NICHOLSON
STEAM TRAP

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INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR OF NICHOLSON THERMOSTATIC BELLOWS STEAM TRAPS

1. INSTALLATION

1.1 Before installing trap, blow steam through equipment and piping to remove scale, pipe threading chips and other dirt.

1.2 Make certain trap is suitable for maximum steam pressure to which it will be subjected. Nicholson Thermostatic Bellows Traps do not require change of parts for different pressures.

1.3 Pipe so flow direction is correct. Check arrows on trap body or cover.

1.4 Locate trap accessibly for rapid testing and cleaning, and below drain outlet of equipment, if possible.

1.5 Use a separate trap for each unit, coil, surface, chest, etc.

1.6 Provide uninsulated condensate reservoir and cooling leg between outlet of equipment and trap inlet. See "Recommended Piping Layouts", Fig. 4.1.

1.7 Include unions in inlet and outlet piping if trap must be removed from installed location for cleaning and maintenance.

1.8 Install a Nicholson Strainer, or a dirt pocket, or both, close to trap inlet. See "Recommended Piping Layouts", Figs. 4.2, 4.3, and 4.4.

1.9 Include gate valves in inlet and outlet piping if it is essential that other plant operations continue while trap is being cleaned or serviced. See "Recommended Piping Layouts", Fig. 4.6.

1.10 Install a check valve close to the trap outlet, if discharging to a common return main, and whenever condensate must be lifted after passing through the trap. See "Recommended Piping Layouts", Fig. 4.5.

1.11 Provide a Nicholson STV three-way test valve that discharges into return mains in piping close to trap outlet for quick testing. See "Recommended Piping Layouts", Fig. 4.6.

1.12 If trap must be located above equipment drained, and whenever condensate is lifted to the trap, provide a water seal at the bottom of the riser. See "Recommended Piping Layouts", Fig. 4.7.

1.13 For piping conditions 1.12, for siphon-drained equipment, and tilting jacketed kettles, specify Nicholson traps with "steam lock release valves" (SLR).

1.14 Make certain freeze proof traps are installed on outdoor applications. Nicholson Types A, C, CS, and N125 traps are freezeproof. Models N450, UMT450, N650, AHV and TA traps are freezeproof when piped vertically with outlet down (see 1.22).

1.15 Provide condensate-collecting pockets for traps draining steam mains, headers, risers, and branches.

1.16 Be sure return main is large enough to handle the condensate from all traps discharging into it, without causing excessive back pressure.

1.17 Always discharge high and low pressure traps into separate return mains.

1.18 Don't insulate the trap or the piping and fittings between equipment outlet and trap inlet unless absolutely essential.

1.19 Don't use piping, nipples, and fittings smaller than trap connection size.

1.20 If possible, don't install trap with a long horizontal run of piping between equipment outlet and trap inlet. If such a hook-up is necessary, specify Nicholson Traps with "steam lock release valves" (SLR).

1.21 Don't include a by-pass around trap unless equipment drained must be kept in operation while trap is being cleaned or serviced.

1.22 Don't jeopardize the advantage of a freezeproof trap by lifting the condensate or by the use of horizontal piping from the trap outlet without considerable pitch in the direction of flow or by piping the trap in any way which will prevent fast gravity drainage when steam is turned off.

2. OPERATION AND TESTING

2.1 When steam is first turned on, the large, wide-open orifice of a Nicholson Trap will quickly discharge all "warm-up" condensate and air from equipment drained. After this initial load has been expelled, live steam will follow and its heat generates a balancing pressure inside bellows, the bellows will immediately expand, closing the valve. Thereafter, trap operation will be intermittent, without live steam discharge, the frequency and duration of the cycles depending on the steam pressure, the amount of condensate and air coming to the trap and the condensate temperature.

2.2 The operation of all traps, which are piped so the discharge cannot be observed, should be periodically tested. The visual discharge by using a three-way test valve is best. If test valves have not been installed, check temperatures of inlet and outlet piping close to the trap. Use a surface pyrometer or an infrared temperature device to detect temperature.

2.2.1 If inlet piping is hotter than outlet piping, with temperature of latter rising and falling in sequence with trap discharge, trap is satisfactory.

2.2.2 If inlet piping is considerably cooler than known temperature of the steam supplied to equipment drained, trap is either not discharging or is too small for the application.

2.2.3 A stethoscope or ultrasonic device can be utilized for testing intermittent discharge types of traps, but some experience is necessary to distinguish proper trap operation.

2.3 The recommended frequency of trap testing depends on the importance of each application and the operating conditions. There is no hard and fast rule, but in general, traps on critical applications should be tested daily to weekly; weekly to monthly for less important equipment.

2.4 Don't mistake the unavoidable flash vapor in trap discharge for a live steam leak. Flash steam is white and wet, and most evident while the trap is discharging. Live steam has a bluish tint, is dry and hot, and may blow continuously.

3. MAINTENANCE

3.1 **NEVER** open a steam shutoff valve rapidly. Condensate always collects at the upstream side of a closed, untrapped steam valve. Waterhammer, destructive to equipment, piping and traps, can be initiated by quick opening of such valves.

3.2 Don't remove cover while the trap is very hot. Wait until steam pressure has dropped and trap can be comfortably touched with bare hand.

3.3 Don't drop traps or spare bellows or toss them about.

3.4 Don't use a Stillson or Monkey wrench to remove or replace bellows or tighten them excessively in trap cover.

3.5 Don't store, pile or carry bellows with tools and pipe fittings.

3.6 Most trap operating difficulties and failures are caused by circumstances which the trap cannot control. Some examples are pipe scale, dirt, waterhammer, corrosive condensate, improper installation and inaccessible location. Try to avoid or correct these detrimental conditions.

3.7 Test Traps periodically (see 2.2 of Operations and Testing).

3.8 Adopt a reasonable "Preventive Maintenance" program by scheduling all traps for internal inspection and cleaning at least once yearly.

3.9 Remember to blow down and clean strainers and dirt pockets regularly.

4. RECOMMENDED PIPING LAYOUTS

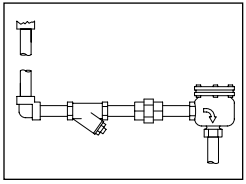

Fig. 4.1 – Ample **UNINSULATED** cooling leg and strainer. If 18" vertical cooling leg is not available, make up the difference with horizontal piping.

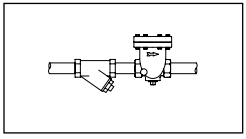

Fig. 4.2 – Type B Nicholson Industrial Traps have either vertical or horizontal outlets. Pipe plug is for draining if there is danger of freeze-up.

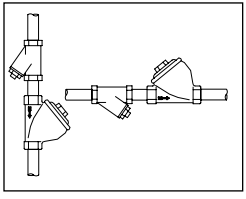

Fig. 4.3 – Type AHV, N450, N650, TA and UMT450 Industrial Steam Traps can be mounted either horizontally or vertically. They are freezeproof when mounted vertically.

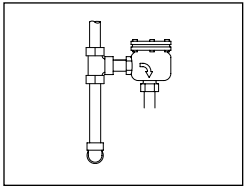

Fig. 4.4 – Dirt pocket made from pipe fittings when a strainer is not available. Clean dirt pockets and strainers frequently.

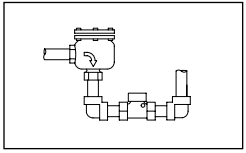

Fig. 4.5 – Check valve installed at the discharge of trap when condensate must be lifted or when return line backpressure exists. Condensate can be lifted 2 feet for each PSI pressure at trap.

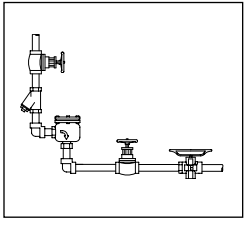

Fig. 4.6 – To determine if trap is working properly, turn STV handwheel to test position. This directs trap discharge to ground. Check for continuous flow of condensate, slight or no flow and live steam. Do not mistake normal flash steam with hot condensate for live steam. After testing, be sure STV is positioned to allow condensate discharge to the condensate return system.

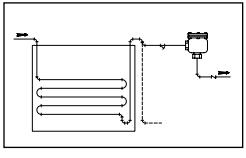

Fig. 4.7 – Recommended piping diagram for applications where condensate must be lifted to the trap.

5. REPAIR

5.1 Wait until trap is cool to the touch

5.2 Remove cover - remove and discard old gasket.

5.3 Remove bellows from cover. Use box or open end wrench if bellows has hexagonal end fitting. If bellows has round valve attached (N125, N450, UMT450), use vise-grip clamping on valve diameter. Do not use pipe wrench on bellows convolutions.

5.4 Remove valve from bellows if construction allows (N125, N450, UMT450).

5.5 Remove valve seat from body.

5.6 Examine bellows by:

a. Comparison to new bellows.

b. Immersing in cold and hot water to test bellows travel.

c. If bellows checks OK, reassemble into cover; if bad, replace. Leave threads of bellows dry, tighten into trap cover snugly, and do not over torque.

5.7 Examine Valve and Valve Seat

a. Clean with 80 to 150 grit emory. If no wear or wiredrawing is present, the valve and seat can be reused; if bad, replace. Use small amount of anti-seize on seat and valve threads. Valve and seat should be torqued for snug fit.

5.8 Insert new gasket.

5.9 Reassemble cover using small amount of anti-seize compound on cover threads if trap has screwed cover. If cover is bolted, anti-seize compound can be used on the bolts.

5.10 Seating of cover gasket may be checked by installing a pipe plug in outlet of trap and applying 80 PSIG air to inlet. Use soapy water or leak detection fluid. A slight seepage should be acceptable since air can pass through a small opening that steam will not.

5.11 If possible, test trap before returning it to service. Any pressure within trap range can be used; a simple drip leg will suffice. Valve in trap should close on steam. Leave trap on line long enough for trap to cycle once.

WHEN THIS HAPPENS	HERE IS WHERE THE TROUBLE MAY BE	AND HERE IS WHAT TO DO
Trap not discharging - cool to touch	1. Condensate not reaching the trap. A. Pipe and or fittings between equipment and trap plugged by dirt. B. Strainer clogged by dirt. 2. Condensate not passing through trap. A. Trap discharge orifice blocked by dirt. B. Pipe and/or fittings between trap and return main plugged by dirt. 3. Valve, upstream or downstream, not open or failed in closed position. 4. Bellows has developed a leak or crack.	A . Remove the obstruction. B . Blow out or clean strainer. A . Clean trap and install strainer. B . Remove obstruction. Open or repair valve Replace the bellows. Check for corrosive condition and, if present, substitute bellows material.
Trap discharging condensate continuously - warm to touch	1. Trap, strainer or piping partially obstructed by dirt. 2. Valve, upstream or downstream, not open wide. 3. Trap too small for condensate load. 4. Condensate load has increased since trap was installed. A . Boiler priming or foaming. B . Leak in submerged coil of equipment. C . Other traps have failed transferring condensate to overloaded trap.	Remove the obstruction, blow down strainer and clean trap. Open valve wide. Add another trap in parallel or replace with larger trap A . Correct the boiler condition. B . Repair leak or replace coil/tube. C . Locate and repair/replace faulty traps.
Trap discharging live steam.	1. Trap valve not closing tight A. Scale or dirt between valve and seat. B. Valve or seat, or both, eroded and worn. 2. Trap has been dropped - bellows misaligned so valve cannot seat. 3. Mistaking open or leaking by-pass valve for trap leak. 4. Bellows damaged by waterhammer.	A . Clean trap and install strainer. B . Replace valve and seat with a matched set. Replace bellows and inspect trap for other damage. Remove the by-pass if permissable, otherwise close or repair valve. Replace bellows, eliminate cause of waterhammer.

WHEN THIS HAPPENS	HERE IS WHERE THE TROUBLE MAY BE	AND HERE IS WHAT TO DO
Slow warm-up or temperature of equipment drained too low.	1. Steam pressure too low for temperature required by process.	
	A. Pressure throttled by thermostatically controlled steam supply valve.	A . Check for lowest throttled pressure and increase if feasible.
	B. Increased demand for steam throughout the plant.	B . Increase boiler capacity if possible. Shut down unneeded equipment.
	C. Steam piping too small for adequate supply.	C . Increase steam pressure or replace piping with larger size.
	2. Pressure differential across trap too low.	
	A. Steam pressure less than when trap was installed.	A . Raise pressure to former level.
	B. Return line pressure higher than when the trap was installed.	B . Return main too small. Other traps discharging live steam into return main. Repair or replace faulty traps. Obstruction in return main or discharge piping.
	3. Short circuiting caused by group trapping.	See 1.5
	4. No cooling leg between equipment and trap, or cooling leg is insulated.	See 1.6
	5. Trap steam-locked.	
	A. Long horizontal piping between equipment and trap.	A. See 1.20
	B. Trap above drain outlet of equipment - no water seal at bottom of riser.	B. See 1.12 and 1.13
	C. Siphon-drained equipment - rotary dryers and tilting jacketed kettles.	C. See 1.13
	6. Apparatus drained by siphon pipe.	Examine siphon for break or leak.