BCC 116

ZYGOTE

Bristol Channel Cutter Information Book 4-1

Haul-out and Blocking

Haul-out

Prepare:

- clean the fenders and stow (do not hang fenders in the straddle crane bay to avoid fouling the slings – fend off with a boat hook or use a roving fender);
- remove and stow the shore power lead;
- revise the procedures for entering the straddle crane bay and the preferred locations for the lifting slings; and
- discuss procedures with the straddle crane crew.
- organise on deck:
    - two ropes, long enough to be tied around the forward slings and taken back to the primary sheet winches;
    - a winch handle; and
    - a boat hook, for fending off in the straddle crane bay;
- close all seacocks (other than the engine seacock if motoring to the straddle crane bay), ready for power wash of the hull;
- close exhaust cocks (other than the engine exhaust, if motoring to the straddle crane bay);
- plug heater exhaust; and
- turn off the LPG cylinder.
- organise for the wash-down bay and/or the work pen or hard stand:
    - scrapers; and
    - small hammer with nylon head.
- revise the procedures for blocking and supporting the boat; and
- discuss those procedures with the blocking crew.

Marine Railway/Patent Slip

Cradles equal to or longer than 3.79 metres (12 ft 6 inches) in length can support the hull from Bulkhead 3 to Bulkhead 6. See Image 4.

Straddle Crane

Small straddle cranes (with capacity of 40 tonnes or less) cannot accommodate the headstay if a BCC enters bow-first, so either enter stern-first into the straddle crane bay or remove the headstay from the cranse iron.

Larger straddle cranes can accommodate the bowsprit and headstay if the BCC enters bow first.

Note that most operators of straddle cranes will not allow a boat to operate a propeller over the slings. That means:

- entering bow-first and exiting stern first if under own engine power; or
- entering stern first using a tug (pushing hip tow, with the tug on a bow).

See below for notes on removing the headstay from the cranse iron.

Sling locations

Forward Sling

The **forward sling** should be placed at Bulkhead 3, the fo'c'sle/accommodation (or forepeak/accommodation) bulkhead. Bulkhead 3 is 3.06 metres (10') aft of the forward face of the stem post.

The external markers for Bulkhead 3 are the two forward chainplates. The bulkhead is between the first and second chainplates and 200 mm (8") forward of the fore face of the mast.

The forward sling needs to remain aft of and clear of *Zygote*'s forward-looking sonar transducer, which is 735 mm (29") forward of the fore face of the mast. The forward sling will be aft of the sonar transducer if the forward edge of the sling is not forward of the first chainplate. Make sure that forward sling is more-or-less vertical, so that it is not forward of the forward chainplate as it turns around the keel.

Aft Sling

The **aft sling** should be located at Bulkhead 6, the accommodation/engine room bulkhead. Bulkhead 6 is 6.858 metres (22' 6") aft of the forward face of the stem post.

Lifeline Stanchion 5 and the primary sheet winches are convenient external markers.

The distance between Bulkhead 3 and Bulkhead 6 is 3.797 m (149.5" or 12' 4.5").

See below for notes on the bulkheads and locating them by external markers.

Sling preventers

Tie a rope to each of the forward slings with a bowline, bring it aft to the primary sheet winch (running inside the lifelines from the gate aft), winch taut (really taut), and cleat, to prevent the forward sling slipping on hull slime.

The straddle crane crew may choose to tie a rope from the forward sling to the aft sling to stop the forward sling slipping on the keel. The straddle crane crew may choose to do that when the keel has been lifted clear of the water.

Image 1. 2022 lift at Scarborough Marina, with slings lashed together.

Image 2. 2011, at Scarborough Marina, QLD. Steve Kviklys driving a 35 tonne Marine Travelift and preparing to re-launch *Zygote*. Forward sling at Bulkhead 3 between Chainplates 1 and 2; Aft sling at Bulkhead 6.

Prepare for pressure wash

Before pressure washing the hull, close all seacocks.

If seacocks are left open, water will blast into the cabin (via the through-hull draining the galley sink), the head (filling up the bowl of the marine toilet), the cockpit (through the cockpit drains), and push debris into hoses carrying raw water to the water strainers of the engine and genset.

Blocking

Keel blocks

Rules of thumb for keel blocks include:

- one keel block stack for every 3 metres (10 ft) of length on deck (L_{OD});
- use blocks around 200 x 100 x 460 mm (8" x 4" x 18"); and
- aim for stacks of one or two blocks, with shims, and not higher.

As many as four keel block stacks or as few as three block stacks can be used to support the mass of a BCC.

Three-stack blocking generally means:

- a central block stack under or very close to the plate of the Longitudinal Centre of Gravity (LCG) to support the mass of the BCC hull; and
- fore and aft block stacks or supports to prevent rocking.

Four-stack blocking means:

- two stacks straddling the LCG, to support the mass and prevent rocking; and
- a bow support and stern stack to prevent rocking and support the mass.

Central keel block stack

For a 3-stack blocking, the crucial central **keel block** stack should be placed under the encapsulated ballast, roughly on the plane of the Longitudinal Centre of Gravity (LCG).

The external marker of the approximate plane of the LCG on *Zygote* is the point midway between Lifeline Stanchion 3 (the forward stanchion of the lifeline gate) and the midships hawse hole.

The plane of the LCG is close to Bulwark Stanchion 8, the wooden Bulwark Stanchion forward of the midships hawse hole. From any position lower than deck level, Bulwark Stanchion 8 is not easily visible. It is roughly midway between Lifeline Stanchion 3 and the hawse hole.

The LCG shifts forward and aft with changes in stowage, including the quantity of fuel and water in the tanks and whether sails are furled in place or bagged and stowed below. Expect movement of the LCG in the order of 30 mm (1.2 inches) fore and aft.

A BCC theoretically will stand, balanced, on just the keel block under the LCG.

Aft keel block stack

An aft **block** stack can be placed under the deep keel where no lead ballast is present (i.e. aft of the seacocks supplying raw water to the auxiliary engine and genset), to support the boat and prevent rocking fore and aft.

Forward keel block stack or bow keel stand

A forward **keel block** stack or a **bow keel stand** can be placed forward of the LCG block for support and to prevent rocking fore and aft.

Four-stack blocking

If you choose to use four keel blocks, place two under the lead ballast such that the LCG is between them (see Images 4 and 5). The general guide is to place one block directly under the mast step and the other close to the aft end of the lead ballast. Detect the transition from lead ballast to deep bilge by tapping the hull; the transition is about 30 cm (12") forward of the seacocks serving the engine and genset.

Adjust the relative heights of keel blocks and stands to make the waterline horizontal. Use a minimum number of wooden shims (e.g. plywood squares).

Do not overly raise the height of the forward keel block or keel stand, including by aggressively driving in a wedge. Doing so will lever the fore-body up, creating a bending moment that sags the keel (bending the stern and stem upwards relative to midships). The forward keel stand or keel block is only to stop the boat rocking fore and aft, not to take weight.

Lateral supports

Lateral supports do not support the mass of the boat. They only keep the boat level athwartships and resist wind loads.

The rule of thumb is one lateral support, on each side, for every 2.4 – 3 metres (8 - 10 ft) of L_{OD}. High wind loads and standing exposed to wind require additional lateral support. Lateral supports should be fixed in place so they cannot move away from the hull. Chaining port and starboard lateral supports together is a usual technique.

Three lateral supports a side – the two verticals of a box cradle and a Brownell boat stand (or tripod stand) – are usual for *Zygote* in an enclosed work pen.

The shaft of a tripod stand should be more-or-less at a perpendicular to the hull where the pad of the stand makes contact. Locating tripod stand pads at bulkhead locations prevents point loading of otherwise unsupported hull panels. Tripod stands should not be used as jacks to raise the boat.

Without a cradle, lateral support stands can be placed against chainplates.

Lateral support can also be provided by running a structural timber, such as a 100 x 50 mm (4 x 2") beam, through the midships hawse holes so the timbers rest on the midships cleats. The beam can be lashed to the midships cleat for additional security. Jackstands under the outboard ends of the two structural timbers can then be used to maintain the boat standing in a level condition.

Moving blocks and stands

When necessary, ask the yard crew to move bow stands and tripod stands to allow parts of the hull obscured by the stand pads to be scraped, sanded, and coated.

Keel blocks can be moved after the boat is temporarily lifted by straddle crane.

Prices of re-blocking are usually prohibitive. One alternative is to place a new keel block beside an existing load-bearing block, then to drive wedges in from port and starboard between the new block and the hull to lift the boat temporarily, allowing the original keel block to be removed.

Bulkheads and Ballast

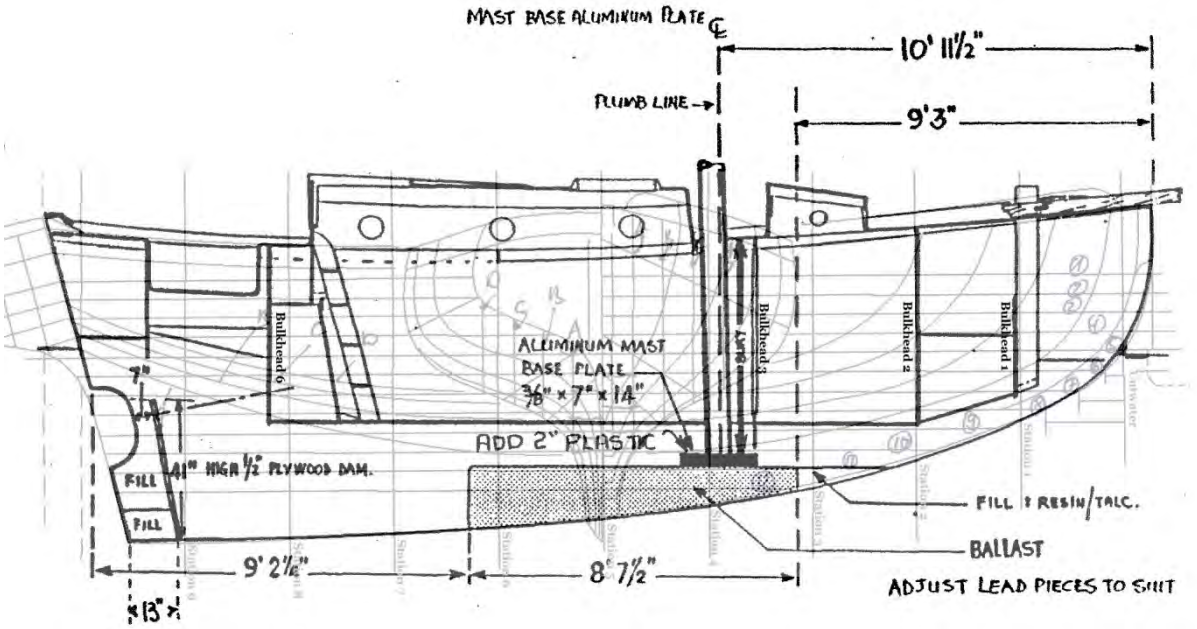

Image 3. Bristol Channel Cutter profile, showing main bulkheads (1, 2, 3, 6, and 7), ballast, and filled voids. The lines (profile plan and body plan) showing numbered stations, all in grey, underlay the profile.

Two or three regions of the hull are voids filled with mish-mash or bog: the deadwood below the propeller shaft dam; and a small region of keel forward of the mast. These two regions, when tapped, sound solid. The fill diminishes point loading of the hull but it contributes little additional strength. Voids filled with mish-mash are not significantly stronger than the hollow bilge sump.

Bulkheads 1 – 6 are of 0.75 inch (19 mm) solid marine-grade fir plywood. Bulkhead 7 is 0.5 inch (12.7 mm) solid marine-grade fir plywood. None of the bulkheads is watertight.

Bulkhead 1 (hawser bin/sail bin & chain locker) is a partial bulkhead supporting the bows and the two bitts. The forward faces of the two bitts (Samson posts) are the external markers.

Bulkhead 1 is at Station 1, one tenth of the Design Water Line (DWL) aft of the cutwater or Forward Perpendicular.

Bulkheads 2 – 4 provide support in the Station 2 – Station 6 zone (20% - 60% of DWL aft of the cutwater) that bears the major slamming and rigging loads on the hull.

Bulkhead 2 (sail bin with anchor windlass above and holding tank and chain locker below/fo'c'sle) is a full bulkhead with a small cut-out that gives access forward to the sail bin and chainlocker. The external markers are the forward ends of the turnbuckles tensioning the bowsprit shrouds.

Bulkhead 2 supports the foredeck and the hull, including loads from the bowsprit shrouds.

Bulkhead 2 is at Station 2, 20% of DWL aft of the Forward Perpendicular.

Bulkhead 3 (fo'c'sle/accommodation) is a full bulkhead with a cut-out that gives access from the saloon or accommodation compartment forward to the fo'c'sle and the rest of the forepeak. The bulkhead is between Chainplates 1 (forward lower shrouds) and Chainplates 2 (cap shrouds), which together mark the bulkhead externally.

Bulkhead 3 supplies main support to the foredeck and the mast partners, the side decks, and the hull including the loads from the forward lower and cap shrouds.

Bulkhead 3 is about 36% of the DWL aft of the cutwater, between Stations 3 and 4.

The centreline of the mast step is at Station 4 (40% of the DWL aft of the cutwater).

Station 5 marks Midships, 50% of the DWL aft of the cutwater.

Bulkhead 4 is a partial bulkhead supporting the hull and side decks (including loads from the midship deck cleats). On port it divides accommodation/galley. On starboard it divides accommodation/radio shack with the Icebox below. The external markers are Portlights 2.

Bulkhead 4 is 60% of the DWL aft of the Forward Perpendicular, at Station 6.

Bulkhead 5 is a partial bulkhead supporting the hull and side deck only on starboard. It divides the radio shack with icebox below from the wet hanging locker and starboard battery bank. Bulkhead 5 is at Station 7, 70% of the DWL aft of the Forward Perpendicular.

Bulkhead 6 is a full bulkhead supporting the bridge deck, side decks including the loads from the primary sheet winches, and hull. It has a cut out allowing access from the cabin aft to the engine room. Bulkhead 6 divides the cabin (galley to port, wet hanging locker and starboard battery bank to starboard) from the engine room and cockpit lockers.

Bulkhead 6 is at about 83% of the DWL aft of the Forward Perpendicular, just aft of Station 8. The external markers are Lifeline Stanchion 5 and the primary sheet winches.

Bulkhead 7 is a full bulkhead supporting the poop deck, including the stern quarter cleats and loads from the boomkin, and the topsides. Bulkhead 7 only extends above the propeller aperture; it does not extend to the keel. The bulkhead divides engine room/lazarette.

Bulkhead 7 is at about 95% of the DWL aft of the cutwater.

Other reference points

Easy reference points for a BCC include:

- midships, the midpoint of the Design Waterline (DWL), half-way between the Forward Perpendicular or Cutwater and the Aft Perpendicular. On *Zygote*, midships is at the outboard corner of the bevelled aft face of the channels. Midships is 4239 mm (13 ft 10.9 inches) aft of the forward face of the stem and 4.0 metres (13 ft 1.5 inches) aft of the Forward Perpendicular, which is 239 mm (9.4 inches) aft of the fore face of the stem.
- middeck, the midpoint of Length on Deck (L_{OD}). On *Zygote*, middeck is where the bevelled aft faces of the channels (the chain wales, the timbers that extend the

chainplates outboard) meet the rub rail. Middeck is 4280 mm (14 ft 0.5 inch) aft of the forward face of the stem;

- LCG for a standard BCC is around 4420 mm (14 ft 6 inches) aft of the Forward Perpendicular and 4658 mm (15 ft 3 inches) aft of the forward face of the stem.

Blocking examples

Image 4. 2000. Sam L. Morse Co. boatyard at Costa Mesa, CA, with Denny of Joule Yacht Transport, and master shipwrights Dick McComb and Tommie Whisler of Sam L Morse Co.: 4-leg box cradle with two jack stands (for extra stability on the lowboy towed by a Freightliner, which reached a top speed of 38 mph without the boat shifting position) and strap ties. The box cradle has its legs close to Bulkheads 3 and 6. The jack stands are at Bulkhead 4. The cradle legs were 6 x 6 inches; the legs were 12 ft 6 inches apart, centre to-centre.

Image 5. 2005. Inside the paint shed at Wavemaster, Langkawi, Malaysia: Four keel blocks and six tripod stands (not chained together athwartships!). Block 1 is under Bulkhead 2. The LCG is midway between Blocks 2 and 3. Block 4 is under a void filled with mish-mash. Tripod stands 1, 2, and 3 are at Bulkheads 3, 4, and 6.

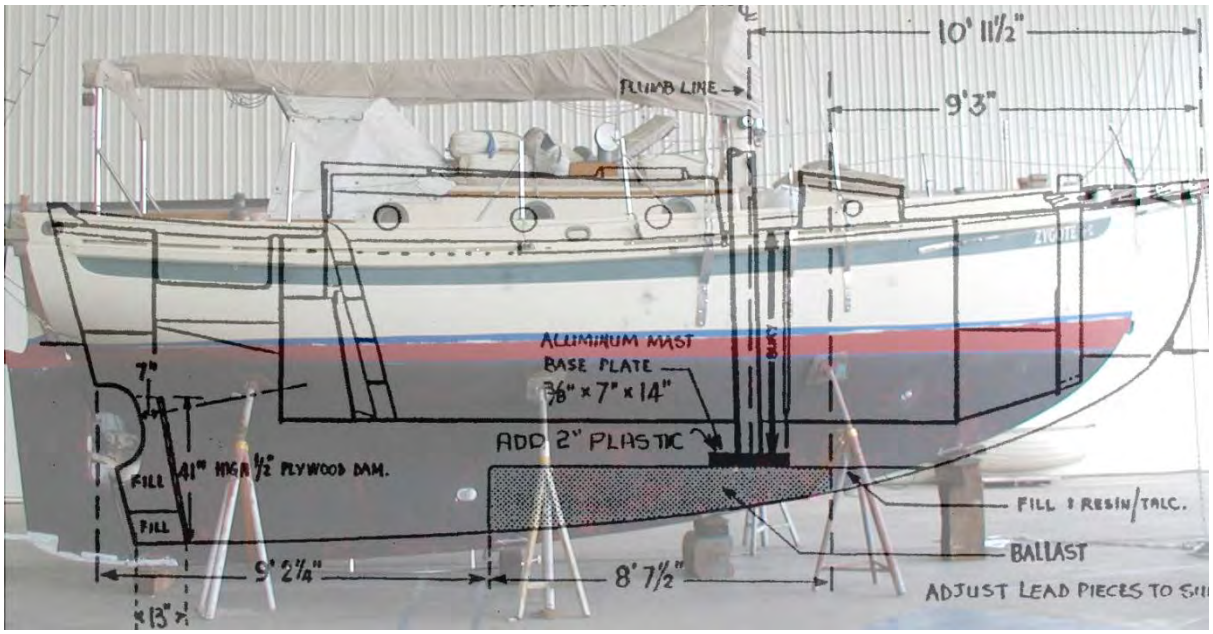

Image 6. Boat photo with overlay of structural profile (note unavoidable lack of registration between the profile drawing in isometric projection and the photographic image in perspective).

Removing the headstay from the cranse iron

For most sloop rigs, the tip of the mast will move forward easily when backstay tension is reduced.

The cutter rig of *Zygote* holds the mast quite firmly, so reducing backstay tension is not usually enough to reduce tension in the headstay to allow the clevis pin to be withdrawn. So in addition to reducing backstay tension you may need to reduce tension in the lower aft shrouds and the intermediate shrouds.

Removing the headstay from the cranse iron can be done relatively easily when the boat is bow-first in a dock, with crew standing on the dock besides the cranse iron.

Evolution:

- Use masking tape to mark the backstay turnbuckle location;
- Remove the split pins from the backstay;
- Reduce tension in the backstay and lower aft shrouds;
- Run the jib halyard to the cranse iron. If a roller-furler drum is present, the halyard cannot be shackled directly to the cranse iron. The workaround is to make a sling of line or webbing around the bowsprit and shackle the halyard to the sling. Tension the halyard to remove all strain from the clevis pin.
- Remove the split pin from the headstay clevis pin;
- Withdraw the clevis pin;
- Move the headstay and roller furler drum aft and lash against a stanchion;
- Leave the jib halyard in tension, to stabilise the mast and bowsprit, until just before entering the straddle crane bay;
- At the straddle crane, remove the halyard; and
- After the boat has been blocked on the hard, re-tension the halyard to stabilise the mast and bowsprit.

Yard Ladder

Set a yard ladder at the lifeline gate, to avoid having to climb over the lifelines and so Stanchions 3 and 5 are available as safety holds.

Check that the ladder legs are on stable and level ground. Use plywood squares to provide support on soft surfaces.

The safe angle for a ladder is 76°. The ladder then forms a right triangle with sides in the ratio of 1:4 (horizontal base: vertical height). Use the NIOSH Ladder Safety app on a smartphone, holding the smartphone against a side rail of the ladder, to check the angle.

Lash the top of the ladder to the mid-ships cleat: make a cow hitch to the appropriate rung of the ladder, lead the rope ends through the mid-ships hawse-hole, and hitch to the cleat.

Maintain three points of contact with the ladder: one hand and two feet, or two hands and one foot.

Re-launch

Employing a preventer on the forward sling and lashing together fore and aft slings are not critical when lifting after applying fresh antifoul. The friction between dry fresh antifouling and dry slings is higher than the friction between straddle crane slings and a wet hull with a biological coating.

A risk-averse straddle crane crew might nevertheless choose to lash together the slings.

Image 7. 2022. Lashing between fore and aft slings at Scarborough Marina, QLD, just prior to relaunch.

Before departing the straddle crane slings:

1. Prime the PYI Packless Sealing System shaft seal by pushing aft on the bellows to compress them and allow water pressure to purge air trapped in the bellows and stern tube. Release the bellows after water runs freely from the gap.
2. Open seacocks and check for leaks.
3. After opening the port side deep bilge seacock and starting the engine, check the flow of cooling water coming from the exhaust.