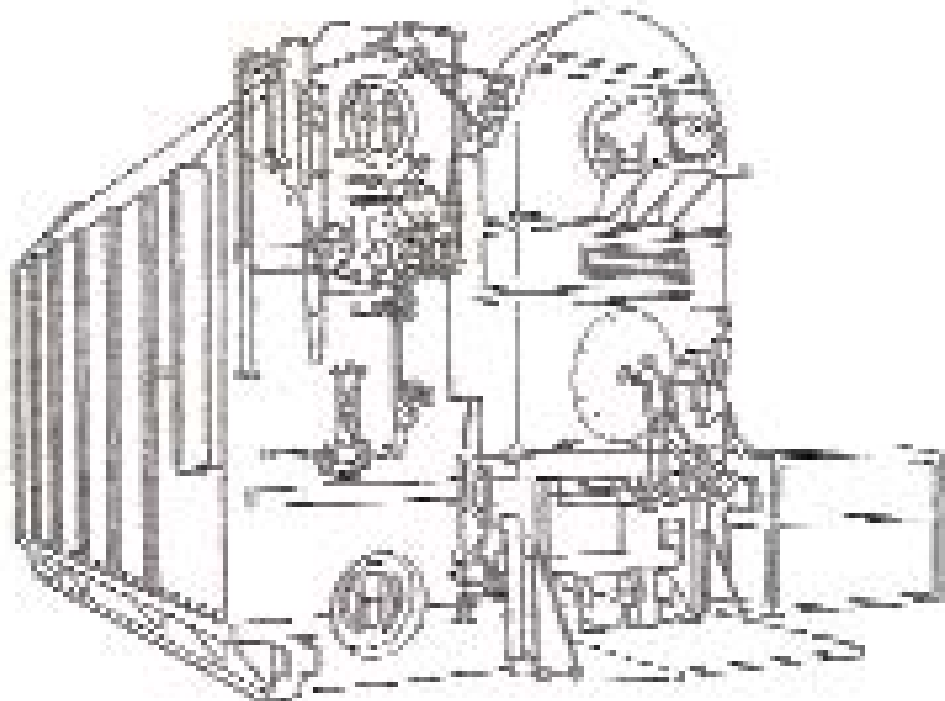


D E S C A L I N G
OHMAN
S E R V I C E S

**PREPARATIONS & SUPPORT
FOR A WATERTUBE BOILER**



1-800-228-6462

Fax: 1-847-838-2226

P.O. Box 96 . Russell, IL 60075

WWW.OHMANDESCALING.COM

OHMAN CIRCULATION DIAGRAM

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.

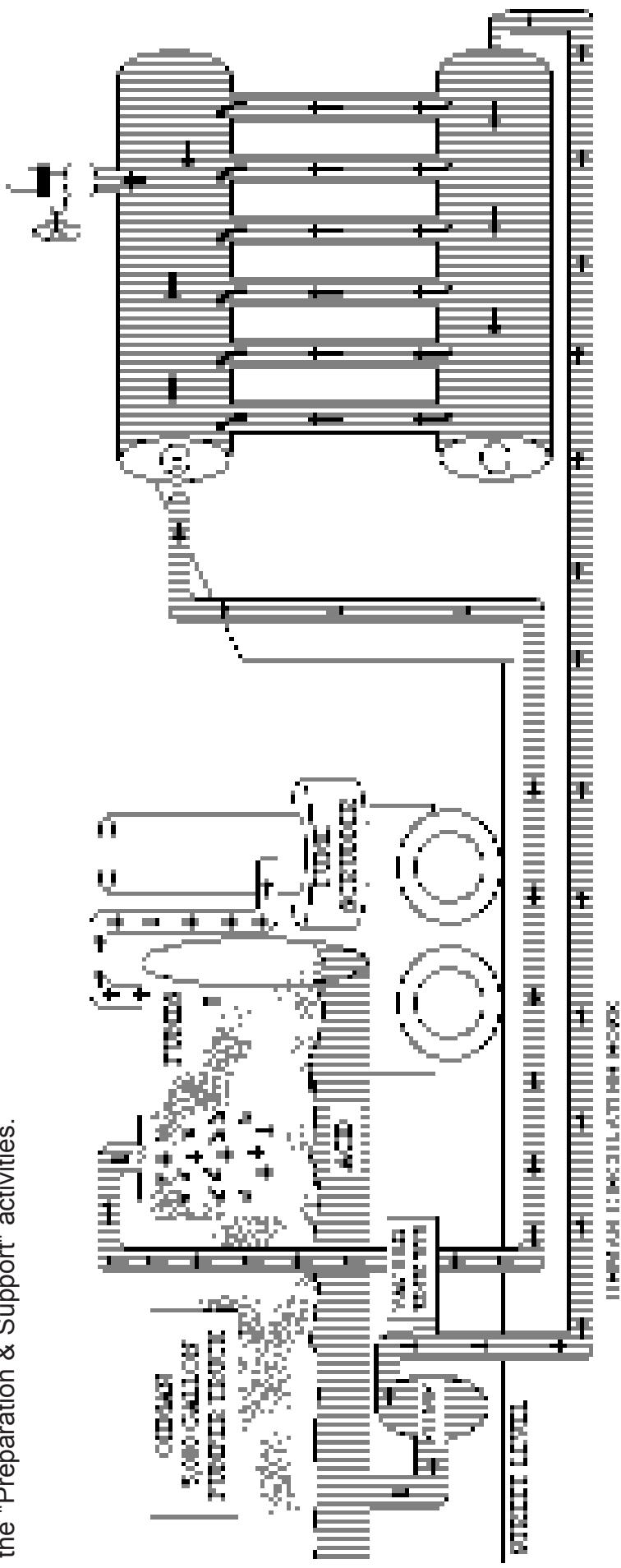
Closed valves cannot be trusted to contain cleaning solution; therefore, all exterior piping must be disconnected, capped, blanked or vented to keep chemicals from straying to where unwanted.

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

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

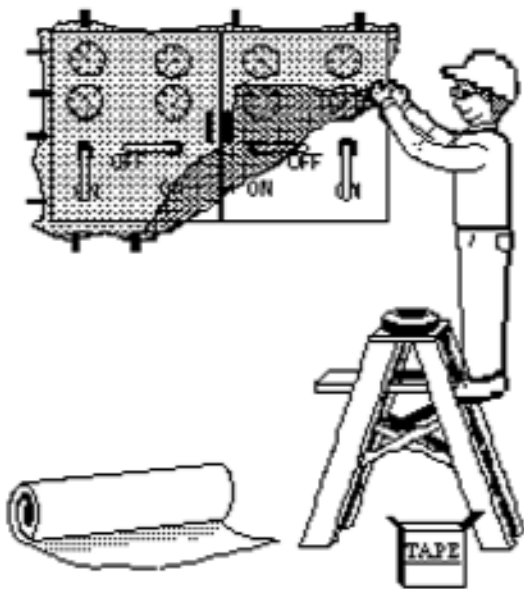
Ohman circulates chemicals (under a vacuum) through the boiler "flooded", IN the bottom, OUT the top.

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



BOILER AREA PREPARATIONS: Customer Responsibility

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

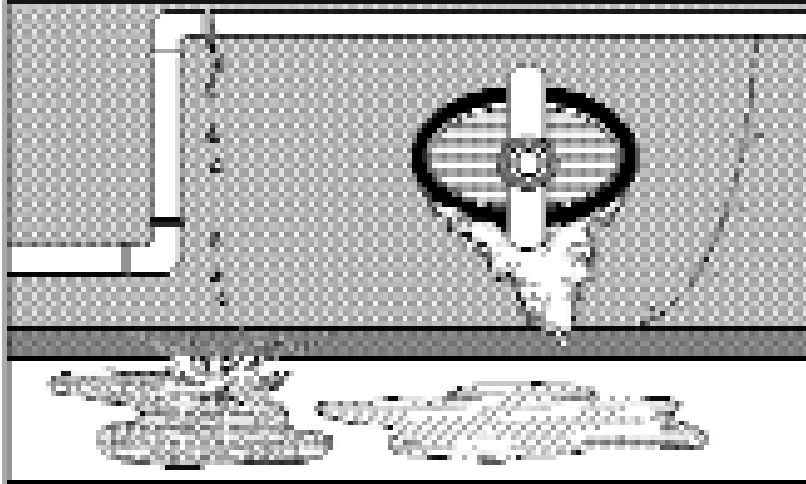


- (2) USE PLASTIC SHEETING TO COVER ALL ELECTRICAL AND NON-MOVEABLE EQUIPMENT THAT COULD BE DAMAGED BY WATER.**

3

INSPECT FOR LEAKAGE: Customer Responsibility

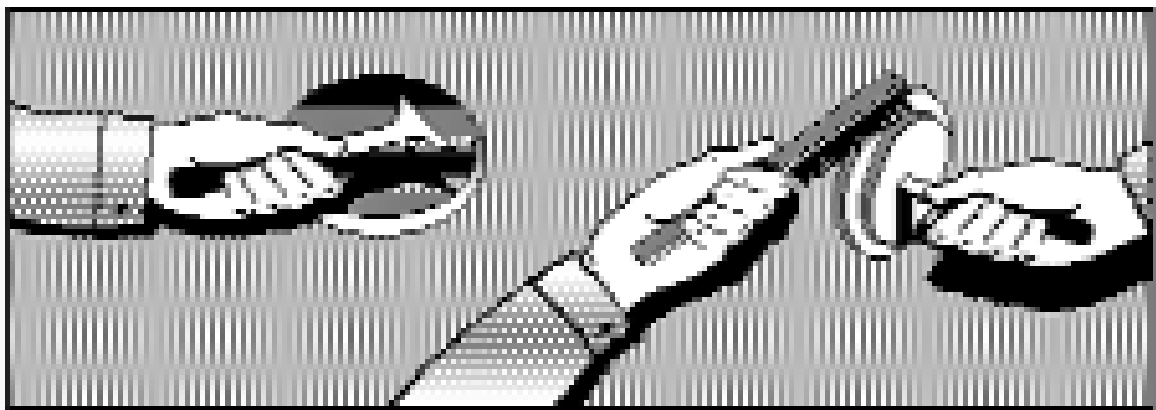
- (1) **INSPECT FOR ANY SIGNS OF PREVIOUS OR CURRENT LEAKAGE.**



- (2) **REMOVE OR REPAIR ANY LEAKING PIPING OR CONTROLS.**

- (3) **REMOVE THE MANWAY OR ANY HANDHOLE COVERS THAT SHOW SIGNS OF LEAKING. (Non-leaking Gaskets May Be Left In Place.)**

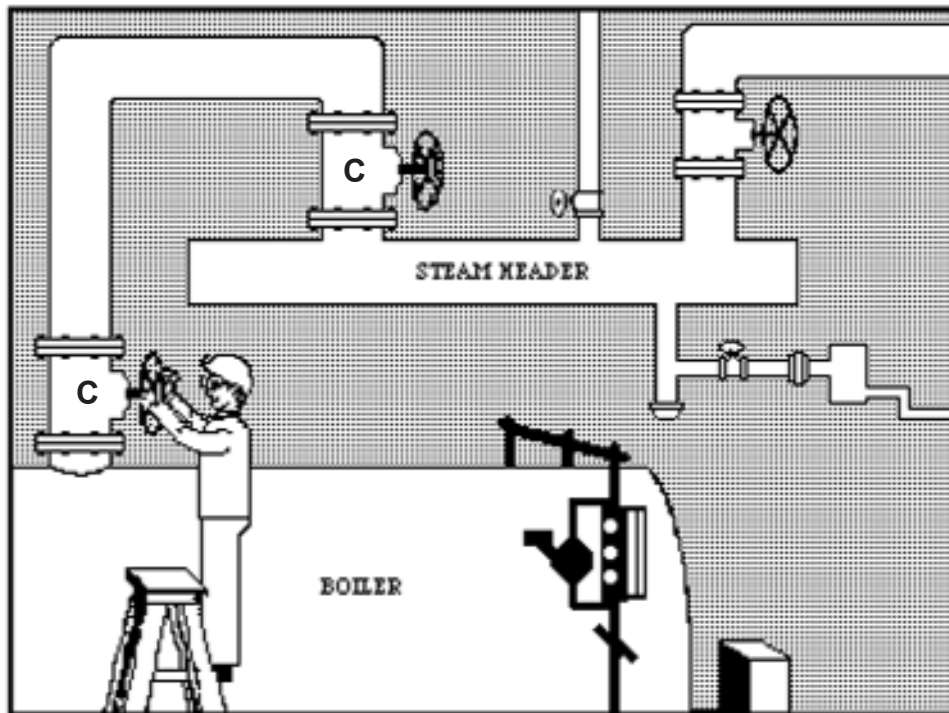
- (4) **CLEAN THE GASKET SURFACES ON THE MANWAY AND HANDHOLE AS WELL AS ON THE INSIDE OF THE BOILER.**



- (5) **RE-INSTALL THE CLEANED MANWAY AND HANDHOLE COVERS WITH NEW GASKETS AT THIS TIME.**

STEAM HEADER GENERAL ISOLATION: Customer Responsibility

**CLOSE STOP & CHECK AND ALL STEAM HEADER
SHUT-OFF VALVES.**



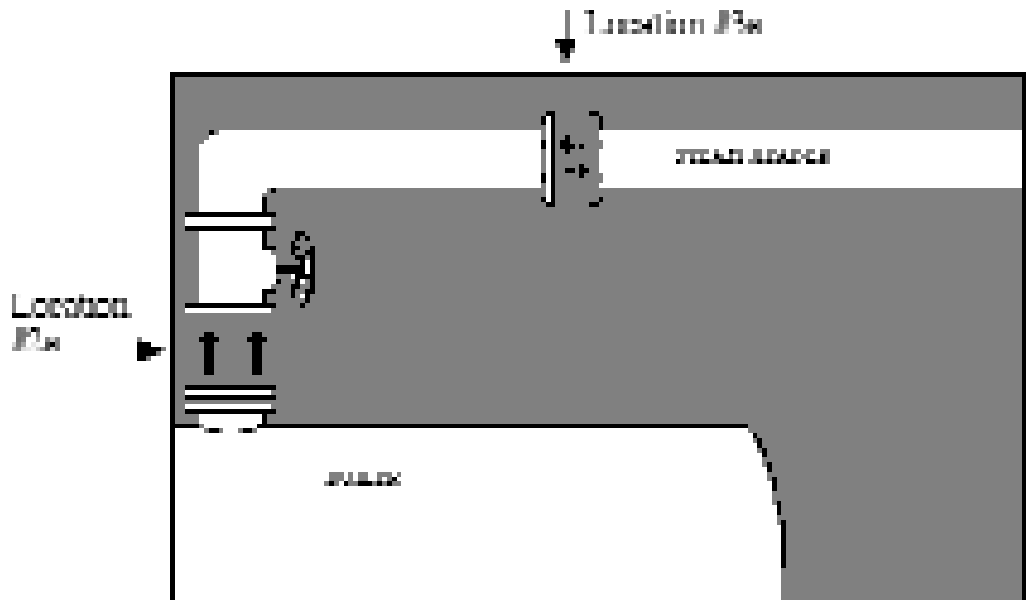
5 STEAM HEADER MECHANICAL SEPARATION: Customer Responsibility

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

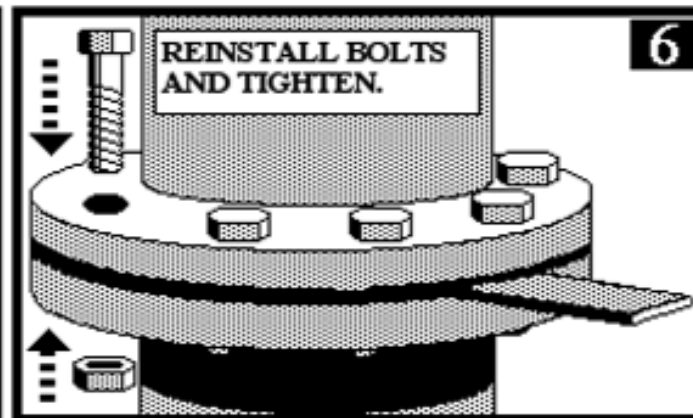
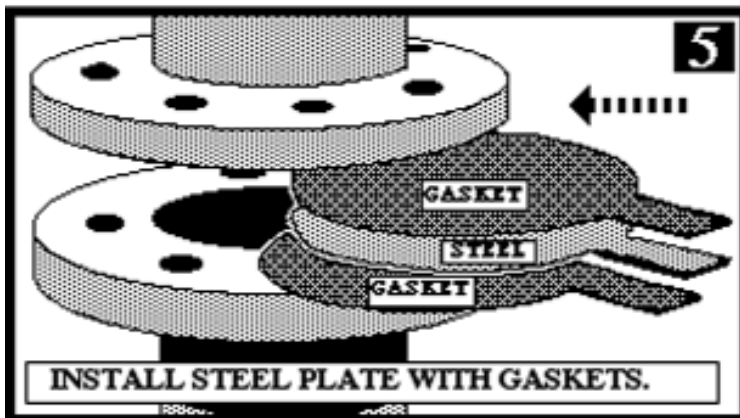
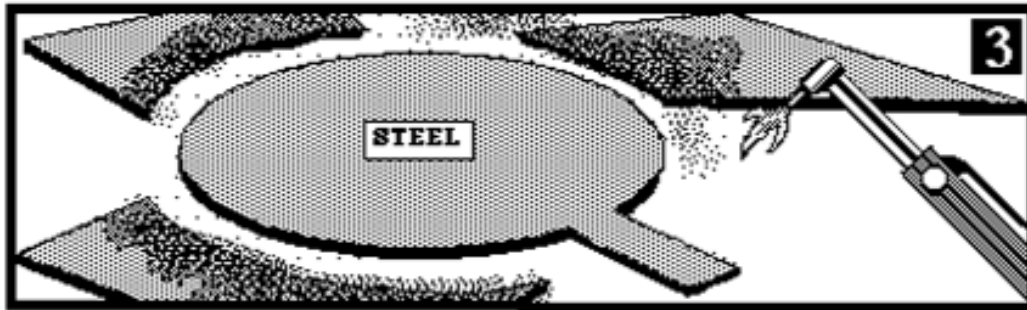
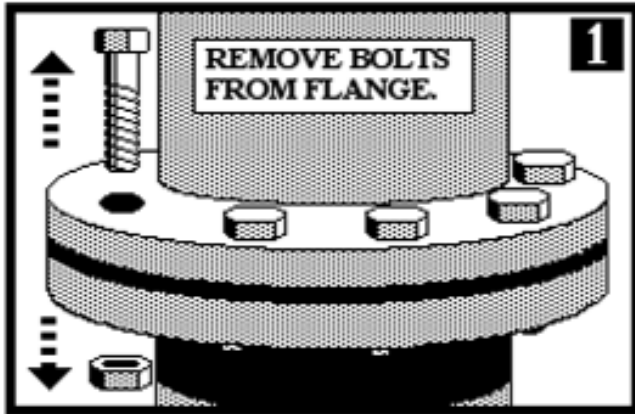
- If the boiler is located in the basement or below street (truck) level.
- If the valves leak during water pressure testing.
- If the steam is used directly on a food process, in a laundry, in a critical environment and/or for humidification.
- If Permit-Required Confined Space Entry is to be conducted.

- (1) **AS A MINIMUM, CLOSE ALL STEAM HEADER VALVES. CAUTION:** Closed valves may not hold the steam pressure! Be sure that all captive pressure has been released before taking apart.
- (2) **THE PREFERRED MECHANICAL ISOLATION LOCATION IS BETWEEN THE STOP & CHECK VALVE AND THE BOILER IF THIS LOCATION IS CHOSEN, SEPARATE THE VALVE FROM THE BOILER AND PROCEED WITH ACTIVITY #4 BELOW**
- (3) **IF LOCATION #2a IS NOT AGREEABLE OR POSSIBLE, SEPARATE THE STEAM FLOW ORIFICE PLATE FLANGES REMOVE THE ORIFICE PLATE AND ACCOMPLISH ACTIVITY #4 BELOW.**
- (4) **INSTALL A 1/2" THICK (OR THICKER) STEEL DISK. BE SURE TO CLEAN THE OLD GASKETS FROM THE FLANGE SURFACES AND INSTALL NEW GASKETS ON BOTH SIDES OF THE DISK. CAUTION:** Be sure that the steel disk is thick enough to hold any shock pressure that may be applied. Lives could be at risk!

You may follow the procedures offered above or completely remove the valve closest to the boiler and install a blank flange with gasket at location #2a.



STEAM HEADER INSTALL BLIND: Customer Responsibility



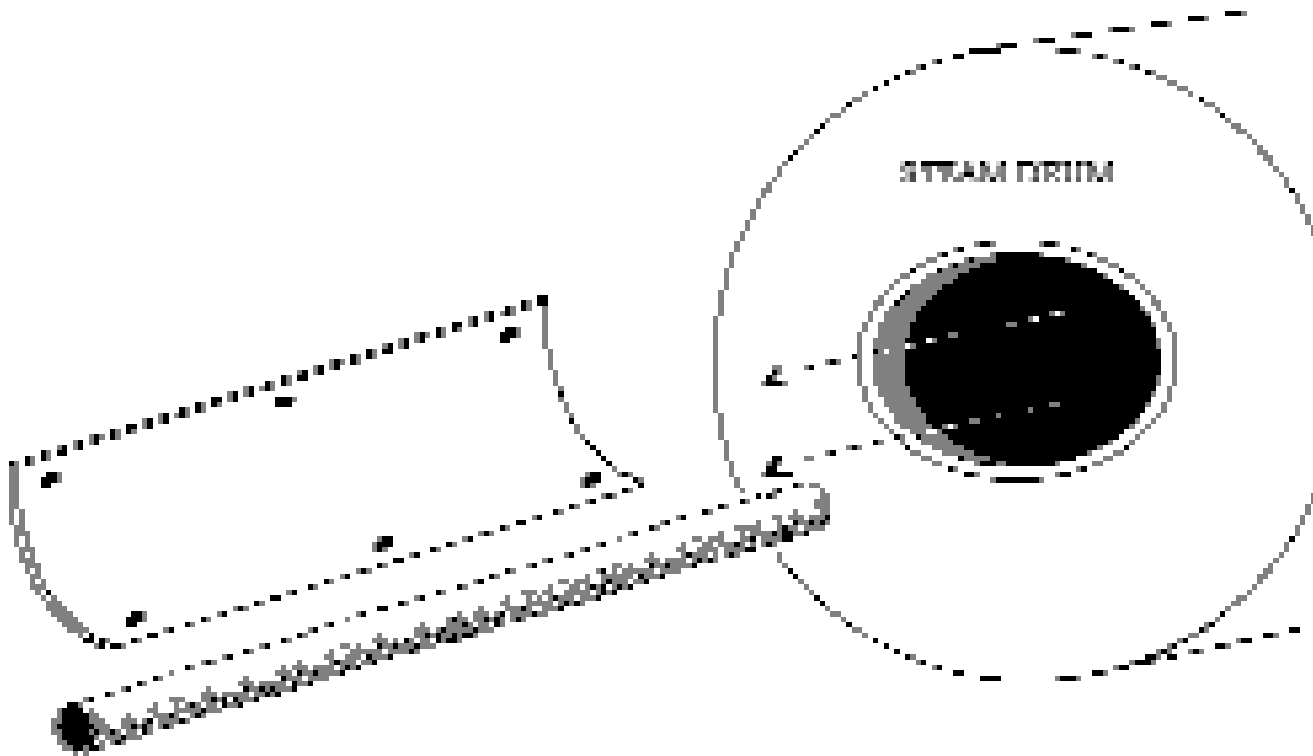
7

REMOVE STEAM DRUM INTERNALS: Customer Responsibility

INTERNALS (BAFFLES, PIPES & SEPARATORS) MUST BE TAKEN OUT OF THE STEAM DRUM.

STEM DRUM INTERNALS ARE REMOVED TO ALLOW FOR AN OHMAN PRE-CLEANING TUBE-FLUSH AND AFTER CLEANING TUBE-FLUSH.

IF YOU DESIRE, THE REMOVED INTERNALS MAY BE PUT INTO THE MUD DRUM TO BE CLEANED. AFTER THE PRE-CLEANING TUBE FLUSH.



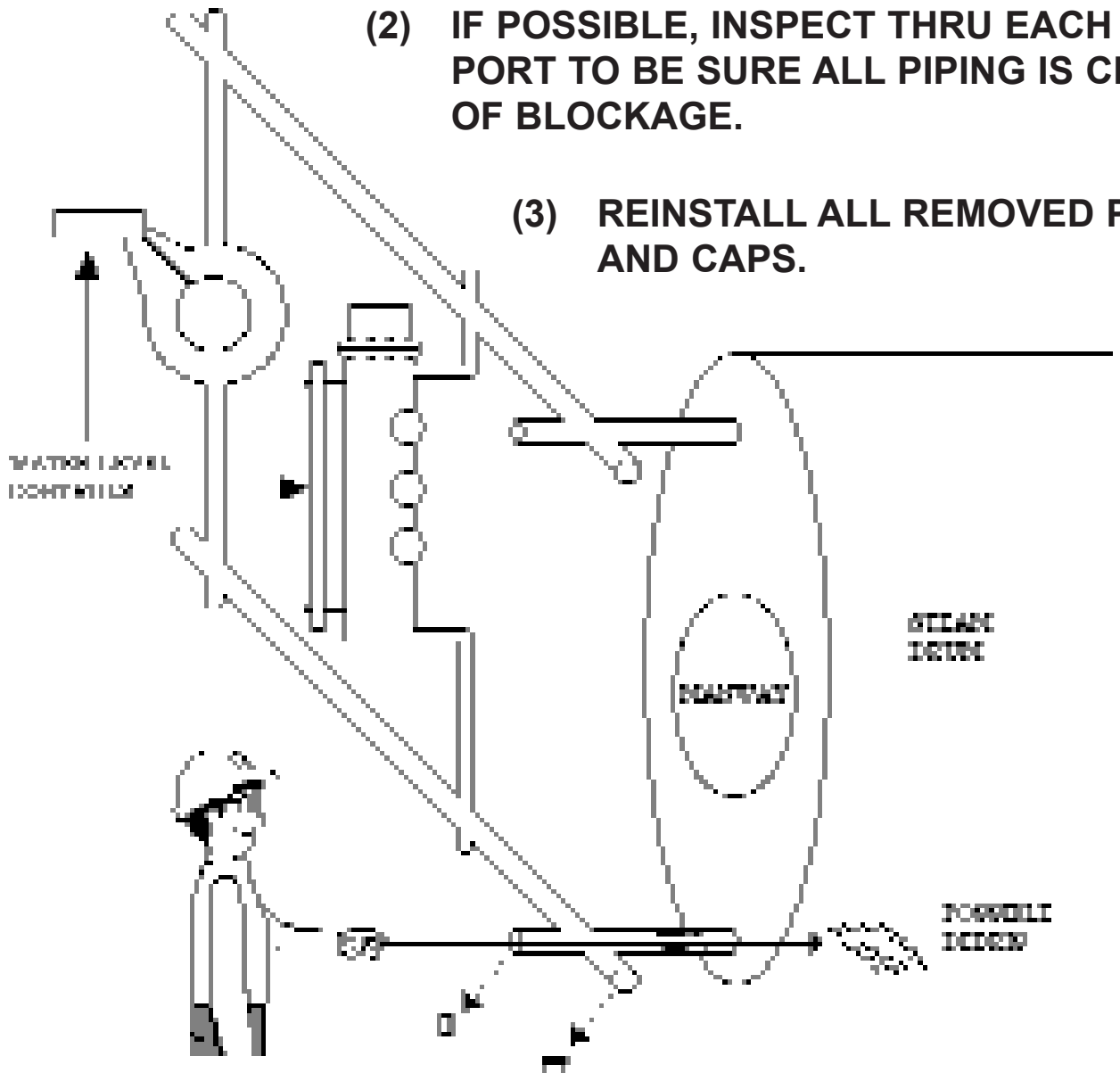
WATER LEVEL CONTROL PIPING: Customer Responsibility

WATER LEVEL CONTROL AND PIPING:

- (1) IF POSSIBLE, REMOVE ALL PLUGS OR CAPS FROM ALL PIPE INTERSECTIONS. THIS MAY NOT BE POSSIBLE IF ALL PIPING IS WELDED DUE TO HIGHER PRESSURES.**

- (2) IF POSSIBLE, INSPECT THRU EACH OPEN PORT TO BE SURE ALL PIPING IS CLEAR OF BLOCKAGE.**

- (3) REINSTALL ALL REMOVED PLUGS AND CAPS.**



- (4) REMOVE EXPENSIVE SIGHT GLASSES CONSTRUCTED WITH MICA PRIOR TO ACIDIZING. INEXPENSIVE STRAIGHT TUBE GLASSES MAY BE LEFT IN PLACE.**

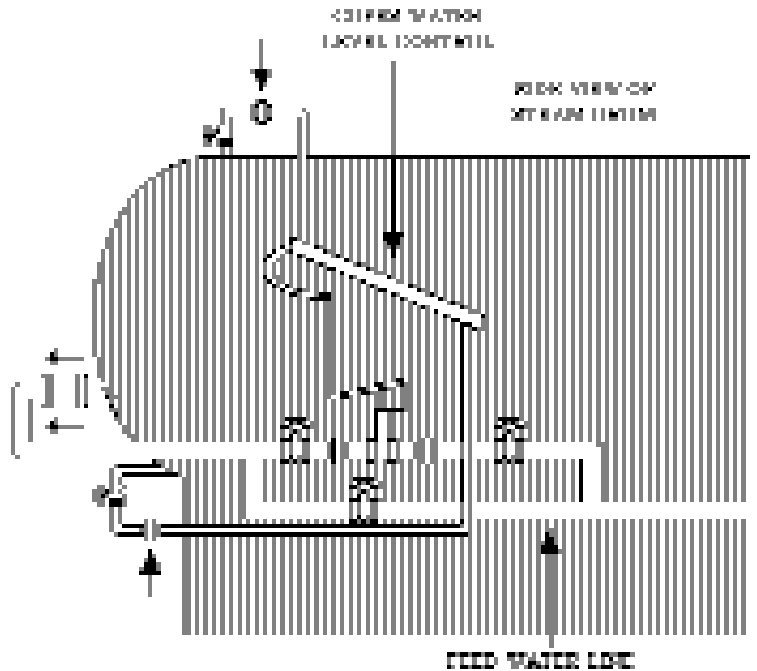
DISCONNECT VARIOUS PIPING

Customer Responsibility

(1) DISCONNECT AND CAP OFF THE LINES TO AND FROM:

- THE COPES WATER LEVEL GENERATOR TUBE.
- THE DIFFERENTIAL PRESSURE DEVICE

DISCONNECT TOP AND BOTTOM UNIONS TO ISOLATE THE WATER LEVEL CONTROL DEVICE. THEN, ON THE BOILER, INSTALL CAPS ON THE REMAINING OPEN PORTS.



(2) DISCONNECT AND CAP OFF THE FEEDWATER PIPING NEAR THE BOILER.

(3) DISCONNECT AND ISOLATE THE ECONOMIZER AND SUPERHEATER FROM THE BOILER.

(4) FIND AND DISCONNECT (TO ISOLATE) ANY OTHER PORTS OR PIPING THAT COULD ALLOW ACID TO STRAY AWAY FROM THE BOILER:

- Continuous blowdown.
- Chemical treatment line.
- Low or high water whistle.
- Line(s) that interconnect the boiler to the control panel.

NOTE: If the pressure gauge is disconnected along with any of these lines, install a temporary gauge so that the pressure or vacuum can be monitored during the cleaning.

- Any soot-blower steam supply ports, valves and piping.
- Any steam-drum or mud-drum heat exchangers.

(5) LOCATE A LARGE (1.5 or 2 inch diameter), COLD, CITY OR WELL WATER SOURCE AS CLOSE TO THE BOILER AS POSSIBLE.

FILL PRESSURE TEST FOR LEAKS & TEST FIRE: 1

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. Be sure safety valves are in place and operational.

(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, if the fire-side doors are open.
- (B) Check the flange blank (if installed) at the steam header valve.
- (C) Check all manway covers, handicap 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. Do not produce steam with this test!
 - (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) LOCATE A DRAIN THAT WILL ACCEPT A LARGE VOLUME OF WATER. IF THE DRAIN IS FOULED, IT SHOULD BE MECHANICALLY CLEARED PRIOR TO THE CLEANING.

NOTE: If this boiler has a superheater and/or an economizer and if these units are not to be cleaned: Both must be mechanically isolated and back-filled with water before cleaning. If either of these units are to be cleaned, please contact our office before accomplishing these preparations.

11 BOILER SAFETY VALVES: Customer Responsibility

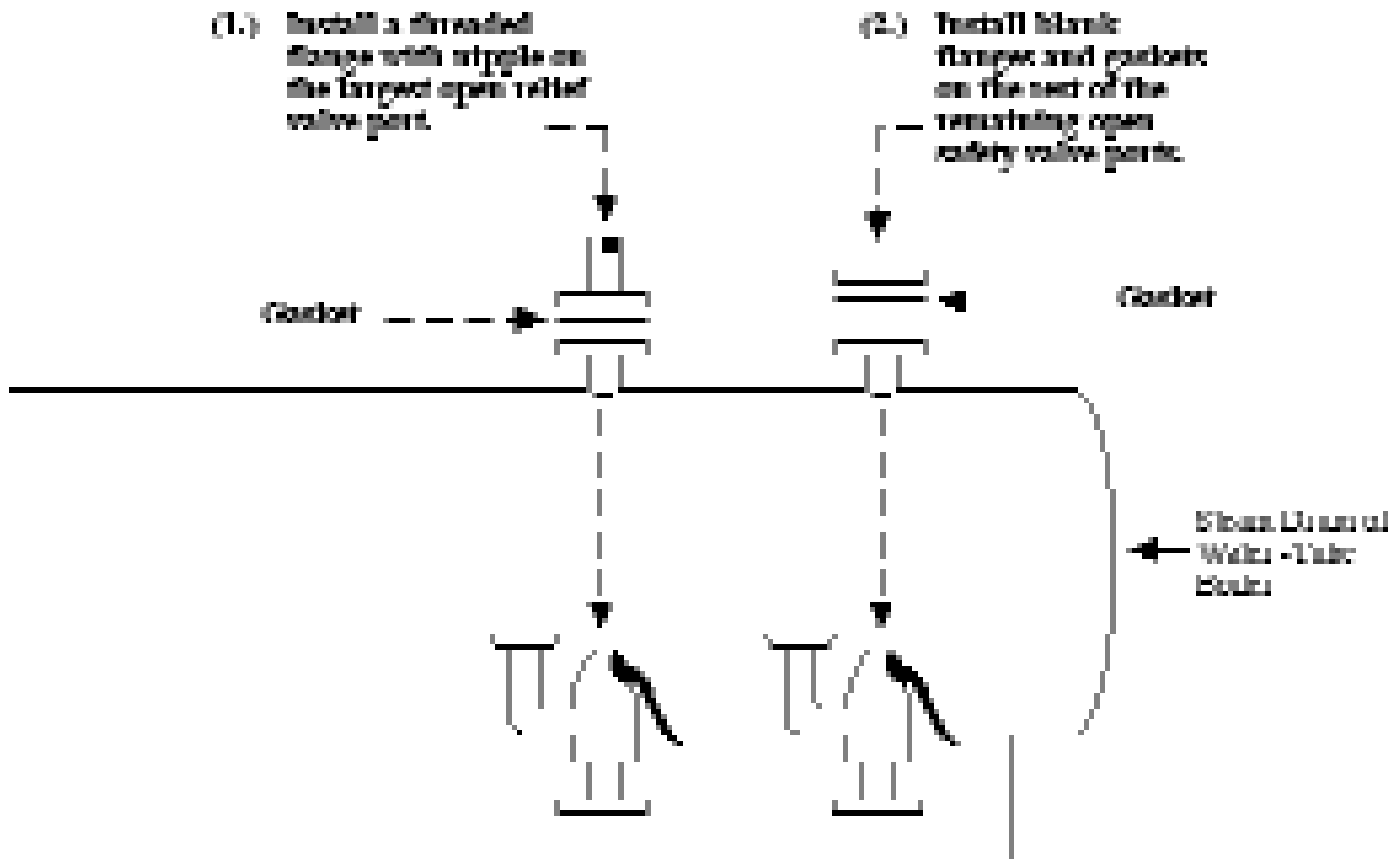
(1) THE SAFETY VALVES MAY BE LEFT IN PLACE FOR THE CLEANING OF THIS BOILER.

OPTIONAL: CONDITIONS FOR REMOVAL OF ALL SAFETY VALVES:

- If set pressure is 30 psi or less.
- If a top circulation port cannot be found elsewhere.
- If valves are to be removed for calibration.
- If these ports must be blocked to accomplish hydrostatic test.
- If any valves show signs of leakage.
- If you care to for any other reason.

ACCOMPLISH BOTH OF THESE STEPS IF SAFETY VALVES ARE REMOVED FOR ANY REASON.

NOTE:DO NOT REMOVE ANY SAFETY VALVES FROM THE ECONOMIZER



BLOWDOWN VALVES & LINES:

Customer Responsibility

1

THE MUD DRUM AND ALL MUD HEADER BLOWDOWN VALVES MUST BE REMOVED.

CAUTION: 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.

PRIOR TO VALVE REMOVAL:

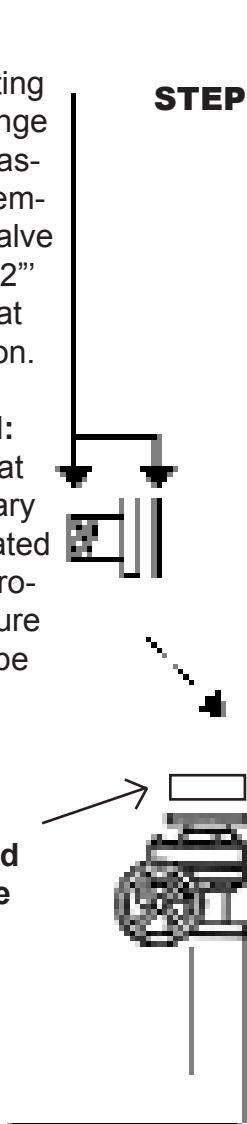
- Communicate with boiler operators. Accomplish all applicable "Lockout / Tagout" procedures.
- Insure boiler is cool, drained & vented.
- Stop all blowdown activity on other boilers if they are running and might be interconnected.
- Secure valve closed and install blank with gasket.

Install a mating threaded flange (with new gasket) and a temporary ball valve (preferably 2" diameter) at each location.

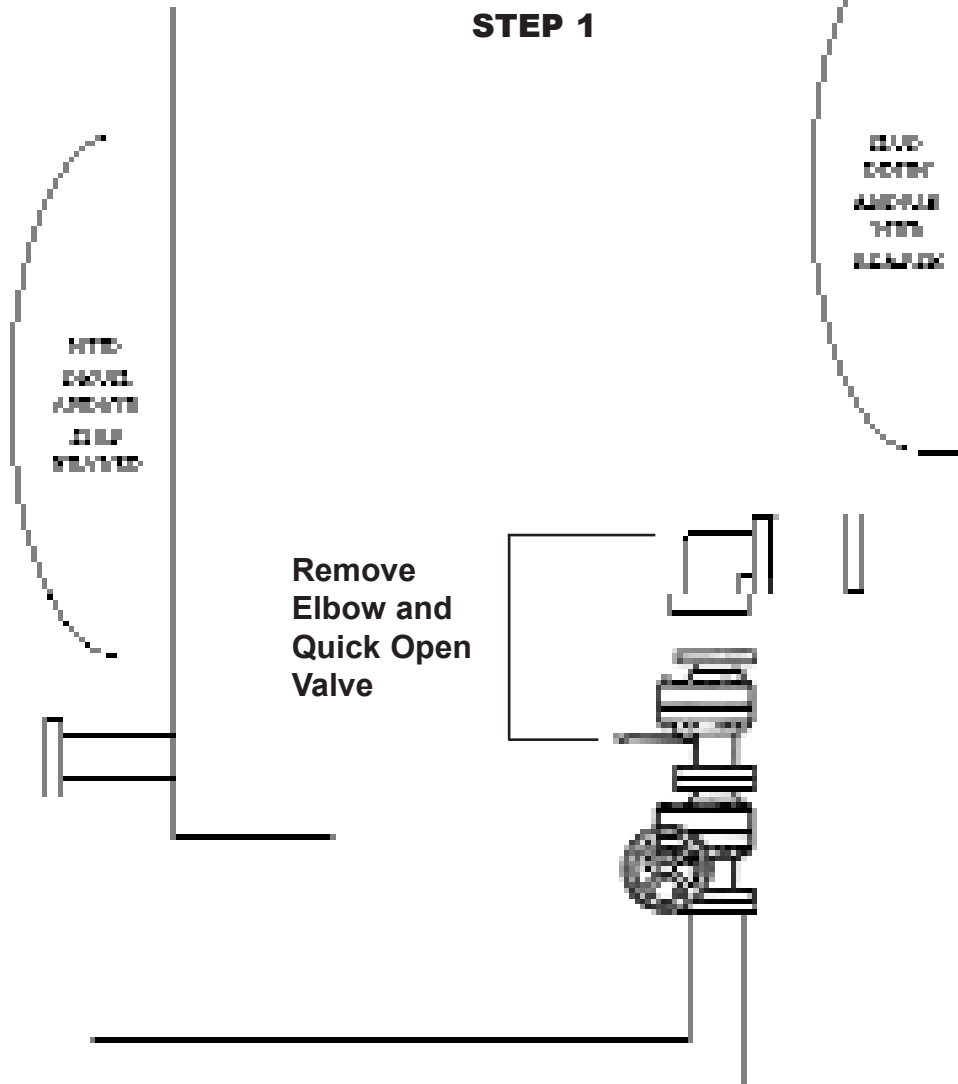
CAUTION:
Be sure that the temporary valves are rated for any hydrostatic pressure that could be applied!

Install A Blind Flange

STEP 2



STEP 1



Remove Elbow and Quick Open Valve

MUD-DRUM AND MUD-HEADER BLOWDOWN VALVES

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 16 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

1

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

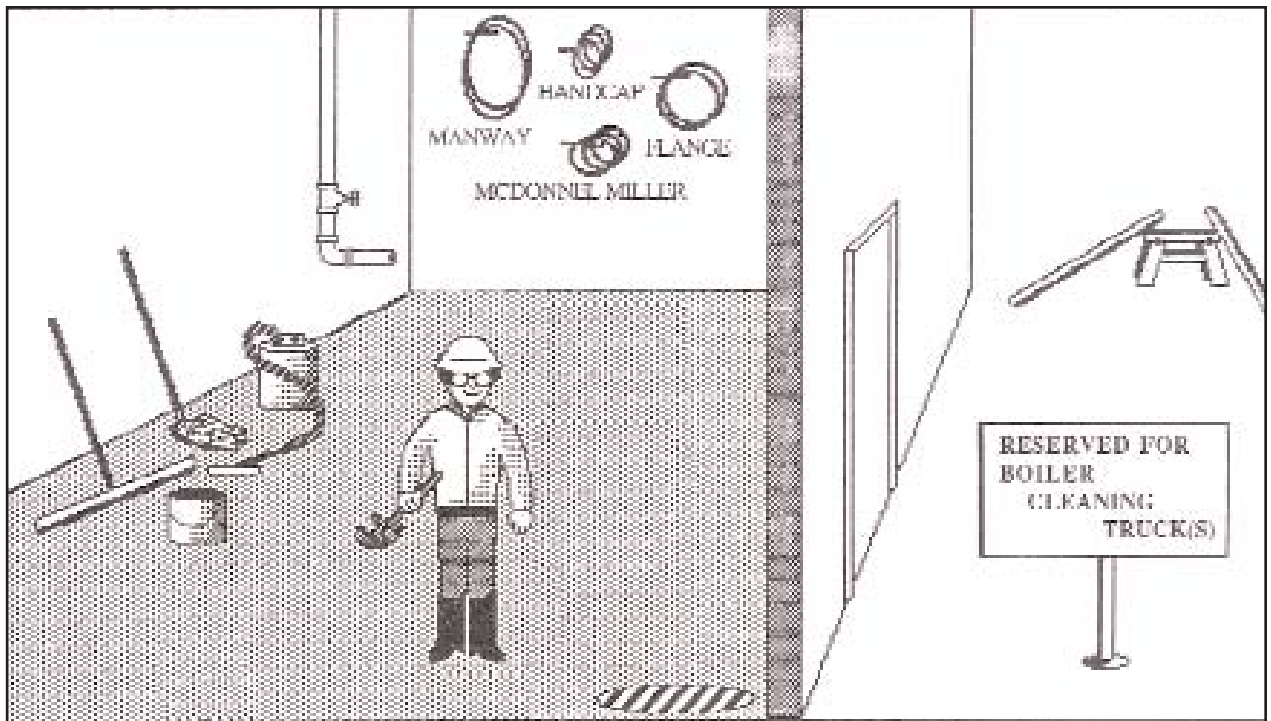
THE CUSTOMER AGREES TO SUPPLY THE FOLLOWING MATERIALS, UTILITIES & PERSONNEL.

(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 customer property, not on public street)



(4) FLOOR CLEAN-UP TOOLS

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

-NOTE: Confirm that this drain is not restricted. This drain should be able to pass a continuous full flow of the open 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 TUBE FLUSH PRIOR TO CLEANING: Ohman Responsibility

This individual tube-flush is an effective means of finding blocked tubes.

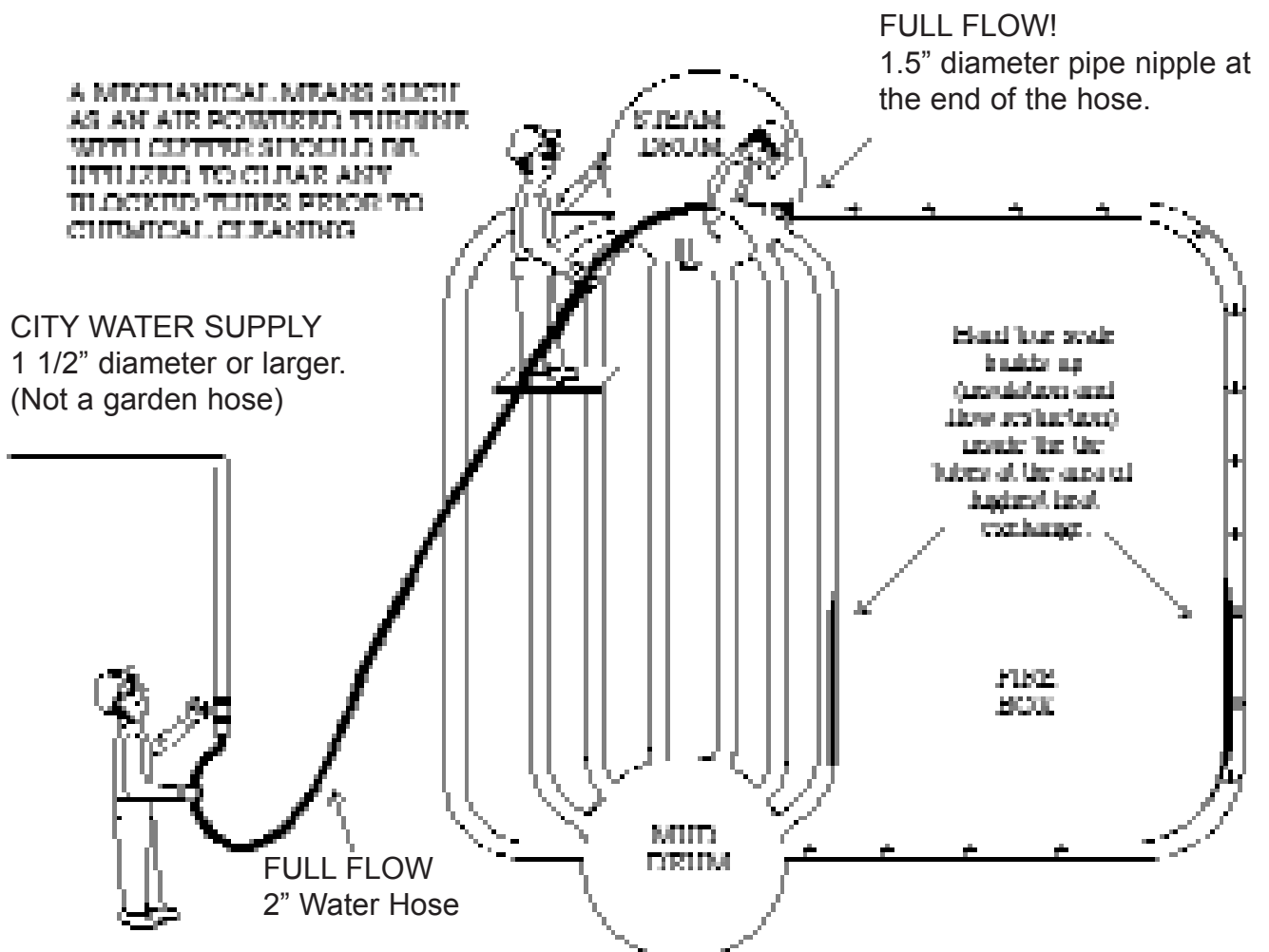
CAUTION: All applicable Lockout / Tagout and Permit-Required Confined Space Entry safety procedures are to be followed.

TO ACCOMPLISH THIS TUBE-FLUSH PROPERLY:

- Internals (baffles, pipe & separators) must be taken OUT of the steam drum.
- Trained personnel will enter the steam drum (a Permit-Required Confined Space) to direct the hose and document the flushing.

LARGE-WATER-VOLUME, INDIVIDUAL, TUBE-FLUSH

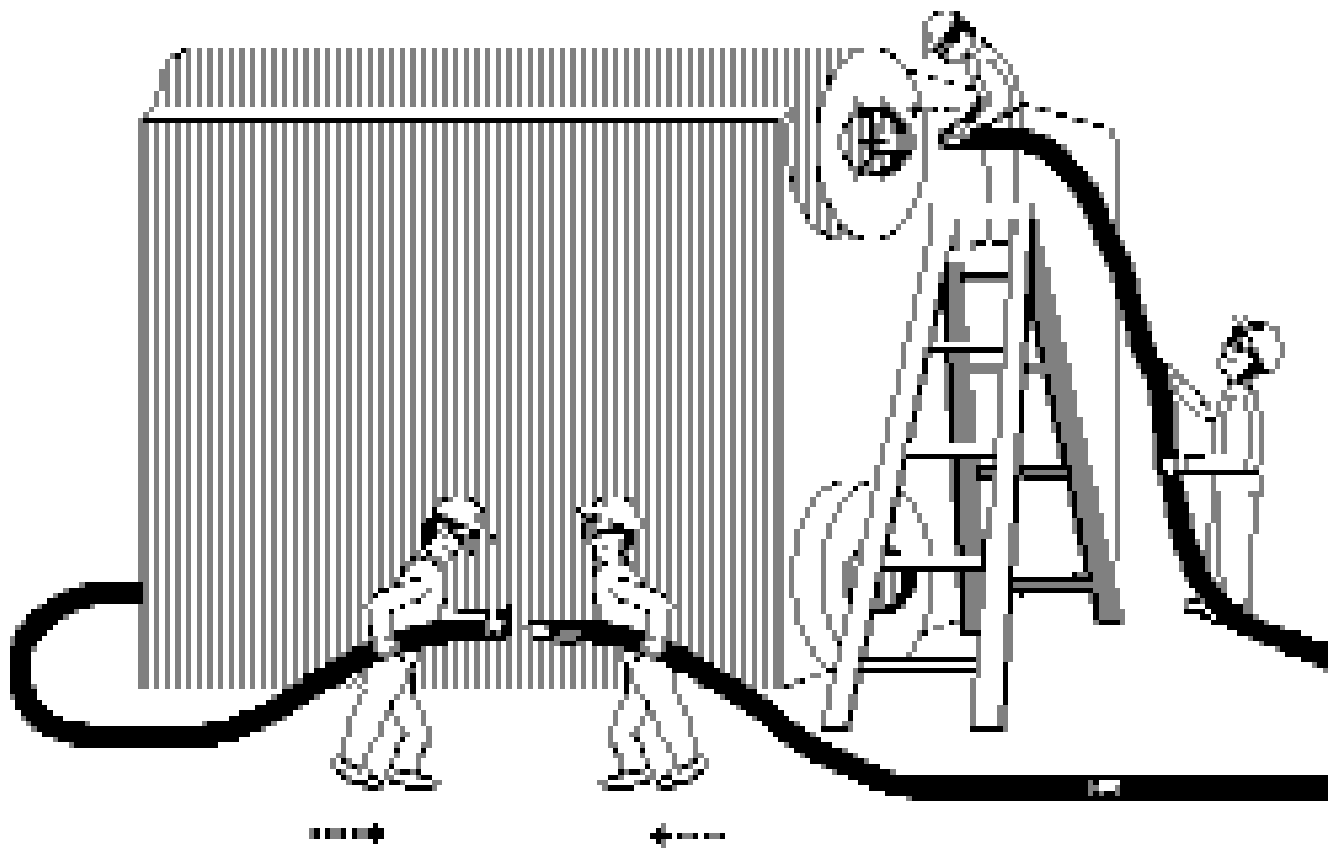
NOTE: A large water volume (not high pressure) is required to successfully accomplish this activity.



INSTALL HOSES & VACUUM TEST: Ohman Responsibility

1

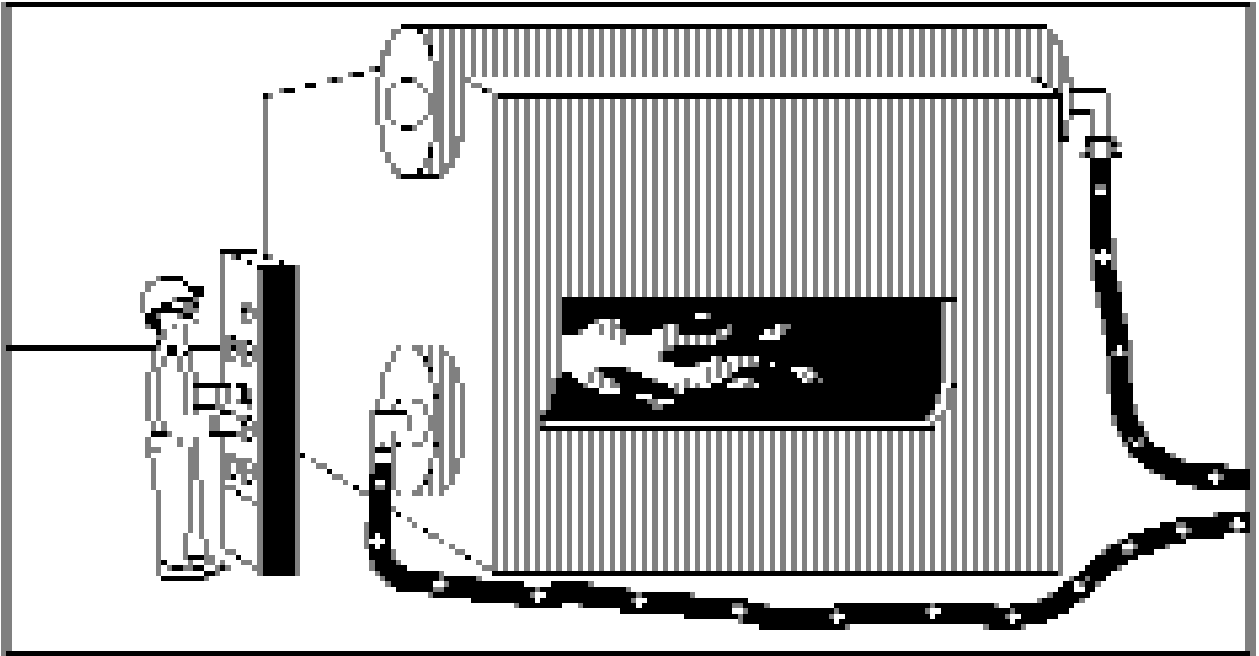
- (1) INSTALL OHMAN SUPPLIED VALVE(S) ON BOTTOM BLOWDOWN PORTS AND CIRCULATION PORTED MANWAY COVERS.
- (2) INTERCONNECT CIRCULATING HOSES AND SPECIAL FITTINGS FROM THE PUMPER TRUCK TO THE BOILER AND BACK AGAIN



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 vacuum is used because it is much safer and faster than using water pressure.

CHEMICAL STAGE: Ohman Responsibility



CUSTOMER AGREES TO SUPPLY QUALIFIED PERSONNEL TO BE AVAILABLE AND RESPONSIBLE FOR FIRING THE BOILER AS NEEDED AND DIRECTED BY OHMAN.

Ohman will fill the boiler with pre-mixed inhibited hydrochloric acid. The acid strength is generally ~ 12% (1 part concentrate acid and 2 parts water). Rodine #213 acid inhibitor to protect the boiler materials of construction.

Large volume circulation will be pumped from the pumper truck via the hoses. Chemical flow will go in the bottom of the boiler, out the top and back to the truck (as pictured). Chemicals will flow through ALL of the tubes more uniformly when the “IN” and “OUT” ports are diagonally opposed as shown.

During chemical circulation, manual low rate of firing will be necessary for short periods of time. Firing warms the various solutions to approximately 140 degrees F.

Ohman will direct the amount of firing by monitoring the temperature of the chemicals as they circulate back to the pumper truck. No steam nor pressure will be produced from this firing.

PH TESTING & CORRECTION: Ohman Responsibility

18

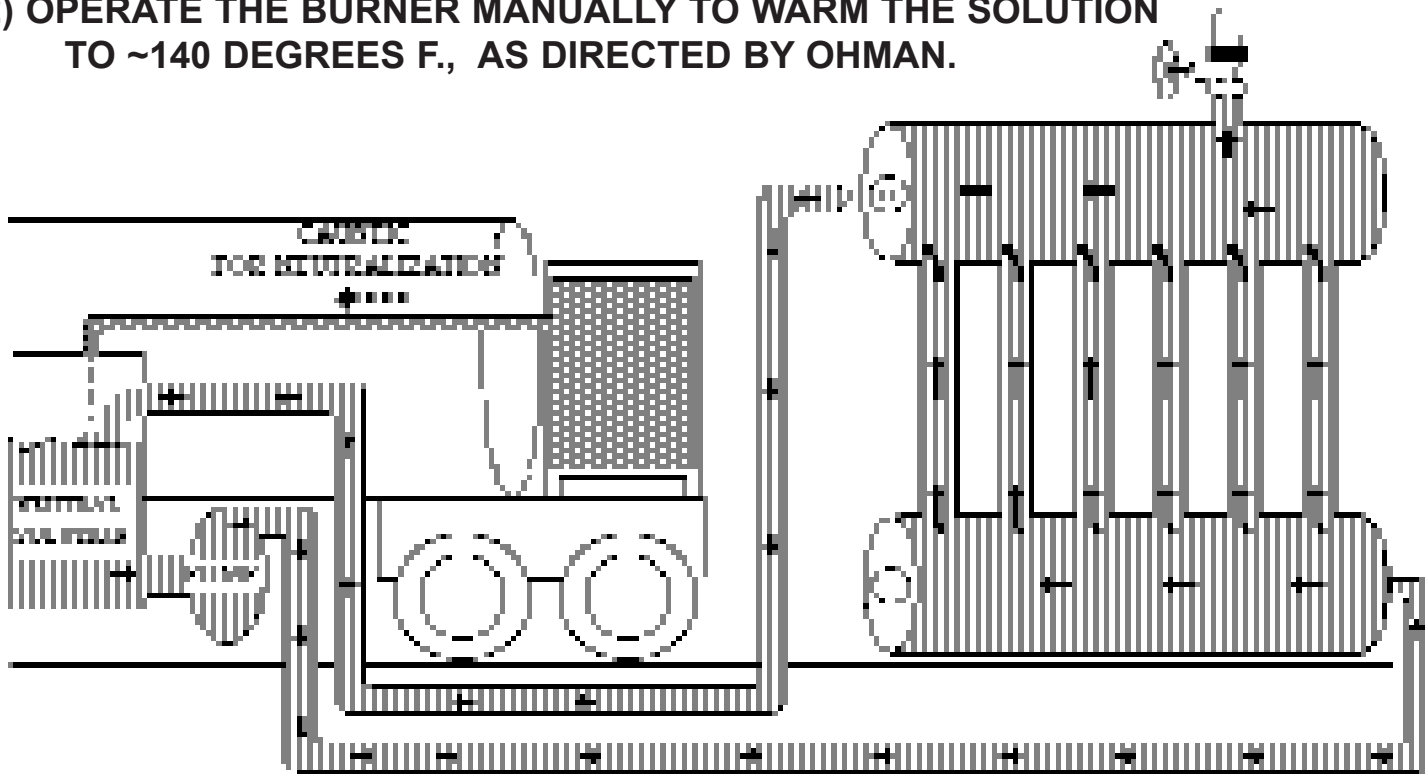
By this time the cleaning solution has been vacuum removed from the boiler to the Ohman tanker(s). After the project, the used chemicals are legally transported away from the site in this specially permitted pumper/tanker(s).

(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.

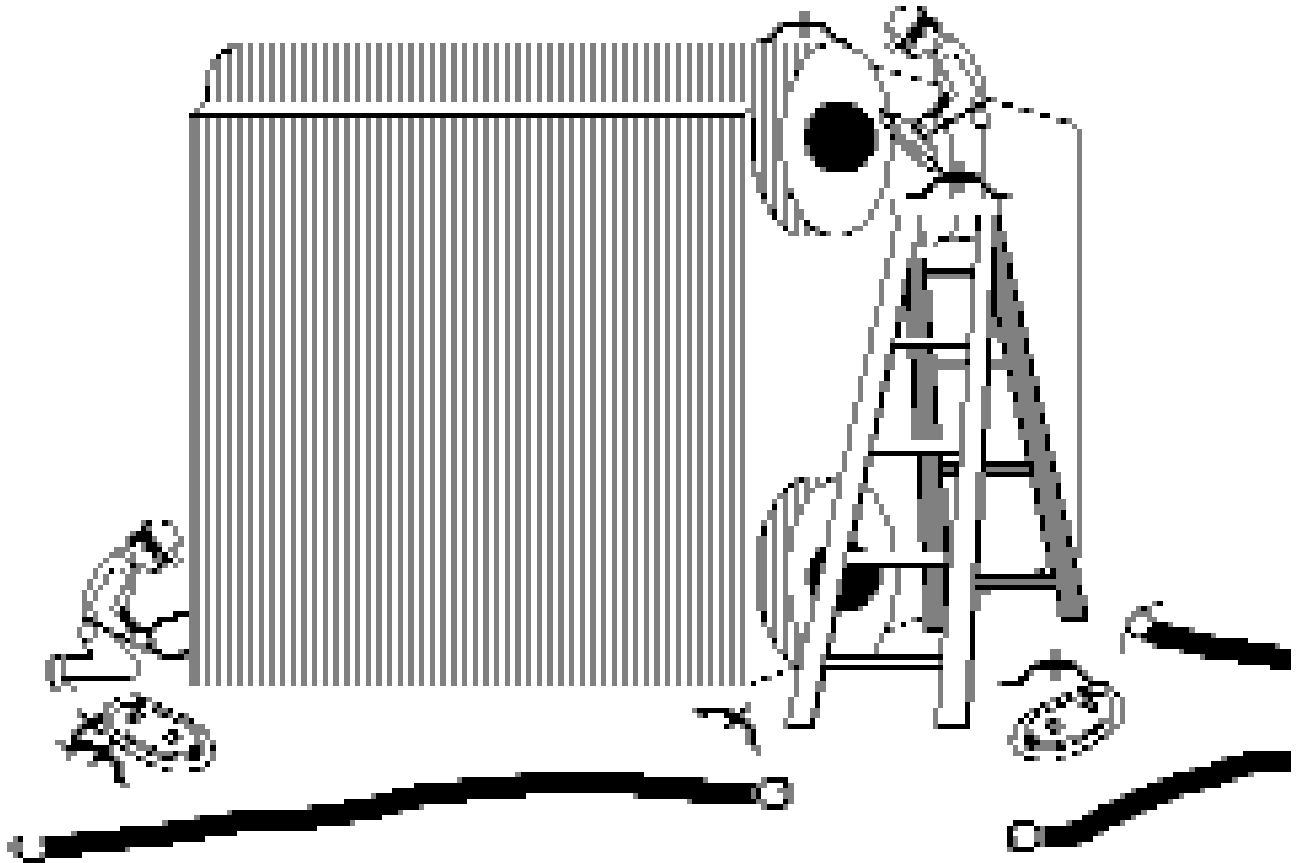
(3) OHMAN PERSONNEL WILL TEST THE SOLUTION pH. OHMAN ENCOURAGES CUSTOMER PERSONNEL TO CONFIRM THE pH IF THEY WISH TO.

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

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

REMOVE PORTS & INSPECT: Ohman Responsibility

(1) DRAIN THE NEUTRALIZING SOLUTION FROM THE BOILER.

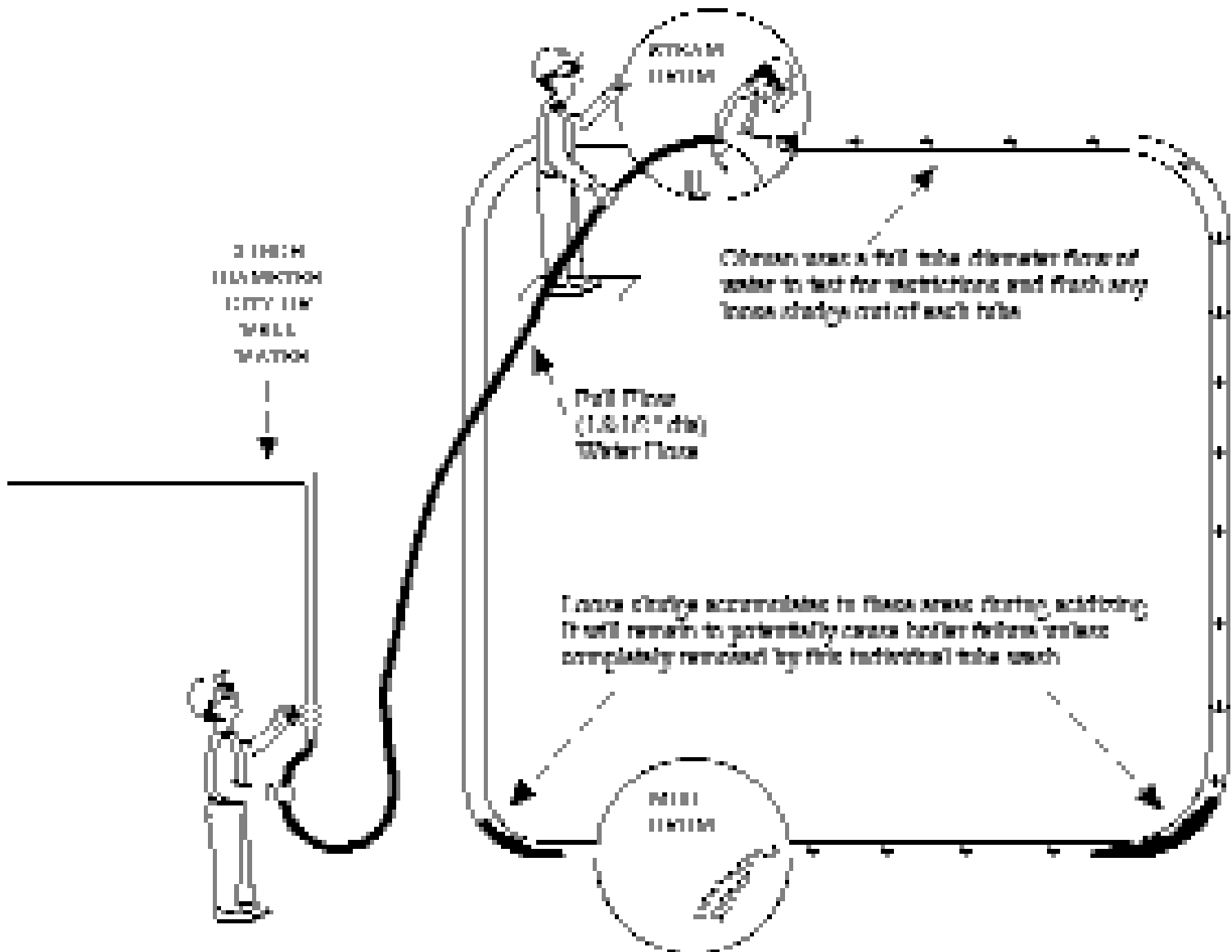


**(2) REMOVE AND REPLACE PORTS AS NEEDED FOR INSPECTION(S) AND/OR
INDIVIDUAL TUBE WASHOUT.**

TUBE WASH AFTER THE CLEANING: Ohman Responsibility

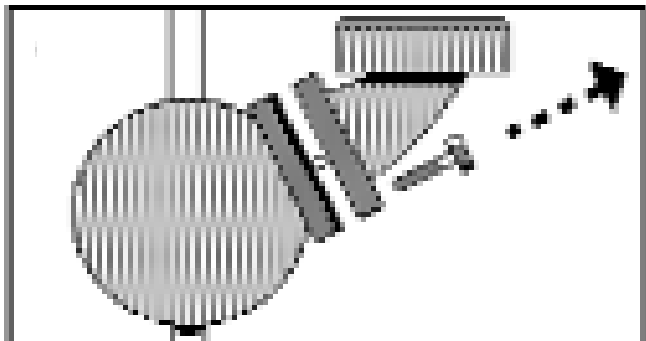
All applicable Lockout / Tagout and Permit-Required Confined Space Entry safety procedures are followed.

CUSTOMER AGREES TO SUPPLY PERSONNEL TO CONTROL THE WATER SUPPLY AND ACT AS A SAFETY PERSON TO MONITOR ACTIVITIES OF THE OHMAN PERSONNEL INSIDE THE STEAM DRUM.

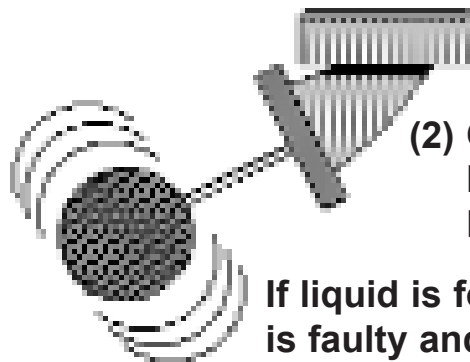
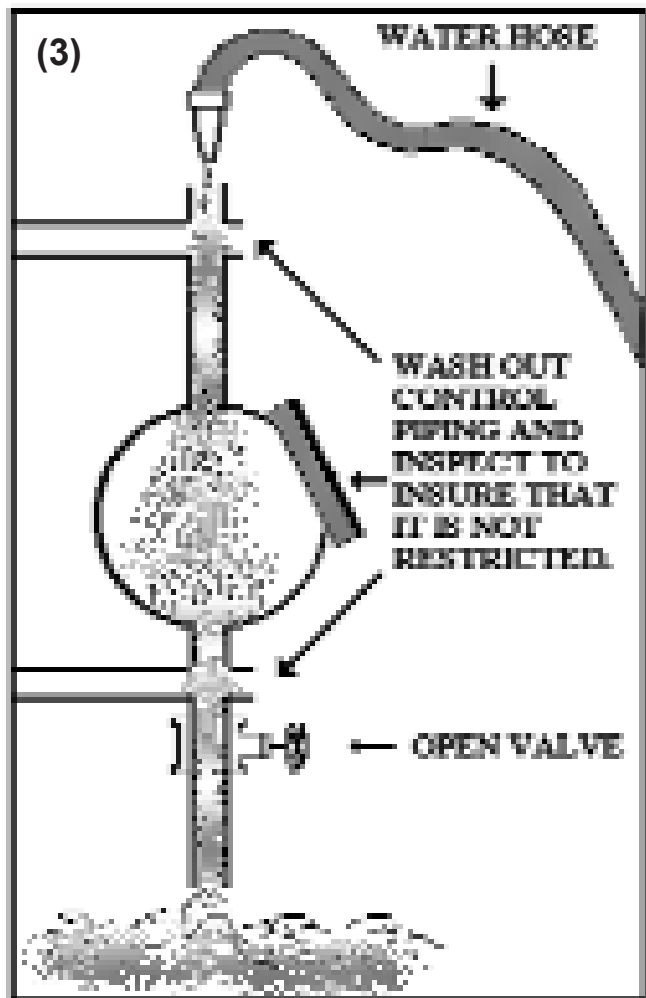


21 CLEAN & FLUSH WATER-LEVEL CONTROLS: Ohman Responsibility

CLEAN LEVEL CONTROLS



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



(2) CHECK THE FLOAT FOR LIQUIDS.

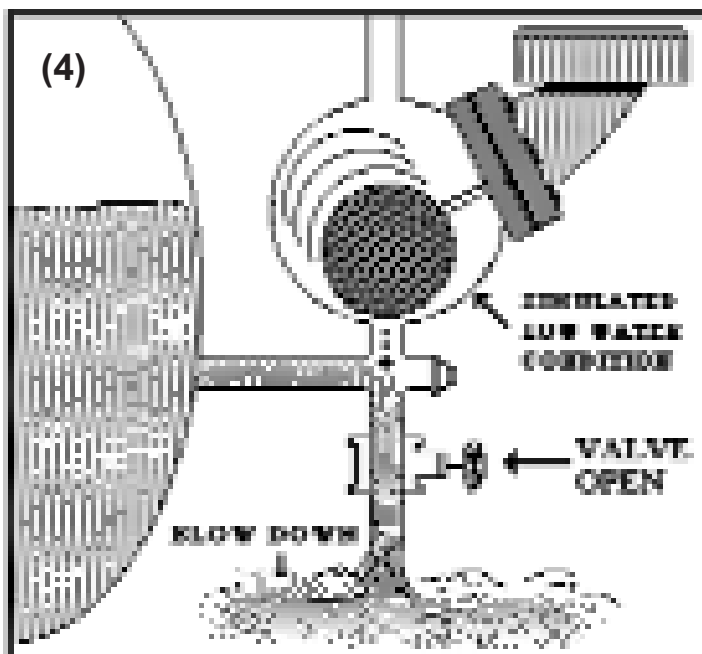
If liquid is found, the float is faulty and should be changed.

Customer Responsibility

This cleaning and inspection activity does not insure that these 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.

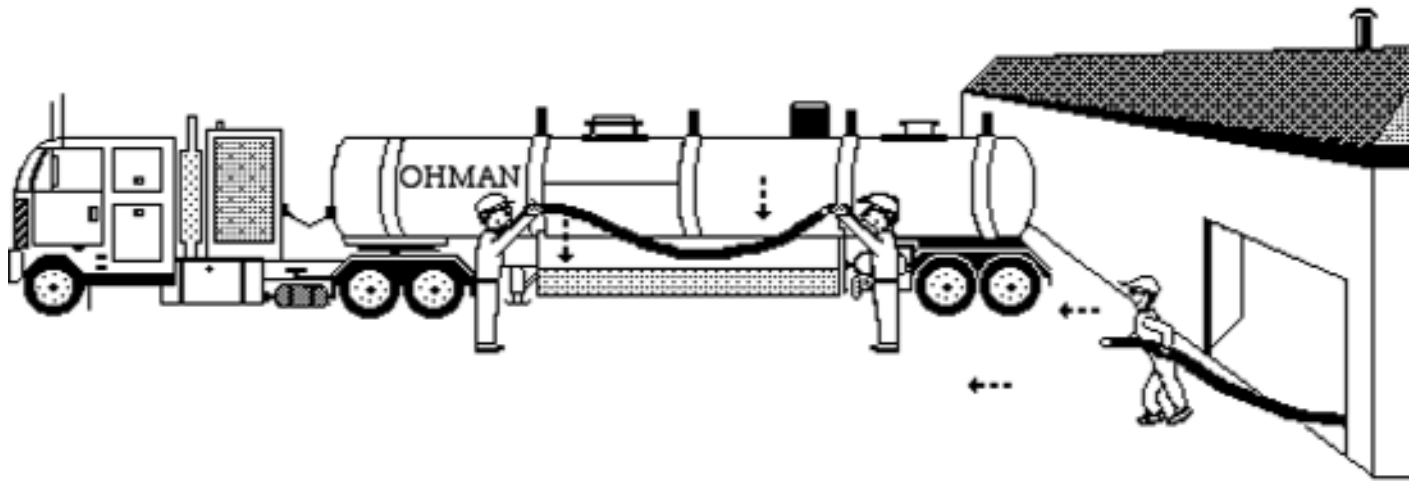
If this test is successful, it should shut down the burner temporarily.



RELOAD HOSES AND EQUIPMENT: Ohman Responsibility

22

**(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.**

23 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 "22". 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.

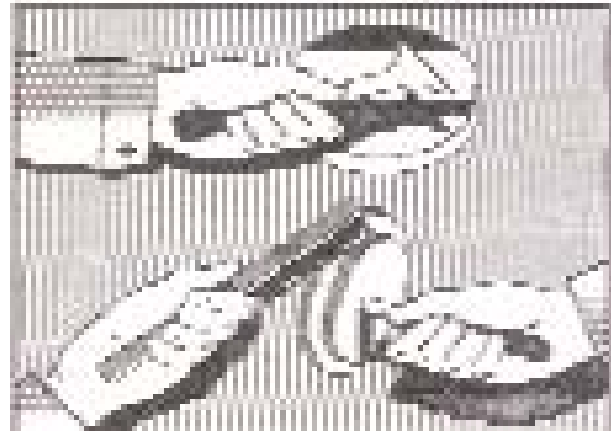
See optional procedure below to determine if the steam header isolation should be changed at this time or not. You may want to leave the steam header closed or blanked off if hydrostatic testing (1.5 times working pressure) is required by your state or insurance inspector.

(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: _____

