BOILER & PRESSURE VESSEL TESTING

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Boiler/Pressure Vessel Testing

Contents:

1: Testers and Testing

1.1: Tests will be performed by at least two people, having a practical working knowledge and understanding of the required theory.

1.2: Testers may not test their own boilers / pressure vessels.

1.3: The test gauge must have a valid calibration certificate.

1.4: The club will maintain records of all tests and certificates issued.

1.5: A retest will be needed if any changes are made to the boiler / pressure vessel.

1.6: All boilers and pressure vessels must have a permanent identification mark.

1.7: New boiler bushes and fittings should be made of bronze to avoid dezincification.

1.8: All boilers and gas tanks are to made of copper, with silver soldered joints.

1.9: Petrol and paraffin tanks may be made of brass if required.

1.10: Owners must present their boilers / pressure vessels suitably plugged and sealed.

1.11: Pressure gauges must be permanently marked at the **'working pressure'**.

1.12: Owners must have their certificates available for inspection at any time.

1.13: Gas tanks are **NEVER** to be filled in the club house.

1.14: Gas tanks over 450cc are **not** permitted.

1.15: Certificates do not guarantee that a pressure vessel is safe, they merely confirm that it satisfied certain minimum standards on the day of the test.

1.16: Owners must check their safety valves every time the plant is run.

1.17: The testers are not liable for any damage resulting from testing.

THE CLUB OR ITS APPOINTED TESTERS WILL NOT BE LIABLE FOR ANY DAMAGE RESULTING FROM THE OWNERS MISUSE OF THEIR BOILERS OR PRESSURE VESSELS.

2: Copper boilers up to 1.5 bar litres

2.1: Design Verification:
Before construction, the tester must see the proposed drawings to confirm that the design and materials are acceptable.

2.2: Shell Test: (Once Only)
A new boiler has this initial test at twice the declared 'working pressure'. It must be stripped of all cladding and fittings, and all but one of the bushes must be plugged. The test pump, which has a 1/8" BSP male outlet is connected to the remaining bush. The tester must witness the boiler being filled with water to ensure the minimum of air remains within. The test pressure will be increased in stages to prevent unnecessary distortion of the annealed copper. The test pressure will be maintained for a minimum of 10 minutes to allow thorough examination of all soldered joints. Leaks from blanking plugs must be rectified and the test repeated, but any leak from a joint will constitute a fail. Minor distortion between stays will (at the tester's discretion) be acceptable, but excessive bulging will constitute a fail. The boiler will then be drained into a jug to measure its capacity.

2.3: Hydraulic test: (Once Only)
A new boiler has this initial test at 1.5 times the declared 'working pressure' after it has passed its shell test. All fittings except the safety valve are to be attached, with blanking plugs fitted where required (safety valve, clacks and gauge glass blow downs etc). Any leaks from the fittings must be rectified. The test pressure is then reduced to the 'working pressure', and the boiler's own pressure gauge's reading is recorded (the gauge needs to be marked by the owner at this reading). The safety valve is then fitted, and its lift pressure will be initially set to the **'working pressure'**.

2.4: Steam Test: (Every Year)
This annual test is performed with the boiler installed in the model and fully operational. No stripping or preparation is required. The test includes:

- Check for leaks.
- Check gauge glass response when disturbed, to prove the bottom fitting is not blocked.
- Ensure safety valve limits pressure to a Max of 1.1 x 'working pressure' with engine stopped.

No periodic hydraulic tests are required.

3: Copper boilers over 1.5 bar litres

3.1: Design Verification:
Before construction, the tester must see the proposed drawings to confirm that the design and materials are acceptable.

3.2: Shell Test: (Once Only)
A new boiler has this initial test at twice the declared 'working pressure'. It must be stripped of all cladding and fittings, and all but one of the bushes must be plugged. The test pump, which has a 1/8" BSP male outlet is connected to the remaining bush. The tester must witness the boiler being filled with water to ensure the minimum of air remains within. The test pressure will be increased in stages to prevent unnecessary distortion of the annealed copper. The test pressure will be maintained for a minimum of 10 minutes to allow thorough examination of all soldered joints. Leaks from blanking plugs must be rectified and the test repeated, but any leak from a joint will constitute a fail. Minor distortion between stays will (at the tester's discretion) be acceptable, but excessive bulging will constitute a fail. The boiler will then be drained into a jug to measure its capacity.

3.3: Hydraulic Test: (Every Four Years)
Brass fittings must be removed to check for dezincification, but cladding and bronze fittings may (if the owner prefers) be left in si'tu. All fittings except the safety valve are then to be attached, with blanking plugs fitted where required (safety valve, clacks and gauge glass blow downs etc). The test pressure of 1.5 times the declared 'working pressure' will be applied in a single stage, and it will be maintained for a minimum of 10 minutes. The tester may require the cladding to be removed if the boiler fails to hold the test pressure. Any leaks from the fittings must be rectified. The test pressure is then reduced to the **'working pressure'** to validate the marking on the pressure gauge.

3.4: Steam Test: (Every Year)
This annual test is performed with the boiler installed in the model and fully operational. No stripping or preparation is required. The test includes:

- Check for leaks.
- Check gauge glass response when disturbed, to prove the bottom fitting is not blocked.
- Ensure safety valve limits pressure to a Max of 1.1 x 'working pressure' with engine stopped.

4: Pressurised Petrol/Paraffin Tanks

4.1: Design Verification:
Before construction, the tester must see the proposed drawings to confirm that the design and materials are acceptable.

4.2: Hydraulic Test: (Every Four Years)
The test pressure is twice the maximum operating pressure, or 75psig, whichever is higher. All but one of the bushes must be plugged, and the test pump, which has a 1/8" BSP male outlet will be connected to the remaining bush. The tester must witness the tank being filled with water, to ensure the minimum of air remains within. The test pressure will be increased in stages on a new tank to prevent unnecessary distortion of the annealed copper. The test pressure will be maintained for a minimum of 10 minutes to allow thorough examination of all soldered joints. Leaks from blanking plugs must be rectified and the test repeated, but any leak from a joint will constitute a fail. Minor distortion between stays will (at the tester's discretion) be acceptable, but excessive bulging will constitute a fail.

No other periodic tests are required.

5: Refillable Gas Tanks below 250cc capacity

5.1: Design Verification:
Before construction, the tester must see the proposed drawings to confirm that the design and materials are acceptable.

5.2: Hydraulic Test: (Once Only)
New small tanks require this initial test. The test pressure depends on the fuel mix being used, but is generally:

- 220 psi for plain butane (Blue Calor gas or lighter fuel).
- 380 psi for propane butane mixes up to 40% propane (Camping gas etc).

All but one of the bushes must be plugged, and the test pump, which has a 1/8" BSP male outlet will be connected to the remaining bush. The tester must witness the tank being filled with water to ensure the minimum of air remains within. The test pressure will be increased in stages to prevent unnecessary distortion of the annealed copper. The test pressure will be maintained for a minimum of 10 minutes to allow thorough examination of all soldered joints. Leaks from blanking plugs must be rectified and the test repeated, but any leak from a joint will constitute a fail. Minor distortion between stays will (at the tester's discretion) be acceptable, but excessive bulging will constitute a fail.

Commercial tanks are supplied with a certificate that satisfies this requirement.

5.3: Gas Test: (Every Year)
No preparation is required. The tank must have all fittings attached, and be filled with its normal fuel. It is immersed in slightly warm water to check for leaks. If fitted, the pressure gauge should not be immersed. Any leaks must be rectified.

The owner should regularly check any stop valves to ensure they don't leak when turned off. The tank must not be stored with gas in it if any leaks are detected (no matter how small they are).

No periodic hydraulic tests are required.

6: Refillable Gas Tanks of 250 to 450cc capacity

6.1: Design Verification:
Before construction, the tester must see the proposed drawings to confirm that the design and materials are acceptable.

6.2: Hydraulic Test: (Every Four Years)
Larger tanks require this periodic test. The test pressure depends on the fuel mix being used, but is generally:

- 220 psig for plain butane (Blue Calor gas or lighter fuel).
- 380 psig for propane butane mixes up to 40% propane (Camping gas etc).

All but one of the bushes must be plugged, and the test pump, which has a 1/8" BSP male outlet will be connected to the remaining bush. The tester must witness the tank being filled with water to ensure the minimum of air remains within. The test pressure will be increased in stages to prevent unnecessary distortion of the annealed copper. The test pressure will be maintained for a minimum of 10 minutes to allow thorough examination of all soldered joints. Leaks from blanking plugs must be rectified and the test repeated, but any leak from a joint will constitute a fail. Minor distortion between stays will (at the tester's discretion) be acceptable, but excessive bulging will constitute a fail.

Commercial tanks are supplied with a certificate that satisfies this test for the first four years.

6.3: Gas Test: (Every Year)
No preparation is required. The tank must have all fittings attached, and be filled with its normal fuel. It is immersed in slightly warm water to check for leaks. If fitted, the pressure gauge should not be immersed. Any leaks must be rectified.

The owner should regularly check any stop valves to ensure they don't leak when turned off. The tank must not be stored with gas in it if any leaks are detected (no matter how small they are).

7: Glossary

7.1: Bar Litres:
This is a measure of the energy stored in a boiler. It is found by multiplying the capacity of the boiler (in litres) by the working pressure (in bar). 1 bar = 14.5psi.

7.2: Pressure gauges:
The pressure gauge must be marked at the working pressure as indicated by the test gauge. Small gauges are not very accurate, so the marking may not be at the working pressure as indicated on the gauge itself.

7.3: Safety Valves:
The safety valve must prevent the boiler pressure from exceeding 1.1 times the stated working pressure. The valve can however be set to any pressure below this if the owner wishes to stabilise the pressure at a lower value.

7.4: Working Pressure:
This causes confusion: It is rarely the pressure at which the boiler is operated. It is defined as the **maximum** pressure at which the boiler may be steamed. The safety valve must limit the pressure to no more than 1.1 times this value with the burner running and the engine stopped. Boilers on RC boats are normally operated at considerably less than the working pressure to avoid the safety valve lifting every time the engine is stopped.