TRANE®

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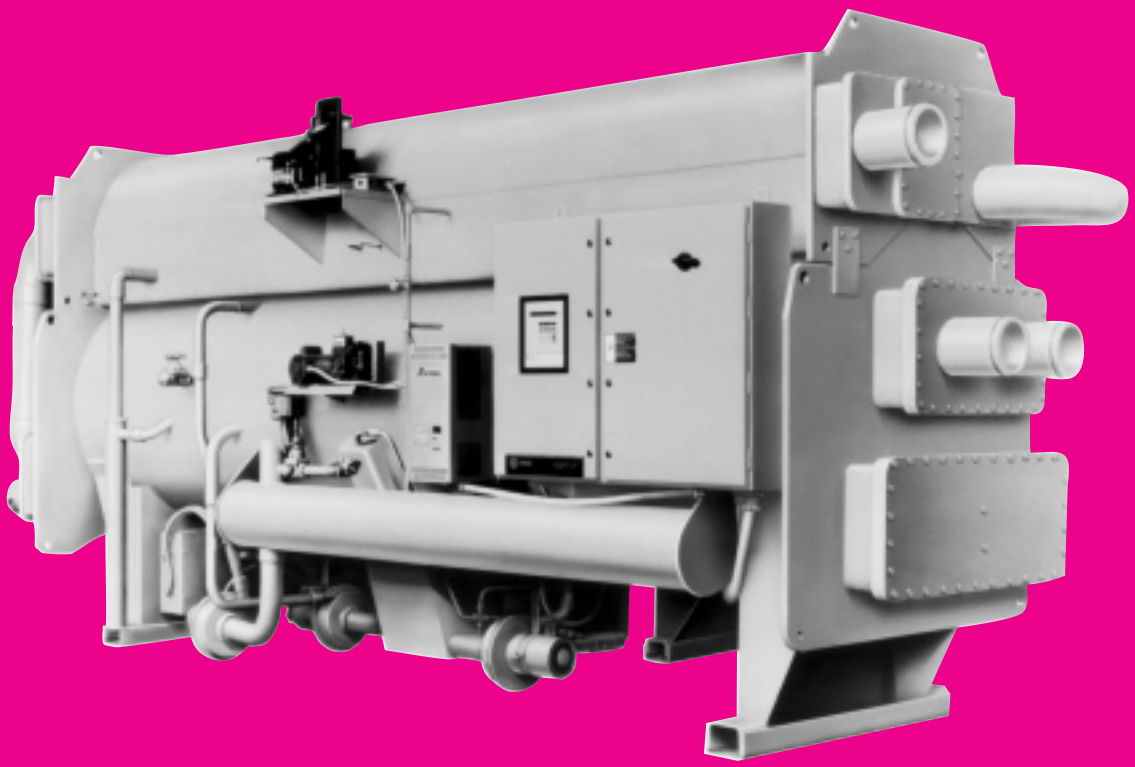
First Printing

Trane Horizon™ Absorption Series

Direct-Fired Absorption Water Chillers 380-750 Tons

ABS-DS-6



Introduction

What's New

This catalog introduces additional sizes to the Horizon™ direct-fired line of chillers. This advanced direct-fired Horizon™ absorption chiller was developed with the assistance of the Gas Research Institute. The models currently available are:

- ABDA-380
- ABDA-440
- ABDA-500
- ABDA-575
- ABDA-660
- ABDA-750

Highlights of the Horizon™ direct-fired chillers include:

- Easily disassembled and reassembled into two or three pieces for those applications which require moving the machine through a smaller space.
- Factory mounted and wired Weishaupt low NOx burner.
- Variable speed drives on the absorber pump and low temperature generator pump which provide improved part load efficiency and a larger operating map.
- 8 to 1 turndown on the burner using natural gas.
- Individual pumps with 50,000 hour service intervals.
- The manufacturing process used to build Horizon chillers is based on the La Crosse Business Unit's ISO 9001 certified quality system. This system follows procedures which define how quality assurance activities are managed, performed, and monitored. Included in the system are verification checkpoints from the time the order is entered until final shipment. In addition, during development, products are subjected to formal planning, review and validation steps. The system is designed to assure maximum consistency in meeting customer requirements.

Product Application Guide

There are many benefits to using the new high efficiency, reliable Horizon™ absorption chiller. These benefits include peak electrical shaving during high demand periods and replacement of existing lower efficiency single or two stage absorption equipment. Absorption chillers are environmentally acceptable and offer smart controls. Direct-fired absorption chillers can be applied to many building designs and chiller plant configurations in all sections of the country and the world.

The Trane Horizon™ chillers are designed for comfort cooling or process applications when a continuous and reliable supply of 40F to 70F chilled water is needed. Absorption chillers are normally applied where there is economic justification that supports lower operating costs. Their primary advantage is the ability to provide cooling and/or heating using natural gas or No. 2 fuel oil.

Combination Systems

Using a combination of electric chillers and absorption chillers for air conditioning loads, peak energy savings can be realized. The absorption chiller is used to shave seasonal billable peak power demands during summer operation, and the electric chiller is run below the allowed demand limit, reducing costly demand charges.

Trane not only has the ability to provide equipment for any type of building application but also has experienced applications engineers that can help with these designs. Trane offers both electric chillers and absorption chillers with the unit control panel (UCP2) as standard. This is an advantage because although the chillers have different features and modes of operation, the chiller control panel looks and acts the same across all chiller lines. Each control panel is programmed to monitor the particular chiller for which it was designed but maintenance and service personnel need only become familiar with one control panel.

Combined with a Trane Tracer® system, a chiller plant has almost unlimited operational flexibility and all equipment is supplied from a single source.

Multiple Machines

Trane direct-fired absorption chillers modulate smoothly from part load to full load conditions automatically. This, combined with inherent reliability, often makes multiple machine installations unnecessary.

Multiple machine installations can be designed for parallel or series flow of chilled water through the machines. There are advantages to each design.

Parallel flow allows minimum chilled water pressure drop through the machines. However, with one machine "off", it is not usually possible to maintain design chilled water temperature unless one machine is valved off and the chilled water flow decreased.

Series flow permits design chilled water temperature at light loads with one machine "off". However, at all operating conditions, the chilled water pressure drop through the machine is high.

A decision concerning which arrangement is best for an individual system should be based on an analysis of system water and temperature rise requirements, system and machine pressure drop characteristics, and installation cost. The control of multi-machine installations is discussed in the control section of this catalog. In multi-machine installations, as in single machine installations, provisions must be made to safeguard the machine from possible freeze-up in event of chilled water flow interruption.

Features Highlights

Integrated Comfort™ System Application
"Chilled Water System" encompasses many levels of control: standalone chiller, chiller plant, applied system, and central building automation system. Regardless of the system level being designed, unit controls become critical not just in making every level operate reliably but facilitating optimal performance. UCP2 provides more capability and more intelligence to make this operation/optimization possible.

Trane has set the standard for unit microprocessor controls:

- Proportional integral derivative (PID) control strategies providing stable operation and higher accuracy resulting in better performance;
- Adaptive Control™ keeping the chiller "on line" and at the same time operating safely.
- Software based safeties that do not depend on electromechanical hardware that mean questionable reliability and added cost.
- Operator interface accesses chiller information and control adjustments at the front of the panel.

Trane offers the ability to adapt to changes easily and effectively without adding prohibitive cost. To provide flexibility, the controller responds to a wide variety of needs for:

System Designs including equipment, operating conditions, and controls variations that are either existing or being considered.

System Upgrades including the ability to accommodate changes in the chilled water system design, equipment room requirements, or to accommodate new technologies as they become available.

The Trane absorption chiller control panel, UCP2, is compatible with Trane Integrated Comfort™ Systems (ICS). UCP2 easily integrates into the Tracer® family of flexible chiller plant system controllers with a single twisted-wire pair communications cable.

Contents

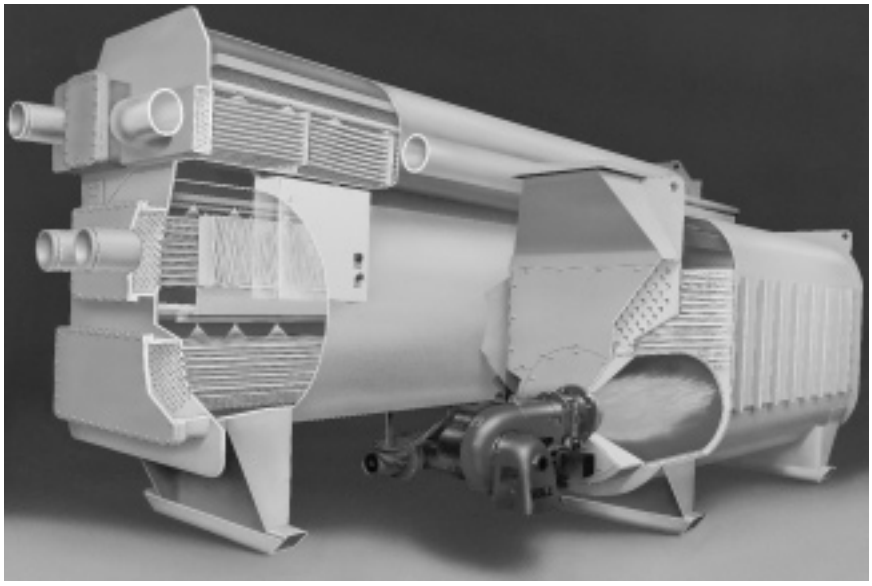
Features and Benefits

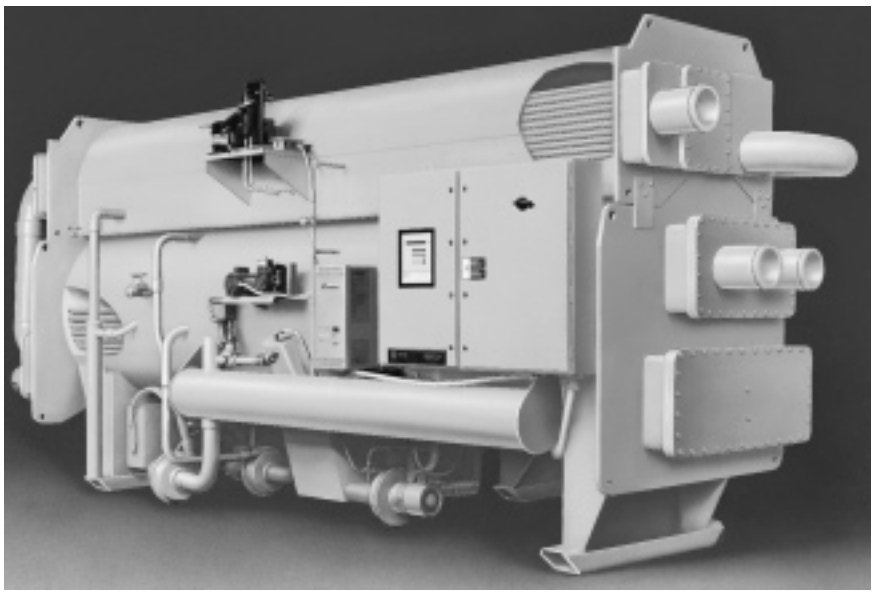
Made in the USA
The new line of Trane Horizon™ absorption water chillers is the only line of two-stage absorption products designed and built in the USA. Trane designs, tests and manufactures in an ISO 9001 environment in La Crosse, Wisconsin.

Leadership and Quality
Trane has been the market leader in absorption water chillers for over 35 years. The company has supported absorption technology through the continuous application, design and manufacture of absorption water chillers since 1959, with over 10,000 units built. Trane's commitment extends to the application of new product technology development through extensive laboratory testing. Factory-trained technicians provide start-up, maintenance and emergency service support.

Fully Automatic Purge
Trane's new purge system removes non-condensables from the machine continuously and automatically while logging purge information through the UCP2. This is designed to prevent damage to the machine while maintaining the machine's peak performance.

Concentration Control
The UCP2 concentration control adjusts the energy input for optimum solution efficiency. The concentrated solution is typically maintained 15 degrees F from the theoretical crystallization point. This is called the crystallization margin. As strong solution concentration and temperature varies, the theoretical crystallization temperature changes. The control system adjusts the energy input to maintain the crystallization margin throughout the load range.





Automatic Crystallization Protection
When/Why it Occurs
Crystallization results from operating conditions that cause the solution to solidify, forming salt crystals which precipitate out and eventually restrict flow. This may result in a chiller failure that is difficult to correct. Concentration control provided by the UCP2 control system maintains solution concentrations at safe levels to avoid crystallization. However, in the event of crystallization, SDR, which is an automatic corrective action process, is activated to reverse any crystallization which has occurred and return the chiller to normal operation.

How UCP2 uses Sensing, Detecting and Recovery (SDR) to Prevent Crystallization
The objective of SDR is to detect the onset of crystallization by continuously sensing the critical cycle temperature points and executing a recovery cycle as appropriate. In the worst case, SDR will shut the machine down safely when reliable operation is not possible. The UCP2 concentration control is designed to maintain a predetermined crystallization margin. The SDR system feature provides a secondary line of defense against crystallization beyond the concentration control system. The SDR feature is designed to protect the machine from transient conditions the machine does not control.

Features and Benefits

Reliability
All major components of the Horizon™ direct-fired absorption chiller were selected based on a 20+ year minimum design life. Major components include tubes, shells, internal parts, waterboxes, unit piping, solution heat exchangers, and pumps. Extensive testing was performed on these components (such as material corrosion rates) in the Trane laboratory.

This product was designed to operate reliably in your system. Here are some features which provide dependable performance:

- UCP2 controls
- Quality industrial grade materials which include:
  - Stainless steel for key components of the chiller including evaporator pan, direct-fired generator tubes, direct-fired generator tube sheets and mist eliminators
  - Cupro-nickel tubes in the absorber, evaporator and second stage generator
  - Effective, environmentally acceptable corrosion inhibitors
- Fixed and floating tube supports which allow for expansion of tubes without problems of high stress
- 50,000 hours design life solution pumps
- Hermetic integrity resulting from superior design and manufacturing
- Factory leak tested

Ease of Installation

- Modular design to facilitate reliable disassembly and reassembly for easy access into existing buildings
- Victaulic™ water connections, factory mounted and commissioned controls complete with sensors, drives, valves, actuators and purge
- Factory installed crossover pipe cuts down on field fabrication and labor
- Factory mounted and wired low NOx burner

Dedicated Support

- Over 35 years of continuous absorption production and customer support
- Professional engineering expertise from the local Trane sales office with headquarters applications, and engineering support

Serviceability

- All tubes individually replaceable
- Marine style waterboxes on the absorber and condenser allowing tube cleaning without removing water connections
- Training of owner's operating personnel
- Quality post-warranty service from trained technicians
- Parts readily available
- Local professionally trained service personnel, backed by headquarters experts
- Customizable extended warranty plans

Controls

- Improved reliability and performance
- Factory installed and commissioned
- Proportional integral derivative (PID) control. Adaptive Control™ strategies for stable, efficient, reliable, and optimal chilled water temperature control
- Easy-to-use operator interface
  - Two line 40 character backlit LCD display in clear language
  - English or SI units
  - Standard and custom reports
  - Over 200 diagnostics including time and date stamping
- Complete range of standard safety controls including: pump motor protection, low refrigerant water temperature cutout, low leaving water temperature cutout, high interstage pressure cutout
- Integration with Trane's building automation systems - all via a single twisted wire pair
- Building Automation System (BAS) interface capabilities

Pumps
A total of four pumps are provided with the Horizon™ direct-fired absorption chiller. Each pump consists of an integral motor and pump mounted on a steel shaft. The bearings are lubricated and cooled by the fluid that is pumped. This system is integrated with the pump so that no external piping or filtration is required.

Waterboxes
Marine style waterboxes are provided for the cooling water side only. Provisions have been made to allow for support of box covers during removal. All waterboxes are designed for standard working pressure of 150 psig.

Inhibitors
Lithium molybdate is used as the corrosion inhibitor and has the following characteristics:

- Non-hazardous
- Will prevent corrosion of steel, copper and stainless steel materials at the conditions during operation and shutdown of the chiller
- Stable chemical over the entire operating range of the chiller

Performance Additive
The performance additive is octyl alcohol. This chemical has the following features:

- Non-hazardous
- Stable over the range of operating conditions that it is exposed to during shutdown and operation of the chiller

No CFC's
In addition to the design benefits of using an absorption machine, the Trane Horizon™ direct-fired absorption chillers are completely non-harmful to the environment. They contain no CFC's. All cooling is achieved using lithium bromide as the absorbent and water as the refrigerant.

Factory Tests
Factory leak tests are performed to assure the machines are leak-free before shipment. The final leak test involves the use of a helium mass spectrometer. The mass spectrometer is so sensitive to helium it can detect a leak that will pass only one pound of helium in 10,000 years.

Features and Benefits

Standard Specification

- Victaulic™ water connections
- Industrial grade tubes unmatched in the industry
  - Direct-fired generator - 409 stainless steel tubes and tubesheets.
  - Low temperature generator - .028″ wall 95/5 CuNi
  - Evaporator - .030 wall 95/5 CuNi
  - Absorber - .028″ wall 95/5 CuNi
  - Condenser - .028″ wall Cu
- Factory mounted and tested microprocessor controls
- 150 psig marine style waterboxes on the condenser and absorber sections
- Cooling water crossover pipe factory installed between the absorber and condenser
- Connections and valves are provided as standard for lithium bromide filter
- Factory mounted and installed low NOx burner on all units. Flue gas recirculation is used for 575-750 ton units to achieve low NOx.

Optional Specification

- 150 psig raised face flanges for the evaporator, condenser, and absorber water connections
- Wooden pallets can be provided under each leg for handling at installation site or to facilitate ocean shipment
- Disassembled unit - Factory provisions allowing easy disassembly and reassembly of major components in the field
- Lithium bromide filter
- Factory installed cold insulation
- Factory supplied and field installed hot insulation
- Simultaneous heat/cool or cooling only/ heating only unit

Design Options

- Enhanced corrosion resistant tube alloys available for special applications
- 300 psig water boxes
- Special code requirements
- Marine style waterboxes on the evaporator

Industrial Options

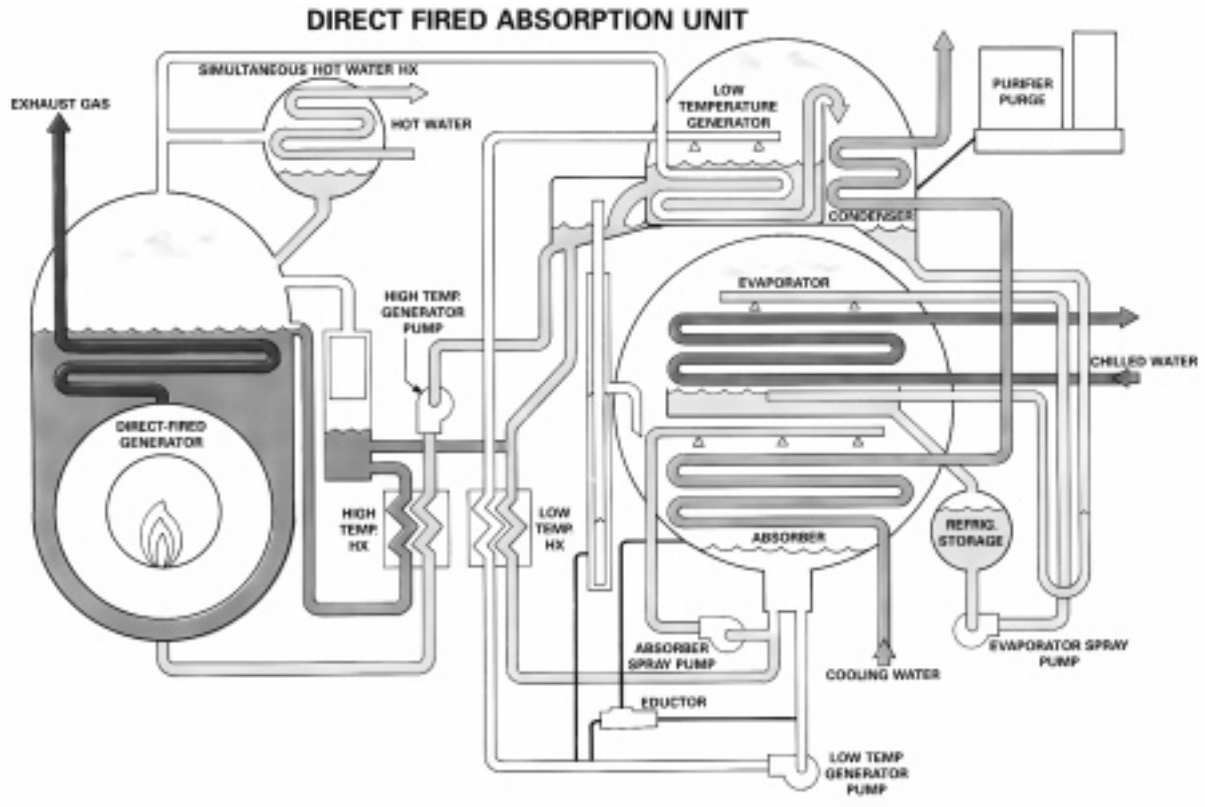
- Sacrificial anodes in the waterboxes
- Corrosion resistant paint. Two step epoxy paint system provides protection in corrosive environments such as chemical plants or salt water locations

Special Applications

The Absorption Team is flexible and creative. We are capable of taking on the design challenges necessary to build a custom unit to specific requirements.

- Special corrosion resistant tubing
- Custom control configurations
- Installation extremes
- Decades of experience in designing and installing absorption equipment for unique applications

Features and Benefits



Refrigeration Cycle

Cooling Cycle
The absorbent/refrigerant combination is a traditional lithium bromide/water solution. The dilute solution is first pumped from the absorber to the low temperature generator, where it is partially concentrated. A heat exchanger transfers heat from the generator and preheats the incoming solution.

Part of the solution is then pumped to the direct-fired (high temperature) generator where it is further concentrated, while the rest of the flow from the low temperature generator is mixed with the strong, concentrated solution coming back from the direct-fired generator. This mixed solution is then combined with additional solution from the absorber to form the absorber spray.

Evaporator/Absorber
Liquid refrigerant — water— enters the evaporator from the condenser through a throttling pipe. As the refrigerant passes to the lower pressure evaporator, flash boiling occurs, cooling the remaining liquid refrigerant to the evaporator saturation temperature. This chilled refrigerant enters the evaporator pan and is circulated continuously to the evaporator sprays system by the refrigerant pump. The transfer of heat from the system water to the refrigerant causes the refrigerant to vaporize or boil, cooling the system water. This refrigerant vapor flows to the slightly lower pressure in the absorber.

In the absorber, refrigerant is absorbed by the lithium bromide solution because of its high affinity for water vapor. This is the fundamental principle of the absorption process. The pressure in the absorber is determined by the temperature and concentration of the solution sprayed over the tubes. A mixed concentration of the solution from the generators and the absorber is pumped through the absorber spray system to thoroughly wet the tubes and provide the opportunity for the refrigerant vapor from the evaporator to be absorbed by the lithium bromide solution.

As the refrigerant vapor is absorbed by the solution, it transfers the heat acquired in the evaporator to the cooling water which is pumped through the absorber tubes. The diluted solution is then pumped through the heat exchangers by the solution pumps to the generators to reconcentrate or regenerate the lithium bromide solution.

Features and Benefits

Low Temperature Generator
The dilute solution is pumped into the low temperature generator after being preheated by the low temperature heat exchanger. The purpose of this generator is to produce refrigerant for the cycle. To achieve this, vapor from the direct-fired generator is used as the energy source to boil the solution. This vapor condenses inside the tubes, flows to the condenser sump, and becomes part of the refrigerant for the cycle.

The intermediate concentration solution leaving the low temperature generator has two paths; the first is to the generator pump and on to the direct-fired generator, the second is mixed with concentrated solution coming back from the direct-fired generator, forming a mixed concentration for the absorber spray system.

Solution Heat Exchangers
The low temperature heat exchanger recovers heat from the mixed concentration solution and preheats the dilute solution going to the low temperature generator. Preheating the dilute solution reduces the heat energy required to induce boiling within the low temperature generator. In turn, the reduction in mixed solution temperature decreases the load on the cooling tower.

The high temperature heat exchanger recovers heat from the strong concentrated solution and preheats the intermediate solution going into the direct-fired generator to further concentrate the preheated intermediate solution. Preheating the solution results in improved cycle efficiency.

Direct-Fired Generator
The direct-fired generator uses combustion of natural gas, No. 2 fuel oil, or propane gas as energy sources. The intermediate concentrated solution enters at the bottom of the generator after being preheated by the high temperature heat exchanger. Heat from combustion is used to boil refrigerant from the solution, producing refrigerant vapor for the low temperature generator. The refrigerant vapor flows to the low temperature generator and the concentrated solution returns to the absorber through the high and low temperature heat exchangers.

Condenser
Refrigerant is introduced into the condenser from two sources; liquid refrigerant from the tube side of the low temperature generator and refrigerant vapor produced by the low temperature generator.

All refrigerant vapor condenses and returns to the evaporator as liquid through the J-tube. This device maintains a liquid seal and therefore a pressure differential from the condenser to the evaporator.

The heat of condensation is rejected to the cooling water loop.

Heating Cycle
The vapor generated by the high temperature generator can go to either the low temperature generator or the separate heating bundle as shown on the cycle diagram. Fluid flow through the tubes of the heating bundle at a temperature cooler than the saturated steam or vapor temperature coming off the direct-fired generator, will cause some of the vapor to condense on these heating tubes. This will make the water temperature rise. The condensed vapor then simply drains back into the direct-fired generator to be recycled. With this arrangement the burner will be called upon to supply heat for either or both the cooling and heating cycles, up to the maximum specified burner input.

Application Considerations

General
Trane Horizon™ direct-fired absorption chillers are designed for use in air conditioning applications requiring a continuous and reliable supply of chilled water in the range of 40 F to 70 F. The Horizon direct-fired model range is 380 tons through 750 tons. Direct-fired machines are most often used where an economic evaluation of refrigeration equipment justifies a higher first cost to obtain a lower operating cost.

Catalog application data is based on ARI-560-92. All selections are based on a fouling factor of .00025 on the interior of all tube surfaces. Selections based on the use of fluids other than water, or with other fouling factors can be obtained by contacting a local Trane sales engineer.

In planning an absorption refrigeration installation, consideration must be given to provide the following:

- Structural support
- Service access
- Tube pull space
- Piping access for tube maintenance
- Condensate handling
- Condenser water temperature control
- Chilled water flow control
- Condenser water flow control
- Chilled and condenser water flow limit
- Simultaneous heat/cool application

Operating Limits
Trane direct-fired absorption chillers can produce chilled water at temperatures as low as 40 degrees F and hot water for heating applications at temperatures as high as 180 degrees F.

Water flows within the limits indicated on the appropriate selection charts will ensure that tube water velocities don't exceed 11 feet per second. Changes in chilled water flow or condenser water temperature should not exceed 3 percent of chilled water flow per minute or a 1 degree F tower water temperature change per minute.

Cooling Water Piping
The cooling water piping design for absorption chillers differs from conventional reciprocating and centrifugal systems in that cooling water on the 380-500 ton chillers, passes through the absorber section of the machine prior to entering the condenser. On the 575-750 ton chillers the cooling water is a parallel flow through the absorber and condenser.

With all absorption chillers, no matter how the tower water flows through the absorber and condenser sections, the cooling water flow must be controlled by the absorption machine as a function of normal control and machine safety.

Trane absorption machines are designed to operate with cooling water temperatures as low as 55 F at reduced loads. In typical applications, the machine is selected on the basis of the cooling water temperature available at full load. This is usually 85 F.

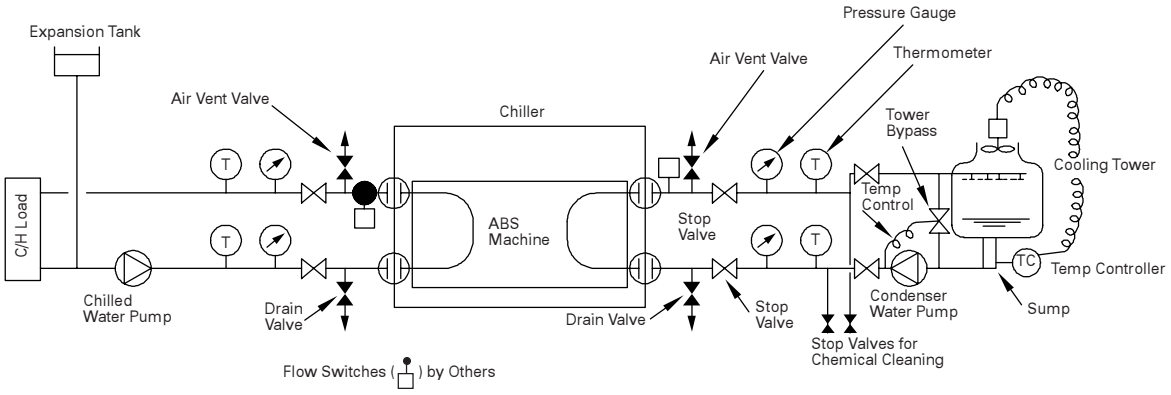
With the cooling tower sized for design conditions, the temperature of the cooling water supplied to the unit will decrease with any decrease in cooling load or depression of outside wet bulb temperature. These reduced cooling water temperatures will normally tend to increase the potential capacity of the absorption machine. The Trane control system takes advantage of this improved efficiency by using automatic controls that limit the energy input to the machine based on entering cooling water temperatures.

Cooling water temperature control may be required at part loads. At part loads with cold outside conditions, cycling of the cooling tower fan can result in undesirable variation of leaving chilled water temperature. Consequently, Trane recommends consideration of multiple speed tower fans or a cooling tower bypass valve to reach equilibrium at all load conditions. The rate of cooling water temperature change allowable is 1 degree per minute.

Figure AC-1 illustrates the recommended method to apply cooling water to the Trane Absorption machine.

Water temperature sensors are factory-installed on the entering and leaving sides of the absorber and condenser water connections. The operating temperatures can be monitored from the control panel.

Application Considerations



Water Treatment
The use of untreated or improperly treated water may result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be used to determine what treatment, if any, is advisable. The Trane Company assumes no responsibility for the results of untreated, or improperly treated water.

Cooling Tower Water Flow
The ARI standard gpm/ton for absorption chillers is 4.5, but lower flow through the condenser and absorber section will present an opportunity for a smaller tower and smaller condenser pump or piping. Trane direct-fired absorption chillers were designed around 3.6 gpm/ton but have the ability to go as low as 3.0 gpm/ton at slightly reduced capacities. By designing a system around lower flows, there will be significant annual chiller plant electrical energy savings and lower initial equipment costs. For more information on lower flows on the cooling tower water circuit, refer to the appropriate Trane Engineering Bulletin.

Electric Service
Factory wired and mounted power control includes main power connections. Units may be supplied for operation on 230, 460, or 575 volt, 3 phase, 60 hertz power. Also 190, 220, 380, 415 volt, 3 phase, 50 hertz power is available.

Machine Installation
A housekeeping pad or support rail is recommended to elevate the machine for maintenance. Any foundation pad should provide adequate structural support and keep the installed machine level within 1/8-inch by length and width for reliable operation. Leveling marks on the tube sheet can be used to check the machine after it is positioned on the pad.

Separated Machine Sections
Disassembled machines are also available factory-separated into two or three main sections as an option. The units can ship separated or assembled and tack welded in the appropriate places for easy disassembly and reassembly at the jobsite. The three piece option ships as an evaporator/absorber section, the direct-fired generator section and the low temperature generator/condenser section. The two piece option ships the evaporator/absorber and low temperature generator/condenser as one piece and the direct-fired generator as a separate piece.

Fuel Handling
The standard burner is designed for natural gas as the primary fuel source. Local codes determine how this fuel is employed. The gas supply trains are furnished by the burner manufacturer based upon the local codes, available gas pressure, and the gas flow rate. The gas train can be sized for design gas supply pressures ranging from 9 inches water column at the inlet up to 5 psi depending on the size and model of the burner. The burner, gas train, burner control panel, and burner front plate sections are provided and completely assembled, installed and wired prior to shipment.

Exhaust Gas Duct
With the installation and proper operation of fuel burning equipment, consideration of the proper sizing, configuration and control of stacks and breeching is very important.

Proper stack design balances the theoretical draft against the pressure drop in the system in order to provide the required draft pressure at the outlet of the machine at all conditions.

The Trane absorption combustion system is engineered to produce a flue gas temperature up to 380 F and a pressure of 0 +/- 0.2 inch W.C. at the outlet of the first stage generator. The stack must be designed to maintain available draft between -0.2 and 0.2 inch W.C. at the outlet of the first stage generator. Whenever possible, each machine should be vented outside the building by the most direct route, with its own separate stack.

CAUTION: Whenever there is a positive stack draft pressure, there does exist the chance of leaking flue gas into the equipment room. It is highly recommended to avoid positive stack pressures to eliminate this potential problem.

To eliminate friction loss, unnecessary turbulence, vibration and resulting noise, the shape of breeching and stacks should be considered. Round breeching and stacks have a more favorable effect on burner operation and are preferred over other shapes. The basic configuration is a vertical stack mounted to a single machine. To determine the available draft at the outlet of the generator it is necessary to measure the height of the stack and the outside ambient temperature. It also should be noted that there is a square connection at the direct-fired generator flue access point. This allows connection to either square or round (preferred) gas ducting systems.

Application Considerations

To verify the stack design, determine the available draft at the minimum and maximum ambient temperatures and the minimum and maximum flue gas flow rate. All of these pressures should fall within specifications of outlet pressure. If the outlet pressure falls outside of the required pressure, the stack diameter sizing should be changed to maintain specified outlet pressure, or a barometric damper should be added if the draft is greater than negative 0.2 inches. Other things which affect stack design are wind conditions and profiles of nearby buildings.

If the stack cannot be run vertically from the chiller, the horizontal run should be as short and straight as possible with a minimum number of bends. **For more information on exhaust ducts refer to the installation manual, or consult a local stack designer.**

Damper Considerations
In order to control the draft for proper burner regulation and combustion of air and gases, a barometric draft control is sometimes required.

Excessive drafts cause a condition that can damage the chiller and waste as much as 15 percent of the fuel.

Whenever a forced draft burner is used with a natural draft stack, the draft must be controlled to remain reasonably constant. If this is not done, the air output of the burner fan will vary in proportion to the amount of draft present. Control of draft under these conditions is important and should be accomplished by either an electric over-fire draft control system or a barometric damper. For more information on damper considerations refer to the installation manual.

Operating Ambients
The minimum recommended ambient temperature with the machine shut down is 40 F. If lower ambient temperatures are expected, special additional protective measures are required. Machines installed outdoors where ambient temperatures will drop below the minimum must be modified and have heated enclosures.

Combustion Air
The machine room must be ventilated to assure that all exhaust gas is removed and sufficient burner makeup air is available for efficient combustion. A positive or neutral room pressure must be maintained at all times. At no time should the equipment room pressure be allowed to drop below the exhaust pressure.

Four-Pipe to Two-Pipe Heating Consideration
There are many applications in which a two-pipe heating system is needed rather than a four-pipe system. The Horizon™ absorption chiller comes as a standard four-pipe system when the heating option is selected, but can be converted to a two-pipe system with the application of control valves. For more information regarding two-pipe vs. four-pipe systems see the appropriate Trane Engineering Bulletin.

Combustion Fuels
All combustible fuels have both a higher heating value (HHV) and a lower heating value (LHV). HHV includes the latent heat of vaporization of water in the hydrocarbon combustion process. LHV does not include this additional energy. US convention calls for the use of HHV. Trane publishes both HHV for conventional use in performance calculations and LHV for comparative purposes.

Commonly Used Definitions
Natural gas utilities meter gas by the cubic foot or therms. The Btu content may vary from 900 to 1,200 Btu/ft^3, the usual range at sea level. Utilities may add propane-air to liquefied natural gas during winter peak periods to meet demand.

Following are some terms and measures commonly used:

1 CF (Cubic Foot) =
Approx. 1,000 Btu HHV
1 Therm =
100,000 Btu's = 100 CF
100 CF=
.1 MCF
1 MCF =
1,000 CF = 10 Therms
1 Quad =
10^9 MCF = 10^{10} Therms =
10^{15} Btu's

Heating Values Defined
Every fuel has a characteristic heating value that describes how much heat can be extracted from it during combustion on a heat per volume or mass basis.

Heating value is defined as "the amount of heat produced by the complete combustion of a unit quantity of fuel. The higher heating value is that which is obtained when all of the products of combustion are cooled to the temperature existing before combustion, the water vapor formed during combustion is condensed, and all the necessary corrections have been made. The lower heating value is obtained by subtracting the latent heat of vaporization of the water vapor from the higher heating value."

When the heating value of a fuel is specified without designating higher or lower, it generally means the higher heating value in the United States. The LHV is approximately 90 percent of HHV.

C.O.P. and Fuel Consumption
C.O.P. = Coefficient of Performance
= The ratio of useful output to Energy Input
= $\frac{\text{Tons x 12,000 Btu}}{\text{Heat Input (MBH)}}$

M.B.H. = 1,000 Btuh

C.O.P. can be defined as the ratio of units of energy output of a system to those put into the system. Care needs to be taken that methods for determining C.O.P. for one machine are the same methods used for another. Notice that both input and output values must be expressed in the same units, as C.O.P. is dimensionless.

Using LHV results in a higher C.O.P. because it ignores the purchased energy used to vaporize the products of combustion. The C.O.P. is artificially high compared to actual consumption, and thus may be misleading to system designers and owners.

Conclusion
C.O.P. can take on different values depending on the reference point being used. The key to making a fair comparison between machines is that the same reference point is used. If not, as shown above, the calculations will yield a significantly different C.O.P.

Selection Procedure

General
Total air conditioning system first cost can be minimized by a careful analysis of system operating parameters. The effect of flow rates and temperatures on both the building airside and the refrigeration machine selections should be investigated. This will establish the system that represents the best investment for the owner.

The information on the following pages provides performance data at ARI standard conditions for capacity in tons, efficiency, flow rates, and water pressure drops. All capacities are based on fouling factors of .00025 hr-ft-deg F/Btu for the evaporator and absorber/condenser waterside tubing. All final selections should be made by the local Trane sales engineer using the Trane Direct-Fired Absorption Selection Program.

Fouling Factors
Unit performance at non-standard fouling factors will vary from standard performance. Fouling factors estimate the heat transfer penalty that occurs as the tubing gets dirty through normal chiller operation. ARI tube fouling standards are shown below:

Fouling factors @ ARI 560-92

Clean	Standard	Excessive
0.00000	0.00025	0.00075

All selections should have a minimum fouling factor of 0.00025 to best estimate the chiller performance in an equipment room and to comply with ARI 560-1992. Any selection that uses a fouling factor above 0.00025 is a more conservative estimate that should only be used if there is an abnormal amount of fouling contamination in the water system. The effect of non-standard fouling factors should be determined by the Trane Direct-Fired Absorption Selection Program.

Unit Performance with Fluid Media Other Than Water
Absorption chillers can be selected with a wide variety of media other than water (evaporator and absorber/condenser cooling water circuits). Typical media include ethylene glycol or propylene glycol either in the evaporator, condenser, or both. For media other than water, contact the Trane sales office for chiller selections and information.

General Data Tables
Located in the general data tables are the evaporator and absorber/condenser flows, pressure drops and the number of passes. Also included in these tables are the weights, rough dimensions and connection sizes.

Part Load Performance
The Horizon™ direct-fired absorption chiller exhibits good part load performance characteristics. Air conditioning system loads are typically significantly lower than full load design conditions. Therefore, the chiller operates at full load a small amount of the time. Part load chiller operation is normally associated with reduced tower water temperatures. At part load operation, the heat rejected to the cooling tower is less than at full load operation, because part load operation is typically associated with reduced outside wet bulb temperatures, resulting in improved cooling tower performance. The result of less heat rejection and lower wet bulb temperature is cooler tower water entering the chiller and improved unit performance. To determine specific unit part load performance, use of the Horizon Direct-fired Selection Program is recommended. A minimum of 65 F entering cooling water to the absorber/condenser can be maintained at all load conditions. Lower entering cooling water temperatures are possible at reduced loads.

Electrical Data
Electrical data tables provide the required information for proper sizing of the electrical service to the Horizon direct-fired absorption chiller.

Model Number Description

The component and options of Trane absorption units can be identified by referring to the alphanumeric product coding block located on the service nameplate for the unit. The coding block precisely identifies all characteristics of a unit. An example is given:

MODL - ABDA
NTON - 500
VOLT - 460
BURN - LNOX
BOPA - 1600
FTAA - UL
SMHC - NSEL
ENSR - DGAS

ENPR - 14W
GNCN - NSEL
LGTM - SB01
HGTM - NSEL
CDTM - ES09
EVTM - ES01
ABTM - ES01
GNWA - NSEL

CAWA - CA01
EVWA - EV01
CAWC - NSEL
EVWC - LEBK
SPKG - DAU
ELPP - SELP
UPNT - SFPT
PPCO - TB

LCLD - CLDC
TRIM - TRMI
PRIM - YES
ACWR - YES
WVUO - YES
OPTM - YES
FLSW - 2FS2
WBLD - YES

Product Coding Description

MODL = ABSORPTION UNIT MODEL
NTON = UNIT NOMINAL TONNAGE
VOLT = UNIT VOLTAGE
BURN = DIRECT-FIRED BURNER TYPE
BOPA = BURNER OPERATING ALTITUDE
FTAA = FUEL TRAIN APPROVAL
SMHC = SIMULTANEOUS HEATING-COOLING
ENSR = UNIT ENERGY SOURCE
ENPR = UNIT ENERGY PRESSURE
GNCN = LOW TEMPERATURE GENERATOR WATERBOX CONSTRUCTION
LGTM = LOW TEMPERATURE GENERATOR TUBE MATERIAL
HGTM = HIGH TEMPERATURE GENERATOR TUBE MATERIAL
CDTM = CONDENSER TUBE MATERIAL
EVTM = EVAPORATOR TUBE MATERIAL
ABTM = ABSORBER TUBE MATERIAL
GNWA = LOW TEMPERATURE GENERATOR WATERBOX ARRANGEMENT

CAWA = CONDENSER AND ABSORBER WATERBOX ARRANGEMENT
EVWA = EVAPORATOR WATERBOX ARRANGEMENT
CAWC = CONDENSER AND ABSORBER WATER CONNECTIONS
EVWA = EVAPORATOR WATERBOX ARRANGEMENT
SPKG = UNIT SHIPPING PACKAGE
ELPP = ELECTRICAL PROTECTION PACKAGE
UPNT = UNIT PAINT
PPCO = CONTROL PANEL POWER CONNECTION
LCLD = LOCAL CLEAR LANGUAGE DISPLAY
TRIM = TRACER® INTERFACE MODULE
PRIM = PRINTER INTERFACE MODULE
ACWR = AMBIENT CHILLED WATER RESET
WVUO = UNDER-OVER VOLTAGE PROTECTION
OPTM = OPTIONS MODULE
FLSW = FLOW SWITCH
WBLD = WATERBOX COVER LIFTING DEVICE

Table PD-1 - Performance Data at Trane Design Conditions

		Coefficient of Performance (COP)		Cooling Duty Fuel Consumption (MBH)		Heating Performance - Fuel Consumption (MBH)		
Model	Capacity (tons)	HHV	LHV	HHV	LHV	Capacity (MBH)	HHV	LHV
ABDA-380	397	1.02	1.13	4.56	4.10	3.78	4.56	4.10
ABDA-440	460	1.02	1.13	5.28	4.75	4.38	5.28	4.75
ABDA-500	524	1.02	1.13	6.00	5.41	4.98	6.00	5.41
ABDA-575	602	1.02	1.13	6.90	6.21	5.73	6.90	6.21
ABDA-660	692	1.02	1.13	7.95	7.14	6.57	7.92	7.14
ABDA-750	785	1.02	1.13	9.00	8.10	7.47	9.00	8.10

Based on Trane Design Conditions
3.6 GPM/Ton Condenser Water
54-44 Chilled Water, 85-97 Condenser Water, std. fouling factors
Heating Duty, 130-140 F Hot water, std. fouling factors

Table PD-2 - Performance Data at ARI Conditions

		Coefficient of Performance (COP)		Cooling Duty Fuel Consumption (MBH)		Heating Performance - Fuel Consumption (MBH)		
Model	Capacity (tons)	HHV	LHV	HHV	LHV	Capacity (MBH)	HHV	LHV
ABDA-380	401	1.03	1.14	4.56	4.10	3.78	4.56	4.10
ABDA-440	464	1.03	1.14	5.28	4.75	4.38	5.28	4.75
ABDA-500	528	1.03	1.14	4.00	6.00	4.98	6.00	5.41
ABDA-575	607	1.03	1.14	6.90	6.90	5.73	6.90	6.21
ABDA-660	698	1.03	1.14	7.92	7.92	6.57	7.92	7.14
ABDA-750	792	1.03	1.14	9.00	9.00	7.47	9.00	8.10

Based on ARI Design Conditions
4.5 GPM/Ton Condenser Water
54-44 Chilled Water, 85-95 Condenser Water, std. fouling factors
Heating Duty, 130-140 F Hot water, std. fouling factors

Table PD-3 - Selection Data Water Flow Rate at Trane Design Conditions

	Water Flow								
	Chilled Water			Hot Water			Cond/Abs.*		
Model	Flow Rate (GPM)	Pr. Drop (Feet H_20)	# of Passes	Flow Rate (GPM)	Pr. Drop (Feet H_20)	# of Passes	Flow Rate (GPM)	Pr. Drop (Feet H_20)	# of Passes
ABDA-380	937	15.0	2	500	12.4	2	1429	27.6	2
ABDA-440	1085	15.5	2	500	13.3	2	1656	30.5	2
ABDA-500	1236	16.1	2	500	14.0	2	1886	33.8	2
ABDA-575	1421	31.6	2	700	21.7	2	2167	25.9	2
ABDA-660	1633	32.3	2	700	23.3	2	2491	28.6	2
ABDA-750	1853	33.8	2	700	25.0	2	2826	32.5	2

Based on Trane Design Conditions
3.6 GPM/Ton Condenser Water
54-44 Chilled Water, 85-97 Condenser Water, std. fouling factors
Heating Duty 130-140 F Hot water, std. fouling factors
*ABDA 380-500 ton units have 2 pass absorber and single pass condenser; ABDA 575-750 have 2 pass absorber and 2 pass condenser

Performance Data (English)

Table PD-4 - Selection Data - Water Flow Rate at ARI Design Conditions

	Water Flow								
	Chilled Water			Hot Water			Cond/Abs.*		
Model	Flow Rate (GPM)	Pr. Drop (Feet H_20)	# of Passes	Flow Rate (GPM)	Pr. Drop (Feet H_20)	# of Passes	Flow Rate (GPM)	Pr. Drop (Feet H_20)	# of Passes
ABDA-380	937	15.0	2	500	12.4	2	18.4	41.7	2
ABDA-440	1085	15.5	2	500	13.3	2	2088	46.2	2
ABDA-500	1236	16.1	2	500	14.0	2	2376	51.5	2
ABDA-575	1421	31.6	2	700	21.7	2	2731	39.2	2
ABDA-660	1633	32.3	2	700	23.3	2	3141	43.5	2
ABDA-750	1853	33.8	2	700	25.0	2	3564	49.5	2

Based on ARI Design Conditions
4.5 GPM/Ton Condenser Water
54-44 Chilled Water, 85-95 Condenser Water, std. fouling factors
Heating Duty, 130-140 F Hot water, std. fouling factors
*ABDA 380-500 ton units have 2 pass absorber and single pass condenser; ABDA 575-750 have 2 pass absorber and 2 pass condenser

Table PD-5 - Selection Data - Air Flow and Flow Rate Limitations

	Air Flow		Flow Rate Limitations			
			Evaporator		Condenser/Absorber	
Model	Combustion Air (CFM)	Exhaust Air (CFM)	Min (GPM)	Max (GPM)	Min (GPM)	Max (GPM)
ABDA-380	905	1445	500	1900	600	2000
ABDA-440	1045	1675	600	2200	700	2200
ABDA-500	1190	1900	700	2500	800	2600
ABDA-575	1365	2185	600	2300	800	3000
ABDA-660	1570	2510	700	2600	900	3400
ABDA-750	1785	2850	800	3000	1000	3700

Table PD-6 - Electrical Data - ABDA 380-750, 60 Cycle, 3 phase

Unit Size	Volts	FLA	Total Motor HP	Total Motor KW	Control CKT Amps	MCA	Max. Fuse Size
ABDA-380	208	72.7	18.3	13.9	10	88	100
	230	67.6	18.3	13.9	8.7	81	100
	460	33.8	18.3	13.9	4.4	40	45
	575	27.6	18.3	13.9	3.5	33	40
ABDA-440	208	72.7	18.3	13.9	10	88	100
	230	67.6	18.3	13.9	8.4	81	100
	460	33.8	18.3	13.9	4.4	40	45
	575	27.6	18.3	13.9	3.5	33	40
ABDA-500	208	86.9	22.7	17.0	10	102	125
	230	80.4	22.7	17.0	8.7	94	125
	460	40.2	22.7	17.0	4.4	47	60
	575	32.7	22.7	17.0	3.5	38	50
ABDA-575	208	130.0	30.9	23.1	10	149	175
	230	116.0	30.9	23.1	8.7	132	150
	460	58.0	30.9	23.1	4.4	66	80
	575	47.0	30.9	23.1	3.5	54	60
ABDA-660	208	130.0	30.9	23.1	10	149	175
	230	116.0	30.9	23.1	8.7	132	150
	460	58.0	30.9	23.1	4.4	66	80
	575	47.0	30.9	23.1	3.5	54	60
ABDA-750	208	130.0	30.9	23.1	10	149	175
	230	116.0	30.9	23.1	8.7	132	150
	460	58.0	30.9	23.1	4.4	66	80
	575	47.0	30.9	23.1	3.5	54	60

Performance Data (SI)

Table PD-7 - Performance Data at Trane Design Conditions

		Coefficient of Performance (COP)		Cooling Duty Fuel Consumption (kCal/hr)		Heating Performance - Fuel Consumption (kCal/hr)		
Model	Capacity (KW)	HHV	LHV	HHV	LHV	Capacity (KW)	HHV	LHV
ABDA-380	1396	1.02	1.13	1,149,120	1,033,200	1107	1,149,120	1,033,200
ABDA-440	1617	1.02	1.13	1,330,560	1,197,000	1283	1,330,560	1,197,000
ABDA-500	1842	1.02	1.13	1,512,000	1,363,320	1459	1,512,000	1,363,320
ABDA-575	2117	1.02	1.13	1,738,800	1,564,920	1670	1,738,800	1,564,920
ABDA-660	2433	1.02	1.13	1,995,840	1,799,280	1924	1,995,840	1,799,280
ABDA-750	2760	1.02	1.13	2,268,000	2,041,200	2189	2,268,000	2,041,200

Based on Trane Design Conditions
3.6 GPM/Ton Condenser Water
12.2-6.7 Chilled Water, 29.4-36.5 Condenser Water, std. fouling factors
Heating Duty 54.4-60.0 Hot Water, std. fouling factors

Table PD-8 - Performance Data at ARI Conditions

		Coefficient of Performance (COP)		Cooling Duty Fuel Consumption (kCal/hr)		Heating Performance - Fuel Consumption (kCal/hr)		
Model	Capacity (KW)	HHV	LHV	HHV	LHV	Capacity (KW)	HHV	LHV
ABDA-380	1410	1.03	1.14	1,149,120	1,033,200	1107	1,149,120	1,033,200
ABDA-440	1631	1.03	1.14	1,330,560	1,197,000	1283	1,330,560	1,197,000
ABDA-500	1856	1.03	1.14	1,512,000	1,363,320	1459	1,512,000	1,363,320
ABDA-575	2134	1.03	1.14	1,738,800	1,564,920	1670	1,738,800	1,564,920
ABDA-660	2454	1.03	1.14	1,995,840	1,799,280	1924	1,995,840	1,799,280
ABDA-750	2785	1.03	1.14	2,268,000	2,041,200	2189	2,268,000	2,041,200

Based on ARI Design Conditions
4.5 GPM/ton Condenser Water
12.2-6.7 Chilled Water, 29.4-35.0 Condenser Water, std. fouling factors
Heating Duty, 54.4-60.0 C Hot Water, std. fouling factor

Table PD-9 - Selection Data Water Flow Rate at Trane Design Conditions

	Water Flow								
	Chilled Water			Hot Water			Cond/Abs.*		
Model	Flow Rate (m^3/hr)	Pr. Drop (m H_20)	# of Passes	Flow Rate (m^3/hr)	Pr. Drop (m H_20)	# of Passes	Flow Rate (m^3/hr)	Pr. Drop (m H_20)	# of Passes
ABDA-380	213	4.58	2	113.6	3.78	2	325	8.41	2
ABDA-440	246	4.72	2	113.6	4.05	2	376	9.30	2
ABDA-500	281	4.91	2	113.6	4.27	2	428	10.30	2
ABDA-575	323	9.63	2	159.0	6.61	2	492	7.89	2
ABDA-660	371	9.85	2	159.0	7.10	2	566	8.72	2
ABDA-750	421	10.30	2	159.0	7.62	2	642	9.91	2

Based on Trane Design Conditions
3.6 GPM/Ton Condenser Water
12.2-6.7 Chilled Water, 29.4-36.5 Condenser Water, std. fouling factors
Heating Duty, 54.4-60.0 C Hot Water, std. fouling factors
*ABDA 380-500 ton units have 2 pass absorber and single pass condenser; ABDA 575-750 have 2 pass absorber and 2 pass condenser

Performance Data (SI)

Table PD-10 - Selection Data - Water Flow Rate at ARI Design Conditions

	Water Flow								
	Chilled Water			Hot Water			Cond/Abs.*		
Model	Flow Rate (m^3/hr)	Pr. Drop) (m H_20)	# of Passes	Flow Rate (m^3/hr)	Pr. Drop) (m H_20)	# of Passes	Flow Rate (m^3/hr)	Pr. Drop (m H_20)	# of Passes
ABDA-380	213	4.58	2	113.6	3.78	2	409	12.71	2
ABDA-440	246	4.72	2	113.6	4.05	2	474	14.08	2
ABDA-500	281	4.91	2	113.6	4.27	2	540	15.70	2
ABDA-575	323	9.63	2	159.0	6.61	2	620	11.95	2
ABDA-660	371	9.852	2	159.0	7.10	2	713	13.23	2
ABDA-750	421	10.30	2	159.0	7.62	2	809	15.09	2

Based on ARI Design Conditions
4.5 GPM/Ton Condenser Water
12.2-6.7 Chilled Water, 29.4-35.0 Condenser Water, std. fouling factors
Heating Duty, 54.4-60.0 C Hot Water, std. fouling factors
*ABDA 380-500 ton units have 2 pass absorber and single pass condenser; ABDA 575-750 have 2 pass absorber and 2 pass condenser

Table PD-11 - Selection Data - Air Flow and Flow Rate Limitations

	@Flow Rate Limitations					
Model	Combustion Air (m^3/hr)	Exhaust Air (m^3/hr)	Evaporator		Condenser/Absorber	
			Min (m^3/hr)	Max (m^3/hr)	Min (m^3/hr)	Max (m^3/hr)
ABDA-380	1537	2455	114	431	136	454
ABDA-440	1775	2846	136	499	159	522
ABDA-500	2022	3228	159	568	182	590
ABDA-575	2319	3712	136	522	182	681
ABDA-660	2667	4264	159	590	204	772
ABDA-750	3032	4842	182	681	227	840

Table PD-12 - Electrical Data - ABDA 380-750, 50 Cycle, 3 phase

Unit Size	Volts	FLA	Total Motor HP	Total Motor KW	Control CKT Amps	MCA	Max. Fuse Size
ABDA-380	190	67.9	17.4	13.2	10.5	84	100
	220	59.1	17.4	13.2	9.1	72	90
	380	34.2	17.4	13.2	5.3	42	50
	405	31.4	17.4	13.2	4.8	39	45
ABDA-440	190	67.9	17.4	13.2	10.5	84	100
	220	59.1	17.4	13.2	9.1	72	90
	380	34.2	17.4	13.2	5.3	42	50
	405	31.4	17.4	13.2	4.8	39	45
ABDA-500	190	76.6	20.0	15.1	10.5	92	110
	220	65.8	20.0	15.1	9.1	79	100
	380	38.0	20.0	15.1	5.3	46	60
	405	34.8	20.0	15.1	4.8	42	50
ABDA-575	190	108.1	27.9	20.8	10.5	126	150
	220	82.5	27.9	20.8	9.1	108	125
	380	65.0	27.9	20.8	5.3	63	70
	405	49.6	27.9	20.8	4.8	58	70
ABDA-660	190	108.1	27.9	20.8	10.5	126	150
	220	82.5	27.9	20.8	9.1	108	125
	380	54.0	27.9	20.8	5.3	63	70
	405	49.6	27.9	20.8	4.7	58	70
ABDA-750	190	108.1	27.9	20.8	10.5	126	150
	220	92.5	27.9	20.8	9.1	108	125
	380	54.0	27.9	20.8	5.3	63	70
	405	49.6	27.9	20.8	4.8	58	70

Performance Data

Figure PD-1 - Percent Energy Input vs. Percent Capacity at Nominal Conditions

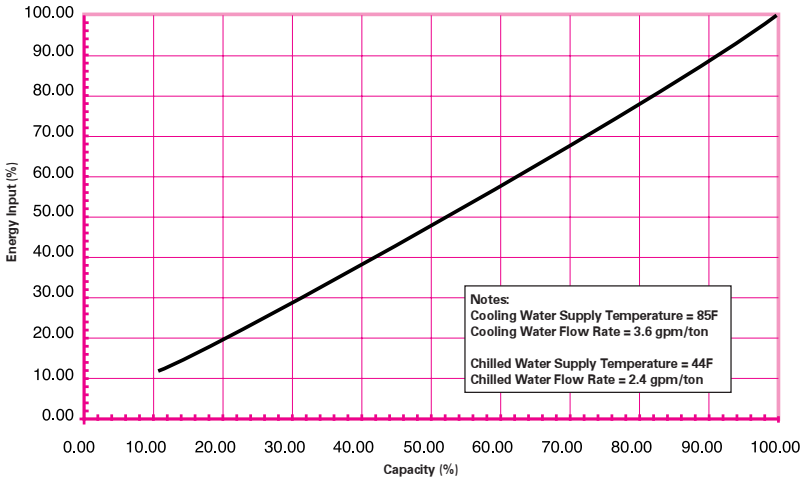


Figure PD-2 - ABDA Maximum Capacity - Maximum Allowable Capacity Vs. Chilled Water Supply Temperature at Various Cooling Water Supply Temperatures

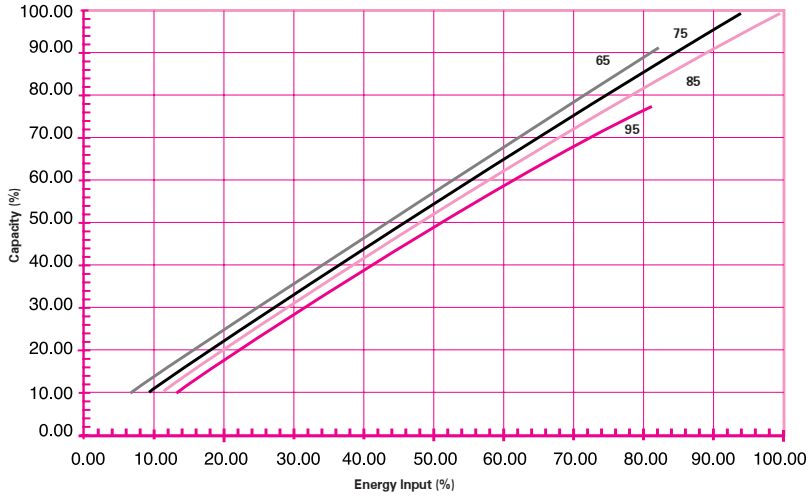


Figure PD-3 - ABDA Part Load Performance - Energy Input vs. Capacity at Various Cooling Water Supply Temperatures - Chilled Water Supply Temperature = 44 F

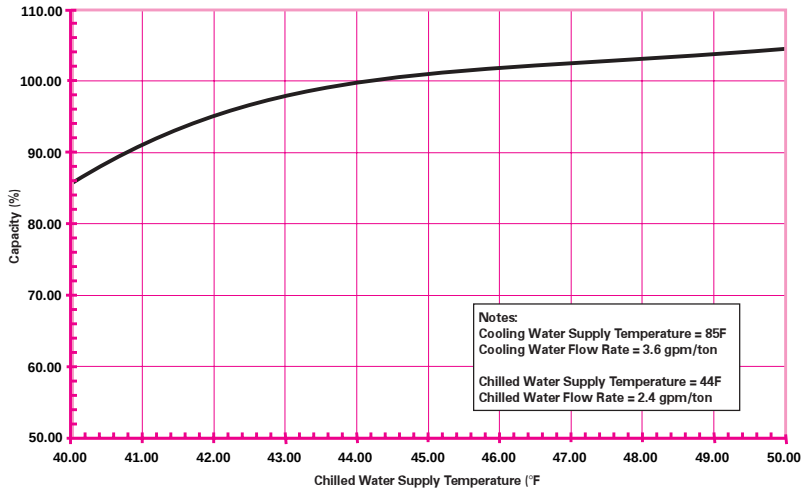


Figure PD-4 - Pressure Drop vs. Flow Rate ABDA-380

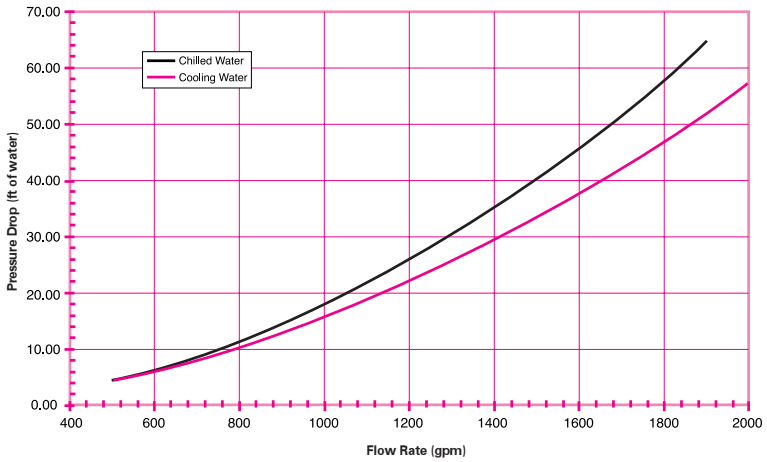


Figure PD-5 - Pressure Drop vs. Flow Rate ABDA-440

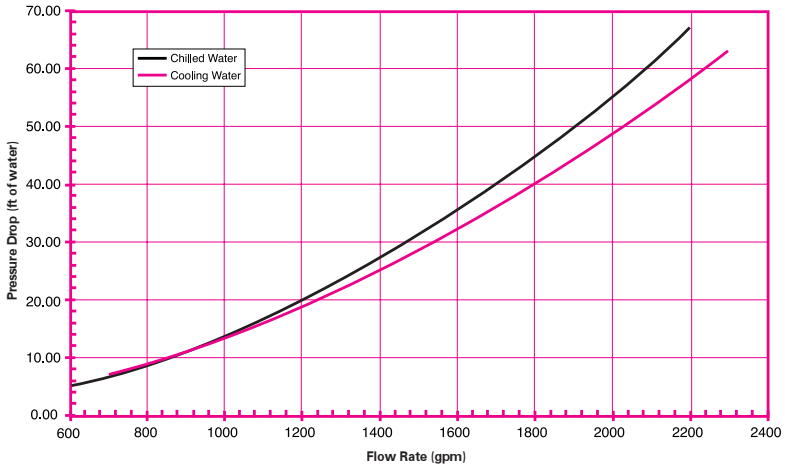
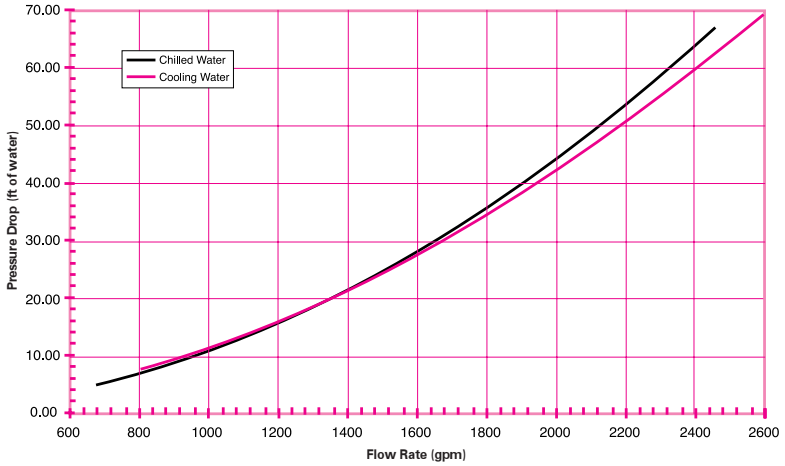


Figure PD-6 - Pressure Drop vs. Flow Rate ABDA-500



Performance Data

Figure PD-7 - Pressure Drop vs. Flow Rate ABDA-575

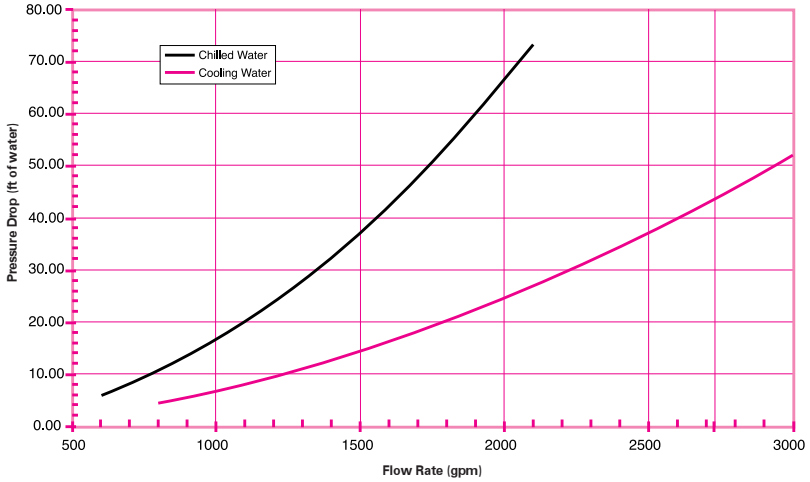


Figure PD-8 - Pressure Drop vs. Flow Rate ABDA-660

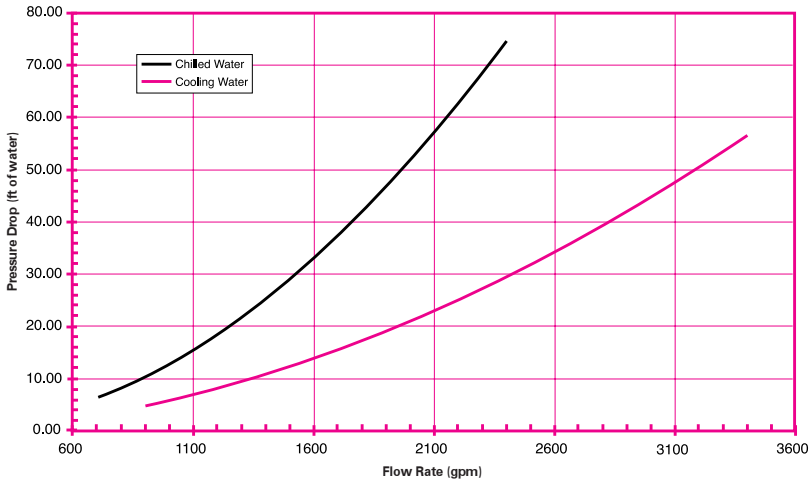


Figure PD-9 - Pressure Drop vs. Flow Rate ABDA-750

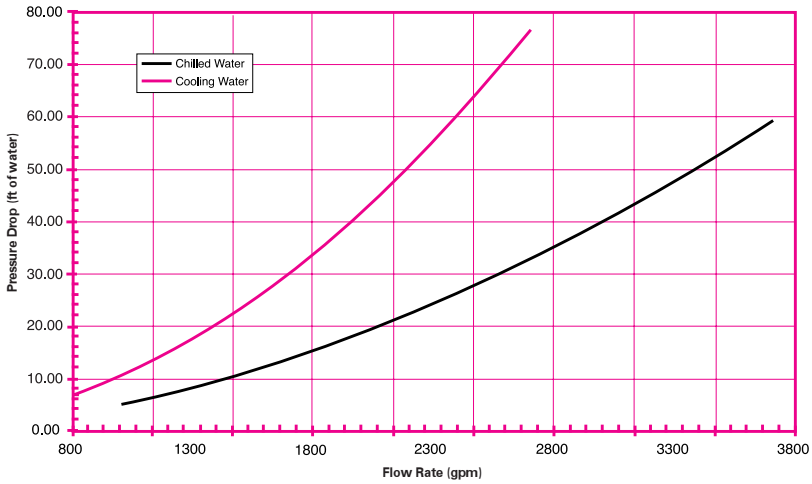


Figure J-1 — Right End Elevation - ABDA 380, 440, 500

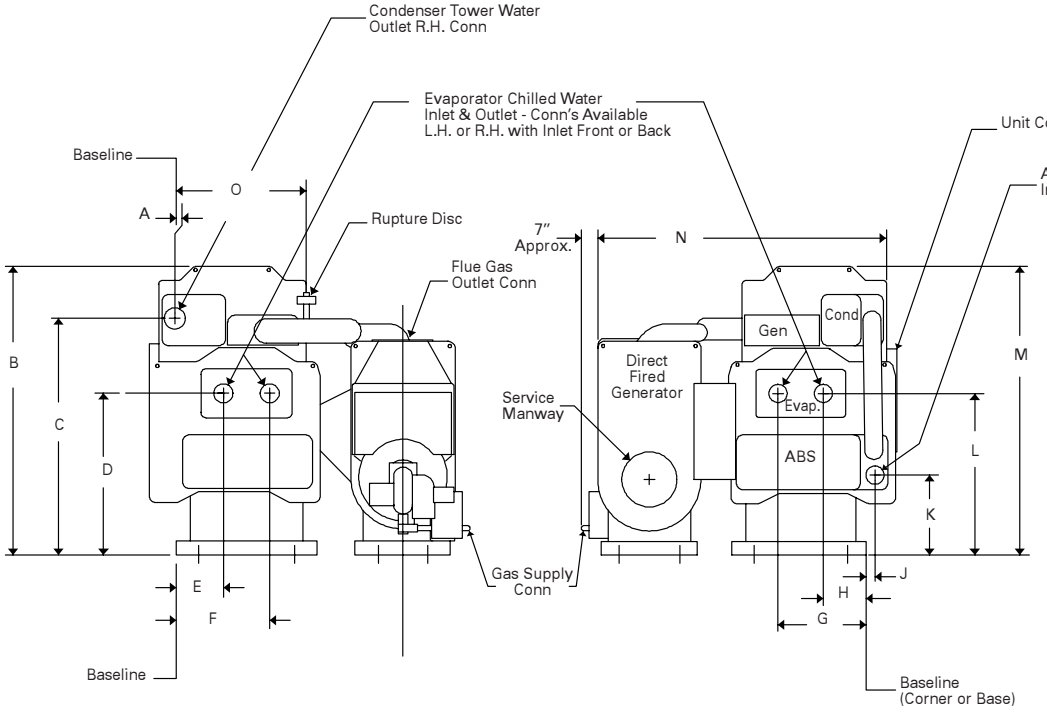


Figure J-2 — Left End Elevation - ABDA 380, 440, 500

Table J-1 — Machine Dimensions (English)

Unit Size	ABDA 380-440-500
A	3/8"
B	9'-6 7/8"
C	7'-9 5/8"
D	5'-4 1/8"
E	1'-8"
F	3'-1"
G	7'-5 3/4"
H	2'-2"
J	8'-6 3/8"
K	1'-1 3/4"
L	4'-9"
M	11 1/4"
N	2 3/4"
O	2'-8 1/4"
P	5'-4 1/8"
Q	9'-5 7/8"
R	3'-4 1/2"
S	10'-1 3/4"
T	7" approx
U	1'-8"
V	3'-1"
W	3'-2"

Table J-2 — Machine Dimensions (SI) -mm

Unit Size	ABDA 380-440-500
A	9.525
B	2917.8
C	2378.1
D	1628.8
E	508
F	939.8
G	2279.7
H	660.4
J	2600.3
K	349.3
L	1143.0
M	285.8
N	69.85
O	819.2
P	1628.8
Q	2892.4
R	1028.7
S	3092.5
T	177.8 approx
U	508
V	939.8
W	965.2

CUSTOMER NOTES:

1. FRONT OF UNIT IS DETERMINED BY FACING UNIT CONTROL PANEL.
2. ALL VERTICAL DIMENSIONS INCLUDE 5/16" THICK ISOLATION PADS.
3. DIMENSIONS SHOWN ARE CALCULATED VALUES. STACK TOLERANCE COULD BE +/- 1/2" UNLESS OTHERWISE SPECIFIED.
4. EVAPORATOR, CONDENSER, AND ABSORBER WATER CONNECTIONS ARE FOR 8" PIPE. AVAILABLE WITH 150# GROOVED CONNECTION FOR USE WITH STYLE 77 VICTAULIC COUPLING. ALSO, AVAILABLE WITH 150# AMERICAN STANDARD RAISED FACE FLANGE. (FLANGED BOLT HOLES STRADDLE VERTICAL CENTERLINE).
5. ALL WATER VOX VENTS ARE 1/4" NPT AND DRAINS ARE 3/4" NPT.
6. FLEXIBLE CONNECTION MUST BE USED FOR ATTACHMENT TO RUPTURE DISC. DO NOT APPLY MORE THAN 12 PSI INTERNAL PRESSURE ON MACHINE WITHOUT REMOVING RUPTURE DISC. PIPE RUPTURE DISC TO FLOOR VENT OR TO THE OUTSIDE TO MEET LOCAL CODE.
7. GAS TRAIN SHIPS ASSEMBLED TO UNIT. GAS SUPPLY CONNECTION SIZE AND LOCATION WILL VARY PER LOCAL CODES AND GAS INLET PRESSURE.
8. FIELD PIPING MUST BE ARRANGED AND SUPPORTED TO AVOID STRESS ON THE EQUIPMENT. IT IS STRONGLY RECOMMENDED THAT THE PIPING CONTRACTOR REFRAIN FROM PRE-PIPING CLOSER THAN 36" TO THE EQUIPMENT. THIS WILL ALLOW FOR PROPER CONNECTION UPON ARRIVAL OF THE UNIT AT THE JOBSITE. NECESSARY ADJUSTMENTS CAN BE MADE AT THAT TIME.

Jobsite/Mechanical Connections

Figure J-3 — Left End Elevation - ABDA 575, 660, 750

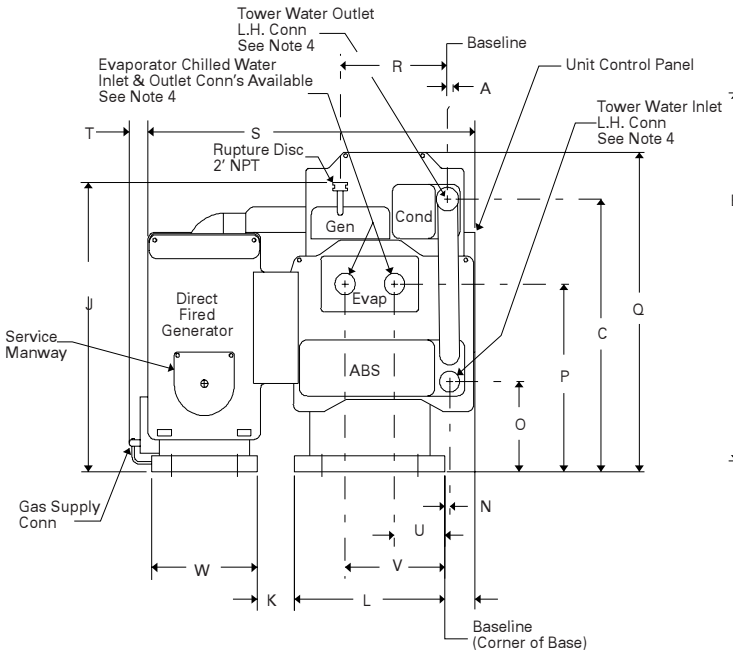


Figure J-4 — Right End Elevation - ABDA 575, 660, 750

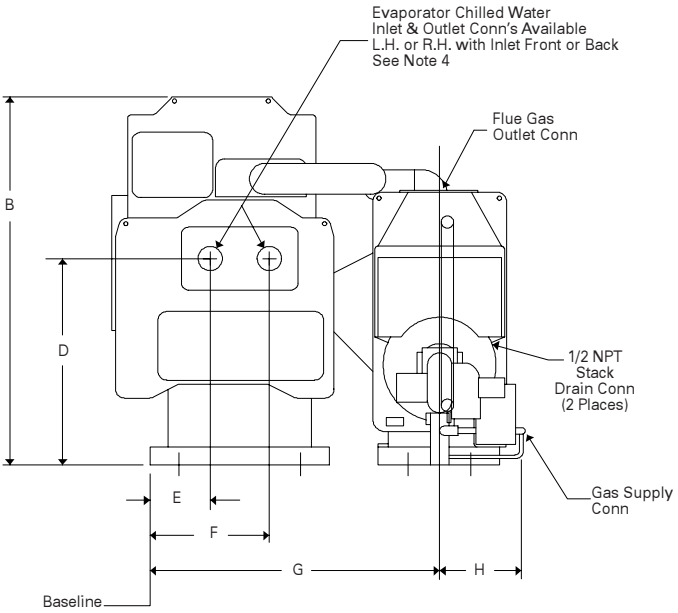


Table J-3 — Machine Dimensions (English)

Unit Size	ABDA 575-660-750
A	1/2"
B	9'-6 7/8"
C	7'-11 5/8"
D	5'-4 1/8"
E	1'-8"
F	3'-1"
G	7'-5 3/4"
H	2'-2"
J	8'-6 3/8"
K	1'-1 3/4"
L	4'-9"
M	11 1/4"
N	2 3/4"
O	2'-6 7/8"
P	5'-4 1/8"
Q	9'-5 7/8"
R	3'-4 1/2"
S	10'-1 3/4"
T	7" approx
U	1'-8"
V	3'-1"
W	3'-2"

Table J-4 — Machine Dimensions (SI) -mm

Unit Size	ABDA 575-660-750
A	12.7
B	2917.8
C	2428.9
D	1628.8
E	508
F	939.8
G	2279.7
H	660.4
J	2600.3
K	349.3
L	1143.0
M	285.8
N	69.85
O	784.2
P	1628.8
Q	2892.4
R	1028.7
S	3092.5
T	177.8 approx
U	508
V	939.8
W	965.2

CUSTOMER NOTES:

1. FRONT OF UNIT IS DETERMINED BY FACING UNIT CONTROL PANEL.
2. ALL VERTICAL DIMENSIONS INCLUDE 5/16" THICK ISOLATION PADS.
3. DIMENSIONS SHOWN ARE CALCULATED VALUES. STACK TOLERANCE COULD BE +/- 1/2" UNLESS OTHERWISE SPECIFIED.
4. EVAPORATOR WATER CONNECTIONS ARE FOR 8" PIPE. CONDENSER, AND ABSORBER WATER CONNECTIONS ARE FOR 10" PIPE. AVAILABLE WITH 150# GROOVED CONNECTION FOR USE WITH STYLE 77 VICTAULIC COUPLING. ALSO, AVAILABLE WITH 150# AMERICAN STANDARD RAISED FACE FLANGE. (FLANGED BOLT HOLES STRADDLE VERTICAL CENTERLINE).
5. ALL WATER VOX VENTS ARE 1/4" NPT AND DRAINS ARE 3/4" NPT.
6. FLEXIBLE CONNECTION MUST BE USED FOR ATTACHMENT TO RUPTURE DISC. DO NOT APPLY MORE THAN 12 PSI INTERNAL PRESSURE ON MACHINE WITHOUT REMOVING RUPTURE DISC. PIPE RUPTURE DISC TO FLOOR VENT OR TO THE OUTSIDE TO MEET LOCAL CODE.
7. GAS TRAIN SHIPS ASSEMBLED TO UNIT. GAS SUPPLY CONNECTION SIZE AND LOCATION WILL VARY PER LOCAL CODES AND GAS INLET PRESSURE.
8. FIELD PIPING MUST BE ARRANGED AND SUPPORTED TO AVOID STRESS ON THE EQUIPMENT. IT IS STRONGLY RECOMMENDED THAT THE PIPING CONTRACTOR REFRAIN FROM PRE-PIPING CLOSER THAN 36" MINIMUM TO THE EQUIPMENT. THIS WILL ALLOW FOR PROPER CONNECTION UPON ARRIVAL OF THE UNIT AT THE JOBSITE. NECESSARY ADJUSTMENTS CAN BE MADE AT THAT TIME.

Trane set the standard for unit microprocessor controls in 1985 with the first generation of UCP. Associated with this standard have been:

- Proportional integral derivative (PID) control strategies which provide stable operation and high accuracy for better performance along with feed forward plus.
- Adaptive Control™ to keep the chiller on line and at the same time keep the chiller away from a major failure.
- Software based safeties that do not depend on electromechanical hardware—hardware that means questionable reliability and added cost.
- Operator interface that accesses chiller information and control adjustments at the front of the panel.

Now— in addition to all of the capability that our customer have come to expect — Trane offers UCP2. Beyond the "traditional" systems, UCP2 adds more flexibility, more reliability and better system performance than even our most demanding customers expect.

Flexibility
Trane offers the ability to adapt to changes easily and effectively without adding prohibitive cost. To provide flexibility, the controller responds to a wide variety of needs:

System Designs including equipment, operating conditions, and controls variations that are either existing or being considered for new installations.

Key to designing non-traditional systems is the ability to evaluate the cost and reliability issues of these systems in comparison to the more traditional systems. Trane recommends the use of C.D.S. Network Equipment Economics, The Trane Applications Manuals, and consultation with a Trane sales engineer for help in these analyses.

System Upgrades including the ability to accommodate changes in the chilled water system design or equipment room requirements or to accommodate new technologies that become available.

How does Trane demonstrate this flexibility:

- The modular structure of the UCP2 makes it possible for the designer to select the system controls and associated interfaces to Tracer® (or other building automation systems) that are required for chiller plant design. With this modular concept, capability can be added or upgraded at any time — with only temporary interruption of chilled water production.
- The operator can quickly program a custom report - so that only what is considered to be the most frequently accessed/important reports are available — at any time, right at the front of the panel.
- With easy front panel programmability of Daily, Service Start-up and Machine Configuration settings and setpoints, the operator, serviceperson, and system designer can customize the use of the microcontroller to unique conditions of the chiller plant — whether the purpose of chilled water is for comfort cooling or for process cooling.
- All data that is necessary for the safe operation and easy serviceability of the chiller is provided as standard on all Horizon™ absorption chillers. Options are available that provide the additional controls/data that are required for an industrial/process system design, applications outside of the typical chilled water system design, the need for redundant machine protection, or the desire for more system information.

Reliability...What does this mean and how do we do it?
To most people, reliability means, "dependability - giving the same result on successive trials." However to our customer it has come to mean, "keeping chilled water flowing." In other words, "when I turn the switch on— cold water comes out," In order to do this, the microcontroller must be aware of what is happening in the system. But more importantly, it must be able to make decisions and adjustments to keep the chiller running as long as possible, even when non-standard conditions exist. This can be conditions such as bad power or bad water (flow, temperature, fouling) or system component failure. Also the Trane UPC2 panel continuously monitors for noncondensables and purges automatically.

With Enhanced Adaptive Control™ the controller does everything it can to avoid taking the chiller off line.

Panel Features
The absorption chiller unit control panel (UCP2) incorporates the following features and components:

- Senses the potential overload, freeze and condenser overpressure conditions
- Displays a warning message about the potential condition/safety trip
- Takes the following corrective action sequentially as the conditions worsens:
  - Limits loading
  - Prevents further loading
  - Unloads until condition improves
  - Takes chiller off line
- With more diagnostics and diagnostic history that are time/date stamped and with help messages, the operator or serviceman can take faster and more effective corrective action.

System Performance
The term "Chilled Water System" encompasses many levels of control: standalone chiller, chiller plant, applied system, central building automation system. However, regardless of the system level being designed, the unit controls become critical not just in making every level operate reliably but in facilitating optimal performance. UCP2 provides more capability and more intelligence to make this operation/optimization possible.

Panel Capabilities
The absorption chiller unit control panel (UCP2) incorporates the following features and components:

Control Functions

- Smart dilution cycle duration based on system requirements
- Adaptive evaporator leaving fluid temperature control
- Low evaporator temperature limit
- High interstage pressure limit
- Solution flow control via AFD
- Softloading
- Nuisance trip prevention via Adaptive Control
- Chilled water reset
- Optimum concentration control
- Crystallization prevention via SDR

Controls

Safeties
- Smart shutdown
- Condenser/absorber loss of flow
- Low condenser/absorber water temperature
- High interstage pressure limit
- High pressure cutout
- Evaporator leaving fluid temperature cutout
- Motor current overload
- High motor winding temperature
- Phase loss, reverse rotation
- Over/under voltage (optional)
- Purge
- High solution temperature
- High flue gas limit and cutout
- Sensor failure detection

Monitored Points
Chiller information is available at the operator interface via a clear language display. Access to the information is through four dedicated report keys: Custom, Chiller, Cycle and Pump/Purge.

Custom Report
User defined custom report (the operator may choose up to 20 points - from a list of over 100 choices).

Chiller Report
Status, fluid temperatures, and setpoints:
- Operating mode (i.e. run status)
- Heating and cooling priority (optional)
- Chilled water setpoint
- Hot water reset (optional)
- Evaporator entering/leaving water temperatures
- Hot water entering/leaving temperatures (optional)
- Absorber entering/leaving water temperatures
- Condenser leaving water temperature
- Outdoor air temperature
- Evaporator leaving water temperature
- Chilled water reset

Cycle Report
Refrigerant temperatures and pressures:
- Solution temperature leaving high temperature generator
- Interstage vapor temperature
- Solution temperature entering level control
- Mixed solution temperature entering low temperature heat exchanger
- Solution temperature entering high temperature generator
- Interstage vapor pressure
- High temperature generator leaving concentration
- High temperature generator cutout and monitor temperature
- Flue gas exhaust temperature
- Crystallization detection temperature
- Crystallization trip temperature
- Solution temperature leaving low temperature generator
- Saturated condenser refrigerant temperature
- Absorber entering concentration
- LiBr crystallization margin
- Solution temperature leaving absorber
- Solution temperature entering low temperature generator
- Saturated evaporator refrigerant temperature
- Evaporator leaving water temperature
- Evaporator entering water temperature
- Absorber entering water temperature
- Absorber leaving water temperature
- Condenser leaving water temperature
- Solution pump auto/manual speed command
- Energy input auto/manual/slaved reported command

Pump/Purge Report
- Solution Pump
  - Starts and hours counters
  - Motor phase voltages (optional)
- Purge Pump
  - Operating mode and status
  - Refrigerant suction temperature
  - Pumpout rate
  - Total pumpout time
  - Service log

Diagnostics
The absorption chiller unit control panel (UCP2) provides over 70 active and historic diagnostics such as:
- Water and refrigerant/solution temperatures out of range
- Solution pressures out of range
- Loss of system water flows
- Sensor and switch faults
- Overload trips
- Over/under voltage (optional)
- Power supply, phase loss and phase rotation
- Crystallization recovery
- High pressure cutout
- High temperature cutout
- Emergency stop
- Loss of communication to other modules
- Motor abnormal

Burner Controls
- Firing rate mode selection, auto/manual via UCP2
- Manual firing rate via UCP2
- Remote/manual fuel transfer via UCP2
- Call for operation indication
- Local/remote burner alarm indication
- Gas pressure normal indication
- Fuel “on” indication
- Ignition “on” indication
- Agency listed flame safeguard system
- Emergency “off” switch
- Audible alarm, with silencer switch

Operator Interface
The Trane Horizon™ direct-fired absorption chiller control panel, UCP2, is easy to use, understand, access information, read, change setpoints, diagnose problems, maintain, and to reset after shutdown.

Convenience
Enunciation of all information is at the front panel display including power, voltage, amps, purge, pressures, and number of starts data. Messages displayed using clear language.

Controls

Readability
- Two line, 40 character display that is easy to read from within a 60 degree angle.
- LCD backlight so that the display can be read in a variety of equipment room lighting.

Remote Operator Interface
With the addition of an optional remote interface panel, up to four chillers with UCP2 can be monitored and controlled. All data is available at each chiller's local operator interface is available to the Remote Operator Interface via a single twisted pair.

Ease of Use
- Keypad programmability - no manual switches or setpoint potentiometers
- Logically arranged report groups with report header and setpoint groups
- Selectable security
- Variable points updated every two seconds
- Messages that direct user to problem source via a menu item

Application Flexibility
- Seven languages available
- Metric (SI) units available
- Complex character human interface available.

Trane ICS Compatibility
The Trane absorption chiller control panel, UCP2, is 100 percent compatible with Trane Integrated Comfort™ systems (ICS). UCP2 easily integrates into the Tracer® family of flexible chiller plant system controllers with a single twisted-wire pair communications cable.

For more information on the Trane absorption chiller unit control panel, please contact your local Trane sales engineer.

Electrical Data

⚠WARNING
HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.

FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERAL PERSONAL INJURY OR DEATH.

⚠AVERTISSEMENT
VOLTAGE HASARDEUX!

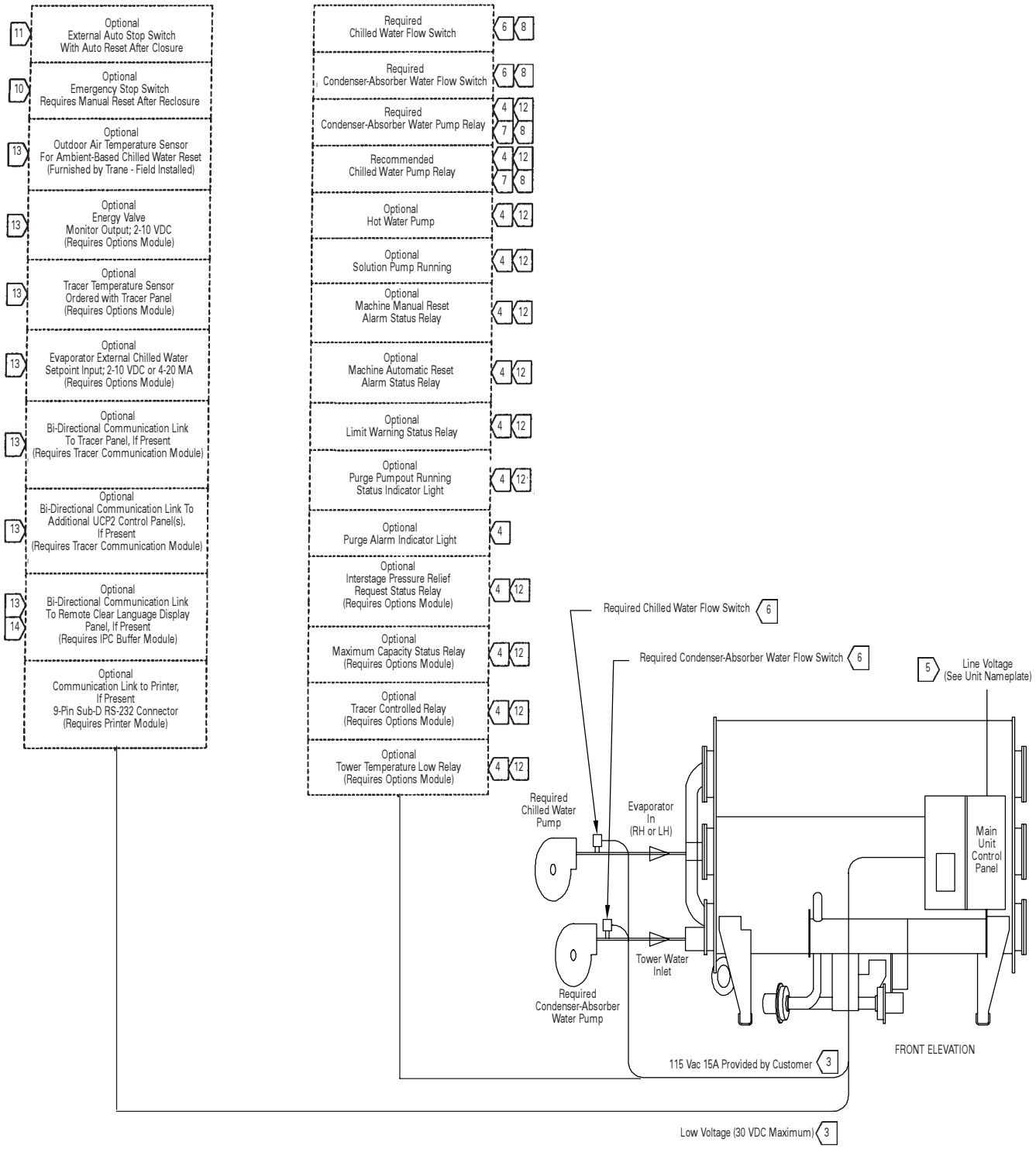
DECONNECTEZ TOUTES LES SOURCES ELECTIRQUES INCLUANT LES DISJONCTEURS SITUES A DISTANCE AVANT D'EFFECTUER L'ENTRETIEN.

FAUTE DE DECONNECTER LA SOURCE ELECTRIQUE AVANT D'EFFECTUER L'ENTRETIEN PEUT ENTRAINER DES BLESSURES CORPORELLES SEVERES OU LA WORT.

⚠CAUTION
USE COPPER CONDUCTORS ONLY!

UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.

FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.



Weights and Dimensions

Figure WD-1 — Left Hand Elevation - ABDA 380, 440, 500

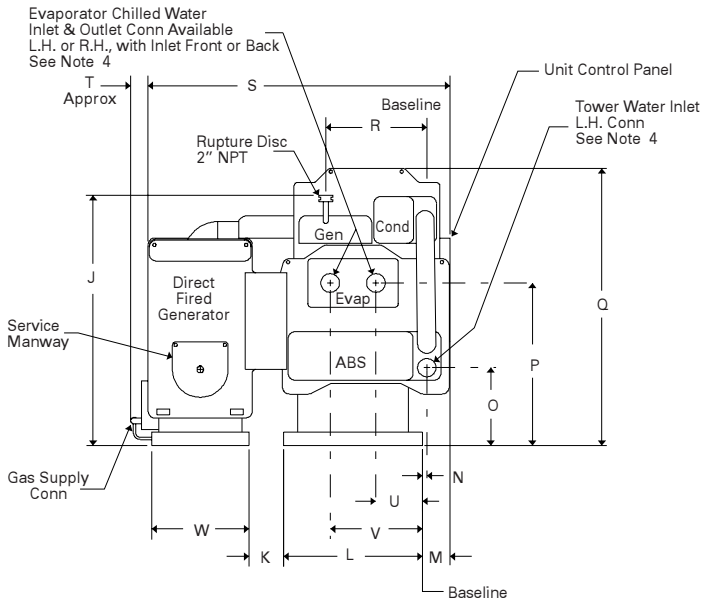


Figure WD-2 — Right Hand Elevation - ABDA 380, 440, 500

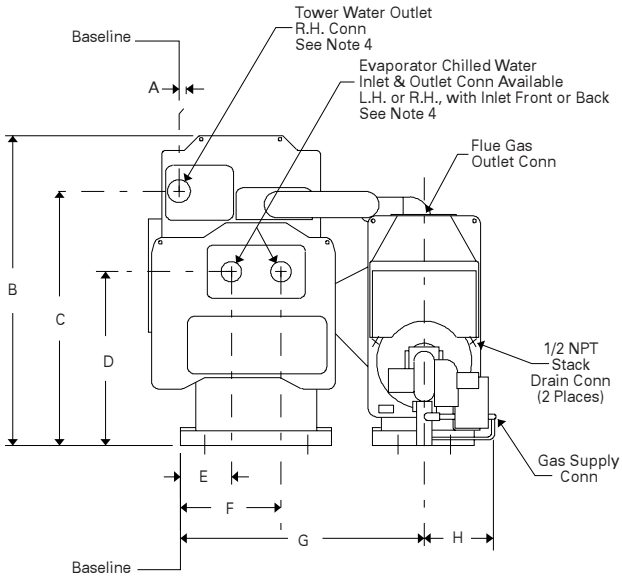


Figure WD-3 — Front Elevation - ABDA 380, 440, 500

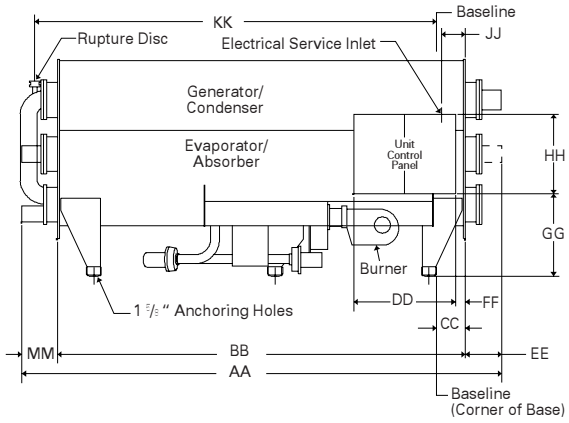
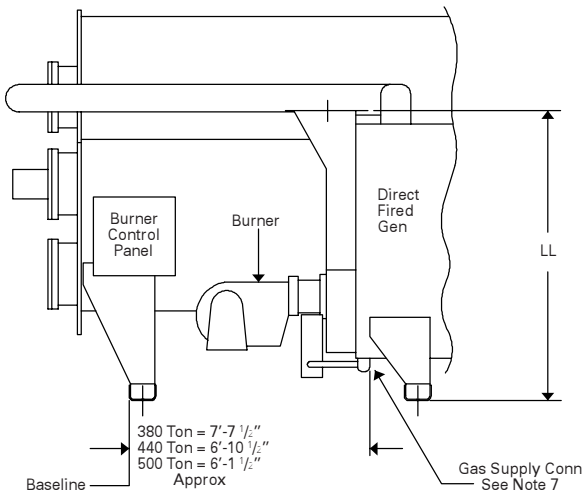


Figure WD-4 — Direct Fired Generator - ABDA 380, 440, 500



Weights and Dimensions

Table WD-1 — Unit Dimensions - English

Figure Reference	ABDA 380-440-500
A	3/8"
B	9'-6 7/8"
C	7'-9 5/8"
D	5'-4 1/8"
E	1'-8"
F	3'-1"
G	7'-5 3/4"
H	2'-2"
J	8'-6 3/8"
K	1'-1 3/4"
L	4'-9"
M	11 1/4"
N	2 3/4"
O	2'-8 1/4"
P	5'-4 1/8"
Q	9'-5 7/8"
R	3'-4 1/2"
S	10'-1 3/4"
T	7" approx
U	1'-8"
V	3'-1"
W	3'-2"
AA	21'-2 1/4"
BB	17'-11 1/2"
CC	1'-1 5/8"
DD	4'-6"
EE	1'-7 3/8"
FF	5 1/4"
GG	3'-7 1/8"
HH	3'-6"
JJ	11 1/4"
KK	17'-10 1/4"
LL	7'-1 3/8"
MM	1'-7 3/8"

CUSTOMER NOTES:
1. FRONT OF UNIT IS DETERMINED BY FACING UNIT CONTROL PANEL
2. ALL VERTICAL DIMENSIONS INCLUDE 5/16" THICK ISOLATION PADS.
3. DIMENSIONS SHOWN ARE CALCULATED VALUES. STACK TOLERANCE COULD BE +/- 1/2" UNLESS OTHERWISE SPECIFIED.
4. EVAPORATOR, CONDENSER AND ABSORBER WATER CONNECTIONS ARE FOR 8" PIPE. AVAILABLE WITH 150# AMERICAN STANDARD RAISED FACE FLANGE. (FLANGED BOLT HOLES STRADDLE VERTICAL CENTERLINE).
5. ALL WATER BOX VENTS ARE 1/4" NPT AND DRAINS ARE 3/4" NPT.
6. FLEXIBLE CONNECTION MUST BE USED FOR ATTACHMENT TO RUPTURE DISC. DO NOT APPLY MORE THAN 12 PSI INTERNAL PRESSURE ON MACHINE WITHOUT REMOVING RUPTURE DISC. PIPE RUPTURE DISC TO FLOOR VENT OR TO THE OUTSIDE TO MEET LOCAL CODE.
7. GAS TRAIN SHIPS ASSEMBLED TO UNIT. GAS SUPPLY CONNECTION SIZE AND LOCATION WILL VARY PER LOCAL CODES AND GAS INLET PRESSURE.
8. FIELD PIPING MUST BE ARRANGED AND SUPPORTED TO AVOID STRESS ON THE EQUIPMENT. IT IS STRONGLY RECOMMENDED THAT THE PIPING CONTRACTOR REFRAIN FROM PRE-PIPING CLOSER THAN 36" MINIMUM TO THE EQUIPMENT. THIS WILL ALLOW FOR PROPER CONNECTION UPON ARRIVAL OF THE UNIT AT THE JOBSITE. NECESSARY ADJUSTMENTS CAN BE MADE AT THAT TIME.

Table WD-2 — Unit Dimensions - (SI) - mm

Figure Reference	ABDA 380-440-500
A	9.525
B	2917.8
C	2378.1
D	1628.8
E	508.0
F	939.8
G	2279.7
H	660.4
J	2600.3
K	349.3
L	1447.8
M	285.8
N	69.9
O	819.2
P	1628.8
Q	2892.4
R	1028.7
S	3092.5
T	177.8 approx
U	508.0
V	939.8
W	965.2
AA	6457.9
BB	5473.7
CC	346.1
DD	1371.6
EE	492.1
FF	133.4
GG	1095.4
HH	1066.8
JJ	285.8
KK	5441.9
LL	2168.5
MM	492.1

CUSTOMER NOTES:
1. FRONT OF UNIT IS DETERMINED BY FACING UNIT CONTROL PANEL
2. ALL VERTICAL DIMENSIONS INCLUDE 5/16" THICK ISOLATION PADS.
3. DIMENSIONS SHOWN ARE CALCULATED VALUES. STACK TOLERANCE COULD BE +/- 1/2" UNLESS OTHERWISE SPECIFIED.
4. EVAPORATOR, CONDENSER AND ABSORBER WATER CONNECTIONS ARE FOR 8" PIPE. AVAILABLE WITH 150# AMERICAN STANDARD RAISED FACE FLANGE. (FLANGED BOLT HOLES STRADDLE VERTICAL CENTERLINE).
5. ALL WATER BOX VENTS ARE 1/4" NPT AND DRAINS ARE 3/4" NPT.
6. FLEXIBLE CONNECTION MUST BE USED FOR ATTACHMENT TO RUPTURE DISC. DO NOT APPLY MORE THAN 12 PSI INTERNAL PRESSURE ON MACHINE WITHOUT REMOVING RUPTURE DISC. PIPE RUPTURE DISC TO FLOOR VENT OR TO THE OUTSIDE TO MEET LOCAL CODE.
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Weights and Dimensions

Figure WD-5 — Left Hand Elevation - ABDA 575, 660, 750

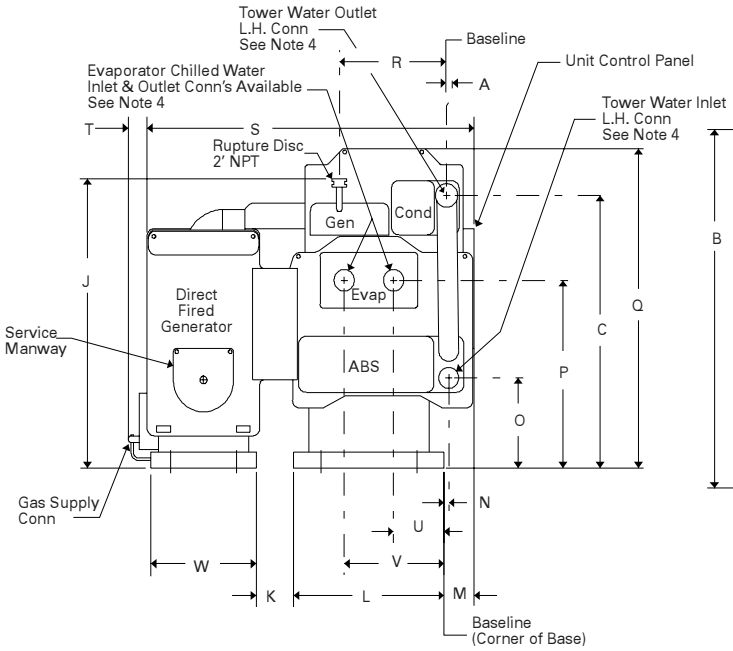


Figure WD-6 — Right End Elevation - ABDA 575, 660, 750

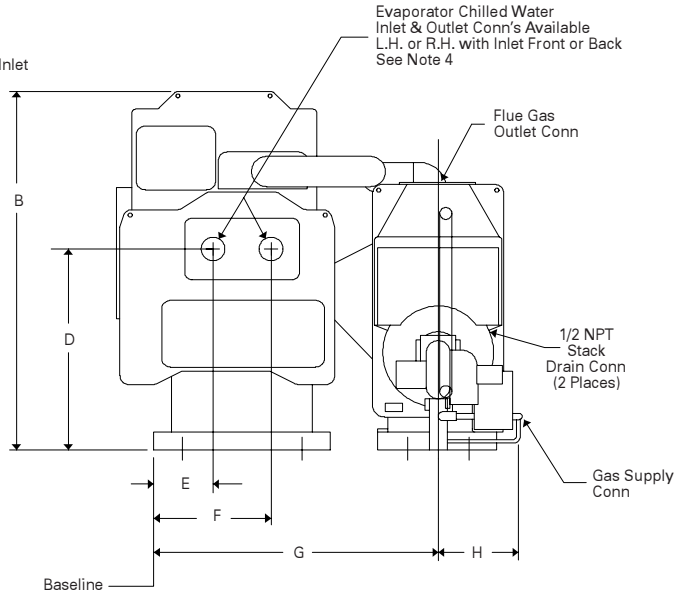


Figure WD-7 — Front End Elevation - ABDA 575, 660, 750

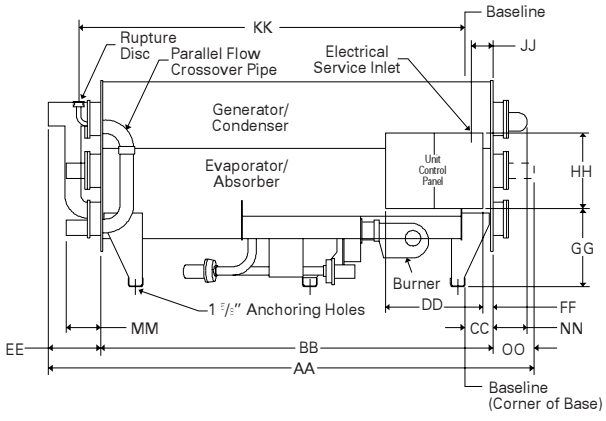
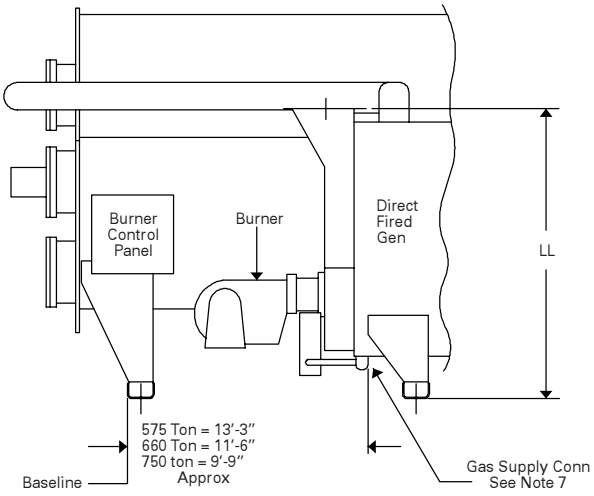


Figure WD-8 — Direct Fired Generator - ABDA 575, 660, 750



Weights and Dimensions

Table WD-3 — Unit Dimensions - English

Figure Reference	ABDA 575-660-750
A	1/2″
B	9′-6 7/8″
C	7′-11 5/8″
D	5′-4 1/8″
E	1′-8″
F	3′-1″
G	7′-5 3/4″
H	2′-2″
J	8′-6 3/8″
K	1′-1 3/4″
L	4′-9″
M	11 1/4″
N	2 3/4″
O	2′-6 7/8″
P	5′-4 1/8″
Q	9′-5 7/8″
R	3′-4 1/2″
S	10′-1 3/4″
T	7″ approx
U	1′-8″
V	3′-1″
W	3′-2″
AA	30′-11 1/4″
BB	27′-0″
CC	1′-1 5/8″
DD	4′-6″
EE	2′3 7/8″
FF	5 1/4″
GG	3′-7 1/8″
HH	3′-6″
JJ	11 1/4″
KK	26′-10 3/4″
LL	7′-1 3/8″
MM	1′-7 3/8″

CUSTOMER NOTES:
1. FRONT OF UNIT IS DETERMINED BY FACING UNIT CONTROL PANEL
2. ALL VERTICAL DIMENSIONS INCLUDE 5/16″ THICK ISOLATION PADS.
3. DIMENSIONS SHOWN ARE CALCULATED VALUES. STACK TOLERANCE COULD BE +/- 1/2″ UNLESS OTHERWISE SPECIFIED.
4. EVAPORATOR WATER CONNECTIONS ARE FOR 8″ PIPE. CONDENSER, AND ABSORBER WATER CONNECTIONS ARE FOR 10″ PIPE. AVAILABLE WITH 150# GROOVED CONNECTION FOR USE WITH STYLE 77 VICTAULIC COUPLING. ALSO, AVAILABLE WITH 150# AMERICAN STANDARD RAISED FACE FLANGE. (FLANGED BOLT HOLES STRADDLE VERTICAL CENTERLINE).
5. ALL WATER BOX VENTS ARE 1/4″ NPT AND DRAINS ARE 3/4″ NPT.
6. FLEXIBLE CONNECTION MUST BE USED FOR ATTACHMENT TO RUPTURE DISC. DO NOT APPLY MORE THAN 12 PSI INTERNAL PRESSURE ON MACHINE WITHOUT REMOVING RUPTURE DISC. PIPE RUPTURE DISC TO FLOOR VENT OR TO THE OUTSIDE TO MEET LOCAL CODE.
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Table WD-4 — Unit Dimensions - (SI) - mm

Figure Reference	ABDA 575, 660, 750
A	12.7
B	2917.8
C	2428.9
D	1628.8
E	508.0
F	939.8
G	2279.7
H	660.4
J	2600.3
K	349.3
L	1447.8
M	285.8
N	69.9
O	784.2
P	1628.8
Q	2892.4
R	1028.7
S	3092.5
T	177.8 approx
U	508.0
V	939.8
W	965.2
AA	9429.8
BB	8229.6
CC	346.1
DD	1371.6
EE	708.0
FF	133.4
GG	1095.4
HH	1066.8
JJ	285.8
KK	8197.8
LL	2168.5
MM	492.1

CUSTOMER NOTES:
1. FRONT OF UNIT IS DETERMINED BY FACING UNIT CONTROL PANEL
2. ALL VERTICAL DIMENSIONS INCLUDE 5/16″ THICK ISOLATION PADS.
3. DIMENSIONS SHOWN ARE CALCULATED VALUES. STACK TOLERANCE COULD BE +/- 1/2″ UNLESS OTHERWISE SPECIFIED.
4. EVAPORATOR WATER CONNECTIONS ARE FOR 8″ PIPE. CONDENSER, AND ABSORBER WATER CONNECTIONS ARE FOR 10″ PIPE. AVAILABLE WITH 150# GROOVED CONNECTION FOR USE WITH STYLE 77 VICTAULIC COUPLING. ALSO, AVAILABLE WITH 150# AMERICAN STANDARD RAISED FACE FLANGE. (FLANGED BOLT HOLES STRADDLE VERTICAL CENTERLINE).
5. ALL WATER BOX VENTS ARE 1/4″ NPT AND DRAINS ARE 3/4″ NPT.
6. FLEXIBLE CONNECTION MUST BE USED FOR ATTACHMENT TO RUPTURE DISC. DO NOT APPLY MORE THAN 12 PSI INTERNAL PRESSURE ON MACHINE WITHOUT REMOVING RUPTURE DISC. PIPE RUPTURE DISC TO FLOOR VENT OR TO THE OUTSIDE TO MEET LOCAL CODE.
7. GAS TRAIN SHIPS ASSEMBLED TO UNIT. GAS SUPPLY CONNECTION SIZE AND LOCATION WILL VARY PER LOCAL CODES AND GAS INLET PRESSURE.
8. FIELD PIPING MUST BE ARRANGED AND SUPPORTED TO AVOID STRESS ON THE EQUIPMENT. IT IS STRONGLY RECOMMENDED THAT THE PIPING CONTRACTOR REFRAIN FROM PRE-PIPING CLOSER THAN 36″ MINIMUM TO THE EQUIPMENT. THIS WILL ALLOW FOR PROPER CONNECTION UPON ARRIVAL OF THE UNIT AT THE JOBSITE. NECESSARY ADJUSTMENTS CAN BE MADE AT THAT TIME.

Figure WD-9 — Rigging Instructions

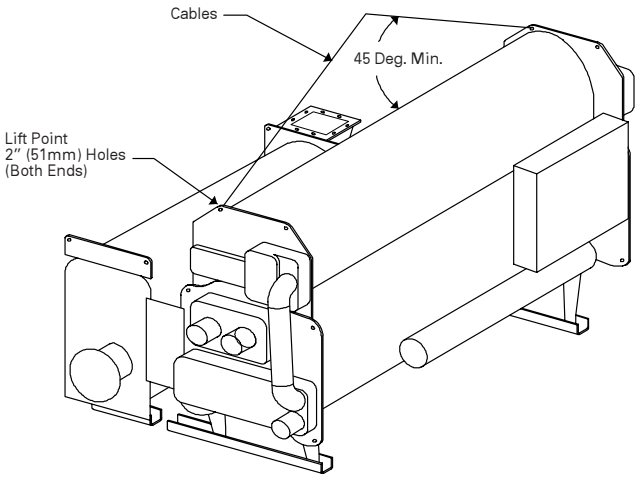


Figure WD-10 — Space Requirements

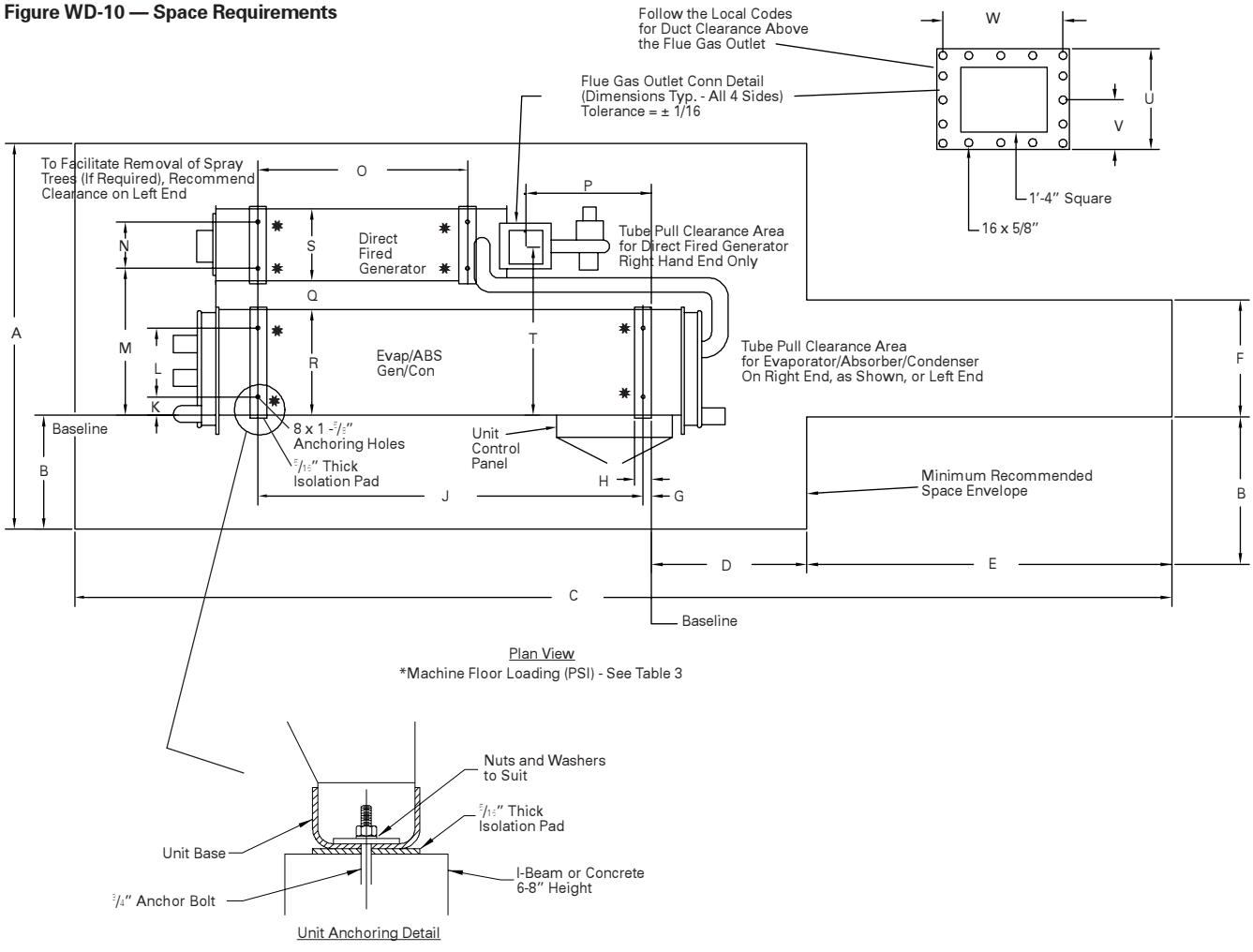


Table WD-5 — Service Clearances (English)

Figure Reference	ABDA 380, 440, 500	ABDA 575, 660, 750
A	18′-6″	18′-6″
B	5′-0″	5′-0″
C	41′-6″	59′-6″
D	6′-0″	6′-0″
E	13′-6″	22′-6″
F	5′-0″	5′-0″

Table WD-6 — Anchor and Flue Locations (English)

Figure Reference	ABDA-380	ABDA-440	ABDA-500	ABDA-575	ABDA-660	ABDA-750
G	5 3/8″	5 3/8″	5 3/8″	5 3/8″	5 3/8″	5 3/8″
H	10 3/4″	10 3/4″	10 3/4″	10 3/4″	10 3/4″	10 3/4″
J	14′-9 1/2″	14′-9 1/2″	14′-9 1/2″	23′-10″	23′-10″	23′-10″
K	10 1/2″	10 1/2″	10 1/2″	10 1/2″	10 1/2″	10 1/2″
L	3′-0″	3′-0″	3′-0″	3′-0″	3′-0″	3′-0″
M	6′-6 3/4″	6′-6 3/4″	6′-6 3/4″	6′-6 3/4″	6′-6 3/4″	6′-6 3/4″
N	1′-10″	1′-10″	1′-10″	1′-10″	1′-10″	1′-10″
O	6′-6″	7′-3″	8′-0″	9′-11″	11′-8″	13′-5″
P	6′-5 7/8″	5′-8 7/8″	4′-11 7/8″	12′-1 3/8″	10′-4 3/8″	8′-7 3/8″
Q	1′-1 3/4″	1′-1 3/4″	1′-1 3/4″	1′-1 3/4″	1′-1 3/4″	1′-1 3/4″
R	4′-9″	4′-9″	4′-9″	4′-9″	4′-9″	4′-9″
S	3′-2″	3′-2″	3′-2″	3′-2″	3′-2″	3′-2″
T	7′-5 3/4″	7′-5 3/4″	7′-5 3/4″	7′-5 3/4″	7′-5 3/4″	7′-5 3/4″
U	2′-0″	2′-0″	2′-0″	2′-0″	2′-0″	2′-0″
V	1′-0″	1′-0″	1′-0″	1′-0″	1′-0″	1′-0″
W	1′-10″	1′-10″	1′-10″	1′-10″	1′-10″	1′-10″

CUSTOMER NOTES:

1. DO NOT RUN WIRING OR PIPING ACROSS THE FRONT OR PANEL SIDE OF THE UNIT WHERE MOST SERVICE IS PERFORMED (THE FRONT IS THAT SIDE ON WHICH THE MAIN CONTROL PANEL IS MOUNTED).
2. UNIT TO BE INSTALLED ON LEVEL SURFACE. HOUSEKEEPING PAD RECOMMENDED.
3. USE ANCHORING HOLES, AS REQUIRED, TO MEET LOCAL CODES, ANCHORING HARDWARE IS PROVIDED BY CUSTOMER
4. ISOLATION PADS ARE PROVIDED WITH THE UNIT.
5. RECOMMENDED SPACE ENVELOPE PROVIDES MINIMUM 3 FT CLEARANCE AT RIGHT END OF UNIT, WITH 4 FT AT FRONT, BACK AND LEFT END (TO DIRECT-FIRED GENERATOR). ALLOW MINIMUM OF 1′-6″ CLEARANCE ABOVE UNIT.

Table WD-7 — Weights

	Weights		Unit Brine Charge		System Water Capacity	
Model	Shipping (Lbs)	Operating (Lbs)	Solution (Lbs)	Refrigerant (Gals)	Evaporator (Gals)	Cond/Abs. (Gals)
ABDA-380	32900	45800	9075	105	130	250
ABDA-440	34500	48300	9645	115	145	280
ABDA-500	36000	50500	10140	120	160	305
ABDA-575	42300	60700	12620	140	250	375
ABDA-660	44600	64500	13750	155	225	335
ABDA-750	46800	68300	14950	170	280	410

Table WD-8 — Service Clearances (SI) mm

Figure Reference	ABDA 380, 440, 500	ABDA 575, 660, 750
A	5638.8	5638.8
B	1524.0	1524.0
C	12649.2	18135.6
D	1828.8	1828.8
E	4114.8	6858.0
F	1524.0	1524.0

Table WD-9 — Anchor and Flue Locations (SI) mm

Figure Reference	ABDA-380	ABDA-440	ABDA-500	ABDA-575	ABDA-660	ABDA-750
G	136.5	136.5	136.5	136.5	136.5	136.5
H	273.1	273.1	273.1	273.1	273.1	273.1
J	4508.5	4508.5	4508.5	7264.4	7264.4	7264.4
K	266.7	266.7	266.7	266.7	266.7	266.7
L	914.4	914.4	914.4	914.4	914.4	914.4
M	2000.3	2000.3	2000.3	2000.3	2000.3	2000.3
N	558.8	558.8	558.8	558.8	558.8	558.8
O	1981.2	2209.8	2438.4	3022.6	3556	4089.4
P	1978.0	1749.4	1520.8	3692.5	3159.1	2625.7
Q	349.3	349.3	349.3	349.3	349.3	349.3
R	1447.8	1447.8	1447.8	1447.8	1447.8	1447.8
S	965.2	965.2	965.2	965.2	965.2	965.2
T	2279.7	2279.7	2279.7	2279.7	2279.7	2279.7
U	609.6	609.6	609.6	609.6	609.6	609.6
V	304.8	304.8	304.8	304.8	304.8	304.8
W	558.8	558.8	558.8	558.8	558.8	558.8

CUSTOMER NOTES:

1. DO NOT RUN WIRING OR PIPING ACROSS THE FRONT OR PANEL SIDE OF THE UNIT WHERE MOST SERVICE IS PERFORMED (THE FRONT IS THAT SIDE ON WHICH THE MAIN CONTROL PANEL IS MOUNTED).
2. UNIT TO BE INSTALLED ON LEVEL SURFACE. HOUSEKEEPING PAD RECOMMENDED.
3. USE ANCHORING HOLES, AS REQUIRED, TO MEET LOCAL CODES, ANCHORING HARDWARE IS PROVIDED BY CUSTOMER
4. ISOLATION PADS ARE PROVIDED WITH THE UNIT.
5. RECOMMENDED SPACE ENVELOPE PROVIDES MINIMUM 3 FT CLEARANCE AT RIGHT END OF UNIT, WITH 4 FT AT FRONT, BACK AND LEFT END (TO DIRECT-FIRED GENERATOR). ALLOW MINIMUM OF 1’-6” CLEARANCE ABOVE UNIT.

Table WD-10 - Weights

	Weights		Unit Brine Charge		System Water Capacity	
Model	Shipping (Kg)	Operating (Kg)	Solution (Kg)	Refrigerant (l)	Evaporator (l)	Cond/Abs. (l)
ABDA-380	14923	20775	4116	397	492	946
ABDA-440	15649	21909	4375	435	549	1060
ABDA-500	16330	22907	4600	454	606	1154
ABDA-575	19187	27534	5724	530	946	1419
ABDA-660	20231	29257	6237	587	852	1268
ABDA-750	21228	30987	6781	643	1060	1552

Figure WD-11 — Break Apart & Center of Gravity - 2-Piece Disassembly

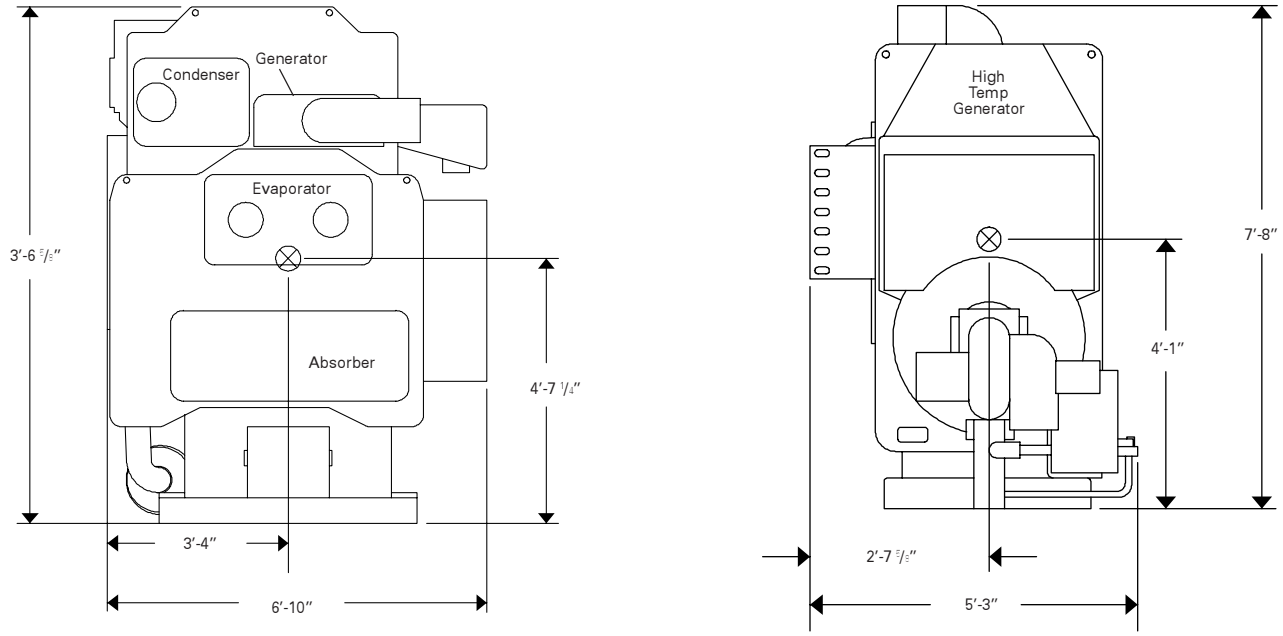
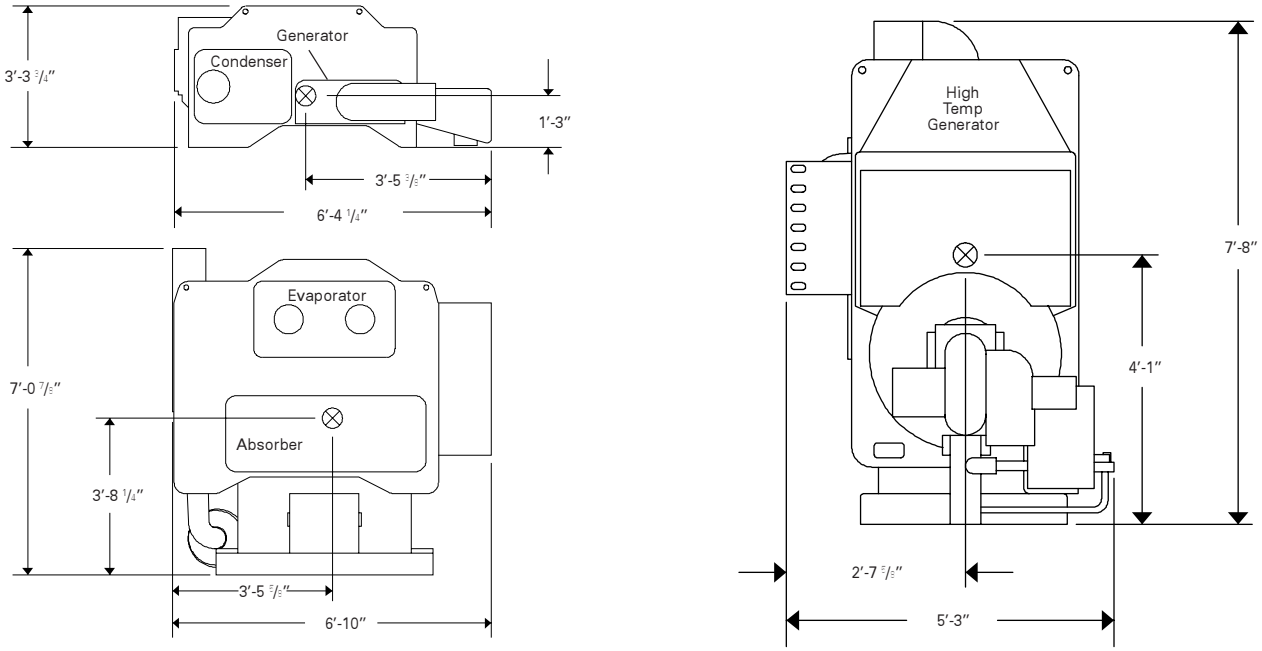


Figure WD-12 — 3-Piece Disassembly



Dimensional Data

Table WD-11 — Component Dimensions - English

Major Component	Length Dimension					
	Machine Sizes					
	ABDA-380	ABDA-440	ABDA-500	ABDA-575	ABDA-660	ABDA-750
Gen/Cond		21′-2 1/4″			30′-7 7/8″	
Evap/Abs		21′-2 1/4″			30′-2 3/4″	
High Temp Generator	14′-6 1/8″	15′-3 1/8″	17′-4″	18′-6 7/8″	20′-4 5/8″	22′-1 5/8″
Gen/Cond-Evap/Abs		21′-2 1/4″			30′-11 1/4″	

Table WD-12 — Weights - English

Machine Size	High Temperature Direct-Fired Generator (Lbs)	Generator/Condenser (Lbs)	Evaporator/Absorber (Lbs)	Generator/Condenser Evaporator/Absorber (Lbs)	Total (Lbs)
ABDA-380	6200	7200	19600	26800	33000
ABDA-440	6700	7500	20400	27900	34600
ABDA-500	7200	7700	21200	28900	36100
ABDA-575	7300	10200	24900	35100	42400
ABDA-660	8400	10500	25700	36200	44600
ABDA-750	9500	10800	26500	37300	46800

Table WD-13 — Component Dimensions (SI) mm

Major Component	Length Dimension					
	Machine Sizes					
	ABDA-380	ABDA-440	ABDA-500	ABDA-575	ABDA-660	ABDA-750
Gen/Cond		6508.8			9344.0	
Evap/Abs		6508.8			9213.9	
High Temp Generator	4422.8	4651.4	5283.2	5664.0	6213.5	6746.9
Gen/Cond-Evap/Abs		6508.8			9429.8	

Table WD-14 — Weights (SI) Kg

Machine Size	High Temperature Direct-Fired Generator (Kg)	Generator/Condenser (Kg)	Evaporator/Absorber (Kg)	Generator/Condenser Evaporator/Absorber (Kg)	Total (Kg)
ABDA-380	2812	3266	8890	12156	14968
ABDA-440	3039	3402	9253	12655	15694
ABDA-500	3266	3493	9616	13109	16375
ABDA-575	3293	4627	11294	15921	19214
ABDA-660	3810	4763	11658	16420	20230
ABDA-750	4309	4899	12020	16919	21228

Dimensional Data

Figure WD-13 — Rigging Sub Assembly Components - Direct-Fired Generator

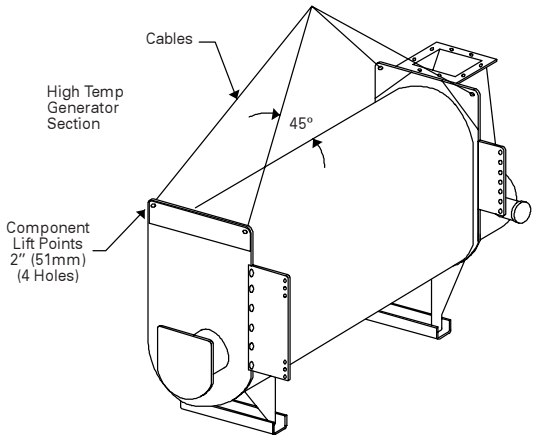


Figure WD-14 — Low Temp Generator/Condenser Section

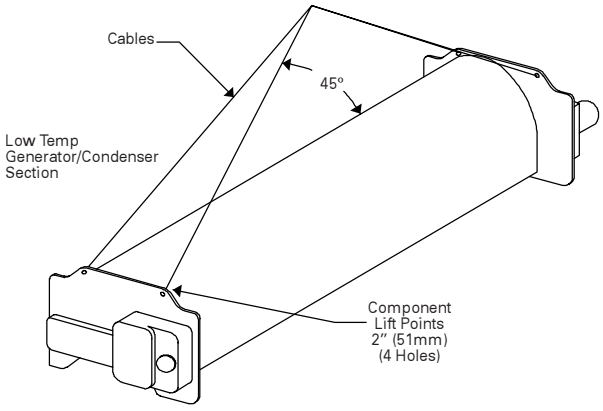


Figure WD-15 — Evaporator/Absorber - Generator/Condenser Section

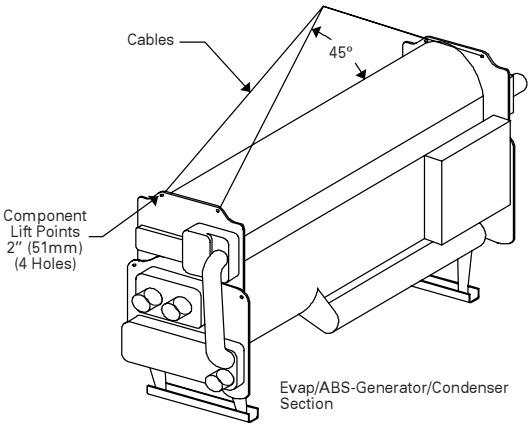


Figure WD-16 — Evaporator/Absorber Section

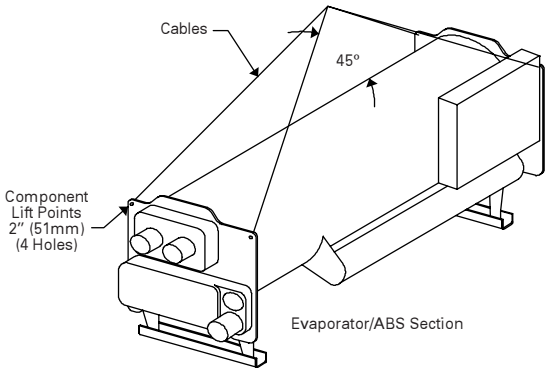
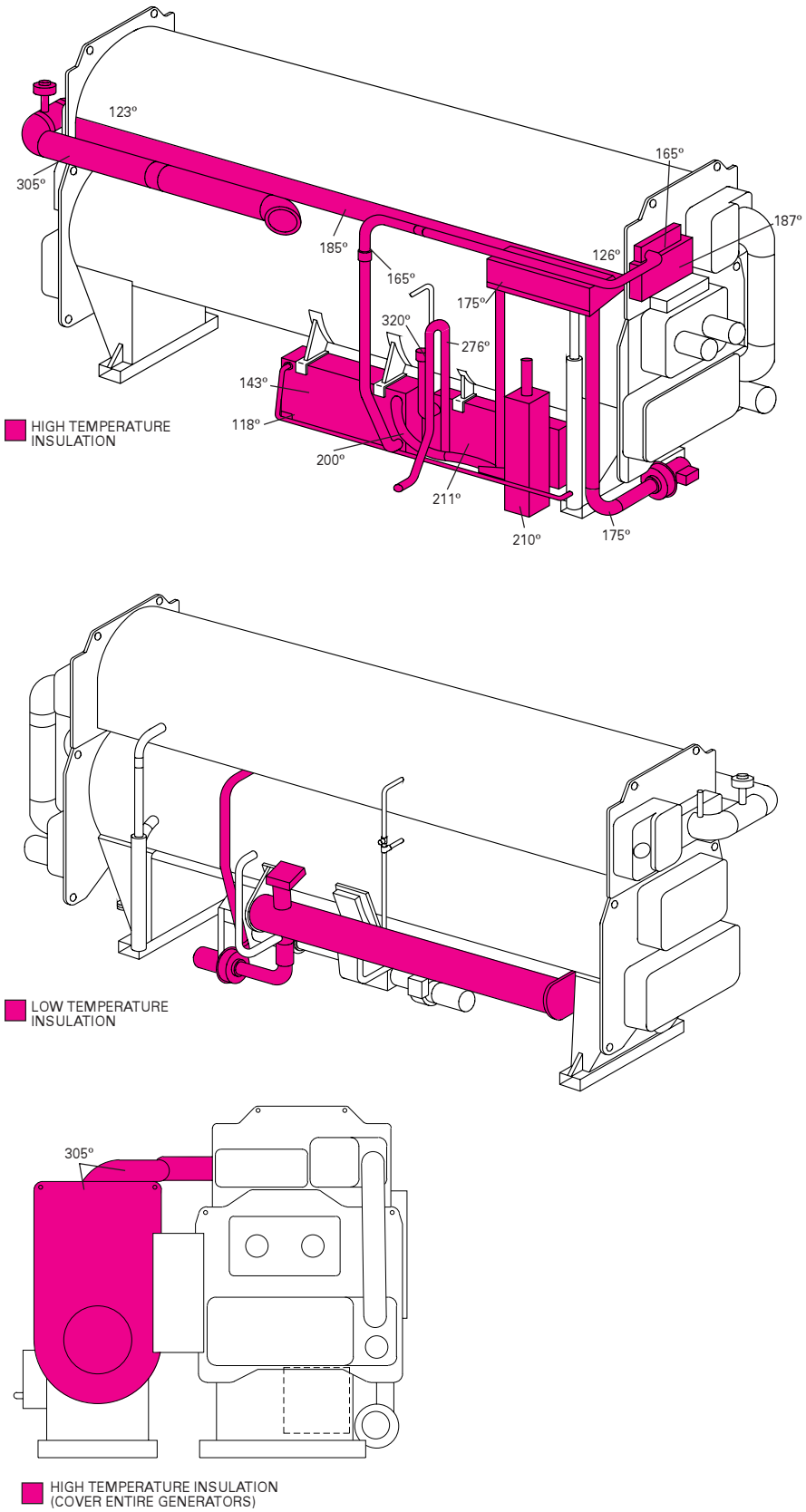


Figure WD-17 — Unit Insulation



Dimensional Data

Table WD-15 — Low Temperature (Cold) Insulation (English)

Cold Insulation	ABDA-380,440,500	ABDA-575,660, 750
Evaporator Shell (Sq. Ft)	88	100
Evaporator water boxes and Refrigerant Storage Tank (Sq. Ft.)	70	115
4″ Pipe (Ln Ft)	3	3
2″ Pipe (Ln Ft)	6	5

Table WD-16 — High Temperature (Hot) Insulation (English)

Hot Insulation	ABDA-380	ABDA-440	ABDA-500	ABDA-575	ABDA-660	ABDA-750
Direct-Fired Generator (Sq. Ft.)	203	219	235	275	312	349
High Temp Heat Exchanger (Sq. Ft.)	23	23	23	26	26	26
Low Temp Heat Exchanger (Sq. Ft.)	28	28	28	31	31	31
8″ Pipe (Ln Ft)	13.5	12.75	12.0	10.0	8.33	6.58
4″ Pipe (Ln Ft)	7.75	7.75	7.75	7.75	7.75	7.75
3″ Pipe (Ln. Ft)	6	6	6	6	6	6
2 ½″ Pipe (Ln Ft)	3.4	3.4	3.4	3.4	3.4	3.4
2″ Pipe (Ln Ft)	13	13	13	13	13	13

Table WD-17 — Low Temperature (Cold) Insulation (SI)

Cold Insulation	ABDA-380,440,500	ABDA-575,660, 750
Evaporator Shell (Sq. M)	8.18	10.68
Evaporator water boxes and Refrigerant Storage Tank (Sq. Ft.)	6.5	10.68
4″ Pipe (Ln M)	1.07	1.07
2″ Pipe (Ln M)	2.15	2.15

Table WD-18 — High Temperature (Hot) Insulation (SI)

Hot Insulation	ABDA-380	ABDA-440	ABDA-500	ABDA-575	ABDA-660	ABDA-750
Direct-Fired Generator (Sq. M)	18.86	20.34	21.82	25.55	29.98	32.42
High Temp Heat Exchanger (Sq. M)	2.14	2.14	2.14	2.42	2.42	2.42
Low Temp Heat Exchanger Exchanger (Sq. M)	2.6	2.6	2.6	2.88	2.88	2.88
8″ Pipe (Ln M)	4.8	4.6	4.3	3.6	3.0	2.4
4″ Pipe (Ln M)	2.77	2.77	2.77	2.77	2.77	2.77
3″ Pipe (Ln. M)	2.15	2.15	2.15	2.15	2.15	2.15
2 ½″ Pipe (Ln M)	1.22	1.22	1.22	1.22	1.22	1.22
2″ Pipe (Ln M)	4.65	4.65	4.65	4.65	4.65	4.65

Mechanical Specification

General
Unit shall be a complete double-effect direct-fired absorption chiller package built in an ISO 9001 environment. The chiller shall consist of a direct-fired generator, low temperature generator/ condenser section, evaporator/ absorber section, controls, pumps, heat exchangers, burner assembly and fuel supply system. All units shall be of hermetic design, factory assembled and leak tested prior to shipment. The control panel, sensors, burner, burner controls and gas control system shall be factory installed. The unit shall be painted prior to shipping with two coats of water base air dry primer. The standard method of shipment shall be by truck from the USA.

Low Temperature Generator/ Condenser-Evaporator/Absorber
The shell material shall be carbon steel. The low temperature generator, evaporator and absorber tube material shall be 95/5 CuNi. Condenser tubes shall be copper. Tubes shall be mechanically rolled into the tubesheets and shall be replaceable from either end. Condenser, evaporator and absorber tube supports shall be fixed. The low temperature generator shall consist of fixed and floating tube supports to allow for even tube expansion. Spray systems shall be replaceable from end of unit without sacrificing the hermetic integrity of the unit.

The standard design working pressure for the waterboxes shall be 150 psig. All tube bundles shall be tested at 150 percent of design working pressure. All waterboxes except low temperature generator shall have gasketed removable covers for access. Marine-type waterboxes shall be provided with either Victaulic™ or raised face flanged connections.

Heat Exchangers
Two welded plate solution heat exchangers shall be provided to improve unit performance. Heat exchanger surfaces shall be 300 series stainless steel.

Pumps
Solution and refrigerant shall be circulated by means of four hermetic, single stage centrifugal pumps. The pump impeller shall be cast iron with a steel shaft. The motor bearings shall be lubricated and the motor shall be cooled by the fluid that is pumped. Adjustable frequency drives shall be provided on the low temperature generator pump and the absorber spray pump to provide solution flow control.

Purge
The purge system shall include a collection chamber in the absorber section, an eductor for moving non-condensables to the condenser, Purifier™ purge shall be supplied to collect the non-condensables in an external storage tank, and a vacuum pump provided for removal of the non-condensables. The purge shall operate automatically to remove non-condensables from the unit during periods of chiller operation and shutdown. Logging of the purge information shall be provided via the unit control panel.

Direct-Fired Generator
An ob-round shell shall be fabricated of carbon steel containing a horizontal fire/flue tube generator. Fire tube, gas turn box, tube sheets and all generator tubes shall be constructed of stainless steel. Generator tubes shall be 1-1/8 inches .055" wall, 409 stainless steel and shall be individually rolled and welded into tubesheets. Unit direct-fired generator shall include rupture disk, located on the low temperature generator outlet box and shall be sized to meet ANSI/ASHRAE B-15. Other items which shall be included are: refractory lined burner mounting plate, flue gas access door, integral exhaust gas recirculation system when required for emissions control, condensate collection system for flue gas and sight glass for observation of the flame.

Burner
The burner shall be completely assembled, installed and wired prior to shipment. The burner shall meet maximum NOx requirements of 30 ppm when firing on natural gas. The burner shall support 8 to 1 turndown with natural gas. The flue gas recirculation parts, when needed, shall be shipped lose and provided for field installation.

Exhaust Gas Duct and Flue Stack
The exhaust gas duct and flue stack shall be provided and installed by others. The flue exhaust duct and flue stack must be designed of material in compliance with municipal, state and federal regulations. The duct and stack must be heat-resistant to accept temperatures up to 675 degrees F. Flue stack should be sized to provide and exhaust gas pressure at the unit of 0 to +/- 0.2" water.

Unit Options
Simultaneous hot water heat exchanger shall provide simultaneous heating and cooling or heating and cooling . A 3-way valve assembly shall be provided for hot water flow control. Dual fuel using gas/propane or gas/oil combinations shall be available. Industrial package shall include special tubing and an option for a factory mounted lithium bromide filter. The disassembled unit shall provide for easy disassembly and re-assembly of major components at the jobsite.

Power Panel
A factory wired and mounted power panel shall include: main power connection, control transformer and 115 volt single phase control circuit. Unit shall be available for operation on 200,230, 460 or 575 volts, 3-phase, 60 hertz power or 190,220, 380 or 415 volts, 3-phase, 50 hertz power.

Mechanical Specification

Control Panel
The factory mounted unit control panel (UCP2) is a microprocessor-based chiller control system that provides complete stand alone operation. The UCP2 shall provide the following items:

Control Function
- Chilled water temperature control
- Concentration Control
- Simultaneous heating and cooling (opt)

System Functions
- User interface with a 40 character, 2 line display and a 16 key keypad, capable of displaying 7 languages in SI or English units.
- Passwords for protection of unit setup and configuration
- Chilled water pump control
- Absorber/Condenser pump control
- Automatic and manual purge system
- Chilled water reset
- Simultaneous heating: cooling only, heating only, cooling priority and heating priority (opt)
- Simultaneous heating water pump control (opt)
- Minimum turndown of 8 to 1 with natural gas
- Minimum turn-down of 3 to 1 with oil (opt)
- Start/stop and reset of flame safeguard at UCP2
- Combustion confirmation and alarm status at UCP2
- Fuel selection and automatic fuel changeover (opt)
- Remote clear language display panel - capable of monitoring 1-4 chillers per panel (opt)

Adaptive Limits
- Evaporator water temperature limit
- High interstage pressure limit
- High exhaust gas temperature limit
- High interstage temperature limit
- Low absorber/condenser limit
- Soft-loading control

System Protection
- Evaporator freeze protection
- Chilled water flow confirmation
- Cooling water flow confirmation
- Simultaneous hot water flow confirmation (opt)
- High interstage pressure cutout to prevent excessive pressure
- Phase loss, phase reversal and under/over voltage detection
- Emergency stop/shutdown of burner

Monitor and Displays
- Chilled water temperature entering and leaving
- Absorber/Condenser water temperature entering and leaving
- Evaporator water flow (opt)
- Cooling water flow (opt)
- Solution concentrations
- Solution temperatures
- Interstage pressure
- Total motor current
- Unit voltage
- Chiller run time and starts
- Purge operation and run time

Interfaces to UCP2™
- Interface to Tracer 100 or Tracer Summit®
- External machine manual reset alarm indication output
- External machine auto reset warning indication output
- External limit warning indication output
- External burner fire rate output
- External combustion indication output
- Interstage pressure relief request output
- Maximum capacity indication output
- External auto-stop/emergency shutdown of unit
- External selection of heating/cooling priority (opt)
- External fuel type selection (opt)
- External chilled water setpoint (opt)
- External heated water setpoint (opt)
- Tracer temperature sensor (opt)
- Tracer controlled relay (opt)
- Printer interface (opt)
- Remote Clear Language Interface

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http://www.trane.com

An American Standard Company

Library	**Product Literature**
Product Section	**Refrigeration**
Product	**Horizon Direct-Fired Absorption**
Model	**000**
Literature Type	**Data Sales Catalog**
Sequence	**6**
Date	**June 1997**
File No.	**PL-REF-ABS-000-DS-6-697**
Supersedes	**ABS-D-3**
Ordering No.	**ABS-DS-6**