

THE BASIC RADIANTEC SOLAR DOMESTIC WATER HEATER

“What is the use of a house if you haven’t a tolerable planet to put it on?” – Thoreau



Introduction - The “**Radiantec Basic Solar Domestic Water Heater**” is a pre-engineered “packaged” residential solar water heater that will provide abundant quantities of domestic hot water for a typical residential family.

The **Radiantec Basic Solar Domestic Water Heater** can serve as a point of departure for more versatile solar energy systems. Useful supplements such as radiant underfloor heating, solar-assisted gardening, snow melting, pool heating and passive cooling applications can be added to the basic system either initially or in the future. For clarity, this manual refers only to the basic water heating system. We encourage you to consult with Radiantec Company for appendices and other information about supplemental uses.

The **Radiantec Basic Solar Domestic Water Heater** is intended in part to meet the basic requirements of solar certification agencies and tax authorities. The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the Solar Rating and Certification Corporation (SRCC). This certification does not imply endorsement or warranty of this product by SRCC.

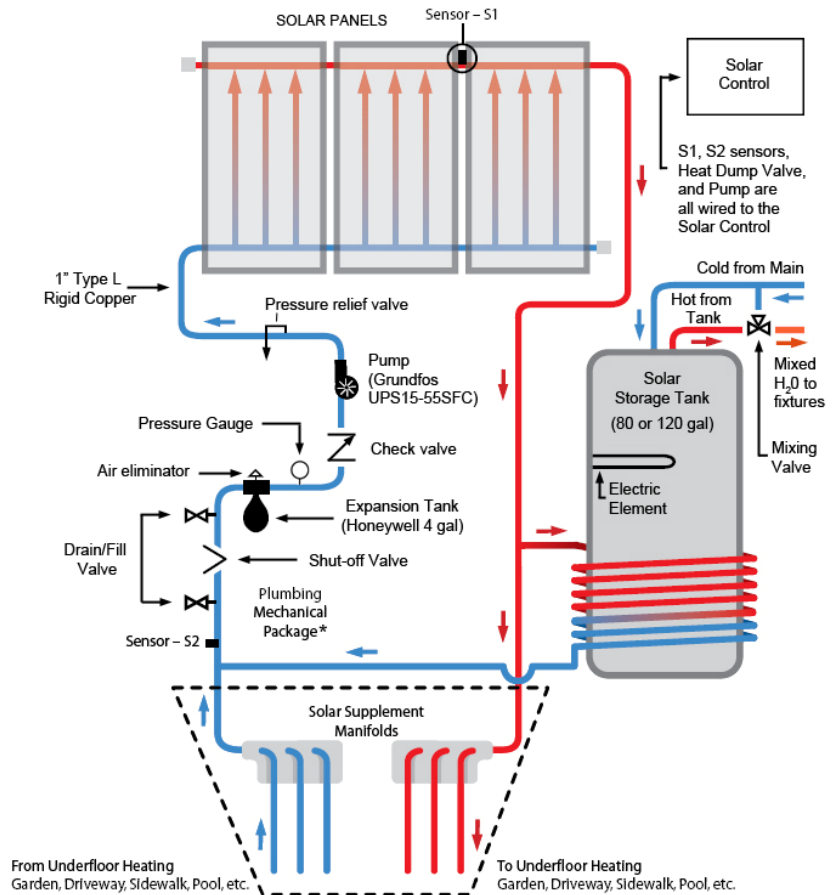
Please pay particular attention to any items shown in red as they will relate to safety considerations.

Description and Operation The Radiantec Basic Solar Domestic Water Heater consists of a solar collector array, a solar hot water storage tank with "wrap around type" heat exchanger, a pump, an electrical control and other mechanicals. A simple control will turn on a pump whenever the temperature inside the solar collectors is warmer than the temperature at the location where the heat will be used. When the sun comes up in the morning, the solar collectors become warm and the heat is passed to a "heat transfer fluid", generally water or a non-toxic glycol antifreeze solution.

Radiantec Solar Option

A thermal sensor near the solar collectors sends temperature information to the solar controller. The controller compares this information with the temperature on the pipe returning from the storage tank. If the collector temperature is warmer, the pump comes on and circulates the heat transfer fluid so that the heat energy is transferred to the solar storage tank.

The Radiantec Basic Solar Domestic Water Heater can be technically described as a **“closed loop, hydronic, antifreeze-based, indirect solar water heater”** – In layman’s language, this means that a solar collector warms up a solution of antifreeze and water. Then the antifreeze solution is circulated by a pump from the solar collector to a copper heat exchanger that wraps around the bottom of the hot water storage tank, and then back to the solar collector to be reheated.



* Plumbing Mechanical Package includes:
Drain & fill valves, shut-off valve, pressure relief valve,
pressure gauge, check valve, expansion tank & air eliminator.

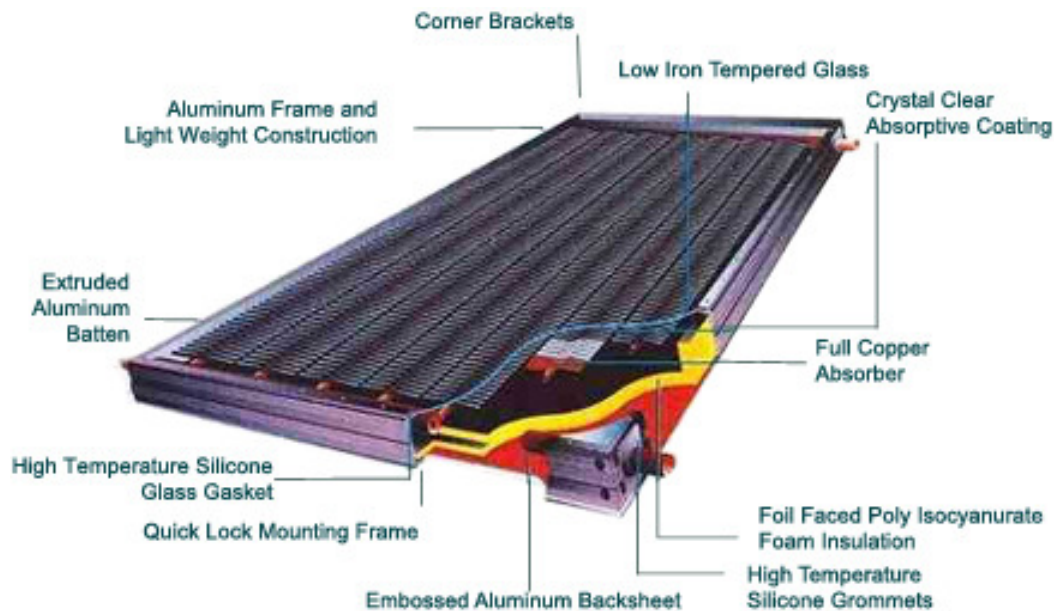
COMPONENTS

Solar collector array

Three solar panels from Alternative Energy Technologies will make up the solar collector array. The model number is AE-32 and the dimensions are approximately 4' X 8'. The *net solar aperture* is approximately 90 square ft and is relatively large in comparison to many other solar collectors. The net solar aperture is the actual amount of black solar absorption area that is exposed to the sun and is a very important factor in performance.

The solar panel is a shallow aluminum box with glass cover. It is essentially a heat trap, like an automobile on a sunny day. Solar radiation passes through the glass cover into the collector where it turns into heat. The collected heat cannot escape easily by radiating back out. The heat is then carried away by a black copper absorber plate with attached fluid passages. In other words, the solar collector turns solar energy into a hot antifreeze solution.

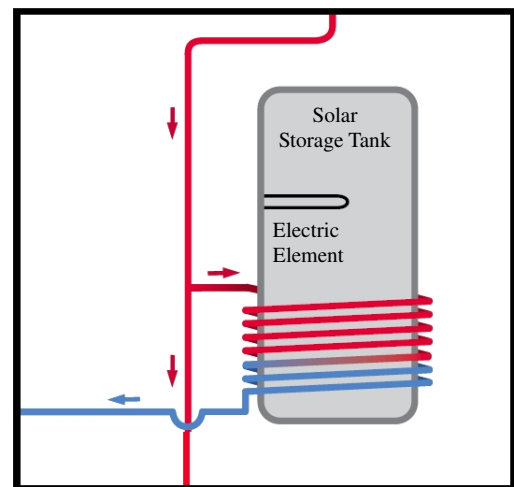




The solar collector

The solar storage tank holds 120 gallons of potable water. It is heated by a “wrap around type” heat exchanger made of copper tubing. Heated solar fluid from the solar collectors circulates through the “wrap around” heat exchanger and the heat is passed to the water in the tank by conduction. The “wrap around” heat exchanger design gives the highest standard of protection for the potable water: Double-wall venting prevents any contamination of water in the tank.

Back-up heating element - An electric element is located within the top 1/3 of the tank as a backup, and it is energized whenever there is insufficient solar energy available. The water heater maintains its own temperature independently from the solar control. For example, if you set the tank thermostat to 100⁰ F., the electric element will be activated by the water heater control to maintain the set-point. Its position in the top third of the tank fosters thermal stratification such that only the top third of the tank is heated electrically while the water towards the bottom of the tank remains at a cooler temperature so that solar energy may contribute to the domestic hot water need. The electric element should be set to the minimal acceptable water temperature. Some users will shut the electric element off manually at the electrical box during favorable solar conditions. In some cases, very high temperatures within the tank could trip the breaker in the tank and need to be reset by pressing the red button.



The solar storage tank with integral “wrap around” heat exchanger

SOLAR MECHANICAL PACKAGE



The Solar Mechanical Package contains all of the parts needed to operate a closed-loop system, including filling, draining, etc. A fuller explanation of the function of the components in the mechanical package is in the following “Installation Manual”. In a closed-loop system the solar fluid is circulated from the solar collector to the tank heat exchanger by means of a pump whenever solar energy is available. The system is said to be closed because the working fluid remains within the system and is never removed except for maintenance. **All components of the Solar Mechanical Package, including the pump, can become very hot during operation.**



SOLAR HEAT TRANSFER FLUID

An antifreeze solution is the medium that transfers heat from the solar collectors to the solar storage tank. The solution will be a 50-50% solution of propylene glycol and water, which is non toxic (*see attached technical data sheet*).

Freeze Protection - The solution will prevent damage from freezing down to -50 degrees F.

High Temperature Protection - The antifreeze solution has a higher boiling temperature than water.

Corrosion Protection - The antifreeze solution has corrosion inhibitors for long service life.

Lubrication - The antifreeze solution serves to lubricate the pump for long service life.

The solar fluid can be dangerously hot under certain conditions. Do not open the fill and drain valves in the “Solar Mechanical Package” if hot.

THE SOLAR CONTROLLER

The Radiantec Solar Controller serves several useful functions:

- Displays the temperature at important points in the system.
- Operates the pump either fast or slow according to solar availability.
- Activates a heat dump.
- Signals system malfunction.



Solar Controller Operation – There are two electrical temperature sensors (S1 and S2). S1 is placed where it will read the temperature of the fluid coming out of the solar collectors and S2 is placed on the piping returning from the storage tank where it will read the temperature going back to the solar panels. The controller compares the two temperatures, and if S1 is greater than S2 by a selectable amount, the pump comes on and fluid circulation begins between the solar collectors and the tank heat exchanger. When the temperature difference is small, the variable speed pump runs slowly and when the temperature difference is greater, the pump runs faster. The variable control feature has many benefits including improved low sun performance, less control cycling and conservation of electrical energy at the pump.

The placement and insulation of the temperature sensors is a very important. Performance can suffer by 20% or more if the sensors are not installed properly. See the installation manual for more details.



The heat dump - The Radiantec Solar Heat Dump is a supplemental method for controlling undesirable overheating of the solar energy system by automatically consuming some domestic hot water and sending it down the drain. The occupant can select a lower setting for the activation of the heat dump if it is desirable to have lower overall temperatures in the solar system. Whenever the temperature at S1 (coming out of the solar collectors) is greater than a selectable temperature (default is 250 degrees F), the heat dump is activated.

The solar heat dump is a small solenoid type valve that sends a small 1/4" stream of water down the drain. The effect is to slowly and gently cool down the entire solar energy system without consuming very much water. The volume of a typical heat dump **is only about ten gallons** and it tends to occur twice per day if the structure is not occupied and once per day or not at all if the building is occupied. Operation of the heat dump will not compromise a septic system because of its low volume and high temperature, which facilitates bacterial action.

Stagnation – A solar heating system is said to be in stagnation when the solar collectors are exposed to sunlight but the heat is not being taken away and put to use. This condition can occur for any of the following reasons:

- Pump failure
- Controller failure
- Electric power failure
- An air bound system
-

Under stagnation conditions, the temperature in the solar collectors may go as high as 275 degrees F and the system pressure could go to 50 psi. As a condition of certification, solar collectors must be able to withstand prolonged periods of stagnation. Nevertheless, these very high temperatures could eventually cause appearance problems with the solar panels due to out-gassing of materials within the panel and subsequent condensation in the inside of the glass cover sheet. Also, temperatures above 250 degrees F will eventually degrade the glycol and cause it to require early replacement. Stagnation is an abnormal condition

that should be corrected but it is not an emergency.

Freezing Conditions – The glycol portion of the Radiantec Basic Solar Domestic Water Heater will not be harmed by freezing conditions; however the solar storage tank will need to be protected if the building is unoccupied.

PERFORMANCE

The variability of solar energy and also the variability in the usage patterns of the occupants mean that most solar energy systems will be supplemental. Solar domestic water heaters are usually designed to provide 60-90% of the need of a typical family of four. It is generally not practical to design a solar energy system that will meet 100% of the needs under every circumstance because the over design needed would raise cost-effectiveness and architecture issues.

ROUTINE MAINTENANCE AND NORMAL OPERATION

The Radiantec Basic Solar Domestic Water Heater is nearly maintenance free. Nevertheless, it should be checked periodically for normal operation. When the sun comes out, the pump should run and the system should make abundant hot water. The pump should not run at night. It would be normal for the solar system to run slowly on a cloudy day and make less hot water or hot water at a lower temperature. It is normal for the heat dump to activate for short periods of time under very sunny conditions when there is little use of hot water.

Periodic rainfall should keep the solar panels free of dirt and dust. You may rinse them off with a garden hose if they get dirty, **but do not do this when the panels are very hot.**

The antifreeze solution should be checked every two years for acidification and freeze level protection. Normal PH is 8.6 and replacement is indicated at 7.0 or below. The PH test can be done using litmus test strips or an electronic PH meter. The antifreeze solution may last up to 25 years if it is not exposed to air. This simple inspection will eliminate corrosion and allow a very long service life for the system. To test the level of freeze protection, use a hydrometer or antifreeze test strip. You may be able to find a test strip that tests both the PH and the level of freeze protection. A specification sheet for the Anti-freeze can be reviewed at the end of this manual.

Inspect the external pipe insulation periodically for UV damage and repaint as needed.

The pressure in the glycol loop as indicated by the pressure gauge should be checked periodically. It should be between 5 and 25 psi. Lower readings might indicate a leak and higher readings could indicate a stagnation condition.

Condensation within the solar panels

It is not unusual for moisture to condense on the inside of the solar panels. Condensation can be removed periodically by allowing the system to operate at high temperatures by restricting domestic hot water use briefly. Expansion and contraction of the solar panels can draw in morning dew. Small air vents are provided on the back of the solar panels but they are not always fully adequate.

ABNORMAL INDICATIONS AND TROUBLESHOOTING

High or low pressure - Low pressure in the glycol loop could indicate a leak. High pressure in the system under full sun could indicate high temperatures in the solar collectors caused by stagnation. Call for service.

No hot water - If there is no hot water in cloudy conditions, the reset button for the electrical element may need to be reset. Very hot water on sunny days could trip the element. If this is a nuisance, you can lower the overall temperature of the system by changing the setting of the heat dump.

Leaks - If there is a leak in the glycol solar loop, it will be necessary to shut down the system and drain it in order to make the repair. Call for service. **Do not perform work on a solar heating system under full sun conditions unless you are a skilled solar technician.** If there is a leak in the potable hot water portion of the system, do not make repairs under full sun conditions.

Power failure - A power failure during sunny periods will shut down the solar pumps and cause a no-flow situation. Temperatures within the panels will get very hot. It is not necessary to do anything. When the electrical power returns, there may be considerable noises from expansion and contraction, but normal operation should resume within a couple of minutes.

Electrical problems - If there is a problem with the electrical control, the system is likely to run constantly or not at all. Problems with the temperature sensors are indicated when the display flashes a high or low temperature indicates a series of dashes (-----). This indicates a short or open circuit in the sensor wiring or a defective sensor. Turn the controller to the “ON” position until it is convenient to make the repair. The solar system will run constantly until it is repaired, which will not harm the system.

SHUT DOWN

It is not necessary to shut down the solar system if the building will not be occupied for a brief period of time. If no hot water will be used for more than 60 days or if the water must be shut off to the heat dump, it would be best to shut the system down by doing the following:

- Disconnect the electrical power.
- Drain the system.
- Cover the solar panels with a tarpaulin.

HAZARDS

Solar collectors can become very hot when they are in direct sunlight and no fluid is taking away the heat. Use great caution when collectors are in this condition. Do not stand near the collectors or the pressure relief valve.

Do not work on a solar heating system when it is in direct sunlight without covering the panels.

The solar heating system can generate SCALDING HOT WATER. Never send water of this temperature directly to faucets or other fixtures. Always provide an approved anti-scald valve to lower water temperature to the fixtures by mixing cold water in with the hot.

PARTS LIST

Basic Radiantec Solar Domestic Water Heater

Solar Collector: Alternate Energy Technologies, Model AE-32

Solar Storage Tank: Rheem Solaraide HE, Model 82V120HE-1

Pumps:

- runs up to 100': Grundfos UPS15-55SFC

Controller: Azel Technologies Differential Temp and Variable Speed Control, Model SH-08 v3

Heat Transfer Fluid: Camco Boiler Anti-freeze -100°

Piping: All Copper

System Operating Parameters:

- Pressure should be between 15 and 20 psi
- Difference between the thermometers should be at least 8° F. if the sun is shining

WARRANTIES

- **Supplemental Manifold:** 1 year from date of installation, not to exceed 18 months from date of purchase.
- **PMP:** 1 year from date of installation, not to exceed 18 months from date of purchase
- **Pumps:** 24 months from date of installation, but not more that 30 months from date of manufacture
- **Solar Control:** 3 year warranty from date of purchase
- **Solar Storage Tank:** 6 Years on parts and tank
- **Expansion Tank:** One year from date of installation, not to exceed 18 months from date of purchase
- **Air-Eliminator:** 1 year from date of installation, not to exceed 18 months from date of purchase
- **Pressure Relief Valve:** 18 months from date of purchase
- **Pressure Gauge:** 18 months from date of purchase
- **Mixing Valve:** 1 year from date of installation, not to exceed 18 months from date of purchase from Radiantec

- **AE-32 Solar Panels:** 10 years from date of purchase. No guarantee for freeze damage
- Any other component not listed is warranted for 18 months from date of purchase

To file a warranty claim for all components in the system, please contact a Radiantec Company customer service representative for details on how to proceed at 1-800-451-7593.

ESTIMATED COMPONENT LIFE

When installed and maintained as directed in this manual, one can expect many years of trouble-free service from this system. All components in this system are subject to the conditions of the installation. In locations where hard water is present, mineral deposits can prematurely foul-out the design life of these components. Periodic maintenance is required to insure that these components are well protected from such damage.

The solar collectors used in this system have a design life of 30+ years. Water storage tanks are designed for 12-20 years of use. The lesser components, such as pumps and valves are designed for 5+ years, however, are more likely to foul, as described above, if not maintained properly.

REPLACEMENT PARTS

Contact Radiantec for replacement parts at 1-800-451-7593.
Our mailing address is: Radiantec Inc. P.O. Box 1111, Lyndonville, VT 05851.

SERVICE

If the system requires service, first contact the person who installed the system. You may also contact Radiantec for contact information for a referral. 1-800-451-7593.

Use this space to write down system specific information:

System Name: _____
 System Model Number: _____
 Name of Service Company: _____
 Address: _____
 Phone Number: _____

IS IT A RADIANTEC SYSTEM?

If you have used the recommended materials and followed the directions, you have the assurances that go with a Radiantec System. These include a warranty, continued customer support and code compliance.

On the other hand, if you made important changes without our consultation, then it is not a Radiantec System. Please understand this distinction. It is not fair or legal to associate the Radiantec name with incorrect products and designs. It is harder for us to support you if we do not know what you did.

Please understand that the toll-free customer support number is for the benefit of our customers.

If you have technical or code problems with other materials and applications, we would still like to help you, but it will be as time permits and on the following number (1-802-626-8045). **Unapproved**

modifications to the Radiantec Basic Solar Domestic Water Heater can create an unsafe condition and might void the warranty.



Installation Manual – The Installation Manual for the Basic Radiantec Solar Domestic Water Heater contains important information and is an essential part of this owner’s manual.

CAMCO Boiler -100° Antifreeze Data

■ SYSTEM LIMITATIONS & CAUTIONS:

BOILER -100° should not be used in:

-systems where antifreeze fluid temperatures frequently exceed 275° F.
-systems that are open to the atmosphere.
-systems containing galvanized parts or fittings. Continuous contact with galvanized materials should be minimal. **Boiler -100°** removes zinc from galvanized materials.
-systems constructed of aluminum and exposed to temperatures of 200° F and higher. Corrosion will result.
-steam type heating systems.
-internal combustion engines as a coolant.
-systems containing other water treatment chemicals. Other fluid treatment chemicals should not be necessary provided the hydronic system is maintained properly and routinely.
-water softeners. To prevent contamination of mineral beds, disconnect all water softeners from system or provide with back flow.

■ SYSTEM REQUIREMENTS:

Boiler -100° requires no modification to existing systems. These considerations apply to new system design:

1. Increase pump head 10% above minimum requirement for plain water.
2. Install strainer in pump suction line just ahead of pump.
3. Increase expansion tank size by approximately 4% above that required for plain water in the same temperature range.

■ RECOMMENDED CONCENTRATIONS:

Systems vary in the amounts of antifreeze required. Listed below are the minimum requirements:

HOT WATER HYDRONIC: Use 50% **Boiler -100°** to maintain adequate corrosion protection and good low temperature fluid flow characteristics.

NOTE: Use a maximum of 75% **Boiler -100°** in hydronic systems unless system is specifically designed for fluids other than water.

SOLAR: Use 65% - 100% **Boiler -100°**. Very high to very low temperature swings, stagnation, high pump heads etc. should be taken into account when **Boiler -100°** concentration is calculated.

GROUND-WATER & EARTH-COUPLED HEAT PUMPS: Use 30% **Boiler -100°** minimum. This provides fluid flow at +15°F to +20°F. This is generally adequate in these type systems. Increase concentration accordingly in extreme climates.

AMANA HTM PUMP & FURNACE MODULES: Use 60% **Boiler -100°**.

COIL DEFROSTING: Use 50% - 75% **Boiler -100°**.

INDUSTRIAL USES: Use 50% - 75% **Boiler -100°** depending upon specific parameters. Consult equipment manual or manufacturer for individual applications.

FIRE HYDRANT: Use 75% - 100% **Boiler -100°**.

■ MAINTENANCE:

Test system annually for **Boiler -100°** concentration and **corrosion inhibitor level**. If **Boiler -100°** concentration is low, add **Boiler -100°** according to the following formula:

$$SC \times \frac{[\% \text{ BAF Desired} - \% \text{ BAF Now}]}{[100\% - \% \text{ BAF Now}]} = \text{BAF needed}$$

SC = System capacity in gallons

BAF = **Boiler -100°**

Drain adequate fluid from system **before** adding additional antifreeze to prevent system operating pressure from becoming too high.

If corrosion inhibitor level tests unsatisfactory,

1. Add one pint of **CAMCO Inhibitor Re-charge** per 20 gallons of fluid in the system.
2. Mix thoroughly.
3. Test corrosion inhibitor level again.

If still unsatisfactory,

4. Add another pint per 20 gallons of fluid in the system.
5. Mix thoroughly.
6. Test corrosion inhibitor level again.

If still unsatisfactory, the system is likely contaminated with minerals and/or an acidic material.

7. Drain, clean and recharge system with **CAMCO Boiler -100°**.

■ BOILER A/F ASSOCIATED PRODUCTS:

CAMCO BOILER ANTIFREEZE PH TEST STRIPS #36001.

Tests solution pH and indicates the corrosion protection.

CAMCO BOILER ANTIFREEZE INHIBITOR RECHARGE

#35016. Replaces depleted corrosion inhibitors in antifreeze solutions to prevent corrosion problems. Can also be added to uninhibited antifreeze solutions.

CAMCO FREEZE-CHECK REFRACTOMETER #65401.

This economical, highly accurate instrument reads the actual freeze and burst points of antifreeze solutions. Eliminates guesswork and reassures the user that the system is protected to the desired level.

■ TECHNICAL SUPPORT:

Camco's Customer Service & Technical Support group will be glad to address any specific question.

Call 1-800-334-2004(8-5 EST).

Material Safety Data Sheets available upon request.

MATERIAL SAFETY DATA SHEET

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Boiler Antifreeze -100

===== SECTION I - COMPOSITION / INFORMATION ON MATERIALS=====

REPORTABLE COMPONENTS	CAS NUMBER	VAPOR PRESSURE mm Hg @ TEMP	WEIGHT PERCENT
Propylene Glycol	57-55-6	0.08 68 F	<68
Dipotassium Phosphate	7758-11-4	N/A	<5

*All chemical components are considered non-hazardous according to OSHA 29 CFR (1910.1200).

===== SECTION II - MANUFACTURER IDENTIFICATION =====

MANUFACTURER'S NAME: **Camco Manufacturing, Inc.**
ADDRESS: **121 Landmark Drive**
Greensboro, NC 27409

EMERGENCY PHONE: **1-800-535-5053** DATE REVISED: 5/27/2008

INFORMATION PHONE: 336-668-7661

NAME OF PREPARER: **CAMCO MANUFACTURING INC.**
121 LANDMARK DR.
GREENSBORO, NC 27409
1-800-334-2004

===== SECTION III - PRODUCT INFORMATION =====

PRODUCT NAME: **Boiler Antifreeze-100**

NFPA CODES: Health 1
Flammability 1
Reactivity 0

Note - NFPA ratings are based on a 0-4 rating scale with 0 representing minimal hazards or risks and 4 representing extreme hazards or risks.

PRODUCT CODE: 30027

===== SECTION IV - PHYSICAL/CHEMICAL CHARACTERISTICS =====

BOILING RANGE: 212 - 370 F

VAPOR DENSITY: NOT DETERMINED

SOLUBILITY IN WATER: Completely Soluble

APPEARANCE AND ODOR: Clear, red liquid - slight odor

SPECIFIC GRAVITY (H₂O=1): 1.04 – 1.05 @ 70° F

MATERIAL SAFETY DATA SHEET

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Boiler Antifreeze -100

pH (as received): 8.5 to 10.0

EVAPORATION RATE: NOT DETERMINED

===== SECTION V - FIRE AND EXPLOSION HAZARD DATA =====

FLASH POINT: > 218 F

FLAMMABLE LIMITS IN AIR BY VOLUME- LOWER: 2.6% UPPER: 12.5%

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, water spray or foam. Use water spray to cool fire-exposed containers. Water or foam may cause frothing.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS: No special equipment or procedures required.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None known

===== SECTION VI - REACTIVITY DATA =====

STABILITY: Stable

CONDITIONS TO AVOID: Excessive heat and strong oxidizers.

INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizing agents.

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: Carbon monoxide and other oxides of carbon.

HAZARDOUS POLYMERIZATION: Do not occur

===== SECTION VII - HEALTH HAZARD DATA =====

INHALATION HEALTH RISKS AND SYMPTOMS OF EXPOSURE: Not expected to have any adverse effects.

SKIN AND EYE CONTACT HEALTH RISKS AND SYMPTOMS OF EXPOSURE

EYE CONTACT: Slight irritant

SKIN ABSORPTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

SKIN ABSORPTION: No evidence of harmful effects from available information.

INGESTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

INGESTION: No hazard identified from data found.

MATERIAL SAFETY DATA SHEET

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Boiler Antifreeze -100

HEALTH HAZARDS (ACUTE AND CHRONIC): None known.

CARCINOGENICITY: No

NTP CARCINOGEN: No

IARC MONOGRAPHS: No

OSHA REGULATED: No

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:

None known

===== SECTION VIII - PRECAUTIONS FOR SAFE HANDLING AND USE =====

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Contain spill if possible, contain with absorbent materials such as clay or soil, and shovel up. Avoid skin and eye contact.

WASTE DISPOSAL METHOD: Propylene Glycol has been evaluated for RCRA characteristics and does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the responsibility of the user of the product to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. It should be disposed of in accordance with federal, state and local regulations.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

Store in a cool, dry, well ventilated area.

OTHER PRECAUTIONS

Store in closed containers in a cool, dry, well ventilated area. Keep away from sparks and open flame.

===== SECTION IX - CONTROL MEASURES =====

RESPIRATORY PROTECTION

No special respiratory equipment is recommended under normal use.

VENTILATION: General ventilation is sufficient.

PROTECTIVE GLOVES: Wear appropriate impermeable gloves

EYE PROTECTION:

Use chemical safety glasses, goggles, or faceshields for eye protection.

MATERIAL SAFETY DATA SHEET

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Boiler Antifreeze -100

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: It is the responsibility of the user to determine the proper protective equipment that is needed based on how the product will be used.

WORK/HYGIENIC PRACTICES:

Wash thoroughly after handling.

===== SECTION X - EMERGENCY AND FIRST AID PROCEDURES =====

INHALATION: Not expected to have any adverse effects.

EYE CONTACT: Flush with large quantities of water for 15 minutes.

SKIN: Remove contaminated clothing and wash contaminated skin with large amounts of soap and water. If irritation persists, get medical attention. Launder clothing before reuse.

INGESTION: Dilute by drinking water. Never give an unconscious person anything by mouth. Ingestion of small quantities, pose no hazardous threat. If more than several mouthfuls are swallowed, abdominal discomfort, nausea, and diarrhea may occur. If large quantities are consumed, obtain medical attention.

===== SECTION XI - 49CFR Transportation Information =====

US 49 CFR DOT Shipping Description: Not Regulated
(This product is not regulated by DOT when shipped domestically by land.)

===== SECTION XII - DISCLAIMER =====

To the best of our knowledge, the information contained herein is accurate, obtained from sources believed by Camco Manufacturing, Inc., to be accurate. However, the information is provided without any representation or warranty, expressed or implied, regarding its accuracy or correctness.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. It is the responsibility of the user to determine the safety, toxicity and suitability of his own use, handling and disposal of this product.