

dti

PRODUCT STANDARDS

Recreational Craft

**Guidance Notes on the
UK Regulations**

(S.I. 2004/1464, as amended by
S.I. 2004/3201)

August 2005

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This guide is intended to assist manufacturers of recreational craft (including personal watercraft) and specified components, as well as manufacturers of propulsion engines intended for installation in recreational craft, to understand the effect of the Regulations (as amended). It is not an authoritative interpretation of the Regulations which is a matter for the Courts.

The guide seeks to explain the requirements of the Regulations in general terms and does not attempt to address detailed issues. **You should refer to the Regulations themselves (and the Amendment Regulations) for a full statement of the requirements.** These can be obtained from The Office of Public Sector Information, details of which are on page 15. They are also available free online at http://www.opsi.gov.uk/legislation/about_legislation.htm

Whilst the Department can offer a view of the position, it is for manufacturers of the relevant products (and others to whom the obligations of the Regulations might relate) to seek and rely on their own advice.

CONTENTS

	PAGE
Recreational Craft - the law in brief	4
Scope	5
• Design and Construction of Craft	5
• Exhaust emissions	6
• Noise emissions	6
• Other measures	6
Free movement of goods	6
The Recreational Craft Regulations 2004 (as amended)	7
Prohibitions on placing on the market	8
CE marking	9
Conformity assessment	10
Notified Bodies	10
Free circulation	10
Enforcement, Offences, Penalties & Notification to the Commission	11
Safeguard procedure	12
Availability of texts of the Harmonised Standards	13
Availability of text of the Regulations	13
Availability of text of the Recreational Craft Directive and other information	13
STRD Website	13
Contact points for further information	14
<u>Annex 1</u> Explanation and examples of 'Froude number' and 'Power displacement ratio' calculations	16

Presentation of Guidance

The major point to note is that the two relevant Directives, 94/25/EC (the "original RCD") and 2003/44/EC (the "new" amending RCD), will remain as separate documents. The consequence of this is that both boatbuilders and engine manufacturers should read them in conjunction because both the original and new RCD are closely interrelated and may be applicable in respect of the product which they place on the market or put into service in the Community. An example of this close interrelationship is that, although the new RCD addresses mainly the issue of noise from recreational craft and exhaust emissions from engines intended for installation in such craft, it also relates to design and construction issues / requirements and to that extent it must be read in conjunction with the design and construction provisions of the original RCD.

Despite the Commission's decision not to consolidate the original RCD with the new amending RCD, the DTI has taken the view that stakeholders would be better served by transposing both directives in a consolidation of the UK requirements in a single text. For this reason, the Recreational Craft Regulations 2004 (S.I. 2004 1464) were made on 26th May 2004. This means that, for most purposes, UK manufacturers (and / or any other person affected by the Directives) need read only the one set of Regulations in conjunction with the guidance contained in this document.

RECREATIONAL CRAFT - THE LAW IN BRIEF

Recreational Craft Regulations (S.I. 2004 /1464, as amended by S.I. 2004/3201) – Consolidated version of the RCR 1996 and Amendment RCR 1998 including the transposition of Directive 2003/44/EC, the amending Directive, into UK law

The Recreational Craft Regulations 1996 (S.I.1996/1353) implemented the European Community Directive on recreational craft (94/25/EC). This Directive (and the UK Regulations) has been in force since June 1996, and became mandatory on 16th June 1998. They apply, in respect of design and construction, to recreational craft measuring between 2.5 and 24 metres in hull length, intended for sport and leisure purposes as well as to some components (specified in Schedule 2 to the Regulations). The 1998 Amendment Regulations related to enforcement in Northern Ireland.

Following several years of negotiation, on 16th June 2003, the European Council and Parliament adopted Directive 2003/44/EC. This Directive extended the scope of the original Directive in terms of design and construction by including personal watercraft (eg. jet skis), as defined, and amending some of the essential requirements of the original Directive relating to recreational craft (e.g. modification of Design category D). More importantly, the new Directive addresses, for the first time, the question of exhaust emissions from propulsion engines intended for use in recreational craft and noise emissions from recreational craft.

The Recreational Craft Regulations 2004 (S.I. 2004 1464) were created to cover all aspects of Directive 2003/44/EC as well as 94/25/EC in a consolidated form¹. The Recreational Craft Regulations 2004 partly came into force on 30 June 2004, thus allowing for the assessment and appointment of Notified Bodies for the new/revised conformity assessment procedures required by the new Directive. However, it should be noted that regulation 2(2)(a) shall not have effect until the date of the coming into force of the relevant Decision by the EEA Joint Committee by which the application of the amending / new Directive 2003/44/EC is extended to the EEA. The Regulations made in May 2004 have however been the subject of a very small amendment to clarify a point².

The remaining/main provisions of the Recreational Craft Regulations 2004 (as amended) came into force on 1st January 2005 (with the consequent revocation of the Recreational Craft Regulations 1996 (as amended) subject to certain limited exceptions where the 1996 Regulations (as amended) continue to apply³). This effectively transferred the provisions of the 1996 Regulations, relating to design and construction of recreational craft (and those relating to the specified components), into the present 2004 Regulations. It also brought into effect the provisions of the new amending RCD for the first time.

¹ It also incorporates the minor amendment made by the Recreational Craft (Amendment) Regulations 1998 (S.I. 1998/116)

² The Regulations were subsequently amended by the Recreational Craft (Amendment) Regulations 2004 (S.I. 2004/3201)

³ Those exceptions (detailed in regulation 1(4) of the 2004 Regulations) relate to their continuing application to: (a) any product (as defined in the 1996 Regulations) placed on the market (as so defined) prior to 1st January 2005; (b) any such product to which the 2004 Regulations do not apply by virtue of regulation 6 of the 2004 Regulations (c) any such product placed on the market in the EEA (other than in the Community) until such time as regulations 2 (2) (a) has effect i.e. an EEA Joint Committee decision or (d) the appointment/termination of appointment of a notified body for the purposes of the 1996 Regulations.

In addition, it is important to note that there are various "transitional periods" to allow industry and others time to adapt to the requirements of the new legislation and these are indicated in more detail below. However, whilst an element of description is provided in respect of the transitional periods provided by the original Directive as implemented in the UK by the 1996 Regulations, those periods have now expired and it is only the new transitional periods which will apply.

- The first transitional period (now expired) related to the original RCD. From 16 June 1996, manufacturers or importers of recreational craft, partly completed recreational craft or specified components covered by the 1996 Regulations had the choice until 15 June 1998 of either complying with those Regulations or continuing to comply with any UK national safety provisions in force as at the date of adoption of the original RCD.
- The first transitional period relating to the requirements of the new amending RCD is between 1 January 2005 and 31 December 2005. In this phase, boatbuilders and importers from outside the Community may choose to apply the original RCD (as implemented in the 1996 Regulations) or the requirements of the new RCD (as implemented in the 2004 Regulations, as amended). Most engine manufacturers may choose between the new RCD, as implemented in the 2004 Regulations as amended) or any other national / UK legislation applicable to their products as at the date of the adoption of the new amending RCD (16th June 2003).
- The final phase relates to manufacturers and importers of two stroke spark ignition engines. They will have a further year – up to 31 December 2006 - during which they may choose to apply the provisions of the new RCD or any other national / UK legislation applicable to their products as at 16th June 2003.

SCOPE

Design and Construction of Craft

Recreational craft intended for sports and leisure purposes, regardless of the means of propulsion, and measuring between 2.5 and 24 metres in hull length, personal watercraft less than 4 metres in length, partly completed recreational craft, and the components specified in Schedule 2 to the Regulations, whether constructed in or imported into the United Kingdom, may only be placed on the market in the United Kingdom and put into service for use if they meet the essential safety requirements (ESRs) set out in Schedule 1 to the Regulations.

Depending on their design category and subject to a limited exception, recreational craft, personal watercraft and the specified components, will need to satisfy conformity assessment procedures involving a Notified Body (see page 10). Recreational craft, personal watercraft and the specified components will be required to carry a CE marking. The product must not endanger the safety and health of persons, property or the environment.

Exhaust emissions

The exhaust emission requirements take the form of limits of acceptable emissions of carbon monoxide, hydrocarbons, nitrogen oxides and, in the case of diesel engines, particulates. They will also apply to engines placed on the market after 1 January 2005 and also to engines placed on the market after 1 January 2005 that subsequently undergo major modification.

Noise emissions

The noise emission requirements are presented in terms of maximum acceptable sound pressure levels determined from a pass-by test or alternative methods of calculation. They will also apply to craft placed on the market after 1 January 2005 and also to craft placed on the market after 1 January 2005 that subsequently undergo major conversions.

Other Measures

The new RCD also introduces a method which will allow craft already built to be assessed to the provisions of the Directive and CE marked (Post Construction Assessment). This is likely to be applied for example when existing craft are imported from outside of the EU.

Failure to comply with the above requirements will mean that these products may be prohibited from being placed on the Community / EEA market⁴, and withdrawn if previously placed on the market.

FREE MOVEMENT OF GOODS

The free movement of goods lies at the heart of achieving an open market for business in Europe. In May 1985, European Community Ministers agreed on a 'New Approach to Technical Harmonisation and Standards' to fulfil this objective.

'New Approach' Directives (that is Community law) set out the essential requirements (on safety for example), written in general terms which must be met before products may be placed on the market or put into service in the United Kingdom or anywhere else in the European Community.

Mandated harmonised European standards provide the detailed technical information enabling manufacturers to meet the essential requirements. The directives also prescribe how manufacturers are to demonstrate conformity with the essential requirements, should such harmonised standards not be available.

⁴ There are 25 members of the Community - Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the UK, Hungary, Czech Republic, Estonia, Slovenia, Slovak Republic, Malta, Cyprus, Poland, Latvia and Lithuania. The EEA adds Iceland, Liechtenstein and Norway.

Products which meet the essential requirements are to display the CE marking, as described and shown in the particular directive, meaning that the products can thus enjoy free movement and be sold anywhere in the Community / EEA.

Further information on the "New Approach" Directives is available in the "Guide to the implementation of directives based on the New Approach and the Global Approach". This booklet, produced by the European Commission and providing guidance on the scope, philosophy and application of New Approach Directives, may be obtained as a downloadable document from the Commission's website:

http://europa.eu.int/comm/enterprise/maritime/maritime_regulatory/rc_introduction.htm

THE RECREATIONAL CRAFT REGULATIONS 2004 - (S.I. 2004/1464, as amended by S.I. 2004/3201)

Entry into force: (in part) 30 June 2004 (remainder / mainly) 1 January 2005.

Primary legislation: the European Communities' Act 1972.

Transitional arrangements: until 15 June 1998 Member States were required to continue to allow products, which conform to the rules in force in their territory on 16 June 1994, to be placed on the market and taken into service for use.

From 1 January 2005 harmonised provisions on personal watercraft as well as exhaust gas and noise emissions from engines installed on recreational craft came into force. Those measures will take full effect from 1 January 2006, in the case of products falling under Article 1 (1)(a), compression and four-stroke ignition engines and, in the case of two-stroke ignition engines from 1 January 2007 – thus allowing two separate periods of transition.

Coverage : Design and construction of recreational craft measuring between 2.5 and 24 metres hull length, regardless of the means of propulsion, and intended for sport and leisure purposes, partly completed recreational craft, personal watercraft and the components specified in Schedule 2 to the Regulations.

Application: the application of the Regulations to any recreational craft or partly completed recreational craft is not precluded by its potential use for charter or recreational boating training when that craft is placed on the market for recreational purposes.

(Note: Switzerland has adopted national legislation which is largely based upon the provisions of the design and construction requirements of Directive 94/25/EC thereby allowing free circulation of recreational craft complying with the regulations in that country.)

Exhaust emissions limits apply to all propulsion engines, both inboard and outboard, installed or intended for installation in recreational craft or personal watercraft and engines that are subject to "major engine modification".

Noise emissions limits apply to all inboard powered craft and stern drive without integral exhaust powered craft, personal watercraft, outboard engines and stern drive engines with integral exhaust. Craft with inboard engines or stern drive engines without integral exhaust, which are subject to major craft conversion and subsequently placed on the market within five years following conversion, are also covered.

The amending Directive also provides for the use of a "Power Displacement Ratio" formula and a "Froude Number" as a method for determining compliance with the Directive. An explanation and examples of "Froude number" and "power displacement ratio" calculations is available at Annex 1. It further provides for the establishment of a database of reference craft whereby craft will be deemed compliant if key design parameters are the same or compatible with those of a certified reference boat. A Power Displacement Ratio and Froude Number (PD/F) calculator can be found at: http://www.icomia.com/pdf_calc.htm

The requirements of the Regulations do not apply to the showing of any product at any trade fair, exhibition, demonstration or the like provided that a visible sign indicates clearly that the product in question may not be placed on the market until it has been made to comply with the Regulations.

Excluded products: These are listed at regulation 4 of the Recreational Craft Regulations 2004 (http://www.opsi.gov.uk/legislation/about_legislation.htm). Some exclusions include, for example, racing and experimental craft, and some craft and engines built for own use.

Placing on the market: The person or company who first places the product on the Community market is responsible for ensuring that the product complies with the Regulations.

Essential safety requirements (ESRs): the requirements are set out in Schedule 1 to the Regulations relating to the design and construction of recreational craft and certain components, exhaust emissions from propulsion engines and noise emissions from recreational craft.

PROHIBITIONS ON PLACING ON THE MARKET:

No product to which the Regulations apply can be placed on the market in the UK unless the following requirements have been complied with:

- it satisfies the essential safety requirements applicable to that product, as set out in Schedule 1 to the Regulations; a product conforming with a relevant transposed harmonised European standard, which covers one or more of those essential safety requirements, is presumed to comply with that, or those, requirements;
- except in the case of partly completed recreational craft and some components, the appropriate conformity assessment procedure has been carried out in accordance with regulation 10 by the manufacturer or his authorised representative established in the Community / EEA; the obligation to retain the

technical documentation required as part of the appropriate conformity assessment procedure must be met by them or the person who places the product on the market;

- except in the case of a partly completed recreational craft and certain engines, the CE marking has been affixed to it or, in the case only of a component, its packaging in accordance with regulation 8 and Schedule 4 to indicate that it conforms with all the provisions of the Directive which apply to it; in certain specified circumstances, the CE marking on a component (or its packaging) will only indicate conformity with the essential safety requirements relevant to it;
- in the case of any partly completed recreational craft, the manufacturer or his authorised representative established in the Community / EEA, or any other person responsible for the placing on the market declares, in accordance with Schedule 3(a) to the Regulations, that it is intended to be completed by others;
- in the case of post-construction assessment for recreational craft, if neither the manufacturer nor his authorised representative established within the Community fulfils the responsibilities for the product's conformity to the Directive (as described in regulation 10(6)), these can be assumed by any person established within the Community who places the product on the market under his own responsibility;
- in the case of inboard engines and stern drive propulsion engines without integral exhaust, that the engine will meet the exhaust emission requirements of the Directive, when installed in a recreational craft or personal watercraft in accordance with the manufacturer's supplied instructions, that engine shall be deemed to satisfy the exhaust emission requirements;
- when correctly constructed, maintained and used in accordance with its intended purpose, it does not endanger the safety and health of persons, property or the environment.

CE MARKING

Recreational craft and specified components intended to be incorporated into them, which meet the essential safety requirements in accordance with Schedule 1 to the Regulations, must bear the CE marking in a visible, legible and indelible form and be affixed by either the manufacturer or his authorised representative established in the Community / EEA. In the case of any component, the CE marking must be affixed either on the component itself or on its packaging or on both.

Where a Notified Body is involved in the conformity assessment procedures its identification number must accompany the CE marking.

Where any recreational craft or specified component is subject to any other directive(s), in addition to the Recreational Craft Directive, the CE marking must indicate that the product(s) also fulfils the provisions of those directives. The Regulations include provisions as regards other markings and inscriptions.

CONFORMITY ASSESSMENT

In the case of recreational craft, the appropriate conformity assessment procedure must be determined in accordance with the boat design category referred to in regulation 10 of the Recreational Craft Regulations 2004.

http://www.opsi.gov.uk/legislation/about_legislation.htm

NOTIFIED BODIES

For the purposes of the Regulations, a Notified Body is an organisation which has been appointed either as a United Kingdom Notified Body by the Secretary of State in accordance with regulation 12, or appointed by a Member State in the Community / EEA other than the United Kingdom, to carry out one or more of the conformity assessment procedures referred to above.

For a list of UK Notified Bodies: <http://www.dti.gov.uk/strd/rcukcb.pdf>

For a full EU list of Notified Bodies:

http://europa.eu.int/comm/enterprise/maritime/maritime_regulatory/doc/rc_notified_bodies_03_44_140705.pdf

Mutual Recognition Agreements have been concluded between the European Union (EU) and the United States and between the EU and Canada which both contain a sectoral annex on the recreational craft. These Agreements allow for the mutual acceptance of test reports, certificates and marks of conformity issued by assessment bodies.

In the case of United Kingdom Notified Bodies' appointments, at present a decision on whether or not to appoint will be made following an assessment by the United Kingdom Accreditation Service (UKAS) in accordance with the DTI guidelines - March 2004 (ref. URN 04/925). Copies of the guidelines are available from the following website: <http://www.dti.gov.uk/strd/rcdnbgde.pdf>

FREE CIRCULATION

Under European Community law - as set out in the original Recreational Craft Directive (as amended by the new Directive) - Member States must not impede the placing on the market of craft, or the specified components, or the other products now within scope which satisfy the essential requirements of that Directive. Furthermore, Member States must presume that recreational craft and the specified components bearing the CE marking do meet the essential requirements of the Directive and also the provisions of the Regulations.

The DTI's "Action Single Market" offers some views and assistance with problems encountered when placing compliant recreational craft or components in the other countries of the Community / EEA market. Information is available on their website at <http://www.dti.gov.uk/europe/asm>

ENFORCEMENT, OFFENCES AND PENALTIES

Enforcement

Regulations 15 and 16 together with Schedule 17 provide for the enforcement of the Regulations in the United Kingdom.

It is the duty of the following organisations to enforce the Regulations within their area:

- (a) in Great Britain, weights and measures authorities (the trading standards departments of local authorities); and
- (b) in Northern Ireland, every district council.

In Scotland, proceedings against infringement of the Regulations are brought by the Procurator-Fiscal or Lord Advocate.

To ensure that only compliant RCR products are being placed on the market, these enforcement authorities will carry out their own surveillance and will investigate complaints from industry and the public etc. to establish whether there are justifiable grounds for taking enforcement action in such cases. In response to complaints, trading standards departments will seek evidence, with the assistance of technical experts such as Notified Bodies where necessary, that the Regulations have been breached and consider what action should be taken.

LACORS (the Local Authorities Co-ordinators of Regulatory Services) is a body whose objective is to co-ordinate enforcement and provide uniformity of interpretation. It provides guidance to local enforcement authorities. Local authorities are seeking to work with manufacturers to help them to comply with the Regulations properly as well as taking enforcement action against manufacturers of non-compliant RCR products.

For further advice on this subject, you should contact your local trading standards authority.

Offences

Enforcement of the Regulations is achieved with the assistance of the application of certain provisions of the Consumer Protection Act 1987, ie those comprised in section 13, 'prohibition notices' and 'notices to warn' (see below) and sections 14, 16 and 17, 'suspension notices' and 'forfeiture'. Action may be directed against any person supplying goods, including retailers, distributors and dealers.

In seeking to ensure proper compliance, Trading Standards Departments may issue 'suspension notices', under section 14 of the 1987 Act and apply the 'forfeiture' provisions of sections 16 and 17 on the grounds that there has been a contravention in relation to the RCR 2004. In relation to 'suspension notices', contravention of any

provisions of the Regulations will be a contravention of a safety provision for the purposes of section 14 and such notices may be served on any supplier.

In appropriate circumstances, the Secretary of State may issue 'prohibition notices' and/or 'notices to warn' under section 13 of the 1987 Act in relation to defective products considered to be unsafe. Such notices may be served on any supplier.

Should any person on whom notices are served choose to ignore them, criminal penalties (including fines and/or imprisonment) are provided for by the 1987 Act and proceedings may be taken.

Penalties

A person upon whom a 'prohibition notice', 'notice to warn' or 'suspension notice' is served who fails to comply with that notice will be committing an offence under the Consumer Protection Act 1987 (as applied to the Regulations).

As such, and subject to the nature of the offence and any mitigating circumstances, a person found to have contravened specific provisions of the Regulations (for example, by supplying a non CE marked product, which requires such marking, when properly maintained and used for its intended purpose, which could compromise the safety of individuals), may be fined up to level 5 (£5,000 at the time of writing) on the standard scale and/or imprisoned for up to three months.

The Regulations also provide that contravention of certain regulations shall be an offence with similar penalties.

Notification to the Commission

The Recreational Craft Directive requires Member States to inform the European Commission of any specific enforcement action taken. This is reflected in the Regulations by way of an obligation imposed on enforcement authorities to inform the Secretary of State when action is taken to prohibit or restrict the placing on the UK market of a CE marked product. The Commission will consider whether the action is justified and advise the parties concerned accordingly. Any person who is found guilty of an offence is liable on summary conviction to the penalties indicated above.

SAFEGUARD PROCEDURE

Member States are required to take all appropriate measures to withdraw from the Community / EEA market, or to prohibit and restrict the supply of, products bearing CE marking which may endanger the safety and health of persons, property or the environment. They must then inform immediately the European Commission of their action and give reasons. The Commission must consult the parties concerned as soon as possible and, where it finds the action justified, inform immediately all member States. The Regulations provide for products to be withdrawn from the market by means of prohibition and suspension notices under the Consumer Protection Act 1987.

AVAILABILITY OF TEXTS OF HARMONISED STANDARDS

These may be obtained from BSI Customer Sales, 389 Chiswick High Road, London W4 4AL. Tel: 020 8996 7000, Fax: 020 8996 7001.

AVAILABILITY OF TEXT OF THE REGULATIONS

Recreational Craft Regulations 2004 (SI 2004 1464) can be obtained from **The Office of Public Sector Information Centre**, details of which are on page 15. They are also available free online at http://www.opsi.gov.uk/legislation/about_legislation.htm

AVAILABILITY OF THE TEXT OF THE RECREATIONAL CRAFT DIRECTIVE AND OTHER INFORMATION

This European Commission website:

http://europa.eu.int/comm/enterprise/maritime/maritime_regulatory/rc_introduction.htm will provide you with the following information:

- The complete text of the Directive 94/25/EC and Directive 2003/44/EC.⁵
- Commission's Comments on the two Directives [these are only comments and have no legal force.]
http://europa.eu.int/comm/enterprise/maritime/maritime_regulatory/doc/guide_v2_94_25_en.pdf
- Recreational Craft Sectoral Group (RSG) Guidance [again, these are only guidelines and have no legal force.]
- List of standards mandated to be harmonised in support of the Recreational Craft Directive along with their status
- List of Notified Bodies under Directive 2003/44/EC Amending Directive 94/25/EC.

STRD WEBSITE

The Standards and Technical Regulations Directorate (STRD) has set up a web site which contains updated information on all the Directives dealt with by the section, including the RCD. When you select the RCD option, you will be able to gain access to some general information on the RCD. You would also be able to gain direct access the European Commission's Website covering the RCD.

The Website address is <http://www.dti.gov.uk/strd/recreat.html>

⁵ Copies of the texts are also generally available from European Information Centres and European Documentation Centres located throughout the United Kingdom, who may provide them for a modest charge.

Further information is also available from the British Marine Federation. They have produced a user-friendly "RCD Programme Manual" which takes the form of an RCD CD Rom that guides the builder through the CE marking process with access to the ISO standards and examples of the documentation required. Their Boat Builders Guide is available in the "Technical" section of their "our Publications" page at <http://www.britishmarine.co.uk>

CONTACT POINTS

Policy relating to the Recreational Craft Directive and UK Regulations:

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151 Buckingham Palace Road
London SW1W 9SS
Tel: 020 7215 1411
Fax: 020 7215 1529
E-mail: Neeroo.girdharee@dti.gsi.gov.uk

Problems encountered selling recreational craft in other Community / EEA countries:

Action Single Market
Kingsgate House
66-74 Victoria Street
LONDON SW1E 6SW
Tel: 020 7215 4212
Fax: 020 7215 4720
Email: asm@dti.gsi.gov.uk

You can find out more about the Single Market on the DTI's website:
<http://www.dti.gov.uk/europe/asm/>

General information about Britain and Europe is available at www.fco.gov.uk

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Recreational Craft Directive 2003/44/EC

Annex 1 C Essential requirements for noise emissions

Explanation and examples of 'Froude number' and 'Power displacement ratio' calculations

The alternative to a full Pass-by sound test for craft with inboard or sterndrive engines without integral exhaust is to comply with two simple calculations.

- 1) The 'Froude number' is calculated by dividing the maximum boat speed V (in metres per second) by the square root of the waterline length lwl (in metres) multiplied by a gravitational constant $g = 9,8 /s^2$

$$Fn = \frac{V}{\sqrt{(g.lwl)}}$$

- 2) The 'Power displacement ratio' is calculated by dividing the engine power P in kilowatts by the boat's displacement D in tonnes

$$P/D = \frac{P}{D}$$

If the calculated 'Froude number' number is equal to or lower than 1.1 and the 'Power displacement ratio' is equal to or less than 40 then the craft is deemed to comply with the noise emission limits.

As an example:-

- 1) A typical motor cruiser could be as follows :-

Water line length	lwl = 7.8 metres
Displacement	D = 4 tonnes
Engine power	P = 35 hp = 26 kW
Speed	V = 8 knots = 4,1metres per second

The 'Froude number' would be calculated from:-

$$Fn = \frac{4,1}{\sqrt{(9,8 \times 7,8)}} = \underline{\underline{0,47}}$$

The Power Displacement ratio would be:-

$$P/D = \frac{26}{4} = \underline{\underline{6,5}}$$

As the 'Froude number' is less than 1.1 and the Power displacement ratio is less than 40 the boat in question will be deemed to comply with the noise emissions.

2) A sailing yacht could be as follows:-

Water line length	lwl = 11,13 metres
Displacement	D = 12,56 tonnes
Engine power	P = 56 hp = 42 kW
Speed	V = 9 knots = 4,6 metres per second

The 'Froude number' would be calculated from:-
$$Fn = \frac{4,6}{\sqrt{(9,8 \times 11,13)}} = \underline{\underline{0,44}}$$

The Power Displacement ratio would be:-
$$P/D = \frac{42}{12,56} = \underline{\underline{3,34}}$$

As the 'Froude number' is less than 1.1 and the Power displacement ratio is less than 40 the boat in question will be deemed to comply with the noise emissions.

3) A semi-displacement power boat could be as follows:-

Water line length	lwl = 10,44 metres
Displacement	D = 9 tonnes
Engine power	P = 430 hp = 320 kW
Speed	V = 22 knots = 11,32 metres per second

The 'Froude number' would be calculated from:-
$$Fn = \frac{11,32}{\sqrt{(9,8 \times 10,44)}} = \underline{\underline{1,1}}$$
 *

The Power Displacement ratio would be:-
$$P/D = \frac{320}{9} = \underline{\underline{35,5}}$$

As the 'Froude number' is equal to 1,1 and the Power displacement ratio is less than 40 the boat in question will be deemed to comply with the noise emissions. * As can be seen the 'Froude number' is exactly on the limit and care should be exercised in the specification and calculations to ensure accuracy.

4) A small inboard engine speed boat could be as follows:-

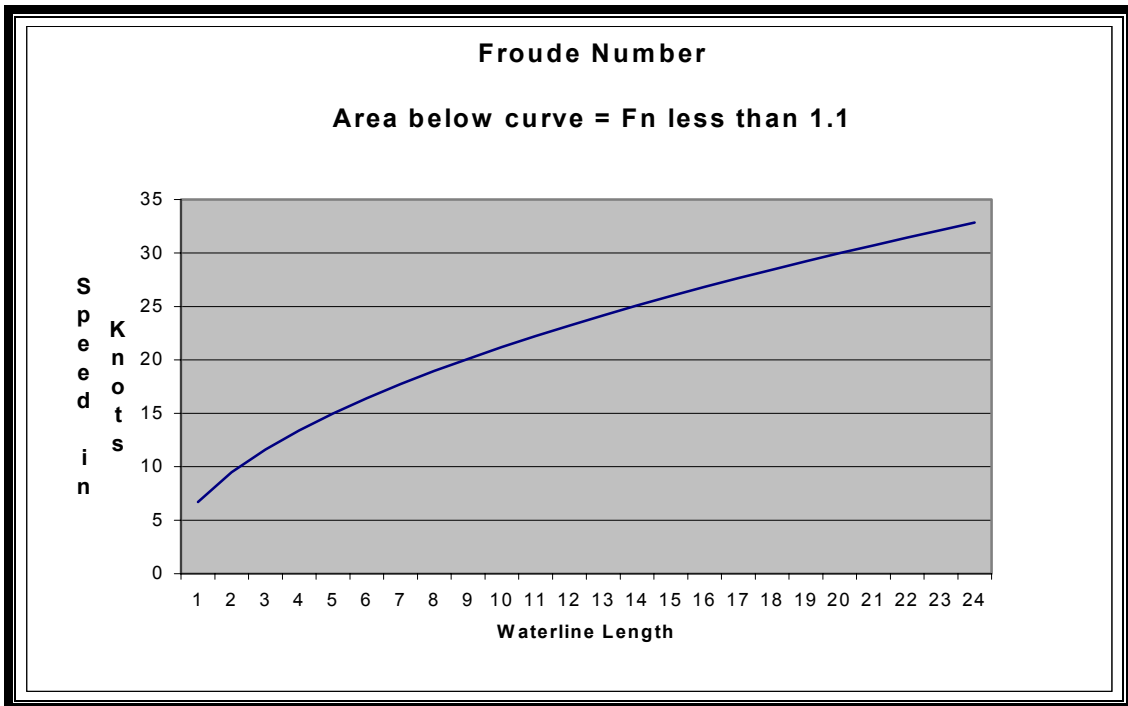
Water line length	lwl = 4,9 metres
Displacement	D = 0,9 tonnes
Engine power	P = 150 hp = 112 kW
Speed	V = 30 knots = 15 metres per second

The 'Froude number' would be calculated from:-
$$Fn = \frac{15}{\sqrt{(9,8 \times 4,9)}} = \underline{\underline{2,16}}$$

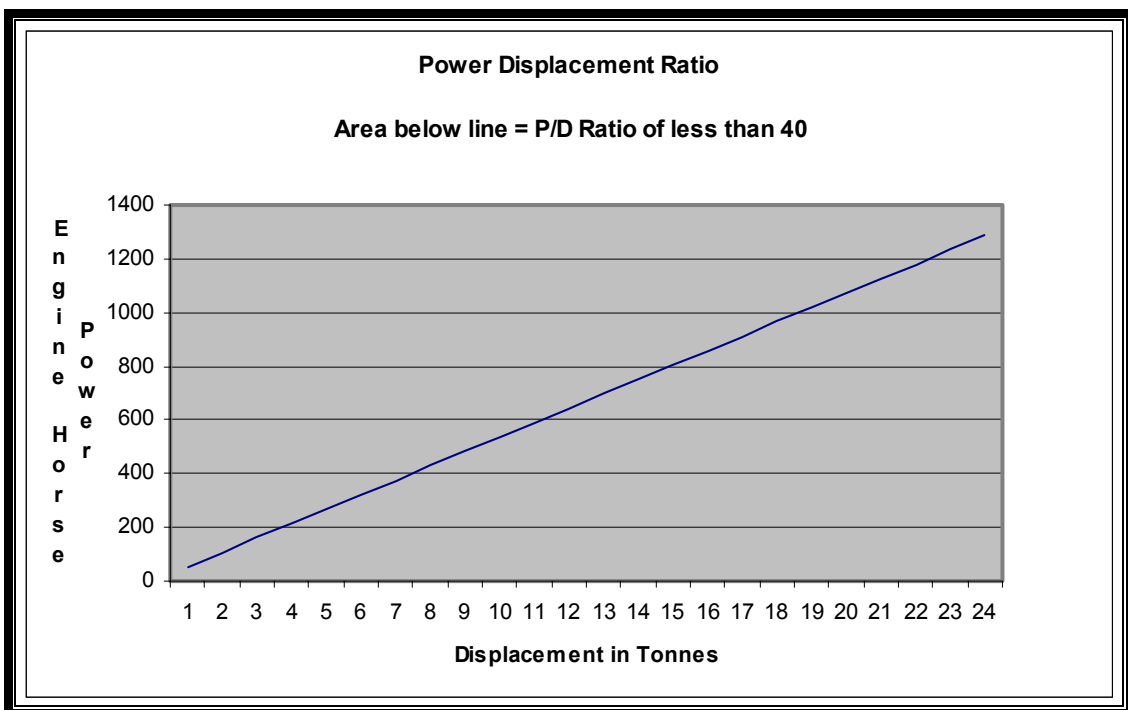
The Power Displacement ratio would be:-
$$P/D = \frac{112}{0,9} = \underline{\underline{124,4}}$$

As this craft exceeds at least one of the calculation limits a full pass-by test or reference boat comparison will have to be undertaken.

Chart for Froude Number



*Waterline length in metres.



*Engine power is shown as Horse Power. For kilowatt rating convert hp x .75

In order to demonstrate compliance both calculations have to be satisfied and the engine(s) must be installed in accordance with the manufacturer's specifications.

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A PD/F calculator can be found at: http://www.icomia.com/pdf_calc.htm