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## 1 WELCOME

Congratulations on purchasing a license for CE-Pro, the unique solution for quick and simple preparation of RCD documentation.

The CE-Pro package is a powerful tool for those involved in CE marking recreational craft. It will enable you to save considerable time when compiling technical documentation. Its "easy to follow" format ensures that so long as the right data is entered, the end product will be accurate and stand up to scrutiny by Notified Body or regulatory authority.

Before starting to compile the first Technical File, we recommend the user studies the first three sections of this manual which will give a basic understanding of the software and help to avoid problems further down the line. We also recommend that a hardcopy of this manual be kept to hand whenever using CE-Pro.

## 2 FUNDAMENTALS

### 2.1 Flexibility

Anyone who has used a computer "program" will identify the frustration of the software not allowing you to make an exception, however well justified. Given that RCD standards apply to a vast range of different types of craft: slow speed and high speed, narrow beam and wide beam, inland and sea going and so on, there needs to be flexibility when interpreting and applying standards.

The EU Commission recognises this need and as a result modern European Directives, of which the RCD is one, do not require strict adherence to the standards. If you build a boat with a novel feature, which cannot strictly follow the letter of the standard, don't panic! Providing there is a justifiable case for not following the standard, part or all, it may be dispensed with.

To provide the required degree of flexibility for assessing all the different types of craft, any software program in support of the RCD also needs to be flexible and allow for the user to create their own solution to reflect special circumstances.

The spreadsheet interface is well proven and familiar to all computer users. It is also extremely adaptable. The user is not constrained by a fixed start and end point or a prescriptive path. A workbook can include as many worksheets as required, allowing users to add their own "extras" to any file where necessary. It also allows, in the easy "cut & paste" manner, the insertion of objects, such as notes & images wherever required. If needed, the user can also "hide" any parts that are not relevant.

All this flexibility, however, disguises Excel's ability to be programmed. CEproof has written many hundreds of lines of hard code to support the RCD spreadsheet. CE-Pro is, therefore, a synthesis of a familiar spreadsheet and a complex program that provides the best of both worlds.

### 2.2 User Requirements

CE-Pro is easy to operate, but the user should have some knowledge of the technical aspects of boat building and of basic boat engineering. It also requires working knowledge of Microsoft Excel.

### 2.3 Knowledge of ISO Standards

As details of the craft are entered, the software will start to select relevant options for that particular type of craft and importantly it de-select options that are not relevant. It will also start to perform calculations in accordance with the ISO standards. To achieve accurate results, all information put into the spreadsheet must be correct.

For this reason, a full set of RCD standards is available. Please enquire if you don't already have a copy. A good working knowledge of the standards is vital to ensure that both the correct information is entered into the spreadsheet and that the output data is interpreted as it should be. It is certain

that users will have occasions where they cannot identify what parameter CE-Pro is requesting of them. The answer will inevitably be found in the related section of the appropriate ISO standard. CE-Pro includes references so that the User may easily refer to the standards as they work through the project.

## 2.4 Notes on Accuracy

“Rubbish in, Rubbish out!”

The downside of the spreadsheet's flexible format is the ease with which the user can inadvertently enter incompatible data and syntax. Sometimes the error is not immediately apparent and can lead to odd results.

This spreadsheet has been written to avoid this as much as possible and there are some syntax checking routines coded for the most critical areas. However, it is in the nature of spreadsheets, especially of a large size such as this, that auditing is required to check the end results. Excel has an in-built toolbar for *Formula Auditing* which can be used to trace back to the cell that has missing or erroneous data.

### **Make sure you check the output!**

CEproof will not be held responsible for any decisions taken on Declarations of Conformity made by the user as a result of the output from this software.

## 3 GETTING STARTED

### 3.1 System Requirements

Before starting to install the software, make sure your computer has the following minimum specification:

- Microsoft Windows XP or later.
- Microsoft Excel 2003 or later
- 1GB RAM
- 10MB of free hard drive space for the installation + approximately 15MB for each Technical File required.

### 3.2 Enabling Macros – Excel Security Settings

If not already loaded on the user's computer, load Excel 2003 (or later) following the instructions.

Many users choose to, or by default, have their security settings set high. At the high security end, Excel will disable macros. If run in this condition, the CE-Pro will not operate and might not even begin to load. The macros are essential for the proper functioning of the software.

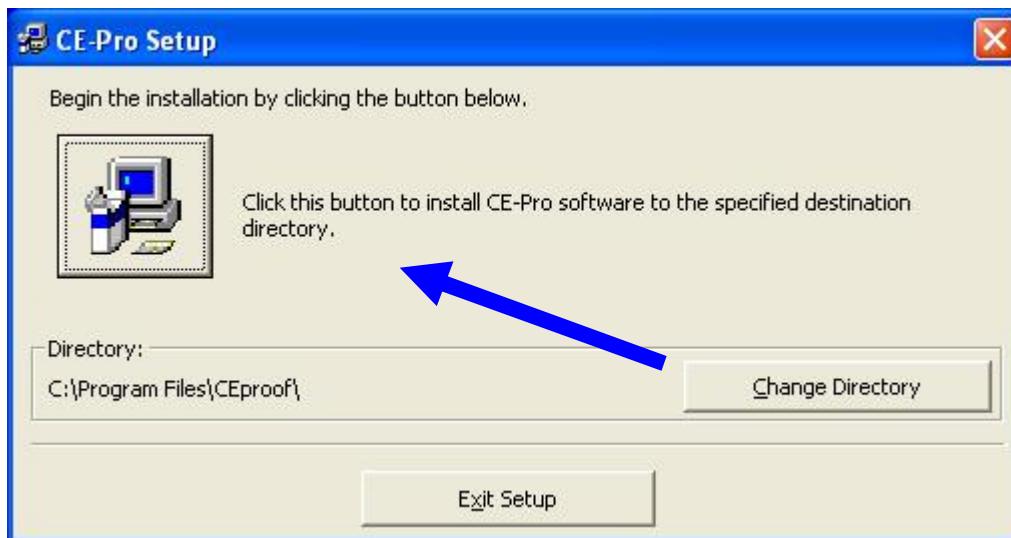
At the medium security setting the user will be prompted to confirm if they want the macros to be enabled every time they run CE-Pro. To unlock, answer in the affirmative.

To permanently enable macros and remove the prompt, set the macro protection to “Low”. Be aware that this will allow any workbook to open without a check of the macros. To change the level of protection:

- Open Excel and ensure there is an open worksheet. (The default “Book1” will suffice).
- Choose “Options” under the “Tools” menu.
- Select the “General” tab of the dialog box.
- In the top half of the dialog box is a checkbox titled “Macro virus protection”. Ensure this is not checked and select “OK” to close the dialog box. This change will apply to all workbooks from this point forward.

## 3.3 Installing CE-Pro

1. Insert the CD into the computer.
2. The disk has an "autorun" file but this may be disabled on some computers. If the installation program does not start automatically, use the file explorer to find the file list on the CD and open or double-click on the program "Install.exe". **IMPORTANT** – running the "setup.exe" program alone will not install all the necessary items and the software will not run.
3. After the Licence Agreement, allow a little time for the installation routine to start.
4. The set-up routine defaults to the path "c:\programs\CEproof" as shown below. It is recommended that the user does not changes this.



5. When you are happy with the Directory, click on the button indicated to start the copying process.
6. The installation routine should complete automatically. If it does not, ensure that you are using Windows XP. It will not run on pre XP versions of Windows.

## 3.4 Autosave – Friend or Foe

Generally speaking the Autosave feature in Excel is great; unless you have a slower PC in which case you'll get fed up waiting for the save to complete, each time wondering whether the application has crashed or is just holding you back. Fear not help is at hand.

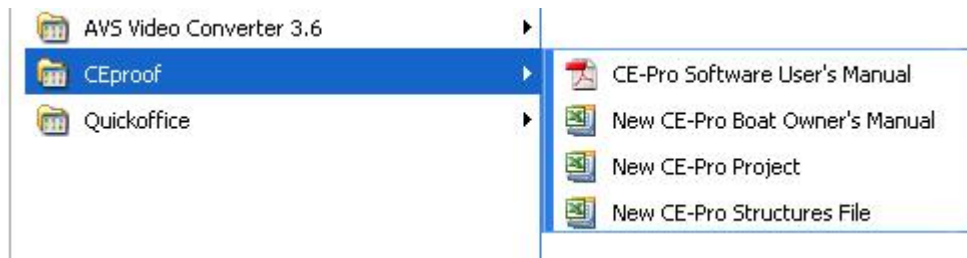
The Autosave parameters are set via the Tools/Options/Save menu bar at the top of the screen. The default is to autosave every 10 minutes. If working on a slower PC you can either set this to a longer time interval (eg 30 minutes) or disable it altogether but if the latter please remember to save manually when you go for coffee/lunch – we both know there's nothing worse than losing hours of work.

As a final point on this you may find that during the autosave the title bar will try to scare you into a reboot by adding "(Not Responding)" next to the workbook name. Fear not, once the save completes, all will be well.

## 3.5 Opening a New Project

### 3.5.1 Start-Up

On completion of the installation routine, your computer should have a new item on the Start bar. Click on the "Start" button and look under "Programs" or "All Programs". You should find a new entry called "CEproof" as shown below.



Click on the "New CE-Pro Project" to start a new project.

If you have not enabled macros, you may not be able to open the file and will be prompted by Excel confirming that you cannot open the program. See the previous section 3.2 to find out how to enable macros. Follow the on-screen instructions to clear the screen.

Assuming you have enabled macros correctly, you will be presented with the CE-Pro splash screen. This has the CEproof contact details should you have any queries. The splash screen also states the version of the software that you have and your specific license data. It can be recalled at any stage by clicking on the "About CE-Pro" button on the toolbar.

Upon opening the file it is recommended that you save your new project file immediately with a new name in your project folder. Although you will not be able to overwrite the original clean template, computers do crash! Save your work frequently.

### 3.5.2 License Information

The splash screen displays the license information. You will see that there are two entries regarding licences:

- Licensed User
- Source of file

The licensed user is the name of the person or company that installed the software on the user's computer.

The Source of the file is the name of the company or person who originated the project file from an empty template. This is of interest, for example, when a company submits their file to a Notified Body for assessment and certification.

Where a licensed user sends a project file to another user, the recipient must be licensed to use the same or a later issue of CE-Pro in order to open the file.

CEproof codes the User and Source into the program at the point of distribution. Contact CEproof if this needs to be changed for any reason.

### 3.5.3 Navigating Around CE-Pro

#### Data Entry & Colour Scheme

Data should be entered in the yellow cells. Sometimes CE Pro will enter data for you.

There are also some cells coloured in pale green. These indicate cells that record information not related to the RCD. For example, the RCD has no requirements for fresh water systems but it is sensible that your TCF and certainly your Owners Manual records the basics about such systems.

= Data required      = Data for OM not related to RCD requirements

Enter data by typing directly into the cell, or, where a "drop-down list" is provided, a selection should be made from the list. You cannot select an object such as a drop down box until the previous cell or object is "closed". This means that you must press enter after typing text so that the cell is not left "open".

#### **Do not overtype the menu boxes.**

The only exception to this is the choice of structural rule on page "E Contents". The user may select from a list or type a reference to any standard.

Cells which are “greyed out” do not require an entry.

If a particular row on a worksheet is not relevant to the project in hand, it may be hidden.

**Never delete or insert a row (except as described in the Owners Manual).**

However, rows may be “hidden” or “unhidden” as you like.

**Never delete a worksheet unless it is one you have inserted yourself.**

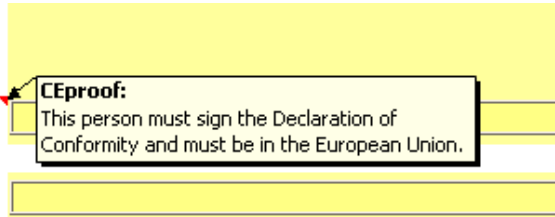
You may insert as many worksheets as you like – within your computer’s limits.

If the cursor hovers over a cell which has a red triangle in the corner, useful advice as to what should be entered in that cell will pop-up as shown below:

Fit-Out By:

Agent/Distributor or other Rep.:

Manufacturer's Authorised Rep. 



Signatory of Declaration:

You can add your own comments to a project (by right clicking on a cell and choosing “insert comment”. You will notice that the comment will show who entered the comment.

On clearing the splash screen with license information, you will be faced with the “Title Page”.

Note the list of tabs along the bottom of the screen. Use the left-most arrows at the bottom of the screen to scroll through the list of sheets to the left of the “Title Page”.

With the exception of the loading data of ESR 3.6 and ESR 2.5 Owners Manual the screens follow the Essential Safety Requirements (ESRs) of the Directive in numerical order. Screen 3.6, “Load”, like the “Principal Dimensions” sheet, has a significant influence on calculations and requirements. Therefore, it has been moved out of sequence so that it is one of the first sheets to be completed. By contrast, the Owners Manual cannot be compiled until we have all the data for the project and in contrast to the Technical File, may need to be different for each boat. The Owners Manual has, therefore, been kept as an independent file to link into the Technical File. We shall discuss this in section 9.

The list of openings, sheet 3.4, influences the choice of a number of standards and has a profound impact on the stability requirements in particular. Section 3.4, *Openings* has been left in its correct numerical order so that it is easier to find but you will need to complete these pages before conducting the stability assessment. See section 5.48.

The sheets with the blue tabs describe the boat and its systems. The information entered in these pages is used by the macros to select the worksheets that are relevant to the project and to strip out those parts of the standards that are not.

As a general rule, working from left to right is a good policy. This is the best way to avoid entering unnecessary information. The only exception to this is the first sheet: “Project Management”. This is not linked to any other sheet. It is simply a page for recording what remains to be done. See 5.1

It is essential that the user keeps checking completed pages as some options may change requirements “upstream”.

## 4 PROJECT PLANNING

### 4.1 The Ideal Route Map

CEproof has compiled more RCD technical files than any other organisation. This experience suggests that the most efficient project map is as follows:

1. A Title Page
2. B Principal Dimensions
3. C Systems Summary

4. D Constants & conversions
5. E Contents
6. 3.6 Load
7. 3.4 Openings 1 – List
8. 3.5 Cockpits (if this is applicable in your case).
9. All remaining ESRs, in order of number: lowest to highest.
10. Owners Manual (in a separate file)

Of course, the building of a boat starts with the structure. Thus, it may be that you have to start with the structural assessment. This is, of course, perfectly acceptable, but data will be required in other sheets to complete proper calculations (e.g. load data).

## 4.2 Iteration

Wherever you start, there are sure to be changes made later in the assessment that invalidate items already entered. For this reason it is essential that you frequently look through the sheets to check that "compliant" answers have not be rendered "non-compliant".

## 5 THE WORKSHEETS

This section works through each worksheet, working from left to right. It is certain that not all the pages will be visible to you at any one time, but you may come across all of them at some stage.

Generally speaking you will always see the left-most sheets up to the point at which the sheet names start to include numbers eg '1.0 NoBo Cert'. These numbered sheets refer to specific clauses in the standards and will vary considerably depending on the type and size of craft being assessed. So, though this manual contains details about a large number of sheets the good news is that for a particular craft you won't see most. The bad news is you won't know what you'll see before you start and thus need the whole manual to hand. Keeps you on your toes though!

### 5.1 Project Management

This worksheet is unusual because it is not linked to any other sheet. It is intended to provide the user with a means of recording the progress of the project to 100% completion by clicking each ESR onto "Complete" or "Not applicable". Notes should be made about outstanding issues and the details of any non-conformities that need to be resolved. But, remember the software *won't* update it for you.

A print out of this sheet at regular intervals makes for a useful progress record. It is also very useful for agreeing outstanding issues with Notified Bodies – so that all parties are clear as to where they stand.

As this is such a critical sheet, CE-Pro has been programmed to jump the user to this sheet by hitting the keys "CNTRL+J". When the user has entered the necessary data into the Project Management sheet, the same keystroke will jump the user back to the last cell. This is to encourage the user to record critical notes and not "save them up" for entry later. It is amazing how lazy we can be when operating software!

### 5.2 A Title Page

This page is the starting point of every project.

The Title Page records the basic details of the project: such as whether it is a complete craft or a part complete craft and its Hull Identification Number (HIN). It also sets out the major players who are involved in the project, including the designer, builder and Notified Body.

For help on the choice of Conformity Assessment Modules, click on the button "Click for help" beside the box for the choice of Notified Body. A separate window will appear with some help. On this window there are further buttons to click to seek more detailed help.

The signatory of the Declaration of Conformity, whether it is the manufacturer or his Authorised Representative, takes RCD responsibility for the project. If an Authorised Representative is involved, he/she must be domiciled in the European Union and must sign the Declaration of Conformity. CE-Pro ensures this is so.

When the Declaration of Conformity covers just one boat, then the Date of Completion (Date of NoBo Certificate, NoBo is Notified Body) should be entered when that boat is complete. But, if the Declaration of Conformity covers a production run, then the Date of Completion should be entered when the final boat in the run is completed. The Technical Construction File (TCF) should be kept for 10 years after that date. An example completion date will be shown in the correct format for your region. You can enter the date in your normal format as Excel will take care of how the date is formatted on the worksheet. When entered the correct "end date" will appear in the next cell.

### 5.3 Register

Details and the CINs (which used to be called HINs in the pre-2006 Directive) of all craft, which conform to the TCF, should be entered here. This is where the program can be used to handle customisation. More about this in section 7.

## 5.4 B Principal Dimensions

The basic dimensions and general information about the format of the craft are entered in this sheet. As stated at the top of the sheet, the values should be measured in compliance with EN ISO 8666. If this is your first RCD project, it is recommended that you refer to this standard, which is provided on the CD accompanying CE-Pro.

In the "Description of Type" section, reference will need to be made to other standards, such as EN ISO 12217 to define the "Deck Coverage" and the type of cockpit, if any, which is installed in the craft. Clicking on the 'Deck Coverage Requirements' button brings up a table to help you. With the table loaded select/confirm whether the vessel is of sail or non-sail type and whether the length is under or over 6m (approx 19' 8"). The table now presents you with a number of options for both RCD Category and Decking along with the group of tests/checks that will be required to meet each available option. So for example for a sailing craft over 6m for use in sheltered or inshore waters (Cat C/D) we see that (option 7) a capsize-recovery test alone could replace the alternative requirements (option 1) to determine down-flooding heights and angles as well as the angle of vanishing stability and the stability index. Which option you choose will be influenced by the data (eg stability curves) you have to hand and of course whether you have the craft built to test. Note that Category A/B craft always require stability curves. Press the 'Done' button to close the table.

The "crew limit" is the maximum number of people who can be carried on board the craft when it is underway and it will subsequently appear on the Builder's Plate. Note that this may be substantially more than the number of berths,

Operating mode defines whether the craft is designed to plane or be limited by its displacement speed. Though yachts may surf down the occasional wave they should not be considered to plane unless such high speeds can be sustained, which though possible in some racing craft would be rare in recreational craft.

Accommodation arrangement really asks whether there is accommodation or not as by definition all accommodation is enclosed.

Hull form should be based on the mid-ships cross-section. Most displacement craft will be round-bilge except for some mostly steel/alloy yachts that are plated in a multi-chine configuration. Most high speed planing craft are hard-chine.

The cockpit arrangement is the subject of EN ISO 11812 to which you wish to refer. Most open cockpits will be classed as quick-draining though whether this is true in practice may not be the interpretation of the standards.

Before we get into the actual dimensions this may be a good point to mention the 'Constants and Conversions' sheet (D) which though discussed in sequence later is relevant here. The conversions in this sheet allow numbers to be entered in the builders units and then converted to ISO units. So for example a yacht of 45' LOA can be entered as +45\*ftom which results in a value of 13.716m in ISO units. The benefit of this is that the formula in the cell still contains the dimension in its original units. Have a look at these conversions now as you'll use several in the course of filling out the workbook and it save you time searching for the scientific calculator you had at college!

Depending on the type of craft, it may be that not all the dimensions in the "Hull Size" table are required and "N/A" will appear in the right hand column for these rows. These rows may be hidden if desired, but not deleted. This is not recommended however because as later issues are resolved (e.g. the choice of stability assessment) the data that is required may change.

Note also that in addition to entering numbers and conversions you can also refer to other dimensions directly. For example if the Beam – Maximum ( $B_{MAX}$ ) is the same as the Beam of hull ( $B_H$ ) you can put the ref "+bh" in the cell for  $B_{MAX}$ . Neat Eh!

The two columns for data entry in the "Hull Size Table" are for those measurements taken at "Minimum Operating Condition Mass" ( $M_{MOC}$ ) and those taken at "Maximum Loaded Displacement Condition Mass" ( $M_{LDC}$ ). It is recommended that both sets of figures are entered although not all craft need have all data in both conditions. Note that 'Maximum Loaded' should include the number of crew specified in 'Crew Limit'.

The "Nominal Projected Sail Area" ( $A_s$ ) will be calculated by the software if figures for "P", "E", "I" and "J" are entered. If not, you may overwrite the equation with a figure. For a motor-sailing vessel,

the “Sails” table may be hidden/shown by clicking on the check box regarding auxiliary sails at the top of the page.

Materials of construction, lists (in drop down boxes the materials used to construct the underwater hull, topsides, deck and superstructure as well as note the type of framing system and bottom arrangement. Note that the term ‘Composites’ includes fibre-glass construction.

Keel data comes next and is self-explanatory. You should assume that a yacht with a separate keel and rudder should be viewed as a fin keel arrangement irrespective of how ‘long’ the keel part may be. Tandem means one in front of the other (or with a slot as used by some production yachts), bilge clearly means side by side. For yachts with a ballast keel with integral centre board these should be classified as ‘Bolted’ and ‘Dagger/Centre Board’.

Lastly in this section is the part relating to swim platforms.

## 5.5 C Systems Summary

The data entered into this sheet enables CE-Pro to select several sheets, which will be needed further on in the project. The information to be entered covers the engine, fuel, electrical, LPG systems and so on. If in the early stages of a project, if some of the information is not yet available, it can be added later. It would be a good idea to put a reminder on the “Project Management” sheet so as not to forget it!

Note that most of the entries are selected from drop-down lists.

With regards to the Fuel System and in particular the fuel tank location, some explanation is required. A ventilation standard applies for petrol engine and tank spaces. If the tank is “open to atmosphere”, then no ventilation is required. However, if the tank is in the engine space, then only space needs to be ventilated. In addition, if a tank is, for example, built into a slot below the deck and between frames such that there is no “space” then clearly ventilation is pointless for the tank. Indeed, it would more likely be source of water ingress than useful for ventilation. CE-Pro needs to know the tank location in order to prepare the ventilation later in ESR 5.1.

Under ‘Discharge Prevention System’ note that any all boats with heads must have with a holding tank or a means to fit one, temporarily. Temporary means might be a loose tank but the builder needs to provide something like a Y valve with a blanked branch so that the holding tank can be temporarily connected.

It is common for only some craft in a production to have, for example, a gas system. If this is so, mark the section as fitted and simply record against each HIN, which boats have gas on the table at the bottom of *A Title Page*. When printing the Declaration for any specific boat, you will need to select or deselect the gas system before printing so as to ensure the list of standards is correct. No data will be lost on the gas sheet by doing this.

The lower section of the page is marked in pale green as it relates to systems that are not within the scope of the RCD Essential Safety Requirements. These options trigger sections in page 2.5 *Notes for Owners Manual*, where further details can be entered for repeating in the OM itself.

## 5.6 D Constants & Conversions

This table gives a list of constants such as densities of fuels and water, plus a useful list of conversions. The conversions can be incorporated into equations anywhere in the project by name, as described on the sheet.

## 5.7 E Contents

The sheet lists forms the list of contents for the TCF. The standards are selected according to the information that has been entered into the “Principal Dimensions” and “Systems Summary” sheets. The only choice to be made on this sheet is from the drop-down list for the structure. This is the only drop down box into which the user may type an answer. The reason for this is that the harmonised standard for structures is not yet complete and not all Notified Bodies are happy to use it. This means that we may have to use an alternative standard as chosen by the user.

Note that in the absence of any structural standard, existing craft may be classified based on their service history. In other words, five years of safe use within an environment reflected by the RCD Category specified is sufficient to demonstrate that the boat is “strong enough in all respects”. In fact, this prolonged demonstration in the field is more reliable than any calculation method. The satisfactory service history of sister ships can be applied although it must be demonstrable that the structural arrangement is comparable. Service history can be described in ESR 3.1 in section 5.25 of this document.

## 5.8 Notified Body Title Page

This sheet is normally hidden from view. It is only called upon when the user wants to print a Stability Report using the button on the tool bar. The sheet is generated entirely by the software and simply lists the main details of the craft and the contents of the stability report.

There is no user input on this sheet.

## 5.9 E1 Drawings

Drawings are an essential part of any assessment. This sheet is a record of the drawings involved in the project. It can be used to ensure that all the relevant drawings are to hand for submission to the Notified Body. It is not linked to any of the other sheets and of course, has to be updated manually.

## 5.10 2.0 Inflatable Arrangements

This sheet is hidden unless the ‘Craft Type’ specified on the ‘Principle Dimensions’ sheet is set to ‘Inflatable’.

Special data required for inflatable boats is entered on this sheet. It includes the basic dimensions of the craft and the sizes of the buoyancy tubes. The software will then calculate the total volume of buoyancy and assess which part of the standard (ISO 6185) is applicable for this inflatable. CE-Pro will select the appropriate sheet for assessment of the craft – see section 5.14 of this document.

## 5.11 Annex IIIa Declaration

A full “Declaration of Conformity” can only be issued for completed craft. (The full “Declaration” for complete craft is in the Owners Manual module of CE-Pro – see section 10). If the project concerns a “part-built” craft, clicking the appropriate radio button on the “Title Page” will substitute an “Annex IIIa Declaration” for the “Declaration of Conformity”.

The “Annex IIIa Declaration is similar to the “DOC”, but states that the craft complies with the RCD as far as it is complete and that it is to be completed by others.

The list of standards has a facility for showing whether or not each standard has been applied in full, or only in part. The user should complete as appropriate for the work they have done on the boat.

## 5.12 1.0 NoBo Certificate

This provides a sheet into which the certificate from the Notified Body (NoBo) should be pasted. If no certificate is required (for Module A craft), this sheet can be hidden.

## 5.13 3.6 Load

The “Lightship Weight” is the weight of the craft, as it would probably leave the yard, i.e. when it is complete, but nothing is onboard which is not an integral part of the fit-out. Therefore, the tanks should be empty, no stores or safety gear should be on board and of course no crew. The weight can be arrived at by calculation or by measuring during craning or transport. The lightweight does not calculate – the user enters it. The user should enter the total lightweight, regardless of where there is a value for engine or ballast in the lines above.

Some of the information will be entered from other sheets, but yellow cells may need a manual entry as appropriate. These include tank capacities, weight of non-permanent ballast, stores and carry-on loads. The weight of liquids in the tank is calculated automatically when the volume of the tank is entered.

As a guide we suggest 30kg per person for baggage and a share of any provisions that might be taken on board. Growth (as in the comment on the sheet) allows for craft to put on weight through age. (Who said boats and their owners were different).

Permanent Stores and Equipment provides an opportunity to add all the gear added after delivery or not previously included in the Lightship weight. For a sailing yacht this would include any sails, spars and deck equipment not included by the builder plus all the cruising gear etc that eventually fills every void. For a more informative definition of Permanent Stores & Equipment please refer to the standards, ISO 12217 and ISO 8666.

The "Maximum Recommended Load" ( $M_{MTL}$ ) is the total load that may be added to the "Lightship Weight" without exceeding the requirements for stability and freeboard.

The "Maximum Load" is the weight of the crew and any personal gear that they take on board. This figure will appear on the "Builder's Plate" sheet.

If the ratio of  $M_{LDC}$  to  $M_{MOC}$  is greater than 1.15 (ie if the heavy load condition is more than 15% greater than the light load condition), then assessment in both the heavy and light load conditions may be required. Refer to the "Principal Dimensions" sheet to enter the extra column of data required for the heavy load case. If the chosen stability assessment option uses a GZ curve then curves for both load conditions will be required.

## 5.14 2.0 ISO 6185 (parts 1-4)

If the craft type entered on the 'Principle Dimensions' sheet is either 'Rigid Inflatable' or 'Inflatable' then a sheet corresponding to the appropriate part of the inflatables standard, ISO 6185, will be presented as follows:

1. ISO 6185-1:2001 is for an engine of 4.5kW (6hp) or less
2. ISO 6185-2:2001 is for an engine over 4.5kW (6hp) but less than 15kW (20hp).
3. ISO 6185-3:2001 is for engines over 15kW (20hp), length up to 8m.
4. ISO 6185-4:2001 is for engines over 15kW (20hp), length over 8m.

These standards deal with the various construction materials used, their ability to withstand load, abrasion, variations in operating temperature and de-lamination within the marine environment. They also cover functional components, fittings, valves, steering etc as well as operational tests including performance, drop and handling tests.

They also look at compliance issues such as builders plate, operating instructions and standard equipment. The first two also consider the possibility of sail power (not for the feint hearted in an inflatable), thankfully not an option when the engine exceeds 20hp.

The standards relating to inflatables have been the subject of much debate with little or no reference to the EU Directive. The original standards made no reference to Category (A-D). This situation led to some very small inflatable craft being offered with Category A (Ocean) compliance. This standard remains unsatisfactory as a tool for the RCD and its interpretation by Notified Bodies varies considerably with respect to stability calculations. The user should be aware that if Category B is sought, some certifiers will demand a stability curve (GZ) for the RIB, so that the stability can be assessed in the same way as for rigid craft under ISO 12217. The fact that RIB & non-RIB stability characteristics are completely different doesn't appear to influence this. (A regular craft has a steady and smooth curve. A RIB has a near-vertical spike in the curve as the tube "fights" against the boat's roll).

## 5.15 2.1 Hull Buoyancy

This sheet is normally hidden but will be visible for Inflatable craft.

Hull buoyancy is determined by looking at both the inherent buoyancy and the volume of air trapped within the hull ie in inflated rubber tubes attached to the hull.

The inherent buoyancy is determined by considering the volume represented by parts of the craft structure, fittings and tankage. These are entered through weights and densities or if known actual volumes can be entered directly.

A list of useful densities is provided to assist you. There's space for 13 entries other than tankage that is lifted automatically from the 'Load' sheet.

Note that if/when excluding the rig and sails this should include spars and rigging (standing and running) and all sails, not just those left furled/set on spars.

The standard only allows 20% of the total buoyancy to be provided by the hull – ie the tubes must be at least 80%. This is to avoid boats with "inflatable fenders" being classed as RIBs. If the buoyancy of the hull exceeds 20%, CE-Pro conducts the calculations on the maximum allowable buoyancy ratio.

## 5.16 SOLAS Rescue Boat

This sheet deals with the specific requirements relating to the use of craft for rescue boat purposes under regulations developed by SOLAS (Safety Of Life At Sea). This is an international code, used extensively in the commercial shipping environment and applies to both rigid hulled, RIB and inflatable craft.

It includes elements of the IMO (International Maritime Organisation) Resolution MSC.48(66) relating to rescue boats. Sections cover:

- Construction
- Carrying capacity
- Access (from mother-ship)
- Buoyancy & Stability
- Propulsion
- Fittings & Equipment

It also includes elements from IMO Resolution MSC.81(70) relating to the testing and evaluation of life saving appliances. This also includes outboard engines, life-saving gear (eg life-jackets) and if required self-righting tests.

Entries are textual, the user is expected to enter how the craft complies with each requirement. Be warned, the list is not short!

## 5.17 1.1 Annex III – BSS Info

This sheet is only to be found in the *Narrowboat* edition of *CE-Pro* as it relates to the UK's Boat Safety Scheme. The sheet has three distinct sections:

1. Brief overview of the BSS and how it relates to the RCD. (A new boat is exempt from BSS examinations for 4 years.)
2. A statement that can be printed and used to inform the BSS authorities about the boat being CE marked and the date at which the first examination would become due.
3. A list of technical requirements of BSS that are not included in the RCD standards.

As CE-Pro is a RCD tool, this BSS sheet is offered as helpful information and requires no input of the user.

## 5.18 2.1 CIN

Once the CIN (called HIN in the pre-amended Directive) has been entered in the "Title Page" it will also appear on this sheet where it is broken down into its component parts for explanation.

The CIN should be composed of 14 numbers and letters and it is possible to check that the format is correct by referring to the explanation of the different components parts.

In addition to the external CIN, it should also be stamped on to a hidden part of the structure, somewhere inside the vessel. The location should be noted on this sheet.

Clicking "Headers" on the toolbar will update the page headers as required – this may include the CIN if the user wishes.

## 5.19 2.2 Builder's Plate

The description of the craft is entered onto the plate from the "Title Page". For some Conformity Assessment Modules, there will be a number under the CE logo to identify the Notified Body. For all Category D craft and Category C craft less than 12 metres in length, no Notified Body is required, so no number will be shown on the plate.

Details of the "Crew Limit" and "Maximum load" are always shown on the plate and depending on the type of craft, other information may be displayed such as outboard motor ratings, tube pressures for inflatables and so on. This information will be entered by CE-Pro from the relevant sheets.

CE-Pro shows an illustration of how the plate may look but the user is not, of course, bound to use this one. Your plate should include the same information and should observe the size limits stated on the page but otherwise may be laid out as you like.

CEproof simply print this page as a "PDF" and email it to the engravers for completion.

CEproof are happy for users of CE-Pro to include the CEproof logo if desired, on the condition that CEproof are informed.

Note that you can record the material used for the plate, the font (size) for the text, the location where the plate will be displayed and optionally whether to include the CIN on the plate itself.

## 5.20 2.3 Man Overboard Prevention (MOB)

This sheet deals with the precautions necessary to reduce the chances of crew members falling over the side and the means of recovering anybody who is in the water.

The requirements for this standard are "category sensitive." This means that in general, for higher categories, more safety features are required.

The safety features are normally only on "working deck areas". These areas must be entered at the top of the sheet and reference should be made to the standard to determine what they should be. Examples of working deck definitions are:

"Within the confines of the cockpit only"

"Fore, aft and side decks excluding coachroof"

"All main deck and flybridge, excluding the boat deck"

Once the "working deck areas" have been entered, reference should be made to the table where a choice of option should be made according to category. Select the number of the option.

A brief summary is made on the sheet for each clause of the standard, but reference should be made to the standard for further clarification of the requirements.

The strength of guardrails and stanchions can be quickly assessed by entering the data into tables 1 and 2. The tables will give an immediate indication of "Pass" or "Fail" as to whether the strength requirements have been met. It should be noted that guardrails are welded together such that each individual rail is rigidly fixed at both ends. Stanchions are only considered to be fixed at the base. Table 1 should be used for rails and table 2 for stanchions.

Many other components in this section must comply with strength requirements, such as, clip-on points, attachments for jack-lines, guard wires, hand holds etc. As these are usually of round cross-section (and usually stainless steel) a table and graph has been provided at the bottom of the page on which the nominal breaking strength is plotted against the diameter for a range of materials. Simply by quoting a material and diameter on the checklist, the breaking load can be confirmed from the graph.

If the deck cleats are to be used for securing jack lines, the strong point data of ESR 3.9 can be called in automatically by clicking the check box. (Note that if you are working from left to right, this will not yet have been completed).

## 5.21 2.4 Vision from Helm Images

This is simply a page for inserting pictures of the vision from the steering positions for reference on the following pages.

## 5.22 2.4 Horizontal Vision from Helm

Some craft are required to show that they comply with the standard for "vision from the helm". Craft, such as sailing vessels, do not have to comply with the standard. CE-Pro will decide for you. If it is not applicable, the Contents page will indicate the reason.

CE-Pro has different sheets for vision from the helm in the horizontal and vertical planes. Reference should be made to the standard for details of other requirements such as the positioning of engine controls.

As all craft do not have to complete this sheet, the details of all steering positions should be entered in sheet 5.4 "Steering Systems". The information will automatically appear on the "Vision from the Helm" sheet.

If the helmsman can be seated or standing when steering the boat, one of the steering positions must meet the requirements of the standard.

Photographs should be entered into the previous sheet showing the visibility forward, astern and to port and starboard. This will help the Notified Body to check that the calculations are taking into account appropriate factors.

The table on the "Horizontal Vision from the Helm" sheet checks that any obstructions such as windscreen pillars, masts, deck gear, etc. which are within the central field of vision, do not subtend an angle of more than  $8^\circ$  to the helmsman's eye. The diagram should explain how this is achieved. If the boat is "open" and there is no structure, the user may choose to "hide" the table and drawing and simply enter text along the lines of "open boat with no obstructions in the horizontal plane" in the table.

The remainder of this sheet is a précis of the standard, setting out other general requirements for the field of vision.

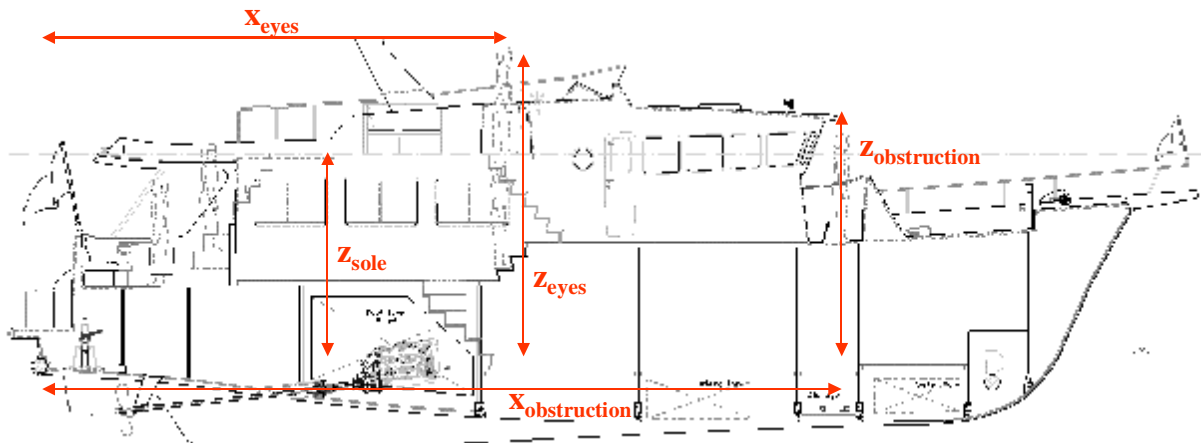
## 5.23 2.4 Vertical Vision from Helm

This sheet calculates the distance in front of the boat at which that helmsman can see the water. This blind spot is created by obstructions in the field of vision such as the stem head, the cabin coachroof and so on.

Firstly, to be able to calculate lines of sight from the helm to the waterline, we need to define a datum point from which all measurements need to be referred. The longitudinal position "x" must always be measured from the aft end of the waterline. The vertical position may be measured from any "horizontal datum line" chosen by the user. It is normal to use the baseline (if you have a drawing) or the waterline (if you are measuring onboard). The waterline will be at height  $z = 0\text{m}$  if you use the waterline.

To be able to enter the exact position of the helmsman's eyes, the vertical position of the cabin sole must first be measured from the datum. The height of the eyes' position above the cabin sole should then be added to the sole height. (The worksheet states the standard height of a person's eyes above his feet is 1.48m!)

In the following example, the waterline has been used as the horizontal datum line.



Using the same method for determining  $x$  and  $z$ , the positions of any obstructions to the helmsman's view of the waterline should be then entered, starting at the front, working backwards. The computer automatically calculates the stem fitting which it already knows from Principal Data's length and freeboard entries. The order of the obstructions is important for the calculation, which systematically compares the angles of vision to the waterline.

If the steering wheel is not on the centreline you should enter a value  $y$  in cell D13: the distance of the eye (which is the same as the steering wheel's hub) from the centreline. This tells CE-Pro not to assume that the stem head (ie the fwd most point of the bow) is the fwd obstruction (in row 16). CE-Pro will estimate what the fwd obstruction on the direct line of sight (which is off the centreline) using the values of the fwd and midship freeboard along with the hull beam. However if the estimate is not accurate, you can overwrite the values in row 16. If the freeboard value is not an accurate reflection of the obstruction (perhaps there is a bulwark above the freeboard height) then the correct value should be entered in cell C16.

The software will then produce figures for the length of the blind spot at level trim and also the maximum angle of trim, which is allowable, before the blind spot exceeds the requirements. If the requirements are not met, "FAIL" will appear at the top of the sheet.

## 5.24 Sheet - 2.5 Notes for Owners Manual

This page is provided for you to record information to be included in the Owners Manual yet are not related to specific RCD Essential Safety Requirements. For example, the RCD has no requirements for fresh water and hydraulic systems. Not detailing these would not be a "fail" for CE marking but the resulting OM would be missing some very important information.

The details for the OM are recorded in an easy to understand tabular form.

## 5.25 3.1 Structure - Introduction

All the information, which has been entered so far concerning the structure, is gathered together on this sheet. The contents page simply states what method of assessment the user has chosen for the structure and the values to be applied in the calculation.

### 5.26 3.1.1 Structure - Service History

If no structural data is available for the craft that are being assessed on a post construction basis, compliance can be demonstrated by using the service history of the craft.

Typical examples of evidence that could be used to show why the structure is considered to be compliant are shown on the sheet. The service history can be fairly easily demonstrated for popular

production craft. However, in the case of a one-off, higher category vessel, it would need to be demonstrated that it had been subjected to the appropriate wind speeds and wave heights.

## 5.27 3.2 Stability Introduction

The parameters that have so far been entered for the craft will enable the CE-Pro to produce a list of possible options that can be used to assess stability.

Reference should be made to the appropriate standard before selecting which option is to be used. It should also be checked, using the standard, that CE-Pro is displaying the appropriate sheets, especially when considering multihulls. Any sheets that are required, but are not displayed, should be "unhidden" by using the tools menu.

For category A and B craft, a GZ curve must be used in the stability assessment. If GZ data is not available from the designer, it must be generated by measurement and calculation.

If a stability curve is used in the assessment, only the data relating to the crew areas is required in the offset load test table. Otherwise a physical offset load test should be carried out and the required data recorded.

When the ratio of  $M_{LDC}$  to  $M_{MOC}$  is greater than 1.15, the stability will need to be assessed in both loading conditions. This means that an offset load test or GZ data will be required for both loading conditions. Similarly, the "downflooding openings" will need to be assessed in both conditions. The relevant masses should be entered in the "Light case" and "Heavy case" cells.

For craft under 6 metres in length, tests such as "Knockdown Recovery" need to be undertaken and the details entered in the final table on the sheet. The windage area ( $A_{LV}$ ) should be entered in this table if required.

Note that the depth of the centre of lateral profile area represents the vertical distance between the waterline and the centre of the lateral underwater profile ie centre of effort of the immersed profile when viewed side on. Also, note that the centre of effort refers to the distance above the waterline (not deck) of the centre of effort of the structure above the waterline including the rig, hull and superstructure (ie not just the sails).

If the vessel under consideration has more than one mast, the "Centre of Effort" must be calculated using the working sails on all the masts.

If flotation is required for craft shorter than 6m, the bottom lines of this sheet will ask for confirmation that the buoyancy materials comply with the standard and whether you will be testing the boat or using calculations. Boats requiring level flotation must be tested and thus CE Pro will not let you enter "Calculation".

## 5.28 3.2 Flotation

This sheet has several sections. In columns F to H are the standard densities that the stability standard allows us to assume for a range of materials and components. By knowing the mass of items we can use these densities to arrive at a volume.

In columns A to D the mass/density/volume data of the craft and components are calculated. In row 9 the required buoyancy volume is quoted. In row 8 the actual buoyancy volume is quoted. This is a summary of items found in row 22 onwards. In row 7 is a check number. This should be, ideally, zero. This represents the difference between the mass of the boat and the mass of items excluded and included in the buoyancy calculation.

The excluded items are listed in rows 13 to 18. The user only needs to estimate the mass of rig and sails to complete this section.

The included items are listed in rows 22 onwards. The first few rows are calculated automatically from data already known to CE-Pro. The rest will need to be entered manually by the user.

The verdict is reported in row 10.

### 5.29 Flotation Tests

This sheet is used to record the result of swamp tests. It simply requires the user to check the boxes to confirm the result of tests. For full details of the test itself, refer to the standard.

The standards allow the buoyancy of some boats to be calculated whereas others must be proven by test. Where testing is mandatory, it is often useful to pre-calculate the buoyancy in order to make sure the provision is in the correct magnitude to avoid an embarrassing and costly test! For this reason an additional checkbox has been provided to allow the user to show the flotation calculations even though a test is required. Also, where a boat is being assessed post-construction, testing may be impractical. The certifier will surely accept calculations in lieu of testing.

### 5.30 Sheet 3.2 - Downflooding & Downflooding (2)

Before attempting this sheet you should first complete the sheet "3.4 Openings – 1 List". It is for this reason that section 3.4 has been brought forward of this section.

Once data concerning openings has been entered there, any of them, which need to be considered as downflooding openings, will automatically appear in the "Downflooding" sheet.

The data for each opening will then be compared with the downflooding height and downflooding angle (if it is required by the standard) that appear at the top of the sheet.

The "Annex A" method of assessment can produce a lesser requirement for downflooding heights. Reference should be made to the standard for further details before entering data.

The standard uses simple trigonometry to estimate the downflooding angle. This can be wildly inaccurate as the boat's trim can vary as the boat heels. If the actual downflooding angle for any opening is known this can be entered in column T.

For some craft the downflooding details of some specific points are required. These are listed in rows 15 to 17. If cells B15 to 17 do not say "Not Required" then the identified points will need to be detailed here. The differences between the actual and required downflooding height and angle are shown in column Q and U. If an opening is not compliant the value will show in red.

If the ratio of the fully laden displacement ( $M_{LDC}$ ) and the light load displacement ( $M_{MOC}$ ) is greater than 1.15, the downflooding heights and angle may need to be assessed in both conditions. If the ratio is less than 1.15, only the laden condition needs to be detailed. CE-Pro provides a worksheet for downflooding in each condition but will only show the second sheet where required.

Downflooding height in the second load case, is, however, automatically entered for you. This is done by adding the "sinkage" between load cases to the heavy load downflooding data. The sinkage is listed on the Stability Introduction page and is considered to be the mean change in freeboards between the two load cases, as entered on the Principal Dimensions page.

The user may overwrite the data if required.

### 5.31 Sheet - 3.2 GZ Table & GZ Table (2)

Data is entered into this sheet to produce GZ and Righting Moment Curves. By clicking on the radio buttons at the top of the sheet, data can be entered as a righting arm (GZ) or righting moment (RM).

If the ratio of  $M_{LDC}$  to  $M_{MOC}$  is greater than 1.15, a second GZ table must be prepared for the heavy condition.

### 5.32 Sheet - 3.2 GZ Curve

A graph derived from the data in the GZ tables shows the righting arms in the light and heavy displacement conditions, if both are required.

### 5.33 3.2 Free Surface Correction

This sheet needs to be manually unhidden when it is required. (Menu: Tools => Sheets => Unhide).

For any category A or B craft which has a non-draining recess, an adjustment may have to be made to the stability data to allow for the free-surface effect. Reference to the standard should be made for further details

ISO 12217 (stability) requires Category A craft to be fully decked. This means that any recesses (such as a cockpit) that can trap water, must be quick-draining in accordance with ISO11812. The standard also says, however, that if the craft meets the stability requirements with (watertight) recess full of water, then the cockpit need not be quick-draining to ISO11812.

This worksheet allows the user to “shift” the righting (GZ) curve to allow for the free surface effect of the water sloshing around the flooded recess.

The recess dimensions are entered in cells B2 to B6. The GZ curve is entered below as in the GZ Table pages described above. The corrected table is output in column H. This can then be copied back in the correct GZ Table.

### 5.34 3.2 Righting Curve & Righting Curve (2)

A graph derived from the data in the GZ tables shows the righting moments in the light and heavy displacement conditions, if both are required.

### 5.35 3.2 Waves and Wind (6.3)

This sheet shows the data required for the “Waves and Wind” assessment. No data input is required; the results are displayed in the “Stability Summary”, if appropriate. A second sheet exists for the heavy displacement condition, if required.

### 5.36 3.2 Heel Due To Wind (6.4)

This sheet shows the data required for the “Heel Due To Wind” assessment. No data input is required; the results are displayed in the “Stability Summary”, if appropriate.

### 5.37 3.2 AVS (6.3)

This sheet shows the data required for the “Angle of Vanishing Stability” assessment. No data input is required; the results are displayed in the “Stability Summary”, if appropriate.

### 5.38 3.2 STIX (6.4)

This sheet shows the data required for the “Stability Index” assessment. No data input is required; the results are displayed in the “Stability Summary”, if appropriate.

STIX is a point scoring exercise where all the component factors have minimum and maximum values. It is, therefore, possible to have a minimum value even before conducting any calculation. It is worthwhile researching each of the factors reported on this page, even if a STIX value is quoted. This is because a wrong downflooding opening definition can dramatically alter the STIX factors.

### 5.39 3.2 Wind Stiffness (6.6)

This sheet shows the data required for the “Wind Stiffness” assessment. No data input is required; the results are displayed in the “Stability Summary”, if appropriate.

### 5.40 3.2 Stability Info 7.4

This page generates the table of sail area v maximum wind speed for a range of sail sets. This table is a mandatory requirement for sailing multihulls according to ISO 12217-2 clause 7.4. The user needs to list the possible sail combinations with the corresponding area and height of centre of effort.

CE-Pro will calculate the appropriate wind speed for each sail plan and will automatically repeat the table in the Owners Manual (as required).

#### 5.41 Stability Info 7.5

This page simply shows the labels that should be fitted for sailing multihulls according to ISO 12217-2 clause 7.5. (It is repeated in Annex I *Labels*).

#### 5.42 3.2 Capsize Warning Labels

This page simply shows the labels that should be fitted for non-sailing monohulls according to ISO 12217-1 clause 6.6.10. (It is repeated in Annex I *Labels*).

#### 5.43 3.2 Multihull Size Factor

This sheet has no user input. It simply calculates the size factor for sailing multihulls and compares with the standard.

#### 5.44 3.2 Offset Load (6.2)

This sheet documents the "Offset Load Test". This simply simulates the angle of heel resulting from all the crew being on the same side of the boat and compares it with the downflooding angle. The heeling moment that can be achieved depends upon how tightly crowded the crew can be and how far off the centreline of the boat the deck allows access.

CE Pro allows the user to input data for up to 5 decks. The area of each deck and beam of each deck must be entered first, in rows 5 and 6. Using the methodology of the standard, CE Pro will then distribute the crew on these decks, starting at the top, using the standard's assumed density of 2 people per square metre. The crew distribution is shown in row 7.

If the user wishes to apply a different limit for any deck (for example, to limit the number of crew on the flybridge for stability purposes), the limit can be manually entered in row 7. A "non-standard" crew limit for a deck must be labelled on the boat and stated in the Owners Manual. CE Pro will automatically do this for the user: appending a label on page *Annex I – Labels*, and adding a note in the Owners Manual.

If a righting curve is being used for the assessment, the user is asked whether they wish to assess the Offset Load Test by calculation from the curve or by physical test. If a physical test is conducted, the results are requested in rows 17 to 20. If a curve is used, no more input is required as CE Pro will calculate the angle resulting for the required offset moment.

## 5.45 3.2 Cockpits

This sheet assesses watertight and quick draining cockpits in accordance with ISO 11812. If the cockpit is not watertight or quick draining then you do not have a “fully decked” boat and no assessment of the cockpit is necessary. To have a fully decked boat you must either have no cockpit or one that complies with ISO 11812 either as watertight or quick draining. There are two sections to this worksheet:

1. Drainage: CE-Pro calculates that the drains, if fitted, can empty the cockpit within a certain time. The time required depends upon the ratio of the cockpit size and the craft displacement.
2. Arrangement: CE-Pro considers the physical properties of the drains and that any openings in the cockpit are arranged to minimise water entering the vessel.

In the first section, up to row 18, the user should enter the fundamentals of the cockpit.

In row 20 CE-Pro calculates the “significant volume” for a cockpit. Cockpits below this volume are considered to be inconsequential, even when flooded and need not have any drains. This does not, however, exempt them from the arrangement requirements.

There are many ways to calculate a volume and everyone has a different way.

Rows 25 to 32 should be used to enter the dimensions of the cockpit in up to 8 sections.

Rows 37 to 44 should be used to enter the dimensions of any watertight voids such as lockers which would not flood in the event of swamping.

The verdict of whether draining is required is entered into row 49.

If required, the minimum required area of the drains is shown in cell C53 along with the corresponding minimum diameter of drain in cell C52. NOTE: the standard requires a minimum of 2 drains so the diameter quoted in cell C52 represents the diameter required where 2 equally sized drains are fitted.

In row 57 the user can input the diameter of up to 7 drains. If any of the drains are not round in section, the length and breadth can be entered into rows 58 and 59.

If the drain is covered by a protective grating or grid, the flow will be restricted as the water passing through the grid will be slowed by friction. The standard requires, therefore, that the total area through the flow holes is 150% of the area of the drain itself. A diagram is shown on the worksheet to explain this. The flow hole area can be entered in row 62. If a grid is not fitted to your drains, leave row 62 blank.

The drainage requirements are assessed and the verdict is quoted in rows 79 to 82.

We are now ready to consider the arrangement of the cockpit in section 2. This is largely self-explanatory.

Note that any openings in the cockpit have been automatically entered into the table at row 117. The user needs to record the height above the cockpit sole for these openings. CE-Pro will make a pass fail decision for each opening.

The user must review section 2 and manually enter a “Yes” or “No” for compliance in cell A135.

## 5.46 3.3 Stability Summary

The summary gathers together the results of the different stability assessments that have been carried out and states whether or not the vessel meets the requirements of the standard. If the requirements have been met, the design category will be stated on the sheet.

## 5.47 3.4 Notes re-Openings

This page has two sections. The first deals with through-hull (skin) fittings according to ISO9093 which requires double hose clamps on skin fittings “low” in the hull side and valves on those below the waterline. The definition of “low” varies for boat types and the figure is quoted here. Bilge

discharge lines are also required (by ISO15083) to have a means of preventing back-flow if fitted below the heeled waterline. (The angle of heel depends upon the boat type). CE-Pro estimates the height of the heeled waterline for the boat. The user should check the correct arrangements are provided or whether the arrangement is not applicable.

The second table describes how various types of openings are exempt from consideration as "downflooding openings" according to ISO12271 – the stability standard. The exemptions are referred to on the "Openings List". Any opening that is not described one of the clauses on this list must be considered as a downflooding opening.

For ease of use the current table is repeated below:

Clause	Description
a	Watertight recesses with a combined volume less than $L_H B_H F_M / 40$ , or quick-draining recesses.
b	Piped drains from quick-draining recesses or from watertight recesses which, if filled, would not lead to downflooding or capsize when the boat is upright.
c	Non-opening appliances.
d1	Openings located in the topsides which comply with ISO 12216 to tightness degree 2 and which are referenced in the Owner's Manual and are clearly marked "WATERTIGHT CLOSURE - KEEP SHUT WHEN UNDER WAY"; and which are emergency escape hatches or appliances fitted with screwed closures.
d2	Openings located in the topsides which comply with ISO 12216 to tightness degree 2 and which are referenced in the Owner's Manual and are clearly marked "WATERTIGHT CLOSURE - KEEP SHUT WHEN UNDER WAY"; and which are in a compartment of such restricted volume that, even if flooded, the boat satisfies all the requirements.
d3	Openings located in the topsides which comply with ISO 12216 to tightness degree 2 and which are referenced in the Owner's Manual and are clearly marked "WATERTIGHT CLOSURE - KEEP SHUT WHEN UNDER WAY"; and which are in a boat of design category C or D and which, when at loaded displacement mass, would not sink if the affected compartment was flooded as a result of the appliance being left open.
e	Opening appliances located inboard of the topsides which comply with ISO 12216 to tightness degree 2 and which are referenced in the Owner's Manual and are clearly marked "WATERTIGHT CLOSURE - KEEP SHUT WHEN UNDER WAY".
f	Engine exhausts or other openings that are only connected to watertight systems.
g1	Openings in the sides of outboard engine wells which are of watertightness degree 2 and having the lowest point of downflooding more than 0.1m above the loaded waterline.
g2	Openings in the sides of outboard engine wells which are of watertightness degree 3 and having the lowest point of downflooding more than 0.2m above the loaded waterline and also above the top of the transom in way of the engine mounting, provided that well drain holes are fitted.
g3	Openings in the sides of outboard engine wells which are of watertightness degree 4 and having the lowest point of downflooding more than 0.2m above the loaded waterline and also above the top of the transom in way of the engine mounting, provided that well drain holes are fitted, and that the part of the interior or non-quick-draining spaces into which water may be admitted has a length less than $L_H / 6$ and from which water up to 0.2m above the loaded waterline cannot drain into other parts of the interior or non-quick-draining parts of the boat.

### 5.48 3.4 Openings 1 – List

Before filling this out for the first time take a look at the comments placed in/on the sheet (lik for the small red tabs at the corner of commented cells). These often describe what the various options mean and can be useful until you get to 'power-user' status.

Now back to the sheet. This is, perhaps, the most critical sheet in CE-Pro. The stability section has the greatest bearing on the choice of design category for the boat and the stability is very highly dependent upon the position of downflooding openings. It is worth spending some time to properly understand this sheet before entering all the data. The program is supplied with a few examples already entered. Once you understand the assessment methodology, you should click on the "Clear Table" button in the top right hand corner to delete these examples.

Any opening might be a downflooding opening. For this reason every opening in the hull or superstructure should be entered into this sheet, whether it is a toilet seacock or a vent for the cabin. Relevant items will then be carried into the appropriate sheets for downflooding, glazing, cockpits and the Owner's Manual. The only exception to this is for deck openings in boats which are being assessed as open (i.e. not decked). The deck coverage was entered in the Principal Dimensions sheet in cell B8. (ISO 12217 uses the term "Any Deck" meaning "open decked"). It is of no consequence whether a deck opening is watertight if the deck itself is not being considered watertight. In all other cases, however, every opening must be entered into the table.

In column B the user should identify the opening being considered.

In column D the user records the location of the opening ONLY if the opening must be identified in the Owners Manual as one to be kept shut at sea. See the notes on the previous sheet to see where this is the case.

Each of the columns F to I pertain to one of the 4 standards that could be applicable to an opening:

- F. ISO 12217, stability – covers downflooding openings
- G. ISO 12216, portlights, windows and hatches (i.e. glazed openings of any material).
- H. ISO 9093, skin fittings (with or without a valve)
- I. ISO 11812, Watertight and Quick draining cockpits

Drop-down list boxes show the user the allowable entries for these columns. These are: "Yes" or "No" for columns G, H & I. This is not the case for column F, ISO 12217. The stability calculations are so sensitive to downflooding openings and it is so easy to misinterpret the downflooding opening definition that there needs to be tighter control. In the column for ISO 12217 the user should enter "Yes" if it is a downflooding opening. If it is not, the clause that excludes it, as listed in the previous sheet (Notes re-Openings) should be entered. For example, a non-opening appliance such as a fixed window, is not considered a downflooding opening according to paragraph "c". See the default examples for guidance.

In column L the means of closing should be entered. The "Means of Closing" for an appliance could be a valve, a steel hatch, pane of glass and so on.

In column O the fitting height of the opening above the light (minimum operating condition) waterline should be entered if appropriate. This is the height of the fitting on the hull/deck. In column P the flooding height should be recorded. This may or may not be the same as the fitting height. The flooding height is the highest point that water must rise above before flooding can occur through this fitting. For example, if a bilge discharge hose has a swan neck, the flooding height would be the top of the loop and the fitting height would be the height of the skin fitting on the shell.

In column Q the distance of the flooding point from the boat's centreline should be entered. Bear in mind that the flooding point may not be the position of the opening itself.

Columns O to Q are only necessary for downflooding openings as it allows CE-Pro to use trigonometry to arrive at an estimated downflooding angle. **IMPORTANT:** as we are concerned only with downflooding, the height and distance off the centreline that is entered should relate to the highest point above the waterline that the water would need to pass to achieve downflooding. This might not be the fitting height. For example, a vent may be ducted up and inboard from the skin fitting. The point to be measured would be the top of the swan neck. Note that the downflooding point for a sink drain is the top of the sink and not the skin fitting!

If a glazed opening (i.e. compliant with ISO 122176) Column T asks if the opening appliance CE marked. Prefabricated portlights and hatches should be CE marked. Record "Yes" or "No", as shown in the drop-down box, in column T with make/model details in column U. Enter "fabricated" in column U if the opening was built by the boat builder. Copies of the Conformity certificates for any CE marked appliances should be pasted into the sheet "Openings 2 - Certificates".

ISO 12216 defines degrees of Watertightness for glazed openings. This selected from the drop-down box in column W. Very few openings are tight to degree 1. Only enter "1" if you have a Declaration from the supplier to prove this is the case. The glazing material (using the abbreviation in the drop-down box and explained in the hover note of cell X5) should be entered into column X and the location relative to the mast (blank for craft without masts) should be entered into column Y.

Glazed appliances which are not CE marked need to be assessed against the standard for strength and watertightness. These details are entered in columns AA to AG. The standard (ISO12216) should be consulted but the area definitions have been included for reference. Clicking on the button on the heading row entitled "Fitting Area" can see these. The results of the assessment of each of the appliances will then appear in column AH.

Finally, row 7 of the table: in open and partially decked boats, we need to consider the deck edge as a downflooding point. This is not so for fully decked boats. The deck edge is automatically considered in this row.

The sheet also has buttons to hide/show blank lines. This is simply to save paper when printing.

A Help button is provided in the top left-hand corner to aid the decision as to whether a particular line needs to have a valve fitted.

#### 5.49 3.4 Openings (2) – Certificates

Certificates from the manufacturer relating to any of the appliances should be inserted in this sheet. If the boat builder has made any of the appliances, details of any physical tests should be entered here.

#### 5.50 Sheet - 3.5 Bilge Pumping

When the details concerning the steering position and the head of pressure (i.e. the vertical height through which the bilge pump must lift the water) are entered, CE-Pro will determine the minimum number, type and capacity of bilge pumps to be fitted.

You will note that there are 2 decking entries in this sheet: "reality" and "ISO12217". The former requires your input, the latter repeats what you entered in the Principal Dimensions. There is a reason for this. You may choose to assess a decked boat as if it had no deck for the stability assessment. Why would you do that? Because this saves you the effort of having to consider the watertightness of your deck fittings (such as hatches). If you do this, you will have entered the decking on the Principal Dimensions page as "any". It is, however, difficult to empty a bilge with a bucket if there is a deck. The bilge pumping standard requires to know, therefore, whether the boat has a deck, regardless of its degree of watertightness. The "reality" cell is where this is clarified. Of course, you should always have a boat with "Full" decking for ISO12217 entered as "Decked" in the "reality" cell. This is the default setting.

The details of the bilge pumps installed should be recorded in the table and these will appear in the Owner's Manual. Many (American) pumps record their capacity in US Gallons per Hour whereas the standard requires a capacity in litres per minute. For ease, a column has been provided in which the US measurement can be entered for automatic conversion.

#### 5.51 Sheet - 3.7 Liferaft Stowage

A liferaft does not have to be fitted, but there should be a location nominated where a liferaft, big enough to accommodate all crew members, can be stowed **only for craft longer than 6m**. The location of the liferaft will appear in the Owner's Manual.

#### 5.52 3.8 Escape

There are two sections of the standard for "Escape", one section for craft under 15m length and one for craft over 15m. CE-Pro will select the appropriate section of the standard.

The "Escape" sheets contain checklists which set out the requirements of the standard. The lists will help to establish whether the cabin layouts are "open plan" or "enclosed plan" accommodation. From this, the layouts of escape routes can be planned. Reference to the diagram in the standard will also assist in deciding this.

The table at the bottom of the sheets assesses the dimensions of openings and indicates if they are suitable for use as an escape. Any escape, which is not a door, must be labelled accordingly.

### 5.53 3.9 (a) Strong Points Description

For craft under 18m long, only the forward and aft strong points must be assessed to show that they are adequate. One of the strong points must be suitable for towing purposes.

For craft over 18m length, the mid-ship strong point must also be assessed.

A photograph and brief description of the relevant strong points should be included on this sheet.

### 5.54 3.9 (b) Strong Points Requirements

CE-Pro derives the minimum breaking load which the various elements of the strong points have to be able to withstand. The data is then carried forward into the assessment sheet.

The "standard material data" records the Ultimate Tensile Strength (UTS) for common materials and enables data for other materials to be used in the assessment.

### 5.55 3.9 (c) Strong Point Assessment

Any element of the strong point can be assessed, either in shear, tension or bearing. Assessing in shear gives the lowest allowable stress and therefore the lowest "limiting load". If the element meets the requirements in shear, then assessment for tension and bearing is not necessary.

Entering the relevant data in the table will compare the "limiting load" in the strong point element with the required "minimum breaking load". The result will be shown as a "pass" or "fail" in the final column.

The assessment method is the same as the chain-plates.

The assessment load should be the breaking strength of the rigging wire but if this is not known, a very high value should be estimated so that the calculation assumes that the wire will not break before the chain-plate.

In column B the reference to the point, as shown on page 3.9(a) should be recorded.

In column C the user should describe the load model.

Columns D – H should be selected from drop-down boxes as follows:

- D. The location of the strong point: Fwd, Mid-ships and Aft.
- E. The purpose of the point: Towing or Mooring
- F. Material of the strong point. (Materials not already on the list can be entered on the previous page, 3.9(b))
- G. The mode of failure: shear, tension or bearing.
- H. Shape of the cross-section which is being analysed.

The calculation simply calculates the stress induced in the component by the equation:  $\text{stress} = \text{Force}/\text{Area}$ . Columns H, I and J are all about calculating the cross sectional area of material over which the load is spread. In column H the user should declare whether or not the cross section area is circular or rectangular.

In column I the user should enter the diameter if column H = Circular, or the length if Rectangular.

In column J the user should enter the number of diameters if column H = Circular. For example, if there are 4 bolts attaching the clear to the deck, the diameter of the bolts would be entered in column I and "4" in column J. If it is not a round section, the breadth should be entered in column J.

The area is calculated in column K.

In the case of a steel bollard, the strength of the deck weld can be assessed by calculating the length of the weld around the circumference of the strong point, which would be "length side 1" in the table. Then the leg (width) of the weld can be entered as "length side 2".

### 5.56 4.0 Handling Characteristics

The RCD handling standard only applies to craft up to 8m in length. The pages regarding this standard are discussed in the following sections. There is no RCD standard for assessing handling of craft larger than 8m (yet).

CE-Pro has a page entitled "4 Handling Characteristics" which is shown for craft longer than 8m. This cannot claim compliance with the standard since such craft are outside the scope. This sheet states that the handling has been assessed loosely using the standard, because there is no other standard which could be used as an alternative. It has some statements that the user may wish to keep, delete or edit in making their own justification regarding good handling.

### 5.57 4.0 Handling – General

If the craft is required to comply with the standard, this sheet states whether or not handling tests need to be applied and whether an appropriate label should be affixed detailing the maximum power of the engine installation.

### 5.58 4.0 Handling – Tests

This sheet details the conditions under which the handling tests should be carried out.

The results of the "Avoidance Line" test should be entered into the table. If the craft does not successfully complete the test at the required speed, precautions should be taken, such as the fitting of a speedometer and warning labels, to ensure that the helmsman does not attempt to make a tight turn above the speed which was achieved in the handling test.

### 5.59 4.0 Handling – Outboard Power

CE-Pro calculates the maximum permissible outboard motor power for the craft and compares it with the size of engine fitted. Compliance with the standard is indicated as a "Pass" or "Fail".

### 5.60 5.1 Engine Installation

No standard applies to the installation of engines. For a diesel engine, basic information only is entered into this sheet.

If the craft is fitted with a petrol unit, compliance has to be shown with the standard covering ventilation for the engine space. A table will be displayed which is used to calculate the volume of air in the engine space. The total volume of air in the engine space is calculated at the top of the table. From this, are subtracted the volumes of all equipment in the engine space which reduce the free volume.

The details of vents and blowers are entered into the next table and CE-Pro will then assess whether the ventilation arrangements meet the requirements of the standard.

### 5.61 Sheet - 5.2 Petrol and Diesel Fuel System

These (two) sheets are primarily checklists for the standard and in many cases, typical text has been entered into the "evidence" cells. These of course should be altered to suit the craft under consideration, if necessary.

The information entered in the tables at the end of the sheets will be displayed in the Owner's Manual. In the "Controls" table, any item of the listed equipment, which is not fitted, should be marked "N/A" in the appropriate yellow cell.

Normally only one sheet will be viewable reflecting whether the engine fuel specified is diesel or petrol.

### 5.62 5.2 Fuel Schematic

Space is provided to paste in a schematic showing the routing and apparatus used in the fuel system.

### 5.63 5.2 Fuel Certificates

Test certificates for fuel hoses, filters, fuel tanks, etc. should be pasted onto this page.

### 5.64 5.3 DC Electrical System

The basic details of the DC electrical system are recorded on this sheet. Some of the information such as the location of the batteries, fuse boards etc. will be entered automatically into the Owner's Manual.

Details of how the system meets the requirements should be entered in the cells adjacent to the list of the clauses contained in the standard.

Note that whilst no specific colour scheme is insisted upon, there is a requirement for the DC and AC to use different colours. CEproof have seen a boat of very high value, on which it was not possible to tell if any cable on the boat was AC or DC, positive, neutral, live or negative. This required a complete re-wiring to achieve certification!

### 5.65 5.3 AC Electrical System

Information about the AC electrical system is recorded on this sheet. Some of the information such as the different types of power sources; location of panel boards and so on will be automatically entered into the Owner's Manual.

Details of how the system meets the requirements should be entered in the cells adjacent to the list of clauses contained in the standard.

Note that whilst no specific colour scheme is insisted upon there is a requirement for the DC and AC to use different colours. See the comment in the previous section above.

### 5.66 5.3 Electrical System

This sheet is a checklist for requirements that repeat in both the low voltage AC and extra low voltage DC systems standards. It consists of very general requirements.

Typical text has been entered into some of the "evidence" cells. This should be altered to suit the craft under consideration, if required.

Note that whilst it is accepted that AC and DC must come together or cross on occasions, they may not be ducted together for any significant distance. This often leads to some frustrating re-routing!

### 5.67 5.3 Conductor Table & Table(2)

The details of every AC and DC circuit should be entered into these tables, including the voltage of the AC and DC circuits, breaker ratings, cable sizes and so on. In the case of the DC circuits, CE-Pro will calculate the voltage drop between the battery and appliance and the suitability of the conductor to carry the current. The voltage drop should be less than 10% to meet the requirements of the standard.

As some craft have 12V and 24V DC systems and sometimes 120V AC and 240VAC systems, there are two tables/pages. Each page may only have a single AC and single DC voltage.

Any non-compliant values will show in red.

### 5.68 5.4 Steering System

Information about steering positions, types of steering systems and emergency steering arrangements are recorded on this sheet. Some of the information will be automatically entered into the Owner's Manual.

### 5.69 5.4 Steering Certificates

Certificates for the steering system including the wheel should be pasted into this sheet. If the boat builder has constructed parts of the system, details of the test procedures and results used to show compliance, should be entered here.

### 5.70 5.5 Gas System

The clauses of the LPG standard are set out in the form of a checklist in this sheet, with typical text entered into many of the "evidence" cells. These of course, should be amended to suit the craft under consideration, if necessary.

By entering the ratings of unflued appliances, (cookers for example) and the number of crew for which the cabin area is designed, CE-Pro will calculate the amount of fixed ventilation required.

At least two vents should provide the required ventilation, one mounted as high as possible and one mounted as low as possible. It would appear that Notified Bodies can consider a hatch or portlight as a vent.

### 5.71 5.6 Fire Protection

Details of the fire extinguishers to be carried on board should be entered into the table. The relevant information will then appear in the Owner's Manual and some of the cells further on in the sheet will be filled in using information from the table.

If the combined total rating of main engines and auxiliaries in the engine space is less than 120kw, a portable extinguisher may be used to protect the engine space. Otherwise, a fixed system should be used.

### 5.72 5.6 Fire Insulation Certificates

Certificates for the fire insulation may be entered here. If such certificates are not available, hide the sheet – it is not mandatory.

### 5.73 Sheet 5.7 Navigation Lights

CE-Pro will select the appropriate arrangement of lights according to the type and size of vessel.

The positions of lights fitted should be recorded in the table. The recording of the wattage of the bulbs is not appropriate for LED lights and is not mandatory, even for bulbs. This is offered simply as an aid to the owner when buying spares. (This table is repeated in the owner's manual).

### 5.74 5.8 Discharge Prevention

Details of holding tanks and heads should be entered into the tables. The method of discharge can be selected from the drop-down list. Information relating to the heads appears automatically in the Owner's Manual.

The second part of the sheet is a checklist of clauses from the standard with typical text entered in the "evidence" cells. The text should be altered as required.

### 5.75 5.8 Discharge Schematic

A sheet into which the user may paste an image of the discharge schematic, if relevant (and available).

### 5.76 2003-44-EC Exhaust Emission

This sheet is used to demonstrate compliance of fitted engine(s) to the RCD's new (2006) exhaust emission requirements. Where available, an Emissions certificate and/or Declaration of Conformity should be sought from the manufacturer/supplier. Copies of the certificates should be pasted into the sheet entitled "Emission Reports & Certificates". New engines, especially if EU-supplied, should now be supplied with a CE mark and a certificate. It is recommended that purchase orders demand such.

Older engines that pre-date the 2006 requirements will not be CE marked. Certifiers will, however, accept engines compliant with another "respectable" emissions standard on second hand imported craft. For petrol engines, the Californian emission controls were the first such regulation and came into force some time around 2001. Larger diesel engines may be compliant with IMO regulations from the mid-1980s. Other engines will not be compliant.

In addition, some authorities (particularly in Scandinavia) are interpreting the "normal usage" limits in the RCD to imply that even a certified engine is not acceptable if it has more than approximately 400 running hours. (The exact limit depends upon the engine type).

Ultimately, if an engine is not CE marked, or if the manufacturer is unable to provide emissions data, the only option may be to have the engine bench tested (expensive) or replaced (equally expensive). For post-construction compliance, especially for older craft with two or more large capacity engines, this alone may make importation un-economic.

Users will be asked to specify how compliance is achieved and provide details of the certificate and the issuing Notified Body. You'll also need to know whether the engine is 2 or 4-stroke.

### 5.77 2003-44-EC Noise Emission

This sheet is used to demonstrate compliance of fitted engine(s) to the RCD's new (2006) noise emission requirements. There are 4 available methods.

1. Engine manufacturer provides certification
2. Power-Displacement method
3. Reference craft method
4. Pass-By testing

The easiest of these to detail is the second: "power/displacement" method. This allows a slow/heavy boat to be "assumed" compliant without any testing or certification. CE-Pro automatically checks the speed, power, waterline length and displacement figures to see if this route is allowable. If so, CE-Pro will disable the other methods, enter the appropriate conformity assessment module (A) and state that no Notified Body is required. There is no input required of the user.

Option 1 is the next easiest in that the user only needs to cut and paste the engine's supplied certificates into the CE-Pro file. However, this is only allowable where the propulsion train is considered self-contained and whose noise signal is largely independent of the installation. To be considered such, the power train must have an integral exhaust. (ie where the exhaust forms part of the outboard engine/sterndrive/jet combo). Compliance of these engines may have been tested by the manufacturer and a certificate will be supplied in the same was as for the exhaust emissions. If so these should be sought and images pasted into the sheet entitled "Emission Reports & Certificates".

The 3<sup>rd</sup> option, Reference craft, is not yet established. This allows, in theory, the user to claim compliance on the basis of a similar vessel that has already been tested and listed in a "central" database of approvals. The measure of "similar" requires some checking and a standard details how this should be measured but it is all futile as the database has virtually no boats listed. This is

because builders do not want their boat's data freely available to all. If, however, you have done some testing of your own and obtained certificates, the same certifier will surely accept your own reference data.

Where the exhaust is not an integral part of the propulsion system or where no certificate or reference craft is available you will have to perform a drive-by noise emission test. The methods to be employed are covered in the standards but in brief you need specialist equipment and calm weather. The craft is driven at various speeds past a microphone at a specified distance. This sounds simple but calm and dry weather with low background noise rarely coincide with the test time and venue.

### **5.78 NoBo Register**

A read-only sheet that acts as a database relating to the Notified Bodies authorised by the European Commission to undertake RCD compliance certification.

### **5.79 Emissions Reports & Certificates**

A sheet into which images of exhaust and noise emission certificates should be pasted, if required and available.

### **5.80 Annex I – Labels**

When the macro button at the top of the page is pressed, CE-Pro will work through the entire TCF and generate a list of all the labels which should be affixed to the craft. Clearly this is best left to the end of the project when all the data is correctly entered.

### **5.81 Annex II – Images**

This is simply a page for inserting pictures for reference throughout the file.

A quick keystroke of CNTRL+I will take the user to this page and back to the previous cell.

To enter images, with the cursor in this sheet, from the main menu, choose Insert -> Picture -> From File, then navigate to the folder with the images, select the ones you want and press 'Insert'. You may insert as many images as you like in one visit. Simply select the images from the list and hold CNTRL.

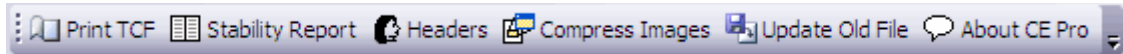
You may size and layout images manually or CE-Pro can do this for you. To use the CE-Pro tool, simply insert all the required pictures anywhere on the sheet and click on the button entitled "Resize & Locate". CE-Pro will run a macro that will resize all the images and lay them out so that they fit neatly onto the default page size. The pictures will be "staggered" so that captions, labels and arrows can be added without confusion.

The locating macro works from the top down so, to change the order of the photos, drag the first photo above all the others.

Turn on your "Drawing" toolbar to bring up tools for adding labels, arrows and other tools that may be of use for pointing out key features. Do not run the locating macro after you have added text and arrows as they will not be moved with the photos.

You can also compress images to reduce memory consumption. This is important as image files are very large relative to text and can give rise to TCF of 50Mb or more. Use the 'Compress' option on the CE-Pro tool bar (see below) to compress all images or alternatively you can compress each image one by one. To do this click the image, then right click, select Format Picture, then in the lower left corner of the 'Picture' (default) tab select 'Compress'. We suggest you use the default 'Print' resolution.

## 6 THE CE-PRO TOOL BAR



### 6.1 Print TCF

To print the entire file, click this button. But first, please make sure you've checked your page breaks. It has been known for some files to print 500 pages instead of 80 due to poor pagination! See the last section of the Owners Manual, at the end of this document to learn about Excel 2003's *Page Break View*.

Now fill the printer with paper if opting for a hard copy!

You will first be asked whether you want to include the Project Management page.

The user will be prompted to select the printer. If you have a PDF (*portable document format*) writer as used by the Acrobat Reader, you may output the entire file in this format. This has two advantages: (a) the file is very much compressed compared to the editable XLS file, and (b) can be viewed by anyone, whether they have a CE Pro licence or not.

It has been noted that some PDF writers, including Adobe's Acrobat, will only print one page at a time. CEproof use the *Fineprint PDF Factory* and have not had any problems with this. CE Pro has been written such that all headings use the font: bold Arial size 14. Users of PDF writers such as *Fineprint's PDF Factory Pro* can automatically create a table of bookmarks by setting the headings auto-detect to this font.

### 6.2 Stability Report

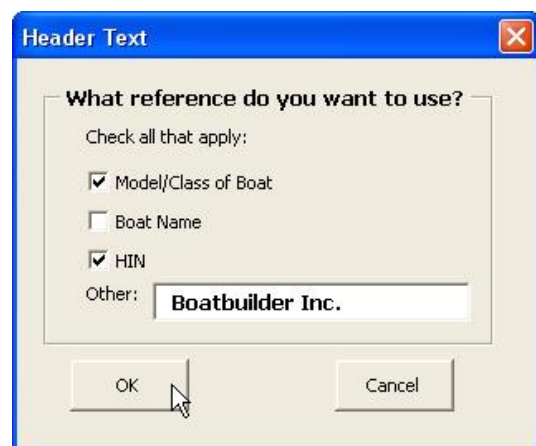
For module "Aa" assessments (category A and B craft shorter than 12m), a Notified Body must review the stability. For these craft, this button allows the printing of a stability booklet. This is not just the stability information but also the principal dimensions, load information etc. A separate title page is used which generates its own contents list.

The report may be printed to PDF. See the comments in the previous section.

### 6.3 Headers

It is important that all hard copy pages in the documentation refer to the same boat in case they become separated. For this reason the user may click on this button to run a macro that inserts the correct header on every sheet of the file.

The can choose what information to show and/or add their own text.



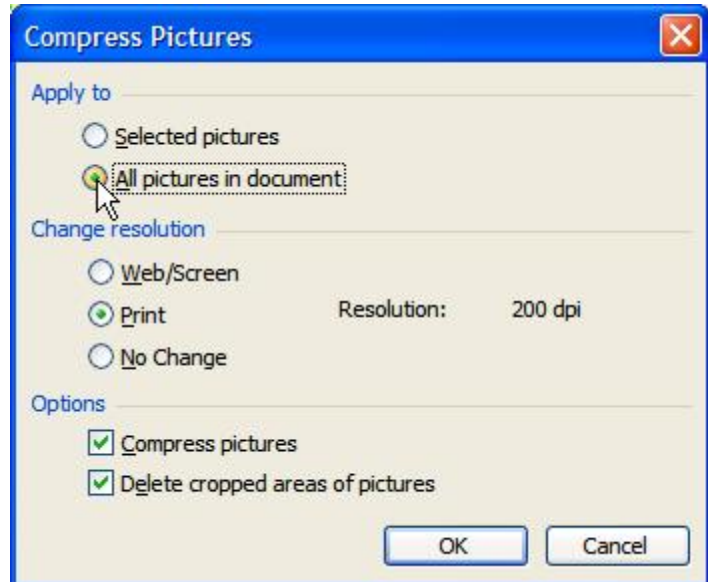
## 6.4 Compress Images

As the user completes the TCF and inserts photos, copies of certificates and schematic drawings, file sizes can rise dramatically. The time to load and save such files can grow and in some cases, memory handling capability of the computer can be challenged.

The file size can, in some cases, be dramatically reduced by compressing the images. To do this, click on this button to reveal the "Compress Pictures" dialog box as shown alongside.

Individual pictures or all pictures can be compressed at the same time.

It is best to "change resolution" to "Print". If the file remains too large, it can be compressed to "Web/Screen" resolution but this will result in a noticeable drop in quality of printed documents.



## 6.5 Update Old File

This is a facility to allow you to import TCF data from old files. This button invokes a routine that will import data from another *CE Pro* project file. You may wish to do this when you receive an updated version of *CE Pro* and want to update an old TCF to reflect any changes to standards and/or interpretations.

This can be a lengthy process and is memory hungry too so please make sure you close all other programs; in fact the best option is to reboot your machine as this is the safest way to ensure Excel has access to the maximum RAM, a resource it likes to otherwise keep hold of...

You should be aware of the conditions and limitations of this feature:

- This routine copies all the data from the file – not just the page that happens to be live at the time.
- It does not copy across any pictures or other objects you may have inserted in the original file. You must do this manually after running this routine.
- *CE Pro* versions higher than 3.02 (February 2006) are fully compatible with the update routine. Older versions will also update successfully but the older the file, the more "holes" there will be in the imported data. It is advised that you check the file after import.
- Depending on your version of *CE Pro* & your computer's capability, the process can take from 2 to 20 minutes.

To update a file, follow these steps:

Open the old file. If it is already open, save changes as the file will be closed without saving during the process.

Open a clean project file

Click on the "Update old File" tool bar button

A warning note will be shown, advising you to close down superfluous programs. Once you have done this, click "Yes"

You may now be asked to enter some data in the new file manually: design category, number of hulls & source of power. This is because these 3 items of data trigger a lot of macros within the file and it saves time to do this from within the file than from outside.



Once you have entered the data and returned to this point, you will be faced with the progress window shown alongside. Firstly, select the file from which you want to import data. The drop-down box will list all the Excel programs that are open.

Now click "start" and make a cup of tea! Each activity will be ticked-off as CE Pro completes them.

Save the updated file.

## 6.6 About CE-Pro

This simply shows the splash screen so that you can see the license information, including the licence renewal anniversary. CEproof contact details can also be found on this sheet.

## 7 HANDLING SERIES & CUSTOM PRODUCTION

If craft are produced in series, with no changes, the user can record production by simply entering CIN in the table in the Register. This has a column for recording the CIN of all the craft complying with the Technical File. A second column allows supporting notes to be entered.

Most production craft, however, will have some degree of customisation and even series production may change fittings at some stage. The Technical File needs to be able to record the differences and which boats are completed with which features.

CE-Pro can manage this process in two ways. The choice will depend upon how significant the changes are. For example, a change to bilge pumping arrangements is not significant whereas a change in keel that shifts the displacement/VCG by more than 10% is significant.

### 7.1 Significant Modifications

If a change is significant and requires re-calculation, it is simpler to start an entirely new Technical File. To do this, simply open the existing File and save it under a new name. Then the user needs only to make the necessary changes for the alterations.

### 7.2 Minor Modifications

The user may add as many new worksheets as required at any stage of the project. These can be used for entering whatever the client likes. These sheets will be included in the updating of headers and, if named "3.2....." will be included in the Stability Report. The table of HIN on the Register page then needs a note alongside each HIN to record to which craft the additional worksheets apply.

## 8 FAST KEY STROKES

Use the following keys to jump to and from the applicable pages:

CNTRL+ b *B Principal Dimensions.*

CNTRL+ c *C – Systems Summary*

CNTRL+ I *Annex II – Images.*

CNTRL+ o *3.1 Openings 1 - List.*

CNTRL+ p *Project Management.*

CNTRL+ s *3.2 Stability – Intro*

**Note** that these fast key strokes will not work while an object has the “focus”. This means, that if you have just clicked on something like a drop-down box, or radio button, the object is “live” and Excel will not run any routines until it is deactivated by clicking onto a “regular” cell.

## 9 STRUCTURAL ASSESSMENT

Since version 2.055, CE-Pro has a separate module for structural assessment but the pages themselves are exactly the same as when they were included in the main body of CE-Pro.

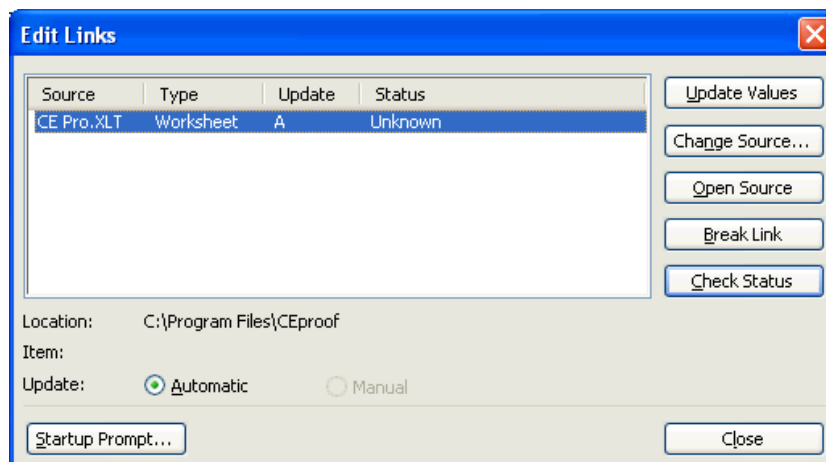
The Structural Assessment module is started from the same Start bar in the same way as CE-Pro. However, the structural file needs to be “linked” to a CE-Pro project file in order to pick-up all the principal data. This is explained in the following section.

### 9.1 Get CE Pro Data - Linking Structure to Project

Click on the “Get CE-Pro Data” button on the toolbar (shown below). This will bring-up the Links dialog box, which is shown on the following page.



Use the “Change Source” button to navigate to the project file you wish to link with.



It is wise, at this stage, to click the “Check Status” button. This confirms whether linking is possible.

Click “Update Values” to fetch the data. If you want, you can open the file by clicking on the “Open Source” button. Once open, the updating of data between the documents is automatic and instant.

You must close the links dialog box before continuing.

### 9.2 Materials - Properties

Three sheets: “Metal Properties”, “Composite Materials” and “Wood Materials” list in table form the strength properties of the materials in common use for boat construction. Data for other materials can be entered if required.

### 9.3 ISO Options

This sheet calculates which of the standard's 4 structural assessment methods are valid for use for the boat being assessed. The user is presented with a choice at the top of the page, where there

are option buttons. The user has only one task to do on this sheet: simply to select the preferred option – if a choice is offered. The user will not be able to select invalid methods.

It is possible for no options to be valid. If this is the case, the boat is outside the scope of the standard and another method must be used, outside of CE-Pro. See the standard for details.

#### 9.4 ISO Base Pressures

There is no input required on this sheet. The page simply records the datum pressures for each part of the structure from which the actual pressures on any panel will be scaled.

#### 9.5 Lay-Up Summary

The only input required on this page is for the user to click the spinner to declare how many FRP laminate schedules are required for detailing. CE-Pro can manage 6 laminate schedules.

#### 9.6 Lay-Up (x)

For each laminate required a sheet is presented on which the laminate schedule should be built-up. Firstly the user should enter the reference name for the laminate and then select the moulding process and resin type.

In the table the user should enter values in column C for each ply. This is the code from the Composite Materials sheet column B. For example, E-glass fibre would be "EG" while a layer of balsa core would be "Balsa". CE-Pro will then lookup the appropriate material data. You can check it has found it by the value that is shown in column B. This should say "Fibre" or "Core" for each ply entered. If it does not, CE-Pro does not recognise the material you have chosen.

Use the hover notes at the top of each column to explain the entry rules for all the columns. Clearly a core only needs data in columns C and I. Fibres need entries in columns C, D and E and never in I. Rovi-Mats will need a weight of the mat entered in column F so that it can calculate the split of fabrics. If the cloth is orientated this should be entered in columns F and H.

#### 9.7 Bottom/Side/Deck Structure

For each part of the structure the user should define a shell panel. Columns A and B are simply for identification & reference purposes. The length, breadth and position of the panel should be entered into columns C, D and E. The curvature (which is measured as the greatest distance in mm between the surface and the chord line) is entered in column F. A flat plate clearly has a curvature of zero and is the "worst case". Select the material grade or laminate from the drop down box. CE-Pro will then calculate all the stresses and present a pass/fail decision.

This can be used as a design tool. If the laminate is too heavy or too light, simply adjust the layers in the appropriate laminate schedule and an instant verdict will be presented.

#### 9.8 ISO A1/A2

These pages simply detail the simplified methods of the standard. See the standard for details.

#### 9.9 ISO B

This page simply describes the Drop Test process and calculates the height to be applied.

#### 9.10 Chainplates - Summary

The assessment of the chainplates is intended to show that in the event of rig overload or failure, the chainplates will not be torn out of the deck, leaving a hole, which could potentially cause the vessel to sink.

This can be achieved by showing that all the chainplate parts are stronger than the rigging wire. The chainplate may still pass if the chainplate is weaker than the rigging wire if the weakest link is above deck, such as the pin. Indeed, it is good design practice to have the pin as the weakest link.

The number of chainplates to be assessed (up to 10) should be set on the spinner. The description of each chainplate should be entered into the parameters table; the results will be entered once the "Chainplate Analysis" sheet has been completed.

## 9.11 Chainplates - Analysis

The assessment load should be the breaking strength of the rigging wire but if this is not known, a very high value should be estimated so that the calculation assumes that the wire will not break before the chainplate.

In column A the chainplate component being considered should be described.

In column B the user should enter 1 if the component being assessed is above deck (and would not leave a hole through the deck upon failure) or 2 if not.

In column C the user should enter the mode of failure.

The calculation simply calculates the stress induced in the component by the equation:  $\text{stress} = \text{Force}/\text{Area}$ . Columns D, E and F are all about calculating the cross sectional area of material on which the rigging load is spread.

In column D the user should declare whether or not the cross section area is circular and thus calculated using pi or rectangular and calculated simply by length x breadth. 1 = round and 2 = rectangular.

In column E the user should enter the diameter if column D=1 or the length if not.

In column F the user should enter the number of diameters if column D =1. For example, if there were 6 bolts in the chainplate foundation, the diameter of the bolts would be entered in column E and 6 in column F. If it is not a round section, the breadth should be entered in column F.

The area is calculated in column G.

The user should enter the component's material strength in column H.

CE-Pro compares the stress, which could be exerted on the chainplate by the rigging against the maximum stress that the chainplate components can withstand. The result is given in the final columns as a "Factor of Safety" and as a "Pass" or "Fail".

Note that the boat may comply with a factor of safety less than 1 as this simply shows the item will break before the rigging wire. This is only a failure if the lowest factor of safety is below deck.

The results are duplicated on the "Chainplate Summary" sheet.

## 9.12 Keel Bolts

The main parameters of the keel and securing bolts should be entered into the table.

The weight of the keel is looked up from the load page, 3.6 or may be over written here.

The distance of each bolt from the side of the keel should be entered into the lower table. For bolts that are offset from the keel centreline, the greater distance to the side of the keel should be entered.

CE-Pro will then calculate the diameter of the bolts required. It does this by assessing the load put on the bolts by the weight of the keel, when it is horizontal.

Refer to ABS Offshore Racing Rules for further details.

## 9.13 Rudder and Stock

CE-Pro provides rudder stock strength calculates for solid or hollow circular stocks with a material whose yield and ultimate strength are known.

The type of rudder is selected from the choice of three at the top of the sheet. Details about the rudder geometry and stock should be entered into the table as required.

The area and centre of pressure of the rudder are calculated by dividing its profile into horizontal strips. The length, depth and distance from the leading edge to the stock for each strip, is entered into the second table. The data will be automatically entered into the "ABS ORY Stock" and "LRSSC" assessment sheets, where the minimum rudder stock diameter will be displayed in each case. The ABS method is valid only for sailing craft and will not be shown for non-sailing boats.

Two methods are used as the requirements differ markedly between the two rules for different types of rudder.

Future updates of CE-Pro will include the ISO12215 rudder stock calculation when the standard is ready.

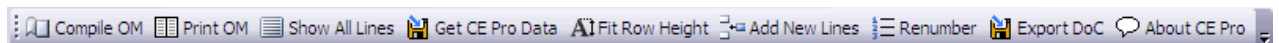
## 10 OWNER'S MANUAL

The Owners Manual exists in a separate file from CE-Pro but is started from the same Start bar in the same way as CE-Pro. The standard template includes 4 worksheets:

- Owners Manual  
Main body of text where all the mandatory document is compiled
- Drawings\*  
Sheet for inserting drawings, schematic sketches etc.
- Images\*  
Sheet for smaller images such as drawings
- Abbreviations\*  
List of abbreviations commonly used in the world of small marine craft.
- Declaration of Conformity.

The middle 3 sheets (marked by an \*) are optional and may be hidden by the user if not required. See section 10.8 for further details of these sheets.

The following tool bar exists in the Owners Manual module. Their functions are explained in the following sections.



The majority of the Owner's Manual is generated by CE-Pro from the information which has been entered into the project Technical Construction File. The following sequence should be followed to compile an OM:

1. Select optional sections. See section 10.1
2. Get CE Pro Data (ie link the OM to a project file). See section 10.2
3. Fit Row Height (so that all the read-in text is visible). See section 10.3
4. Edit the main document (add/delete lines). See section 10.4
5. Renumber the sections if required. See section 10.5
6. Compile OM. See section 10.6
7. Set Page Breaks. See section 10.7
8. Add additional pages if required. See section 10.8.
9. Complete the Declaration of conformity. See section 10.9.
10. Print OM. See section 10.10
11. Export the Declaration – if required. See section 10.11.

### 10.1 Owners Manual Options

The Owners Manual template includes more sections than are covered by the Directive itself. For example, there are no fresh water requirements in the RCD but the OM would be incomplete without a description of the system. The TCF has a page where these "non-regulated" systems can be

detailed for inclusion in the Owners Manual. This can be found in section 5.24, *Sheet - 2.5 Notes for Owners Manual*.

There are two non-regulated sections which are not detailed anywhere else. To “turn on/off” these sections, tick the boxes show at the head of the document as shown here:

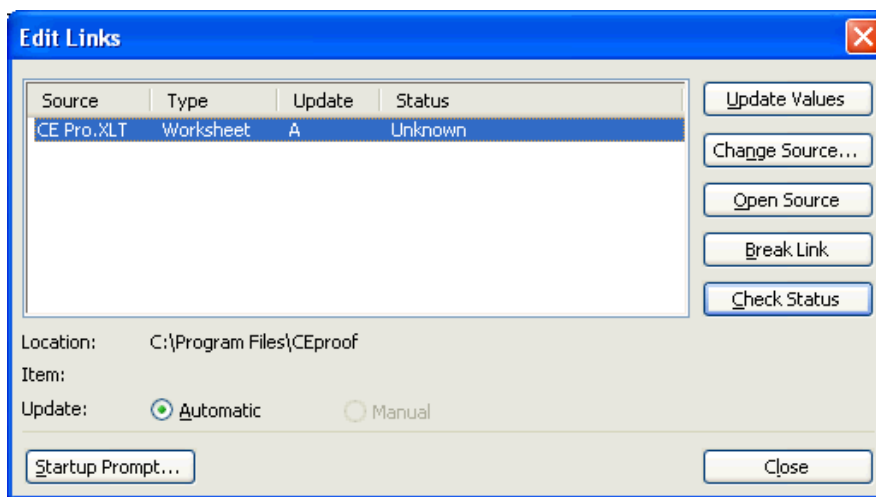
A hover note advising on the use of each section is provided alongside.

- Receipt required?
- "Other Fuel Burning Systems" required?

These sections and others that require user input are written in blue text. All other sections, already fully detailed in the Technical File, are written in black text.

## 10.2 Get CE Pro Data - Linking OM to Project

Click on the “Get CE-Pro Data” button on the Owners Manual toolbar. This will bring-up the Links dialog box, which is shown below.



Use the “Change Source” button to navigate to the project file you wish to link with.

It is wise, at this stage, to click the “Check Status” button. This confirms whether linking is possible.

Click “Update Values” to fetch the data. If you want, you can open the file by clicking on the “Open Source” button. Once open, the updating of data between the

documents is automatic and instant.

If you wish to separate a complete Owners Manual from the source file, click on the “Break Link” button. All the entries will be turned from links to actual values. The Manual cannot then be linked back a file but a fresh template could be used. You must close the links dialog box before continuing. On closing the above window, the program will ask if you want to “Fit the row height”. This is described in the next section.

## 10.3 Fit Row Height

This may be necessary because some large packages of text read-in from CE-Pro may spill over the visible size of the rows. The macro automatically follows the “Get CE Pro Data” action outlined in the previous section. It can also be triggered directly from the toolbar. In either case, the user is asked to confirm that he wishes to continue since this can take a little time.

If you click “OK”, the program will work through the entire document making sure that all the text is visible.

## 10.4 Add New Sections/Lines

The Owners' Manual has some clever coding to make sure that the contents page and heading numbering fit the sections that you want to show and don't want to show. This numbering system can be confused if you add and delete lines in the normal way.

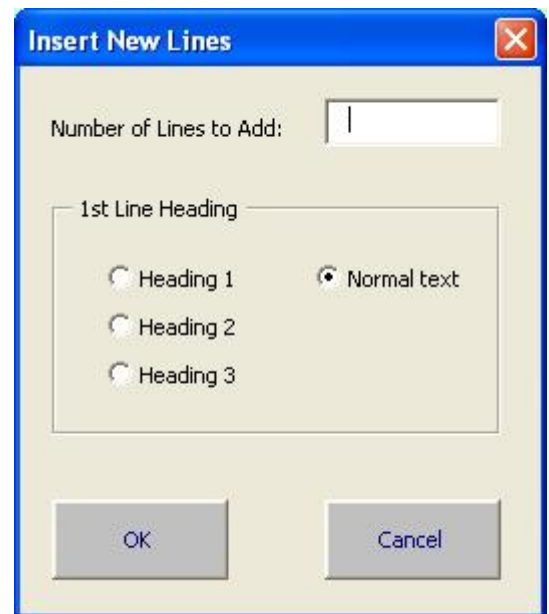
If you want to add one or more lines, click on the “Add New Lines” toolbar button. You will then be presented with the dialog box shown along side.

Enter the number of new lines to add to the manual. Ensure the selected cell is at the point where the lines are to be inserted.

If you would like the first of the new lines to be a heading, select the correct level and click OK. CE-Pro will insert the lines and if appropriate, add the heading row and include it in the Contents page.

## 10.5 Renumbering (after Deleting Lines)

Lines may be deleted in the normal way but in doing so, the section numbering system will become confused and the term “REF!” will appear throughout the document. To reset the numbering system, simply click on the “Renumber” button on the tool bar.



## 10.6 Compiling the Manual

To compile a manual, click on the toolbar button called “Compile OM”. This runs a macro that simply hides all lines in which a “1” is showing in column “P”.

CE-Pro will have already selected some of the rows for hiding. Other lines of the manual which are not relevant to the project can be manually hidden by inserting a “1” into column “P” at the end of the row. Once all the lines, which are not required, have been selected, pressing the macro button will hide them all. No lines should be deleted but new lines may be added.

Diagrams covering the electrical system, fuel system etc., should be inserted into the manual as appropriate. Text which is highlighted in blue should be amended or hidden, depending on the type of craft being assessed.

## 10.7 Paginating the Manual

Paginating a large document used to be a troublesome process but Excel 2003+ has provided a tool for this process. Simply change the view to “Page Break View” by clicking on the *View* menu. This has the effect of showing the incidental and forced page breaks on a compressed view as shown on the following page. The very useful feature is that breaks can be dragged and dropped where the user wants them. Pages may even be “stretched” to fit that extra line onto the bottom of a page.

## 10.8 Additional Sheets

**Drawings Sheet:** simply insert drawings and resize them manually to fit the page breaks.

**Images Sheet:** insert photos/pictures onto the sheet. You may size and layout images manually or CE-Pro can do this for you. To use the CE-Pro tool, simply insert all the pictures you want included in any part of the sheet and click on the button entitled “Resize & Locate”. CE-Pro will run a macro that will resize all the images and lay them out so that they fit neatly onto the default page size. The pictures will be “staggered” so that captions, labels and arrows can be added without confusion.

**Abbreviations Sheet:** a list of common abbreviations used in the small craft industry.

	A	B	C	D	E	F	G	H	I	J	K
55										3.2.2	
56										3.2.3	
57										<b>4</b>	
58										4.0	
59										4.0	
60										4.0.0	
61										4.0.0	
62										4.0	
63										4.0	
64										4.0	
65										4.1	
66										4.1.1	
67										4.2	
68										4.2	
69										4.2	
70										4.2	
71										<b>5</b>	
72										5.1	
73										#####	
74										#####	
75										#####	
76										#####	
77										#####	
78										#####	
79										#####	
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88										#####	
89										#####	
90										#####	
91										#####	
92										#####	
93										#####	
94										#####	
95	<b>1</b>										<b>WELCOME</b>

## 10.9 Declaration of Conformity

The Declaration of Conformity (DOC) is auto-filled from the information entered elsewhere and to be completed, it only needs to be signed and dated by the signatory – on a hard copy.

It also lists the standards that have been used to meet the ESRs. In cases where no standard is available, the DOC states the alternative means by which the ESR has been satisfied.

**IMPORTANT:** this document is legal declaration related to legislation. CEproof will not be held responsible for any declaration signed by a user of CE-Pro. It is imperative, therefore, that the user checks the data on the declaration before signing. If there are any doubts, contact your nearest CEproof office.

Some of the fields can be edited. In particular, the CIN field can be changed so that production builders can set the CIN to a range rather than a specific value. To do this, set the country and the MIC (Manufacturer's identification code) which are "outlined" separately and override the rest of the CIN, in the larger cell, with your range of serial numbers and dates.

### 10.9.1 Translating the Declaration

The Owner's Manual should be provided in the language of the user, where the seller knows it. In practice, however, English is so widely spoken, that many owners will be happy to sign a receipt to say that they are happy to accept an English Manual. English is, after all, one of the 3 "official" languages of the EU Commission itself and also the "language of the sea". However, it is common for authorities to demand a Declaration in the correct language. This is particularly true where the boat is to pass through customs. For this reason, CE-Pro's Declaration can be translated at the click

of a mouse into a growing number of languages. Simply click beside the flag of the language required on the Declaration page itself.

## 10.10 Printing the Manual

To print all sheets/pages of the manual, simply click on the tool bar button "Print OM" and follow the instructions. If not all the sheets are to be printed, hide the sheets you do not want to print by selecting the sheet and using the menus: Tools => Sheets => Hide.

## 10.11 Export DOC

Large volume builders will tend to print a Declaration of Conformity that is valid for a "batch" of boats. Some builders choose to output a DOC that is valid for an entire model year. Builders producing smaller volumes will issue a DOC for each individual boat. Some builders will want to produce a number of different DOC for a model – perhaps where there is a degree of customisation – without significant changes to the TCF or OM. In these cases, it is more efficient to have a template of the DOC that is independent of the rest of the TCF/OM so that users who do not have a licensed installation of CE-Pro can use it. Clicking on this button on the toolbar exports a copy of the DOC to a new Excel file. The builder can quickly open this file and change the HIN to print individual DOC as often as necessary without opening the TCF.

## 11 TRAINING

If you have read the entire document through to this point, you will, by now, realise that CE-Pro covers a huge amount of technical and regulatory ground. Only experienced RCD personnel will be able to fly through a complete Technical Construction File at the first attempt. Most personnel will require some time to become acquainted with the standards and their vocabulary as much as with CE-Pro itself. Dedicated CE-Pro training for new users is very strongly recommended. CEproof staff, who have been using CE-Pro during its development over recent years, can dramatically reduce the duration and steepness of your learning curve. It would be a false economy to ignore this service. Contact your nearest office to discuss training options.

## 12 CUSTOMISATION

CEproof is in a position to provide customised versions of CE-Pro for clients who have particular needs. For example, if you use another software program whose output will become input for CE-Pro, it may be advantageous for your version of CE-Pro to be coded to automatically read-in the data without the need for manual input.

The Owners Manual template is the most obvious candidate for customisation. The standard template is unashamedly minimalist: it meets the requirements but only just. Your template could be dressed in your corporate image, with logos, fonts and colours to suit. It can include your warranty information and any other usage information you require. If your production has a particular number of optional variants the manual may benefit from being coded to recognise the particular trigger points so that it is easier and quicker to generate.

Anything is possible! Please contact CEproof at [software@ceproof.com](mailto:software@ceproof.com) to discuss your needs.

## 13 FUTURE DEVELOPMENTS

CE-Pro is under constant development as CEproof's own staff continually feedback comments. Our own staff, however, are very experienced RCD personnel for whom CE-Pro, standards and technical files are an every day issue. CEproof warmly welcomes feedback from anyone but especially those with less experience of CE-Pro and of the RCD. This will allow us to provide updates of CE-Pro that meet the ever-changing demands of the user.

Please send comments to [software@ceproof.com](mailto:software@ceproof.com)

## 14 APPENDIX I - CE-PRO LICENCE AGREEMENT

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YOU ACKNOWLEDGE THAT YOU HAVE READ THIS AGREEMENT, UNDERSTAND IT, AND AGREE TO BE BOUND BY ITS TERMS AND CONDITIONS. YOU FURTHER AGREE THAT THIS IS THE COMPLETE AND EXCLUSIVE AGREEMENT BETWEEN THE PARTIES.

IF YOU AGREE TO THE FOREGOING, please select

- I Agree -

IF YOU DO NOT AGREE, select

- Cancel -

in which case, installation of the program will stop."