



**ACT**  
Think different!

Giovanni Soldini  
*ocean sailing champion*

# NAUTICAL

A handbook on safety  
in shipyards



# A VOYAGE



A sea voyage begins long before you set sail. Knowing the sea means fearing and respecting it. It means planning every detail and checking that

everything works 100% to be ready to face and solve any unforeseen event that comes up. Safety always comes first. That goes for me and for all my crew, on site and at sea. And it is to them that I dedicate this guide

Safety in shipyards is a fundamental right for all workers and a guarantee of the quality of results and is an objective that requires the collaboration and commitment of all: employers, workers, bodies responsible for prevention and control, suppliers of materials and equipment and designers. And attention to respiratory health is paramount. Working in a shipyard exposes you

to various respiratory health risks because materials such as resins, adhesives, paints and fiberglass are used and can release vapours, gases, fumes or dust. Inhaling these substances can cause irritation, allergies, asthma, bronchitis, emphysema, fibrosis and other notorious respiratory diseases.

In addition, poor ventilation, high temperatures, humidity and low oxygen levels can occur in shipyards, which can further impair respiratory and cognitive function. If workers breathe well, however, they are more alert and responsive and less prone to accidents. To prevent and reduce risks, it is necessary to adopt a series of safety measures concerning both the organisation of work and the personal protection of workers. Among these measures, the first is to always wear a protective mask. Because the danger to the lungs is often invisible.

**Giovanni Soldini**

A handwritten signature in dark ink, appearing to read 'Giovanni Soldini'. The signature is fluid and cursive, with a long horizontal stroke at the end.

# SAFETY FIRST

**The reduction of accidents in the workplace and occupational diseases inevitably involves substantial prevention and awareness-raising by all.**

The European Commission has set up a comprehensive plan over the 2021 – 2027 period focused on protecting people from health and safety hazards on the job. Prevention is of course the key to achieve the best possible results, and educating people to correct behaviours in terms of safety at work is one of the main targets. An integral part of the plan is training activities, to be developed across the board, to promote an ingrained (and

not imposed) culture of the value of safety in the workplace.

This brief guide dedicated to safety in the shipbuilding industry, while not claiming to be exhaustive, aims to make a contribution to awareness of the risks of this specific sector and the possible actions to be taken to prevent the occurrence of occupational diseases.



# WORK RELATED ILLNESSES

## The pitfalls of an invisible enemy

The hypothetical danger and seriousness of an accident is immediately perceivable: the projection of a splinter in an eye, a serious fall from a height, the danger of burns or possible crushing are intuitive, as they involve immediate tangible damage. Occupational disease, which can be defined as a disease that arises in connection with a work activity, in most cases develops over years. Some occupational diseases of the respiratory system are specifically related to risk factors in the work environment, such as pneumoconiosis, while in other cases, workplace exposures contribute to the development or aggravation of respiratory diseases, such as chronic obstructive pulmonary disease (COPD), asthma or lung cancer.

2022/2337 European Commission's Recommendation of November 28<sup>th</sup> 2022 lists the pathologies that must be directly linked to the occupation, as well as the chemical agents that may be the cause of them. It must be emphasised that, although the number of respiratory diseases' cases is lower than for other occupational diseases, respiratory diseases lead to a higher number of impairments and deaths; by way of example, carcinogens are responsible for approximately 100,000 occupational cancer deaths in the EU.



# SHIPYARDS WHAT ARE THE RISKS?

Knowing the environment where you work is the basis of prevention

What are the hazardous situations that could cause (or contribute to aggravate) respiratory diseases?

Here are the main ones:

## 1. Handling of chemical agents.

In addition to the risk of intoxication due to short-term massive exposure (e.g. accidental spillage of large quantities), the most insidious risk is that of exposure that is perhaps relatively brief, but continuous over months and years. Any negative consequences depend not only on the level of toxicity that characterizes the substance, but also by the degree of sensitivity of the individual to the effects of that specific

substance. The processes that most involve exposure to chemical agents are:

- Surface cleaning/pre-treatments/stripping
- Use of resins and related catalysts
- Grouting
- Painting

## 2. Exposure to dust/fibres/fumes

The term “powders” refers to particulate material of various grain sizes, resulting from operations such as:

- Grinding
- Sanding
- Brushing
- Fibreglass cutting





When we talk about “fumes” it is actually still a particulate matter: for example, in welding the metal is sprayed and substantial quantities of particles are released into the air.

In all cases, we remind you that the level of danger of the particles to which you are exposed does not only depend on the intrinsic toxicity of the material, but also on the particle size of the particulate: particles with particle size  $< 5$  microns have considerable possibilities of escaping natural defences and reaching the lungs. In this regard, it must be said that, wherever there is particle generation, there is a contextual risk of nanoparticle generation (diameter  $0.001 \mu\text{m}$   $0.1 \mu\text{m}$ ): their infinitesimal dimensions mean

that their behaviour can be defined as intermediate between that of the gases and that of the rest of the suspended particulate, creeping between cells and tissues, causing biochemical damage. There is still no complete and in-depth knowledge of the damage that can be caused as a result of exposure from nanoparticles, but various studies have focused on the most common and frequent risk situations, including welding and painting. Other processes, in which the generation of nanoparticles is inevitable, are wood-working, sanding, grinding and combustion processes. Moreover, ‘fibres’ are part of the same family of contaminants: in this case, the most significant risk is posed by asbestos fibres,





the carcinogenicity of which is well known as they penetrate deep into the lungs, creeping into the alveoli where they remain for an indefinite time.

On November 22<sup>nd</sup>, 2023, the European Parliament issued Directive 2023/2668, which repeals the previous 2009/148/EC, in relation to the protection of workers against the risks related to exposure to asbestos fibres. It will be implemented from December 21<sup>st</sup> 2025 and stipulates that employers shall ensure that their workers are not exposed to asbestos concentrations exceeding 0.01 fibres per cm<sup>3</sup>, averaged over 8 hours of exposure. This limit is 10 times lower than the current limit and this gives us the measure of the growing attention to

the need for increasingly stringent and precautionary measures to arrive at an effective prevention of lung diseases. Among the fibres that need attention, we also mention fibreglass: although it is not classified as a carcinogen, its effects on human health are as irritating and inflammatory as to be able to favour degenerative processes.





# WHICH PPE WHICH APPLICATIONS

## PRODUCTION

During the construction of the hull, resin coating and the application of Gel Coat with its catalysts are among the most sensitive operations. The resins, whether polyester, vinyl or epoxy, are all organic-based substances, from whose exhalations one must protect oneself with half masks combined with activated carbon filters for organic gases and vapours together with dust protection. In this case, with equal protection, there are two possible protective solutions: a half mask with non-replaceable integrated A2P3 filters, or a half mask with interchangeable filters of the same type. The reasons that may influence the choice of one or the other solution are related to practicality and/or greater cost-effectiveness: a device with in-

tegrated filters does not require maintenance and the entire device must be replaced as soon as the filters are exhausted. Choosing a half-mask with interchangeable filters, on the other hand, is cheaper, as the facepiece can be cleaned and reused for months at a time by replacing the filters only. In case of prolonged exposure, and especially considering the need to combine eye protection, it may be preferable to use a full face mask, similarly with A2P3 filters. In mould waxing operations, there is no specific need to use PPE, but it may be useful to alleviate the discomfort of odour with an activated carbon filtering face-mask. When cutting fiberglass panels, due to the generation of particulate, it is advisable to use an FFP3 filtering facepiece with activated carbons.



Turning to carpentry operations, here too there is an issue of particle generation: from dust of more relevant grain size to nanoparticles.

A lightweight device, such as an FFP3 filtering facepiece, preferably with adjustable elastic bands and full gasket to ensure a perfect seal, is a practical and effective solution. Application of antifouling: due to the nature of these substances, the type of protection to be used is similar to that used in the case of resin. Even in this case, the choice of a half mask or a full face mask will depend on both the level of exposure and a choice of practicality: the full face mask guarantees protection for the respiratory tract and for the eyes at the same time.

## MAINTENANCE

Sanding operations, physical or mechanical, obviously involve the need for adequate dust protection: a FFP3 filtering facepiece and a half mask with P3 filters offer similar protection and the choice depends on the subjectivity of the individual. The filtering facepiece is characterized by its lightness and low respiratory resistance, while the half mask is sometimes preferred due to the longer life of the filters and the possibility of choosing between different sizes.

And it is again P3 protection that must be used in the case of welding operations. In this case, however, it is preferable to use an FFP3 filtering facepiece with activated carbon, to alleviate the annoyance of unpleasant







odours and, in the case of using half-masks, there is the possibility of combining dust filters with particularly light activated carbons and a slim shape, specially designed to allow combination with welding visors.

For grouting, the use of a half mask with type A filters is recommended, while, only for short operations, with a very limited exposure, you can opt for a filtering facepiece with activated carbons. Paintwork deserves a separate chapter: a practical and economical solution is the use of a half mask with A2 filters (protection from organic gases and vapours), to be combined with P2 pre-filters, which can be replaced when clogged, extending the life of the gas filter.

Another possibility is the practical half mask version with incorporated A2P2 filters, which has the advantage of not requiring any maintenance: once the filters are exhausted, the entire device

is replaced. Once again, however, the need to combine eye protection must be assessed: an extremely effective solution is a full face mask with a glass visor. The fundamental characteristic of glass is a great resistance to the aggression of chemical agents and this implies that it can be cleaned with any type of solvent without being damaged. An A2P3 filter must be combined with the mask.

The use of solvents is also widely used and for them a half mask with type A filters is always recommended as a minimum protection.



# **BLS RECOMMENDS**

For over 50 years, BLS has been dedicated to the protection of your breath, seeking innovative and technologically advanced solutions, always offering state-of-the-art, designer devices and always putting the quality of its products first.

## USE OF CORRECT PERSONAL PROTECTIVE EQUIPMENT

# SELECTION GUIDE

*NOTE* – The recommended solutions are based on the evaluation of the vast majority of cases: it is understood that the selection of the correct filter must be made on the basis of the analysis of the safety datasheet (ASDS) of the individual chemical agents used. As an example, some solvents, such as acetone (low-boiling organic substances), require AX filter, while for diisocyanates an ABE type filter is recommended.

Brushing  
Sanding  
Polishing  
Cutting fibreglass panels  
Carpentry

### **DUST RISK**

Allergy, asthma, respiratory tract irritation, chronic intoxication, cancers of the nasal and paranasal sinuses (hardwood)

Welding

### **DUST RISK**

Soldering iron fever, chronic effects on the liver, pulmonary oedema, ulcers, nasal septum perforation

Grouting  
Primer Application  
Brush Polish Application  
Brush Painting  
Degreasing

### **UNPLEASANT ODOUR ●**

(with concentrations < TLV)

### **GAS / VAPOUR RISK**

Cough, asthma, liver and kidney damage, liver and blood cancer

Paint stripping  
Spray Polish Application  
Spray Painting  
Resin Coating  
Gel Coat Application  
Anti-fouling Application

### **GAS / VAPOUR RISK**

Cough, asthma, liver and kidney damage, liver cancer

### **RISK FOR EYES ●**

Redness, conjunctivitis, chronic irritation

## USE OF CORRECT PERSONAL PROTECTIVE EQUIPMENT

# SELECTION GUIDE

*NOTE* – it is recommended to prefer a full face mask instead of a half mask when:

- gas/vapour concentrations are high ( $> 30 \times$  TLV);
- when it is necessary to combine an eye protection with the protection of the respiratory tract.



BLS Zer0 30  
FFP3 R D



BLS Zer0 32  
FFP3 R D



Kit BLS 4000next S  
+ BLS 201-3 P3 R filters  
BAYONET CONNECTION



BLS Zer0 30 C ●  
FFP3 R D  
ACTIVATED CARBON



BLS Zer0 31 C ●  
FFP3 R D  
ACTIVATED CARBON



BLS 4000next S ●  
+ BLS 201-3C P3 R filters  
ACTIVATED CARBON  
BAYONET CONNECTION



BLS Zer0 30 C ●  
FFP3 R D  
ACTIVATED CARBON



BLS 8100next  
A1P2 R D  
WITHOUT MAINTENANCE



Kit BLS 4100next S  
A2P2 R  
BAYONET CONNECTION



BLS 4000next S ●  
+ BLS 201-3C P3 R filters  
ACTIVATED CARBON  
BAYONET CONNECTION



BLS 8100next  
A1P2 R D  
WITHOUT MAINTENANCE



Kit BLS 4100next S  
A2P2 R  
BAYONET CONNECTION



BLS 5000 ●  
BLS 5600 (Thermoplastic)  
BLS 5700 (Silicone)  
+ BLS 221 A2P3 R filters  
BAYONET CONNECTION



BLS 2000 ●  
BLS 2150V (Glass Visor)  
BLS 2150 (Polycarbonate Visor)  
+ BLS 421 A2P3 R filters  
UNIVERSAL CONNECTION

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# ***SAFETY KNOWS NO BOUNDARIES***

## **HEADQUARTERS — MILAN**

via dei Giovi, 41  
20032 Cormano (MI) – Italy  
+39 0239310212  
info@blsgroup.it – www.blsgroup.com

## **BLS IBERIA SAFETY — SPAIN**

+34 938663153  
info@blsgroup.es – www.blsgroup.com/es

## **BLS NORTHWEST — THE NETHERLANDS**

+31 787370146  
info@blsgroup.nl – www.blsgroup.com/nl

## **BLS GERMANY — GERMANY**

+49 8005015000  
info@blsgroup.de – www.bls-atenschutz.de

## **BLS FRANCE — FRANCE**

+33 481919196  
info@blsgroup.it – www.blsgroup.com/fr

## **BLS DO BRASIL — BRAZIL**

+55 11 2619-9429  
diretoria@blsgroup.com.br  
www.blsgroup.com/pt

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TO BREATHE**

