.

4.1.13. Crew Safety

(1) Numerous factors can influence crew safety during towing operations. Identifying and addressing these factors is crucial to prevent incidents and injuries.

(2) Fatigue is a significant contributor to incidents. International regulations, outlined in the IMO Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW),

mandate a minimum of ten hours of rest in any 24-hour period. Vigilance against fatigue-related risks is paramount, even for non-international trading tugs.

(3) Poor weather conditions escalate the risk in towing operations. Tug masters must thoroughly assess weather conditions and prioritize crew safety. If conditions pose a risk, it is advisable to abort the operation to safeguard lives.

(4) Night working demands heightened vigilance and effective lighting to mitigate risks. Ensuring good visibility is critical for crew safety during nocturnal operations.

(5) The danger posed by damaged tow lines or equipment requires constant attention. Regular inspections and maintenance are imperative to minimize equipment-related risks.

(6) Working in rivers or tidal areas introduces additional hazards due to strong currents and unexpected changes in current direction. Crew awareness and preparedness are vital to navigate such challenges safely.

(7) Working alone amplifies risks. Adequate precautions, such as thorough risk assessments and emergency preparedness, are necessary when solo operations cannot be avoided.

(8) Failures in effective communication are a recurring cause of accidents. Establishing and maintaining clear communication channels between the wheelhouse, working deck, engine room, port/river authorities, tow master, and the towed unit is paramount. Pre-towing briefings and agreed-upon hand signals enhance communication protocols.

(9) Tug working decks should feature non-slip surfaces, adequate lighting, and clear markings to highlight potential hazards.

(10) Steps and ladders should be well-maintained, with non-slip steps painted in light colors for increased visibility at night.

(11) Tugs should be equipped with means to recover a man overboard (MOB), whether through a rescue boat or a MOB device like Jason's Cradle.

(12) Both the tug and towed unit must adhere to communication equipment requirements set by the administration.

(13) Establishing and maintaining effective communication, including pre-towing briefings and adherence to hand signals, is critical for accident prevention.

(14) The communication equipment on both the tug and the towed unit is mandated to adhere strictly to administration requirements, ensuring regulatory compliance and operational safety. Special attention should be devoted to the communication gear aboard a manned towed unit. This entails the presence of a minimum of two portable VHF radio telephones and a daylight signalling lamp. In instances where the towed unit is boarded, the availability of at least two VHF radios is imperative. The significance of this meticulous approach is underscored by the frequent role of ineffective communication as a contributing factor in accidents.

(15) A holistic approach to effective communication is outlined, encompassing internal coordination, external updates, tow master and towed unit collaboration, and standardized hand signals. Internally, ensuring robust communication channels between the wheelhouse, working deck, and engine room is essential. The implementation of pre-towing briefings, exemplified by toolbox talks, is deemed indispensable for fostering understanding and coordination among crew members.

(16) Externally, facilitating effective communication from the tug to port/river authorities is crucial for keeping the tug informed about potential hazards and traffic movements, enhancing overall operational safety. The necessity for seamless communication extends to fostering good communication between the tug, tow master, and the towed unit. This ensures synchronized efforts and a shared understanding of operational objectives. Additionally, establishing a clear understanding of agreed-upon hand signals among all personnel is identified as a fundamental element. This ensures a universal language for communication, further fortifying safety protocols.

4.2. Lifting Operation

(1) It is highly recommended that all lifting operations conducted to or from a service vessel adhere to recognized guidelines or standards, such as the *IMCA M187 Guidelines for lifting operations*, or *IOGP RP 376 Lifting and hoisting safety recommended practice*.

(2) Certain aspects of *G+/DROPS: Reliable Securing Booklet for Offshore Wind*, including a pre-task checklist, best practice recommendations on reliable securing, and a backloading guide, can be applied to lifting operations from small service vessels.

(3) Safe and successful lifting operations hinge on clear leadership fostering safety and efficiency in line with company management systems.

(4) The commitment of senior line management to provide policy objectives.

i. Corporate HSE policies and lifting, hoisting, and communications procedures in an appropriate language.

ii. The provision of adequate and suitable personnel and equipment.

iii. Requirements for inspection, maintenance, removal of unsuitable equipment, and record-keeping.

(5) Lifting Operation Roles and Responsibilities:

i. Responsible Person: The responsible person, encompassing roles like project managers, construction managers, vessel masters, and others, holds overall responsibility for work activities. Recognizing the need for a lifting activity, they notify or appoint a competent person to plan the operation.

ii. Competent Person – Appointed to Plan the Lift: The competent person, designated by the company, possesses practical skills, theoretical knowledge, and the ability to conduct risk assessments, develop lift plans, and supervise lifting operations. Examples include offshore engineers, vessel masters, foreman riggers, and others. Their responsibilities cover categorizing the lift, risk assessment, lift plan development, technical review, personnel, and equipment selection, toolbox talks, and post-job debrief.

iii. Technical Authority: The technical authority, a technically competent individual like a structural engineer or rigging supervisor, provides an informed and impartial judgment of a lifting operation plan or installation procedure.

iv. Lift Supervisor: Nominated by the competent person, the lift supervisor actively supervises the lifting operation on-site. This role, which could be filled by a deck officer,

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diving superintendent, or others, ensures proportionate supervision based on risk exposure and personnel competence. The lift supervisor must be clearly identifiable, have a clear view of the lift, and ensure adherence to the agreed plan.

v. Lifting Team: Comprising suitably trained and experienced personnel, the lifting team, with roles like supervisors and operators, must work within their competency and experience. All team members share responsibility for safety, attending pre-lift meetings, conducting pre-use inspections, and having the authority to stop an operation if safety concerns arise. Competency standards align with IMCA C 002 for offshore marine personnel.

vi. Lifting operations in the offshore construction industry are diverse, making it challenging to universally categorize them as routine or non-routine. A company's perception of a lift may differ, leading to variations in classification. Nonetheless, meticulous risk assessments and lift plans are imperative for all operations.

(6) Factors for Lift Categorisation:

i. Lifting Equipment: Diverse lifting equipment demands specific operating practices.

ii. Loads and Lifting Arrangements: Varying loads, such as reels and containers, present distinct hazards.

iii. Lifting Environment: Operations occur in onshore, offshore, and subsea environments, each with unique challenges.

iv. Lifting Team: Consideration of all personnel involved, their competencies, and potential role transitions during the lift.

v. Communications: Varied communication options, including verbal, visual, and audible methods.

(7) Defining Routine and Non-Routine Lifts:

i. Routine Lifts:

- Covered by a job risk assessment (JRA).
- May not require a new lift plan.
- Known, repetitive lifts familiar to the lift team.
- Covered by a previously prepared JRA and lift plan.
- Lift plan verified as the current issue.
- For routine lifts, a generic lift plan may suffice, with each operation individually risk-assessed to ensure alignment with the established plan.

ii. Non-Routine Lifts (4.2.2):

- Require a job risk assessment and a completed lift plan.
- New specific lift plan based on a risk assessment.
- Pre-lift meeting or toolbox talk involving all relevant parties.

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- Non-routine lifts, like engineered lifts, necessitate a comprehensive lift plan prepared by a competent person, reviewed by another competent person and/or a technical authority, and finalized by the on-site competent person and lift supervisor.

4.2.1. Risk Assessments

(1) A documented Job Risk Assessment (JRA) is necessary for any lift, including routine ones. Existing assessments, such as HIRA documents, should be reviewed for applicability. Site-specific JRA, including an assessment of lifting equipment, must be conducted before work begins. Appropriate controls for identified hazards in the risk assessment should be integrated into the lift plan.

(2) Utilization of a risk assessment matrix allows quantification of hazard probability and severity. The matrix aids in determining the overall risk level for a specific activity.

4.2.2. Lift Plans

(1) Proper planning involves initial checks for equipment suitability and detailed planning for each lift. The lift plan, prepared by a competent person, is based on a comprehensive risk assessment. The plan addresses identified risks and outlines resources, procedures, and responsibilities for a safe lifting operation. Equipment safety, pre-use checks, communication methods, and language identification are integral parts of the lift plan. The degree of planning varies based on equipment type and operation complexity. Changes to established company procedures require a management of change procedure. For multi-employer lifting activities, the lift plan should define specific roles and responsibilities, coordinated by the lift supervisor. Non-routine lifting operations necessitate pre-lift meetings with all relevant parties, using risk assessments, lift plans, and drawings as the basis.

(2) Engineered lifts, being project-specific, undergo planning in the engineering phase. Lift plans for engineered lifts are often prepared onshore and serve as summaries of points to be considered before commencing a lifting operation. The plan, treated as a live document, should be finalized on-site by the relevant competent person. Rigging specification summary drawings and lift plan summary drawings are crucial components. These drawings provide essential details for rigging suppliers, relevant company departments, and on-site lift supervisors. Crane curves play a significant role in engineering lift plans, with different types available for various scenarios. It is crucial to consult the appropriate competent person when considering crane curves different from the company's specifications.

4.2.3. Lifting Checks

(1) For any lift, a thorough assessment of the load is crucial. This includes considerations such as the weight, certification of lift points, stability of slinging, centre of gravity, integrity, and potential challenges like rotation or flexing. Specific considerations apply for subsea lifts, involving shock loads, buoyancy changes, and environmental effects.

(2) Key assessments for lifting equipment selection include identifying correct PPE, evaluating sling angles, ensuring adequate attachment points, and considering factors like diver or ROV involvement. The layout and lay-down of slings, compatibility with underwater work, and the suitability of equipment for the lifting operation are essential aspects.

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(3) Operators must perform pre-use checks to identify faulty equipment. The frequency is determined by the lift plan, focusing on wear and tear detection. The checks' frequency can vary based on operational factors and environmental aspects.

(4) The suitability of the lifting team, the identification of the lift supervisor, and the clarity of roles and responsibilities within the team are critical aspects. Clear procedures for control transfer and team coordination are necessary.

(5) Assessment of the lift path includes considerations for load rotation, available space, and potential conflicts with other operations. Checks for clearance of subsea architecture, moorings, and set-down areas are essential components of this assessment.

(6) Environmental considerations involve windage area, vessel movement effects, changes in environment during the lift path, and the use of heave compensation. Subsea lifts require specific preparations for flooding, draining, and buoyancy effects. Various environmental factors such as rain, snow, ice, wind, and light conditions can impact lift control and handling.

(7) In the process of selecting lifting equipment and accessories, the competent person plays a pivotal role, ensuring that equipment is fit for purpose, possesses appropriate certificates, and undergoes defect checks before use. This involves considerations such as technical specifications, usage conditions, health and safety risks, PPE identification, ergonomic factors, manual handling, and maintenance requirements. Thorough examination schemes and in-service inspections are implemented to maintain equipment integrity.

(8) One example of a procedural requirement is crane authorization, where approval for lifts exceeding a specified percentage of the crane's SWL necessitates authorization from an identified competent person. *IMCA M 171* provides valuable guidance for selecting cranes for projects.

(9) As part of the Job Risk Assessment (JRA), an equipment risk assessment should be conducted, identifying hazards and assessing risks associated with the equipment for various lifting operations. Factors considered include equipment design, modifications, alarm settings, strength, stability, ergonomic considerations, environmental conditions, and maintenance requirements.

4.2.4. Strength and Stability

(10) Company procedures ensure adequate strength for lifting equipment, load, and attachments. An equipment risk assessment verifies strength, and an outlined process (Appendix 7) aids in assessing strength adequacy.

(11) Ensuring equipment stability involves evaluating factors like dynamic hook load, subsea lifting considerations, and external forces. Methods to improve stability include designing a suitable base, using anchorage systems, outriggers/stabilizers, counterbalance weights, and ballast. Vessel stability is crucial, especially for heavy lifts, considering vessel motion, trim, heel, and stability.

(12) Vessel stability is critical in lifting operations, with load transfers affecting motion, trim, heel, and stability. Lift plans must carefully consider these effects on vessel stability and the resulting impact on lifting equipment stability.

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4.2.5. *Equipment*

(1) A process ensures the competent person reviews equipment positioning/installation to minimize risks. Hazards and risks associated with positioning/installation are addressed in the risk assessment and lift plan. Proper positioning/installation aims to avoid collisions, provide protection, prevent risks along the lift path, and ensure controlled movement.

(2) In addressing the use of lifting equipment for personnel transfer or lifting, a crucial reassessment is emphasized for each instance. Ideally, personnel lifting should be minimized, and if unavoidable, equipment specifically designed for such purposes should be employed within its designated parameters. A thorough review of all equipment used for personnel lifting is mandated to reduce risks to the lowest reasonably practicable level. Compliance with local regulations, including clear markings on equipment suitable for lifting persons, is essential. Risk assessments, technical specifications, and adherence to legislative requirements are integral to maintaining safe lifting operations involving persons.

4.2.6. *Communication*

(1) Communication is a pivotal factor in lifting incidents, necessitating comprehensive training and adherence to proper procedures. Verification of a shared language among personnel, established signal systems, and visible communication aids at the worksite are crucial. The document underscores the significance of effective communication methods, including hard-wire systems, sound-powered systems, radios, and various visual signals, to ensure safety during lifting operations. Clear task assignments, designated signallers, and high-quality communication are essential, with an explicit directive to halt operations if a signal is unclear.

4.2.7. *Halting*

(1) The authority of any person to halt lifting operations in the presence of potential safety issues. Examples include unclear signals, alarm sounds, or the exceeding of specific competence levels. Consideration of a Management of Change (MoC) procedure is highlighted, prompting a re-evaluation of potential safety concerns before resuming activities.

4.2.8. *Technical Review*

(1) Following the initial planning of non-routine lifting operations, a thorough review by the competent person is mandated. Generic lift plans also require the competent person's scrutiny to ensure safety and efficacy.

(2) Management of Change (MoC) procedures are deemed applicable to various operational aspects. Any team member can invoke an MoC procedure to suspend an activity, prompting a comprehensive assessment before resumption. The procedures cover deviations from approved procedures, unplanned modifications, changes to equipment, alterations to the sequence of operations, and more. They serve as a structured approach to manage changes safely and efficiently.

(3) The planning of operations should incorporate emergency fall-back procedures, including backup set-down areas, considerations for environmental changes, and preparation for vessel position loss or nearby operation failures.

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4.2.9. Lifting Team

(1) The competent person is tasked with selecting a capable team for a specific lifting operation, ensuring a qualified and skilled workforce.

(2) 5.12 Explanation of a Toolbox Talk:

(3) At the worksite, the competent person reviews the risk assessment and approved lift plan with the lifting team during a pre-lift meeting or toolbox talk. Responsibilities are allocated, and the lift plan is discussed step-by-step, addressing questions and potential changes. Clear communication procedures are established, and any agreed-upon changes are documented and approved by the competent person following MoC procedures.

4.2.10. Post-Job Debrief and Recording

(1) After a lift, a debrief session is conducted to identify learning points, good practices, and areas for improvement. Learning points are reviewed by the competent person, and necessary actions are taken, contributing valuable information for future lifts.

(2) To demonstrate the effectiveness of company procedures and identify improvement opportunities, records of lifting procedures should be retained. Access to previous lift plans, risk assessments, and post-job debriefs is deemed desirable for effective planning of future lifting operations.

4.2.11. Examination and Inspection

(1) There are two primary methods of assessing lifting equipment: inspection and thorough examination. Inspections can be performed by personnel meeting specified competence criteria outlined in company procedures, ensuring visual checks and, where feasible, function checks. Thorough examinations and equipment marking, on the other hand, fall under the responsibility of an independent competent person (ICP).

(2) The ICP, appointed for thorough examinations on behalf of the company, must be both sufficiently competent and independent to make impartial, objective decisions about the lifting equipment. While the ICP can be either an appointed independent contractor or an appropriately competent in-house person, their competence should cover practical and theoretical knowledge relevant to conducting a thorough examination. It's crucial to distinguish the role of the ICP from that of the competent person.

(3) Inspection, defined as a visual and, where possible, functional check to identify apparent damage or deterioration, is crucial for maintaining health and safety conditions. Pre-use checks, periodic inspections, and checks aligned with lift plans and risk assessments should be conducted by appropriately competent personnel, not necessarily the ICP.

(4) Lifting equipment should undergo inspection at specified intervals, such as before each use, weekly for in-use items, and based on manufacturer recommendations, risk assessments, or equipment records. The frequency and results of inspections should be recorded, and pre-use checks should be documented in the lift plan.

(5) A thorough examination, carried out by the ICP, involves critical assessment, measurement, non-destructive testing, or other methods to detect defects or weaknesses. The procedure includes processes to verify the equipment's continued suitability for safe use and clear marking to indicate its thorough examination status.

(6) Procedures for thorough examinations should encompass appropriate intervals, considering equipment condition, usage environment, and the nature of lifting operations. Records of examinations, defects found, and verification of equipment condition for safe use should be maintained. Periodic revisions to these procedures, following risk assessments, may impact intervals and the extent of required examinations.

(7) Thorough examinations of lifting equipment, based on regulatory requirements, manufacturer recommendations, risk assessments, or frequency of use, should occur regularly. Additional situations, like changes in conditions of use, first-time use, accidents, or extended periods out of use, warrant thorough examinations. Reports of thorough examination should be promptly issued and defects recorded daily.

(8) The ICP issues a report detailing the thorough examination results, including defects found or an affirmation of equipment fitness for continued safe use. This report should be retained and made available as needed.

(9) Records of all thorough examinations, defects found, and corresponding reports should be maintained. Immediate notification to the company focal point is necessary for any defects deemed or potentially dangerous. In certain situations, involving serious personal injury risk, the ICP may need to notify the relevant enforcing authority.

(10) To ensure safe usage, lifting equipment and accessories must be clearly and permanently marked with their safe working load (SWL) and unique identification markings. The SWL signifies the maximum load the equipment can withstand under normal use. Equipment designed for lifting persons should be distinctly marked accordingly. The ICP is responsible for re-marking equipment when changes affect the SWL, ensuring compliance with regulatory requirements. The company should have clear procedures for marking and designate responsible departments or personnel for oversight. The ICP should remove and re-mark any equipment not meeting regulatory marking requirements after verifying necessary certificates. Regular checks on markings should be integrated into pre-use inspection procedures, with re-marking exclusively performed by the ICP.

(11) Ensuring the efficiency, safety, and effectiveness of all work equipment is vital and should be maintained through a well-structured maintenance system. This system must address key aspects:

i. Adequate Maintenance Intervals: Work equipment should undergo regular maintenance at appropriate intervals to sustain its reliability and safety.

ii. Maintenance Log Keeping: Maintenance logs must be meticulously maintained, offering a comprehensive record of all maintenance activities.

iii. Record of Maintenance Frequencies: Keeping a record of maintenance frequencies is crucial, and the internal audit process should be employed to monitor and ensure adherence.

iv. Formalized Maintenance Management: The maintenance management system, whether planned preventative, condition monitoring, or breakdown maintenance, should be formalized for clarity and efficacy.

(12) Additional guidance on wire rope maintenance can be found in *IMCA SEL 012 – Guidance on the management of life cycle maintenance of non-man-riding wire ropes*.

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(13) All relevant data concerning work equipment should be recorded systematically. This data serves as the foundation for trend analyses, providing insights into the overall performance of the equipment.

(14) Lifting equipment, especially in offshore conditions, undergoes deterioration from its first use. A systematic approach should be established to identify equipment approaching the end of its life expectancy. This enables timely overhauls or removal from service, ultimately reducing the risk associated with defective or worn-out equipment.

(15) Equipment may be sent to a third party for maintenance, and any defects discovered must be promptly communicated to the equipment owner within the company. If legislative requirements deem these defects a significant risk, reporting to the local enforcing authority may be necessary.

(16) When maintenance intervals are defined for lifting equipment, whether based on manufacturer recommendations or risk assessments, strict adherence is paramount. If planned maintenance is due around the time of equipment mobilization, it should be conducted before mobilization or scheduled during its in-service period.

(17) This comprehensive approach to work equipment maintenance ensures a proactive strategy, minimizes risks, and contributes to the overall safety and effectiveness of the equipment.

(18) A systematic approach to record retention is crucial to ensure quick accessibility of information by competent persons involved in lifting equipment management. Key considerations include:

(19) Competent persons should have seamless access to the certificates relevant to lifting equipment, promoting efficiency and informed decision-making.

(20) Utilization of Company Checklists: Printed company checklists for rigging and lifting equipment, both for utilization and retention, serve as practical tools for ensuring adherence to established standards.

(21) Extended Retention Periods for Reports and Records: Lifting equipment reports and records must be retained, meeting regulatory requirements at a minimum. Prolonged retention beyond regulatory mandates is advisable when such documents offer insights into trends or opportunities for improvement.

(22) Original documented records should be centralized within a secure system, organized by vessel, project, location, or region, as appropriate.

(23) All relevant documentation should be readily available or copied for individuals at the equipment's location and should be accessible to inspectors from enforcing authorities upon request.

(24) Periodic reviews of documentation, aligned with examination intervals, are essential. Incorporating lifting equipment records and reports into formal management system audits ensures comprehensive oversight.

(25) The review of records should not only meet regulatory requirements but also facilitate assessments of ongoing effectiveness and identify areas for improvement.

(26) Management system arrangements supporting lifting equipment management should be auditable and subject to formal change control procedures.

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(27) Relevant reports, records, and documentation can be stored in hard copy, electronically, or on computer disks. If a computer system is utilized, it should be safeguarded against unauthorized alterations, with provisions for providing written copies when necessary.

(28) Other pertinent documents and information, such as management system procedures, communications, audit reports, and records of management reviews, should be retained as per management system arrangements and contractual requirements, especially those demonstrating the application of management of change procedures.

4.2.12. Working in Heights

(8) When working at height, it is crucial to utilize proprietary tools and tool kits explicitly designed for such environments, ensuring the safety of personnel and preventing potential hazards associated with dropped objects.

(9) A comprehensive risk assessment should precede the use of any tools at height, evaluating factors such as suitability, working environment, access, tool condition, and the competence of the user. All tools employed must be inherently suitable for height usage and securely fastened to prevent accidental drops during transportation, usage, or storage at elevated locations. Employing a tool bag with internal loops is advisable when dealing with multiple or heavy tools.

(10) In situations requiring an anchor point other than the belt or bag, an appropriate part of the surrounding structure, preferably above the work level, should be utilized. Tools exceeding 2 kg/4.5 lbs should not be affixed to the body; instead, they should be securely fastened to the adjacent worksite structure. When working in proximity to rotating machines or traveling equipment, a crucial safety measure involves securing all tools to the adjacent structure.

(11) Attention to detail is paramount in ensuring the safety of tools and personnel. Attachment points or devices on tools and bags should be well-documented, acknowledging that not all apertures on handles are designated as rated tie-off points. All connectors, snap hooks, and carabiners should be constructed from acid-proof steel (AISI 316), featuring screw lock or self-lock gates and captive eyes.

(12) For tools attached to the body, energy-absorbing lanyards, also known as fall dampers, are recommended, enhancing safety measures. While the standard use of wrist lanyards is generally discouraged, exceptions are recognized for specific tasks within confined spaces. However, Velcro wrist lanyards should be avoided in environments where the fastening integrity might be compromised by the nature of the work.

(13) A meticulous check-out/in process in a Register is essential for tools used at height, ensuring that no items are inadvertently left behind. Lastly, it is imperative not to modify proprietary tools or their retention components, as such alterations or the use of non-proprietary or modified tools may compromise their integrity, leading to potential safety risks.

(14) When engaging heavy tools and hand-held machinery designed for robust use at height, it is imperative to adhere to stringent safety measures to prevent potential hazards associated with dropped equipment.

(15) A fundamental prerequisite involves conducting a thorough risk assessment for all instances involving heavy tools and hand-held machinery, particularly where the risk of equipment falling to a lower level exists. This assessment ensures that safety protocols are tailored to the specific challenges posed by heavier equipment.

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(16) Furthermore, every heavy tool and hand-held machinery utilized at height must be diligently secured to mitigate the risk of drops, whether in active use or during transportation. The securing points for these tools should be strategically positioned above the work site and ideally fastened using a reliable anchor point to reinforce stability.

(17) Crucially, tools surpassing 2 kg should not be attached to the body; instead, they must be securely affixed to designated anchor points. The attachment points and devices on these tools should be meticulously documented, and the securing wires must undergo regular inspections in accordance with the manufacturer's recommendations to ensure ongoing reliability.

(18) To minimize shock loading effects, the securing wire should be kept as short as possible. In situations where energy-absorbing lanyards and tethers might stretch beyond safe calculations or drop distance, fixed securing wires are recommended, aligning with the unique demands of the work environment.

(19) Moreover, only certified lifting equipment should serve as securing devices where appropriate, ensuring that the tools are reliably anchored and safeguarded against accidental drops. A robust check-out/in process should be implemented for tools used at height, guaranteeing that no equipment is inadvertently left behind.

(20) It is of utmost importance to refrain from modifying proprietary tools and their retention components. Non-proprietary, modified tools, or alternative retention accessories pose a significant risk of compromising integrity, potentially leading to hazardous situations. Strict adherence to these guidelines is paramount for a secure working environment when utilizing heavy tools at height.

(21) In contemporary work settings, tool cabinets designed for use at height have become a common feature, playing a pivotal role in enhancing safety protocols and minimizing the risk of dropped objects at worksites.

(22) To foster a secure working environment, it is imperative that all tools selected for use at height are suitable for this purpose and possess well-documented attachment points. These attachment points play a crucial role in the overall safety system, ensuring that tools remain securely fastened during transportation and, notably, after the operation of equipment like turbines, especially if left in the nacelle.

(23) Efficient storage practices further contribute to accident prevention. Tools should ideally be stored horizontally in drawers, avoiding vertical hanging in cupboards, which could lead to instability and potential dislodgment. The location of tool cabinets and chests is also a critical consideration; they should be strategically placed to avoid any interference with hatches or openings, ensuring unobstructed access.

(24) Beyond the tools themselves, cabinets and chests should be equipped with robust provisions for tool tethering. This additional layer of security helps fortify the containment of tools within the storage units, significantly reducing the risk of inadvertent drops.

(25) Maintaining meticulous control over the inventory of tools is paramount. Each cabinet should have a comprehensive inventory list detailing certified and traceable contents. Additionally, these cabinets must be kept securely locked, designating a specific individual as responsible for overseeing the cabinet's contents.

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(26) Implementing a structured check-in/check-out system under the purview of the designated responsible person ensures accountability for every tool entering or leaving the cabinet. Regular checks at the end of each shift further solidify the safety measures, confirming that all tools are accounted for and properly stored.

(27) Numerous reported incidents underscore the need for heightened attention to the safety of portable equipment, including radios, gas detectors, and digital cameras, which are susceptible to unintentional drops from height.

(28) In a proactive approach to mitigate risks, it is imperative that all portable equipment used in settings where the potential for falling exists be effectively secured to prevent accidental drops. Specifically, radios and similar devices lacking certified securing points should be carried in designated pouches, providing an additional layer of containment.

(29) The choice of pouches becomes a critical consideration. Pouch locks should feature a double securing mechanism, designed to prevent any inadvertent openings that could compromise the secure containment of the equipment. Belt clips that allow detachment upon a 180º turn and snap fasteners on belts are deemed unsuitable for securing equipment at height, as they pose an increased risk of detachment.

(30) A crucial aspect of securing portable equipment involves safeguarding battery compartments and covers. Ensuring these components are properly secured serves to prevent internal elements from falling out, mitigating potential hazards associated with loose components.

4.2.13. Lifting Equipment

(1) The paramount importance of Weight Load Limit (WLL) in describing the capacity of items like hooks, slings, and shackles. The WLL, specified by the manufacturer, represents the maximum mass or force authorized for support during general service. It is crucial to replace the traditional Safe Working Load (SWL) terminology with WLL for accurate capacity representation.

(2) Shackles, integral to lifting and static suspended systems, play a pivotal role as removable links connecting wire rope, chain, and other fittings. The user must be diligent in adhering to manufacturer specifications, including reducing factors for side loads. It is recommended to consult the manufacturer's guidance or technical data sheets consistently.

(3) Various shackle types are available, each designed for specific applications. For safety and traceability, shackles should be individually identifiable, featuring an adequate WLL, an in-date certified and approved inspection record, and, if used, colour coding post-inspection. Additionally, certain shackle types, such as the 4-Part Shackles (Safety Bolt type), should be equipped with two barriers: a nut and stainless-steel split pin/cotter pin, ensuring secure fastening.

(4) It is imperative to avoid the use of unsuitable items like linch pins, nappy pins, or R-Clips during lifting operations, as these may pose risks of unintended detachment or snagging. The correct type of shackle should be selected based on the intended work/application and always aligned with the manufacturer's guidelines.

(5) Shackles are engineered to support the load at the bottom of the hollow torus and evenly across the shackle bolt. Any deviation from this loading principle, such as side loading or loading shackle pin to pin, can compromise the shackle's capacity and must be avoided. In situations where

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unavoidable point loading occurs, efforts should be made to centre the load on the shackle bolt using packing if necessary.

(6) For flat slings in use, sling shackles are recommended to maintain 100% of sling WLL and provide an even load distribution within the sling fibres. The user should refer to the manufacturer's technical data sheets for loading and operational limitations. Rigorous attention to correct usage, adherence to guidelines, and routine inspections contribute to the overall safety and integrity of shackles in lifting applications.

(7) In the realm of lifting operations, it is crucial to acknowledge that installing safety securing devices to arrest the fall of a block arrangement caused by operational overloading or catastrophic damage is not practicable. Safety securing slings, when needed, should be secured to an independent anchor point, certified, and clearly display the Weight Load Limit (WLL). These slings should be as short as possible to minimize shock loading, not interfere with the performance of the block, and undergo routine inspection and certification.

(8) Moving on to synthetic web slings, their advantages, such as low weight, flexibility, and resistance to water, are commendable. However, these slings are susceptible to damage in dynamic and caustic environments. The usage of unprotected slings with forklifts is discouraged, and precautions must be taken to protect them from ultraviolet radiation, chemicals, and sea water. Routine inspection, careful handling to avoid damage, and compliance with the manufacturer's technical data sheet are imperative for safe and effective use.

(9) Wire ropes play a vital role in lifting operations, with considerations for strength, fatigue resistance, and abrasive wear resistance. Galvanized wire ropes are recommended for harsh environments, and routine visual inspections before each use are mandatory. Unique identification, marking of WLL on the ferrule or tag, and inspection of sling end fittings for damage are vital aspects of wire rope sling safety.

(10) Eye bolts, commonly used in lifting equipment, must adhere to designated WLL, be certified, and used only for their intended purpose. Tightening before use, removal after use, and preservation of threads are standard practices. Specific types like plain and dynamo eye bolts are designed for vertical lifting, and their correct use, along with adherence to guidelines and limitations, ensures safe lifting operations.

(11) Hooks used for lifting should always be equipped with a safety device to prevent unintentional load detachment. The standard device, a spring safety clip, is suitable for many applications, but 'locking' hooks are available for enhanced safety. Selection by a competent person, regular checks of safety latches, and adherence to guidelines contribute to the safe use of hooks in lifting operations.

(12) Securing hanging hoses, especially loading hoses, poses safety challenges, and the use of unsatisfactory clips and chains is discouraged. Safety securing devices for hoses should be designed to support maximum loads generated by a burst hose, and their installation, maintenance, and inspection should adhere to specific norms and guidelines.

(13) Plate pad eyes, commonly used as anchor/attachment points for lifting appliances, play a crucial role in ensuring the integrity of lifting operations. These engineered devices, including lifting lugs and rings, should adhere to strict standards. Flame plate cut or poorly drilled pad eyes lacking design provenance should be condemned and immediately removed from service. Displaying

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identification and weight load limit (WLL) for permanently installed pad eyes is essential for clear visibility and safe utilization.

(14) Specialist lifting accessories encompass a variety of tools designed for specific lifting operations. The selection of accessories should be meticulous, considering factors such as compatibility, wear, and defects. Approved, tested, and certified accessories must be used only for their intended purpose. Rigging of specialist equipment should be performed exclusively by trained individuals, and routine inspections, closure indicating device tests, and adherence to lift plans are paramount.

(15) In the realm of chain hoists, a durable and flexible product extensively used in industrial hoisting equipment, safety is of utmost importance. Competent individuals should be responsible for the selection, use, and maintenance of hoists. Hoists should only be attached to certified beams or anchor points, with appropriate end stops in place. Regular inspection and maintenance, as per manufacturer recommendations, are mandatory to ensure the continued integrity of the chain hoists. Criteria for removal from service, such as excessive wear, damage, or lack of articulation, should be strictly adhered to.

(16) Structures and transportable equipment commonly incorporate gratings, hatches, doors, and access panels, making them susceptible to vibration and environmental loads that can compromise their integrity, leading to dropped objects. To ensure safety, grating should be securely fixed to underlying structures with through bolts or threaded connections, accompanied by secondary retention of the nut. The use of fastening clips with minimal parts is recommended, and openings in the grating should not exceed 1,500 mm^2. Regular inspection and adherence to manufacturer's recommendations for loads and support spans are crucial.

4.2.14. Grating, Hatches, Doors and Access Panels

(1) Hatches, doors, and access panels pose dropped object hazards due to inappropriate fixings, improper use, lack of inspection or maintenance, and general lack of awareness. It's essential to avoid gravity pin and loop hinges that can become disengaged. Proper seating and securement, inspection for corrosion and cleanliness of sliding doors and doors on tracks/rails, and regular checks of hinges and lugs for corrosion and wear are necessary measures. Additional security, such as safety securing wire, should be considered to reduce risks further.

(2) Piping and equipment feedthroughs can also lead to dropped objects if not adequately covered. It's crucial for all piping and equipment feedthroughs to have a toe board and be covered to the greatest extent possible, using canvas or cladding material. Regular inspection of pipe clamps for fatigue, corrosion, and missing components is necessary, and appropriately engineered pipe clamps should be used.

(3) Guard rails play a vital role in preventing dropped objects, but major defects can compromise their functionality. They should be functionally designed for their intended areas, with safety mesh installed as required. Guard rails and attachment points for collapsible and movable types should undergo regular inspections. Safety barricades and mesh systems, when used, should be of suitable materials and installed and maintained according to manufacturer's recommendations. Particular attention should be paid to fitting guardrails during the installation phase to prevent the risk of dropped objects in areas like ladder hatches and stairways. Overall, the design and installation of guard rails and toe boards should adhere to relevant national regulatory dimensions and industry practices.

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(4) Observations reveal frequent instances of missing or incorrectly installed toe boards, often with excessive gaps between the bottom of the toe board and the deck. It's essential to meet the requirements of EN ISO 14122 for safety machinery. Decks, gangways, and platforms should have toe boards at least 100 mm high, with the gap between the deck or grating and toe board not exceeding 10 mm. Temporary removal of guard rails should prompt a checklist that includes the reinstallation of toe boards in adherence to rules and regulations.

(5) Inadequate quality and design strength of hinges in swing gates have been noted, with many older gates lacking integrated toe boards. Recommendations include welding hinges to form an integral part of the gate, fitting removable gate hinge pins with secondary retention, and ensuring gates open inward. Gates should match the strength of surrounding guard rails, remain secure against disengagement, and automatically return to the closed position. Regular inspections are necessary, and where possible, integrating toe boards into gates is advised.

(6) While work at height codes govern ladder use, incidents of ladder and safety cage damage due to collisions with mobile equipment are common. Regular inspection of ladders, safe landing platforms, and fall arrest equipment is crucial. Damage and deformation should be promptly reported and corrected, and tools carried during climbs should be tethered. Mobile phones and radios should be adequately secured, and any platform hatches passed through during ladder climbs should be closed afterward to prevent snagging.

(7) Signage ideally should be directly painted on the structure, or if not possible, securely screwed or bolted to a mount or within a suitable frame. Fasteners used for attachment should have appropriate primary fixings and secondary retention. Sign frames attached using through-bolts are recommended.

4.2.15. Lighting and CCTV

(1) Lighting units installed at height often lack adequate security against falling or colliding with mobile equipment. Proper positioning, secondary retention for fixtures and brackets, safety nets for at-risk fittings, and evaluation of attachment points' strength in relation to fall energies are essential. Guidelines for correct mounting, maintenance, and inspection should be provided for new installations or when adding securing devices to existing equipment. Covers for electrical connections should not be completely removable, and plastic components should be avoided due to UV radiation weakening over time. Temporary or task lighting used at height should be suitably secured.

(2) Pivoting equipment on crane booms is exposed to shock loading, vibration, and cyclic motion. Ensuring two independent barriers, secure bolts, integrated attachment points, and regular inspections is essential. Inspection routines should include pivot bolts, attachment brackets, and primary fixings. Regular evaluations identify fatigue, corrosion, and loose fittings in securing devices and attachments.

(3) Incorrectly located junction/control boxes pose risks. Proper mounting, securing hatches, and wire/chain use for large detachable hatches are critical. Screw-secured covers and designed securing devices are necessary. Removing loose items after maintenance ensures safety.

(4) Loose nuts and bolts in cable ducts are often due to vibration or faulty installation. Approved bolted connections, adequate screw connections in pipe clips, and insulation to prevent galvanic corrosion are essential. Calculations for attachment points, necessary tightening force, and comprehensive user manuals covering installation, maintenance, and inspection are crucial.

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(5) Communications and meteorological instruments face continuous environmental forces, leading to incidents of dislodgment. Secure fasteners, through-bolts, safety securing for heavy antennas, stability measures, and preventive maintenance routines are vital. Locating sensors in areas least likely to present a dropped object risk is a prudent practice.

(6) Cargo Carrying Units (CCUs), including containers, baskets, and tanks, have been associated with serious incidents. Ensuring safe handling involves various checks, such as certified slings and intact shackles. The CCU's condition, including lifting lugs, doors, and hinges, must be inspected for excessive corrosion or damage. Adequate distribution and securement of permitted loads, well-sealed tank access chambers, and prevention of protruding equipment are vital. Regular inspections should verify no loose objects, and proper securing practices must be applied to prevent transportation hazards.

(7) Gas cylinder storage is often inadequately secured, posing risks. Storing cylinders must not obstruct passageways, and a risk assessment should guide safe storage practices. Temporary storage requires secure chains, webbing, or clamps, even inside transporting CCUs. Permanent racks must be equipped with securing brackets or chains. Adverse weather conditions can impact rack integrity, emphasizing the need for cautious loading.

(8) Inappropriate design of racks and shelves for material storage can jeopardize safety. Temporary storage should adhere to regulations concerning goods type, duration, storage area, and housekeeping. Storage arrangements must not hinder accessibility, evacuation, or emergency equipment access. Safeguarding against accidental drops is crucial, prioritizing lower storage for heavier equipment. Mobile units should secure temporary storage space, and shelving with baffle plates and closed types is recommended. Regular inspections are imperative to assess the integrity, load limitations, stability, and fastenings of shelving systems, ensuring secure storage practices.

(9) Vessels equipped with winches, tackles, and lifting gear must have this equipment installed efficiently and safely, taking into account the intended service of the vessel. All components of the lifting gear and similar equipment, whether fixed or movable, as well as items used in connection with such equipment, must be constructed solidly and designed to withstand foreseeable loads. They should be appropriately secured, supported, or suspended based on their intended purposes, with easy access provided for maintenance purposes.

(10) All components of the running gear, including wires, chains, and similar items, must possess sufficient strength and safe working load capacity to withstand foreseeable loads. All load-bearing parts should be regularly maintained and inspected for their condition.

4.3. Net Cleaning

(1) The Environmental Best Management Practice (EBMP) guideline outlines procedures for in situ net cleaning activities that are environmentally friendly, reducing waste and pollution. Adherence to these practices significantly lowers the risk of water quality impact from in situ net cleaning. The EBMP guideline emphasizes that it should be followed, except when an alternative course of action achieves equal or superior environmental outcomes.

(2) Farm managers play a crucial role, holding overall responsibility for in situ net cleaning. They must ensure compliance with standard operating procedures and environmental guidelines, minimizing difficulties in net cleaning. The EBMP suggests planning for the management of net

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cleaning, identifying procedures to minimize difficulties, and scheduling cleaning based on net conditions.

(3) MIC operators, responsible for actual net cleaning, must perform their activities without causing environmental harm. This includes proper maintenance of MIC and associated equipment and providing induction and ongoing vocational training to employees or contractors. The EBMP emphasizes the need for training in environmental responsibility and operational rules.

(4) The EBMP provides specific best management practices for different aspects of net cleaning, such as operational rules based on loading and mass balance, location and placement of pipes, and cleaning of antifouled nets. For example, cleaning should increase over the winter period to prevent high biofouling in spring/summer.

(5) Regarding the location and placement of pipes, proper placement during net cleaning minimizes the risk of net-wash flowing through cages, preventing fish health issues. Recommendations include positioning the barge downstream from the cage and placing the pipe at least two meters below the cage base.

(6) Cleaning antifouled nets requires special attention, emphasizing that the blasting method should never be used on such nets. Training and supervision are crucial, with employers having a duty to provide training and supervision to ensure employees follow environmental best management practices during net cleaning operations. Environmental induction training covers reading the EBMP document, setting up and maintaining pipes, and spill cleanup procedures.

(7) The primary objective of implementing operational rules based on loading, biofouling types, and mass balance is to establish and maintain daily net cleaning activities that minimize the release of net wash into the water column. This proactive approach aims to address several critical environmental considerations and enhance the overall efficiency of net cleaning operations.

(8) These operational rules serve multiple applications with a focus on preventing net damage caused by heavy biofouling, particularly in minimizing mussel settlement. Additionally, the rules contribute to increasing dissolved oxygen levels by promoting improved water flow through the cages. Furthermore, they guide adjustments in cleaning regimes based on seasonal variations in biofouling levels, ensuring that cleaning activities align with the specific challenges posed by different times of the year.

(9) Strategic planning is essential for the successful implementation of operational rules. This involves deciding on a cleaning regime tailored to a specific time of the year. Some sites may benefit from prioritizing cleaning based on the cleanliness of cages (net scores), while others adopt a continuous rotation approach. Flexibility in planning allows for adjustments in cleaning frequency, responding to variations in biofouling levels during different seasons.

(10) The best management practices underscore the significance of adapting cleaning practices to seasonal demands. For instance, during the winter period, cleaning should intensify by mid-August to prevent the influx of biofouling organisms into the spring/summer period. Notably, adjustments should be made if winter biofouling levels are unusually high. Specific attention is given to the presence of hydroids from June to August, necessitating an increase in the number of cleans during this period.

(11) To minimize biofouling, a critical benchmark is introduced: nets should be cleaned when the net score is below 4. This strategic approach, coupled with cleaning both the cage wall and cage base, acts as a preventive measure against the seeding of cages. Seeding refers to the process

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where hydroids proliferate and 'seed' a cage, emphasizing the importance of thorough cleaning to mitigate potential environmental impacts.

(12) The strategic location and proper placement of the pipe during net cleaning play a crucial role in minimizing the risks associated with net-wash flowing through the cage and surrounding areas, which could potentially lead to adverse fish health issues.

(13) To achieve optimal results, it is imperative to consider the placement of the pipe, especially the end of the pipe, while the Marine Icing (MIC) system is in operation. A key best management practice involves positioning the barge downstream from the cage, ensuring that the plume from net-wash rapidly exits the cage system. Referencing Figure 1 provides a visual representation of where the net cleaner barge should be placed in two different cage systems to prevent the net wash plume from traveling through the cages.

(14) Careful attention to tidal movements is essential, as tides predominantly influence the current direction and speed, particularly in the operational context of fish farms in Tasmania. This consideration ensures the effective management of the net-wash plume, preventing unintended impacts on surrounding marine environments.

(15) For cages operating within a system, a crucial practice involves weighting the pipe and placing it no less than two meters below the cage base. This measure significantly reduces the likelihood of solids traveling into the upper water column and passing through cages, potentially causing irritation to fish. The Marine Icing (MIC) operator must possess knowledge of the water column's depth where cleaning activities are conducted, ensuring the pipe is appropriately placed to prevent net-wash entry into the mid and upper water column.

(16) Maintaining the integrity of the equipment is paramount for environmental protection. Regular inspections and maintenance routines should be diligently performed to minimize leaks and drips from the machinery. It is imperative to inspect the pipe for any holes promptly, ensuring immediate patching to prevent potential environmental hazards. Additionally, operators must remain vigilant regarding tidal movements in relation to the end-of-pipe release, carefully considering its trajectory and potential environmental impact.

(17) Despite these meticulous practices, challenges arise in placing the barge in an optimal position due to net and mooring infrastructure constraints, as well as unpredictable weather conditions. These limitations necessitate a thoughtful and adaptive approach to ensure effective pipe placement while navigating practical challenges associated with farm infrastructure and varying weather conditions.

(18) The proper management of cleaning activities for nets depends significantly on whether they are coated with antifoulant. This distinction underscores the need for a tailored approach in addressing the unique challenges associated with nets treated with antifoulant substances.

(19) Primarily applicable to farms utilizing antifoulant paint on some or all of their nets, best management practices dictate a clear distinction in cleaning methods. Notably, the blasting method is strictly prohibited when dealing with nets coated with antifoulant. Instead, the recommended approach is the use of the suction method, ensuring a gentle yet effective cleaning process for these specialized nets.

(20) While the suction method stands as the exclusive choice for antifoulant-coated nets, a versatile approach allows for the concurrent use of both suction and blasting methods when dealing with non-antifouled nets. This adaptability ensures that cleaning procedures align with the specific

characteristics of the nets in question, maximizing efficiency and minimizing environmental impact.

(21) Recognizing the critical role of knowledge and skill in mitigating environmental risks, employers bear the duty to provide thorough training, information, instruction, and supervision to employees engaged in net cleaning operations. Environmental induction training, a fundamental aspect of onboarding for new employees or contractors, should encompass key components such as reading and understanding relevant documents, setting up and maintaining pipes, and spill clean-up procedures. By focusing practical net-cleaning training on these components, employers can significantly reduce the likelihood of environmental incidents stemming from inadequate skills or knowledge.

(22) Supervisors play a pivotal role in ensuring the adherence to environmental best management practices during net cleaning operations. Their responsibilities include authorizing only trained and instructed employees to carry out the work, fostering a workforce that understands and follows environmental protocols. Additionally, supervisors are tasked with actively monitoring the ongoing work, providing real-time oversight to confirm the implementation of environmental best practices.

4.4. Diving

(3) Diving work is broadly categorized into general diving work and high-risk diving work. Each category carries distinct Work Health and Safety (WHS) duties and regulations, necessitating careful consideration by PCBUs.

(4) Under the model WHS Act, everyone in the workplace holds responsibilities, with specific duties outlined for diving work. PCBUs must ensure the fitness and competence of divers, along with prioritizing the health and safety of all individuals involved.

(5) Competence in general diving work requires comprehensive training in various aspects, including diving physics, equipment usage and maintenance, decompression planning, and emergency procedures. Specific certification is mandatory, except for incidental diving or limited scientific diving, as detailed in the model WHS Regulations.

(6) High-risk diving work involves underwater tasks related to construction, testing, maintenance, repair, and commercial recovery or salvaging. Compliance with the AS/NZS 2299.1:2015 standard is mandated, emphasizing the importance of ensuring the fitness and competence of individuals engaged in such work.

(7) Identifying, assessing, and controlling hazards is integral to managing risks associated with diving work. PCBUs are tasked with conducting risk assessments, appointing qualified supervisors, developing dive plans, and maintaining comprehensive dive safety logs.

(8) Dive plans serve as a blueprint for safe diving practices, encompassing details of the diving work, individuals involved, equipment, procedures, and emergency protocols. PCBUs may have a single dive plan for multiple dives if risks are similar.

(9) Dive safety logs provide a detailed record of each dive in general diving work. Ensuring up-to-date and accurate entries is crucial, with either the diver or the supervisor responsible for prompt documentation after each dive.

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(10) Stringent record-keeping requirements are stipulated by the model WHS Regulations, including the maintenance of medical fitness certificates, evidence of competencies, risk assessments, dive plans, and dive safety logs for specified durations.

4.5. Work, Health and Safety

4.5.1. Emergency Equipment and Procedures

(1) Ensuring the safety of personnel and vessels, emergency procedures and equipment are paramount in aquaculture operations.

(2) Each vessel will have the correct emergency equipment provided and readily available at all times, as per the Authority requirements relevant to the vessel.

(3) To adhere to maritime safety standards, vessels must be equipped with the necessary emergency gear, as dictated by the Authority regulations.

(4) Crew members will be adequately trained in emergency procedures. The details of the training will be documented.

(5) Crew members must undergo comprehensive training in emergency procedures, and records of this training should be meticulously documented.

(6) Good fire prevention procedures must be in place on board the vessel.

(7) Implementing effective fire prevention measures is imperative for onboard safety.

(8) Each vessel will conduct regular emergency drills, with new crew members and existing crew members at regular intervals.

(9) Regular emergency drills, tailored to the vessel's size and equipment, are essential for preparing both new and existing crew members for unforeseen situations.

(10) Where employees work in isolation from others, there shall be an appropriate emergency procedure for them to obtain immediate assistance or for the provision of first aid.

(11) In situations where employees work alone, there must be specific emergency procedures in place to facilitate immediate assistance or first aid provision.

(12) Maintaining a sober and drug-free work environment is crucial for ensuring the safety of personnel engaged in maritime activities.

(13) No drugs, other than prescription medicines and first aid items will be carried or used on board any vessel or brought into any operations workplace.

(14) Strict adherence to a no-drug policy, excluding prescribed medications and first aid supplies, is vital for vessel safety.

(15) No crew member/employee will arrive for work, or in the course of their work be under the influence of any alcohol or drug substance so as to affect their ability to work in a safe manner.

(16) If a crew member/employee is under the influence of alcohol or drugs and the safety of other employees is at risk, the employer must remove that crew member/employee from the work process until that crew member/employee is able to work without increased risk to safety.

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4.5.2. Weather Conditions

(1) Given the unpredictability of weather conditions, a comprehensive approach is essential to protect both personnel and vessels during various weather-related challenges.

(2) The skipper of the vessel must ensure that the safety of the crew be considered at all times when encountering inclement weather conditions.

(3) Prioritizing crew safety, the vessel's skipper is responsible for making informed decisions during adverse weather conditions.

(4) If the workplace is within a cyclone area, a Cyclone Contingency Plan must be put in place to deal with sea operations.

(5) In the event of electrical storms, adherence to enterprise guidelines is crucial for employee safety, particularly in avoiding lightning-related risks.

4.5.3. Clothing And Footwear for Vessel Operations

(1) Ensuring appropriate attire for vessel operations is a key component of personnel safety.

(2) The ideal clothing requirements should be lightweight boots, heavy-duty rubber gloves, sun visors/hats, sunscreen, lightweight clothing, and aprons with quick-release mechanisms.

(3) Appropriate clothing and footwear should be worn when working in the vicinity of machinery on deck, i.e., close fitting, no toggles, ties or torn edges.

(4) A wide-brimmed hat or cap with a flap should be worn, provided it does not comprise the safety of the work being carried out.

(5) During daytime deck work, sunglasses must be worn that comply with AS/NZS1337 & 1338.2 – wrap-around polaroid glarefoile lenses with an eye protection factor level of 10.

4.5.4. Vessel Safety

(1) Ensuring the safety of vessels and those on board requires strict adherence to established safety measures.

(2) All vessels shall conform to the Authority safety requirements and equipment as appropriate.

(3) Maintaining a vigilant lookout is crucial for navigating safely in various maritime conditions.

(4) Preventing tripping hazards, unnecessary loose gear must be secured appropriately within the vessel.

(5) During operations that are conducted in hours of darkness, sufficient lighting should be provided to enable the crew to work safely.

(6) Choosing appropriate footwear based on the deck surface and debris is necessary for maintaining secure footing.

(7) Vigilance against crew members falling overboard is a collective responsibility for everyone on board.

(8) The selection of the vessel launching and retrieval site shall be the best available site considering aquaculture operation requirements, environmental conditions, personnel involved, and the location of other users.

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(9) Where vehicles are used to haul vessels, no person will stand behind a vehicle and vessel being reversed.

(10) Safety precautions are essential, and individuals should avoid standing behind a winch cable, particularly when using an electrical winch.

(11) To prevent overloading and maintain stability, a secure and safe method of loading vessels is mandatory.

(12) Ensuring the closure of tanks and hatches, especially those flush with the deck, whenever feasible, contributes to vessel safety.

(13) Cautious decision-making by the skipper and crew during adverse weather conditions is essential for deciding the use of personal flotation devices or auto-inflating jackets.

(14) The skipper's responsibility extends to ensuring vigilant crew monitoring and exercising extra caution in vessel manoeuvres during unfavourable weather conditions.

4.5.5. Dinghy and Outboard Motor Craft Safety

(1) Adherence to motor size standards outlined in AS 1799.1 is crucial for dinghy and outboard motor craft safety.

(2) Ensuring that fresh water and necessary safety gear are stowed in dinghies/small craft before departure or unloading is fundamental for preparedness.

(3) Readiness for emergencies includes having oars/paddles and a bail implement on board for potential use.

(4) Careful calculation of required fuel for a trip, along with safe storage of additional fuel, is essential for safe operations.

(5) Even load distribution and securement are crucial preconditions before initiating the motor for safe travel.

(6) Maintaining a safe speed aligned with the load and prevailing water/weather conditions is pivotal for dinghy/small craft safety.

(7) Safe practices for setting and retrieving fishing gear are essential to avoid accidents such as falling overboard, tilting, or sinking. Overloading vessels should be strictly avoided.

(8) Applying correct manual handling techniques is imperative for reducing the risk of injuries during dinghy and small craft operations.

(9) Ensuring safe load distribution and securing within the dinghy/small craft is crucial for stability.

(10) Safely transferring loads from dinghy/small craft to shore or other vessels is a critical practice for avoiding accidents.

(11) For those working alone, wearing a flotation device is mandatory to mitigate the risk of accidents.

(12) Working in isolated areas requires a trip plan to be left with a supervisor or another responsible individual for safety monitoring.

(13) Communication facilities are vital on-board vessels and in isolated areas to ensure quick and effective response in case of emergencies.

(14) Comprehensive training in basic outboard motor maintenance, emergency repairs, and dinghy/small craft handling is essential for employee competency and safety.

4.5.6. Housekeeping

(1) Maintaining a clean and organized environment is essential for both operational efficiency and personnel safety.

(2) Ensuring a clutter-free and hazard-free environment, all equipment must be properly stowed on vessels when not actively in use.

4.5.7. Fire Safety

(1) Vigilance and preparedness for fire-related emergencies are critical components of overall safety protocols.

(2) Regular fire drills, led by the skipper, are imperative on vessels to ensure the crew is well-prepared and capable of responding effectively in case of a fire emergency.

4.5.8. First Aid/Medical

(1) Prioritizing the well-being of individuals, the provision of first aid and medical resources is crucial in various operational settings.

(2) To address immediate medical needs, all vessels are mandated to carry a fully equipped first aid kit.

4.5.9. Dams, Ponds and Raceways

(1) Ensuring safety in areas involving water bodies necessitates thoughtful planning and infrastructure development.

(2) The establishment of suitable jetties and mooring areas is essential to facilitate safe access to vessels and the efficient loading and unloading of equipment and stock in dams, ponds, and raceways.

4.5.10. Training/Inductions

(1) Investing in comprehensive training is pivotal to enhance the skills and awareness of personnel.

(2) To foster skill development and ensure adherence to safety protocols, on-the-job training should be conducted under the guidance of a supervisor, leading hand, or vessel skipper.

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5. Electrical, Control and Monitoring Systems

5.1. Navigation

(1) All aquaculture vessels must adhere to requirements of prevention of collisions in *Marine Order 30*. Also note that states and territories apply COLREGS in state waters.

(2) Aquaculture vessels must comply with the requirements outlined in *NSCV Part C7C*, *Marine Orders 27*, and *28*.

(3) Rules in this Part shall be complied with in all weathers.

(4) Vessels that operate only during daylight hours and in good visibility are not obliged to carry navigation lights. However, failure to display navigation lights while underway between sunset and sunrise or in restricted visibility would be a violation of the Regulations.

(5) The Rules concerning lights shall be complied with from sunset to sunrise, and during such times no other lights shall be exhibited, except such lights as cannot be mistaken for the lights specified in these Rules or do not impair their visibility or distinctive character or interfere with the keeping of a proper look-out.

The lights prescribed by these Rules shall, if carried, also be exhibited from sunrise to sunset in restricted visibility and may be exhibited in all other circumstances when it is deemed necessary.

(6) The Rules concerning shapes shall be complied with by day.

(7) The lights and shapes specified in these Rules shall comply with the provisions of Annex I to these Regulation Important parts (yellow highlight above) have been omitted.

5.2. Communication

(1) Aquaculture vessels must comply with the requirements outlined in *NSCV PART C7B* and *Marine Order 27*.

(2) Exemptions in accordance with *AMSA EX41* may apply for unpowered barges.

5.3. Electrical

(1) Aquaculture vessels must comply with the requirements outlined in *NSCV Part C5B* and *Marine Order 1 and State / territory WHS requirements.*

(2) Exemptions in accordance with *AMSA EX41* may apply for unpowered barges.

5.4. Control and Monitoring

(1) The use of dynamic positioning is recommended for vessels that regularly interact with a floating collar.

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6. Certificates

6.1. Certificates of Survey

(1) Aquaculture vessel should possess a certificate in accordance with *Marine Order 503*.

(2) Exemptions in accordance with *AMSA EX41* may be applicable for unpowered barges and other vessels as outlined in *AMSA EX02* and *EX06.*

6.2. Certificates of Operations

(1) Aquaculture vessel equipment should possess a certificate in accordance with *Marine Order 504*.

(2) All DCVs need to have a safety management system that complies with the requirements of Marine Order 504 or the ISM Code.

(3) Exemptions in accordance with *AMSA EX41* may be applicable for unpowered barges and other vessels as outlined in *AMSA EX03*, *EX06*, *EX07.*

(4) According to AMSA, the determination of appropriate crewing must meet or exceed the minimum numbers specified in the following table. An assessment of appropriate crewing should be the starting point in determining crewing requirements, as outlined in 5.2(5)(e) below. See also section 6 of Schedule 1 in Marine Order 504.

Vessel Size Range	Total Minimum Figures for Master and Crew (Including Engineer)	Master	Engineer
>55 m and <80 m[#]	4	1	1
>35 m and <55 m[#]	3	1	1
>12 m and <35 m[#]	2*	1	1
<12 m	1**	1	

Provided that the vessel falls under the criteria of being <3000 GT and <3000 kW.

* In the case of a vessel with <750 kW propulsion power, the roles of master and engineer may be combined into one person if the master holds a certificate allowing them to operate the vessel's engines. However, there must still be another crew member on board to maintain a total of 2 individuals. For vessels with ≥750 kW propulsion power, the roles of master and engineer cannot be combined into one person.

**If the master of the vessel does not hold a certificate permitting engine operation, an additional crew member with an engineering certificate must be present on board.

(5) Safety in vessel operations is required to be improved through appropriate risk management. In particular:

(a) Keeping the safety management system onshore, with shore-based personnel.

(b) Preparation of risk assessment in consultation with master and crew.

(c) Making the risk assessment, including the determination of appropriate crewing, readily available to the master and crew.

(d) Identifying during risk assessment when a lifejacket must be worn.

(e) Determining appropriate crewing, taking into account the operation of the vessel and the requirements of key onboard operations plus qualifications and competencies of the master and crew.

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6.3. Certificates of Competency

(1) Aquaculture personnel should possess a competency certificate in accordance with Marine Order 505 or meet the equivalence requirements in accordance with Marine Order 51 (Fishing vessels) 1989, section 6.1 Competence. Alternatively, they should hold or have applied for the appropriate Letter of Registration substantive registration in accordance with the Trans-Tasman Mutual Recognition Act 1997 (TTMRA).

NOTE The IMO has carried out a comprehensive review that involved updating and modifying the provisions in the Convention. Additionally, a new obligatory Code on Standards of Training, Certification, and Watchkeeping for Fishing Vessel Personnel (STCW-F) was sanctioned. This code outlines the minimal competency standards required. the new Code aims to bring about a uniform level of qualification, thereby ensuring that individuals working on fishing vessels, as covered by the Convention, possess a minimum standard of competence. This, in turn, streamlines the mobility of fishermen and the acknowledgment of certifications among countries that have ratified and put into practice the STCW-F Convention. The fresh regulations will be applicable to all seafarers, incorporated through modifications to the STCW Code, specifically in table A-VI/1-4, which outlines the minimum standards of competence in personal safety and social responsibilities.

(1) Exemptions in accordance with *AMSA EX10*, *EX23*, EX*45* and *EX46* may be applicable.

7. Food Safety Management

(1) As a minimum requirement, food safety management and monitoring should be conducted in accordance with *Safe Food Australia: A Guide to the Food Safety Standards*.

(2) The requirements in this section have been obtained from the *Best Aquaculture Practice (BAP)* guidelines.

7.1. Process and Requirements

(1) Refuelling, maintenance, and record-keeping procedures for all equipment that uses oil or fuel should be implemented to prevent leaks or spills. Additionally, documentation should be maintained to verify that used oil is sent to an approved handling facility.

(2) Procedures should be established for the collection, storage, and disposal of trash, garbage, refuse, and other waste materials.

(3) Procedures, as well as the necessary materials and equipment, should be in place for emergency containment and cleanup of spilled materials.

(4) Procedures should be implemented for the sanitary storage and disposal of human waste (blackwater).

(5) Feasible procedures for recycling waste should be established.

(6) A written waste reduction plan should be developed to measure and record waste volumes, as well as outline strategies for reducing waste through recycling or other means over time.

(7) Workers with open wounds, sores, or skin infections should be prohibited from handling harvested products.

(8) Workers should receive training in good personal health and hygiene to ensure they understand their roles and responsibilities in protecting aquaculture products from food safety risks.

(9) Under no circumstances should untreated wastewater be allowed to enter any space with harvested species.

7.2. Refrigeration

(1) If animals are chilled at harvest, they should be rapidly chilled to an internal product temperature of 4°C or below for fish and 10°C or below for shellfish.

(2) Ice used for chilling harvested products should be made from water that meets microbial and chemical limits for potable water, or it should be water certified as safe for use on aquatic animals intended for human consumption by government regulatory authorities.

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8. Live Aquatic Animal Welfare

(1) The requirements in this section have been obtained from the *Best Aquaculture Practice (BAP) guidelines*.

(2) Chapter 7.2 of the *OIE Aquatic Animal Health Code* provides detailed guidance on the welfare of aquatic animals, especially finfish, during transport. It includes information on planning for transport, vehicles and transport containers, procedures for maintaining water quality, preparation for transport, loading, transport, and unloading.

(3) All holding, transport, and culture systems should be designed, operated, and maintained to minimise the release of aquatic animals at any life stage.

(4) Equipment and containers used to harvest and transport animals should be cleaned, sanitised, and free of lubricants, fuel, metal fragments, and other foreign materials that pose an injury risk or potential food safety hazard. This equipment should be maintained in good working order, cleaned after each use, and inspected for potential food safety hazards prior to each use.

(5) Containers should be labelled and maintained in good condition, and records of repairs should be kept. The vessel should have an operational Animal Health Management Plan or manual in place.

(6) A vessel-specific written Animal Health Management Plan should include, at minimum, the following elements:

(a) Protocols for water quality management to maintain water quality within the tolerance limits of aquatic animals (such as aeration, water exchange, liming, fertilization, etc.).

(b) Protocols for feeding and meeting the nutritional requirements of aquatic animals at each life stage.

(c) Routine disease surveillance and characterization of the animal's health status should be conducted. Regular health monitoring is essential for the health and welfare management of aquatic animals, providing an early warning detection system for rapid response to disease outbreaks.

(d) Protocols for regular observation of the behaviour and welfare of aquatic animals should be described.

(e) Disease diagnosis techniques that will be used to evaluate the prevalence of expected diseases.

(f) Disease control procedures to be followed in the event of disease outbreaks should consider a range of options, including vaccination, quarantine, therapeutic treatments, and treatment types (e.g., medicated feed, baths or dips, etc.) as well as humane slaughter (euthanasia).

(g) Procedures should also consider responses in the event of a disease emergency with the potential to cause mass mortality.

(7) The vessel should implement biosecurity controls to prevent the introduction and spread of disease agents and diseases.

(8) Vessel crew should be trained in biosecurity procedures and should comply with them, as should all visitors.

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(9) Maintaining water quality within the tolerance limits of the aquatic animals, using high-quality feeds that meet nutritional needs, and stocking at a density that will not cause stress are key approaches.

(10) Provisions should be in place for incoming stock.

8.1. General Requirements

(1) A record-keeping system for group-based welfare indicators of aquatic animal behaviour should be maintained.

(2) The behaviour of aquatic animals should be regularly inspected by trained personnel.

(3) Regular assessment of feeding response is an important component of health management that enables rapid response if necessary. Assessing feeding response can also indicate if animals are being underfed.

(4) Swimming behaviour is a reliable indicator of group welfare. Abnormal swimming behaviour, such as vertical orientation, lethargy, whirling, flashing, rubbing, and piping, can indicate disease. Custom indices for these behaviour measures may be developed, which can be qualitative or semi-quantitative (e.g., percentage range of the group exhibiting a certain behaviour).

(5) Aquatic animals experience stress during handling operations when they are concentrated. Therefore, handling operations should be conducted in ways that minimise stress, including limiting crowding time and time out of water. Procedures for routine handling operations (crowding, transfer, grading, vaccination, chemical treatment, etc.) should be described in a Standard Operating Procedure document.

(6) Equipment used for handling operations should be maintained in good working order and used in ways that minimise the potential for animal injuries.

(7) All live transport operations should be conducted with due consideration to aquatic animal welfare, biosecurity, potential disease transmission, and minimising physical injuries to preserve product quality.

(8) Vessels should be washed and disinfected before and after use. Aquatic animals should be loaded at densities suitable for the species and the distance to be travelled to other production units.

(9) A transport logbook should be maintained, including information about the group of aquatic animals loaded for traceability to the destination, as well as any mortalities that may occur during transport.

(10) Vessels crew should receive training in their roles and responsibilities in maintaining the welfare of aquatic animals on the following topics:

(a) Evaluation of welfare indicators, including normal and abnormal behaviour, signs of poor welfare, and expected diseases.

(b) Water quality management and aquatic animal husbandry.

(c) Aquatic animal handling procedures (crowding, disease treatment, transfers, loading for transport).

(d) Humane euthanasia methods.

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(e) Maintaining training logs to document crew training activities.

8.2. Live Animal Tank Water Control Systems

(1) All chemicals used during transport should be approved by government regulatory authorities for application to aquatic animals. A list of approved chemicals should be maintained on file at the vessel.

(2) Containment systems for all life stages should be designed, constructed, and operated to minimise the escape of cultured animals. These containment systems can be used to grow, temporarily hold, or transport aquatic animals.

(3) The equipment used to contain aquatic animals should be inspected according to a regular schedule. A program for regular preventative maintenance and repair of containment and equipment should be in place. A reporting system should be implemented to indicate inspection results and preventative maintenance activities.

(4) All incidents involving animal escapes should be accurately documented. This documentation should include the reason for the escape, the number of organisms that escaped, the health status of the escapes, and any recovery plans or effectiveness statistics.

(5) Vessels should maintain equipment for attempted recapture of escaped animals and have written procedures for its use. The procedures should enable rapid response, considering legal constraints on the types of equipment that can be used. If an escape is known or suspected, immediate investigation should be conducted, corrective steps should be taken, and plans and actions should be proposed to address future escape risks. These actions should be documented in vessel records. If there are grounds to believe an escape occurred after the investigation, the remaining aquatic animals in the culture system should be counted, if possible, without causing excessive distress, and any loss of inventory should be recorded.

(6) Vessels should have a written Containment Plan that addresses escape prevention and deals with known or suspected escapes. The Containment Plan should include the following elements:

(a) Integrity of infrastructure and equipment: design and construction standards for an effective containment system, equipment testing.

(b) Inspections: inspection program for infrastructure and equipment, including preventative maintenance and repair.

(c) Inventory control procedures: counting methodology and verification, aquatic animal inventory reconciliation.

(d) Aquatic animal handling practices: precautions during transfers, counting, grading, disease treatment, harvesting, transport, and other vessel operations.

(e) Predator deterrence and control plan: predator control structures (as appropriate), control of predator access, control methods.

(f) Response procedures and escape mitigation: recapture and recovery of stock, escape incident reporting requirements, root cause analysis of escapes or containment failure.

(g) Recordkeeping: equipment testing results, aquatic animal inventory reconciliation or escape detection, escape event log, training activities.

(h) Training: definition of employee responsibilities and oversight.

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(7) The vessel should have a written Water Quality Management Plan that includes:

(a) Frequent or continuous monitoring of dissolved oxygen concentration and at least daily monitoring of water temperature and salinity.

(b) Monitoring for other aspects of water quality that may affect in the vicinity of the farm, including seasonal occurrences such as phytoplankton blooms.

(c) Training of staff on measuring temperature, dissolved oxygen, and, if relevant, concentrations of harmful phytoplankton.

(d) A list of practical mitigation measures that can be used in the event of water quality problems, as well as available equipment and trained staff to deploy them rapidly.

(e) Provision of equipment to maintain and monitor dissolved oxygen levels at 80 to 100 percent of saturation during live animal transport.

8.3. Live Animal Loading and Unloading Systems

(1) Animals should always be treated with care. Therefore, the good aquatic animal husbandry practices should be applied.

(2) The average vessel stocking density should not normally exceed 25 kilograms per cubic meter. However, it may be allowed to temporarily rise higher for up to 5 percent of the production cycle if the animal show other indicators of good welfare, such as low mortality, and if water quality is considered good.

(3) Good water quality would typically include water temperature below 12°C, dissolved oxygen above 80 percent saturation, and minimal presence of harmful algae. Sudden artificial illumination, underwater noise, and other environmental disturbances should be limited.

(4) If live aquatic animals are transported from one production unit to another, the animals should be acclimated to the new conditions prior to unloading.

8.4. Examination and Testing

(1) Live animal tanks must be equipped with methods to assess the liquid levels in the tanks. If permanent sounding arrangements are in place, remote level indicators should be installed in the tank control room or navigation bridge. In cases where an air bubbling type level gauging system is used in the tank, the air supply should be drawn from a location on the weather decks with a suction strainer. The air pumping system must be designed to prevent contamination of the air by the lubricant used in the air pump.

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