

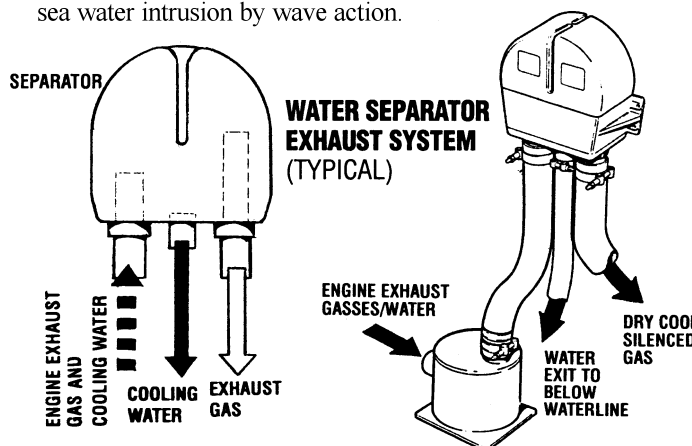
# EXHAUST SYSTEM INSTALLATION

## Check Valves

Various types of check valves are available and suitable for exhaust runs. Examples are in-line check valves offered by some exhaust component manufacturers and flapper valves on exhaust outlets. None of these may be considered as an alternative to a good installation. They can leak, they can foul, and they can open intermittently. Think of them as an emergency means to keep out that rogue wave or extreme following sea. Never rely on them to stay closed for more than a second or two. Read again "CUMULATIVE PROCESS" on the previous page.

## Water Separators Exhaust Systems

Water separators are the latest innovation in exhaust systems. The separator uses gravity and centrifugal force to separate the cooling water from the exhaust gas and then discharges then separately under the vessels hull. This makes for a quiet and efficient system that reduces back pressure and prevents sea water intrusion by wave action.



## Installation

The separator must be securely mounted as high as possible (point A in the previous diagrams) above the water lift muffler and well above the vessels waterline in all attitudes of operation.

The discharge (drain) hose for the separated cooling water must go directly and vertically down from the separator to a thru hull fitting on the hull below the waterline. This provides a very quiet exhaust.

The discharge (drain) hose for the exhaust gas must also go directly and vertically down to a thru hull fitting under the hull just above the waterline. This gas discharge hose will still contain some water, to prevent this water from becoming trapped and impeding the flow of gases, make certain the hose leads down hill without any loops or dips.

Water separators are manufactured by:

**Halyard Limited**  
Whadden Business Park  
Southampton Road  
Whadden, Salisbury SP5-3HF  
United Kingdom  
[www.halyard.eu.com](http://www.halyard.eu.com)

**Centek Industries, Inc.**  
116 Plantation Oak Drive  
P.O. Box 3028  
Thomasville, GA 31799-3028  
[www.centekindustries.com](http://www.centekindustries.com)

## Dry Stack Exhaust Systems

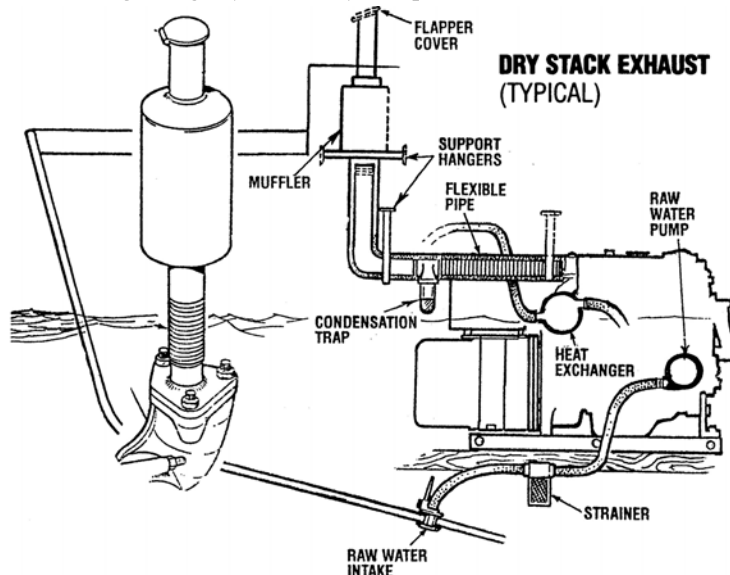
Commonly seen on commercial fishing boats, dry stack exhausts can also be used on trawler style pleasure boats. A dry stack exhaust directs the exhaust gas straight from the generator or engine without obstructions. A dry stack exhaust becomes very hot when the engine is operating and should not be close to any combustible materials (wood, fiberglass, etc.) unless it is properly shielded or insulated.

Make certain the exhaust and muffler are of sufficient diameter to clear the exhaust gasses and prevent excessive back pressure. Provisions must also be made for discharging the raw cooling water.

After final assembly, test run the generator and check all connections and elbows for exhaust leaks. A back-pressure test should also be performed at this time. Back pressure should not exceed 1.5 psi (0.11 kg/cm<sup>2</sup>).

Regulations require that the exhaust muffler be constructed of aluminized steel or other corrosion resistant material and be of welded or crimped construction. An approved spark arrestor must be installed with the muffler in gasoline installations.

**NOTE:** Liability for damage or injury and warranty expenses becomes the responsibility of the person installing an exhaust system. Contact WESTERBEKE or your WESTERBEKE dealer regarding any exhaust system problems.



## Exhaust Back Pressure

After the installation is operational, exhaust back pressure must be measured at the outlet of the water injected exhaust elbow. Measure with an appropriate gauge or manometer. Operate a propulsion engine underway at cruising RPM. Operate a generator at rated load. As the engine/genset operates it continuously pushes the exhaust gases and raw water thru the exhaust system, up hill and overboard thru the exhaust outlet. This causes significant back pressure. Excessive back pressure reduces engine power, higher temperatures and can reduce the life of the engine.

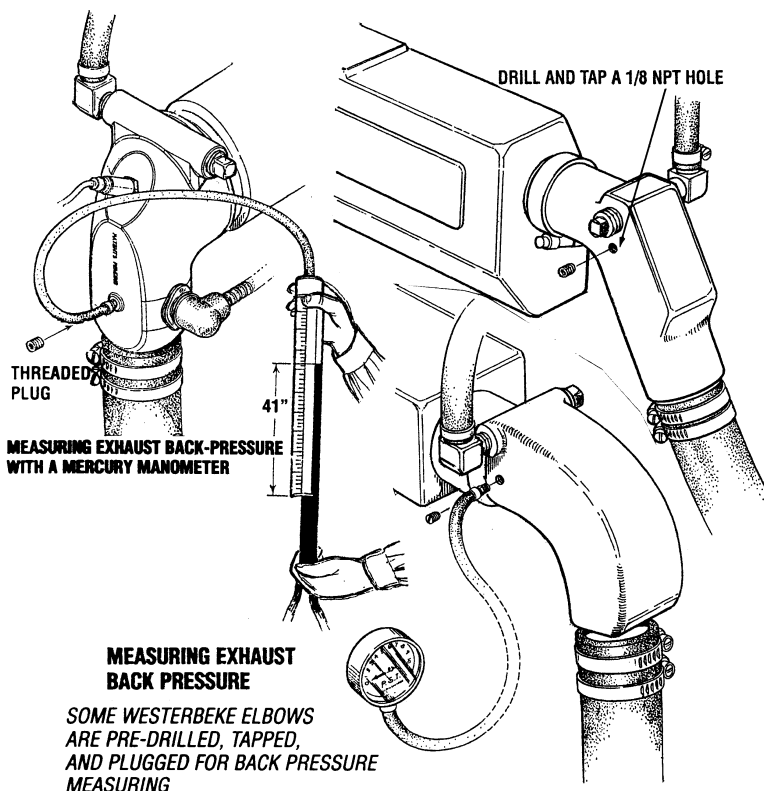
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## Exhaust Back Pressure (cont.)

Back pressure should not exceed 1.5 psi or 41" WC. Excessive back pressure can be reduced by increasing **E**, increasing the size of the water lift muffler, reducing **J**, and reducing **G**. However **A**, **C**, and **B** should not be compromised to relieve back pressure.

Back pressure should not exceed the following specifications:

**3 inches of mercury**



## Sea Trial

A sea trial must be conducted to confirm that no water intrusion takes place, either via the exhaust outlet or via the sea water intake seacock. Do not operate the engine during the trial. Disconnect the exhaust hose at the muffler outlet and place it in an empty bucket (bucket #1). Disconnect the sea water hose entering the exhaust elbow and place it into a second empty bucket (bucket #2).

Select the worst sea conditions available. Operate the boat as aggressively as possible, putting it through as large a variety of operating situations as you would ever encounter. Operate the boat in this way for as long as possible.

Periodically verify that no water enters either bucket. Any water in bucket #1 is water intrusion via the exhaust outlet. Any water in bucket #2 is water intrusion via the sea water intake seacock. Either instance of water intrusion shows that the installation is not adequate, since you will someday experience conditions worse than the sea trial.

## Exhaust Hose

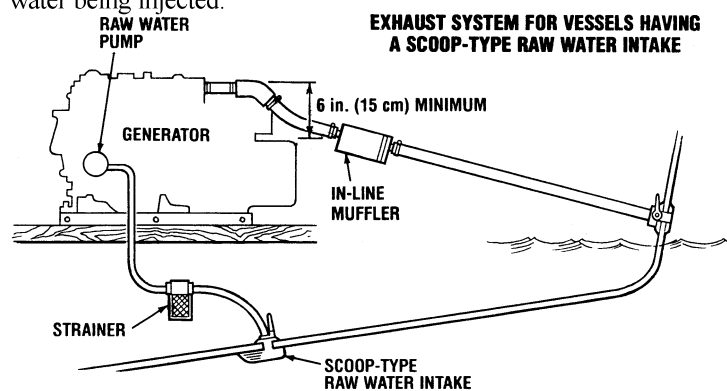
To ensure that engine/generator vibration doesn't transmit to the hull, most installations use flexible rubber exhaust hose for the water cooled section of the exhaust line because of the ease of installation and flexibility. This exhaust hose must be marine certified. Provide adequate support for the rubber hose, to prevent sagging, bending, and formation of water pockets. Always use corrosion resistant carriers and hangers.

For dry or custom pipe exhaust systems, use a flexible section, preferably of stainless steel, no less than 12" (30 cm) overall, threaded at each end and installed as close to the engine as possible. This flexible section should be installed with no bends and covered with insulating material. The exhaust line should be properly supported by brackets to eliminate any strain on the manifold flange studs.

**▲ WARNING:** Do not install rubber hose with sharp bends as this will reduce efficiency. Do not use rubber hose on dry type exhaust applications. Doing so may cause hose failure and leakage of deadly exhaust gas.

Make sure that the water discharge into the rubber hose section is behind a riser elbow or sufficiently below the exhaust flange so that water cannot possibly flow back into the engine. Also, in custom systems, make sure that entering raw water cannot spray directly against the inside of the exhaust piping. Otherwise excessive erosion will occur.

Dry components of the exhaust system between the exhaust manifold and the water injected exhaust elbow must be properly insulated to hold in the heat, prior to the cooling water being injected.



## Scoop-Type Intake

Where generators are installed in very high speed vessels (50-60 knots), it has been necessary to use a scoop-type raw water intake to insure an adequate supply of cooling water to the generator. Generally, this is not recommended, but if it needs to be done, the generator must be mounted high enough so that the exhaust piping has a continuous downward pitch from the muffler to the exhaust outlet in the hull. The pitch should be adequate so that the muffler will continuously drain and no water can back-up into the engine (see illustration).