

TECHNICAL BULLETIN

No. 632C

Chockfast®

Installation Guidelines for Sterntubes

CHOCKFAST Installation Guidelines for Sterntubes

INTRODUCTION

The guidelines contained in this bulletin are provided as an aid to marine designers, shipyards and ship owners who are using CHOCKFAST to secure main bearings into a ship's structure. Several design suggestions are presented, as well as a general installation procedure.

This guide may be followed, modified, or rejected by designers, owners, or shipyards since they — and not CHOCKFAST (ITW Philadelphia Resins) — are responsible for proper design, planning and execution.

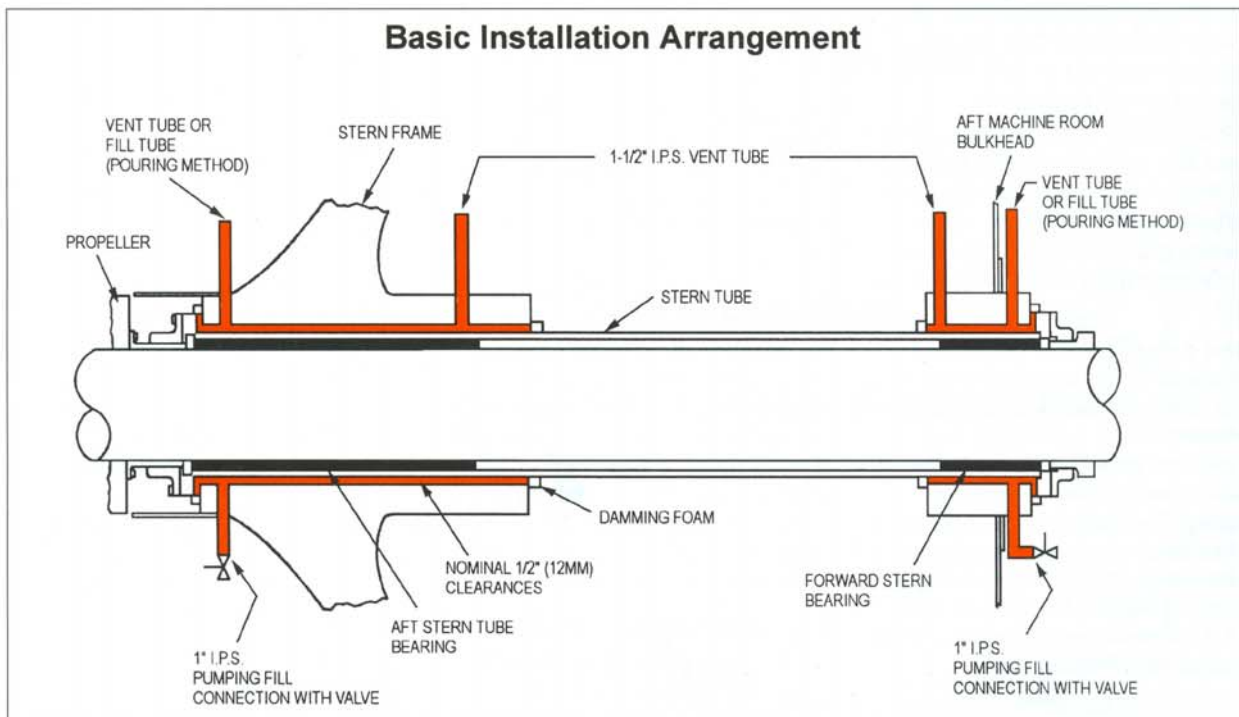
When the planned procedures differ from those discussed herein, the user is urged to contact the local CHOCKFAST Distributor or ITW Philadelphia Resins to discuss alternative methods.

GENERAL

Installation of sterntube bearings using traditional methods of interference fitting can be a labor-intensive and time-consuming job. Boring bars and hydraulic jacks are difficult to set up and operate, and any resulting alignment errors are difficult to correct.

The use of pourable epoxy chocking compounds to install sterntube bearings is a technique which has been in existence since 1979 and has been used worldwide. Basically the bearing, supported on jacking screws, is aligned inside the stern frame which has previously been bored oversize.

The annular clearance provides for flexibility in positioning the bearing for alignment purposes. Once the bearing is positioned, the annular area is dammed forward and aft, and then filled with liquid epoxy which is either poured or pumped into the space. After the epoxy cures, the bearing is



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“captured” (encapsulated) in the bore with virtually 100% surface contact.

INITIAL DESIGN

Oil-Lubricated Bearings

In a typical design, the sterntube bearing is press-fitted into a bearing sleeve while in the machine shop. The sleeve is flanged on the aft end to facilitate bolting to the stern boss after installation on the ship. For designs incorporating forward and aft sterntube bearings, the sleeve can be one piece with a bearing installed in each end. In this case, the inboard flange is of a slip-on design which is welded, after insertion through the sterntube bore.

The bore through the stern frame is typically designed to have a diameter 25mm (1 inch) larger than the bearing sleeve(s). This provides a nominal 12mm (1/2 inch) annular gap which will be filled with CHOCKFAST after alignment. This gap size is recommended because it allows for a reasonable range of adjustment for alignment, while avoiding the possibility of a thick resin pour if the radial gap is eccentric.

The surface finish of the outside diameter of the sleeve(s) is not critical, since the sleeve is not usually intended to be removable. It is, however, advisable not to deliberately interlock sleeves into the epoxy. Sterntube bearing assemblies which are intended to be removable should have a surface finish of N9 (6.3 Ra microns, 250 CLA micro-inches) or better, and be coated with Release Agent.

Fill and vent connections must be provided. Usually these are specially drilled holes, but sometimes access can be made into the end of the annular gap. Installations where

the epoxy will be poured, should have the filling connection on the top at the low end. Installations where the resin will be pumped, should have a valved connection at the bottom.

Alignment of the sterntube is usually achieved with the aid of radial jacking screws. It is not always necessary to drill through the stern casting from the outside; sometimes external screws acting on the flange can be used. Three or four alignment screws are needed at each end.

Water-Lubricated Bearings

Water-lubricated bearings can be installed in one of three different ways: (1) using CHOCKFAST to bond the bearing in place by pouring directly around the bearing after it has been properly positioned; (2) pouring around a dummy bearing which is subsequently removed and the operating bearing is interference fitted; (3) or installing the bearing in a sleeve or sterntube which is positioned in the ship and the CHOCKFAST poured around it.

Synthetic bearing manufacturers are primarily concerned with the heat produced by the epoxy as it cures, and any negative effects it may have on the bearing. As a result, a 1/2 inch annular gap is recommended between the bearing or sleeve surface and the I.D. of the bearing bore. This will provide an ample range of adjustment for alignment purposes and limit the heat generated by the epoxy.

INSTALLATION PROCEDURE

1. The stern casting should not be drilled for the flange bolts (if they are required) until after the CHOCKFAST work is complete.
2. Provide filling and vent connections by drilling, as necessary.

3. Provide means of aligning the sterntube or bearing in the bore. The preferred method for doing this is by installing jacking bolts (alignment screws). The alignment screws can often be arranged to act on the flange, thus avoiding drilling the stern frame casting.

4. Thoroughly clean the bore of the stern frame and the outside diameter of the sterntube or bearing (*See Cleaning Note*).

5. If the initial design requires removal of a dummy bearing or has provision for future removal of the sterntube bearing assembly, spray the outer surface with Release Agent.

6. If the bearing is oil-lubricated, seal any oil connections which can be plugged by the epoxy. (It is often convenient to use soluble plugs of foamed polystyrene. These can be dissolved out later with acetone.)

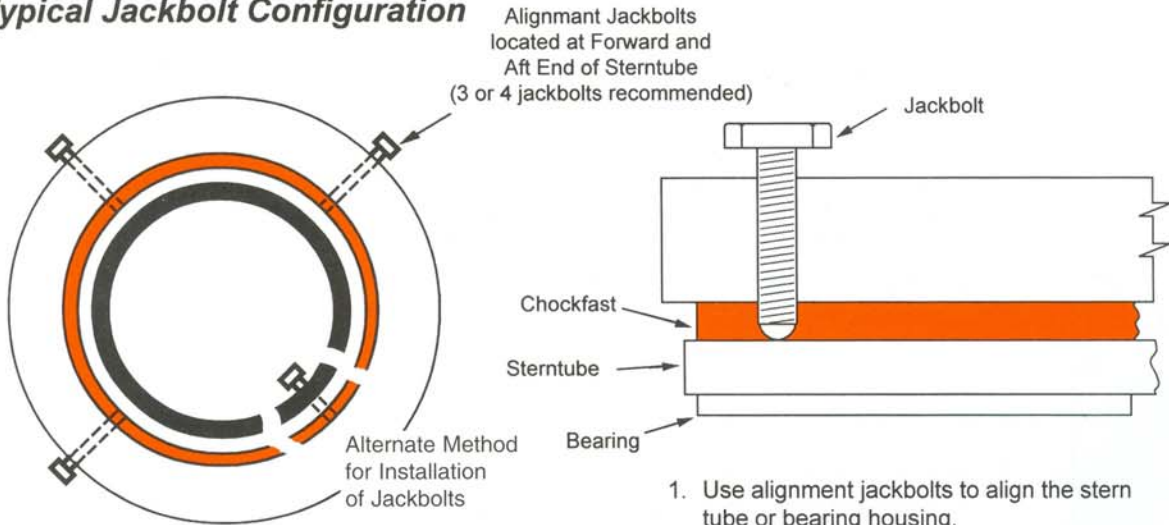
7. Install and align the bearing or sterntube assembly.

8. Fit the damming foam, making sure it is adequately strong to withstand the pressure of liquid epoxy. If the damming foam is intended as part of the primary sealing arrangement, closed cell foam should be used. If the foam is to be removed, and other means of sealing installed, use open-cell foam to permit additional air venting. At the flange end, it is usual to use a metal strip sealed and reinforced with epoxy paste. If there are flange bolt holes, plug them with greased wood or “Armorflex”.

9. Fit riser pipes to the vents, about 38mm (1-1/2 inch) inside diameter and 250mm (10 inch) high.

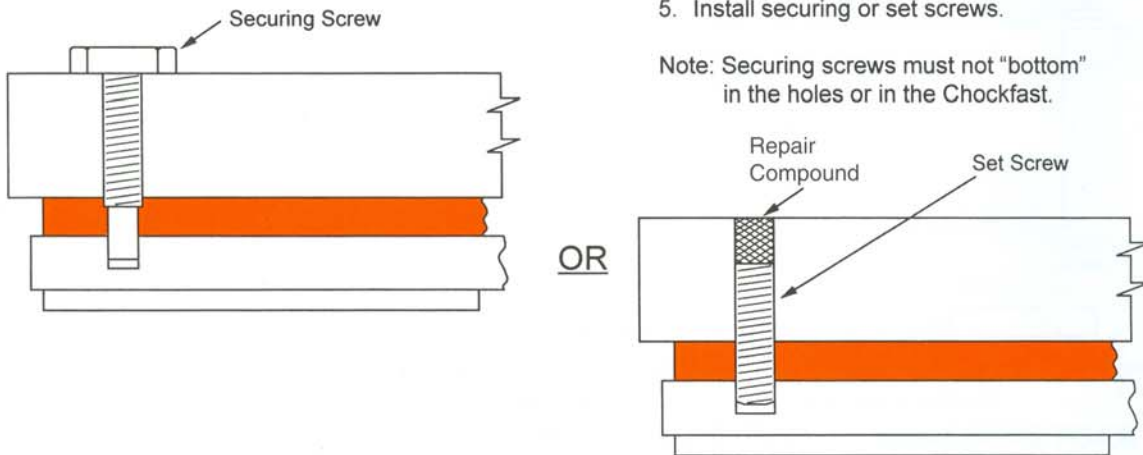
Suggested Method of Securing Bearing from Axial and Rotational Movement

Typical Jackbolt Configuration



1. Use alignment jackbolts to align the stern tube or bearing housing.
2. Cast the Chockfast and allow to cure.
3. Remove jackbolts.
4. Drill into stern tube or bearing housing.
5. Install securing or set screws.

Note: Securing screws must not "bottom" in the holes or in the Chockfast.



10. If the sterntube area is exposed to the weather, a canopy or tent arrangement should be erected for protection. If ambient temperatures will be below 13°C (55°F), heated air should be blown into the area and the temperature allowed to rise for 24 hours minimum.

11. Fill the cavity with CHOCKFAST*. This can be done in one of two ways.

□ *By pumping* — the filling connection should be made at the lowest point of the cavity, typically the bottom of the aft end. The pump is connected using approximately 25mm (1 inch) inside diameter flexible hose and a disposable valve, mounted right at the sterntube. The pump should be a positive displacement type with a pumping rate of approximately 1 liter/minute (0.25

gpm) and equipped with a discharge pressure gauge to monitor back-pressure in the hose.

If using 6.8 kg CHOCKFAST units, mix the first unit and stand the pump in the can. If using 3.4 kg units, the pump should be stood in a can similar to that of a 6.8 kg unit, and the mixed units poured into it.

Start pumping. Add mixed CHOCK-

*When mixing Chockfast Orange for sterntube applications, always use full hardener reduction. See instructions packed with material.

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FAST units to the can in which the pump stands, as required. Do not move the pump from can to can. Keep count of the units used, and as the total approaches the required quantity, slow the pumping rate to avoid over-pressurizing the resin cavity.

□ *By pouring* — the pouring connection should be on the top of the low end (usually aft) of the cavity. The filling connection should be equipped with a funnel and made from 36mm (1-1/2 inch) inside diameter pipe, 250mm (10 inches) long to provide some head pressure.

Pour the CHOCKFAST at a high enough rate to keep the level up in the fill funnel. This will help to avoid trapping slugs of air in the pipe.

12. The CHOCKFAST should be allowed to rise in the vents until they are full. If pumping, close the valve and disconnect the tubing. If the pump will not be *immediately* used again, clean it.

13. Monitor the level in the fill and vent pipes and top up, if necessary as the resin gels.

14. Allow the resin to solidify.

15. Remove any temporary damming and the filling and vent tubes. Clear any oil connections that were plugged. Remove any plugs in the flange bolt holes.

16. The alignment screws may be removed and replaced with set screws to assist in locking the sterntube or bearing in place, if desired. (If this is done, a drawing in the ship's file should indicate the fact.) *See Illustration.*

17. Exposed edges of CHOCKFAST should be coated with a sealing compound such as Repair Compound or PHILLYBOND Orange.

TESTING:

Make Certain There Are No Leaks

Serntube assemblies are normally required to be leak-tight. In order to ensure no leaks after the CHOCKFAST has been installed and allowed to cure, an air test should be conducted. This test should be done prior to installing the propeller shafting and seals; and, in the case of oil-lubricated bearings, before filling the sterntube cavity with oil.

Heavy blanks are usually installed to seal off the inside diameter of the bearing. Positive air pressure is placed between the O.D. of the bearing and the I.D. of the sterntube bore. This pressure is equal to the maximum differential pressure expected to be experienced across the sterntube seals when the vessel is in service. A leak detector solution can be used to detect any leakage, which can be locally corrected with an epoxy sealing material.

WARNING: Compressed air testing is dangerous. Ensure the blanks used for testing are strong enough to withstand the forces which will be placed on them by the air pressure.

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IMPORTANT NOTE:

Watertight Installations

Although CHOCKFAST ORANGE combines a high degree of structural security with superior maintenance of alignment, it does not always provide a watertight installation.

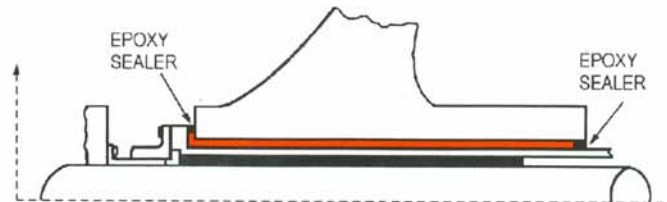
As is the case with pressed-in bearings, a primary sealing arrangement must be included in the design and installation of a sterntube assembly.

Sealing arrangements can consist of, but not necessarily be limited to:

- O-rings
- closed-cell damming foam
- sealing foam used with backing rings
- flat bar sealing strips
- epoxy sealing compounds
- or a combination of these seals

Several different designs have been included in this Installation Guide as examples.

Watertight Installation Examples



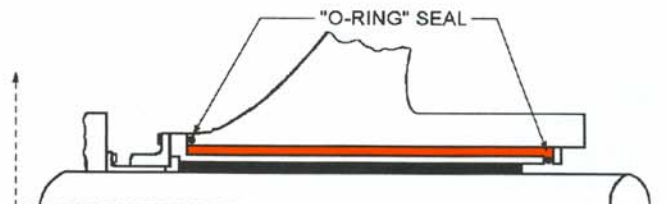
EPOXY SEALING COMPOUND



SEALING STRIP



WELDED RING WITH DAMMING FOAM



"O-RING" SEALS

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CLEANING NOTE:

Recommended Cleaning Procedure

To assure proper adhesion and to reduce the possibility of leakage to a minimum, it is absolutely imperative to thoroughly clean surfaces which will be in contact with CHOCKFAST. Although each shipyard may have its own preferred procedure, ITW Philadelphia Resins recommends the following:

- ◆ Wipe all surfaces with clean rags liberally soaked with PRT-59 solvent
- ◆ Sandblast all surfaces to a near-white finish.
- ◆ Wipe all surfaces with clean rags liberally soaked with PRT-59 solvent at least five times, changing to a new rag each time.
- ◆ Coat all surfaces with Phillyclad 1014 Rust Inhibitive Primer.
- ◆ Immediately before installing the bearing or sterntube assembly into the ship, solvent-wipe the surfaces a final time.

a reputation for reliability

Throughout the world, ITW Philadelphia Resins' marine products are in use . . . chocking main propulsion systems and auxiliary equipment . . . mounting bearings in deep-sea mooring buoys . . . installing LNG/LPG tanks of various configurations . . . providing structural damping, nonskid deck and ramp coatings, and repair compounds for damage control . . . chocking crane rails . . . protecting exposed propeller shafts on military and commercial vessels.

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