



GUIDANCE NOTES ON

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**RESPONSE MEASURES TO COVID-19 FOR THE MARINE  
AND OFFSHORE INDUSTRIES  
MAY 2020**

American Bureau of Shipping  
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## Foreword

As the world's leading classification society, ABS has been setting maritime and offshore standards for almost 160 years. These standards promote the security of life and property, and preservation of the natural environment.

The impact of the COVID-19 pandemic is being felt across all sectors of shipping and offshore, including stakeholders' supply chains. As carriers of 90% of world trade volumes, the fortunes of the commercial shipping sector and its supply chain are directly tied to those of the global economy.

With all maritime and offshore parties affected by the outbreak of the virus, it is important that industry works to achieve standards of cleanliness and contamination response to improve health and safety of personnel while maintaining continuity of operations. This will require that best practices for disease prevention and mitigation are understood and implemented.

In response to the global outbreak of COVID-19, these Guidance Notes provide best practices for:

- Storage, use, and disposal of cleaning and disinfecting products
- Mitigating the COVID-19 exposure risks by cleaning, disinfecting, screening, and social distancing
- Response to COVID-19 case onboard through isolation, contact tracing, quarantine, cleaning, disinfecting and disembarkation.

These Guidance Notes have been developed based on several independent governmental and commercial sources and are intended to present a consolidation of the best available information at the time of publication.

This document may be applied to marine and offshore assets including navy vessels, commercial vessels, drilling units, production installations, and other offshore units. Certain types of passenger vessels may have special guidelines beyond the scope of these Guidance Notes. Guidance on shoreside facilities may be included in the future revisions.

Due to the nature of this publication and the amount of new information being released, users are advised to check periodically on the ABS website [www.eagle.org](http://www.eagle.org) to verify that this version of these Guidance Notes is the most current.

*We welcome your feedback. Comments or suggestions can be sent electronically by email to [rsd@eagle.org](mailto:rsd@eagle.org).*

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## SECTION 1 Introduction

### 1 General

In response to the outbreak of the virus SARS-CoV-2, and the disease it causes, COVID-19, ABS has created these Guidance Notes to assist the marine and offshore industry to protect their workforce while maintaining continuity of operations.

### 2 Scope

These Guidance Notes provide best practices for:

- Storage, use, and disposal of cleaning and disinfecting products (Section 3)
- Mitigating COVID-19 exposure risks by cleaning, disinfecting, screening, and social distancing (Section 4)
- Response to COVID-19 cases onboard through isolation, contact tracing, quarantine, cleaning, disinfecting, and disembarkation (Section 5)
- Risk management framework (Appendix 1) for developing Prevention Management Plan (see 4/2) and Outbreak Management Plan (see 5/2)

The measures in this document are intended to help reduce the spread of the virus but will not eliminate the risk of transmission. They should be used in conjunction with operating practices of each asset.

These Guidance Notes have been developed based on current information provided by several independent governmental and commercial sources and are intended to be a consolidation of the best available information at the time of publication.

The policies and procedures vary among government and commercial resources and their “best practices” may change over time in this very dynamic environment.

This document does not cover medical treatment of COVID-19 patients on board. Personnel in charge of medical care onboard should rely on the recommendations of recognized medical professionals.

### 3 Application

These Guidance Notes are applicable to marine and offshore assets including navy vessels, commercial vessels, drilling units, production installations and other offshore units.

### 4 Regulatory Compliance

#### 4.1 Port Authority

Commercial vessels should comply with special guidelines provided by port authorities to help control the spread of the virus that causes COVID-19, prior to calling at these ports. When there is a suspected case of COVID-19 disease onboard, the vessel master should inform the port health authority at the next port of call in accordance with the International Health Regulations (IHR) [1]. A Maritime Declaration of Health (MDH) should be completed by vessels on an international voyage and sent to the authorities at the next port of call.

## 4.2 ISM Code

All assets that are subject to the International Safety Management Code (ISM code) [2] are required to establish safeguards against all identified risks. Therefore, Prevention Management Plan as well as Outbreak Management Plan are encouraged to address the risk of infection by and/or transmission of virus that causes COVID-19. Appendix 1 outlines a risk management framework that may be useful in developing such plans.

## 5 Definitions

For the purpose of these Guidance Notes, the following definitions apply:

*Cleaning:* Removal of visible soil (e.g., organic and inorganic material) from objects and surfaces. It is usually accomplished manually or mechanically using water with detergents or enzymatic products [3].

*Close Contact:* See 5/3.2

*Confirmed Case:* See 5/3.1.2

*Decontamination:* The use of physical or chemical means to remove, inactivate, or destroy pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal [4].

*Disinfection:* A process that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects [3].

*Isolation:* Separation of sick people with contagious disease from people who are not sick [5].

*Microbe:* Microscopic bacteria, viruses, fungi, and protozoa.

*Quarantine:* Separation and restriction of movement of people who were exposed to a contagious disease to see if they become sick [5].

*Sanitation:* Effective use of tools and actions that will reduce the occurrence and growth of bacteria, viruses, and fungi and help maintain hygienic conditions.

*Sanitization:* Lowering the number of microbes on a surface.

*Suspected case:* See 5/3.1.1

## 6 Abbreviations

ABS	American Bureau of Shipping
COVID-19	COronaVirus Disease - 2019
ECHA	European CHEmicals Agency
HDPE	High-Density PolyEthylene
ICS	International Chamber of Shipping
IHR	International Health Regulations
ILO	International Labour Organization
IMO	International Maritime Organization
IP	Ingress Protection
ISM	International Safety Management
LDPE	Low-Density PolyEthylene

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MARPOL	The International Convention for the Prevention of Pollution from Ships
MDH	Maritime Declaration of Health
MERS	Middle East Respiratory Syndrome
MODU	Mobile Offshore Drilling Unit
MEPC	Marine Environment Protection Committee
PHEIC	Public Health Emergency of International Concern
PLF	Passenger/Crew Locator Form
PPE	Personal Protective Equipment
ppm	parts per million
PVC	Polyvinyl Chloride
QAC	Quaternary Ammonium Compounds
SARS	Severe Acute Respiratory Syndrome
SARS-CoV	Severe Acute Respiratory Syndrome Coronavirus
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus - Second
SOLAS	The International Convention for the Safety of Life at Sea
SCC	Stress Corrosion Cracking
US EPA	United States Environmental Protection Agency
UV	Ultraviolet Light
WHO	World Health Organization





## SECTION 2 COVID-19

### 1 Background

The coronavirus disease 2019 (COVID-19) is an infectious disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Coronaviruses are a family of viruses that commonly cause respiratory illnesses in people. The novel coronavirus, SARS-CoV-2, is a newly discovered virus, and is the seventh of the coronaviruses that are known to infect people. Coronaviruses also circulate among animals, including camels, cattle, cats, and bats [6].

A diagnosis of any of the more common human coronaviruses (229E, NL63, OC43, HKU1) is not the same as a COVID-19 diagnosis. Patients with COVID-19 should be evaluated and cared for differently than patients with more common coronavirus diagnoses.

Two other coronaviruses that cause human infection are the Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV, causing SARS) and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV, causing MERS).

SARS was first recognized in 2003 with reports of an atypical pneumonia in mainland China. Within about six months, the outbreak spread to 26 countries; the virus infected more than 8,000 patients and caused 774 deaths. The most recent human SARS cases were in 2004. They were laboratory-acquired infections reported from China.

MERS was first recognized in Saudi Arabia in 2012. Of the nearly 2,500 reported laboratory-confirmed cases, 80% have been in Saudi Arabia with the remainder in 26 other countries. About one third of those infected have died. MERS is not readily spread person-to-person, though outbreaks have occurred in healthcare settings and other environments with close person-to-person contact. The most recent cases can be directly or indirectly traced to dromedary camels in the Arabian Peninsula.

The SARS-CoV-2 virus causes COVID-19. The syndrome was first recognized in China through reports of atypical pneumonia in late 2019. The disease spread rapidly, primarily through person-to-person contact. By January 30, 2020, WHO declared it a “public health emergency of international concern”.

The disease had been reported from nearly every country around the world, and is having tremendous impacts on the entire world, ranging from health to economics.

### 2 Symptoms

Symptoms of COVID-19 may appear 2 to 14 days after exposure and may include fever, cough, and shortness of breath or difficulty breathing. Some people are at higher risk for severe illness, including older adults and those with chronic medical conditions such as asthma, diabetes and heart disease [7].

The most common symptoms include [8]:

- fever
- tiredness
- dry cough

Other symptoms can include:

- Shortness of breath

- Aches and pains
- Sore throat
- In limited cases, diarrhea, nausea, or a runny nose
- Neurologic, such as impaired taste and smell

More severe symptoms may include:

- Inflammation of the lungs, leading to other health complications
- Multi-system organ failure, e.g., renal, cardiac
- Death

Some people become infected, but do not show any symptoms (asymptomatic), but may serve as carriers for the disease, and contribute to the spread of the virus.

### **3 Transmission of Disease**

The virus is believed to be primarily spread by respiratory droplets produced when an infected person coughs, sneezes or talks. These droplets can land in the mouths, noses or eyes of uninfected people who are nearby, or possibly be inhaled into their lungs. These droplets can land on surfaces or objects, and if an uninfected person touches these surfaces or objects then touches their mouth, nose, or eyes, he/she may become infected. Additionally, droplets expressed from an infected individual can linger in the air and be inhaled into the lungs by individuals within 2 m (6 ft). The virus may also be spread by people who are not showing symptoms [9].

The ease with which a virus spreads from person-to-person varies. The virus that causes COVID-19 spreads very easily and sustainably between people. Information from the ongoing COVID-19 pandemic suggests that this virus spreads more efficiently than common influenza, but not as efficiently as measles, which is highly contagious.

### **4 Impact to Personnel**

Due to the nature of transmission, and the close quarters maintained by individuals on marine and offshore assets, it is possible for the virus to spread rapidly. Given the range of symptoms, and severity of the disease, assets with suspected cases should take immediate measures to limit exposure to the virus.

The virus may potentially spread throughout the personnel onboard, straining onboard medical resources, impacting the operation of an asset, and affecting the ability of a vessel to enter a port or disembark personnel. Additionally, personnel onboard experiencing severe symptoms may not be able to receive adequate medical care in time.



## SECTION 3 **Cleaning Products, Disinfectants and PPE**

### **1 General**

Cleaning of visibly dirty surfaces followed by disinfection is a best practice measure for the prevention of COVID-19 and other viral respiratory illnesses [11]. The effectiveness of disinfection is greatly reduced if it is applied to a visibly dirty surface.

This Section provides best practices for storage, use, and disposal of common cleaning and disinfecting products, as well as the recommended types and use of PPE for various activities on board an asset. Cleaning and disinfection frequency is discussed in Sections 4 and 5.

### **2 Cleaning Products**

Detergents, soaps, and other common cleaning products should be used in accordance with manufacturer's instructions and regular marine and offshore cleaning procedures. Hard, non-porous, surfaces should be cleaned using a detergent or soap and water. Soft, porous, surfaces such as carpeted floors, rugs, and drapes should be cleaned with cleaners designed specifically for use on these surfaces, or with a steam cleaner. Visible contaminants also should be removed from all electronic items using the appropriate general-purpose cleaners.

It is important to follow the manufacturer's recommendations regarding the usage of cleaning solutions, their concentration, and method of application for each surface to be cleaned. Standard asset procedures for storing, handling, and disposing of cleaning products should be followed.

The list of Safety Data Sheets (SDS) kept on board any asset for each chemical being carried should be updated if new cleaning agents are brought on board.

### **3 Disinfectants**

#### **3.1 List of Disinfectants**

Disinfectant products based on the following chemical compounds are understood to be effective against SARS-CoV-2 virus:

*i) Bleach (sodium hypochlorite or calcium hypochlorite)*

This is a fast-acting disinfectant that does not leave a toxic residue and is unaffected by water hardness.

*ii) Alcohol*

Isopropyl alcohol (also known as isopropanol, 2-propanol) and ethyl alcohol (also known as ethanol or drinking alcohol) are frequently used in rubbing alcohol, hand sanitizers, and disinfection pads and wipes.

*iii) Quaternary Ammonium Compounds (QAC)*

Quaternary ammonium compounds are often found in disinfectants. Their effectiveness depends on other chemical compounds in the disinfectant.

*iv) Hydrogen Peroxide*

Commercially available hydrogen peroxide (3% ~ 6%) is a stable and effective disinfectant when used on surfaces.

Two other disinfectants are being increasingly used to disinfect medical facilities, laboratories, schools, etc. Their performance has not been independently verified by ABS.

*i) Hypochlorous Acid (electrolyzed water)*

Hypochlorous acid is very effective against bacteria, fungi, and viruses. In concentrations used for disinfection, e.g. 50 ppm, it does not irritate skin and is very mild to mucous membranes. It is often used for sanitizing food and contact surfaces.

*ii) Accelerated Hydrogen Peroxide® (AHP®)*

AHP® contains hydrogen peroxide that has been accelerated to increase its germicidal potential.

*Note:* AHP® is the registered trademark of Virox Technologies Inc.

Other chemical compounds may be considered as disinfectants if their effectiveness against the virus that causes COVID-19 has been confirmed by national or international health authorities e.g. United States Environmental Protection Agency (US EPA) [12] and European Chemicals Agency (ECHA) [13]).

When evaluating a disinfectant that is not listed above, the following characteristics may be considered:

- i)* Fast acting and effective against the virus that causes COVID-19
- ii)* Compatible with soaps, detergents, and other cleaning chemicals
- iii)* Nontoxic
- iv)* Should not corrode instruments and metallic surfaces and should not cause the deterioration of cloth, rubber, plastics, and other materials
- v)* Easy to use with clear instructions on the label
- vi)* Stable in concentrate and after being diluted
- vii)* Not harmful to the environment when disposed of

The list of SDS kept on board any asset for each chemical being carried should be updated if new disinfectant agents are brought on board.

### 3.2 Disinfectant Concentration Guidance

For the disinfectant to be effective against the virus that causes COVID-19, the following concentrations of chemical compounds are recommended:

- i)* Diluted bleach solutions should be used with at least 1000 ppm sodium hypochlorite (e.g. five tablespoons of bleach per one gallon of water)
- ii)* Spray-on disinfectant or sanitizers should contain a minimum of one of the following: 0.5% sodium hypochlorite, or 70% isopropyl or ethyl alcohol, or 0.5% hydrogen peroxide
- iii)* Hand sanitizers should contain a minimum of 70% alcohol (isopropyl or ethyl)

### 3.3 Preparation and Handling of Disinfectants

The typical concentration of chemicals found in commercial disinfectants can have adverse effects on human health.

Bleach at the concentrations recommended for cleaning has generally a low incidence of serious toxicity according to the CDC. However, contact with the eyes can be serious even at relatively low concentration.

In high concentration (e.g. from the original container) bleach can irritate mucous membranes, the skin, and the airway, and is especially toxic if splashed into the eyes.

Isopropyl and ethyl alcohol can cause skin itching, redness, rash, drying, and cracking under repeated exposure. Skin exposure to quaternary ammonium compounds can lead to skin rashes and inhaling can irritate the lungs.

Hydrogen peroxide is mildly irritating to the skin and mucous membranes.

All of these chemicals can cause serious eye irritation and damage. Therefore, the manufacturer's guidance for wearing personal protective equipment (PPE) while working with disinfectants should be followed. If such guidance is not available, reference should be made to Section 3/4.

Manufacturer's instructions for preparation of any disinfectant should be followed, especially the recommended concentration levels. These levels should not be exceeded, as adverse effects on human health, surfaces (corrosion, bleaching, hardening, swelling, etc.) and the environment may occur. The manufacturer's recommended concentration levels should also satisfy the recommendations from 3/3.2, otherwise a different disinfectant should be used.

Disinfectants should be used within their shelf lives for maximum effectiveness against the virus that causes COVID-19.

Different disinfectant products should never be mixed as this can produce hazardous vapors and oxidizing reactions (i.e., bleach and ammonia). Also, disinfectants should never be mixed with other cleaning agents.

The preparation of disinfectant solutions should be conducted in well-ventilated areas. Additional ventilation may be needed to reduce the concentration of hazardous vapors. Precautions should be taken to avoid splashing, especially to the eyes; eye goggles should be worn when appropriate. Eyewash stations should be provided in the areas where disinfectants are being prepared. Portable handheld eyewash stations may also be used.

Bleach should be diluted with cold water as hot water reduces its effectiveness. Once diluted, bleach solutions should be stored in closed containers, and used within 24 hours.

Alcohol wipes should be transported within a container with a closed lid to prevent evaporation and combustion.

### 3.4 Precautions for Applying Disinfectants

Disinfectant chemicals can have adverse effects when they come in contact with various types of surfaces and materials. For example, they can cause fabrics to lose color; plastics to harden, crack and discolor; and the surfaces of metal objects to oxidize. It is important to follow the manufacturer's recommendations for use on each specific surface or material. The disinfectant first should be tested on a small part of the surface to see if there are any immediate adverse reactions between the disinfectant and the surface material.

The long-term effects of daily usage of disinfectants on various substrates remain largely unknown and constant monitoring of surface degradation is recommended. Appendix 2, Tables 1 and 2 contain the degradation risk of various metallic and non-metallic substrates on marine and offshore assets when in contact with common disinfectant chemicals.

The subsection below contains general precautionary measures that should be employed when applying disinfectants to various surfaces.

#### 3.4.1 Impact of Disinfectants to Various Surfaces

##### 3.4.1(a) Structure and Bare Metal Surfaces

Chlorine causes stress corrosion cracking. The use of bleach solutions or hypochlorite wipes should be avoided on any bare metals to avoid stress corrosion cracking.

Disinfectants based on QAC should not be used on copper bearing alloys (piping, components, fasteners) to avoid stress corrosion cracking.

Hydrogen peroxide will corrode copper, zinc, and brass.

Alcohol based disinfectants are recommended on bare metal surfaces. Use of flammable disinfectants should be avoided in hot-work areas.

#### 3.4.1(b) Machinery and Sensitive Equipment

Using bleach solutions or hypochlorite wipes should be avoided on sensitive machinery casings and valves.

Alcohol-based disinfectants are recommended for machinery and other sensitive equipment. It is important not to oversaturate the equipment with the disinfectant and to prevent the pooling of liquids.

Alcohol-based disinfectants should not be applied to machinery components that are hot to touch or energized.

Alcohols may damage the shellac mountings of lensed instruments; they tend to swell and harden rubber and some plastic tubings after prolonged and repeated use. They can also bleach rubber and plastic tiles.

#### 3.4.1(c) Coatings

In general, alcohol-base disinfectants can soften coatings. The bases for coating are variable, and there are numerous types of fillers that perform a specific function. The paint bases for accommodation and deck areas are usually:

- Epoxy
- Alkyd
- Acrylic
- Polyurethane

To understand the influence of disinfection chemicals on a specific coating, it is necessary to know what paint systems have been applied in the areas of concern, and the paint supplier. In this regard advice from the coating manufacture is recommended.

#### 3.4.1(d) Cables

To clean and disinfect exposed cables, use general purpose cleaning liquids and disinfecting liquids that are free of bleach, alcohol, and ammonia.

#### 3.4.1(e) Electronics

To clean or disinfect any enclosure for electrical equipment, the equipment should first be disconnected from its electrical power sources. If this is not possible, a qualified operator or technician of the specific equipment should be present to prevent cleaning liquids from getting inside the equipment or onto sensitive electronics. Also, since alcohol-based disinfectants are flammable, the risk of combustion is greater if electronic equipment is connected or hot to touch.

All electrical equipment installed on vessels should have a minimum IP (Ingress Protection) rating according to the location where the equipment is installed. See 4-8-3/Tables 1A, Table 1B, and Table 2 of *ABS Rules for Building and Classing Marine Vessel*. For example, electrical equipment installed in a dry accommodation space should, at minimum, to be rated IP 20. Electrical equipment in machinery spaces should be rated IP 22, IP 44, or IP 55. Equipment installed in exterior locations should have a minimum rating of IP 55 or IP 56.

The first numeric digit in the IP rating represents the degree of protection against solid objects, such as dirt and dust. The second numeric digit in the IP rating represents the degree of protection against water.

Cleaners and disinfectants may be sprayed on equipment that has an IP rating of at least IP x5.

In general, cleaners and disinfectants should not be poured or sprayed directly onto any electrical equipment. It is recommended to dampen a lint free cloth with the cleaner or disinfectant, and then wipe the equipment with the cloth. Liquid contact with pushbutton switches should be avoided to reduce the risk of intrusion to internal electrical connections.

It is recommended to use general purpose cleaners on electrical and electronic equipment. Bleach, ammonia, compressed air, or hydrogen peroxide should not be used. For disinfection, isopropyl alcohol-based disinfectants are recommended. Ethanol disinfectants may also be considered as effective alternatives.

Keyboard should be unplugged before cleaning and disinfecting. Lint-free cloth dipped in isopropyl alcohol should be used. Top and sides of each key should be rubbed before proceeding to other keyboard surfaces, including its bottom. The mouse should be disinfected using a new disinfectant wipe or cloth.

Cleaners with bleach or ammonia should not be used for coated glass or screens to avoid damage. Isopropyl or ethanol alcohol products are typically available in a range of concentrations. If no manufacturer guidance is available, alcohol-based wipes or spray containing at least 70% alcohol should be used to disinfect touch screens [11].

When using alcohol-based products, one should be cognizant of the risk of combustion if the product is exposed to a spark, static electricity “shock” (especially in extremely dry environments), or electric current.

#### 3.4.1(f) Fabrics

Bleach should not be used on fabrics. QAC and hydrogen peroxide are recommended for disinfecting fabrics (carpets, drapes, furniture, etc.). Alcohol may also be considered.

#### 3.4.2 Summary of Disinfectant Usage Guidance

Section 3, Table 1 presents a general guidance for using disinfectants on different surfaces on marine and offshore assets.

**TABLE 1**  
**Usage of Disinfectants on Common Surfaces**

<i>Surfaces</i>	<i>Bleach</i>	<i>Alcohol</i>	<i>QAC</i>	<i>Hydrogen Peroxide</i>
Floors in accommodation spaces				
Structure and bare metal surfaces				
Machinery and sensitive equipment				

<i>Surfaces</i>	<i>Bleach</i>	<i>Alcohol</i>	<i>QAC</i>	<i>Hydrogen Peroxide</i>
Cables				
Electronics				
Fabrics				

*Notes:*

	Should be considered
	May be considered
	Should not be considered

### 3.5 Techniques for Applying Disinfectants

The effectiveness of the disinfectant is a function of the time it remains on a surface, especially in a liquid or mist form. To a point, the longer it is on a surface, the more effective it is. It is generally agreed that disinfectants should be left on a surface for at least 10 minutes. Also, all surfaces should be free of visible dirt before applying the disinfectant.

#### 3.5.1 Mopping

Floors and other horizontal surfaces can be mopped using a damp cloth that has been soaked in a disinfectant and wrung. A steady mopping motion should be used to prevent liquid splashing which may aerosolize the virus.

#### 3.5.2 Wiping

Walls, other vertical surfaces, doors, windows, furniture, armrests, tabletops, switches, electronic equipment and components, light fixtures, thermostats, lavatory surfaces, galley work area, various equipment, handrails, handles, knobs, tools and some re-usable PPE, etc. can be wiped down using a damp cloth that has been soaked in a disinfectant and wrung, or using disinfectant wipes.

#### 3.5.3 Spraying

Sprayers that offer a wide-dispersion mist can be used to dispense disinfectant on a treated surface. Delivering a stream of disinfectant should be avoided. Light mist spraying is recommended to mitigate the risk of virus re-aerosolizing from the surface.

All types of hard non-porous and soft porous surfaces can be treated with spraying, except for the surfaces in machinery, propulsion spaces and those covering electrical equipment, components, and outlets.

One coating of mist is sufficient. In general, the surfaces should not be wiped afterwards. However, if pools of disinfectant occur, the excess should be wiped off.

#### 3.5.4 Other Techniques

This subsection contains a list of other techniques for disinfection that have a limited track record for application and proven effectiveness in marine and offshore industries. Extra precautions should be exercised when using these techniques as their effects on human health and equipment have not been fully evaluated.

##### 3.5.4(a) Fogging

Foggers are used to uniformly dispense nonflammable and noncombustible disinfectants in the form of dry mist to all the surfaces in a room. Optimal coverage is usually achieved by setting the particulate size to 10-20 microns.



Fogging is useful for disinfecting soft surfaces and hard to reach places. Considerations should be given to the size and type of space being fogged. All occupants should leave the room or any area being disinfected. All air ducts and gaps around room openings should be sealed off. The effect of fogging techniques on electronic equipment has yet to be sufficiently studied. Therefore, if foggers are to be used, electronic equipment should be sealed off.

Only products approved for fogging should be used, in conjunction with the appropriate equipment and PPE.

#### 3.5.4(b) Steaming

Steam-cleaning machines may aid in the disinfection process. Handheld steam cleaners may be used for upholstered items such as chairs, couches etc. For larger areas, such as rugs and carpets, larger steamer units may be used. Because there are uncertainties related to the temperature of the steam, the relative humidity at the surface, contact time with pathogens, distance between the surface and the steam outlet, skill of the cleaning crew, etc., this processes' ability to kill pathogens can vary significantly. Therefore, steaming on its own should not be considered as an alternative for using chemical disinfectants.

#### 3.5.4(c) Ultraviolet Radiation

Although not a chemical disinfectant, ultraviolet (UV) light can be effective at reducing harmful pathogens. UV radiation is a part of the light spectrum with three wavelength ranges: UVC (100 nm-280 nm), UVB (280 nm-315 nm), and UVA (315 nm-400 nm). Its maximum germicidal effect occurs between 240 and 280 nm, which is in the range of UVC light [3].

UVC light systems are sometimes incorporated with air and water-filtration systems for sanitization purposes on marine and offshore assets. UVC lights also can be placed near the coils and drain pans of heating, ventilation and air-conditioning (HVAC) systems to keep microorganisms from increasing in these damp areas.

UVC light products (wands, tunnels) are also available and used for sanitizing work surfaces and small devices, such as phones, small appliances, luggage and packages.

However, there is presently insufficient information on the proper usage of UVC light and its efficacy in eliminating harmful bacteria, viruses and molds. UVC light should not be considered as an alternative to using chemical disinfectants.

### 3.6 Storage of Disinfectants

All disinfectant products that are brought on board an asset should be stored in accordance with manufacturer's recommendations and the appropriate class or IMO requirements. For assets subject to the International Convention for the Safety of Life at Sea (SOLAS) or IMO *Code for the Construction and Equipment of Mobile Offshore Drilling Units* (MODU Code), spaces used for storing flammable disinfectants containing alcohol should be designated as high fire risk service spaces of category 9. Reference also can be made to 4-7-2/5.1 of *ABS Rules for Building and Classing Marine Vessels*, which addresses paint and flammable liquid lockers.

Oxidizing disinfectants such as bleach (calcium hypochlorite, sodium hypochlorite) and hydrogen peroxide and flammable disinfectants containing alcohol never should be stored in the same compartment.

Secondary containers used to store diluted disinfectant solutions should be properly labeled with the product name, the manufacturer's name, stock number (if applicable), date of preparation, and the nature of the hazard (e.g., flammable, corrosive, toxic, irritant, etc.).

When not in use, the disinfectants should be sealed to prevent the release of vapors and the evaporation of active ingredients.

The supply of cleaning and disinfecting products may exceed the capacity of designated lockers. In that case, spaces designated as service spaces per SOLAS/IMO MODU Code, may be used to store cleaning products and disinfectants. Any area that is used to store cleaning products and disinfectants should be well-ventilated, cool, and shaded. Other products should not be stored in the same space. Special consideration should be paid to storing alcohol, which is flammable.

### 3.7 Disposal of Disinfectants

Liquid disinfectants and their solutions may be disposed of by discharging them into the asset's sanitary system. The sewage should be managed with the assumption that it contains human pathogens and treated through the asset's sewage treatment plant, if installed, in accordance with MEPC Resolutions 159(55) [14] or 227 (64) [15] of MARPOL Annex IV, as applicable.

For assets not equipped with a sewage treatment plant (i.e. fitted with a sewage comminuting and disinfecting system or with a holding tank), discharge of sewage should meet MARPOL Annex IV provisions subject to any recommendations/instructions that might be issued by local Authorities or the WHO.

Disinfectant wipes should not be flushed down the sewage system and should be disposed of similar to other infectious waste (see 5/4.3.3).

## 4 Personal Protective Equipment

The following PPE should be available on board a marine or an offshore vessel in sufficient quantities as determined by the asset's risk assessment (see Appendix 1) and specified in the Prevention Management Plan (see 4/2) and Outbreak Management Plan (see 5/2):

- Disposable surgical masks with three layers
- Respirator masks (N95 or FFP2 equivalent)
- Disposable latex-free nonsterile gloves
- Disposable cleaning gloves
- Eye protection (goggles)
- Face shields
- Aprons
- Disposable medical gowns or coveralls
- Chemical resistant boots

The following table contains general guidance for usage of PPE for different activities onboard an asset. In addition, during cleaning and disinfecting, PPE guidance from the cleaning and disinfection product manufacturers should be followed.

**TABLE 2**  
**Usage Guidance for PPE<sup>(1)</sup>**

<i>ACTIVITY</i>	<i>PPE Level</i>	<i>Disposable Masks</i>	<i>Respirator Masks</i>	<i>Disposable Gloves</i>	<i>Goggles or Face Shield</i>	<i>Apron</i>	<i>Disposable Gown</i>
Onboard activities in public or shared spaces <sup>(2)</sup>	Level 0						
Handling, preparing, and serving food	Level 1	✓		✓			
Interaction with visitors, including the pilot							
Interaction with bridge team							
Gangway watch							
Handling supplies and documents from shore							
Handling of regular garbage							
A COVID-19 patient briefly interacting with crew member <sup>(3)(4)</sup>	Level 2		✓	✓	✓	✓	
General cleaning and disinfection <sup>(5)</sup>							
Handling of contaminated waste <sup>(6)(7)</sup>							
Cleaning and disinfecting contaminated areas <sup>(6)(7)</sup>	Level 3		✓	✓	✓		✓
Interacting with and supporting the COVID-19 case <sup>(4)(7)</sup>							

*Notes:*

- 1 Depending upon the circumstances, identified PPE in this table may not be available for all personnel involved, it is important to continually identify risks and make adjustments accordingly.
- 2 Disposable mask is recommended when there is an occurrence of COVID-19 on board.
- 3 Respirator mask is recommended.
- 4 Specific PPE would vary with type of interaction.
- 5 Goggles may be required based on the cleaning and disinfectant products being used and whether there is a risk of splash [11].
- 6 Chemical resistant boots are recommended.
- 7 When respirators are not available, use the best available alternative, like a disposable mask [16].

Individuals should be provided proper training for the application and removal of PPE. This should also include the proper maintenance and how to inspect the PPE for any issues or removal from service. The training should be provided in person, for verification of proper understanding.

As the service life and replacement recommendations will differ depending on the PPE manufacturer, reference should be made to equipment instruction manual.

Some individuals may have compromised health conditions and it may affect their ability to use face masks. This should be taken into consideration when issuing guidance. Crew members should be assessed for issues using a face masks during employment physicals, if and when possible.

Biohazard disposal stations should be available throughout the asset for the disposal of any contaminated PPE.

The WHO advises the following regarding the use of disposable and respirator masks [17]:

- Any person coughing or sneezing should wear a mask
- Any person wearing a mask should know how to use it and dispose of it properly
- The masks are effective only when used in combination with frequent hand-cleaning with alcohol-based hand rub or soap and water
- There should be no gaps between face and the mask
- Touching the mask while using it should be avoided
- Hands should be cleaned with alcohol-based hand rub or soap and water after accidentally touching the mask
- The mask should be replaced with a new one as soon as it is damp
- Disposable masks should not be re-used
- The mask removal process should be as follows:
  - Remove the mask from behind the head without touching the front of the mask
  - Discard the mask immediately in a closed bin
  - Clean hands with alcohol-based hand rub or soap and water



## SECTION 4 Measures to Mitigate Exposure

### 1 General

Early detection, prevention, and control of COVID-19 is important to protect the health of other personnel and avoid transmission of the virus. This section addresses how to prevent the marine and offshore assets from getting contaminated during the global COVID-19 pandemic.

### 2 Prevention Management Plan

All asset managers are advised to develop a written plan to prevent the outbreak of disease that includes active measures to minimize the risk of exposure. As persons may be carriers of the virus without exhibiting symptoms, social distancing measures that minimize unnecessary exposure are recommended. Appendix 1 outlines a risk management framework that may be useful in developing the plan.

The prevention-management plan should include the descriptions of the following, if applicable:

- Identification of high-risk areas to focus cleaning and disinfection efforts
- Access-control measures for visitors, contractors, pilots, etc.
- Measures to mitigate personnel exposure (personal hygiene, social distancing, etc.)
- Personnel rotation and shift-change procedures
- Port call and liberty policies based on the prevalence of disease in that specific geographical area
- Specific cargo-handling procedures
- Adjustments in work practices, as necessary, to avoid exposure (this may include meetings, meal preparation and service, work teams and any adjustment of work shifts)
- Selection, provision, education and use of PPE

### 3 Hand and Respiratory Hygiene

Hand and respiratory hygiene are vital protection measures against transmission of SARS-CoV-2. The following recommendations are derived from general advice provided by the WHO [18] and based upon guidance from the International Chamber of Shipping (ICS) [19]:

- All crew, passengers and visitors should frequently wash their hands using soap and hot water or alcohol-based (at least 70%) hand rub for 20 seconds
- Touching the face, including the mouth, nose and eyes, with unwashed hands should be avoided; in general, physical contact with the mouth, nose and eyes should be minimized.
- All crew, passengers and visitors should cover their nose and mouth with a disposable tissue when sneezing, coughing, wiping and blowing their noses. The tissue should be immediately disposed of into a no-touch waste bin with a lid. If a tissue is not available, a bent elbow can be used to cover the nose and mouth while coughing and sneezing
- Signs and posters displaying proper hand and respiratory hygiene should be placed in highly trafficked areas
- Highly trafficked areas should be equipped with hand-sanitization stations, wherever possible. A supply of hand sanitizer should be maintained within all areas that are normally manned. The touch points on the hand-sanitizer dispensers should be cleaned regularly

## 4 Social Distancing

Maintaining social distance of at least 2 m (6 feet) is very important in preventing the spread of virus that causes COVID-19 [20]. All crew, passengers, and visitors should practice social distancing. Special attention should be paid to keeping a social distance from people who may be coughing, sneezing, or may have a fever. Persons at high risk for serious disease (older persons and those with existing medical conditions such as diabetes or heart disease) should take extra precautions to avoid infection as they are more susceptible to severe disease.

To promote social distancing, the following measures are recommended:

- Unnecessary access to areas, especially those of vital importance to the asset (e.g. bridge, engine control rooms, etc.) should be restricted
- Crew should be divided into smaller groups based on their workspaces, duties and shifts. Staggering shifts should be considered. Group activities should be eliminated or minimized
- Use remote communication technology as much as possible
- Limit social contacts among highly specialized and mission critical personnel
- Organize meal schedules to allow only a limited number of people to occupy the galley and dining mess at any given time. Consider removing chairs from dining areas to prevent overcrowding
- Eliminate self-serve dining

Consider sealing off public bathrooms, showers, fitness rooms and other non-essential areas.

## 5 Food Handling

Personnel handling, preparing, and serving food should wash their hands with soap and water or hand sanitizer upon each entry into the galley. Level 1 PPE should be worn by all personnel handling, preparing, and serving food in accordance with Section 3, Table 2. Disposable masks should be worn while entering the walk-in refrigerators.

The use of disposable paper towels for drying surfaces and hands should be promoted in the galley. Accessible disposal containers should be available and emptied as needed.

Food preparation personnel should be separated from the cleaning personnel.

Consider replacing community plates, cups and utensils with individually wrapped or disposable plates, cups, and utensils. Communal condiments should be packaged individually.

## 6 Cleaning and Disinfection Practices

An elevated level of cleaning and disinfection activities is recommended to mitigate exposure to COVID-19.

Cleaning of visibly dirty surfaces followed by disinfection is a best practice measure for the prevention of COVID-19 and other viral respiratory illnesses.

At least daily, disinfection should be performed on all frequently touched surfaces after visible dirt has been removed from them. Very highly trafficked areas may require more frequent disinfection. Reusable equipment and tools should be cleaned and disinfected at the end of each use. Information on disinfectant selection, preparation, handling, application, storage, and disposal can be found in 3/3.

The preferred way to apply cleaning and disinfectant solutions is by mopping or wiping as described in 3/3.5.1 and 3/3.5.2, respectively.

During cleaning and disinfection, Level 2 PPE should be worn in accordance with Section 3, Table 2. The PPE selection should also be in accordance with the manufacturer's recommendations for the disinfection product being used.

The following subsections present recommended cleaning and disinfection practices for typical spaces found on marine or offshore assets. Cleaning and disinfection measure for other spaces not listed below should be considered on a case-by-case basis.

### 6.1 Shared Accommodation Areas

Focus on tables, hard-backed chairs, doorknobs, light switches, remotes, phones, handles, desks, toilets and sinks.

### 6.2 Mess and Main Deck Common Areas

Focus on counter tops, tables and chairs, doors, door handles, drink machines, coffee machines, remote controls, phones, visitor sign-in binder (plastic portion where hands are placed), garbage bins, and switches.

### 6.3 Restroom & Shower

Focus on faucets, counter tops, sinks and their drains, soap dispensers, shower surfaces and curtains, toilet seats, fixtures, doors, door handles, garbage bins and switches.

Soap dispensers should be checked daily and refilled as necessary. Toilets and urinals should be sprayed daily with disinfectant, scrubbed with a brush and flushed. Care should be taken not to aerosolize or splash while brushing.

### 6.4 Galley

Focus on sinks and their drains, faucets and their filters, counter tops, cutting boards, doors and their handles, drawer/cabinet handles, refrigerator door handles, galley appliances, stove overhead vent and drip pans, garbage bins and switches.

Sponges and dishcloths should be rotated out and washed daily.

### 6.5 Bridge

Focus on control panels and consoles, helm, electronics, navigation equipment, displays (especially touch-sensitive), control sticks, computer peripherals, telephones, radios, binoculars and other visual-augmentation systems, reusable PPE, office material, sign-in binders, tabletops, desks, chart tables, armrests, handles, doors, windows, garbage bins and switches.

### 6.6 Machinery Spaces

Focus on equipment casings (cooled down and not energized), tools, electrical tools (unplugged) handrails, ladders, frequently operated valve handles, doors, waste bins and door handles.

### 6.7 Engine Control Room

Focus on control panels and consoles, electronics, displays (especially touch sensitive), computer peripherals, telephones, radios, reusable PPE, office material, sign-in binders, tabletops, desks, armrests, handles, doors, remote controls, garbage bins and switches.

### 6.8 Open Deck Spaces and Equipment

Focus on handrails, ladders, on-deck equipment controls, lashing bridges, lashing equipment, frequently operated valves.

Special attention should be paid to areas that may have been accessed by shore personnel.

## 6.9 Re-usable Equipment and Tools

Re-usable crew equipment such as helmets, goggles, flashlights, binoculars and other visual augmentation systems, radios, gas detectors, body armor, etc. should be cleaned and disinfected.

Equipment used during drills should be cleaned and disinfected after use.

Tools used by the crew, including small electrical appliances, should be cleaned and disinfected.

## 6.10 Laundry

Focus on washing machine consoles and doors, floors and horizontal working surfaces, garbage bins and switches.

Precautions should be taken not to shake laundry items such as linen and cloths, as this could re-aerosolize the virus. The manufacturer's instructions should be followed when washing laundry items, using the hottest appropriate water setting. Laundry should be dried thoroughly using the highest appropriate drier setting.

Hampers and other carts used to transport laundry should be cleaned and disinfected in accordance with the guidance for cleaning and disinfecting hard and soft surfaces in Section 3.

# 7 Embarkation and Disembarkation

## 7.1 Personnel Coming Onboard

### 7.1.1 Crew, Passengers and Offshore Workers

All crew and passengers boarding marine and offshore assets should be provided with general information on COVID-19 and its preventive measures. The WHO also advises asset owners to implement pre-boarding screening [21].

Pre-boarding screening is to identify contact with any probable/confirmed COVID-19 case or any person displaying the common symptoms of COVID-19. These persons should not be allowed to board the asset.

According to the WHO, a 'contact' is defined as a person who experienced any one of the following exposures during the 2 days before and the 14 days after the onset of symptoms of a probable or confirmed COVID-19 case [22]:

- Face-to-face contact with a probable or confirmed case within one meter and for more than 15 minutes;
- Direct physical contact with a probable or confirmed case;
- Direct care for a patient with probable or confirmed COVID-19 disease without using proper personal protective equipment; or
- Other situations as indicated by local risk assessments.

*Note: For confirmed asymptomatic cases, the period of contact is measured as the 2 days before through the 14 days after the date on which the sample was taken which led to confirmation.*

Access points to the assets (gangways, heliports, shorebases) should be limited and controlled. Pre-boarding screening should be performed at all access points. No crew member should come into direct contact with shore gangways and ladders. Gangway watch should wear appropriate Level 1 PPE in accordance with Section 3, Table 2.

It is recommended that personnel should be quarantined for 14 days before boarding.



### 7.1.2 Temporary Visitors

Temporary visitors can be divided into two categories:

- Shore personnel (port and shipyard/drydock workers, repair crew, surveyors)
- Pilots

They board the asset while it is in port, shipyard, drydock, or while passing through canals and gates. All shore personnel coming on board the vessel should wear appropriate Level 1 PPE in accordance with Section 3, Table 2.

#### *7.1.2(a) Shore Personnel*

All shore personnel boarding the asset should be pre-screened for common symptoms of COVID-19. The shore personnel, as well as the crew and passengers of the asset, always should be reminded and encouraged to practice social distancing. The mixing of crew and shore personnel should be minimized by restricting shore personnel access.

Special attention should be paid to restricting the access of shore personnel to vital areas of the asset, such as the bridge or the engine control room. Whenever possible, it is recommended to use email for exchanging documents between the crew and the shore personnel. Remote communication techniques (phone, VHF, e-mail) between the crew and shore personnel while performing cargo operations should be promoted.

Shore personnel should not bring food on board, nor use the common dining mess. The asset manager should designate separate restrooms for shore personnel. These restrooms should be cleaned and disinfected before the shore personnel embark the asset and after they disembark, in accordance with 4/6.

All crew members interacting with shore personnel should wear Level 1 PPE in accordance with Section 3, Table 2.

#### *7.1.2(b) Pilots*

Pilots coming on board the asset should be pre-screened for common COVID-19 symptoms. All frequently touched surfaces on the bridge and on the way to the bridge, pilot designated restroom, as well as any equipment used by the pilots, should be cleaned and disinfected before embarkation and after the pilots disembark the asset in accordance with 4/6. While the pilot is on board the asset, periodic disinfection of these surfaces and equipment is also recommended.

Only essential personnel should be allowed on the navigational bridge while the pilot is on board. Social distancing between the crew and the pilot should be practiced at all times. All crew members and the pilot should wash their hands with hand sanitizer before entering the bridge. The pilot should not bring any food on board the vessel.

Multiple pilot ladders should be available on board to avoid using the same ladder by pilots and the existing crew.

All crew members interacting with the pilot should wear Level 1 PPE in accordance with Section 3, Table 2.

### 7.1.3 Infected Individuals

In case a vessel is tasked to transport an infected individual from offshore location, the exposure response measures in Section 5 should be followed.

## 7.2 Disembarkation Measures and Crew Rotations

Until the end of the COVID-19 pandemic, the WHO [21] advises that all crew and passengers on board marine and offshore assets should complete a Passenger/Crew Locator Form (PLF). This form should be

kept on board the asset for at least one month after the passenger or crew member disembarks. The PLF can help local health authorities with contact tracing if a confirmed COVID-19 case is detected after disembarkation.

Any crew member should report to the asset management office, if he or she has been diagnosed with COVID-19 or exhibits symptoms within 14 days of disembarkation. Also, the management of the asset should inform all potentially exposed crew members if there has been a confirmed or suspected case onboard the asset within 14 days of disembarkation.

During crew rotations, special attention should be placed on social distancing between the on-signing and off-signing crew members.

## **8 Crew Baggage and Supply Provisions**

### **8.1 Crew Baggage**

Crew and passenger baggage should be cleaned thoroughly and handled wearing appropriate Level 1 PPE in accordance with Section 3, Table 2. The luggage should be disinfected before it is brought inside the accommodation area.

### **8.2 Supply Provisions**

Careful consideration should be given to adjusting the standard inventory and purchasing procedures to secure sufficient supplies of food, freshwater, cleaning and disinfection agents, PPE and response-critical medical supplies related to COVID-19. The possibility of an extended stay of an asset at the port or a shipyard / drydock should be considered when ordering the supplies.

All provisions and supplies should be ordered from licensed suppliers. It is recommended to avoid ordering the supplies from high-risk ports.

Appropriate Level 1 PPE should be worn when bringing supplies on board in accordance with recommendation in Section 3, Table 2. The supplies may be cleaned and wiped with disinfectant when received on board. Any direct contact of food with cleaning agents and disinfectants should be avoided.

Packing material and dunnage should be returned to the supplier or put in closed garbage bags and disposed of onshore, if permitted by the port authority.

It is recommended that incoming supplies should be over wrapped in plastic where possible and stowed onboard for 3 days where possible.

## **9 Crew Training**

All crew on marine and offshore assets should be trained to recognize the common symptoms of COVID-19 and follow the basic procedures for handling any suspected COVID-19 cases. This includes proper isolation measures, contact tracing and quarantine procedures. The crew should be trained to keep social distance and use PPE as appropriate for each activity on board the vessel.

Managers of marine and offshore assets should emphasize the importance of cleaning and disinfecting their assets and provide special training to their cleaning crews. In particular, the cleaning crews should be familiar with:

- Common cleaning and disinfection techniques
- Cleaning and disinfectant chemicals
- Handling, preparation, storing and disposal of cleaning and disinfectant solutions
- Handling laundry, garbage and contaminated waste
- Proper usage and disposal of PPE

Health care staff on board assets should be continuously informed and updated on any new information and guidance regarding viral transmission, diagnosing and treating of COVID-19 patients, and any new disinfectants being brought on board in case there are additional medical considerations.

All staff on board should have knowledge of the Prevention Management Plan (see 4/2), understand their responsibilities under the plan, and implement it as required.



## SECTION 5 Exposure Response Measures

### 1 General

This section outlines the basic steps that an asset operator should take when there is a suspected case of COVID-19 disease on board with a focus on decontamination of the asset. This section is not meant to provide medical advice. The medical management of the patient should rely on best practices provided by recognized medical professionals.

If a suspected case emerges on board the asset, the Outbreak Management Plan should be activated immediately.

Those areas which were accessed by the suspected case should be thoroughly cleaned and disinfected. Other personnel should be restricted from entering those areas until the decontamination activities are complete. The extent of cleaning and disinfection should be determined on a case-by-case basis.

Once the infected personnel are disembarked and the asset is decontaminated, the exposure mitigation measures featured in Section 4 can be resumed.

### 2 Outbreak Management Plan

All assets should develop a written plan to manage the outbreak of the disease that should be implemented once an exposure is suspected. This plan should include the definitions of a suspected case of COVID-19, the definition of ‘contacts’ and an isolation plan. Reference can be made to Appendix 1 to develop the Outbreak Management Plan.

The Outbreak Management Plan should include descriptions of the following:

- Locations where suspected case(s) can be isolated before disembarking
- Management of the communication between departments related to the isolated patient(s)
- Clinical management of suspected case(s) before disembarkation
- Procedures to identify, clean and disinfect potentially contaminated areas, including the isolation cabins
- Management of the contacts of the suspected case
- Collecting procedures for PLFs (passenger/crew locator forms)
- Procedures for services provided to the isolated suspected cases and/or close contacts, including food service and utensils, waste-management service and laundry service
- Protocols and procedures for disembarkation of suspected cases
- Selection and provision of PPE

All staff on board should have knowledge of the Outbreak Management Plan and an understanding of their related responsibilities; they should be able to implement it as required.

### 3 Prior to Decontamination

#### 3.1 Isolation of Suspected Cases

##### 3.1.1 Suspected Case

The following three scenarios should be considered as a suspected case [22]:

- *A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease e.g. cough, shortness of breath), and with no other set of causes that fully explains the clinical presentation and a history of travel to or residence in a country/ area or territory reporting local transmission of (COVID-19) during the 14 days prior to the onset of the symptoms.*
- *A patient with any acute respiratory illness and having been in contact with a confirmed or suspected COVID-19 case during the 14 days prior to the onset of the symptoms.*
- *A patient with severe acute respiratory infection (fever and at least one sign/symptom of respiratory disease e.g. cough, shortness of breath) and requiring hospitalization and with no other set of causes that fully explain the symptoms.*

In the context of these Guidance Notes, the term “suspected case” also includes confirmed case as defined in 5/3.1.2 below.

##### 3.1.2 Confirmed Case

A confirmed case is defined as: “*A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms.*” [22].

##### 3.1.3 Isolation Protocols and Procedures

In the event of a suspected case on board, isolation protocols and procedures should be put in place immediately to prevent further transmission of COVID-19.

In general, the suspected case should be immediately isolated in a predefined isolation ward, cabin, room or quarters with a separate toilet and bathing facilities. Consideration should be given to the HVAC arrangement onboard the asset to avoid airborne contamination.

The access to the isolation space should be restricted only to the personnel needed to support the suspected case. All persons entering the isolation area should be appropriately trained and wear Level 3 PPE as listed in Section 3, Table 2.

Isolation protocols should cover the management of the isolated suspected case.

#### 3.2 Close Contact

To avoid delays in implementing health measures, before laboratory results are obtained in case of a suspected case, close contacts should be identified immediately.

In the context of a suspected case on board an asset, a close contact could be considered as an individual without PPE who, for example [21]:

- Has stayed in the same cabin with a suspected case
- Has had close contact within one meter with a suspected case
- Has dined at the same table with a suspected case
- Has participated in common activities
- Has worked with a suspected case in the same area
- Has cleaned the cabin where the suspected case was identified
- Has delivered food to the cabin where the suspected case was identified

- Has provided direct care for a suspected case.

All close contacts should be quarantined for 14 days from the last time they were exposed to the suspected case. If no symptoms appear within 14 days of their last exposure, they will no longer be considered as close contacts [21].

Personnel entering the quarantined spaces should take the same precautions as entering the isolated spaces.

### 3.3 Disembarkation of Suspected Cases

The disembarkation and transfer of the suspected case to an onshore health care facility for further assessment and laboratory testing should be arranged as soon as possible to best provide that patient's medical care and to minimize the exposure of the rest of the crew.

Disembarkation protocols and procedures, as stated in the Outbreak Management Plan should be followed.

During the disembarkation of suspected cases, every effort should be made to minimize the exposure of other persons and environmental contamination. Suspected cases should wear Level 1 PPE and personnel involved in transporting suspected cases should wear Level 3 PPE as listed in Section 3, Table 2.

### 3.4 New or Replacement Crew Members

Where possible, new crew members should not be allowed to come on board the asset until all suspected cases have disembarked and all contaminated spaces have been cleaned and disinfected.

## 4 Disinfection of Contaminated Spaces

Isolation spaces occupied by suspected cases should be cleaned and disinfected daily. Cleaning and disinfection also should be carried out after they have disembarked.

Quarantine spaces should be cleaned and disinfected at least daily, until the end of the quarantine period.

Other areas that suspected cases might have contaminated prior to their isolation should be thoroughly cleaned and disinfected. Until decontamination of those areas is performed, other personnel should be restricted from entering those areas.

The cleaning crew should

- Wear appropriate Level 2 PPE (see Section 3, Table 2) while cleaning and disinfecting
- Clean all visibly dirty surfaces prior to disinfection
- Follow disposal instructions.

Reference should be made to Section 3 for the selection of suitable cleaning agents, disinfectants and PPEs.

### 4.1 Disinfection of Isolation and Quarantine Spaces

Cleaning and disinfection of isolation and quarantine spaces should be performed last in order to minimize the risk of contaminating other areas on the asset.

#### 4.1.1 Disinfection of Isolation and Quarantine Spaces While Occupied

During the period of isolation and quarantine, the following activities should be performed.

- i)* Remove all visible biological contamination, e.g. blood, respiratory secretions, or other body fluids when first noticed. Clean and disinfect the site
- ii)* Clean and disinfect frequently touched surfaces in the room at least daily. Focus on bedside tables, bedframes, desks, other bedroom furniture, doors, doorknobs, handles, remote controls, light fixtures and switches

- iii)* Clean and disinfect bathroom and toilet surfaces at least daily
- iv)* Change towels and bed linens as needed. Place laundry items into designated laundry bags. Precautions should be taken not to shake laundry items as this could re-aerosolize the virus

#### 4.1.2 Disinfection After Disembarkation of Suspected Cases

After the suspected cases have disembarked, the isolation spaces should be cleaned and disinfected thoroughly.

- i)* Remove linen, curtains, and other washable fabrics. Do not shake any fabric type materials. Any fabric materials that are removed should be laundered prior to being reinstalled
- ii)* Wipe all accessible surfaces including walls, windows, and blinds that may have been contaminated in the space with disinfectant
- iii)* Mop the floor with disinfectant. Carpeted floor and rugs should be cleaned and disinfected according to the manufacturer's instructions
- iv)* If a disinfectant sprayer is used, spray all horizontal and vertical surfaces in the space that may have been contaminated.

## 4.2 Disinfection of Potentially Contaminated Areas

The identification of potentially contaminated areas may be made based on the exposure by the suspected case and the requirement of the local authority. General procedure to disinfect those areas should be as follows:

- i)* Isolate the area requiring decontamination
- ii)* Clean and disinfect in accordance with 5/4.1.2
- iii)* Disinfect non-porous cleaning equipment used in one room before using it in other rooms
- iv)* Discard cleaning equipment made of cloths like wiping cloths or absorbent materials after cleaning each area to prevent cross-contamination.

## 4.3 After Disinfection

### 4.3.1 Laundry

Manufacturer's instructions should be followed when washing laundry items, using the hottest appropriate water setting for the item. Laundry should be dried thoroughly using highest appropriate drier setting. If possible, launder potentially contaminated items separately.

Hampers and other carts used to transport laundry should be cleaned and disinfected in accordance with the guidance for cleaning and disinfecting hard and soft surfaces in Section 3.

### 4.3.2 Reusable Items

Reusable items should be handled as contaminated material.

Contaminated dishware should be taken to appropriate washing station for cleaning and disinfection. Machine dishwashing at the highest possible temperature is recommended.

Disinfect goggles according to the manufacturer's instructions after use.

Disinfect buckets by soaking in disinfectant solution or rinse in hot water before filling.

#### 4.3.3 Disposal of Infectious Waste

All waste produced in the isolation or quarantined spaces should be handled according to the procedures for handling infectious material on board [23]. Infectious waste should be placed into designated bags, completely sealed and clearly labeled.

Appropriate Level 2 PPE should be worn during handling and disposal of infectious waste in accordance with Section 3, Table 2.

If an incinerator is available on board, the paper-based or cloth-based waste may be incinerated. Plastic and wet materials should not be incinerated.

Discarded cleaning equipment and PPE should be treated as infectious waste.

## 5 Post Decontamination

Once the infected areas have been disinfected and use restored, the exposure mitigation measures outlined in Section 4 should be resumed.





## APPENDIX 1 Risk Management Framework

### 1 General

Risk management is the process of identifying and managing the impact of uncertain events, and bringing the consequences to acceptable levels. The recommended risk-management cycle is comprised of the following four phases (See Appendix 1, Figure 1):

- 1) establishing objectives by identifying the strategic goals and determining constraints;
- 2) analyzing the risks;
- 3) selecting controls and evaluating the alternatives to address the risks;
- 4) implementing the alternatives and monitoring the progress and results.

The cycle has proven to be effective for prioritizing risks and weighing the value of alternate risk-mitigation strategies. The process organizes information about the possibility of a spectrum of unwanted outcomes into an inclusive, orderly structure that helps decision makers to make more informed choices about their organization's ability to reduce risks. For marine and offshore assets, reference can be made to *ABS Guidance Notes on Risk Assessment Applications for the Marine and Offshore Industries*.

**FIGURE 1**  
**Risk Management Cycle**



## 2 Establish Objectives

Phase 1 of the risk-management cycle involves establishing the scope and structure of the decision-making process. Mission-critical steps in this phase include:

### 2.1 Understanding and Defining the Decision

Specifically describe what decision(s) should be made and what options are available to the decision maker. For example, is the scenario of concern avoiding exposure or dealing with a suspected case of COVID-19 onboard the asset?

### 2.2 Determine Who Should be Involved

Input from key stakeholders is essential to a sound risk management process. Planners at all levels should identify and solicit input from the stakeholders who should be involved in making the decision, and those who will be affected by actions resulting from the decision-making process.

Identify the factors that will influence the decisions. The decision to pursue a given strategy is not based solely on risk. For each individual element within a strategy and for the strategy as a whole, decision makers should weigh a number of factors, including:

- How effective will the strategy be in reducing risk?
- Is it feasible to implement?
- Is it cost efficient?
- How will a risk reduction be measured?
- Will there be likely negative repercussions? If so, what are they?

### 2.3 Establish Formal Risk Acceptance/Tolerance Criteria

The risk-informed decision-making process relies on an assessment of whether the identified risks are tolerably low. For example, the criteria regarding potential exposure, will be to minimize the potential for crew exposure.

### 2.4 Establish Common Risk Terminology

A common terminology for risk discussion reduces any poor communication that might lead to gaps and redundancies in the application of risk-informed processes. The definitions in subsection 1/4 may help improving the consistency. All involved stakeholders should be educated about the meanings and operational implications of the terminology.

## 3 Risk Assessment

Risk information fundamentally seeks to help decision-makers answer three critical questions:

- i)* What can go wrong? In this instance, consider the following two scenarios:
  - Scenario 1 – The vessel is not infected by COVID-19 (prevention management scenario)
  - Scenario 2 – There is at least one COVID-19 Case aboard (outbreak management scenario)
- ii)* How likely is it? This is typically captured in the threat and vulnerability analyses.
- iii)* What are the impacts? This can be impacts to people, property, business interruption, and the environment, among others.

### 3.1 Determine the Risk-Related Information Needed to Answer the Questions

Describe the information necessary to answer each question posed in the previous step. For each informational item, identify the following:

- Information type needed

- Level of precision required
- Level of certainty required

### 3.2 Select the Risk Analysis Method and Tool

Risk modeling techniques vary by the cost of use, the level of precision and certainty of output produced (information), and the required quality of input data. Given the high degree of uncertainty during this pandemic, and precision available, a relative ranking/risk indexing approach is suggested. This considers the features of an operation or facility to calculate index numbers that are useful for comparing the risks of different options. However, one should recognize that the calculated index numbers are estimates.

### 3.3 Establish the Scope for the Analysis

Set any physical or analytical boundaries for the analysis. For example, it may be desirable to perform a separate risk assessment for specific areas of a vessel to include:

- Bridge
- Machinery spaces
- Lockers/storage areas
- Cargo areas
- Tanks & Bilges
- Staterooms
- Meeting spaces
- Recreational spaces
- Galley
- Dining Area/mess
- Food storage/reefers
- Passageways/Ladders & Railings

In addition, the tolerable risk of transmission should be determined. This involves considering whether the vulnerability to infection from performing work in a defined area is tolerable.

Other factors to consider are the numbers of people, personnel risk factors (e.g. age, pre-existing medical conditions, etc.), access controls, potential transmission modes (i.e. surfaces, personal contact, airborne) and the likelihood of transmission.

### 3.4 Generate Risk-Based Information Using the Analysis Method(s) and Tool(s)

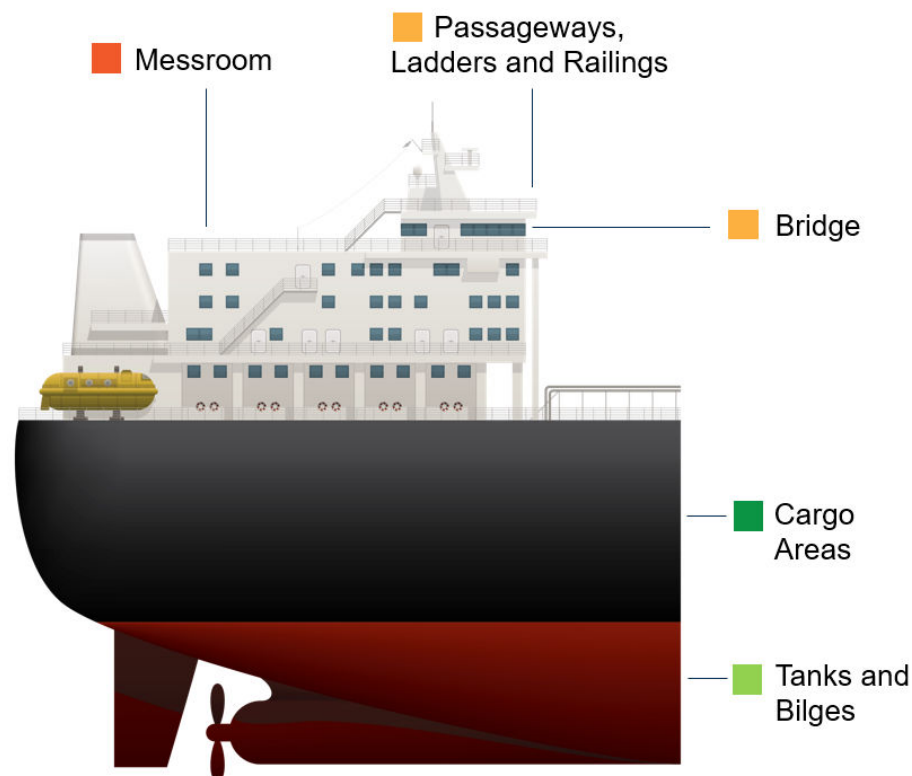
Apply the risk-analysis tool(s) that were selected. This may involve some iterative analysis (i.e., starting with a high-level assessment and progressing to a more detailed evaluation); or performing separate assessments for a prevention-management scenario and progressing to an outbreak-management scenario. An example of a risk-ranking tool is shown below.

<i>Risk Level</i>	<i>Description</i>
<b>Very High</b>	Area contains numerous characteristics that increase the probability of virus transmission with numerous crew members who are required to interface with those vulnerabilities on a daily basis
<b>High</b>	Area contains numerous characteristics that increase the probability of virus transmission with several crew members required to interface with those vulnerabilities on a daily basis
<b>Medium</b>	Area contains a few characteristics that increase probability of virus transmission with more than one crew member required to interface with those vulnerabilities on a daily basis

<i>Risk Level</i>	<i>Description</i>
<b>Low</b>	Area contains at least one characteristic that increases probability of virus transmission with at least one crew member required to interface with that vulnerability on a daily basis
<b>Very Low</b>	Area contains no known characteristics that increase probability of virus transmission

An example of risk levels for a vessel during outbreak is shown in Appendix 1, Figure 2.

**FIGURE 2**  
**Example Risk Levels for a Vessel**



## 4 Alternative Evaluation & Selection

The goal of most decision-making processes is to lower risk as much as possible. Sometimes the risk will be acceptable; at other times, the risk should be reduced to become acceptable. To reduce risk, action should be taken to manage it. These actions should provide more benefit than they cost. They should also be acceptable to stakeholders and not cause other significant risks. Key steps in this process are:

### 4.1 Develop Alternate Strategies to Manage Risk

The analysis team should engage the stakeholders to determine how the risks for each scenario can be managed most effectively. Examples to consider are cleaning and disinfecting, isolating and quarantine, social distancing, securing contaminated spaces, as well as other operational and organizational measures.

### 4.2 Assess the Risk Impact of the Proposed Alternatives

The planning team should reassess the risk of each scenario based on the expected effectiveness of the alternatives assuming the implementation of each alternative. This step will characterize risk reduction for

each of the alternate strategies. While quantitative estimates of risk reduction might be desired, a qualitative assessment of the alternative will likely be sufficient to inform the planning process.

#### **4.3 Select Risk Management Alternatives**

Once the alternatives have been fully developed and their risk reduction value has been described, the risk management process moves to the management selection phase, in which decision makers choose the collection of alternatives for implementation.

### **5 Implementation and Monitoring**

The risk management process then moves to implementation of the chosen alternatives and the ongoing monitoring to confirm they are functioning as intended. Critical steps in this phase include:

#### **5.1 Implement the Chosen Mitigation Strategies**

This step involves the implementation of the alternatives identified during the management selection phase. These will often take the form of a project and require deliberate planning and management of the implementation tasks.

#### **5.2 Develop Metrics to Measure Effectiveness**

The implementation team should develop a collection of metrics, both qualitative and quantitative, to measure the effectiveness of the chosen alternative. These may include outcome-oriented metrics, and leading, or lagging indicators.

#### **5.3 Monitor the Performance**

After the strategies have been implemented and the metrics have been developed, the asset management should monitor the effectiveness of the actions taken to manage risk. The goal of the monitoring phase is to verify that the asset is getting the expected results from its risk management decisions. Key inputs into the monitoring phase include testing, crew training, and implementing. The results of the monitoring step will inform subsequent iterations of the risk management cycle. It should be noted that real-time monitoring can result in a real-time modification of the actions to improve outcomes and further reduce risk.



## APPENDIX 2 Chemical Compatibility

The following two tables contain the risk of degradation to various metallic and non-metallic substrates on marine and offshore assets when contacted with common disinfectant chemicals.

**TABLE 1**  
**Risk of Metallic Substrate Degradation for Common Disinfectants**

<i>Disinfectant</i>	<i>Risk of Degradation</i> <i>(Known Exposure Temperatures Given for Reference)</i>						
	<i>Stainless 304</i>	<i>Stainless 316</i>	<i>Aluminum</i>	<i>Copper</i>	<i>Bronze</i>	<i>Brass</i>	<i>Carbon Steel</i>
<b>Bleach</b>	High <sup>(1)</sup>	High <sup>(1)</sup>	High <sup>(1)</sup>	High <sup>(1)</sup>	High <sup>(1)</sup>	High <sup>(1)</sup>	High <sup>(2)</sup>
<b>Isopropyl Alcohol</b>	Low <sup>(3)</sup>	Low <sup>(3)</sup>	Low <sup>(3)</sup>	Low	Low	Low	Low
<b>Ethyl Alcohol</b>	Low	Low	Low <sup>(3)</sup>	Low <sup>(3)</sup>	Low	Low <sup>(3)</sup>	Low <sup>(4)</sup>
<b>QAC</b>	High	High	High	High	High	High	High
<b>Hydrogen Peroxide (Dilute)</b>	Low	Low (<300°F)	Low (<212°F)	Low	Low	Low (<70°F)	High

*Notes:*

- 1 If left on surface
- 2 Forms adherent black ferrous oxide
- 3 Causes slight oxidation discoloration
- 4 Causes stress corrosion cracking (SCC) after long duration

**TABLE 2**  
**Risk of Non-Metallic Substrate Degradation for Common Disinfectants**

<i>Disinfectant</i>	<i>Risk of Degradation</i> (Known Exposure Temperatures Given for Reference)						
	<i>Rubber</i>	<i>Fiberglass Epoxy</i>	<i>Fiberglass Polyester</i>	<i>Polyethylene<sup>(1)</sup></i>	<i>Polypropylene</i>	<i>PVC<sup>(2)</sup></i>	<i>Nylon</i>
<b>Bleach</b>	Low (<100°F)	Low (<150°F)	Low	Low (<150°F)	Low (<120°F)	Low	Low (at room temperature)
<b>Isopropyl Alcohol</b>	Low	Low	Low	Low	Low	Low	High <sup>(3)</sup>
<b>Ethyl Alcohol</b>	Low	Low	High	Low	Low	Low	High
<b>QAC</b>	Low (<150°F)	Low (<250°F)	Low (<300°F)	Low (<150°F)	Low	Low (<140°F)	Low
<b>Hydrogen Peroxide (Dilute)</b>	Low (<70°F)	Low (<225°F)	Low (<225°F)	Low (<70°F)	Low (<150°F)	Low (<70°F)	Low <sup>(4)</sup>

*Notes:*

- 1 Depends on the type of polyethylene (HDPE or LDPE)
- 2 Depends on the type of PVC
- 3 May swell and weaken the material
- 4 May weaken the material



## APPENDIX 3 References

- [1] WHO, International Health Regulations (2005), 2nd ed., Geneva: World Health Organization, 2008.
- [2] IMO, ISM Code and Guidelines on Implementation of the ISM Code, London: International Maritime Organization, 2015.
- [3] CDC, Guideline for Disinfection and Sterilization in Healthcare Facilities, Atlanta: Centers for Disease Control and Prevention, 2019.
- [4] OSHA, "Bloodborne Pathogens - Definitions," United States Department of Labor - Occupational Safety and Health Administration, 4 2012. [Online]. Available: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1030>.
- [5] CDC, "Quarantine and Isolation," Centers for Disease Control and Prevention, 4 2020. [Online]. Available: <https://www.cdc.gov/quarantine/index.html>.
- [6] CDC, "Situation Summary," Centers for Disease Control and Prevention, 4 2020. [Online]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/summary.html>.
- [7] CDC, "People Who Are At Higher Risk," Centers for Disease Control and Prevention, 4 2020. [Online]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk.html>.
- [8] CDC, "Symptoms and Testing," Centers for Disease Control and Prevention, 4 2020. [Online]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>.
- [9] CDC, "Protect Yourself," Centers for Disease Control and Prevention, 4 2020. [Online]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>.
- [10] CDC, "Social Distancing," Centers for Disease Control and Prevention, 4 2020. [Online]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html>.
- [11] CDC, "Cleaning and Disinfecting Your Facility," Centers for Disease Control and Prevention, 4 2020. [Online]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html>.
- [12] US EPA, "List N: Disinfectants for Use Against SARS-CoV-2," United States Environmental Protection Agency, 4 2020. [Online]. Available: <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>.
- [13] ECHA, "COVID-19 updates," European Chemicals Agency, 4 2020. [Online]. Available: <https://echa.europa.eu/covid-19>.
- [14] IMO, "Resolution MEPC 159(55) - Revised Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants," International Maritime Organization, London, 2006.
- [15] IMO, "Resolution MEPC 227(64) - 2012 Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants," International Maritime Organization, London, 2012.
- [16] CDC, "Using Personal Protective Equipment (PPE)," Centers for Disease Control and Prevention, 4 2020. [Online]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/using-ppe.html>.



- [17] WHO, "Advice on the use of masks the community, during home care and in health care settings in the context of the novel coronavirus (2019-nCoV) outbreak - Interim guidance," World Health Organization, Geneva, 2020.
- [18] WHO, "Home care for patients with COVID-19 presenting with mild symptoms and management of their contacts - Interim Guidance," World Health Organization, Geneva, 2020.
- [19] ICS, Coronavirus (COVID-19) Guidance for Ship Operators for the Protection of the Health of Seafarers, London: International Chamber of Shipping, 2020.
- [20] CDC, "Social Distancing," Centers for Disease Control and Prevention, 4 2020. [Online]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html>.
- [21] WHO, "Operational considerations for managing COVID-19 cases or outbreaks on board ships - Interim guidance," World Health Organization, Geneva, 2020.
- [22] WHO, "Global surveillance for COVID-19 caused by human infection with COVID-19 virus - Interim guidance," World Health Organization, Geneva, 2020.
- [23] WHO, Handbook for management of public health events on board ships, World Health Organization, 2016.