



# BSS Examiner CO Alarm Requirements Training Course Learning Document

## Critical Information

- This document forms part of the BSS CO Alarm Online Training Course.
- The new ECP Checks represented in this document may be subject to slight change, so
- Examiners who successfully pass the course must use the ECPs provided after the course when undertaking BSS Examinations on boats from 1 April 2019.
- Examiners must not use the four new Checks prior to 1 April 2019.

Version 1.1 24/03/2019

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## 1. Introduction

### 1.1 Document overview

This document represents the learning material for the BSS Examiner CO Alarm Requirements Training Course.

The course supports the introduction of the new BSS CO Alarm Requirements from 1 April 2019. From this date at least one carbon monoxide alarm will be required on all boats in scope of the BSS Requirements where they have one or more accommodation spaces.

It is essential that BSS Examiners are ready for the introduction of the Requirements and are fully conversant with the new Checks and confident about how to apply them.

The information in this document represents all the information you will need to prepare you for April and will help you to successfully pass the course's online assessment.

Examiners should read through and become familiar with the information contained within this document before completing the online assessment.

The online assessment must be completed and passed before 1 April 2019, or before an Examiner undertakes their first examination after 1 April 2019. A link to the online assessment will be provided by email.

Around half of all BSS Examiners are qualified to examine hire boats to the BSS Hire Boat Requirements and for those Examiners much of the information will be familiar as the BSS introduced Requirements for CO alarms on hire boats having solid fuel stoves in April 2017. However, it remains essential that such Examiners read this information and take the online assessment as there is new information and changed Requirements.

### 1.2 Scope, course aim and learning objectives of the training

The BSS Examiner CO Alarm Requirements Training Course supports the introduction of the new BSS CO alarm Requirements. This document provides all of the information necessary for Examiners to understand why the Checks have been introduced, how to apply the Checks properly and consistently and how to answer any queries about the Checks from boat owners or their representatives.

As set out in this document, and in support of their application of the new Checks, Examiners must have a good understanding of a range of concepts, topics and background information.

It is intended that the relevant supporting information from this document, in particular that covering CO alarm manufacturing standards and accredited third-party certification, will appear in a supporting Appendix in the ECPs. You will note references to Appendix I in the ECPs. The Appendix will be provided at the same time as the confirmed Checks are published later in March.

It is recognised that the CO alarm subject presents a significant crossover between an examination of a boat to the new BSS Requirements and the published CO alarm coverage within the 'CO Safety on Boats' leaflet that is aimed at influencing boat owner behaviour to stay safe from CO poisoning.

This course covers CO alarms in the context of the BSS Examination Checking Procedures (ECPs) and Examiner's engagement with boat owners. The course is not aimed at Examiners influencing boat owner behaviour other than to ensure owners comply with the mandatory Checks and promote compliance to the Advice Check to owners of private or privately managed boats.

At a future date there will be a separate online learning course associated with carbon monoxide poisoning and its symptoms, what to do if CO poisoning is suspected, the danger signs and the signs that behaviour change is necessary. The separate course will support Examiners in their role as Trusted Messengers.

The course aim is that Examiners will be able to apply the new BSS CO alarm Requirements from 1 April in a consistent manner and to report (in writing) non-compliances (to a customer) in a correct and consistent manner.

Underpinning this aim, the learning objectives of this course are that Examiners should:

- a. Have a good understanding of why the new CO BSS Requirements are being introduced;
- b. Have a good understanding of why three of the four new CO related ECP Checks will be mandatory Requirements in all classes of Examination, whereas one will be an Advice Check for BSS Examinations for privately owned and managed vessels;
- c. Have a good understanding of the overall safety objectives of the new CO BSS Requirements, and of how the individual Checks help to control the risks;
- d. Understand that accommodation space is an ECP Glossary term, and understand its meaning;
- e. Understand that damage or deterioration is an ECP Glossary term, and understand its meaning;
- f. Have a good understanding of the CO alarm manufacturing standards, and accredited third-party certification, and understand how these relate to the BSS Requirements;
- g. For each of the four new CO Checks:
  - Have a good understanding of the Checking actions and the Requirements
  - Have a good understanding of any Applicabilities and Guidance for owners (including being able to point boat owners or their representatives to the relevant published BSS guidance at Check 6.4.1).
- h. Understand how to format written reports to customers;
- i. Understand that CO alarms can also detect hydrogen gas.

It is essential that BSS Examiners do not provide information to customers beyond the CO safety information published by the BSS, as this may introduce legal liabilities and compromise insurance cover.

### **1.3 Introducing the new BSS CO Alarm Requirements**

The new BSS CO Alarm Requirements are being introduced from 1 April 2019 following a full risk review by the BSS support committees, and a formal public consultation.

#### **CO entering boats from sources outside of the boat**

The risk review established that the risk represented by CO entering boats with accommodation spaces from sources outside of the boat (e.g. the use of engines and appliances on adjacent boats) is high enough that it warrants the introduction of new BSS mandatory Requirements.

New BSS Requirements are only introduced by the BSS where there is a known risk to third-party waterway users. In this case, because there is a known risk of CO generated on one boat affecting the occupants on an adjacent boat, and because the occupants have no control over the presence of the CO, the risk warrants a BSS Requirement for the presence of one or more CO alarms on all boats with accommodation spaces.

#### **CO from solid fuel stoves**

The risk review also confirmed that solid fuel stoves present a specific CO risk (solid fuel stoves can, under certain normal operating conditions, produce 100 times more CO than LPG hob burners that are faulty).

Given the level of risk, the BSS support committees agreed to the introduction of a new Requirement for the presence of a CO alarm in the same space as a solid fuel stove on boats where there are also berths within accommodation spaces. However, because on privately owned or managed vessels the boat owner is in control of the risk (the owner is in control of the function of the stove) the Requirement will take the form of an Advice Check on such classes of vessel.

#### **The new BSS Requirements**

In support of the above, from 1 April 2019 there will be four new Checks:

1. one addressing the provision of CO alarm(s) on all boats with accommodation spaces; and,
2. one addressing the provision of CO alarm(s) on boats with solid fuel stoves (and berths within accommodation spaces); and,
3. one addressing the location and suitability of CO alarms; and,
4. one addressing the condition of CO alarms.

These four new Checks will be incorporated into the Core (2015) Examination Checking Procedures (ECP) as Checks, 6.4.1, 6.4.2, 6.4.3 and 6.4.4.

### **1.4 BSS activity to promote the changes to boat owners**

The BSS is running a promotional campaign to ensure boat owners are aware of the new CO alarm Requirements coming in from April, which will last for six months or more.

It remains the case that the CoGD/EM/BSS awareness leaflet 'Carbon Monoxide Safety on Boats' should be considered as authoritative and a crucial reference for boat owners.

Additional safety information and guidance for boat owners is available on the BSS website at <https://www.boatsafetyscheme.org/co>

## 2. Overall safety objectives for introducing BSS CO alarm Requirements

### The qualities of all BSS Requirements

All of the BSS Requirements are risk-based. This means that each Requirement is accepted by the BSS support committees as addressing a known risk. All Requirements are subject to periodic review, including against known incidents and data from the BSS Database (Salesforce).

### Features of CO, and the CO poisoning risks

Three of the key features of CO are that:

1. it cannot be seen, smelt, tasted or felt: and,
2. at high concentrations CO can kill without warning, sometimes in minutes; and,
3. low-level, repeated exposure to CO may cause irreversible long-term damage to health and/or mental well-being.

### How the CO Requirements address the risks

As CO is a hidden danger, CO alarms represent an appropriate and proportionate risk control measure. The required provision of CO alarms is a reactive risk control measure, having the potential to radically reduce the likelihood of injury or fatality in the event CO is present.

In general terms, CO alarms address the potential risk to boaters presented by carbon monoxide, both from high levels of CO over a short period of time, and potentially from low concentrations over time, that can affect peoples' physical and mental health.

#### Check 6.4.1

The main safety objective of the BSS requirement that vessels having one or more accommodation spaces must be provided with at least one CO alarm at Check 6.4.1 is to ensure that incidents caused by CO from sources generated outside of the boat by others (e.g. the use of engines and appliances on adjacent boats) are kept to a minimum.

#### Check 6.4.2

The main safety objective of Check 6.4.2, that vessels having a solid fuel stove(s), and where berths are present in an accommodation space(s), must be provided with a CO alarm within each accommodation space that contains a solid fuel stove, is to ensure that CO incidents caused by solid fuel stoves are kept to a minimum.

Solid fuel stoves present a specific CO risk as during normal operation they can produce 100 times more CO than LPG hob burners that are faulty. In addition, solid fuel stoves are known to be a particular threat at night when occupants are asleep (when there are relatively fewer air changes within the boat, and when a fire within a solid fuel stove is dying down).

#### Check 6.4.3 and 6.4.4

Checks 6.4.3 and 6.4.4 support the main safety objectives by helping to ensure that alarms will work effectively when called upon.

It is not a direct safety objective of the BSS CO alarm Requirements, but an additional benefit is the prevention of death or injury to boat owners from CO caused by their own boat's engine(s) and appliance(s) in addition to solid fuel stoves.

### 3. The new BSS CO Checks 6.4.1 – 6.4.4

There are four separate Checks within the Core (2015) ECP’s new Section 6.4, all of which address CO alarms on boats with accommodation spaces.

Boats without accommodation spaces are not required to have CO alarms. Boats without accommodation spaces are likely to be open boats, boats with partially open cuddies, or boats where the superstructure is a combination of permanent and non-permanent (e.g. canvas) structures. On such boats the risk of CO building up to potentially dangerous levels is determined to be low.

Boats with accommodation spaces, but no fuel-burning appliances, or having only room-sealed appliances, are still in scope of the new CO alarm Requirement at Check 6.4.1 because the threat being addressed is from outside sources of CO from adjacent vessels and equipment.

#### 3.1 – Check 6.4.1

6.4.1	If the vessel has one or more accommodation space(s), are the correct number of carbon monoxide alarms provided?	R
<p>Identify the presence of one or more accommodation space(s).</p> <p>If present, check for the presence and location of carbon monoxide alarm(s).</p> <p>Check by visual assessment and, if necessary, measure the distance between carbon monoxide alarm(s) and any door that links accommodation spaces.</p>	<p>All vessels having one or more accommodation space(s) must be provided with at least one carbon monoxide alarm.</p> <p>A carbon monoxide alarm must be located within 10m of any door that links accommodation spaces.</p>	
<p>Examiner action – Examiners must refer to Section 1 of Appendix I for essential information on measuring the distance between a carbon monoxide alarm and any door that links accommodation spaces.</p> <p>Applicability – where there is only a single, open-plan accommodation space only one carbon monoxide alarm is required irrespective of the size of the space.</p> <p>Guidance for owners – this is a minimum safety requirement, intended to provide a warning that is audible throughout the boat, related to carbon monoxide entering the boat from outside sources. For the best protection from carbon monoxide entering the boat from sources outside and inside the boat follow the carbon monoxide alarm manufacturer’s or supplier’s advice about the number and placement of alarms as far as the space and nature of the boat allow. Make sure alarms are audible to all craft occupants. More information about staying safe from carbon monoxide on boats is available at <a href="http://www.boatsafety.org/co">www.boatsafety.org/co</a> and within the CoGD/EM/BSS CO Safety on Boats leaflet.</p>		

#### Purpose of the Check

The Requirements at Check 6.4.1 address whether, for boats with accommodation spaces, there are the correct number of CO alarms.

#### How the Check helps control the risk

Accommodation spaces are areas within a boat surrounded by permanent boat structure, and if CO enters one or more accommodation spaces it may not naturally vent to outside the boat.

Therefore, if CO enters the boat from sources generated outside of the boat by others e.g. the use of engines and appliances on adjacent boats, then having the correct number of CO alarms helps to ensure protection.

If there are two or more accommodation spaces the bulkheads and doors between those accommodation spaces will deaden the sound given off by an alarm. Therefore, the maximum distance measurement (of 10m) between a CO alarm and any door that links accommodation spaces helps ensure that an alarm activation will be audible to all craft occupants, wherever they are on board.

### **Applying the Check**

At Check 6.4.1 Examiners must identify the presence of any accommodation space(s) and if present, must check for the presence and location of carbon monoxide alarm(s).

Check 6.4.1 covers the provision of CO alarms in suitable numbers in 'accommodation spaces'. Therefore, to be able to apply the Checking action in a robust and consistent manner Examiners must be able to recognise 'accommodation spaces'. 'Accommodation space' is an existing ECP defined Glossary term:

"Glossary term - Accommodation space - Space surrounded by permanent boat structure in which there is provision for any of the following activities: sleeping, cooking, eating, washing/toilet, navigation, steering. Spaces intended exclusively for storage, open cockpits with or without canvas enclosures and engine rooms are not included."

Notes – Therefore, each individual space within a boat completely surrounded by permanent boat structure, and where there is provision for sleeping, cooking, eating, washing/toilet, navigation, or steering, is an individual accommodation space.

Wheelhouses completely enclosed by permanent boat structure are accommodation spaces, but wheelhouses with canvas-type screens/curtains, and cockpits with canvas-type hoods, are not accommodation spaces as such movable screens/curtains/hoods are not permanent boat structure.

Individual passageways completely surrounded by boat structure are not accommodation spaces unless there is provision for sleeping, cooking, eating, washing/toilet, navigation, or steering within the passageway.

Engine rooms are not accommodation spaces however they are configured (e.g. even walk-through engine rooms are not accommodation spaces in the context of the BSS Requirements).

In the context of accommodation spaces, curtains are not permanent boat structure.

Examiners must look for CO alarm(s) in all accommodation spaces, determine which doors link accommodation spaces and measure the distance between any CO alarm and any door linking an accommodation space without a CO alarm.

In the context of Check 6.4.1, 'links' means that the door can be used to gain access to another accommodation space, even though the two accommodation spaces may not be immediately adjacent, or directly connected, to each other.



The following two diagrams help explain the distance measurement Requirements for different accommodation space configurations –

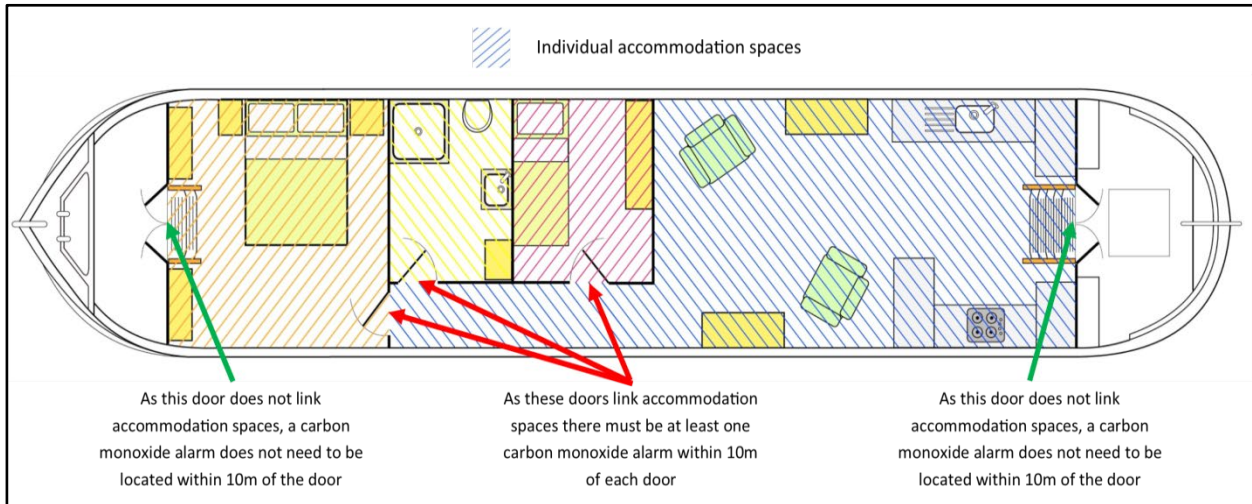


Fig 1. To be compliant at Check 6.4.1 one carbon monoxide alarm must be located within 10m of the three doors that link accommodation spaces.

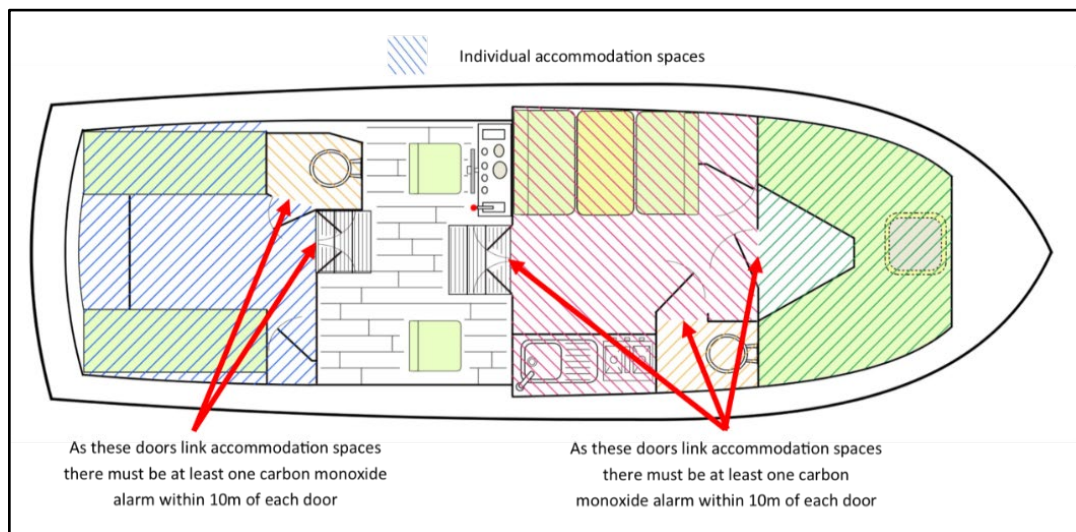


Fig 2. To be compliant at Check 6.4.1 one carbon monoxide alarm must be located within 10m of the five doors that link accommodation spaces. In this example the cockpit/wheelhouse is not an accommodation space, but the two companionway doors do link to other accommodation spaces (the aft cabin's companionway links to the main cabin, and vice versa).

When applying the Checking action Examiners:

- should use a tape measure to determine whether a CO alarm is located within 10m of each door linking accommodation spaces where the distance is not obviously compliant from visual assessment alone
- ideally, measure using the plan view and by placing the end of the tape measure on the floor directly below the CO alarm and measure to each door's threshold
- must apply the supporting information from the diagrams Fig 1 and Fig 2 above.

Where boats are configured with a single, open-plan accommodation space only one carbon monoxide alarm is required irrespective of the size of the space. In an open-plan boat the alarm sound is not deadened by bulkheads and doors and will be audible over the whole space.



Examiners must be familiar with the ‘Guidance for owners’ at 6.4.1 and be prepared to represent the guidance during engagements with owners, as appropriate. The guidance stresses that:

- Check 6.4.1 is a minimum safety requirement intended to provide warning of carbon monoxide entering the boat from outside sources
- for the best protection, boat owners should follow the carbon monoxide alarm manufacturer’s or supplier’s advice about the number and placement of alarms as far as the space and nature of the boat allow
- in view of the fact that some internal walls and doors may have extraordinary sound insulation properties or that various craft occupants may have different hearing abilities, those occupants must assure themselves about the audibility of CO alarms. Note that alarms, accessories and warning devices for people with hearing loss are available.
- more information about staying safe from carbon monoxide on boats is available at [www.boatsafetyscheme.org/co](http://www.boatsafetyscheme.org/co) and within the CoGD/EM/BSS CO Safety on Boats leaflet.

### 3.2 – Check 6.4.2

6.4.2	If any solid fuel stoves are installed, and if the vessel has berths present within any accommodation space, is a carbon monoxide alarm provided within the same accommodation space(s) as the solid fuel stove(s)?	A
<p>Identify the presence of any solid fuel stove <u>and</u> whether berths are present within any accommodation space.</p> <p>If any solid fuel stove(s) <u>and</u> berths within any accommodation space(s) are present, check for the presence and location of carbon monoxide alarm(s).</p>		<p>All vessels having one or more solid fuel stove(s) installed, and where berths are present within one or more accommodation space(s), must be provided with a carbon monoxide alarm within each accommodation space that contains a solid fuel stove.</p>
<p>Applicability – the provision of a carbon monoxide alarm(s) in support of the requirement at Check 6.4.2 does not have to be in addition to the provision at Check 6.4.1. Depending on the configuration of the accommodation spaces (see 2<sup>nd</sup> requirement at Check 6.4.1) one correctly located alarm might be all that is required to comply with Checks 6.4.1 and 6.4.2.</p>		

#### Purpose of the Check

Check 6.4.2 addresses whether, for boats with solid fuel stoves, and where there are berths in accommodation spaces, there is a CO alarm within each accommodation space that contains a solid fuel stove. Check 6.4.2 is an Advice check for privately owned and managed vessels, but a mandatory Requirement for all other classes of vessel.

#### How the Check helps control the risk

Requiring a CO alarm to be present within each accommodation space containing a solid fuel stove (where berths are present within one or more accommodation spaces), helps to keep the particular risk associated with CO emissions from solid fuel stoves at night time when occupants are asleep to a minimum.

Although otherwise the BSS Requirements do not address the risks from CO sources within a boat, solid fuel stoves are considered an exception. The published BSS guidance for boat owners is that solid fuel stoves are considered a CO risk as flue gases may under normal operating conditions inherently contain 100 times more CO than LPG hob burners produce that are faulty. Accordingly, the published BSS guidance for boat owners also emphasises the need to properly maintain solid fuel stoves. A CO alarm in the same space as the stove provides protection to craft occupants should flue gases escape from the stove into the space.

### Applying the Check

At Check 6.4.2 Examiners must i) identify any solid fuel stoves, ii) identify the presence of any accommodation space containing berths, and iii) must check for the presence of a CO alarm within the same space as the stove(s).

To be able to apply the Checking action in a robust and consistent manner, Examiners must be able to recognise accommodation spaces containing berths, and be able to recognise solid fuel stoves, taking particular care not to mistake a diesel stove as a solid fuel stove.

Examiners must be mindful that depending on the configuration of the accommodation spaces one correctly located CO alarm could be sufficient to meet the BSS Requirements at 6.4.1 and 6.4.2.

### 3.3 – Check 6.4.3

6.4.3	Are carbon monoxide alarms in open view and of a suitable type?	R
<p>Where one or more carbon monoxide alarms have been found to be necessary at Checks 6.4.1 and/or 6.4.2, check the location of each required alarm.</p> <p>Check the markings on each required carbon monoxide alarm.</p> <p>Identify the test function button on each required carbon monoxide alarm.</p>	<p>Carbon monoxide alarms must be in open view with all cabin doors, cupboard doors, curtains and loose furniture etc in place.</p> <p>Carbon monoxide alarms must be marked as being certified by an accredited third-party certification body to BS EN 50291 or equivalent.</p> <p>Carbon monoxide alarms must be provided with a test function button.</p>	
<p>Applicability – the main accredited third-party certification bodies in the UK are BSI and LPCB. For the following makes of carbon monoxide alarm accredited third-party certification to BS EN 50291 can be assumed – BRK, Dicon, Ei Electronics, Fire Angel, FireHawk Alarms, First Alert, Honeywell and Kidde. For other makes, removing the alarm from its base may be necessary to view labels and approval marking on the base. Permission for removal should be sought from the owner (or representative). Documentary evidence of accredited third-party certification to BS EN 50291 is acceptable.</p> <p>Guidance for owners – although not a BSS requirement, carbon monoxide alarms marked to the ‘BS EN 50291-2’ are the best choice for boats. They have been tested to meet the more onerous conditions found in boats.</p> <p>Supporting information on accredited third-party certification is provided at Appendix I.</p>		

### Purpose of the Check

Check 6.4.3 addresses that i) required CO alarm(s) must be in open view, ii) that they must have accredited third party certification, and iii) must have a test function test button.

## **How the Check helps control the risk**

Requiring CO alarms to be in open view helps to ensure that any displays and/or indicator lights are visible to craft occupants, and that the sound of the alarm, if activated, is not deadened by immediately adjacent boat structures

Requiring CO alarms to have accredited third-party certification gives an assurance that they will have been manufactured to the published standard, and provides an assurance about performance and reliability.

Requiring CO alarms to have a test function button means that boat owners (and others where appropriate) can periodically test an alarm therefore providing a reassurance that it is working correctly.

## **Applying the Check**

At Check 6.4.3 Examiners must check that all required CO alarms are in open view, and recognise that the alarms are of a suitable type.

On boats where Checks 6.4.1 and/or 6.4.2 do not apply but a CO alarm is present on board, Examiners must not apply 6.4.3 (the Check is not relevant).

Concerning the location of a CO alarm, Examiners must be mindful that CO alarms do not need to be fixed with a bracket, they could be located on a shelf at the time of the BSS examination. It is not unusual for example, for occupants staying aboard to move an alarm to the sleeping area at night to optimise the protection.

## **Alarm suitability – general**

Concerning CO alarms being of a suitable type, and to be able to apply the Checking action in a robust and consistent manner, Examiners must be able to:

- recognise accredited third-party certification marks and understand that accredited third-party certification can be assumed concerning any CO alarm made by BRK, Dicon, Ei Electronics, Fire Angel, FireHawk Alarms, First Alert, Honeywell and Kidde
- understand that existing CO alarms manufactured to BS EN 50291 or BS EN 50291-1 are acceptable, albeit that the BSS recommends owners select new CO alarms marked to the BS EN 50291-2 standard as these have been tested to meet the more onerous conditions found in recreational vehicles, including boats
- recognise the CO alarm test function button

## **Alarm suitability – accredited third-party certification**

At Check 6.4.3 CO alarms must be marked as being certified by an accredited third-party certification body ('certification body') to the manufacturing standard BS EN 50291 (or equivalent).

Accredited third-party certification, sometimes known as 'type approval' schemes ensure a high level of confidence in the manufacturer's claims of adherence to:

- manufacturing standards
- performance standards
- consistent product quality.

Accredited third-party certification is employed extensively in safety critical applications. In practice accredited third-party certification works by certification bodies taking account of the performance testing reports of accredited laboratories and overseeing the manufacturing process to ensure that alarms are consistently manufactured to the correct standard. CO alarm manufacturers are then licenced to display the certification body's mark on their alarms.

In the UK the main certification bodies for CO alarms are BSI and LPCB. Other certification body marks may be acceptable. Examiners should contact the BSS office for confirmation of acceptability if other marks are found.



A CE mark on a CO alarm is not an accredited third-party certification mark. The CE mark relates to the Electromagnetic Compatibility (EMC) Directive. Conformity with the EMC does not give any assurance of manufacture or performance testing to a CO alarm manufacturing standard.

Because the following companies only make CO alarms to BS EN 50291 that have accredited third-party certification, Examiners are not required to check for the certification body mark on alarms made by these companies. The companies are:- BRK, Dicon, Ei Electronics, Fire Angel, FireHawk Alarms, First Alert, Honeywell and Kidde.

Documentary evidence of alarm type and/or accredited third-party certification is acceptable, where the type of alarm in view is not obvious or where suitability features are not marked on the unit casing.

However, if there is no evidence of suitability (either on the visible external parts of the alarm, or in supporting documentation), Examiners can, with permission from the owner (or their representative), remove the alarm from its base to view labels and approval marking on the back of the unit. In such cases, care should be taken to remove (and refit) the unit without damaging it. Most alarms will simply be a twist and release, others may have a securing lug that will need to be pushed gently to allow the alarm to release.

Examiners are reminded that 'black-spot' colour-changing indicator cards are not a suitable alternative to CO alarms.

Where the CO alarm does not have an accredited third-party certification mark to BS EN 50291, and/or is not manufactured by one of the makers listed above, then the alarm cannot be accepted as compliant. In such circumstances, Examiners must be sensitive to the fact that the boat owner may have only recently acquired the non-certified alarm. Published BSS guidance states that CO alarms are vital pieces of life saving equipment, but only independently tested and certified alarms should be trusted to do this most important of jobs.

### **Alarm suitability – CO alarm manufacturing standard BS EN ISO 50291**

Until 2010 BS EN 50291 was a single standard, but in 2010 it was divided into two parts (BS EN 50291-1 and BS EN 50291-2). The requirement at Check 6.4.3 is simply that CO alarms must be certified to BS EN 50291.

Therefore compliant CO alarms may have been certified to:

- BS EN 50291, or
- BS EN 50291-1, or
- BS EN 50291-2.

In addition, some alarms may have been manufactured to both BS EN 50291-1 and '-2'.

However, as the life expectancy of a CO alarm is usually 7-10 years it is unlikely that Examiners will come across many CO alarms manufactured to the original BS EN 50291.

Although the BSS accepts CO alarms certified to BS EN 50291, BS EN 50291-1, or BS EN 50291-2, alarms to BS EN 50291-2 are actually best suited for boats. The '-2' edition of the BS EN means that the units will have been tested to meet additional performance standards specifically relevant to boat installation - namely, shock, static orientation, dynamic orientation and steady-state acceleration. Therefore, although not a BSS requirement, at the point of selection boat owners are recommended to choose '-2' units. The BSS website has a list of '-2' alarms recommended by the makers as suitable for use in boats <https://www.boatsafetyscheme.org/media/294453/boat-co-alarms-may-18.pdf>

CO alarms manufactured outside of the UK may not be marked 'BS EN 50291' and may just be marked 'EN 50291' or 'xx EN 50291'. If these carry certification body marks other than BSI or LPCB, Examiners should contact the BSS office for confirmation of acceptability.

The Requirement at Check 6.4.3 states that accredited third-party certification can be to BS EN 50291 or equivalent. At this time the BSS is not aware of an equivalent standard to BS EN 50291 and so any claims of equivalence should be reported to the BSS office.

Combined alarms (for example smoke/CO alarms) can be accepted provided the CO alarm aspect has accredited third-party certification to BS EN 50291.

CO alarms in greater numbers than required at Check 6.4.1 may be found on board. This is acceptable as the BSS Requirements are minimum safety specifications. The published BSS guidance for boat owners is that where CO alarms are kept on board in additional numbers to the minimum BSS Requirements, these will not be subject to Checks 6.4.1 - 6.4.4.

The BSS recommends that only CO alarms deemed a suitable type at Check 6.4.3 should be trusted to provide protection from CO poisoning and the published BSS guidance is to remove any unsuitable CO alarms as they may not work, or work effectively and reliably. Alternatively, owners are recommended to replace such units with compliant alarms.

Examiners must be familiar with the 'Guidance for owners' at 6.4.3 and be prepared to represent the guidance during engagements with owners, as appropriate. The guidance stresses that:

- although not a BSS requirement, carbon monoxide alarms marked to the 'BS EN 50291-2' are the best choice for boats. They have been tested to meet the more onerous conditions found in boats.

The BSS website has a list of '-2' alarms recommended by the makers as suitable for use in boats <https://www.boatsafetyscheme.org/media/294453/boat-co-alarms-may-18.pdf>

### 3.4 – Check 6.4.4

6.4.4	Are carbon monoxide alarms in good condition?	R
<p>Where one or more carbon monoxide alarms have been found to be necessary at Checks 6.4.1 and/or 6.4.2, visually check the condition of each required carbon monoxide alarm.</p> <p>Operate the test function button on each required carbon monoxide alarm.</p>	<p>Carbon monoxide alarms must be in good general condition, and must not show signs of any of the following indicators of poor condition:</p> <ul style="list-style-type: none"> <li>• damage or deterioration to the body of the alarm or the fixing mechanism;</li> <li>• having passed any manufacturer’s express replacement date;</li> <li>• failing the test function test.</li> </ul>	
<p>Applicability – examiners are not required to open up alarms to check for internal damage or deterioration or for manufacturer’s express replacement dates.</p> <p>Applicability – some CO alarms have a manufacturer’s label stating, for example, ‘Replace 10 years after installation’ and if the installation date has not been added to the label, then the express replacement date should be taken as 10 years after the stated manufacturing date.</p>		

#### Purpose of the Check

Check 6.4.4 addresses whether each CO alarm is in good condition.

#### How the Check helps control the risk

Requiring CO alarms to be in good condition, to be within the manufacturer’s express replacement date, and that they pass the test function test, helps ensure they will work if called upon.

#### Applying the Check

At Check 6.4.4 Examiners must check that any required CO alarm is in good condition and passes the test function test. On boats where Checks 6.4.1 and/or 6.4.2 do not apply but a CO alarm is present on board, Examiners must not apply 6.4.4 (the Check is not relevant).

To be able to apply the Checking action in a robust and consistent manner Examiners must be able to recognise:

- the signs of damage or deterioration materially affecting, or likely to affect, the integrity, efficiency or operation of the CO alarm
- any markings on the outside of the alarm indicating that it had passed the manufacturer’s express replacement date
- that the CO alarm has passed or failed its test function test

‘Damage or deterioration’ is an existing ECP defined Glossary term:

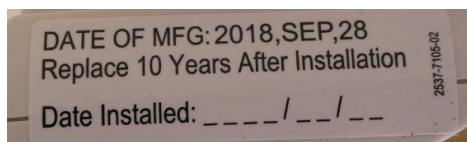
“Glossary term - Damage or deterioration - Damage or deterioration materially affecting, or likely to affect, the integrity, efficiency or operation of the item or device. [For example, a crack through the bowl of a clear bowl filter would constitute damage warranting a fail but damaged paint or a torn label on the filter would not].”

Examiners must be careful to apply the check for signs of damage or deterioration robustly but fairly. For example, signs of mechanical damage such as broken/missing pieces of outer casing or exposed circuitry are indicators of poor condition, but light scratches on the outer casing is not. As with all BSS Requirements it’s as important not to over apply pass / fail criteria as it is not to under apply them.



Examiners need not remove the alarm from its base to check for any manufacturer's express replacement date. This is because suitable models will alert the owner with a periodic beep once the unit is in need of replacement. However, in the event the Examiner has cause to remove the unit in support of the checking actions at 6.4.3, any marking indicating the replacement date should be viewed for full re-assurance. If indeed the unit has passed its replacement date than this would be a sign of poor condition and a failure logged at 6.4.4.

Some CO alarm makers, notably Kidde, have a label stating, for example, '*Replace 10 years after installation*'.



If the installation date has not been added to the label, then the express replacement date should be taken as 10 years after the stated date of manufacturing.

Examiners must press and hold down the test function button. This is generally located in an obvious position in the centre of the alarm. In the event the alarm activates this provides a good level of assurance that the unit is fully functioning. In the event the alarm remains silent this is a sign of poor condition and a failure must be recorded at 6.4.4.

## **4. Applying the new Checks to the different classes of vessel**

### **Privately Owned and Managed Vessels**

From 1 April 2019 the new Checks 6.4.1 – 6.4.4 will be added to the Core (2015) Examination Checking Procedures for Privately Owned and Managed Vessels. Salesforce recording of faults will also be possible for 1 April.

Although the downloadable version of the BSS Examination Record Form for Privately Owned and Managed Vessels will be amended at Section 2 (Checklist) to include the four new Checks, no new pads will be available at this time because of other changes coming later in 2019.

### **Hire boats**

Examiners qualified to examine hire boats will apply the Checks 6.4.1 – 6.4.4 from the Core (2015) BSS Examination Checking Procedures for Privately Owned and Managed Vessels to hire boats, but Check 6.4.2 will be applied as a mandatory Requirement. Salesforce recording of faults will also be possible for 1 April, with Advice Check number 6.4.2 being suffixed with an X (e.g. 6.4.2X) rather than an 'A' or an 'R'. This the same for all Advice Checks in the Core Requirements.

The current Checks 10.8.3 and 10.8.4 at Appendix 10 – Hire Boats will be removed as from 1 April 2019 these will be superseded by the new Core Checks at 6.4.2 - 6.4.4.

Although the downloadable version of BSS Examination Record Form for Hire Boats will be amended at Section 2 (Checklist) to include the four new Checks, no new pads will be available at this time because of other changes coming later in 2019.

### **Other classes of commercial vessel (i.e. vessels covered by the 2002 ECP)**

Examiners qualified to examine commercial vessels covered by the 2002 ECP will apply the four new Checks to such vessels from 1 April.

We are currently reviewing the names or number references for some of the existing checks in Part 6 of the 2002 ECP.

The plan currently is to:-

- re-assign the current C6.4.1 for heat damage to GRP to C6.7.1,
- withdraw the current C6.4.2 that is currently not checked and
- newly assign the four new CO alarm checks to C6.4.1-4 inclusively.

Qualified Examiners will get additional instructions covering these other classes of commercial vessel shortly and in time for April.

## **5. Recording and reporting the new Checks**

As for all BSS faults found, Examiners must communicate 'not-passed' CO alarm related BSS Check Items to their customers clearly in writing, i.e. not only a verbal briefing - except in cases where the customer rectifies any faults to make the boat compliant while the Examiner is still on board.

The written report to customers must:

- Identify the relevant Check Item number;
- Identify where onboard the boat the non-compliant item is located
- Explain the nature of the 'not-passed' item using key text drawn from the BSS Requirement (i.e. CO alarm not provided, CO alarm not in the same accommodation space as the solid fuel stove, CO alarm fails the test function test, etc)

Examiners are also reminded that it is a condition of registration that:

- a checklist must be completed during all examinations and retained on file for six years from the date of the examination;
- all examinations must be recorded on the BSS Database (Salesforce), including identifying and providing a description of all 'not passed' Check Items identified during the examination (this includes any non-compliant items rectified during the examination).

## **6. CO alarms – can detect hydrogen gas**

The published BSS guidance for boat owners is that CO alarms can activate when boat batteries gas off, especially if the batteries are being over-charged. The chemical sensors in CO alarms react to hydrogen typically at around 5% of the Lower Explosive Limit.

Therefore, there is a concern that if the concentration of diluted hydrogen has reached this level at the remote location of the CO alarm, then the hydrogen concentration closer to the source of the gas is likely to be much higher, and could be approaching an explosive concentration, especially in the battery compartment itself.

Hydrogen readily forms an explosive mixture with air and the ignition energy required to ignite a flammable hydrogen/air mix is very low. Even very small sparks, such as those produced by wearing certain types of clothing, are capable of igniting hydrogen/air mixtures and causing an explosion.

Accordingly, published BSS guidance for boat owners is that should battery charging produce enough hydrogen to activate a CO alarm, it is a call to action not to be ignored by the boat owner. If any boater is confident that a CO alarm activation was not caused by the presence of CO, they should stop the battery charging, not allow any source of ignition to be operated and should investigate any battery charging issue having first immediately opened windows, doors and awnings to disperse any hydrogen – noting that this flammable gas rises rapidly.