



**Heat Exchanger
Anchor HX
Steam-to-Water & Water to Water
SU & WU**

Operating and Maintenance Manual



*Designed and Manufactured in
Accordance with
ASME Code Section VIII Div. I*



SHELL AND TUBE HEAT EXCHANGERS

INSTALLATION AND MAINTENANCE INSTRUCTIONS

"U" TUBE TYPE

HEAT EXCHANGER SETTINGS

CLEARANCE FOR DISMANTLING

Provide sufficient clearance at the channel end of unit to permit removal of tube bundle from shell.

FOUNDATIONS

Foundations must be adequate so that exchangers will not settle and cause piping strains. Foundation bolts should be set to allow for setting inaccuracies. In concrete footings, pipe sleeves at least one size larger than bolt diameter slipped over the bolt and cast in place are best for this purpose, as they allow the bolt center to be adjusted after the foundation has set.

FOUNDATION BOLTS

Loosen foundation bolts at one end of unit to allow free expansion of shell. Oval holes in supports are provided for this purpose.

LEVELING

Set exchangers level and square so that pipe connections may be made without forcing.

CLEANLINESS PROVISIONS

CONNECTION PROTECTORS

Inspect all openings in exchanger for foreign material. Remove all temporary plugs and shipping pads just before installing. Do not expose units to the elements with pads or other openings since rain water may enter the unit and cause severe damage due to freezing.

DIRT REMOVAL

The entire system should be cleaned and flushed before starting operation to prevent plugging of tubes. Under most conditions, the use of strainers in the pipe is recommended.

CLEANING FACILITIES

Provide convenient means for cleaning the unit frequently as suggested in "Cleaning Methods."

FITTINGS AND PIPING

BY-PASS VALVES

Provide valves and by-passes in the piping system so that both the shell and tube bundle may be by-passed to permit inspection or repairs.

TEST CONNECTIONS

Provide thermometer wells and pressure gauge connections in all piping to and from the unit and located as near the unit as possible.

VENT COCKS

Provide necessary air vent cocks for unit so it can be purged to prevent or relieve vapor or gas binding of either the tube bundles or the shell.

DRAIN CONNECTIONS

Drain connections should be piped to an open drain sump.

SURGE DRUMS

In all installations, care should be taken to eliminate or minimize transmission of fluid pulsations and mechanical vibrations to the heat exchangers.

INSPECTION OF UNIT

Frequently and at regular intervals, observe interior and exterior condition of all tubes and keep them clean. Neglect in keeping all tubes clean may result in complete stoppage of flow through some tubes, with consequent overheating of these tubes as compared to surrounding tubes, resulting in severe expansion strains and leaking tube joints.

INDICATIONS OF FOULING

Exchangers subject to fouling or scaling should be cleaned periodically. A light sludge or scale coating on the tube greatly reduces its effectiveness. A marked increase in pressure drop and/or reduction in performance usually indicates cleaning is necessary, (assuming the unit has been checked for air or vapor binding and this has been found not to be the cause). Since the difficulty of cleaning increases rapidly as the scale thickens or deposit increases, the intervals between cleanings should not be excessive.

ACCESS TO TUBES

To clean or inspect inside of tubes, remove channel cap. *CAUTION: Do not loosen channel cap until sure all pressure is off equipment, and the unit is drained.*

TUBE BUNDLE REMOVAL

When removing tube bundles from exchangers for inspection or cleaning, care should be exercised to see that they are not damaged by improper handling. Tube bundles are often of great weight, yet the tubes are small and of relatively thin metal. The bundle, therefore, should never be supported on the tubes, but should rest on parts designed to carry it, i.e., on the tube sheets support plates, or baffles. For withdrawing tube bundles from the shell, the use of steel eye bolts which are bolted through the tubesheet is recommended for the attachment of cable or other pulling devices. When steel cables are used for lifting vertical tube bundles, the cable should be attached to lifting eyes where possible.

HANDLING TUBE BUNDLES OUTSIDE SHELL

Do not handle tube bundles with hooks or other tools which might damage the tubes. Bundles should be moved about on cradles or skids. Horizontal tube bundles should be lifted by means of suitable slings. Baffles can easily be bent and damaged by dragging a bundle over a rough surface. Since the proper functioning of the apparatus depends upon a close fit between the outside of the baffle and the inside of the shell, any damage to the baffles must be carefully avoided.

LIFTING AND PULLING MECHANISMS

The following are safe loads for eye bolts:

EYE BOLTS	
SIZE	SAFELOAD (LBS.)
3/4"	4,000
1"	6,000
1 1/4"	10,000
1 5/8"	15,000

Cleaning Methods

Provide convenient means for cleaning heat exchangers frequently as suggested below:

1. Circulating hot wash oil or light distillate through tubes or shell at high velocity will effectually remove sludge or other similar soft deposits.
2. Soft salt deposits may be washed out by circulating hot fresh water.
3. Some commercially available cleaning compounds may be used for removing sludge, provided hot wash oil or water, as described above, does not give satisfactory results.
4. Removal of various scales and foreign material by chemical cleaning is now being quite extensively practiced. Certain qualified organizations will check the nature of deposits to be removed, furnish proper acid solutions containing inhibitors, and provide equipment and personnel for a complete apparatus and piping cleaning job.
5. If none of the above methods is effective for the removal of a hard scale, or other deposit, mechanical means may be used.

CLEANING PRECAUTIONS

1. Do not attempt to clean tubes by blowing steam through individual tubes. This overheats the tube and results in the same severe expansion strains and leaks as for plugged tubes.
2. Do not blow out heat exchangers with air when fluids normally handled are inflammable.
3. In cleaning a tube bundle, tubes should not be hammered on with any metallic tool. In case it is necessary to use scrapers, care should be exercised to see that the scrapers are not sharp enough to cut the metal of the tubes.

TUBE ROLLING

To tighten a loose tube joint, use a suitable roller type tube expander. Do not roll tubes that are not leaking, as it needlessly thins and work hardens the tube wall.

GASKET REPLACEMENT

Gasket and gasket surfaces should be thoroughly cleaned and should be free of scratches and other defects. Gaskets should be properly positioned before attempting to retighten bolts. It is recommended that when a heat exchanger is dismantled for any cause, it be reassembled with new gaskets. This will tend to prevent future leaks and/or damage to the gasket seating surfaces of the heat exchanger. Composition gaskets become dried out and brittle so that they do not always provide an effective seal when re-used. Metal or metal jacketed gaskets, when compressed initially, flow to match their contact surfaces. In so doing, they are hardened, so, if re-used, they may provide an imperfect seal or result in deformation and damage to the gasket contact surfaces of the exchanger.

OPERATION OF HEAT EXCHANGERS

STARTING OPERATION

When placing a unit in operation, open the vent connections and start to circulate the cold medium only. Be sure that the passages in the exchanger are entirely filled with the cold fluid before closing the vents. The hot medium should then be introduced gradually until all passages are filled. Then close vents and slowly bring the unit up to temperature.

TEMPERATURE SHOCKS

Start operation gradually. Do not admit hot fluid to the unit suddenly when empty or cold. Do not shock unit with cold fluid when unit is hot.

BOLTED JOINTS

Heat exchangers are hydrostatically tested in accordance with Code requirements, and are certified as satisfactory by inspection agencies agreed upon by manufacturer and purchaser. However, normal yielding of gaskets will occur in the interval between hydrostatic testing in the manufacturer's shop and installation at the jobsite. Therefore, all external bolted joints should be properly retightened after installation and again after the exchanger has been heated, to prevent leaks and blowing out of gaskets.

DESIGNS AND OPERATING CONDITIONS

Do not operate equipment under conditions in excess of those specified on nameplate.

SHUTTING DOWN OPERATION

In shutting down, flow of hot medium should be shut off first. If it is necessary to stop circulation of cooling medium, the circulation of hot medium should also be stopped by by-passing or otherwise.

DRAINING UNIT

When shutting down the system, all fluids should be drained to minimize the possibility of freezing and corrosion. To guard against water hammer, condensate should be drained from steam heaters and similar apparatus when starting up or when shutting down. To minimize water retention after draining the tube side of water cooled exchangers should be blown out with air.

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Maintenance Instruction

Component Weights

Single-Wall Units

MP Size	Coil Weight	Bonnet Weight	Shell Weight
4"	30 lbs.	30 lbs.	60 lbs.
5"	54 lbs.	40 lbs.	73 lbs.
6"	77 lbs.	45 lbs.	85 lbs.
8"	110 lbs.	60 lbs.	115 lbs.
8L"	132 lbs.	60 lbs.	125 lbs.
10"	200 lbs.	95 lbs.	180 lbs.
10L"	230 lbs.	95 lbs.	200 lbs.
12"	253 lbs.	130 lbs.	250 lbs.
12L"	300 lbs.	130 lbs.	300 lbs.

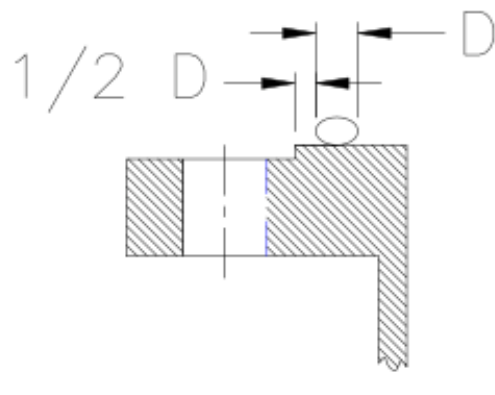
Double-Wall Units

MP Size	Coil Weight	Bonnet Weight	Shell Weight
5"	125 lbs.	40 lbs.	95 lbs.
6"	170 lbs.	45 lbs.	105 lbs.
8"	260 lbs.	60 lbs.	135 lbs.
10"	430 lbs.	95 lbs.	210 lbs.
12"	550 lbs.	130 lbs.	310 lbs.

Gasket Installation

Caution: It is recommended that you wear proper eye protection.

1. Thoroughly clean the gasket surface of foreign matter and scratches. Dirt and scale provide leakage paths.
2. Lubricate the bolts and the underside of the nuts. A heavy graphite and oil mixture will do. Threads should be well formed and free running. Lubricating the threads doubles the clamping force.
3. Gasket should be properly positioned before attempting to retighten bolts. The placement of the gasket is important and must be done on a clean surface area. It covers a very thin area, which widens as the bolts are tightened. Place the gasket on the flange toward the outside of the gasket sealing area so that a width of the flange is approximately equal to half the width of gasket is on the outside (as shown in VIEW "A", D equals width of gasket). Peel back adhesive strip protective paper and firmly press down gasket as you go around flange. The adhesive strip will hold the gasket in position. Flanges, especially blind flanges, bend appreciably when bolts are torqued and might come together without adequately compressing the gasket if it were placed further toward the inside of the flange face.

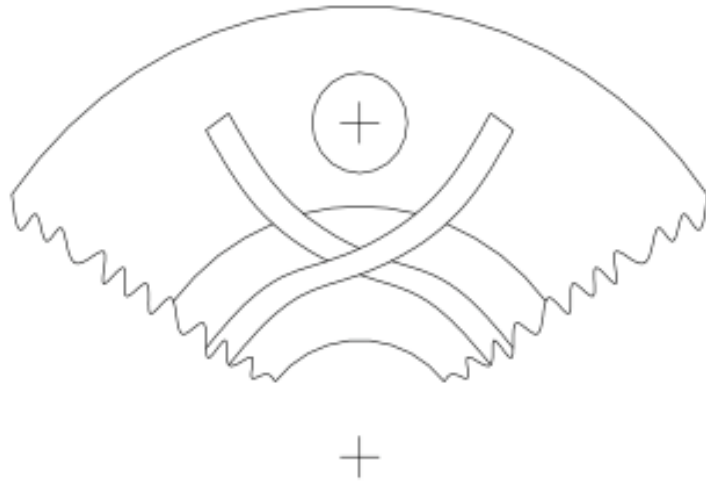


**VIEW
"A"**

Maintenance Instruction

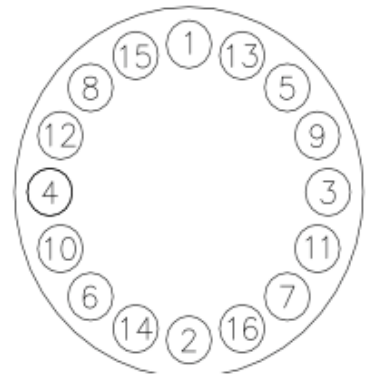
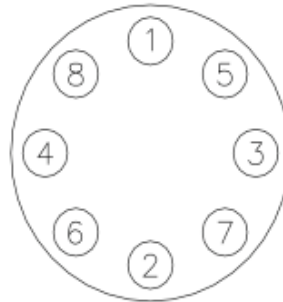
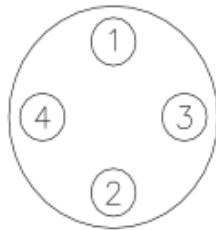
4. Complete the seal by crossing the ends near a bolt hole. Cross one end over the other about 1" and cut (as shown in VIEW "B").

**VIEW
"B"**



5. Assemble the flanged joints and torque the bolts as follows.
- Run up all the nuts, finger tight.
 - Develop the required bolt stress in a minimum of about three equal steps, following a tightening sequence (as shown in VIEW "C"). The gasket material is highly compressible, but has little resilience; so gradual tightening is necessary to form a gasket of uniform thickness. Use a torque wrench to get recommended torque rating.

**VIEW
"C"**

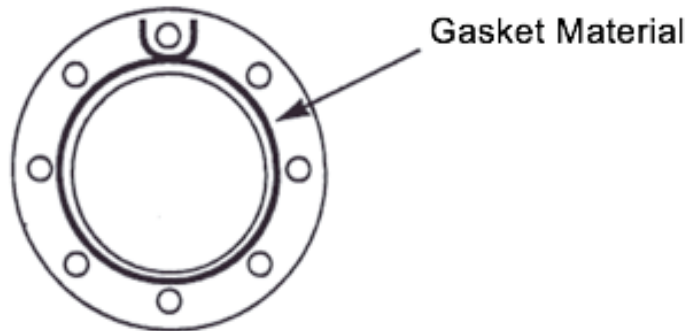


Maintenance Instruction

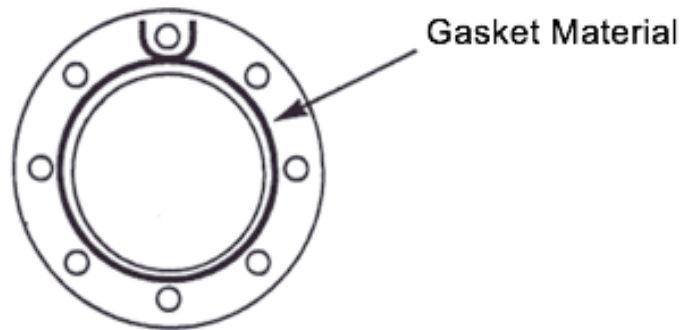
Tube Bundle and Bonnet Installation

Caution: It is recommended that you wear proper eye protection.

1. Flange and tube sheet preparation: Thoroughly clean the gasket surface of foreign matter and scratches. Dirt and scale provide leakage paths.
2. Apply gaskets: Install gasket material on stationary flange with adhesive side down. See Step #3 from Gasket Installation above.
 - a) Overlap material at top of flange.
 - b) Overlapped ends should protrude out of flange, with one end on each side of top bolt.
 - c) Make sure gasket does not extend into bore.



3. Install heat exchanger bundle: Bundle should be lifted or jacked with care as to not damage the tubes or tube sheet gasket surface. Lift the bundle to the proper height prior to tightening nuts down. Do not use the nuts to lift the bundle into the shell. Bundle should be left supported until installation is complete.
4. Apply gasket material on channel bonnet: Overlap gasket material around bolt hole as above. Apply gasket on divider sections as well. Overlap the divider gasket strips over the main gasket.



5. Bolting bonnet: Use jack or overhead support to lift bonnet into position, align with the bolts that are in place, level and slide the bonnet against tube sheet. Install nuts on bolts in place and tighten finger tight. The bonnet should be left supported until installation is complete.

HEAT EXCHANGERS

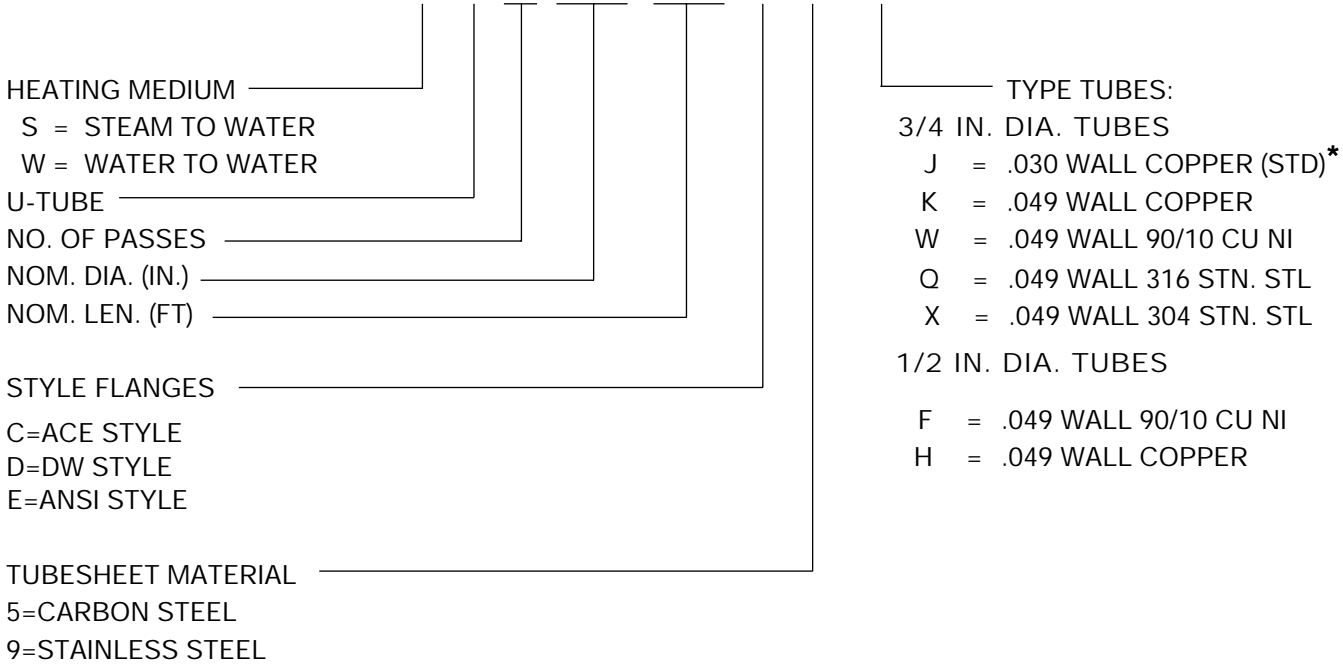
SINGLE-WALL AND DOUBLE-WALL

SINGLE-WALL HEAT EXCHANGERS

Double-Wall on reverse side

EXAMPLE:

MODEL NO. S U 2 0 4 0 8 C 5 J

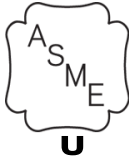


Ace Heaters LLC maintains a policy of continuous improvements and therefore reserves the right to change specifications without notice.

* Standard design - all others available as special orders with extended lead times.
 (Consult factory for details.)

Other Styles and Combinations are available.

Contact factory for price quotes and availability.



HEAT EXCHANGERS

SINGLE-WALL AND DOUBLE-WALL

DOUBLE-WALL HEAT EXCHANGERS

Single-Wall on reverse side

EXAMPLE:

MODEL NO. S U 2 0 4 0 8 D 5 5 L

HEATING MEDIUM

S = STEAM TO WATER

W = WATER TO WATER

U-TUBE

NO. OF PASSES

NOM. DIA. (IN.)

NOM. LEN. (FT)

STYLE FLANGES

D=DOUBLE-WALL

E=ANSI STYLE

TUBESHEET MATERIAL

5=CARBON STEEL

9=STAINLESS STEEL

SHELL T.S. MAT'L.

BONNET T.S. MAT'L.

TYPE TUBES:

3/4 O.D. x 5/8 I.D. IN. DIA. TUBES

OUTER x INNER TUBES

L = COPPER x COPPER (STD)*

R = 90/10 CU NI x 90/10 CU NI

* Standard design - all others available as special orders with extended lead times.
(Consult factory for details.)

Other Styles and Combinations are available.

Contact factory for price quotes and availability.





FACTORY LIMITED WARRANTY POLICY

The Ace Factory limited warranty provides assurance that all products are free from manufacturer defects at the time of shipment and meet specifications and performance described in the product literature.

It is important to understand the difference between a factory warranty and an installed warranty. There are many factors that can occur to the products after they are shipped that the company has no control over and can not fully verify. These includes:

1. Hidden damage during the shipping.
2. Handling damage.
3. Damage during storage.
4. Installation conditions.
5. Other unknown variables in the system design: maintenance, pulsation and vibrations.

The installed warranty is the responsibility of the architect, specifying engineer, contractor and/or owner who jointly have control over the application, installation, location, operating and maintenance conditions.

The Ace Heaters, LLC warranty excludes extended liabilities. Extended liability typically occurs when products are installed without proper drainage, flooding containment or when safety devices are not tested and repaired or replaced when needed.

Product problems are often caused by the condition of the water, the lack of water treatment and/or the improper treatment of the water, insufficient combustion air, improper draft conditions, bolts not re-tightened, pipes not flushed and cleaned of oil, metal chips, rags, vibration and pulsation etc. These are installation, operating and/or maintenance conditions that are beyond the seller's responsibility and are not covered by the factory warranty, but may be covered by the installer's warranty.

The factory warranty covering company products is based upon extensive product development and testing. Combustion products under go certification testing and approvals to Underwriters Laboratory (UL) standards. Auditing of the production of combustion products is conducted by a nationally recognized testing laboratory.

Pressure vessel products are designed and manufactured to American Society of Mechanical Engineering (ASME) and National Board (NB) Design standards. Design reviews, factory product manufacturing quality inspections and testing are carried out by a third party National Board authorized inspection agency.

Ace Heaters, LLC products have proven themselves in service for over 85 years which indicates that the company products perform exceedingly well when normal installation, operating and maintenance conditions exist.

The following is a review from the terms and conditions of sale. Also included in paragraph two, below, is the Ace Heaters LLC nonconformance policy.

1. Ace Heaters, LLC warrants its products against defective material and/or workmanship only. The warranty does not apply to operational failures, electrical failures, gasket leaks, and/or other malfunctions caused by improper application, installation and/or maintenance.
2. It is the buyer's responsibility to inspect and accept the product, when received, as conforming to their purchase order, specifications and approved drawings. All claims for non-conformance, errors, shortages, etc. must be made within 10 days after receipt of the shipment.
3. Ace Heaters, LLC do not provide a warranty or guarantee, express or implied, in any manner, form, usage of trade, merchantability or fitness which extend beyond the product description and quotation.
4. Ace Heaters, LLC liability is limited to the factory repair or replacement of warranty failures, or non-conformance, upon the return of the product to the factory.
5. Ace Heaters, LLC is not liable for any direct or consequential damages.
6. Ace Heaters, LLC warranty is based upon section 23161(2) of the uniform commercial code and is printed in the terms and conditions of sale which is referenced in every quotation, on the back of sales order acknowledgements and invoices. It is legally correct and is an industry standard policy.

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Water Heater – Water Quality Requirements

Properly ensuring the water within the water heater is treated is essential for maintaining the water heaters performance over time and preserving the components connected to the system. It is advisable to manage any water treatment program under the guidance of a water treatment specialist.

Water heaters can suffer from scale buildup and chemically induced corrosion due to poor water quality. Among these problems, the most common is the formation of scale inside the unit, which predominantly occurs on the hottest surface; the u-tube bundle heat exchanger. The accumulation of scale in the unit can lead to a reduction in the water heater's capacity as it coats the heat exchanger surface.

Poor water quality can contribute to chemically induced corrosion of the heat exchanger or the vessel. Different forms of chemically induced corrosion may arise, including general corrosion, pitting corrosion, and stress corrosion. Such corrosion has the potential to significantly decrease the lifespan of the vessel or the tube bundle. General corrosion might manifest as a uniform deterioration of the tube, tubesheet, or vessel material, eventually causing material failure. Pitting corrosion involves the creation of small pits on the tubes, tubesheet, or shell, which can ultimately lead to material failure. Stress corrosion results in stress corrosion cracking. This refers to the development of brittle cracks along the metal's stress lines and grain boundaries. Stress corrosion cracking is more likely to affect materials like austenitic stainless steel, such as the grade 316L commonly used in the water heater's vessel, tubes, and tubesheet. This type of corrosion is associated with the presence of chlorides in the water. The likelihood of stress corrosion cracking increases with higher concentrations of chlorides and temperatures.

Under normal design and operating conditions, the water temperatures within a water heater usually remain below the threshold required for stress corrosion to occur.

Ace Heaters, LLC requires all water heaters to be operated within the following ranges to help control corrosion and scaling:

Water Property	Range
Alkalinity (CO ₃ , HCO ₃)	Less than 300 ppm
Chlorides	Less than 100 ppm
Conductivity	Less than 1,500 ppm (3,000 uS/cm)
pH	6-8
Silica	Less than 150 ppm
Sulfates	Less than 250 ppm
Total Dissolved Solids	Less than 50 ppm
Total Hardnes (Ca and Mg)	Less than 150 ppm



WARRANTY

Limited

Ace Heaters, LLC provides a limited warranty on its products against **defective material and/or workmanship only**. This limited warranty is not applicable to operational failures, electrical failures, gasket leaks, wear or malfunctions caused by improper application, storage, installation, and/or maintenance.

Product Period - The following Limited Warranty period are from date of shipment:

Tanks

Tanks - Carbon Steel: One Year

Tanks - Stainless Steel: Three Years

Storage Water Heaters Single-wall or Double-wall Tank/Exchanger Coils: One Year

Clean Steam Generators: One Year

Linings: (Pro-rated Warranty)

Magnesium Anodes must be used at all times to maintain the Limit Warranty

Section VIII Tanks:

Epoxy: 30" dia. and above (Three years)

Glass: 24" dia. and under (One year).

Glass: 30" dia. and above (Five years).

Cement: (Five years).

Pre-Krete: (Ten years).

Section IV Tanks: SW Model Only

Glass (One year) & Epoxy (Three years).

Minipacks™ Single-wall or Double-wall: One Year

Shell & Tube Heat Exchangers Single-wall or Double-wall: One Year

Atlas™ Series Condensing Boiler (Heat Exchanger): One Year

Triton™ Series Near Condensing Boiler (Heat Exchanger): Twelve Years

Liberty™ Series Condensing Boiler (Heat Exchanger): Ten Years

B-Series Copper Fin Boiler: Three Years

Controls: Components manufactured by other than Ace Heaters, LLC such as controls, instruments, forced draft burner, etc., provided with the boilers and packaged products are not covered by the Ace Heaters, LLC Warranty. However, Ace Heaters, LLC extends to the customer the same warranty provided by the manufacturer to Ace Heaters, LLC. The customer shall receive the full benefits of adjustments made to Ace Heaters, LLC by the manufacturer.

Any claim for adjustment under this limited warranty must be made within the warranty period. Ace Heaters, LLC's liability shall be limited to factory repair or, at Ace Heaters, LLC's option, replacement of all parts which, upon test and examination by Ace Heaters, LLC, prove to be defective material and/or workmanship and within the above limited warranty. If required by Ace Heaters, LLC, parts which are claimed to be defective must be promptly delivered to the Ace Heaters, LLC facility, transportation charges prepaid. This warranty does not cover the cost of labor, removal, or installation of the warranted item during the limited period. This warranty is limited to the above and applies only for the period set forth. Ace Heaters, LLC will not be liable for any loss damage, direct, incidental or consequential damages of any kind, whether based upon warranty, contract, negligence or strict liability and arising in connection with the sale, use or repair of the products. Ace heaters's maximum liability shall exceed the contract price for the product's merchantability or fitness for any particular purpose and in no event shall be held responsible for any consequential damages.

For complete Limited Warranty conditions see Section G and H under terms and condition of sale.

Ace Heaters, LLC, also doing business as Ace Heaters, LLC, is referred to herein as Ace Heaters, LLC



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Ace Heaters, LLC

WARNING

PRODUCT SAFETY NOTICE

ACE BOILER AND WATER HEATER PRODUCTS OPERATE AT HIGH TEMPERATURE AND PRESSURES

- Before using this product, read and understand instructions. Save these instructions for future use.
- Before servicing, to prevent serious burns or injury, the boiler and water heater products must be cooled to less than 80°F (27°C) and the pressure must be 0 psi (0 bar).
- Turn off the electrical power before making electrical connections to prevent electrical shock.
- These products must be placed in a controlled location where untrained or unqualified personnel cannot access the operating or safety controls, must not be able to come in contact with high temperature or high pressure parts and must not perform maintenance or demolition work.
- All work performed must be by qualified properly equipped personnel trained in the proper application, installation, and maintenance or demolition of plumbing, steam, and electrical equipment and/or systems in accordance with all applicable codes and ordinances.
- ACE Boilers and Water Heaters are complete package units with safety and operating controls and are constructed with non ASBESTOS materials. Any replacement gaskets, refractory, insulation, etc used must not contain Asbestos.
- No additional insulation is required on the Boilers and Water Heaters.
- Additions or replacement of insulation on any connecting pipes or accessories to the Boilers and/or Water Heaters must be of "NON-ASBESTOS" and contain only non-hazardous materials.
- Crystalline Silica, a material known to cause cancer, may be encapsulated in some refractory or insulation materials and must be handled only by authorized trained personnel. Crystalline Silica as used is encapsulated and is not harm full in this form. Care must be taken during removal or replacement of refractory or insulation to remove it in bulk form and avoid generation or inhalation of dust. Removal must be properly performed by trained, qualified and equipped personnel. This is also true of Asbestos not contained in ACE products but may be otherwise contained in replacement materials or parts, in connecting piping or other nearby products.
- All safety and operating controls must be set within the specified operating limits and tested periodically to assure proper operation. All limit and operating controls must be installed in series on the boiler.
- Connect drain pipes to a safe drain to prevent serious personal injury from relief valve discharge and or from boiler blow down discharge.
- After installation, check for proper operation of all limit and operating controls before leaving the site.
- Perform scheduled and annual inspections including checking Controls for proper calibration and performance.

Failure to follow these warnings, to allow access by unauthorized persons and the use of non-properly trained and equipped personnel in the operation, service, modification, removal or demolition of these products or replacement of parts with non-authorized factory non-asbestos materials could cause damage, personal injury or death.

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