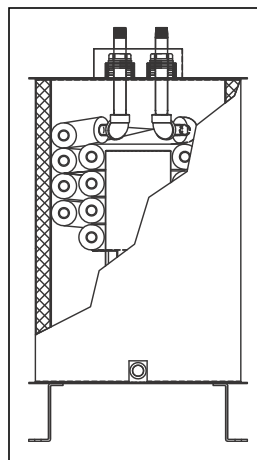
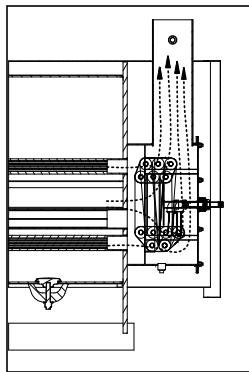




ClearFire Economizer

Model ECF
Integral or External

Addendum to manuals 750-295 CFH
and 750-269 CFV



CB-8466
08/2011

1-GENERAL

The Model ECF economizer is a stainless steel coil tube arrangement using extended heating surface fins to maximize heat transfer. Flue gas from the boiler passes over the coiled tube, which conveys incoming feed water. Feed water preheated in this way eliminates the need for a steam feed water heater, with resulting efficiencies of up to 87% in non-condensing applications.

The ECF is offered as either an integral or an external unit. The integral ECF-I is designed for Model CFH high pressure steam boilers and can be installed in a new or existing boiler without the requirement for additional space above or behind the boiler. The economizer is installed in the smoke box at the rear of the boiler with water connections at the rear.

The external ECF-E is designed for Model CFV boilers and may also be used for CFH low pressure steam boilers. The economizer mounts in a vertical position and connects to the boiler flue gas outlet.

For all ECF applications, feed water is pumped continuously through the economizer. A two position 3-way diverting valve - controlled by the boiler's normal on-off level control - sends heated feed water either directly to the boiler for make-up, or re-circulates heated water back to the feed system as a method of preheat.

The ECF economizers are virtually maintenance free, having no moving parts.

2-INSTALLATION

Consult submittal data for specific weights and dimensions to ensure a well designed and safe installation.

The external economizer is shipped ready to be mounted in the vertical position as originally specified (consult the factory if a change in the gas flow direction is desired).

For existing retrofit installations, ensure that the boiler has been turned off and has cooled. Follow established lockout/tagout procedures.

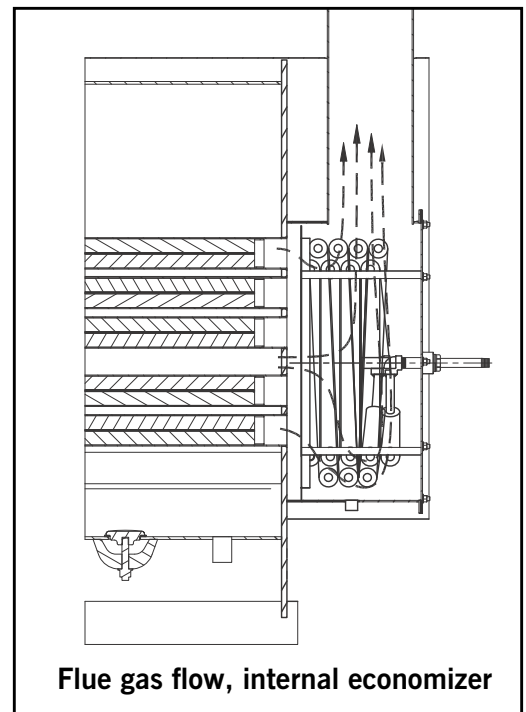
For retrofit installations the economizer is installed in line with the existing exhaust stack or duct unless otherwise noted. Generally a section of the exhaust stack is cut and removed to accommodate the insertion of the economizer. The remaining portion of the exhaust stack above the cut should not exceed 200 lbs and must be adequately supported.

When calculating total length of breeching the external economizer should be considered as 2 elbows or 10 feet total equivalent length of ductwork.

Apply expansion joints (supplied by others) as required by the installation to ensure that no outside forces from thermal expansion to either the exhaust gas connections or to the piping will be permitted.



Economizer fin tubes



Flue gas flow, internal economizer

Ensure that the economizer is level before final bolting into position.

Liquid connections are connected with NPT threaded fittings. Liquid piping should include shut-off and bypass valve piping in the event the economizer is required to be isolated.

NOTE: *The safety relief valve provided with the economizer must be located between any isolation valves and the economizer and within close proximity of the economizer. Liquid piping to and from the economizer should allow the economizer to be filled at all times especially when flow could stop.*

Softened water is highly recommended with any C-B economizer. Refer to the boiler manual for additional water treatment recommendations. Proper water treatment is essential to the longevity, safety, and efficiency of your boiler system.

Generally, schedule 80 or schedule 40 steel pipe is used in the piping installation. In some applications other piping material may be needed. Consider the type of liquid, operating pressures and temperatures, and any corrosive elements in the liquid or in the atmosphere when determining the best piping material for your installation. The use of unions and/or flanges is recommended where isolation might be required. Stainless steel piping is recommended if using non-deaerated water.

If a circulating pump is part of the system being installed, a ball or flow control valve installed on the suction side of the pump and one on the discharge side of the pump will allow for easier pump removal and replacement.

Piping should include valves of dependable manufacture, properly rated for operating conditions, in order to reduce the possibility of an undetected leak.

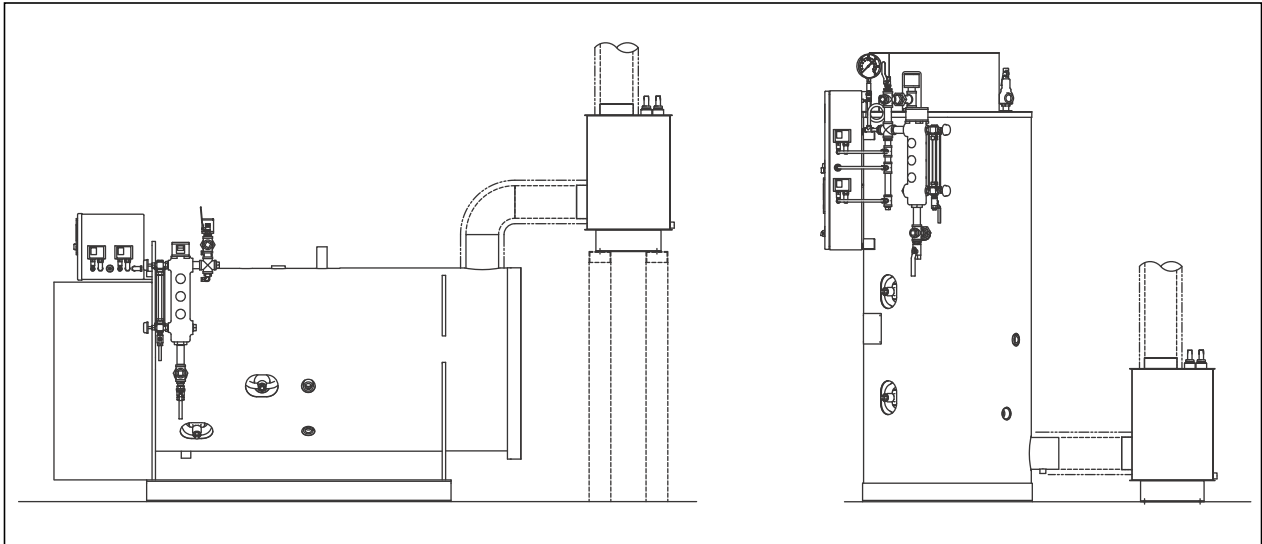
A safety relief valve is provided as required. It should be located at the economizer and piped separately and safely to the drain. *Do not connect safety valve piping to the boiler blowdown piping.*

A manual vent valve is provided and should be installed at the highest point in the piping system. The vent valve purges air from the system, especially during filling and initial start up.

While condensing should be avoided when operating the CFH or CFV boilers, small amounts of condensation can be expected due to cold startups and other transient conditions. For this reason a condensate drain is provided at the bottom of the smoke box (CFH) or stack outlet (CFV). For installations with external economizers a second drain is provided at the economizer. See the piping diagrams for details.

Condensate drain piping can be piped to the floor drain. Condensate piping should include a water trap to prevent the escape of flue gas. For external economizers the boiler and economizer drains can be trapped and drained separately, or they may be piped to a common drain with a single p-trap. See piping diagrams.

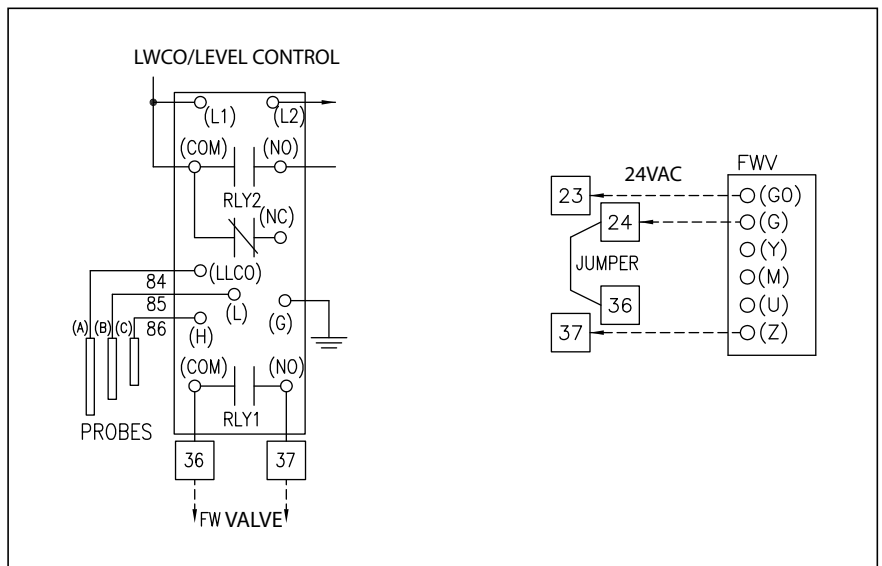
To ensure proper drainage, the external economizer must be installed in the upright position.



External economizer installation

2.1- Feedwater Valve

Wire the feedwater 3-way valve as shown. In this diagram, control panel terminals 36 and 37 are connected to the pump/valve relay on the LWCO/Level control. Terminals 23 and 24 are connected to 24VAC power (installations may vary; consult the wiring diagram provided with the boiler for wiring terminal assignments).



2.2- Special Installation Considerations

Freeze protection concerns: During a system shutdown where combustion halts for an extended period of time (other than normal cycling), cold air will travel back down the stack and exhaust breechings, through the economizer and into the combustion source. If the cold air is below freezing, it could freeze the finned tubing and cause a rupture, ultimately destroying the economizer. For potential freezing applications where the water flow might stop, a manual system shut down routine should be incorporated.

Insulate piping and exhaust ducting as required.

Consult the circulating flow diagram (if applicable) for your application with regard to the piping layout and components. Exhaust and liquid inlet and outlet thermometers are included for the installation. Capped tees, one on the liquid inlet side and one on the liquid outlet side, should be incorporated into the piping installation to allow a descaling solution to be used with the economizer in place. The

manual vent valve can also be used for this purpose. Consult the factory for suitable descaling solutions.

The economizer relief valve should not have a set pressure rating higher than the rated pressure of the economizer. To avoid relief valve leakage, ensure that valve set pressure is sufficiently higher than dead head pressure of the feed pump.

It is recommended that the pipe and surge/feed tank (if included) be insulated to reduce heat loss.

A feed pump suitable for continuous service is required. A single-stage or multi-stage centrifugal pump is recommended (single-stage for low pressure boiler applications and multi-stage for high pressure).

For applications with the potential of producing condensation in the economizer and flue, corrosion resistant materials should be used in flue design.

3-STARTUP

Filling the Economizer - first ensure the boiler has been filled to the normal operating water level.

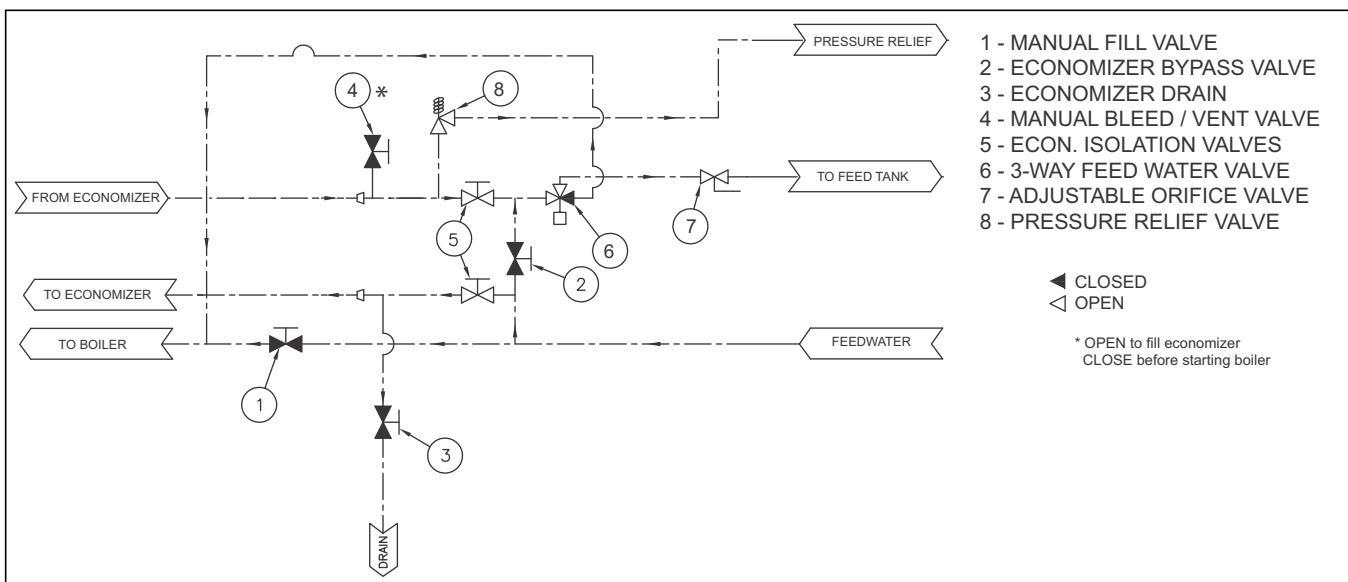
Verify the 3-way valve has been properly wired to the water level control.

The feed pump should be in manual operating mode.

Make sure all valves are in the proper position for startup (see diagram; refer also to piping diagrams in Section 6).

- **CLOSED:** manual fill valve [1]
economizer bypass valve [2]
drain valve(s) [3]

- **OPEN:** manual bleed/vent valve [4]
economizer isolation valves [5]



Valve positions for initial startup

Begin with the orifice valve open approximately half way and the 3-way valve in the recirculation position.

Start the feed pump. Check the pressure gauge and adjust the orifice valve to maintain feedwater pressure within 10-20 psi of the boiler's operating setpoint.

When water can be seen escaping through the vent valve, close the valve.

Verify proper operation of the 3-way valve by opening the water column drain. When the water level drops sufficiently, the valve should allow flow to the boiler feedwater inlet. Close drain before continuing.

Put the feed pump in automatic mode and start the boiler.

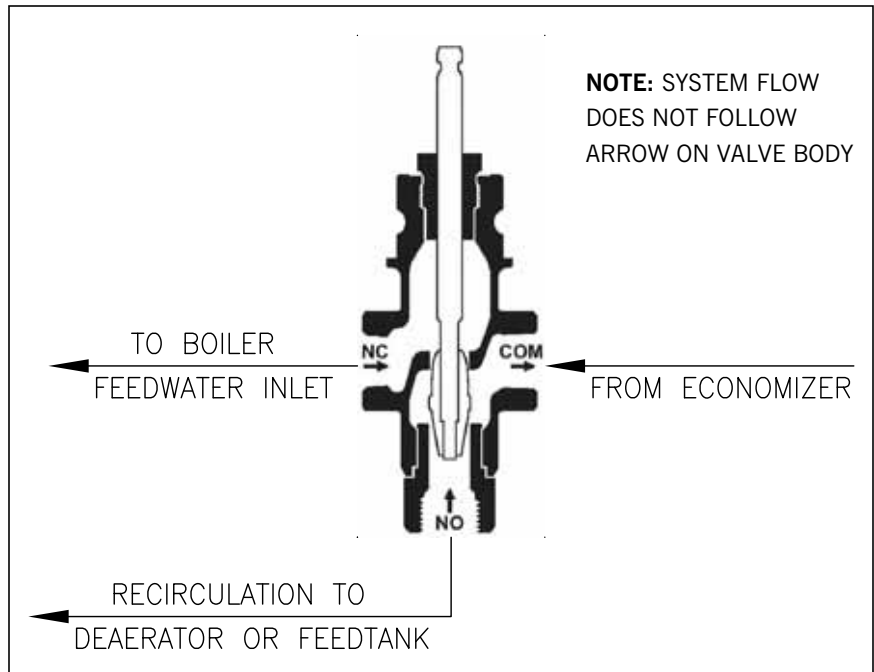
When the boiler reaches operating pressure, adjust the orifice valve as necessary. System pressure should be consistent regardless of the position of the 3-way valve. This is to ensure steady flow through the economizer and to avoid steaming downstream of the economizer outlet.

Observe operation of the system for several feedwater cycles.

NOTE: C-B requires that liquid must be flowing through the economizer at all times while the economizer is in use. This is to avoid steaming in the coil. *Upon cold startup of a full boiler, provisions must be made to ensure water flow through the economizer.* Assure sufficient flow to prevent any unwarranted temperature and pressure buildup within the liquid side of the economizer.

If the final exhaust temperatures are too low (causing undesirable condensing in the flue) or if the desired feedwater temperature is not met, adjust the orifice valve to attain the desired objective.

The economizer may be bypassed if it is first drained. After operating in bypass mode, before the economizer is returned to service it must be allowed to cool and must be filled with water.



3-Way Valve

Important

If liquid is introduced into a hot economizer, severe damage can result and will void any warranty. Contact C-B for applications where the economizer is requested to run dry at temperatures above 500 deg F.

4-MONITORING PERFORMANCE

It is recommended to inspect the core or coil if the performance (liquid temperatures leaving and Btu/hr. recovery) begins to decrease. A good practice of maintenance is to keep a performance schedule starting when the economizer is installed to compare with any future changes.

While the economizer is in a clean, like-new condition, note and record the following:

- Water flow rate
- Boiler firing rate
- Liquid inlet and outlet temperatures
- Exhaust gas inlet and outlet temperatures
- Steam pressure gauge reading (if applicable)

This information will provide a point of reference in the event of a future fouling condition.

A simple method of determining whether the economizer is performing properly is to monitor the exit temperatures on the liquid and gas sides while in the new condition to establish a base of comparable data. If the stack temperature leaving the economizer is higher than normal and the liquid exit temperature is lower than normal, then the external heat transfer surface is fouled or scaled on the inside of the tubing. This requires cleaning as soon as possible during a convenient shut down period.

If the economizer pressure relief valve discharges, it is likely that there is no or little liquid circulating through the economizer. Check the pump operation and repair or replace as necessary. **DO NOT ATTEMPT TO REMOVE OR REPLACE THE PUMP UNLESS THE PUMP, PIPES AND LIQUID HAVE BEEN ALLOWED TO COOL.** You may also need to check for flow restrictions in the piping and/or the economizer.

If the economizer inlet and outlet temperatures are approaching being equal, this may be a pump problem and/or a scale accumulation in the finned tubing. Remedy as indicated above. It is also possible that the fin coils are severely fouled. Refer to section 5 below for cleaning.

5-MAINTENANCE

As stated in the general description, the economizers are mechanically maintenance free.

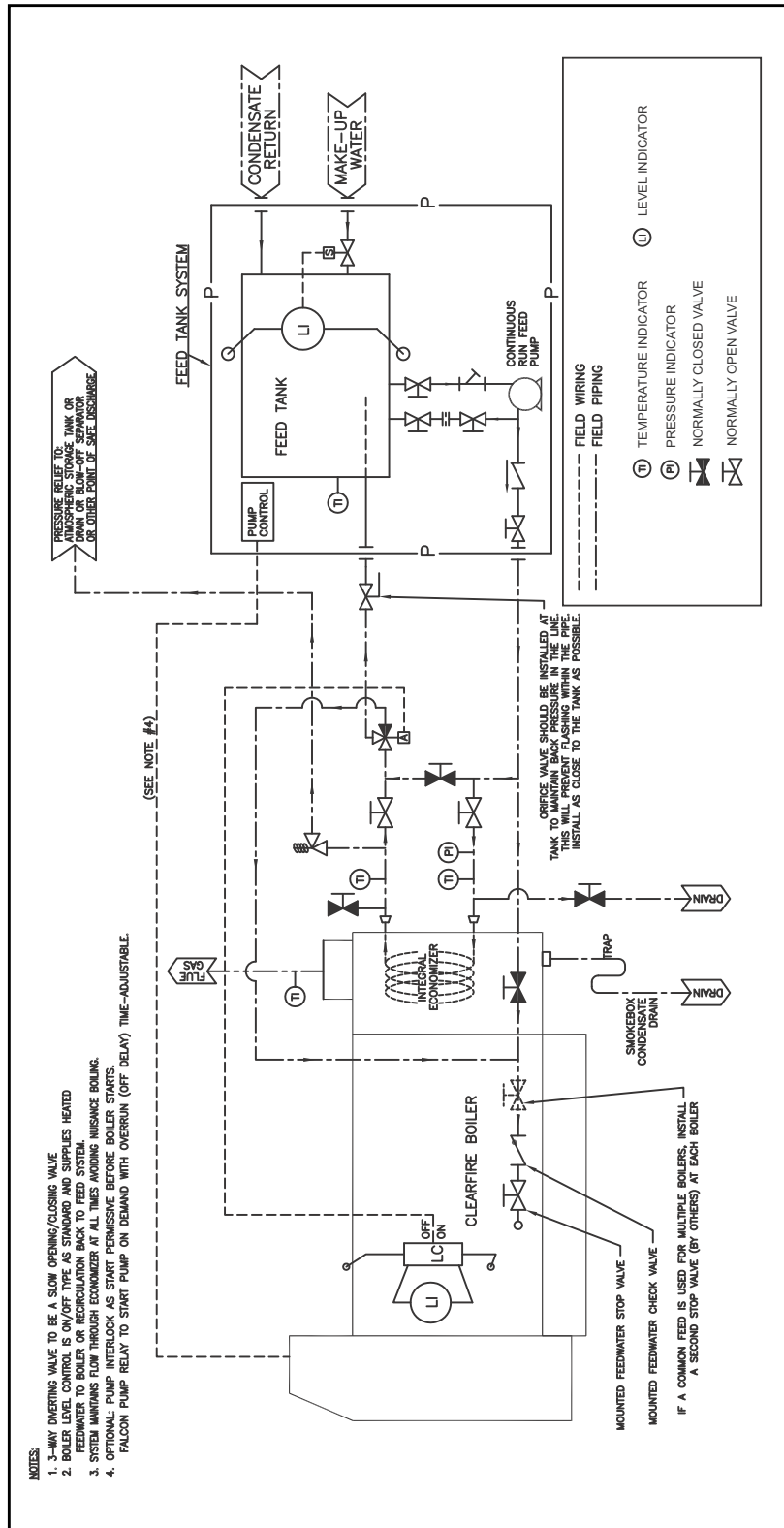
A routine physical inspection of the heat transfer core area will be dependent on the temperature conditions and combustion quality within the flue gas stream. **NOTE:** Ensure that the boiler is off and is cool, and that the economizer is cool before attempting to inspect or clean the fin coil(s).

On natural gas or propane fired applications, with clean exhaust conditions, physical inspection will be minimal if proper combustion at the burner is maintained.

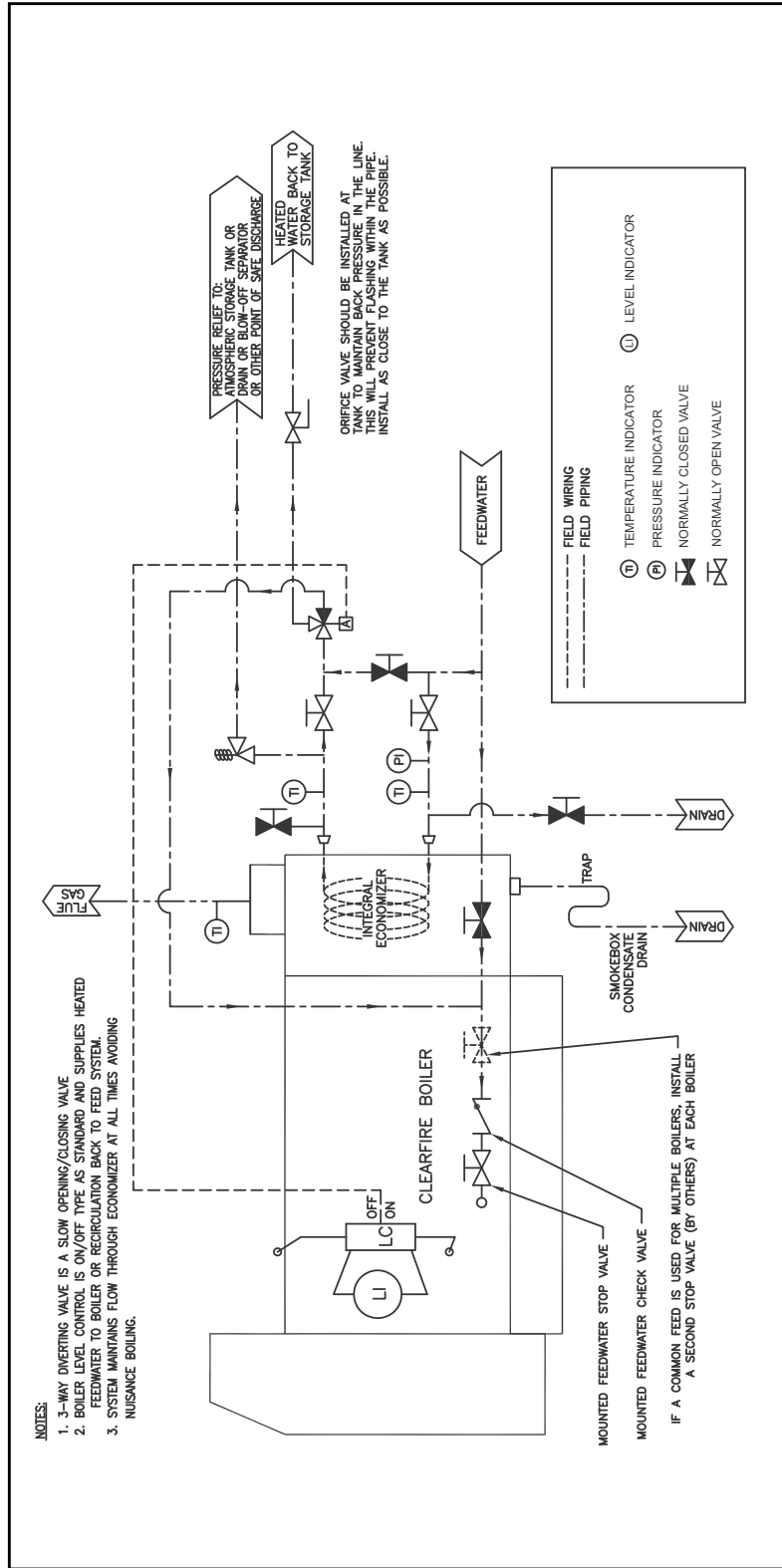
In the unlikely event of an accumulation of dirt on the fins (i.e. a 1/16" thickness build up on the fins), the fouled finned tube area can be manually cleaned by blowing air with a lance assembly across the fins. If high pressure air is not available, an industrial vacuum cleaner may be substituted.

If a waterside inspection shows a buildup of scale due to inadequate water treatment, descaling should be performed before resuming operation. Investigate deficiencies in the water treatment program and correct accordingly.

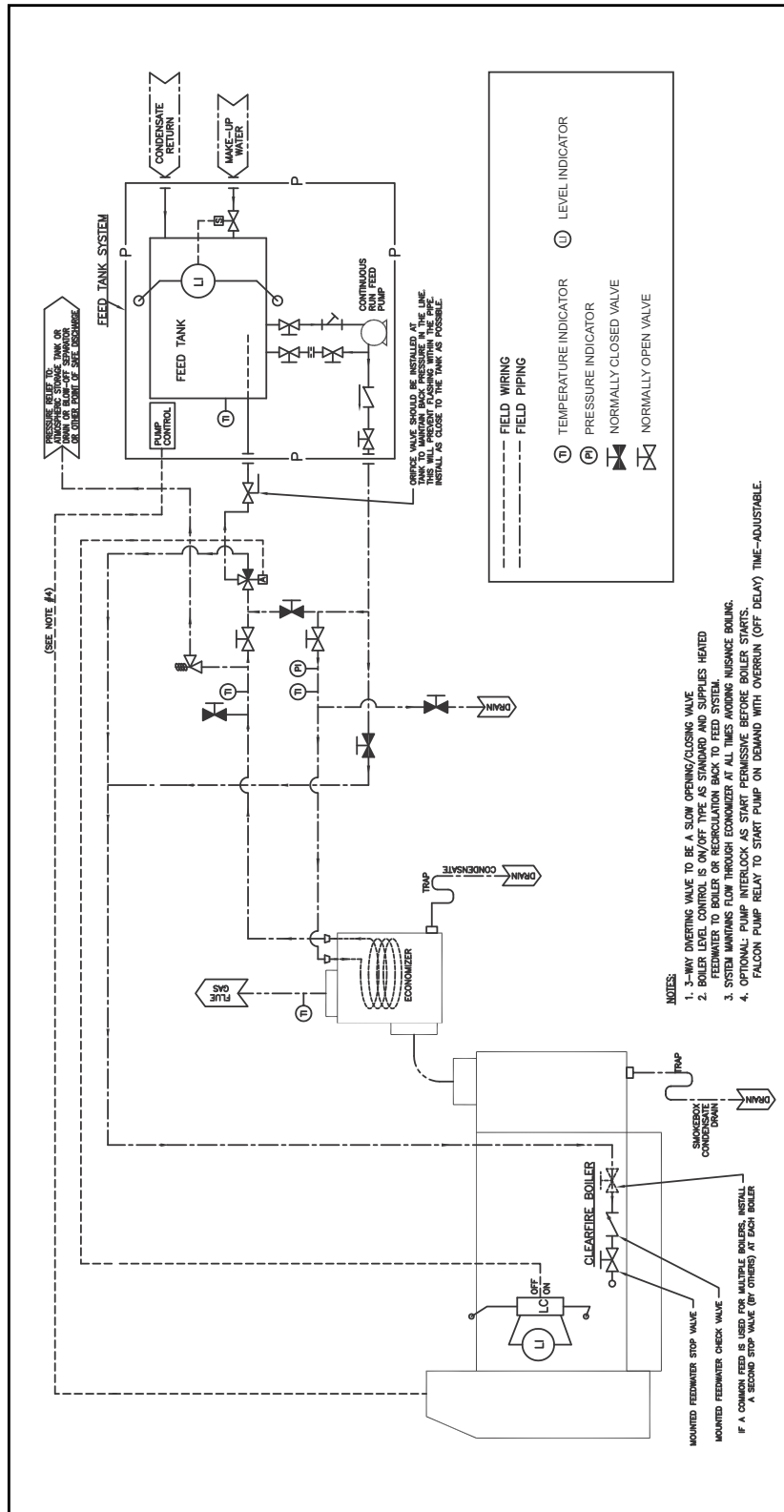
6- PIPING EXAMPLES



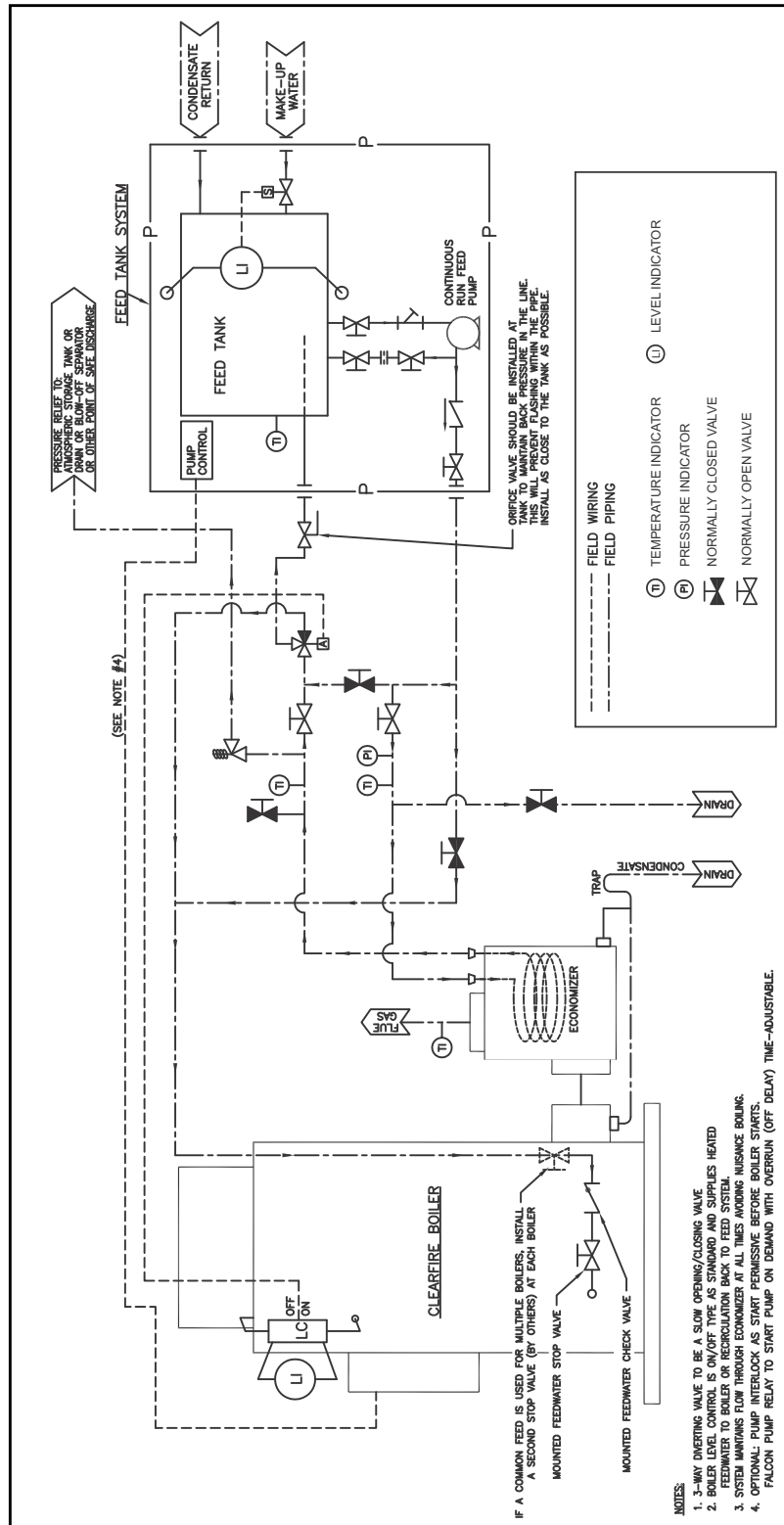
CFH boiler - integral economizer with feed tank



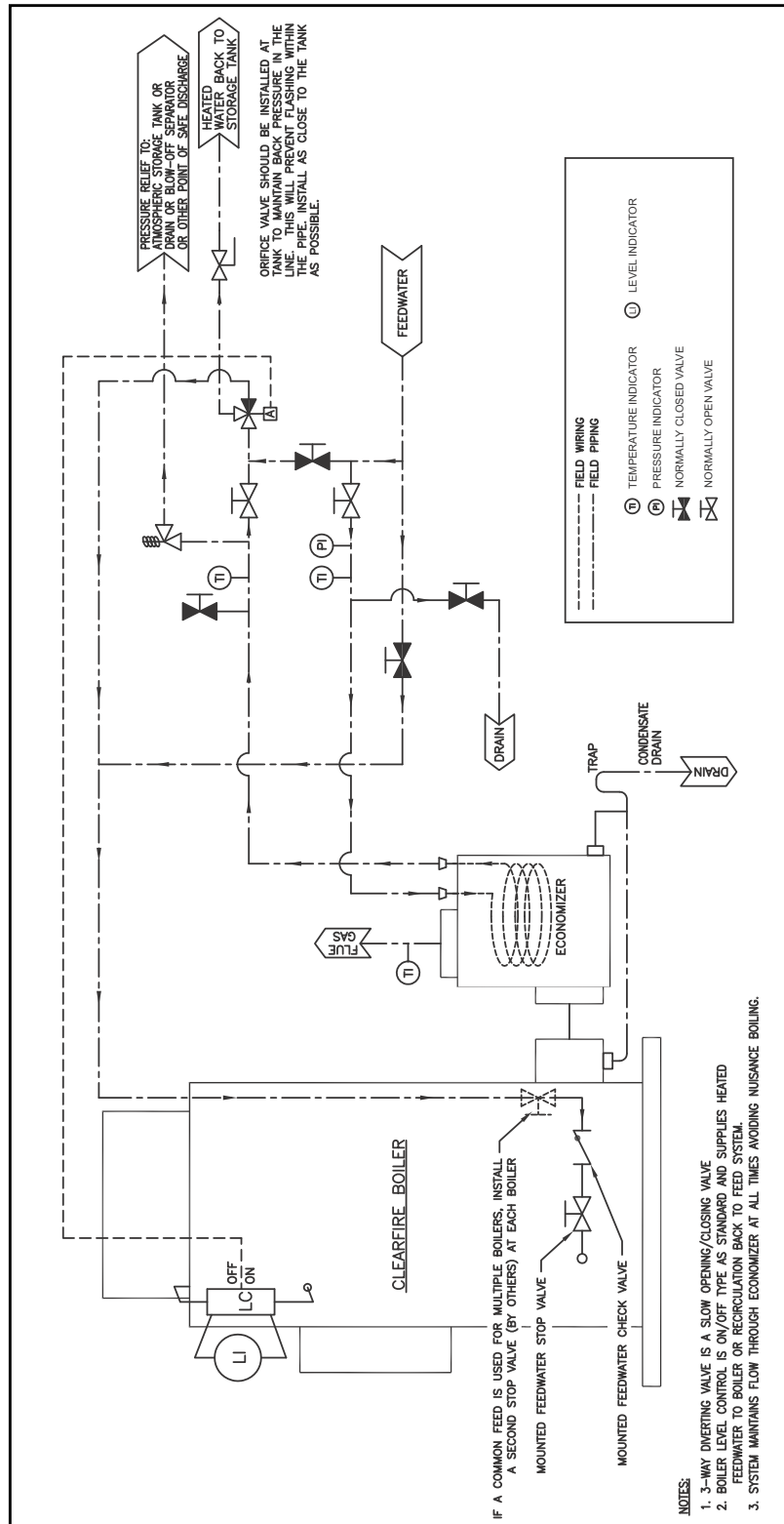
Integral economizer, no feed tank



CFH low pressure steam applications



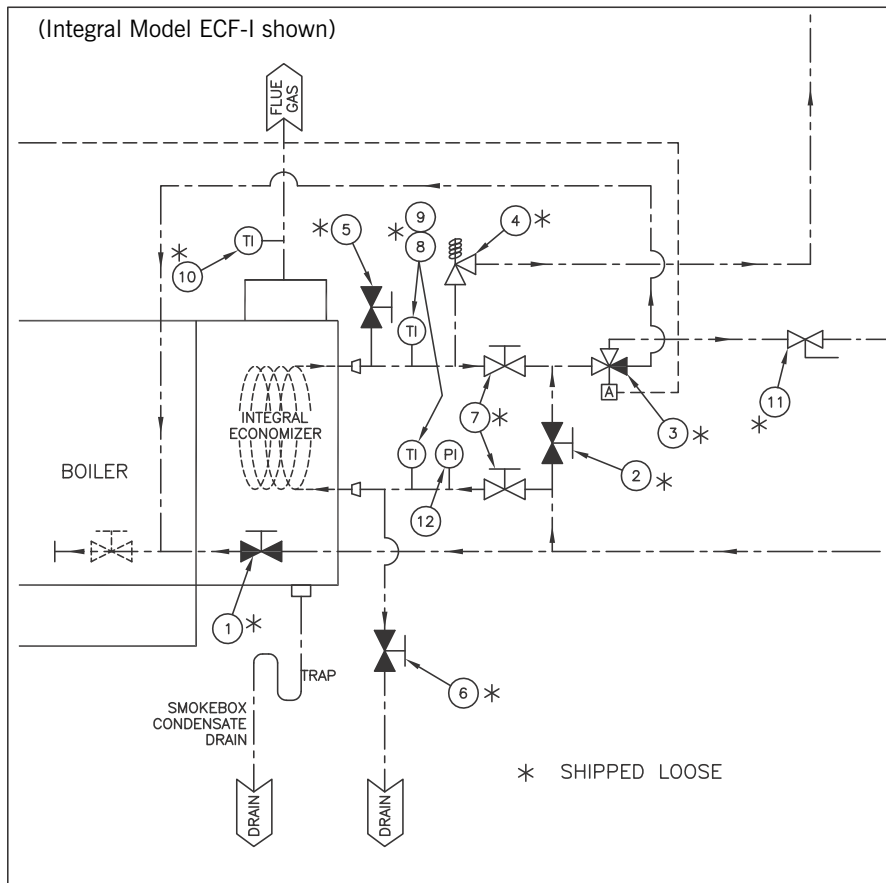
CFV, external economizer with feed tank



CFV, external economizer no feed tank

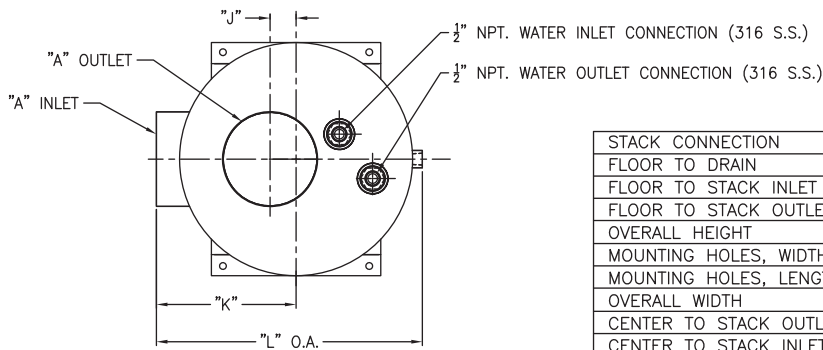
7-PARTS

ALL ITEMS ARE PART OF KIT P/N 880-03801-000			
ITEM	QTY	PART NO.	DESCRIPTION (ALL PROVIDED BY CB)
1	1	941-00402-000	MANUAL FILL VALVE, 1" NPT.
2	1	941-00402-000	BYPASS VALVE, 1" NPT.
3	1	949-00474-000	3-WAY VALVE WITH ACTUATOR, 1" NPT.
4	1	210-00260-000	PRESSURE RELIEF VALVE, 300 PSIG. 1/2" NPT. INLET x 3/4" NPT. OUTLET
5	1	941-00322-000	MANUAL BLEED/VENT VALVE, 1/2" NPT.
6	1	941-00322-000	DRAIN GLOBE VALVE, 1/2" NPT.
7	2	941-00402-000	ECONOMIZER ISOLATION VALVE, 1" NPT.
8	2	937-00720-000	THERMOMETER, 50-300°F
9	2	937-00721-000	WELL
10	1	937-01016-000	STACK THERMOMETER, 50-300°F
11	1	941-00401-000	ADJUSTABLE ORIFICE VALVE, 3/4" NPT.
12	1	850-00122-000	PRESSURE GAUGE, 0-300 PSI, 1/4" NPT. BOTTOM CONN.

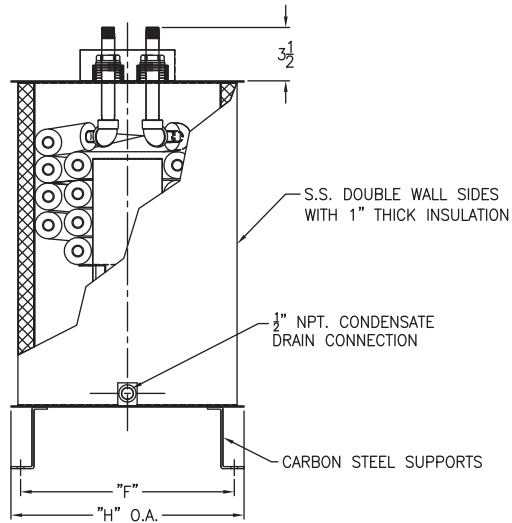
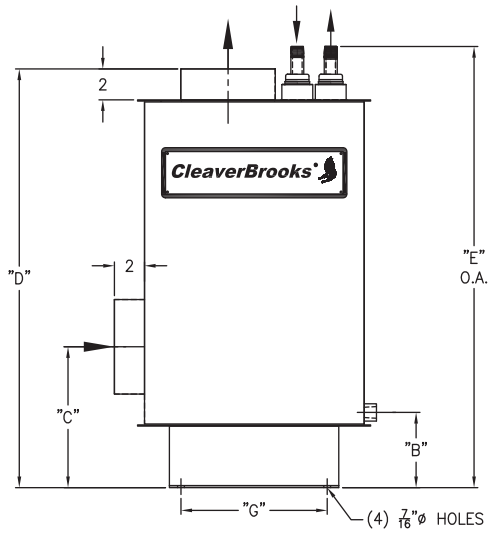


8-DIMENSIONS AND CONNECTION SIZES

ECF external economizer



		BOILER SIZE			
		10-15HP	20-25HP	30-40HP	50-60HP
STACK CONNECTION	A	6" I.D.	6" I.D.	8" I.D.	10" I.D.
FLOOR TO DRAIN	B	4-7/8"	4-3/8"	5"	5-1/4"
FLOOR TO STACK INLET	C	9-1/8"	8-5/8"	9-3/4"	11-1/4"
FLOOR TO STACK OUTLET	D	27-1/8"	26-5/8"	28-7/8"	33-1/4"
OVERALL HEIGHT	E	28-5/8"	28-1/8"	30-3/8"	31-1/4"
MOUNTING HOLES, WIDTH	F	13-7/8"	17-3/8"	21-1/8"	21-1/8"
MOUNTING HOLES, LENGTH	G	9-1/2"	10-7/8"	12-1/4"	12-1/4"
OVERALL WIDTH	H	15-1/8"	18-5/8"	22-3/8"	22-3/8"
CENTER TO STACK OUTLET	J	1-3/4"	2"	3-3/4"	3-3/4"
CENTER TO STACK INLET	K	9"	10-7/8"	13"	13"
OVERALL LENGTH	L	17-1/4"	21"	24-1/8"	24-1/8"
DRY WEIGHT (LB)		50	80	105	135
OPERATING WEIGHT (LB)		53	84	112	143





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