Effective date: TBD
Status:PROPOSAL

BUILDING SPECIFICATIONS FOR HULL AND HULL APPENDAGES

INTERNATIONAL ETCHELLS CLASS ASSOCIATION

The Etchells was designed in 1966 by Skip Etchells and was adopted as an International Class in 1974.

sport / nature / technology

World Sailing
Class Association

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INTRODUCTION

The Building Specifications for Hulls and Hull Appendages are provided for the use of Licensed Builders only. They do not govern the use of, or permit the modification of the equipment defined herein. Rules governing the use of, and permitted **modifications** of equipment may be found in the **class rules**.

To ensure the one design, closed class rules, nature of the Etchells is maintained, the International Etchells Class Association provides the following documents to Licensed Builders of International Etchells:

- the **class rules**
- Building Specifications for Hulls and Hull Appendages (this document)
- Plans

When building an International Etchells, Licensed Builders must comply with all requirements in the documents above, and their Licence Agreement.

The Building Specifications and Plans are part of the **class rules**.

The International Etchells Class Association **class rules** are closed class rules: if the **class rules** do not say that you may, then you shall not.

The Building Specifications include references to the Plans.

THE BUILDING SPECIFICATIONS ARE PART OF THE **CLASS RULES**.
ANY DEVIATIONS FROM THE METHODS, MATERIALS, WEIGHTS OR DIMENSIONS CONTAINED HEREIN IS PROHIBITED

Section BS.A — ADMINISTRATION

BS.A.1 DEFINITIONS

(a) Licensed Builder: a boat builder who has a valid Licence Agreement for the construction of the hull and hull appendages of International Etchells.

(b) Licence Agreement: a document executed with World Sailing ("WS"), which may include the International Etchells Class Association ("IECA") as a party, agreed in writing by all parties.

BS.A.2 Changes to this document shall be made in accordance with the IECA Constitution and WS Regulations.

BS.A.3 When a term is printed in "**bold**" the definition in the WS Equipment Rules of Sailing (ERS) applies, except where the term is used in headings.

IMPORTANT NOTICE

It is impossible to mention every suggestion that has been ruled illegal in the past, and to foresee every innovation which may be thought of in the future. Therefore, when considering anything in connection with the boat or its equipment which is not clearly permitted by the class rules, it must be assumed illegal until approval has been obtained from WS through the IECA.

Section BS.B — TOOLING

BS.B.1 MOULDS

(a) Moulds requiring approval, and their respective approval authority, are shown in Table 1. Approval shall be obtained before use for production.

Commented [JMcW1]: Clarifying which items of tooling shall be approved by World Sailing (as advised by the IECA), and which shall be approved by the IECA. This is to clarify any doubts about which items are subject to tight one-design shape control.

Table 1

Tooling Item	Type	Approval Authority
Hull Shell	Mould	WS
Deck	Mould	WS
Covering Board	Mould	WS
Hull	Assembly Jig	WS
Thwart	Mould	WS
Skeg	Mould	WS
Rudder	Mould	WS
Keel Casting	Chill	WS
Hull Stringers	Mould	IECA
Bow Tank Ring Frame	Pattern	IECA
Forward Bulkhead	Pattern	IECA
Forward Bulkhead access cover	Pattern/Mould	IECA
Forward Knees	Pattern	IECA
Intermediate Knees	Pattern	IECA
Aft Knees	Pattern	IECA
Rudder Stock Partition	Pattern/Mould	IECA
Aft Bulkhead	Pattern/Mould	IECA
Aft Bulkhead access cover	Pattern/Mould	IECA

(b) The requirement for approval of moulds exists to ensure the moulding created therein is strictly controlled.

(1) It is prohibited to place material in the mould that modifies the intended shape of the moulding. The only exception is that blocks may be placed on the deck mould to create recesses as permitted in class rule C.7.1(e).

(2) It is prohibited to deform the mould in a way that modifies the intended shape of the moulding.

Commented [JMcW2]: New addition, to prevent any changes to the intended moulded shape.

(c) Moulds and keel chills (moulds):

(1) shall be constructed by builders approved for that purpose by WS and IECA

(2) shall be numbered and have clearly visible individual identification marks

(3) if required to be approved, shall be approved in accordance with World Sailing/IECA Mould Approval Procedures

(4) shall not be modified in any way except that a non-skid surface may be incorporated in any place on the deck or thwart moulds.

BS.B.2 ASSEMBLY JIGS

(a) Assembly jigs shall be constructed by builders approved for that purpose by WS and IECA.

(b) Assembly jigs shall be approved by WS and IECA prior to use.

(c) Assembly jigs shall be numbered and have clearly visible individual identification marks.

(d) Assembly jigs shall not be modified in any way without prior approval of WS and IECA.

(e) It is prohibited to deform the assembly jig in a way that modifies the intended shape of the moulding.

Section BS.C — GENERAL

BS.C.1 DEFINITIONS

(a) Materials: refer to **class rules** Appendix H.1.

(b) Abbreviations used in the Building Specifications:
(1) CSM: E-glass Chopped Strand Mat
(2) GRP: E-glass Reinforced with Polyester Resin
(3) GRV: E-glass Reinforced with Vinylester Resin

BS.C.2 The hull and **hull appendages** shall only be manufactured by Licensed Builders.

BS.C.3 **Modification** of the external shape of the hull and hull appendages is not permitted except for:

(a) fairing of local imperfections inadvertently created in the moulding process, including trimming and fairing of the skeg and rudder mouldings

(b) fairing of the keel/hull join, no more than 150 mm above and 100 mm below the join, following application of the glass tape layup for the join

(c) fairing of the skeg/hull join

(d) **sanding**

Note: ERS definition of sanding: "Removal of the outermost surface through use of an abrasive material with or without a lubricating agent, which does not alter the shape but may remove localised irregularities or textures in the surface. It may include polishing through the use of a cutting compound."

Commented [JMcW3]: Permission is given to licensed builders to enable them to deliver the finished product in the shape intended by the approved moulds. The permission is strictly limited.

BS.C.4 Limitations of 3MKB – 1A Line Plan
This Plan is the original line drawing of an Etchells. Although maintained as part of the **class rules** it is noted and accepted that the current plug ("Plug 2"), and moulds made directly from it, have unintentional variations from this line drawing.

BS.C.5 Everything in the Building Specifications or on the Plans is mandatory unless specifically denoted as recommended ("rec") or optional ("opt"). For anything that is denoted as "rec", the recommendation shall be followed, unless prior approval to use an alternative is received in writing from the IECA.

Commented [JMcW4]: To clarify the concept of "recommended", which is what the designer intended.

BS.C.6 Dimensions and weights with tolerances are mandatory.

BS.C.7 A console or Samson post is optional. Rules covering the console are to be found in the **class rules** and the Plans.

BS.C.8 Floorboards are mandatory but it is not a requirement that they be constructed or installed by a Licensed Builder. Rules covering floorboards are to be found in the **class rules** and the Plans.

BS.C.9 Measurement sections/stations shall be marked permanently in the mould by the Licensed Builder. The marks created in the moulding shall be a circular indent with a diameter of 5 mm and when the boat is completed the gel coat in the indent shall be of a contrasting colour to the hull gelcoat. Marks to be created are shown in Table 2.

Table 2

Section(s)	**Location of Mark (in all cases on the exterior surface of the hull)**
0, 3, and 10	• One mark on the centreline • One mark on the port side, 5 mm below the **sheerline** • One mark on the starboard side, 5 mm below the **sheerline**
6	• One mark 75 mm to port of the centreline • One mark 75 mm to starboard of the centreline • One mark on the port side, 5 mm below the **sheerline** • One mark on the starboard side, 5 mm below the **sheerline**

Section BS.D — HULL

BS.D.1 The hull parts are as shown in this list.

(a) Hull Shell

(b) Bow tank ring frame

(c) Deck

(d) Bulkheads

(e) Thwart

(f) Partition aft of the thwart

(g) Knees

(h) Keelson

BS.D.2 One-Design Fittings

(a) The One-Design Fittings are as shown in this list.

(1) Chainplates

(2) Forestay Fitting

(3) Mast Step

(4) Backstay Fitting

(b) The One Design Fittings are mandatory and shall be fabricated in accordance with the Plans. They shall be installed in the positions described in the Plans. The installation of the One Design Fittings is to be done with extreme care in order to ensure and develop continuity of strength.

(c) It is permitted to use countersunk bolts, in addition to the tabbing specifications shown on the Plans, to install the Forestay Fitting.

Commented [JMcW5]: Additional permission to prevent the forestay fitting ripping out. Has been used previously by builders, but not formally specified.

BS.D.3 The hull shall be fully decked except for the mast spar hole and cockpit openings, and shall have flotation elements comprised of fore and aft tanks formed by bulkheads and the deck.

BS.D.4 Hull layup schedules are as follows and as shown on the Plans.

(a) Hull Shell

(1) The strakes referred to below consist of sheets of fibreglass laid in the mould. The location of the strakes and tolerances are shown on the Plans.

(2) Layup Schedule

(i) Gelcoat

(ii) Strake “a” – 2 plies 450 g/m^2 CSM; 1 ply 610 g/m^2 Woven roving

(iii) Strake "b" – 2 plies 450 g/m^2 CSM; 2 plies 610 g/m^2 Woven roving
(iv) Strake "c" – 3 plies 450 g/m^2 CSM; 3 plies 610 g/m^2 Woven roving
(v) Strake "d" – 4 plies 450 g/m^2 CSM; 4 plies 610 g/m^2 Woven roving
(vi) Transom – 2 plies 450 g/m^2 CSM; 1 ply 610 g/m^2 Woven roving
(vii) Strakes "a", "b", "c", and "d" laminates shall overlap 100 mm ± 25 mm on either side of the centreline of the hull.

(3) The layup schedule, and in particular the resin content, shall be uniformly distributed over the whole of each strake.

(4) Vacuum bagging, or any other method to create a laminate with a lower ratio of resin to fibre than would be achieved in the absence of such method, is prohibited.

Commented [JMcW6]: This is mainly to prevent any egregious lightening of the ends of the boat by sucking out resin or excessive squeegeeing.

(b) Deck – GRP with a balsa core:
(1) Gelcoat
(2) Primary bond or barrier laminate. 1 ply 225 g/m^2
(3) 1 ply 450 g/m^2 CSM.
(4) 12 mm end grain balsa core (outboard edge 75 mm in from deck edge), vacuum bag cure, or equivalent.
(5) 1ply 450 g/m^2 CSM.
(6) 1 ply 610 g/m^2 Woven roving
(7) Additional ply 450 g/m^2 CSM in way of coaming.
(8) Covering board layup schedule (may equal or exceed following schedule):
(i) Primary bond or barrier laminate – 1 ply 225 g/m^2
(ii) 2 plies 450 g/m^2 CSM.
(iii) 1 ply 610 g/m^2 Woven roving

(c) Tank top – GRP:
(1) 1 ply 450 g/m^2 CSM
(2) 1 ply 610 g/m^2 Woven roving

(d) Thwart – GRP:
(1) Gelcoat
(2) 3 plies 450 g/m^2 CSM

BS.D.5 Hull construction compliance

(a) Before **coating** with gelcoat between the bulkheads, an **official measurer** shall check that the hull layup complies with the Building Specifications and the Plans.

Commented [JMcW7]: Insertion of In-Build inspection process, because checking layup compliance after gelcoat painting is almost impossible.

(b) At any time during the life of the boat, the IECA or WS may take further steps to verify that the hull layup complies with the Building Specifications and the Plans.

(c) Verification of compliance may include inspection, ultrasound, core sampling, and other methods. Core sampling shall be of the minimum size required to verify compliance and shall only be taken if no other adequate method of verification is available.

Commented [JMcW8]: Clarification that layup compliance may be inspected at any time in the life of the boat. Strict control of the layup is critical to the One-Design nature of the Etchells.

BS.D.6 Tabbing

(a) For the forward bulkhead and the bow tank ring frame, the tabbing specifications on the Plans shall be used.

(b) For all other bulkheads, knees and other items bonded to the deck and hull, the tabbing specification may be either (1) or (2):

(1) Updated tabbing specifications from November 2007:

(i) a minimum of 580 g/m^2 stitch bonded cloth with ±45° fibre orientation

(ii) a 25 g/m^2 CSM.

(iii) If commercially available a single stitch bonded product of the specified composition and fibre orientation may be used.

(iv) This does not change the length, width or location of any tabbing in the hull or deck shown on the Plans.

(2) The specification for that item as shown on the Plans.

BS.D.7 The recommended microballoon/resin mix to fill in the bilge shall be in the ratio of 4 parts microballoons to 1 part resin by volume.

Commented [JMcW9]: Easier recommendation format (by volume) for builders, agreed through discussions.

BS.D.8 Weights:

(a) Glass Hull weight:

(1) Minimum Glass Hull weight shall be 395 kg. This weight is to be the glass hull with deck attached as it comes from the mould or assembly jig. It shall include microballoon fill in the bilge, deck stiffeners, bow stringers, **skeg** with microballoon fill, glassed-in forestay and backstay fittings, forward and aft bulkheads without access hole covers, bow tank ring frame, chainplates, thwart, knees. (It shall exclude **keel**, keel bolts, keelson, mast step, interior gelcoat, floorboards, Samson post or console, tiller, **rudder**, bulkhead access hole covers and partition aft of thwart).

(2) If the Glass Hull weight is less than 395 kg, Glass Hull **corrector weights** of lead shall be **fastened** and **bonded** in equal amounts by weight to the top of the cockpit side of the forward and aft bulkheads, on the centreline, until the Glass Hull weight plus Glass Hull **corrector weights** is at least 395 kg. The maximum total weight of the Glass Hull **corrector weights** shall be 10 kg.

Commented [JMcW10]: Bilge in-fill added to the definition of Glass Hull, to reduce build costs. Minimum weight increased appropriately, from 380kg to 395kg. No effect on boat construction.
Addition of corrector permission at this stage, again to reduce cost and increase ease of construction compliance.

(b) Bare Hull weight:

(1) Minimum Bare Hull weight shall be 1405 kg. This weight is to be the Glass Hull including Glass Hull **corrector weights**, but with the **keel** attached,

bulkhead access hole covers, interior gelcoat, mast step, keelson, **rudder** and partition aft of the thwart. (It shall exclude floorboards, tiller and tiller extension, Samson post or console, **spars**, **standing rigging** and **running rigging** and associated **fittings**). If the console is installed before the Bare Hull is weighed, the weight of the console shall be recorded by an **official measurer** prior to installation.

(2) If the Bare Hull weight is less than 1405 kg, Bare Hull **corrector weights** of lead shall be **fastened** and **bonded** in equal amounts by weight to the top of the cockpit side of the forward and aft bulkheads, on the centreline, until the Bare Hull weight plus Bare Hull **corrector weights** is at least 1405 kg. The maximum total weight of the Bare Hull **corrector weights** shall be 10 kg.

Commented [JMcW11]: Permission added to install Console before hull is taken out of mould, to reduce build costs.
Addition of corrector permission at this stage, again to reduce cost and increase ease of construction compliance.

(c) The following weights shall be recorded by an **official measurer**:

(1) Glass Hull weight

(2) Glass Hull **corrector weights**

(3) Bare Hull weight

(4) Bare hull **corrector weights**

(d) Complete Boat **corrector weights** are covered in **class rules** Section C

BS.D.9 The Licensed Builder shall follow procedures and standards which ensure strict control of the one-design shape and shall assemble the parts in accordance with the **class rules**.

BS.D.10 Local reinforcement, as shown on the Plans, is permitted at points of stress concentration or high loadings. Such reinforcement shall not affect the strength or rigidity of the hull and/or deck except where permitted in the **class rules**.

BS.D.11 The attachment of the deck to the hull shell shall follow the methods shown on the Plans. Other methods for joining the deck to the hull require approval of WS through the IECA.

BS.D.12 The WS Building Plaque number shall be cut into keelson or moulded into the hull in the bilge area.

BS.D.13 Between the forward and aft bulkheads, the inside surface of the hull, bulkheads and underside of deck shall be **coated** with gelcoat.

BS.D.14 The hull shell shall have the deck with stiffeners, hull stringers, **skeg** with microballoon fill, glassed in Forestay and Backstay Fittings, forward and aft bulkheads without access hole covers, chainplates, thwart and knees and may have the console fitted before the **hull** is removed from the mould.

BS.D.15 The bulkheads and deck above the compartment formed by their installation are an important safety feature of the boat. **Particular care is required to ensure their effectiveness at keeping the air in and the water out.**

BS.D.16 The forward end of the Mast Step shall be aft of and within 30 mm of the forward bulkhead. The Mast Step as shown in the Plans shall be shortened at the forward end if necessary to fit aft of the forward bulkhead. The Mast Step Layup Schedule, as shown in the Plans, applies all the way forward to the forward bulkhead.

Commented [JMcW12]: Formalisation of previous technical memo about Mast Step and forward bulkhead.

BS.D.17 Dimensions

	Min (mm)	Max (mm)
Hull/Keel Thickness as measured by the Garboard Measurement Tool. Garboard Measurement Point ("GMP") is 3786 mm measured forward from the HDP following the hull shape, and 75 mm from hull centreline port and starboard.		
300 mm forward of GMP	74	83
750 mm forward of GMP	142	151
1200 mm forward of GMP	118	127
1300 mm forward of GMP	82	91
Distance of Hull/Keel trailing edge forward of GMP	106	138
Distance of Hull/Keel from Hull/Keel Leading Edge Profile Template	-3	5
Hull/Skeg fillet radius forward of a point 100 mm forward of the centre of the rudder shaft at the hull	6	
Hull/transom corner radius	3	
Beam of hull, excluding rubbing strakes and **fittings**, at **sheerline** at section 6	2105	2125
Cockpit width at section 6	930	960
Distance of **hull** from templates at sections 0, 3, 6 & 10	0	14
Vertical distance from baseline to:		
Forward Measurement Point	1260	1290
hull datum point	660	685
Vertical distance from baseline to underside of hull shell at:		
Section 3	155	175
Section 6 – 75 mm out from centreline	135	160
Rudder Reference Mark	385	410

Commented [JMcW13]: New baseline measurement designed to prevent modification (speed-shopping) to close the gap between the hull and the top of the rudder.

Section BS.E — KEEL

BS.E.1 The lead blank shall be cast in a chill (mould) supplied by IECA to an approved foundry; both the chill and foundry shall be approved by IECA and WS prior to commencement of production.

BS.E.2 The lead blank shall be made of lead with a maximum of 3% antimony.

BS.E.3 10 solid 16 mm diameter [316] stainless steel keel bolts shall be fitted at the foundry.

BS.E.4 The **keel** shall have a constant horizontal section before and after any **coatings** are applied.

BS.E.5 The **keel** before **coating** shall have a constant vertical section at the trailing edge, and at three stations approximately 343 mm, 686 mm and 1229 mm forward of the trailing edge. Allowance to be made for the lip in the moulding for filler towards to top.

BS.E.6 Paint, filler, GRP or GRV may be used to **coat** the **keel.**

BS.E.7 Two lifting eyes shall be fitted to keel bolts. The design of the lifting eyes is optional. Materials used shall be from those permitted in **class rules** Appendix H.1.

BS.E.8 The WS Building Plaque number shall be stamped on the **keel**.

BS.E.9 The weight of the **keel** including keel bolts but excluding **coatings** shall be:

minimum	maximum
953 kg	965 kg

BS.E.10 Keel shape

(a) Before **coating** the lead of the raw **keel**, the lead shall be ground to achieve a uniform cross section from top to bottom so that the lead is evenly distributed. This can be confirmed by:

(1) Placing a straight-edge from top to bottom of the keel lead parallel to the leading edge, at different distances along the chord. This will highlight any material convexity or concavity in the lead, which is prohibited

(2) Using the keel template to confirm that the cross-section of the keel lead doesn't broaden or narrow from top to bottom

(3) Immediately prior to **coating**, the weight of the **keel** and keel bolts will be recorded by an **official measurer**

(4) After **coating,** the **keel** shall have a constant shape both horizontally and vertically. Application of the template shall be used to confirm this.

BS.E.11 Dimensions

	Min	Max
With leading edge at 54.2° to horizontal, Station 0 above Station 10	20 mm	50 mm

Section BS.F — RUDDER

BS.F.1 The **rudder** shall be made in a mould approved by IECA and WS.

BS.F.2 The rudder stock and its tangs shall be manufactured of solid 316 stainless steel or bronze to the dimensions on the Plans.

BS.F.3 The rudder blade shall be of GRP **coated** with gelcoat, and any internal void shall be filled with a microballoon/resin mix.

BS.F.4 **Rudder** layup schedule:

(a) Gelcoat

(b) Primary bond or barrier laminate – 1 ply 225 g/m^2 CSM

(c) 1 ply 450 g/m^2 CSM may be substituted for the 225 g/m^2 CSM

(d) 2 plies 450 g/m^2 CSM (1 ply of 610 g/m^2 Woven roving may be substituted for 1 ply 450 g/m^2 CSM

BS.F.5 The design of the rudder head is optional: materials used shall be Standard Materials as defined in **class rules** H.1.

BS.F.6 Dimensions

	Min	Max
Minor local concavities in surface of **rudder**		1.5 mm
A straight edge applied to the surface of the **rudder** in any direction shall show no systematic concavities, except in the areas immediately adjacent to the rudder stock		

Section BS.G — SKEG

BS.G.1 The **skeg** shall be made in a mould approved by World Sailing.

BS.G.2 The **skeg** shall be of GRP **coated** with gelcoat, and any internal void shall be filled with a microballoon/resin mix.

BS.G.3 **Skeg** layup schedule:

(a) Gelcoat

(b) Primary bond or barrier laminate – 1 ply 225 g/m^2 CSM.

(c) 1 ply 450 g/m^2 CSM may be substituted for the 225 g/m^2 CSM

(d) 2 plies 450 g/m^2 CSM (1 ply of 610 g/m^2 Woven roving may be substituted for 1 ply 450 g/m^2 CSM)

BS.G.4 Dimensions

	Min	Max
Minor local concavities in surface of **skeg**		1.5 mm
A straight edge applied to the surface of the **skeg** in any direction shall show no systematic concavities, except in the areas immediately adjacent to the rudder stock, hull and leading edge.		