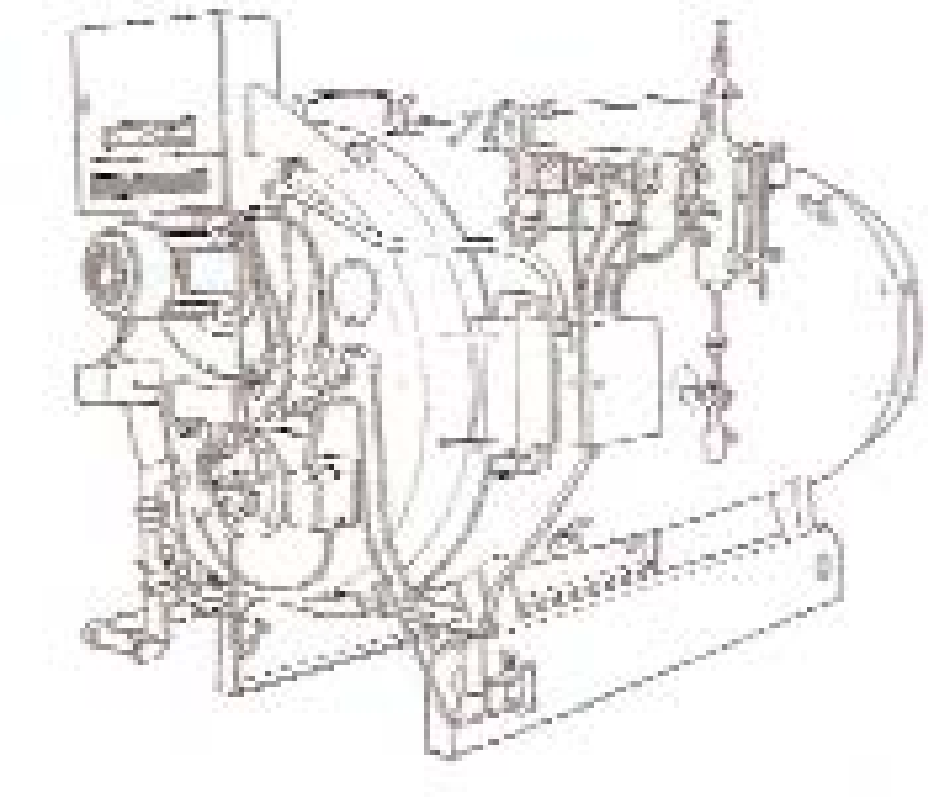
DESCALING

OHMAN

SERVICES

PREPARATIONS & SUPPORT FOR A FIRE-TUBE STEAM BOILER



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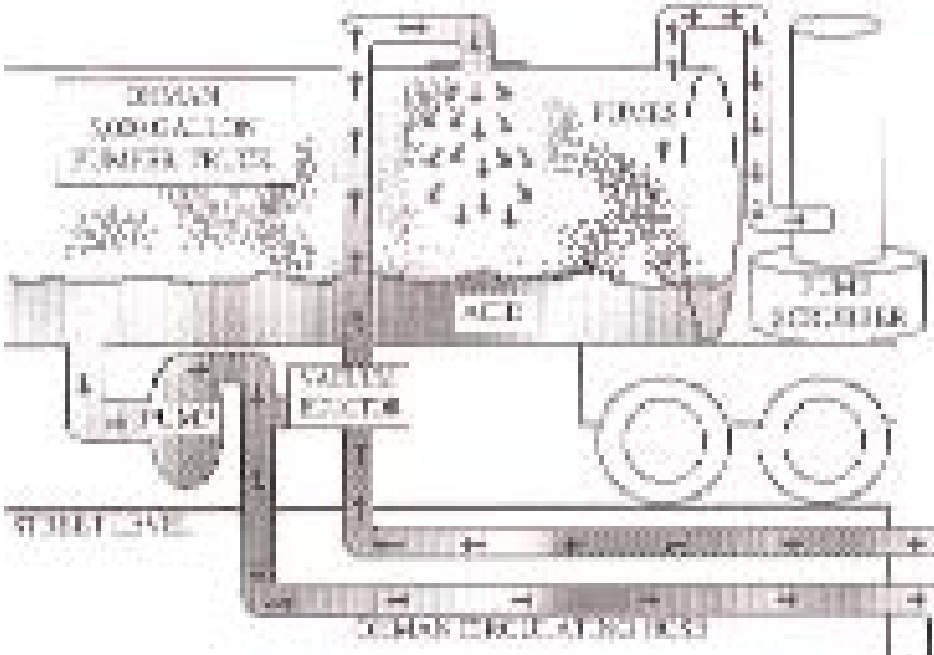
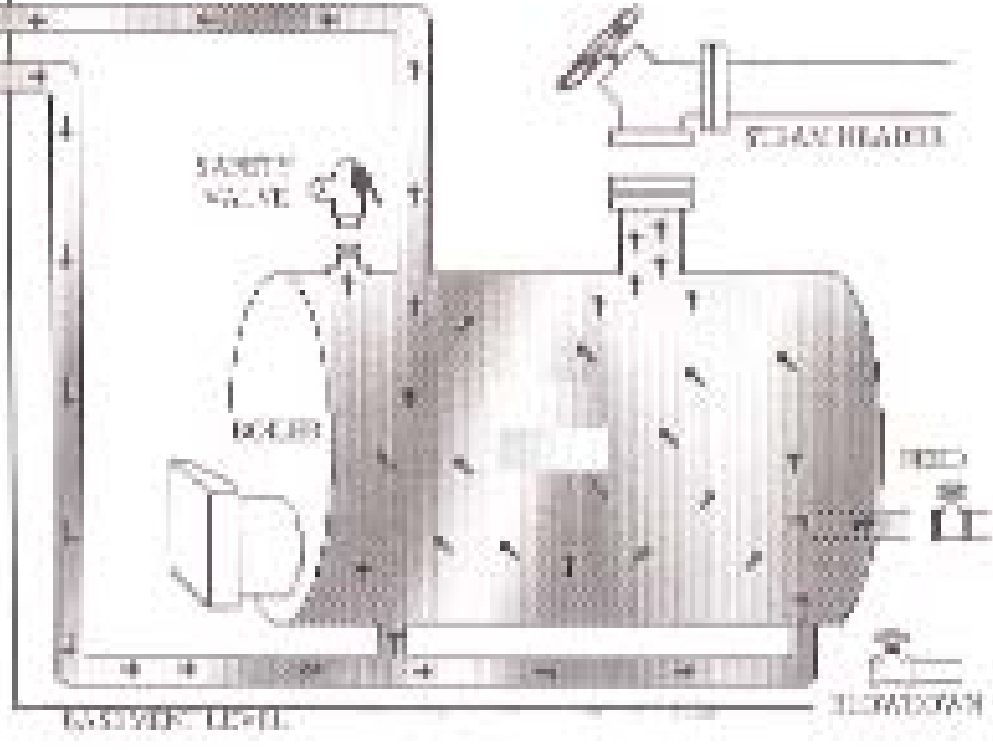
OHMAN CIRCULATION DIAGRAM



Ohman provides custom designed and specially permitted semi truck pumper-tankers to comply with all applicable DOT, OSHA and EPA laws.

Ohman circulates chemicals (under a vacuum) through the boiler "flooded", IN the bottom, OUT the top.

This method is used to provide uniform chemical strength, uniform temperature, to contain potentially corrosive chemicals and fumes.



As you can see in the picture, the static head pressure of the weight of the liquids alone, could create 5 to 15 psi pressure within the boiler.

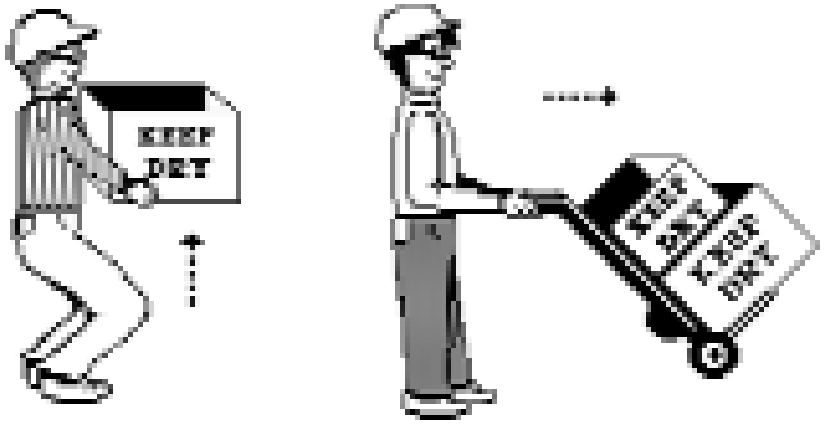
Like dissolving Alka-Seltzer tablets in water, acid "fizzes" when it comes in contact with the scale. This "fizzing" or gas reaction must be dealt with in addition to the normal head pressure and the circulation of the liquids.

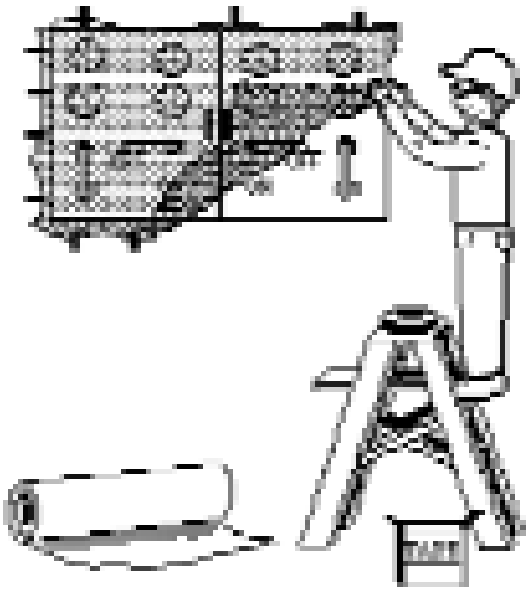
Closed valves cannot be trusted to contain cleaning solution; therefore, all exterior piping must be disconnected, capped, blanked or vented to keep chemicals from straying to where unwanted.

The following pages are provided as a guide for accomplishing the "Preparation & Support" activities.

BOILER AREA PREPARATIONS:
Customer Responsibility

(1) ***REMOVE ANY MOVEABLE VALUABLES FROM THE BOILER ROOM FLOOR AREA THAT COULD BE DAMAGED BY WATER.***

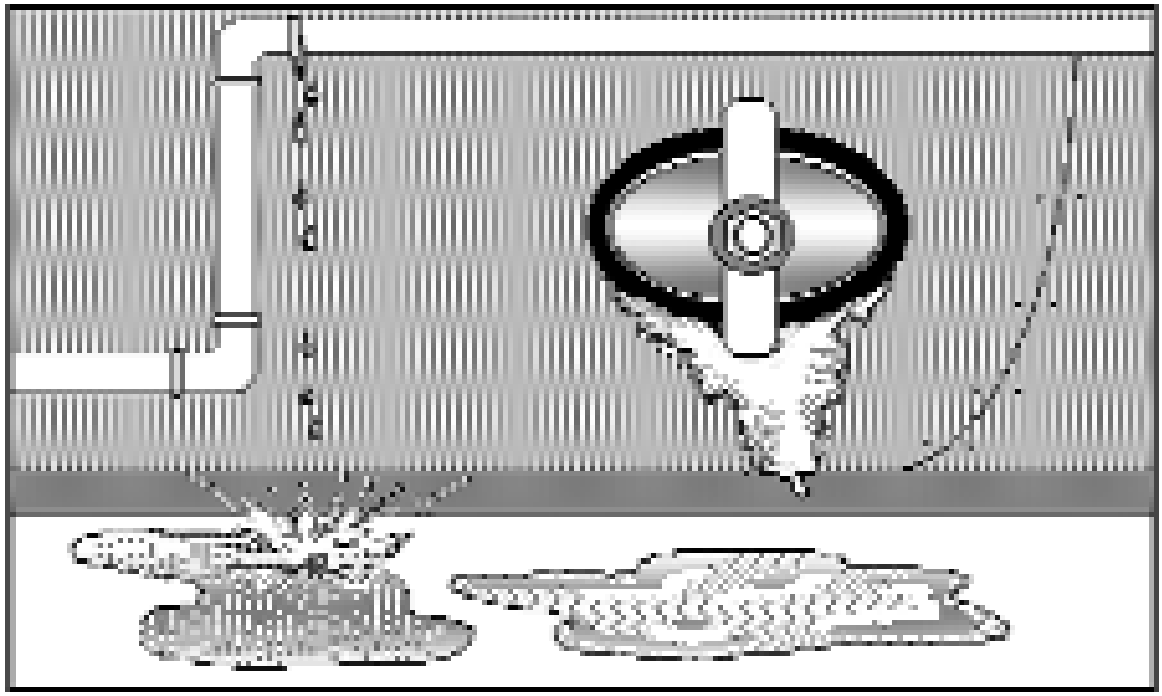




(2) ***USE PLASTIC SHEETING TO COVER ALL ELECTRICAL AND NON-MOVEABLE EQUIPMENT THAT COULD BE DAMAGED BY WATER.***

3 REPAIR ALL LEAKS: Customer Responsibility

INSPECT FOR ANY SIGNS OF PREVIOUS OR CURRENT LEAKAGE AS SHOWN BELOW.



MAKE REPAIRS AS NECESSARY.

REPAIR AND CLOSE WATER-SIDE:
Customer Responsibility

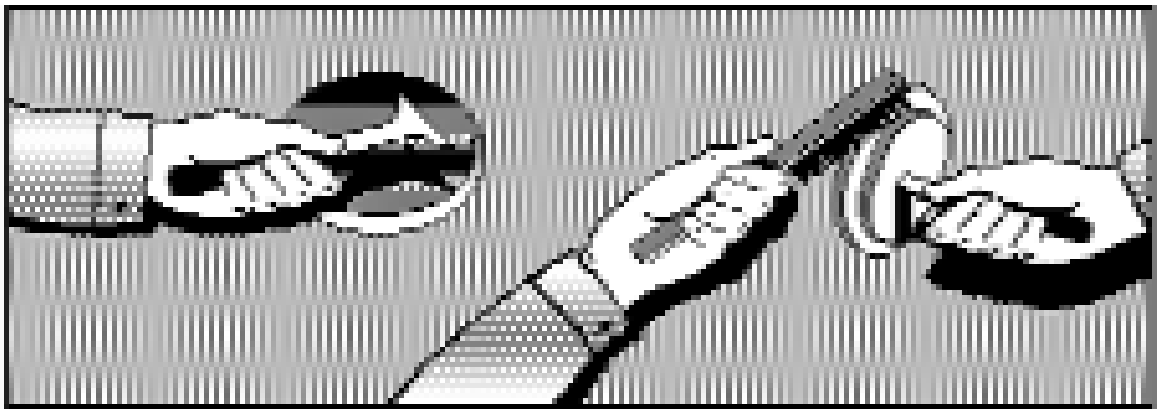
(1) IF THE BOILER IS FULL OF WATER AND NO REPAIRS ARE NECESSARY, LEAVE THE WATER IN THE BOILER.

(2) IF ANY SIGNS OF PREVIOUS OR CURRENT LEAKS ARE FOUND THAT NEED REPAIR AND IF THE BOILER IS FULL OF WATER, PROCEED AS FOLLOWS:

a. Open the top valve for an air vent.
b. Shut off the feed-water pump
c. Open the bottom drain valve(s) and drain the water.

(3) WHEN THE BOILER IS EMPTY, REMOVE OR REPAIR ANY LEAKING PIPING OR CONTROLS. REMOVE ANY HANDHOLE OR MANWAY COVERS THAT HAVE BEEN LEAKING. (Non-leaking Gaskets May Be Left In Place.)

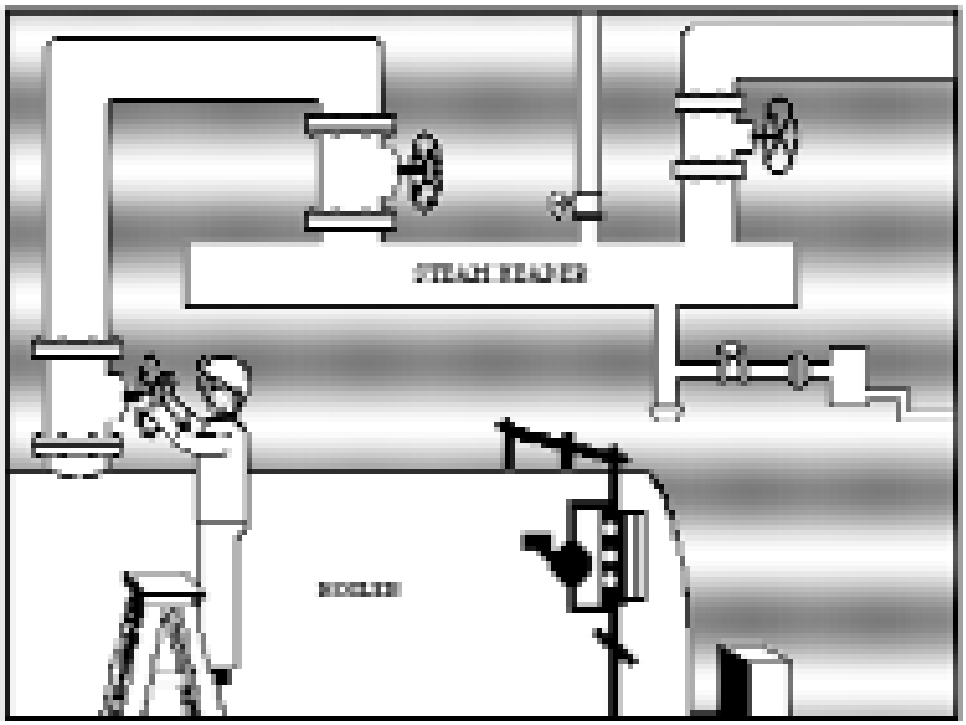
(4) CLEAN THE GASKET SURFACES ON THE REMOVED COVERS AS WELL AS ON THE INSIDE OF THE BOILER.



(5) RE-INSTALL THE CLEANED COVERS WITH NEW GASKETS.

5 STEAM HEADER GENERAL ISOLATION: Customer Responsibility

(1) CLOSE ALL STEAM HEADER VALVES.



STEAM HEADER MECHANICAL SEPARATION:
Customer Responsibility

Often, closed steam header valves CANNOT be trusted to hold steam or chemicals. The following is a list of situations that ma require a more positive isolation.

- ☐ If the boiler is located in the basement or below street (truck) level.
- ☐ If the valves leak during water pressure testing.
- ☐ If the steam is used directly on a food process, in a laundr in a critical environment and/or for humidification.
- ☐ If Permit-Required Confined Space Entry is to be conducted.

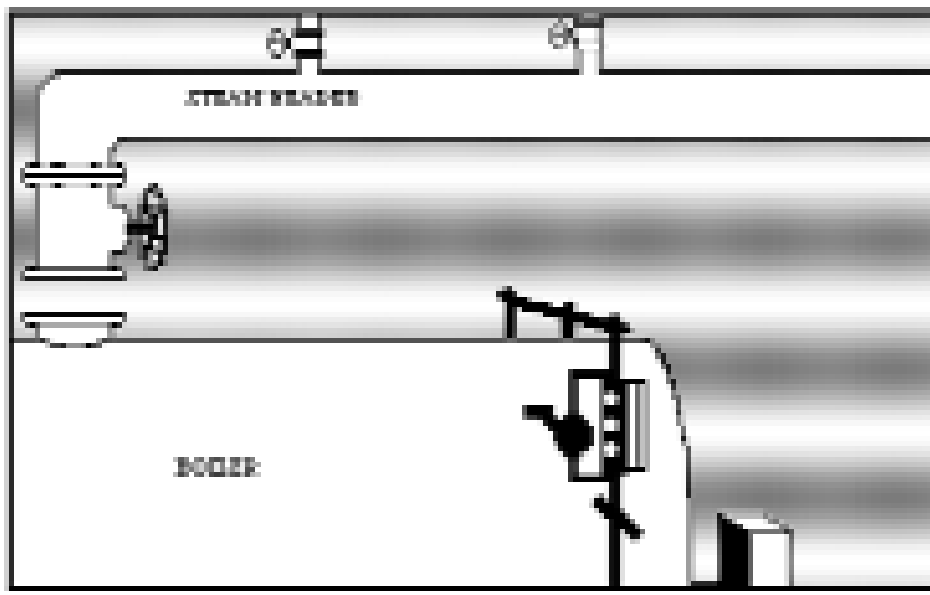
(1) IF CLOSED VALVES CANNOT BE TRUSTED, SEPARATE A FLANGE NEAREST THE BOILER.

(2) INSTALL A 1/4" THICK STEEL DISK OR INSTALL A BLANK FLANGE TO PROVIDE A POSITIVE ISOLATION.

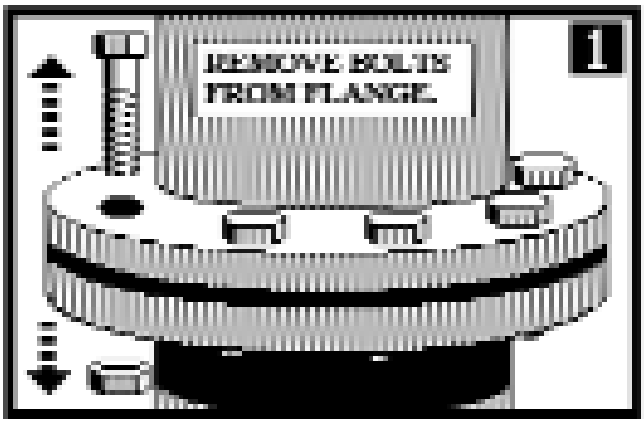
- OR -

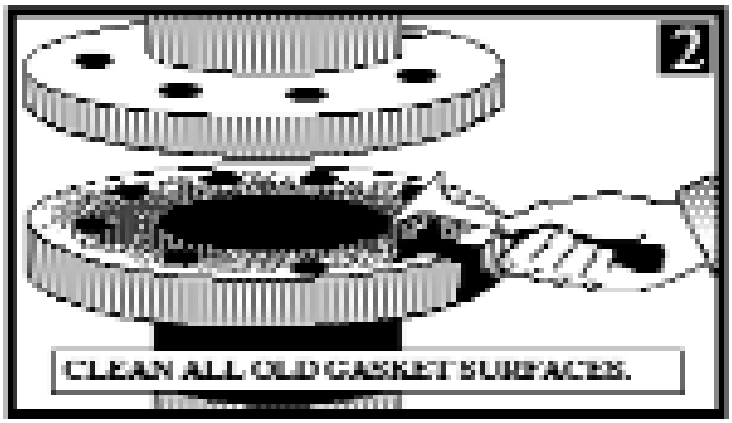
- Completely remove the valve closest to the boiler and install a blank flange with gasket. (See Next Page)

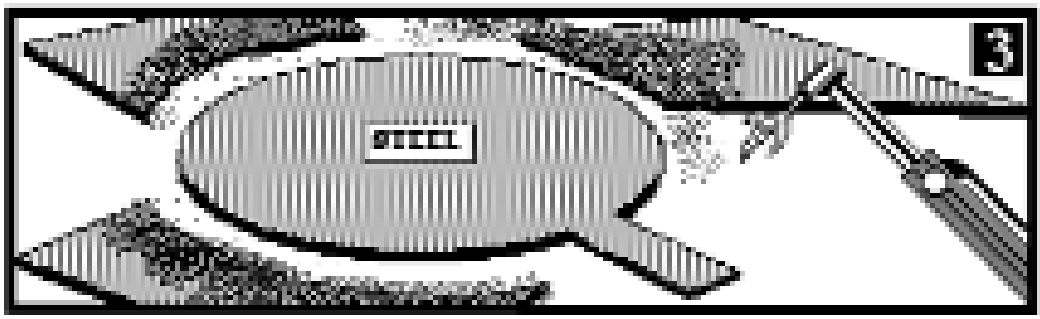
SEPARATE THE STEAM HEADER FROM THE BOILER HERE.



7 STEAM HEADER INSTALL BLIND:
Customer Responsibility

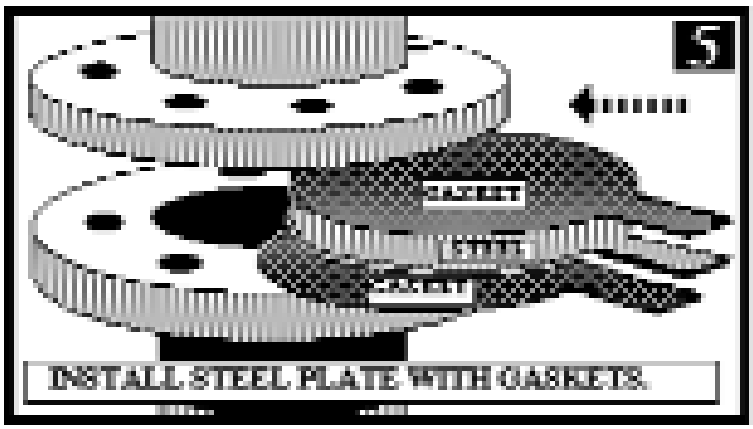


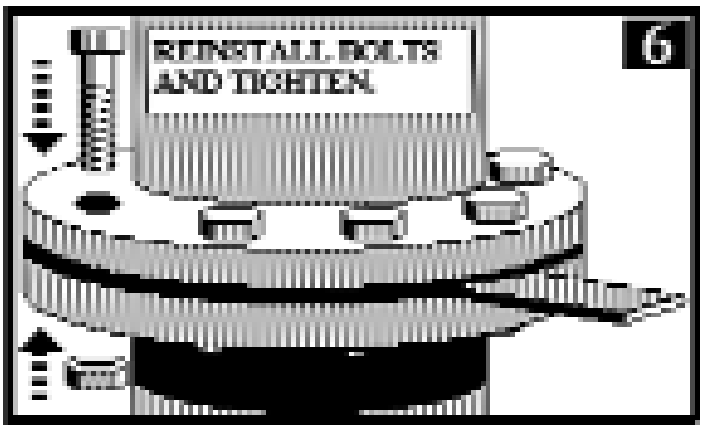




CUT 1/4 INCH STEEL PLATE FOR BLANK IN HEADER

CUT TWO GASKETS THE SAME SIZE AS THE STEEL PLATE.





FILL TO PRESSURIZE, TEST FIRE & DRAIN:
Customer Responsibility

(1) OPEN THE TOP AIR VENT VALVE

(A) This will allow air to escape during filling.

(B) During filling, when water comes out this port you will know that the boiler is full.

(2) USE PLASTIC SHEETING TO COVER EQUIPMENT BENEATH OPEN VENT VALVE.

(3) COMPLETELY FILL THE BOILER WITH WATER.

(A) Add water through the feedwater line valve or temporary water hose, until water comes out the open top vent valve. NOTE: If the feedwater pump is used, the water level control may need to be bypassed to allow filling above normal water level.

(4) CLOSE THE TOP VENT WHEN BOILER IS FULL.

(5) ADD WATER TO PRESSURIZE. (NOTE: DO NOT OVER PRESSURIZE)

(6) INSPECT FOR LEAKS

(A) Inspect inside the firebox/furnace tube, and at the ends, if the fire-side doors are open.

(B) Check the flange blank (if installed) at the steam header valve.

(C) Check all manway covers, handcap covers and special fittings.

(D) If pressure is lost, repair the leak and pressure test again.

(7) TEST FIRE THE BURNER:

(A) Reduce the pressure, but leave boiler COMPLETELY full of water.

(B) Open the vent valve.

(C) Temporarily close the fire side access doors.

(D) Operate the burner to insure it will fire (while the boiler is full of water).

NOTE: During the various cleaning stages, the burner will need to be fired to manually warm the solutions.

(E) Stop firing as soon as you are sure the burner will operate.

(8) OPEN THE BOTTOM BLOWDOWN VALVE(S) AND DRAIN THE BOILER.

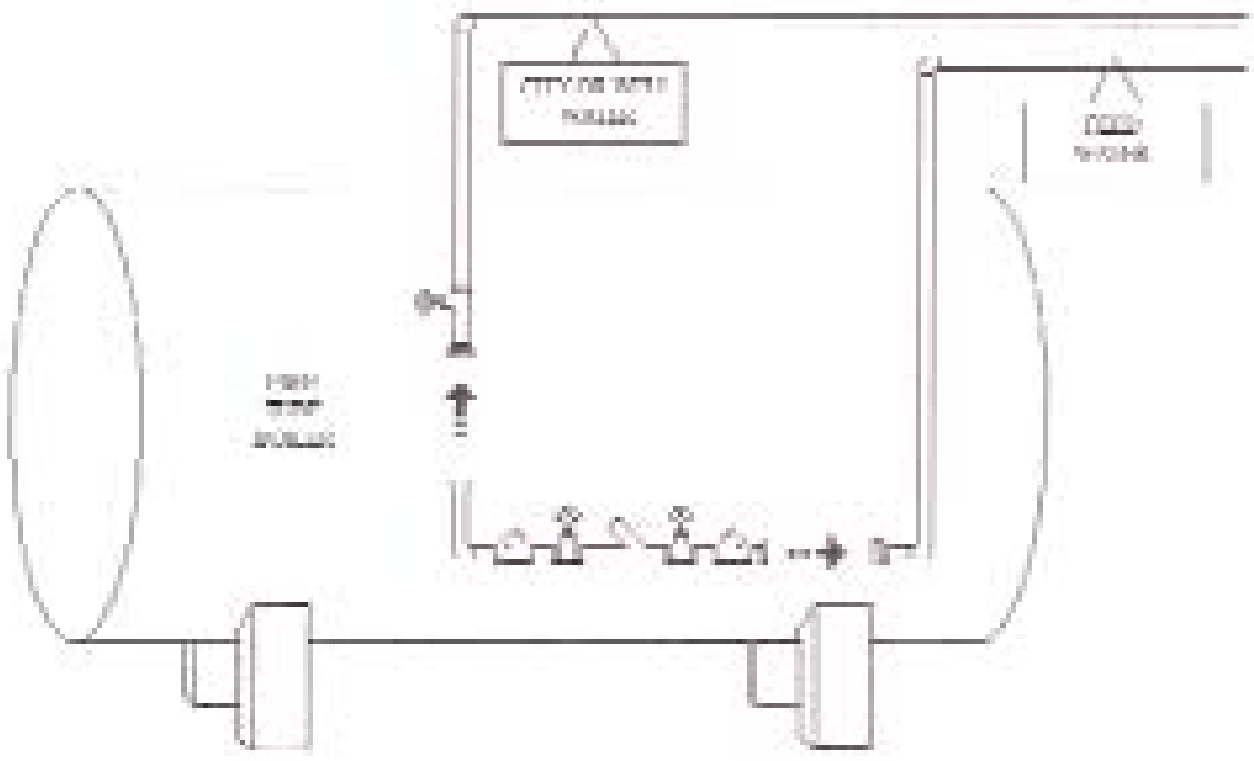
9 POTABLE & FEED WATER LINES: Customer Responsibility

(1) DISCONNECT BOTH THE FEED WATER AND THE (POTABLE) CITY OR WELL WATER AS SHOWN.

(A) To insure that chemicals will not stray from the boiler through faulty closed valves this would contaminate either of these systems.

(B) Inspecting and cleaning these pipes is a good preventive maintenance activity. The check valve(s) could also be checked for proper operation. During normal operation, cool water is rapidly heated as it enters the boiler at these locations. As the water is heated, minerals start to drop out. This could potentially restrict piping close to the boiler.

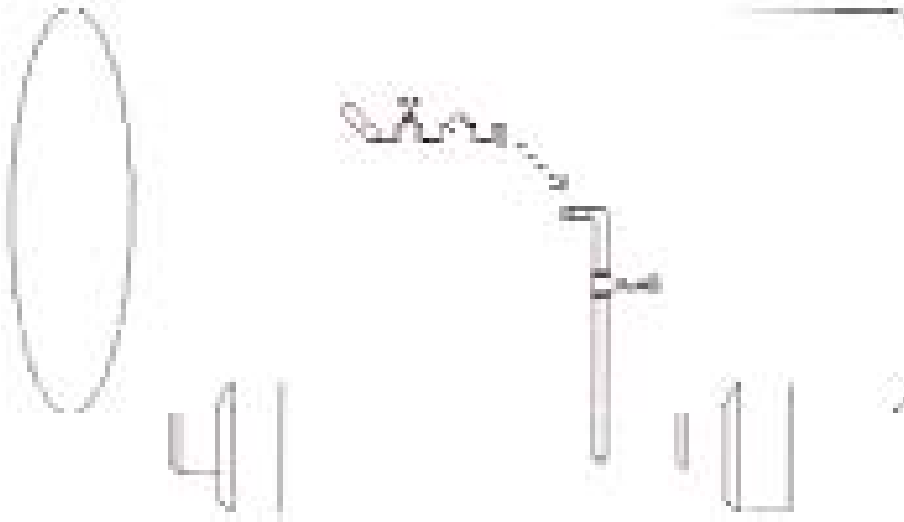
(2) INSTALL CAPS ON THE REMAINING OPEN BOILER PORTS.



WARNING: Hand Valves and Check Valves cannot be trusted to isolate these systems. If these lines are not disconnected, chemicals could contaminate the feedwater system or the building drinking water.

SURFACE BLOWDOWN LINES: 1
Customer Responsibility

Surface or continuous blown down lines can be located in many different positions on a boiler. They can be single (as shown) or double. Often they come out of the top of a boiler with an interior drop pipe.



CAUTION:

Before accomplishing any blowdown disconnections, please consider:

Our concern is to avoid scalding of personnel with hot blowdown steam and/or water which may escape from this boiler or backwards through open blowdown piping from another operating boiler.

- Communicate with boiler operators.
- Accomplish all applicable "Lock out, Tag out" procedures.
- Stop all blowdown activity on other boilers if they are running and might be interconnected.

(1) FIND AND DISCONNECT AT THE UNION CLOSEST TO THE BOILER.

(2) REMOVE BOTH UNION HALVES.

(3) INSTALL CAPS ON ANY REMAINING OPEN BOILER PIPING PORTS.

(4) CHECK FOR OTHER ATTACHMENTS.

(A) In addition to continuous blow downs there could be other equipment and piping attached to the boiler such as:

- Steam line to manual feedwater eductors.
- Steam line to fuel oil heater exchanger.
- Various types of heat exchangers

(5) IF ANY OTHER ATTACHMENTS ARE FOUND, FOLLOW THE SAME PROCEDU AS ABOVE TO ISOLATE THEM.

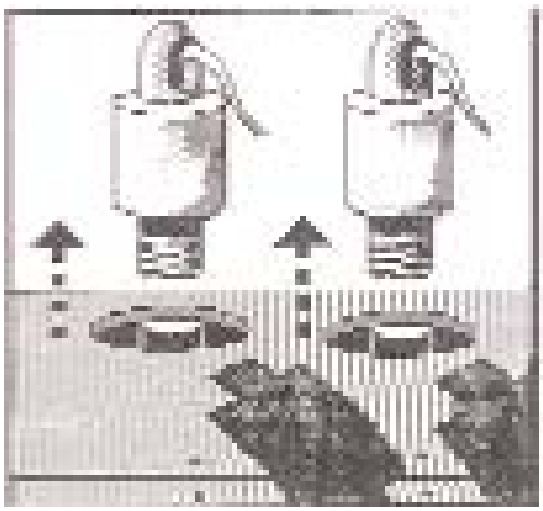
11 SAFETY VALVES & TOP CIRCULATION: Customer Responsibility

A top circulation port (2" diameter or larger) will be required as one of the cleaning connections. This top port can be provided by:

Option 1) the removal of the safety valve(s) OR…
Option 2) the use of an Ohman circulation manway.

(1) REMOVE ALL SAFETY VALVES (if required by one of the following options)

- ☐ If valve "set" pressure is 30psi or less.
- ☐ If valves show signs of leakage or are to be removed for recalibration.
- ☐ If these ports must be plugged to accomplish hydrostatic test after acidizing.
- ☐ If this boiler does not have a top manway.



OR:

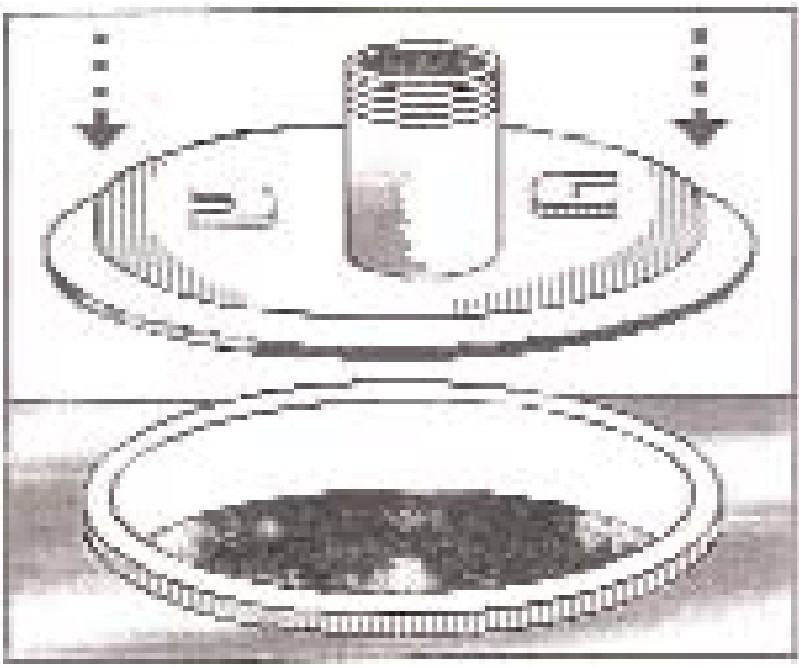
(Ohman Responsibility)

(2) LEAVE SAFETY VALVES IN PLACE (If none of the above apply)

If the safety valves do not need to be removed and if this boiler has a manway this option may be used.

At the start of the project the normal manway cover will be removed and replaced with a special circulation-ported manway cover supplied by Ohman.

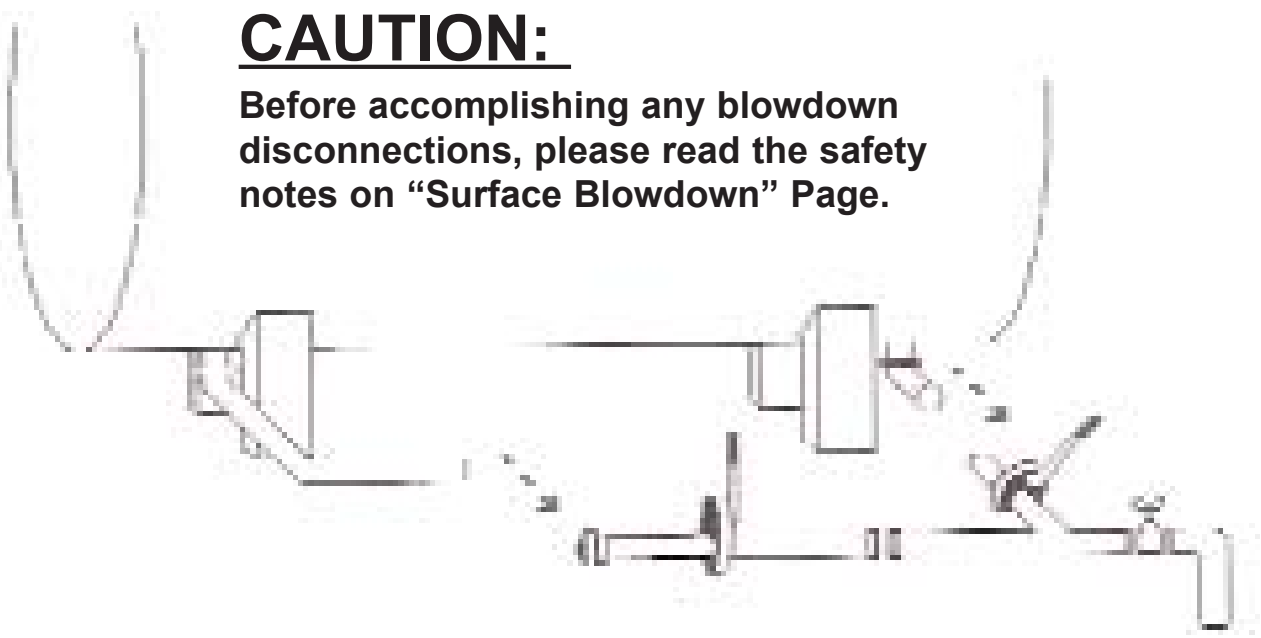
This device can serve as the required top circulation port.



BOTTOM BLOWDOWN LINES: 1
Customer Responsibility

CAUTION:

Before accomplishing any blowdown disconnections, please read the safety notes on "Surface Blowdown" Page.



(1) REMOVE ALL BOTTOM BLOWDOWN VALVES AND PIPING.

(A) Valves and piping are to be removed for the following reasons:

(1) To provide bottom hose connections for circulation and fast chemical removal.

(2) To avoid any possible etching of the machined valve seats.

(3) We find that this piping usually leaks if used during the chemical cleanin process.

(a) During normal operation, the piping on the drain side of the valves lays wet and full of oxygen. Because of this situation, this piping has usually been previously damaged by oxygen corrosion.

(B) At the start of the cleaning project, Ohman will install temporary valves on the open ports and used during the cleaning.

THE BOILER IS NOW READY FOR CHEMICAL CLEANING.

13 PROCEDURES & SAFETY MEETING: Customer Responsibility

For cost purposes, most customers elect to supply in-plant personnel to accomplish these "Support" activities while Ohman supervises and operates the pumper truck. For those customers who have decided to do the "Support" activities, we offer the following guidelines.

THE CUSTOMER AGREES TO ACCOMPLISH THE FOLLOWING DUTIES UTILIZING PLANT PERSONNEL OR ANOTHER OUTSIDE CONTRACTOR.

(1) Removing and replacing manway cover, handhole caps and water level controls (with new gaskets) as needed.
(2) Boiler operations: operating the burner, filling with water and draining.
(3) Supply and control of customer supplied utilities.
(4) Operate (on/off) water valve.
(5) Monitor activities at all times. Watch for leaks. Stop unauthorized people.
(6) General security. Passage for hoses will be kept open throughout project.
(7) Janitorial cleanup of the area when the project is complete.

The estimated project "Support" time for ONE boiler of this type is approximately 12 continuous hours. Unforeseen circumstances can extend this time.

SPECIFIC EXPLANATION OF THE "SUPPORT" ACTIVITIES STARTS HERE!

When the Ohman truck and operator(s) arrive at the project site, the following activities will be conducted:

(1) Truck parking, site familiarization and introduction of all involved personnel.

(2) Project procedures, scheduling and safety meeting.
Ohman's policy is to comply with all of the applicable local, state and federal laws. The federal Hazard Communications Standard ("Right To Know" law), Lockout / Tagout and Permit Required Confined Space Entry Procedures, all enforced by OSHA, are of the most importance at this time. We also wish to follow all of your plant activity safety guidelines. We would, therefore, appreciate being introduced to, and having a safety meeting with, the managers of production, safety, environmental matters, first aid and security.

(3) Notifying the work place and community of the presence of hazardous materials will be accomplished in the form of written booklets supplied by Ohman. Current information will be written in and the completed booklet will be hand delivered to plant security and the local fire department.

"SUPPORT" UTILITIES & PERSONNEL: Customer Responsibility

"Support" means: The activities that the customer is responsible for (while Ohman is on-site) utilizing OTHER THAN OHMAN personnel.

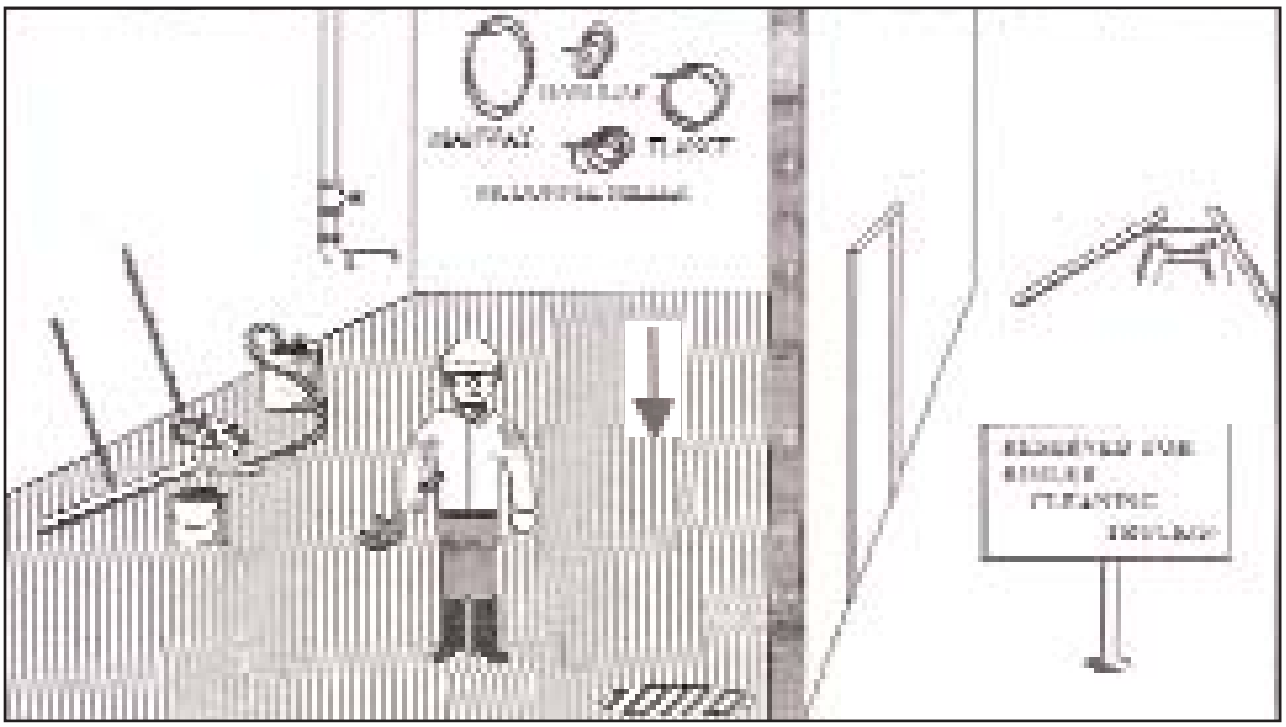
THE CUSTOMER AGREES TO SUPPLY THE FOLLOWING MATERIALS, UTILITIES & PERSONNEL.

(1) A VALVED SUPPLY OF COLD WATER: 1.5 INCH OR LARGER NEAR UNIT TO BE CLEANED

(2) SPARE GASKETS

(3) PARKING SPACE(S) FOR 50 FOOT LONG SEMI PUMPER/TANKER TRUCK(S).

(Parking should be provided on cu tomer property, not on public stree



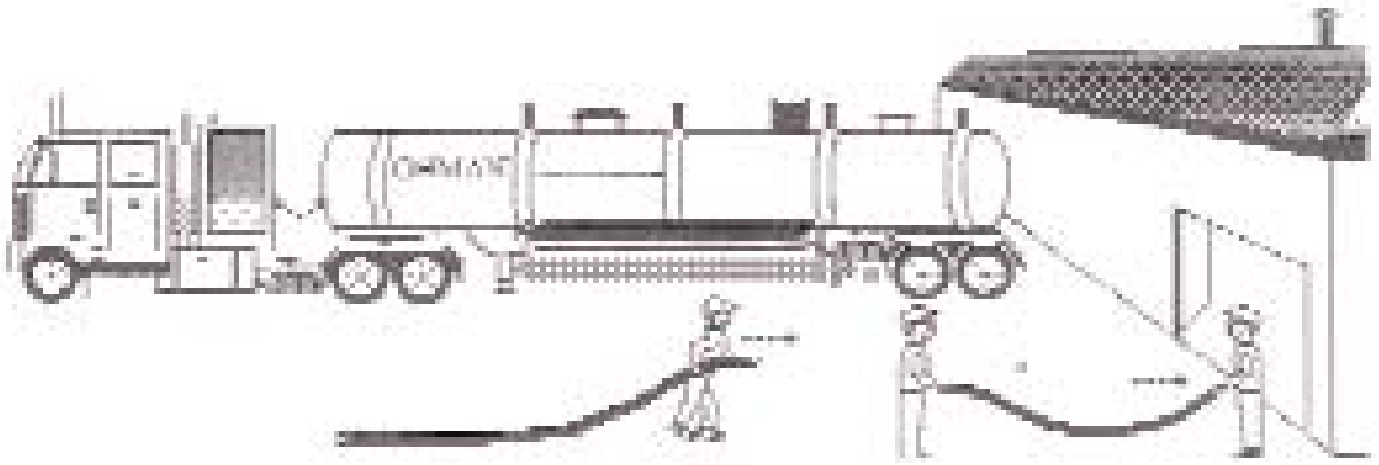
(4) FLOOR CLEAN-UP TOOLS

(5) SANITARY (NOT STORM SEWER) FLOOR DRA NEAR THE BOILER TO BE CLEANED.

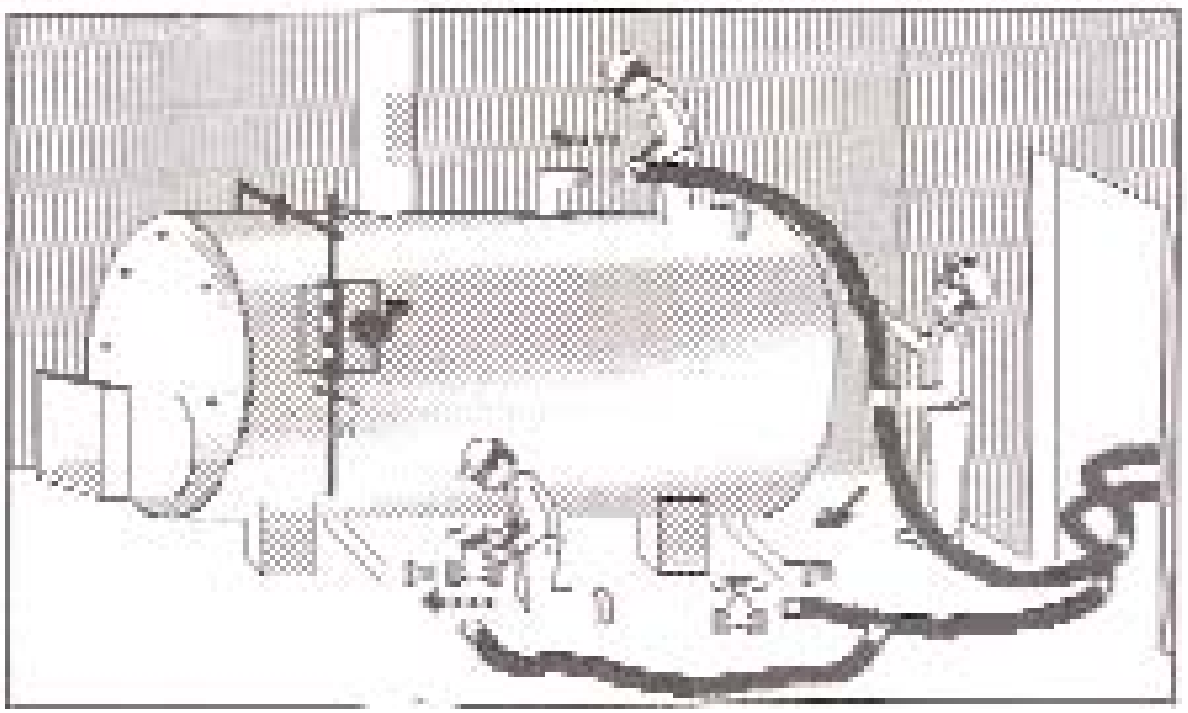
-NOTE: Confirm that this drain is not restricted. This dra should be able to pass a continuous full flow of the oper bottom blowdown valve without backing up.

(6) SCHEDULE AT LEAST 1 MECHANICALLY TALENTED PERSONNEL TO BE AVAILABLE THROUGHOUT THE ENTIRE CLEANING OPERATION. PROVIDE THEM WITH RUBBER BOOTS, GLOVES AND EYE PROTECTION. THEIR RESPONSIBILITIES WILL BE AS SHOWN ON THE FOLLOWING PAGES.

15 UNLOAD & CONNECT HOSES: Ohman Responsibility



(1) UNLOAD HOSES AND EQUIPMENT FROM THE PUMPER TRUCK.



(2) INSTALL OHMAN SUPPLIED TEMPORARY VALVE(S).

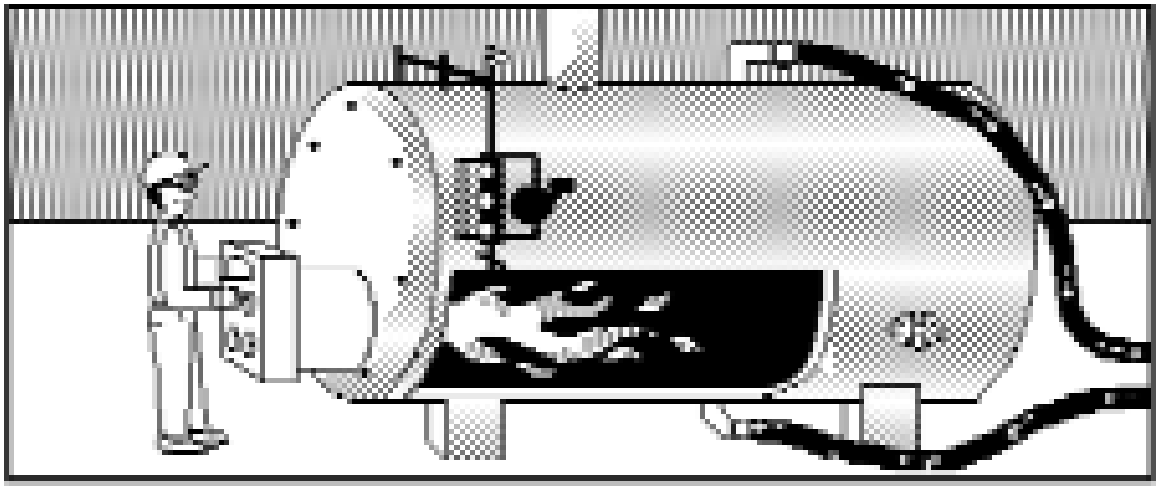
(3) CONNECT BOTH LARGE CIRCULATING HOSES FROM THE TRUCK TO THE CONNECTIONS ON THE TOP AND BOTTOM OF THE BOILER.

VACUUM TEST & CHEMICAL STAGE: 1

VACUUM TEST: As a precautionary measure (once the hoses are inter-connected) Ohman uses the pumper truck to pull a vacuum on the entire system (including the boiler and Ohman's hoses). This activity is accomplished to check for leaks. A vacuur is used because it is much safer and faster than using water pressure.

CHEMICAL STAGE: Ohman will fill the boiler with pre-mixed inhibited hydrochloric acid. Ohman uses Rodine #213 inhibitor to protect the boiler. Circulation will be from the pumper tank-truck via the large hoses. Flow will go in the bottom of the boiler, out the top, and back to the truck.

THE CUSTOMER IS TO SUPPLY QUALIFIED PERSONNEL TO BE AVAILABLE AN RESPONSIBLE FOR FIRING THE BOILER AS NEEDED.



During the large volume circulation, the customer's operator will cycle the boiler on/of for short periods of time to warm the boiler and cleaning solution to ~ 140 degrees F. Ohman will direct the amount of firing by monitoring the temperature of the circulated cleaning solution. No steam or pressure will be produced from this firing.

Large volume circulation and intermittent manual firing will continue until the uniform temperature of ~ 140 degrees F. is reached. The warmed cleaning solution will then b periodically cycled (soaking and circulating) for 1 to 3 more hours while being monitored and tested.

Remove Cleaning Solution From the Boiler: The cleaning solution is then vacuum removed from the boiler and hoses, back to the tanker.

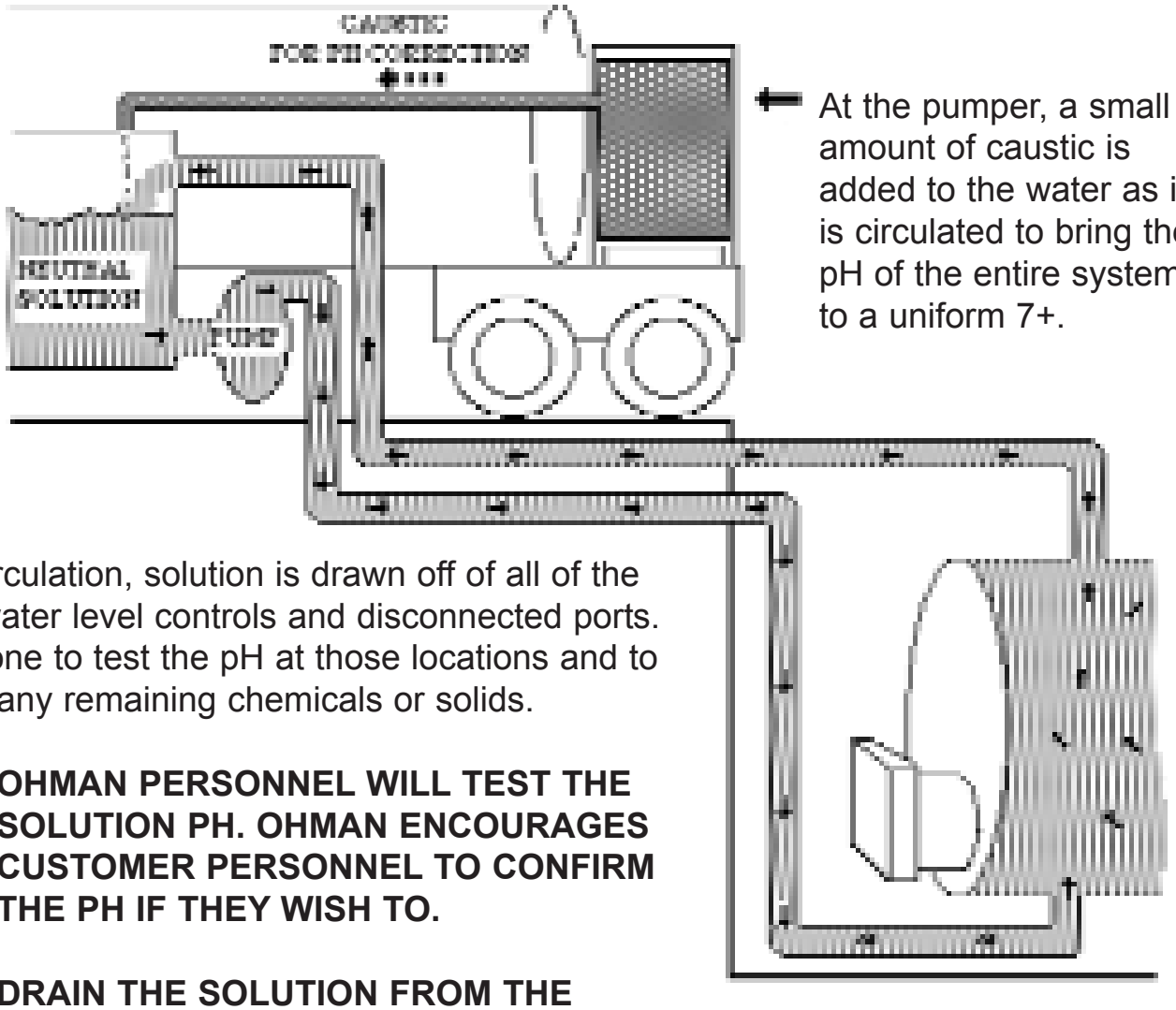
17 COOLING, PRESSURE & PH TESTS: Ohman Responsibility

By this time the cleaning solution has been vacuum removed from the boiler to the Ohman tanker(s). After the project, the used chemicals are legally transported away from the site in this specially permitted pumper/tanker(s).

(1) FURNISH AND CONTROL A LARGE VOLUME SUPPLY OF COOL CITY WELL WATER. FILL THE BOILER AT THIS TIME.

Ohman will supply necessary hoses if within 100 feet of the boiler.
The empty boiler will be filled with this water to cool the clean surfaces.

(2) OPERATE THE BURNER MANUALLY TO WARM THE SOLUTION TO ~140 DEGREES F., AS DIRECTED BY OHMAN.



At the pumper, a small amount of caustic is added to the water as it is circulated to bring the pH of the entire system to a uniform 7+.

During circulation, solution is drawn off of all of the various water level controls and disconnected ports. This is done to test the pH at those locations and to flush out any remaining chemicals or solids.

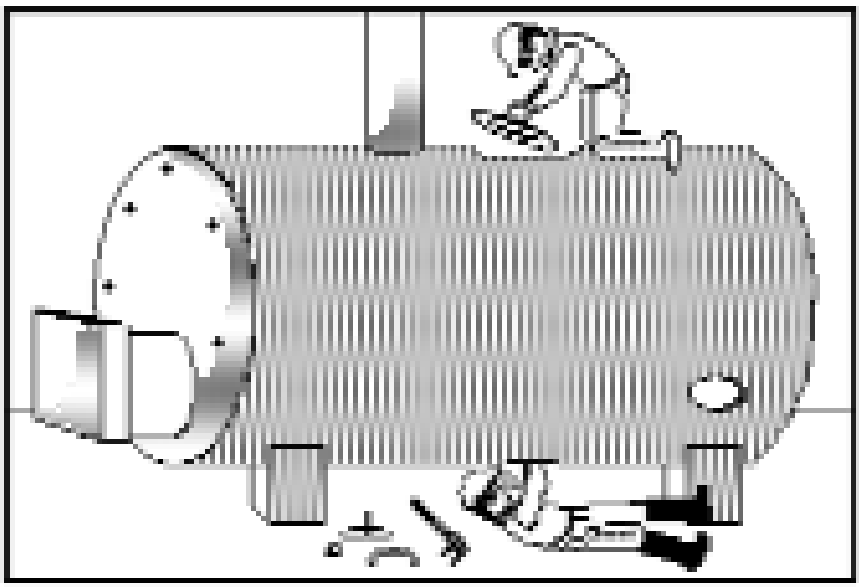
(3) OHMAN PERSONNEL WILL TEST THE SOLUTION PH. OHMAN ENCOURAGES CUSTOMER PERSONNEL TO CONFIRM THE PH IF THEY WISH TO.

(4) DRAIN THE SOLUTION FROM THE BOILER TO A PLANT SANITARY DRAIN.

Please contact Ohman (in advance) if this is not possible or agreeable.

OPEN, INSPECT & WASH OUT: 1
Ohman Responsibility

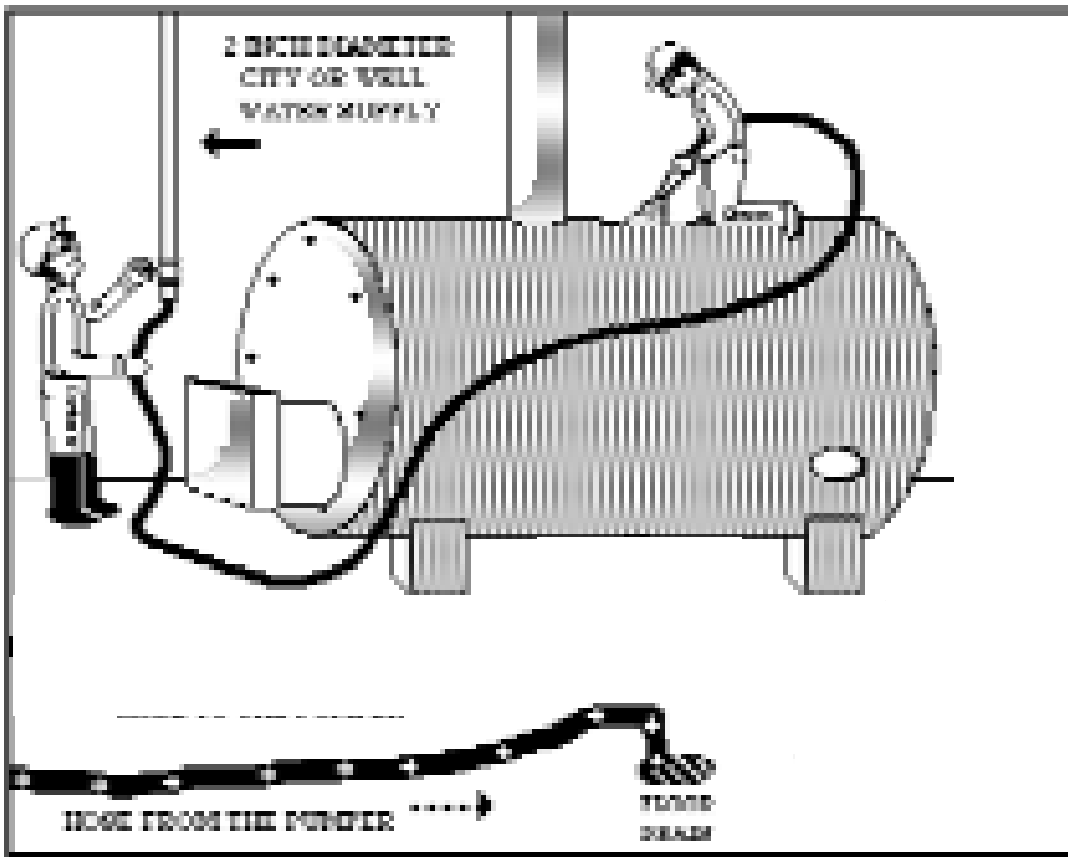
(1) REMOVE PORTS AS NEEDED FOR INSPECTION AND WASH-OUT.



(2) WASH ANY LOOSE SLUDGE OUT OF THE BOILER.

THE WASH-OUT SOLUTION IS VACUUMED TO THE PUMPER WHERE IT IS pH CORRECTED.

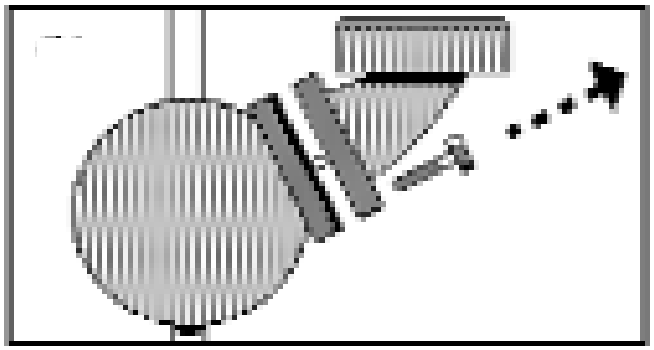
THE SOLUTION (7pH) IS THEN PUMPED BACK VIA HOSES TO THE PLANT SANITARY DRAIN.



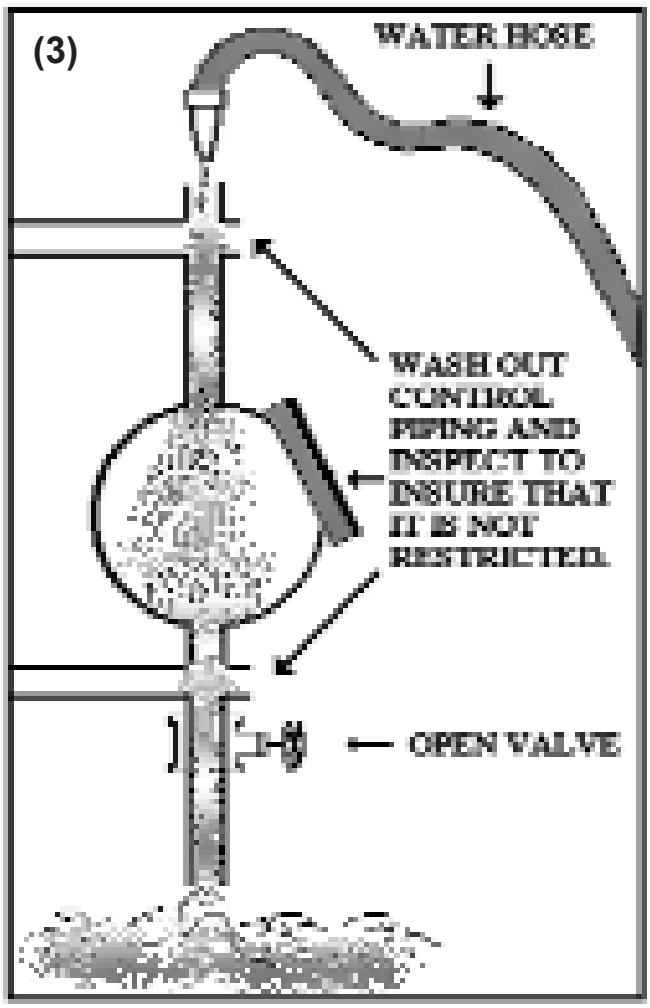
19 CLEAN & FLUSH WATER-LEVEL CONTROLS: Ohman Responsibility

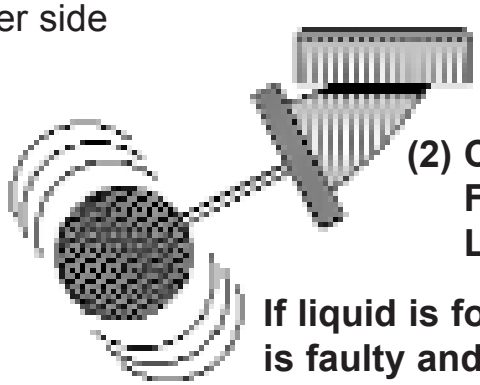
At this point the cleaning truck and crew have left the site. The boiler is empty and most of the water side inspection ports are open after the wash-out.

CLEAN LEVEL CONTROLS



(1) REMOVE THE BOLTS FROM THE WATER LEVEL CONTROL.





(2) CHECK THE FLOAT FOR LIQUIDS.

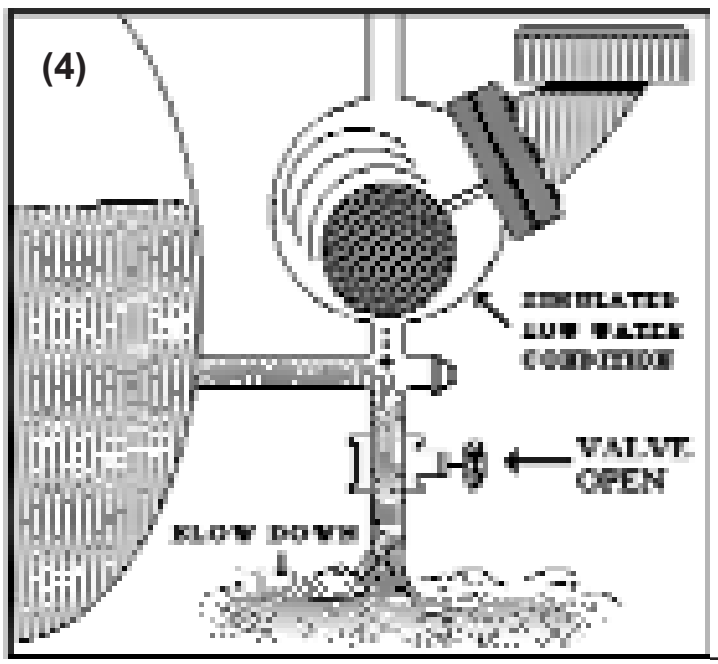
If liquid is found, the float is faulty and should be changed.

Customer Responsibility

This cleaning and inspection activity does not insure that theses mechanical safety devices will operate correctly.

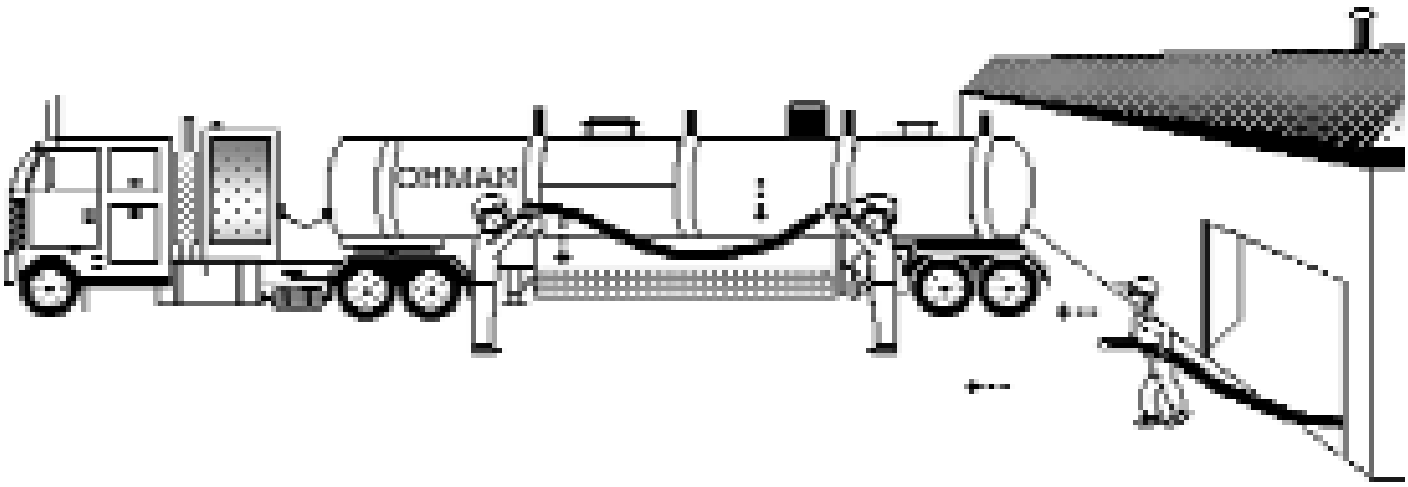
UPON START UP OF THE BOILER, WITH THE BURNER OPERATING, THESE DEVICES SHOULD BE BLOWN DOWN TO PROVIDE A SIMULATED LOW WATER CONDITION.

If this test is successful, it should shut down the burner temporarily.



RELOAD HOSES AND EQUIPMENT: 2
Ohman Responsibility

(1) BREAK DOWN AND LOAD ALL EQUIPMENT AND HOSES BACK ONTO THE PUMPER TRUCK.



END OF “SUPPORT” ACTIVITIES:

NOTE: THANK YOU FOR TAKING THE TIME TO READ THIS INFORMATION.

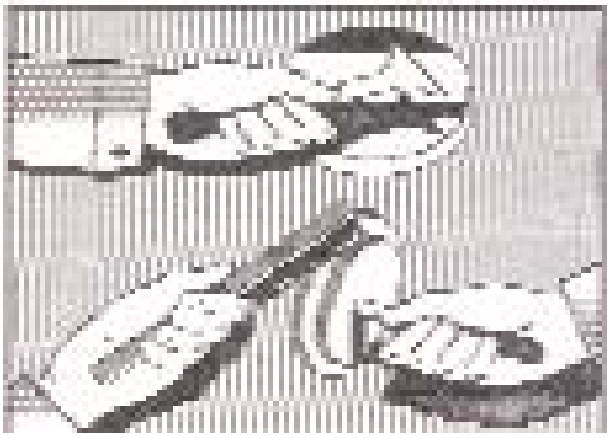
IF YOU WOULD LIKE MORE COPIES OF THIS BOOKLET PLEASE CONTACT OHMAN AT (800) 228-6462.

PLEASE SEE THE FOLLOWING PAGES, TO PREPARE YOUR BOILER FOR ITS RETURN TO NORMAL OPERATIONS.

21 PREPARE FOR NORMAL OPERATION: Customer Responsibility

After the cleaning, a certified boiler and system engineer or other qualified individual, supplied by the customer, will be responsible for inspecting and testing the water level controls, steam quality and returning the boiler and all associated equipment to safe operating condition.

(1) IF THE WATER LEVEL CONTROLS ARE NOT ALREADY DISASSEMBLED, TAKE THEM APART AT THIS TIME TO CLEAN AND INSPECT.
Follow the procedure as shown on page "19". In addition, you may want to clean or replace the sight glass and gaskets.



(2) BE SURE TO REMOVE ALL INSPECTION PORT COVERS FOR CLEANING AND GASKET REPLACEMENT.

(3) CLEAN THE GASKET SURFACES INSIDE THE BOILER AS WELL AS ON THE COVERS.

(4) INSTALL ALL PLATES OR COVERS WITH NEW GASKETS.

(5) RECONNECT THE EXTERIOR ATTACHMENTS, PIPING, AND SAFETY VALVES.
See optional procedure below to determine if the steam header isolation should be changed at this time or not. You may want to leave the steam header closed or blanked off if hydrostatic testing (1.5 times working pressure) is required by your state or insurance inspector.

(6) CHECK FOR LEAKS, FILL THE BOILER WITH WATER AND PRESSURIZE (STAY BELOW SAFETY VALVE SET PRESSURE). IF LEAKS ARE FOUND, MAKE REPAIRS AT THIS TIME.

(7) ALL BOILERS SHOULD BE OPERATED (WITH PROPER PH & OXYGEN CONTROL) AS SOON AS POSSIBLE AFTER CLEANING.

*** OPTIONAL PROCEDURE FOR FOOD PROCESS OR BOILERS TO BE STORED.***
Ohman advises a pre-operational alkaline boil-out while the steam header is still isolated, but the safety valves are back in place. This is done to reduce possible odors. In addition, a lot of bottom blowdown is advised to reduce any excess chlorides and rust colored suspended solids which occur naturally after acidizing. Coordinate this activity with your on-line treatment company representative.

Please complete this form and fax it to Ohman Descaling Services at 847-838-2226.

Company Name: _____

Contact Name: _____

Address: _____

_____

Phone Number: _____

Fax Number: _____

Cell Number: _____

Email Address: _____

EMERGENCY AFTER HOURS CONTACT

Name: _____

Phone Number: _____

ACCOUNTS PAYABLE INFORMATION:

Name: _____

Phone Number: _____