

Non-metallic seacocks and through-hull fittings

March 2018

ITN-02-18

Background

- MNZ rules require the material of Seacocks and through-hull fittings to be ductile

Maritime Rules Part 40A

40A.35 Inlets, discharge and sea water piping:

(5) Fittings attached to the shell, and the seacock or valve required by rule 40A.35(1) must be of steel, bronze, or other ductile material acceptable to a surveyor.

MR 40C and 40D have similar clauses.

- Wording **Shell fittings** is used in this document for *seacocks and through-hull fittings required by rule 40A.35(1) and the like* in this document for brevity.
- Steel or bronze are common material for these fittings. In New Zealand, it's not uncommon we see non-metallic shell fittings being used on ships, especially smaller boats.
- MNZ was requested by surveyors to provide guidance on use of non-metallic shell fittings in relation to the above rule requirements.
- Initially a General Exemption was considered, but afterwards it's considered more appropriate as a Position Statement as the existing rule does not actually prohibit the use of non-metallic materials.

Purpose / Application

The purpose of this document is to provide interpretation of *ductile* material for shell fittings.

As 40A.35(1), which is referred to by 40A.35, applies to ships of less than 24m in length, the same ship length range applies in this document.

Analysis

What property of material are the rules concerned about?

While fire safety properties, i.e. fire resisting / retarding, are sometime also important, in this case, i.e. specifically for shell fittings alone in relation to 40A.35, the key word is **ductile**. It's not **fire** – fire safety is covered by other rule provisions, e.g. when the fittings are in *areas of major fire hazard* or similar.

The intent of this interim technical note (ITN) is to provide clarification in respect of the application of rules where the meaning is unclear or conflicting. ITNs provide supporting information on specific technical issues or areas related to maritime rules. The material in this ITN should not be treated as a substitute for the rules, which are the law. This ITN may be replaced with or clarified by operational guidance or an advisory circular at a later date. Any future guidance is unlikely to apply retrospectively, unless over-riding safety concerns become apparent.

What is ductility?

- Ductility
Ductility is the solid material's ability to deform under tensile stress; this is often characterized by the material's ability to be stretched into a wire. Ductile materials are those which could show plastic deformation.
- Ductility vs. malleability
Malleability is similar to ductility but it's under compressive stress rather than tensile stress. A ductile material is not necessarily malleable.
- Ductility vs. brittleness
Brittleness is the opposite of ductility. Ductile materials can be actually drawn or bent before it reaches its fracture point. Brittle materials fracture before yield point but ductile materials go beyond yield point.
- Ductility vs. (impact) toughness¹
Toughness is the amount of energy that can be absorbed by a material before it breaks. Ductility is the amount of deformation that can occur (until it breaks) when a material is put under (tensile) stress.
Toughness, and impact strength are interchangeable in this document. Toughness can be measured in terms of impact energy.
- Is ductile material necessarily metallic material?
While most of the time when talking about ductility we are talking about metallic materials, ductile material is not necessarily metallic.
- Examples of metallic and non-metallic ductile material as well as brittle material

	Ductile	Brittle
Metallic	Steel, copper, aluminium, nodular cast iron	Grey cast iron
Non-metallic	Nylon, polypropylene, polyethylene	Ceramic, glass, polystyrene

- Ductility / toughness / strength
In order to be tough, a material must be both strong and ductile.
- A ductile material becomes brittle under certain temperatures (the so called ductile-brittle transition temperature). That means, generally speaking, there is no material which is categorically ductile.
- Ductility/malleability, ductility/toughness are closely related/relevant but are different. Having one property doesn't mean having the other.
- Cast iron is not necessarily brittle material – some nodular cast iron could be ductile.

Possible origin of the wording 'Steel, bronze or approved ductile material'

An early occurrence of this wording was in SOLAS 1948 -

Cocks or valves of more than 3 inches bore (or 76 millimetres) for main and auxiliary sea inlets and

¹ Strictly speaking, toughness doesn't only mean impact toughness. But in this document, the term toughness is used for impact toughness.

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discharges in connection with machinery shall be of steel or bronze as applicable, or other approved ductile material.

There are now widely seen exactly identical wordings in current SOLAS convention and class rules - presumably all from the same origin.

Cases where ductile materials are required by rules and conventions

- Valve on collision bulkhead
- Shell fittings and valves for inlets and discharges
- Terminal fittings at cargo loading stations for Oil Tankers
- Refrigeration Systems
- Materials exposed to low sea-water temperature (e.g. Ice operation)

All these cases are closely related to the need of a material's property to withstand impact and/or of low temperature toughness. Basically, in practical terms, they are all about toughness which is expressed in terms of impact energy.

Further analysis

As we can see the clause and wording probably came from early version of SOLAS, and considering the cases where 'ductile material' is required, it's not unreasonable to conclude that the wording *ductile* does not in a strict sense mean *ductility* itself but instead impact strength. The reason is only impact strength (toughness) rather than ductility is something that is directly related to the material's ability to withstand impact or collision. From its definition, the ability to *deform* without crack, ductility alone should not be the property that the rules are after. In the meantime, ductility can be assured with toughness (in terms of impact energy).

Practicable approach

ISO 9093-2:2002² *Small craft – Seacocks and through-hull fittings – Part 2: Non-metallic* provides prescriptive requirements on mechanical properties of non-metallic materials used for shell fittings, including³

- Tensile strength
- Flexural modulus
- Impact strength

It's considered that these mechanical properties adequately cover the ductility of material that is required for the shell fittings.

Conclusion / interpretation

- For the purpose of interpreting 40A.35, and similar clauses in other rule parts, and the use of non-metallic shell fittings, it's acceptable to apply the requirements of ISO 9093-2:2002 for ships of less than 24m in length.

² As the standards evolve, latest version of the standard at the time of reading is recommended.

³ At room temperature. There are more requirements including storage temperature and operating tests below and above room temperature.

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- Alternatively, for ships of less than 24m in length, where exist and applicable, classification rules could also be considered and accepted.

Appendix: A sample of certificate of non-metallic seacocks and through-hull fittings⁴ (3 pages)

⁴ According to BV's certification framework, this is only a type approval certificate. As indicated by 5.3 of the Schedule of Approval, the individual valves and fittings (or a batch) require separate product certificates.

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Further information on this note may be obtained from:

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Maritime New Zealand

Level 11,

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Wellington 6011

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Calling from outside New Zealand: +64 4 473 0111

Email: domestic.operations@maritimenz.govt.nz

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Marine & Offshore

Certificate number: 27801/B0 BV

File number: ACM 135/2705/01-02

Product code: 6505I

This certificate is not valid when presented without the full attached schedule composed of 7 sections

www.veristar.com

TYPE APPROVAL CERTIFICATE

This certificate is issued to

TRUDESIGN

AUCKLAND - NEW ZEALAND

for the type of product

SEACOCKS / THROUGH-HULL FITTINGS

Thru-Hull Skin Fittings including Ball Valves & Aquavalves

Requirements:

- BUREAU VERITAS Rules for the Classification of Yachts
- ISO 9093-2:2002

This certificate is issued to attest that Bureau Veritas Marine & Offshore did undertake the relevant approval procedures for the product identified above which was found to comply with the relevant requirements mentioned above.

This certificate will expire on: 12 Mar 2023

For Bureau Veritas Marine & Offshore,

At BV AUCKLAND, on 12 Mar 2018,

Sam NARIMAN

S. Nariman



This certificate remains valid until the date stated above, unless cancelled or revoked, provided the conditions indicated in the subsequent page(s) are complied with and the product remains satisfactory in service. This certificate will not be valid if the applicant makes any changes or modifications to the approved product, which have not been notified to, and agreed in writing with Bureau Veritas Marine & Offshore. Should the specified regulations or standards be amended during the validity of this certificate, the product(s) is/are to be re-approved prior to it/they being placed on board vessels to which the amended regulations or standards apply. This certificate is issued within the scope of the General Conditions of Bureau Veritas Marine & Offshore available on the internet site www.veristar.com. Any Person not a party to the contract pursuant to which this document is delivered may not assert a claim against Bureau Veritas Marine & Offshore for any liability arising out of errors or omissions which may be contained in said document, or for errors of judgement, fault or negligence committed by personnel of the Society or of its Agents in establishment or issuance of this document, and in connection with any activities for which it may provide.

The electronic version is available at: <http://www.veristarnb.com/veristarnb/jsp/viewPublicPdfTypepec.jsp?id=tbddar3m24>
BV Mod. Ad.E 530 June 2017

This certificate consists of 3 page(s)

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION

Through-hull Skin Fittings including Ball Valves & Aquavalves

1.1 Design

- Can be used on aluminium, steel wood or FRP hulls
- Skin fittings are designed to meet EN ISO 9093-2 applicable to small crafts
- Ball valves are designed for use in marine applications above and below the water line
- Aquavalves are designed for use in marine toilet applications where the need to control effluent discharge is required
- Aquavalve skin fittings and ball valves are designed to a max. working pressure of 1 bar
- Pressure tested at 300 psi for Aquavalves and 600 psi for Ball valves, and 100% leak tested at the end of assembly
- Working temperature range is -40° to 80°C (-40° to 176°F)
- Electrically conductive: composite material not conductive

1.2 Size range

Type	inch / mm						
Skin Fittings with tail	1/2" BSP 13 mm	3/4" BSP 19 mm	1" BSP 25 mm	1" BSP 28 mm	1-1/4" BSP 32 mm	1-1/2" BSP 38 mm	2" BSP 50 mm
Skin Fittings (recessed and flanged)	1/2" BSP 13 mm	3/4" BSP 19 mm	1" BSP 24 mm	/	1-1/4" BSP 32 mm	1-1/2" BSP 37 mm	2" BSP 48 mm
Manual Ball Valves	1/2" BSP 1/2" NPS 19 mm ID	3/4" BSP 3/4" NPS 19 mm ID	1" BSP 1" NPS 19 mm ID	/	1-1/4" BSP 1-1/4" NPS 32 mm ID	1-1/2" BSP 1-1/2" NPS 32 mm ID	2" BSP 2" NPS 52 mm ID
Manual Aquavalve	BSP 1-1/2"						

1.3 Material specification

- Skin Fittings and Aquavalve components : EMS Grilon BG30/2
- Ball Valve body components : Ultramid B3GK24 (PA6-(GF10+GB20))

When other choices of materials are used per manufacturer's recommendations, the BV agreement is to be obtained.

2. DOCUMENTS AND DRAWINGS

- Skin Fittings : Details and Product Information Doc PIS - Skin Fittings 3.0.doc
 - Skin Fittings with Tail : Details and Product Information Doc PIS - Skin Fittings with Tail 3.1.doc & Tail Long Thread 3.0.doc
 - Ultramid product information sheet dated 02/2017
 - Grilon product information sheet dated April 2004
 - Manual Ball Valves : Details and Product Information Doc PIS - Ball Valve 4.1.docx
 - Manual Aquavalve : Details and Product Information Doc PIS - Aquavalve 3.0.doc & SIS - Aquavalve 1.0.doc
- No departure from the above documents shall be made without the prior consent of the Society. The manufacturer must inform the Society of any modification or changes to these documents and drawings.*

3. TEST REPORTS

- 3.1 Tests carried out: visual inspection, hydrostatic pressure test, assembly test
- Type tested with a 155 kg load hanging off a ball valve and hose fitting
 - Test report N° 4301.11 dated 21/01/2014
 - Not carried out acc. to the Society's rules : Low flame spread characteristics and fire endurance test
- 3.2 Type tests carried according to ISO 9093-2 under witness of a BV surveyor.
- Test report dated 31/10/2017 & 23/02/2018

4. APPLICATION / LIMITATION

- 4.1 Approved as hull penetration, seacocks and through-hull fittings and marine sanitary applications.
- 4.2 Valves and fittings fitted on the yacht side belong to class II according to Pt C, Ch 1, Sec 4 of the Society's rules.
- 4.3 The location and the mounting to the hull are to be approved for each application on board BV-classed ships. Limit of use of plastic material is given in table 7 - Pt C, Ch 1, Sec 4 of the Society's rules. When installed, attachment of valves and through-hull fittings must be watertight and secure to prevent loosening under normal operating conditions.

4.4 The valves are to be located in an accessible area for installation, operation, disassembling and inspection.

4.5 TRUDESIGN has to inform its clients about proper methods of arrangement, fitting and general maintenance of the products.

5. PRODUCTION SURVEY REQUIREMENTS

5.1 The products are to be supplied by TRUDESIGN in compliance with the type and the requirements described in this certificate.

5.2 This type of product is within the category IBV of Bureau Veritas Rule Note NR320.

5.3 BV product certificate is required.

5.4 Materials of valve housings of Class II (DN<100) and for other parts of Class II are to be with Work's certificates.

5.5 Each valve housing for class II is to be subjected to hydrostatic test at 1.5 times the design pressure. Valves and fittings which are secured on the yacht side below the load waterline are to be subjected to hydrostatic test at a pressure test not less than 0.5 MPa. The test can be carried out at the yard or on board.

For information, TRUDESIGN has declared to Bureau Veritas the following production site:

TRUDESIGN: 243 TI RAKAU DRIVE, EAST TAMAKI, AUCKLAND, NEW ZEALAND

6. MARKING OF PRODUCT

The products is to be marked with at least :

- Manufacturer's name or logo
- Type designation
- Manufacturing data
- Identification data
- Society's brand as relevant

7. OTHERS

This approval is given with the understanding that the manufacturer will accept full responsibility for informing shipbuilders or their sub-contractors of the proper method of fitting and general maintenance of the products and of the conditions of this approval.

This certificate supersedes the Type Approval Certificate No. 27801/A0 BV issued by the Society.

***** END OF CERTIFICATE *****