

I Interim ECP 6.4 Segment Appendix I - Carbon Monoxide Alarm Requirements supporting information

1 – Essential material needed by BSS Examiners to be able to apply certain ECP Part 6 Checks

1.1 Carbon monoxide alarms – essential material – understanding the ECP Glossary term ‘accommodation space’

Check 6.4.1 covers the provision of carbon monoxide (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.

ECP 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.”

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.

1.2 Carbon monoxide alarms – essential material – measuring the distance between a carbon monoxide alarm and any door that links accommodation spaces

The second Requirement at Check 6.4.1 specifies that on boats with two or more accommodation spaces a carbon monoxide (CO) alarm must be located within 10m of any door that links the accommodation spaces.

Where there are a number of accommodation spaces (e.g. separate cabins) the sound of an alarm will be deadened by the separating boat structures including closed cabin doors.

By requiring an alarm to be located within 10m of each door that links accommodation spaces there is an assurance that wherever someone is located within the interior of a boat they are likely to be able to hear an activated 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 –

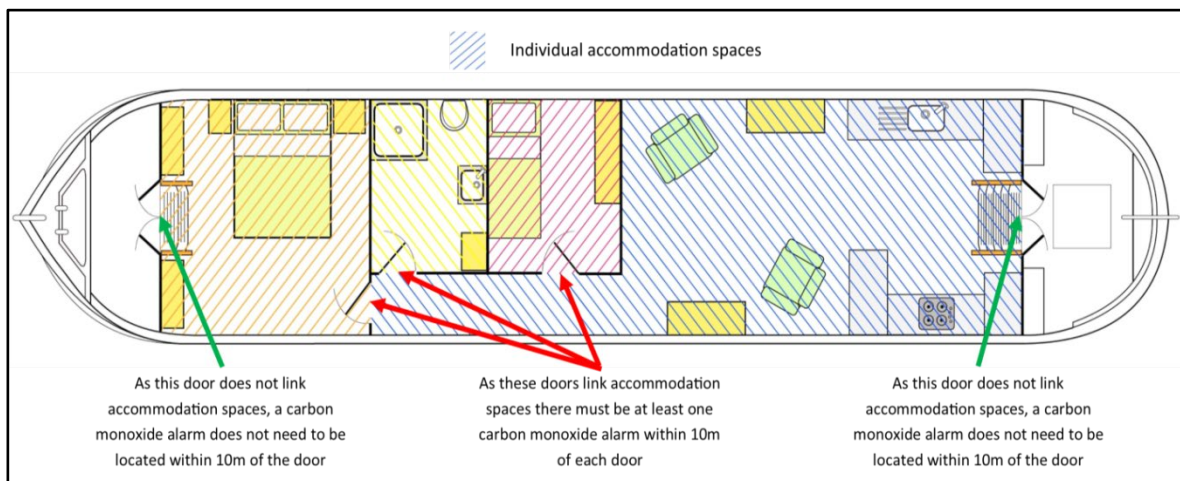


Fig 1. To be compliant at Check 6.4.1 a carbon monoxide alarm must be located within 10m of the three doors that link accommodation spaces.

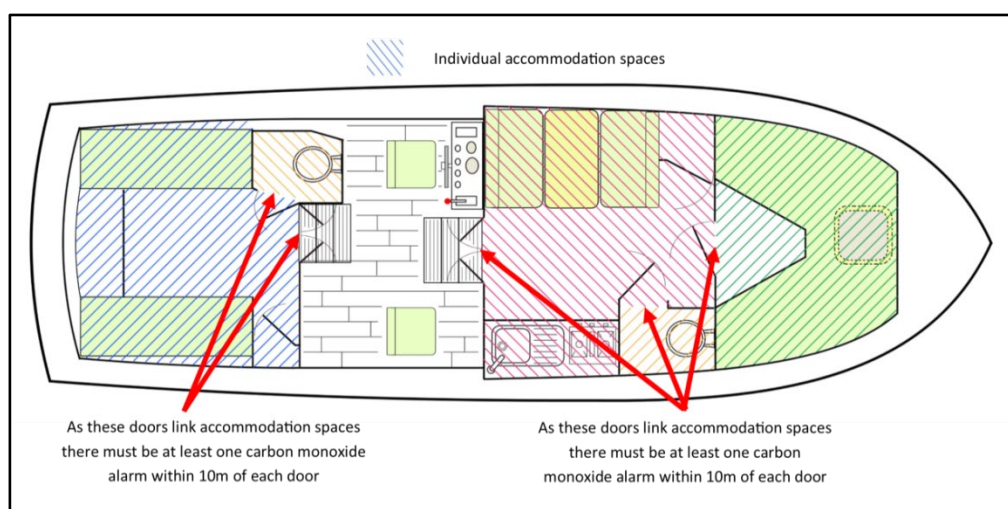


Fig 2. To be compliant at Check 6.4.1 a carbon monoxide alarm must be located within 10m of the five doors that link accommodation spaces. In this example the cockpit/wheelhouse is not an accommodation space, but the two companionway doors do link to other accommodation spaces (the aft cabin's companionway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

2 – Additional information to support BSS Examiners' understanding of the BSS Requirements

2.1 Carbon monoxide poisoning – reference material

The CoGD/EM/BSS awareness leaflet 'Carbon Monoxide Safety on Boats' should be considered as authoritative and as containing crucial underpinning knowledge for boat owners.

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

2.2 Carbon monoxide alarms – the BSS Requirements

The Requirement at Check 6.4.1 that all boats having one or more accommodation space(s) must be provided with at least one carbon monoxide (CO) alarm addresses the risk presented by carbon monoxide entering from sources outside the boat.

CO entering from outside a boat can quickly build up to dangerous levels as the enclosed nature of accommodation spaces means that it may not be easily dissipated or vented.

Check 6.4.2 is very different from the other CO alarm requirements, firstly it concerns risks from an internal CO source and as such, for privately owned and managed boats it is an advice check.

For all other boats in non-private use where the navigation authorities' duties of care are greater, compliance with Check 6.4.2 is mandatory.

The focus on only solid fuel appliances is because they produce relatively high levels of CO e.g. in normal operation they can produce 100 times more CO than faulty LPG hob burners.

Also, when occupants are asleep, and the stove fire is dying down, there are relatively fewer air changes within the boat, CO may build in the accommodation. At the same time occupants may be unaware of any creeping effect of CO on themselves.

A CO alarm in the same space as the stove provides early, audible warning to craft occupants should flue gases escape from the stove into the space.

2.3 Carbon monoxide alarms - manufacturing standards

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 carbon monoxide (CO) alarms must be certified to BS EN 50291, and therefore compliant CO alarms may have been certified to BS EN 50291, BS EN 50291-1, or BS EN 50291-2.

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, noting that alarms to BS EN 50291-2 are 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/co>

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'

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.

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

2.4 Carbon monoxide alarms - accredited third-party certification

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

The principles behind the certification of CO alarms are the same as those for portable fire extinguishers.

In the UK the main certification bodies for CO alarms are BSI and LPCB (Examiners should be familiar with these body's certification marks from ECP Part 6 Check 6.1.2).

Other certification body marks may be acceptable, but Examiners should contact the BSS office for confirmation of acceptability if other marks are found.

Because the following companies only make CO alarms to BS EN 50291 and all their alarms are certified by an accredited third-party certification body, Examiners are not required to establish the accredited third-party certification mark –

BRK	FireHawk Alarms
Dicon	First Alert
Ei Electronics	Honeywell
Fire Angel	Kidde

Note, 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 Directive does not give any assurance of manufacturing quality or performance testing to a CO alarm manufacturing standard.

2.5 Carbon monoxide alarms – unsuitable, or excessive numbers

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 any unsuitable CO alarms should be removed by the owner from the boat, as these may not work or work effectively and safely if called upon. Alternatively, owners are recommended to replace such units with suitable alarms.

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, rather than absolute, 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.

2.6 Carbon monoxide alarms – location and placement

The BSS Requirements (at Checks 6.4.1 to 6.4.4) do not address the location or placement of CO alarms, other than the Requirement at Check 6.4.3 that alarms found to be necessary at Checks 6.4.1 and/or 6.4.2 must be in open view.

Guidance for boat owners in regard to the location and placement of CO alarms to provide best protection can be found with the alarm manufacturers' installation instructions. However, if these instructions are difficult to meet on the boat, then best practice pointers are published in the CoGDEM/BSS awareness leaflet 'Carbon Monoxide Safety on Boats', and on the BSS website at <https://www.boatsafetyscheme.org/co>

2.7 Carbon monoxide alarms – can detect hydrogen gas

The published BSS guidance for boat owners is that carbon monoxide (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.