DRY-O-TRON® Dectron

INDOOR POOL DESIGN GUIDE
Design & Dehumidification

DRY-O-TRON®

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Design & Dehumidification

DECTRON, a Leading Manufacturer of Energy Recycling Dehumidifiers and Pool Water Heaters. Creators of Engineered Environments for Indoor Pools and Whirlpools.

INDEX

HyPoxy® Coated Coils

DRY-O-TRON® Quality

DRY-O-TRON® for the ultimate indoor pool environment

Intertek

AHRI MEMBER

Congratulations!

With Dectron's Indoor Pool Design and Dehumidification brochure, you have taken the first step towards creating a state-of-the-art indoor pool environment.

Dectron, a HVAC industry leader, has been manufacturing innovative dehumidification equipment that recycles energy and conserves pool water for nearly 40 years. Saving costs and protecting the environment have been Dectron's guiding philosophies from the day the first DRY-O-TRON®, the original energy recycling dehumidifier, was designed.

A TRUE LEADER

Dectron has been pioneering advances in natatorium design and dehumidification since its first installation in 1977. The company's direct involvement with the engineering community through ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) has led to major upgrades in ASHRAE natatorium design guidelines. In fact, Evaporation Rates are now calculated based on the model developed by Dectron. The company has also worked to help develop an industry standard for dehumidifier performance.

This brochure contains valuable design guidelines based on Dectron's extensive knowledge and experience in solving humidity control problems in over 40,000 indoor pool installations worldwide. Dectron Inc., the company that invented the DRY-O-TRON®, is dedicated to providing state-of-the-art design, engineering and quality products.

QUALITY CONTROL

Dectron has set the industry's Quality Control standard. Every DRY-O-TRON® is fully tested in one of the company's four test chambers, which can generate the same amount of moisture as any pool environment. Under these full load conditions, the units are performance tested and adjusted to operate at the exact conditions of your facility. No other manufacturer in the industry can give you this assurance and peace of mind. Furthermore, a copy of each test report is available for review by the customer at any time. In fact, Dectron welcomes visits from customers interested in witnessing the testing of their unit.

ALL SOLUTIONS

Dectron has long established itself as the company that can do it all. Its ability to offer the widest selection of unit sizes and configurations in the industry explains why the DRY-O-TRON® brand name has become synonymous with quality, reliability and energy savings. All other manufacturers combined do not offer the selection available from Dectron.

The DRY-O-TRON® is only one of several key components in the natatorium environment control system. In order for a pool enclosure to be comfortable and condensation free, the following areas must be addressed by the owners, together with the contractor, engineer and architectural design team:

- **Humidity Control**
- **Pool Activity Levels**
- **Indoor Air Quality**
- **Air Distribution**
- **Duct Design**
- **Chemical-storage facility**
- **Exhaust Air Requirements**
- **Heating Requirements**
- **Cooling Requirements**
- **Condensation Protection**
- **Pool Water Chemistry**
- **Outdoor Air Requirements**

A dehumidifier alone isn't enough!

The DRY-O-TRON® line of products encompasses an extensive array of standard systems for industrial, commercial and residential applications.

Dectron also offers the services of its skilled sales, engineering, manufacturing and technical staff for custom engineered projects. All Dectron indoor pool products incorporate the company's latest high-tech advances, such as microprocessor control, specially painted enclosures and HyPoxy® coated coils.

DRY-O-TRON®'s special HyPoxy® coated coils accelerate the draining process of entrained moisture and also act as a protective barrier for the finned surface. The HyPoxy® coating also enhances performance and extends coil longevity.

WHY DO IT RIGHT?

Since 1976, Dectron has been involved in all aspects of indoor pool design. An indoor pool is truly a unique facility in that its level of end-user satisfaction is inversely proportional to the number of compromises made in the design. A good design will have better overall performance and lower operating costs over the facility's lifecycle.

Why do it right?

Simple. It is the most cost effective method of pool design and the only way to ensure 100% customer satisfaction. To do this, the following issues must be addressed by the design team:

- AIR QUALITY
- COMFORT
- MOLD, MILDEW AND CORROSION
- OPERATING COSTS

Indoor air quality is affected by several key factors including relative humidity, air distribution, outdoor air, chemical-storage and water chemistry. The type of building being designed to house the pool will have an impact on each of these factors.

The relationship between relative humidity and indoor air quality is well documented. High relative humidity levels inside a building are well-known for their destructive effects on building components and can pose serious health concerns. They facilitate the growth of mold and mildew which, in addition to being unsightly, can attack wall, floor and ceiling coverings, while their spores can adversely impact the air quality. Condensation can also degrade many building materials.

Human comfort levels are very sensitive to relative humidity. Fluctuation of relative humidity outside the 40%-60% range can result in increased levels of bacteria, viruses, fungi and other factors that reduce air quality and lead to respiratory problems. (See 'Health Factors Vary with Relative Humidity' chart on this page).

The consequences of high humidity in indoor pools can be catastrophic. Besides being detrimental to health, there are many incidents on record of major damage, including roof collapse, as a result of the corrosive effects of water condensing within a building's support structure.

The operating costs of an indoor pool facility are most impacted by three factors:

- OPERATING TEMPERATURES
- BUILDING CONSTRUCTION
- AIR VELOCITY ON THE POOL WATER

The water temperature, air temperature and relative humidity desired by an owner will determine the size of the DRY-O-TRON® and the heating/cooling needs of the facility. A typical indoor pool is kept warmer than a regular room.

Consequently the heating requirements are greater than average while the cooling requirements are slightly less.

The type of building chosen to house the pool will significantly impact the cost of the mechanical system. An all-glass structure is the most expensive to heat and cool due to the poor insulation characteristics of glass, while a windowless room is less costly. Additionally, a large number of windows requires great care in the air distribution system to keep them condensation-free in cold weather.

The relationship between air velocity and the evaporation rate varies. To remove chloramines, air speed over the water's surface should be between 10 and 50 fpm. Excess air speed over the water's surface can raise the evaporation rate above design value. A balance must be established in order to maintain desirable air quality at the water's surface while not generating too much load for the dehumidification system.

One of the best solutions is to use the DRY-O-TRON® Environment Control System, in which the specialized mechanical dehumidification system is tailored to the specific application.

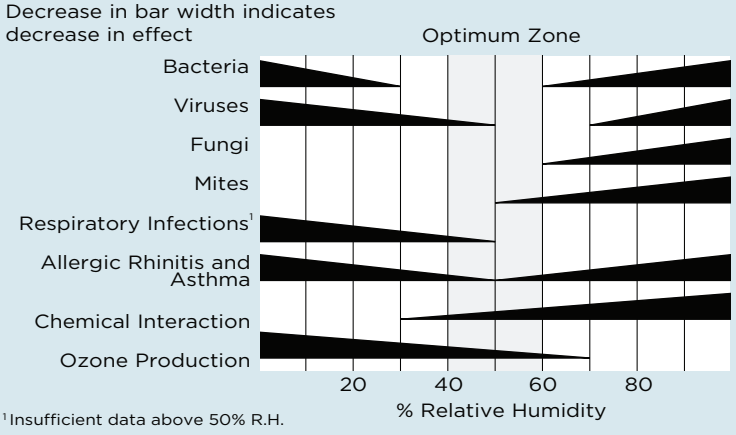
A well-designed dehumidification system will not only control humidity, but will recycle energy efficiently. Every DRY-O-TRON® features patented energy recycling, which provides simultaneous energy recovery and energy recycling for pool water and air heating.

Dectron's products and expertise can help the green building projects applying for the following LEED rating systems:

- LEED 2009 for New Construction and Major Renovations (NC).
- LEED 2009 for Core and Shell Development (CS).
- LEED 2009 for Schools New Construction and Major Renovations (Sch)

Dectron can support 5 prerequisites and 15 credits which total more than 20 points in Energy and Atmosphere, Indoor Environmental Quality, and Innovation in Design categories. Find more details in the Dectron LEED Support Guide.

HEALTH FACTORS VARY WITH RELATIVE HUMIDITY



[1] Insufficient data above 50% R.H.

Study by
Theodore Sterling Ltd.,
A. Arundel Research Associates
and Simon Fraser University

FAQs

SUSPENDED CEILINGS

Why are suspended ceilings not recommended?

They create an unconditioned space that is prone to condensation and corrosion problems. Pools with suspended ceilings are notorious for corroded hardware ('T' bars and hangers) and condensation-soaked tiles falling into the pool.

SKYLIGHTS

Why are skylights not recommended?

They are prone to condensation problems in colder weather. The quantity of supply air (3-5 CFM per ft^2 or 15-25 l/s per m^2 of glass) required for condensation control is sufficient to blanket the entire skylight. Visible ductwork may be required to supply this air to the skylight and can cause concerns about aesthetics with the owner.

DUCT DESIGN

How important is duct layout?

It is absolutely vital. The total quantity of supply air must be sufficient to provide four to eight air changes per hour (as recommended by ASHRAE) to prevent stagnation and air stratification. Care must be taken to ensure the entire space receives the required amount of air flow and to prevent supply air from short-circuiting to the return inlet. Air speeds of 10-50 FPM are recommended across the pool surface and in the direction of the return grille(s).

HEATING SPAS and WHIRLPOOLS

Can a DRY-O-TRON® be used to heat a whirlpool?

The economics of this option make it a good investment, but only for larger spas/whirlpools that represent more than 25 percent of the total evaporation from all pools.

SWIM MEETS

What special design concerns must be addressed?

A pool that will host swim meets has essentially two modes of operation: normal and swim-meet. A swim meet generally has a very large spectator load while the pool swimmer density is less than during normal operations. The Activity Factor for a swim meet should be 0.65 whereas in normal operation it would be 0.8-1.0, (as per the "Activity Factor" table on page 17). The designer should review computer models of each mode to ensure that the size of the selected unit is appropriate for both.

POOL COVERS

Are they recommended for daily use?

Experience shows that unless a pool cover is automatic, it will not be routinely used. A pool cover is important to have at a facility in the event of a power failure when the DRY-O-TRON® is not able to run. The use of a pool cover, however, does not affect the size of the DRY-O-TRON® required since it is sized for the load presented by the pool when in use.

CONDENSATE

What should be done with the condensate that comes from the unit?

The amount of condensate a DRY-O-TRON® recovers in a year is approximately the equivalent of one entire pool fill. The condensate from DECTRON's HyPoxy® coated coils is drinking-water quality and can be returned to the pool where local codes permit. It is usually reintroduced upstream of the filter or into the skimmer.

Contact your local representative for additional information.

COOLING

What if more cooling is required than the unit can provide?

If the DRY-O-TRON® selected has a capacity close to the minimum required, a unit one size larger would be the most cost effective solution. If the cooling requirement is significantly more than the selected DRY-O-TRON® supplies, the difference can be made up by a separate cooling circuit added to the DRY-O-TRON®, or a separate system by others (controlled by DRY-O-TRON®) with separate ducts.

AIR DIRECTION

Should air blow at the water surface?

Excess air movement at the water surface increases the evaporation rate. The U.S. Olympic Committee (USOC) does however recommend some air movement at the water surface for its facilities because a slightly higher concentration of chloramines (compared to the rest to the space) tends to remain there.

RETURN AIR

Should the return air inlet be near the spa?

This is not recommended. The air around the spa has the highest concentration of chloramines and can be the most corrosive air in the space. This could reduce the lifespan of the ductwork and equipment. A separate exhaust fan near the spa is recommended.

WET DECK

Why use wet deck area in lieu of total deck area to calculate the outdoor air requirement?

The purpose of outdoor air is to dilute the chemicals evaporating from the pool water. A section of deck that will never get wet does not contribute to air quality issues. As outdoor air is expensive to heat, cool and dehumidify, designing the outdoor air requirement to match the wet areas is a means of reducing the operating costs of the facility. Refer to ASHRAE 62.1 for recommended OA ventilation volumes for Wet and Dry deck area.

DUCT MATERIAL

What duct material is recommended?

The recommended duct material is standard galvanized sheet metal, aluminum, 316-grade stainless steel or fabric duct. Painted galvanized spiral ductwork is popular when the duct is exposed. Where pool-water chemistry or pool-chemical storage may not be as recommended, all metal duct should be protected by paint or coating. The entire ductwork system must be designed to be dry at all times, and all seams must be sealed with an approved duct sealant. If a below-grade duct system is used, non-metallic or PVC-coated round metal ductwork should be used.

DUCT INSULATION

Is it required?

If the temperature of the air surrounding ductwork might go below the dew point of the ducted air, or if the dew point of the surrounding air might go above the temperature of the ducted air, the duct should be insulated with at least two-inch (5 cm) fiberglass duct wrap on the outside of the duct, with a vapor-retarder. This will prevent condensation and heat gain/loss. Acoustic duct liner or fiber insulation should not be used inside the duct.

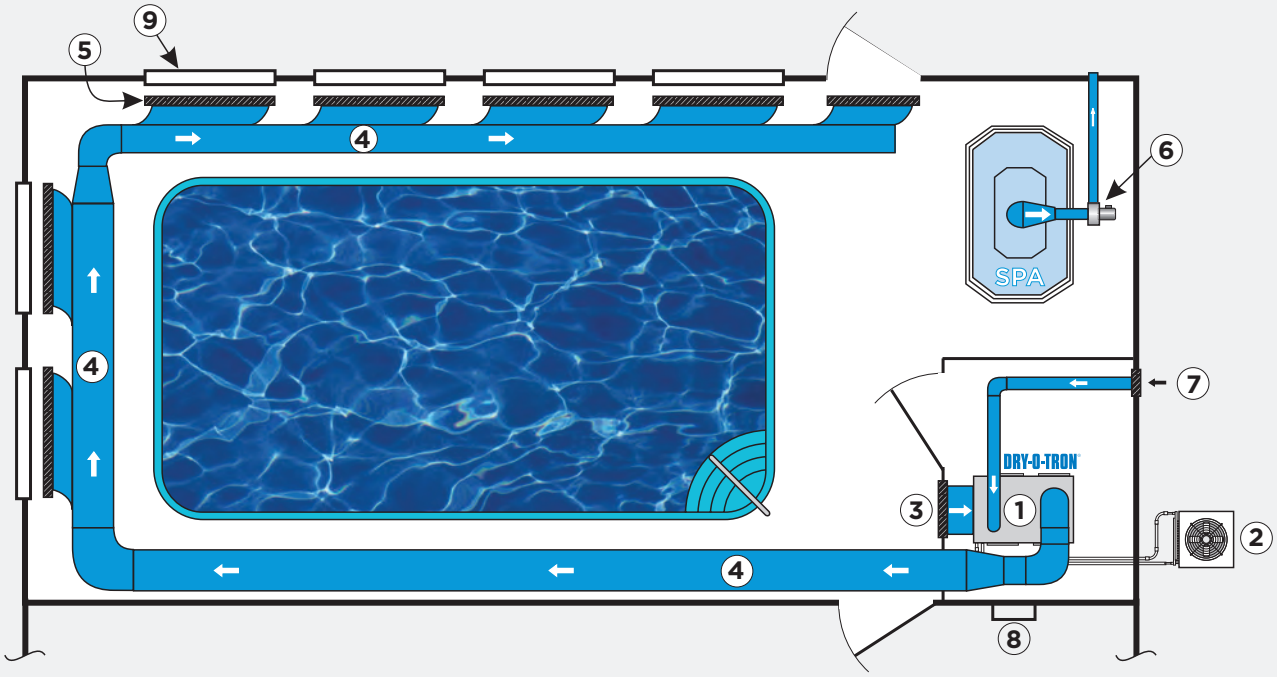
SMALL ROOMS

What is recommended for a room with only a therapy pool or whirlpool?

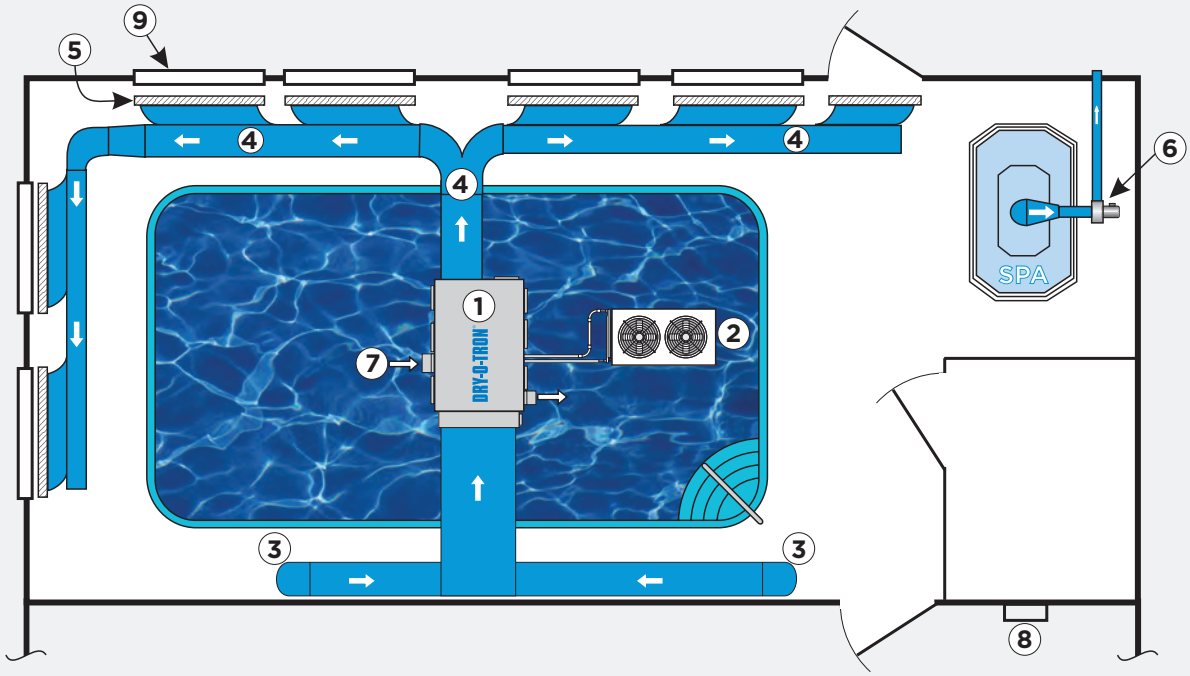
These smaller rooms are common in hotels and physical therapy clinics. The small dehumidification load and lower air flow requirement is an ideal application for Dectron's MAM Series.

Typical Installations

HOTEL/RESIDENTIAL



INSTITUTIONAL ROOFTOP



AIR DISTRIBUTION & DESIGN

Proper air distribution in a natatorium is critical to ensuring proper system performance and space conditions.

KEY TO PAGE 6

1. DRY-O-TRON®
Good air starts here. Proper selection and location of the DRY-O-TRON® ensures ideal system performance. There are many styles and options to choose from in order to allow the designer the best solution for the facility's specific needs.

2. OUTDOOR CONDENSER
The condenser should be located as close as possible to the DRY-O-TRON®. Water-cooled and glycol-cooled configurations are also available to reduce total system refrigerant charge.

3. RETURN AIR
The location of the return-air grille should optimize the overall air flow pattern of the facility. The goal is to ensure all areas receive enough air movement.

4. SUPPLY DUCT
Air distribution must be arranged to ensure all areas of the room receive proper air turnover. If overhead ductwork is used, ensure the air reaches the deck level to avoid stratification. All exterior glass must be fully covered by supply air, or must be heated by other means to maintain its temperature above natatorium-air dew point.

5. LINEAR DIFFUSERS
Supply air should be focused on exterior surfaces prone to condensation. 3 - 5 CFM per ft² (15 - 25 l/s per m²) of exterior glass is a good rule of thumb. The diffuser should be designed to fully cover the entire surface of all exterior windows.

6. EXHAUST FAN
DRY-O-TRON® units have two types of exhaust: minimum exhaust and purge exhaust. The location of the exhaust fan is flexible. It can be mounted in the DRY-O-TRON® or in the space. However, when the space has a spa or whirlpool, the exhaust fan should be by others and should be located directly above it. This expels the most chlorine-laden air before it can diffuse into the space and negatively impact the room air quality.

7. OUTDOOR AIR
The DRY-O-TRON® is configured to have outdoor air introduced at a factory-supplied opening ONLY. Units can have an outdoor air opening with a filter and balancing damper. Motorized dampers and time clocks are available to control damper operation.

8. MICROPROCESSOR
The remote operator panel should be located where the operator has easy access. Some operator panels can be located in the natatorium.

9. EXTERIOR WINDOWS
Windows and glass doors on an indoor pool's exterior walls present a special challenge to the natatorium designer. Exterior glass is especially susceptible to condensation when the outdoor temperature is low (see pages 12 & 15).

Dectron | CREATING THE RULES OF POOL DESIGN

DEHUMIDIFICATION LOAD
Water temperature, room temperature, relative humidity, activity level, spectator numbers and outdoor air dictate the load.

EXHAUST AIR
ASHRAE recommends the room be maintained at 0.05-0.15" WC (13-37 Pa) negative pressure relative to surrounding rooms. Ten percent more exhaust air than outdoor air is a good rule of thumb.

COOLING & HEATING
Outdoor air must be included in these load calculations.

TOTAL SUPPLY AIR
ASHRAE recommends 4-6 air changes per hour for non-spectator pools and 6-8 air changes per hour for spectator facilities.

REQUIRED ACCESS SPACE
Mechanical room access is critical for proper maintenance, service and duct design.

OUTDOOR AIR
ASHRAE Standard 62.1 recommends 0.5 CFM/ft² (2.5 l/s per m²) of pool and (wet) deck area and 15 CFM (7 l/s) per spectator. Dectron recommends that the larger of the two be used.

NO CONDENSATION ALLOWED
Proper air distribution and vapor retarder installation are crucial.

Duct Connections to DRY-O-TRON®

NOTE: Never compromise the return air duct connection as it negatively affects the performance of the entire unit. The supply air duct connection affects the performance of the blower. (See Industrial Ventilation, American Conference of Governmental Industrial Hygienists, section: Fans-systems effects.)

NOTE: Top or bottom air discharge is also available on all units.

"X" : For recommended duct lengths, refer to O & M Installation Manual.

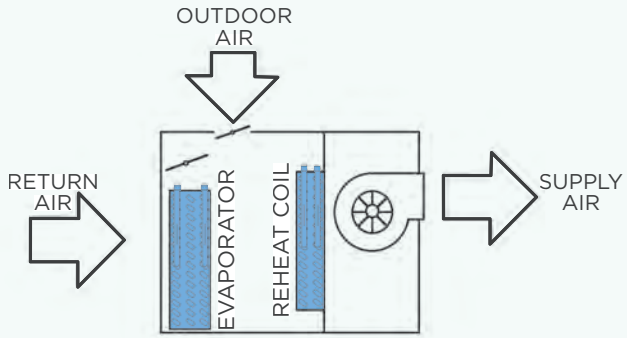
UNIT CONFIGURATIONS

State-of-the-Art Configurations for All Facilities

DRY-O-TRON® FEATURE CHART

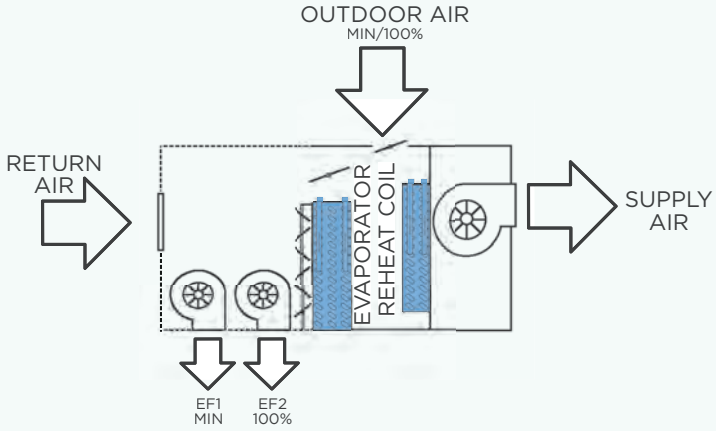
CONFIGURATION	EXHAUST AIR	OUTDOOR AIR	HEAT RECOVERY	INITIAL COST
CONVENTIONAL	REMOTE	MINIMUM	COMPRESSOR	LOWEST
DECTRON PURGE™	MIN./100%	MIN./100%	COMPRESSOR	MEDIUM
ECONOSAVER	MINIMUM	MINIMUM	COMPRESSOR	MEDIUM
ECONOMIZER	MIN./100%	MIN./100%	COMPRESSOR	HIGH
SMART SAVER	MINIMUM	MINIMUM	COILS & COMPRESSOR	HIGH

Conventional Unit



1. Ideal for hotels, therapy pools and residential pools.
2. Outdoor air opening sized for minimum code requirement. Filter and manual balancing dampers standard, with optional motorized dampers and 7-day time clock available (size: 040 and up).
3. Remote exhaust fan (over whirlpool, where applicable).

Dectron Purge™ Mode



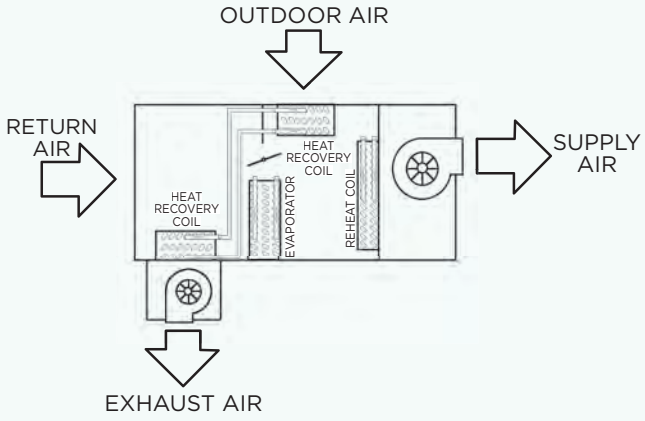
1. Ideal for facilities requiring frequent water shocking (superchlorination).
2. Exhaust fans can be unit mounted or remote.
3.

MODE	EF1	EF2	OA	FACE & BYPASS
Normal	On	Off	Min.	Open
Purge	On	On	100%	Closed

4. Motorized control of outdoor air, and face and bypass dampers.
5. EconoPurge economizer mode will operate whenever outdoor conditions permit and will override cooling mode compressor operation.

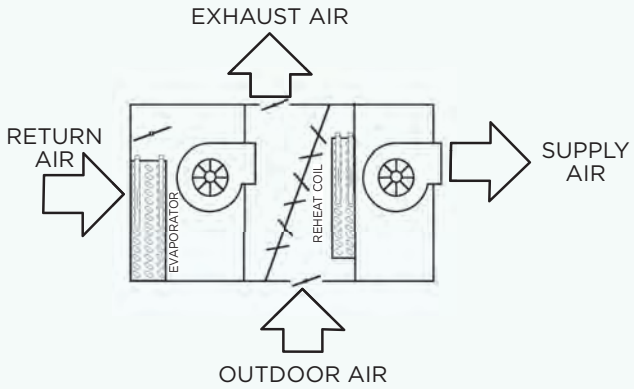
UNIT CONFIGURATIONS

Smart Saver



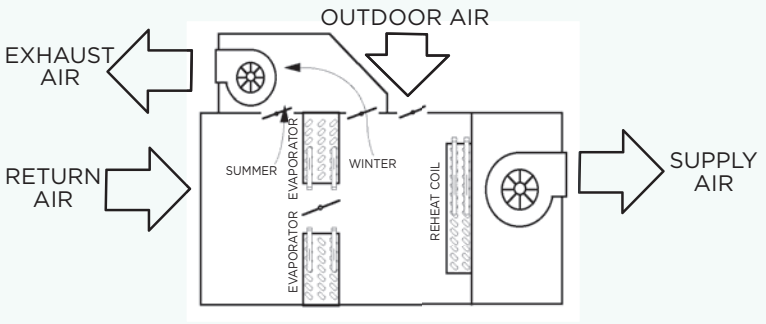
1. Ideal for colder climates where significant reduction in space heating is realized from heat recovery option.
2. Passive heat recovery device. Ideal for the harsh pool environment.
3. Recovers heat even when compressor is off.
4. Can be combined with Dectron Purge™ mode.

Economizer



1. Ideal for areas with weather mild enough for Economizer operation.
2. Unit has ability for full Dectron Purge™ mode.
3. Standard 7-day time clock, exhaust damper, mixed air damper and return air damper.

Econosaver

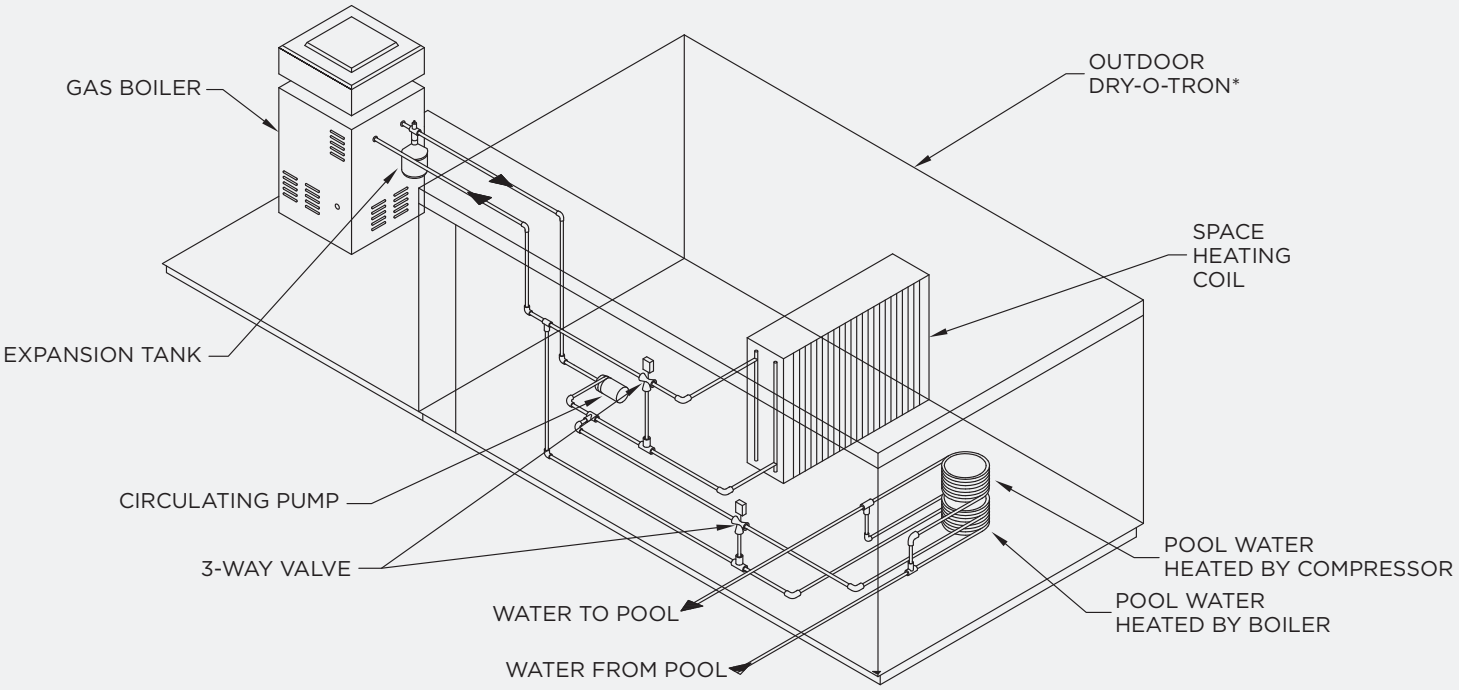


1. Ideal for systems requiring unit mounted air exhaust.
2. Heat recovery is accomplished with a compressor. Air is exhausted before or after the evaporator as seasonally appropriate.

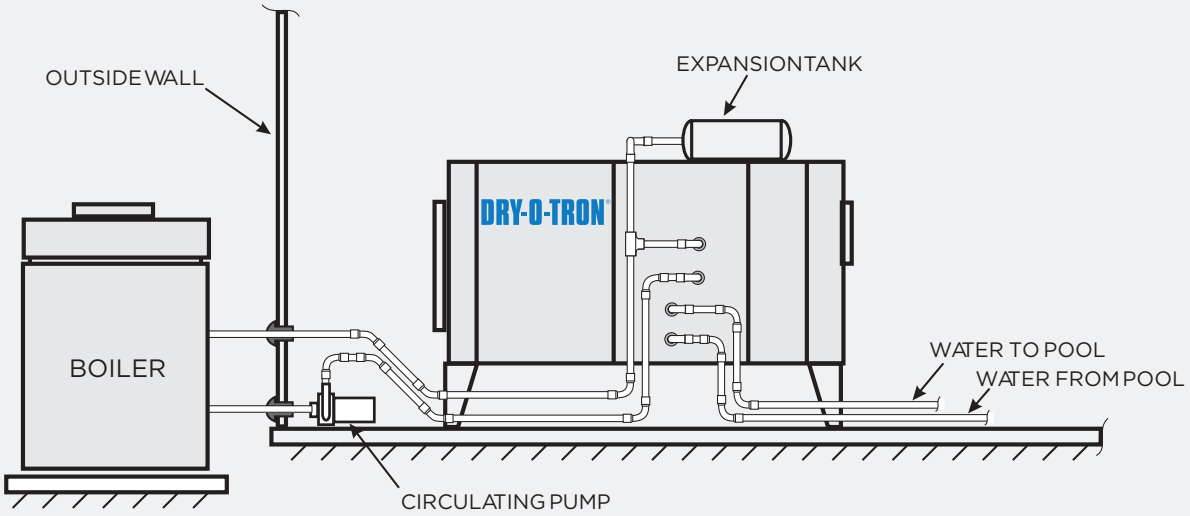
Gas Boiler Package for Space and Water Heating

Dectron has the industry's best solution for gas heating in a natatorium. The boiler package ensures absolute protection from cross-contamination and corrosion from flue gases. The boiler heats a secondary fluid circuit which circulates to a unit-mounted space heating coil and/or the auxiliary pool water heater resulting in a complete packaged environmental control solution.

OUTDOOR CONFIGURATION DRY-O-TRON®



SPLIT/INDOOR CONFIGURATION DRY-O-TRON®



POOL WATER CHEMISTRY

Pool water quality concerns not only human health and comfort, but also affects the space air quality and performance of the mechanical equipment.

The owner/operator of the natatorium is responsible for maintaining proper pool water chemistry.

Failure to maintain proper pool water chemistry will result in several on-site problems:

- **AIR QUALITY COMPLAINTS**
- **CORROSION**
- **COSTLY MAINTENANCE**
- **REDUCED EQUIPMENT LIFE**

Codes require that a separate, continuously ventilated space MUST be provided to store pool chemicals.

DO NOT STORE POOL CHEMICALS IN THE MECHANICAL EQUIPMENT ROOM OR IN ANY SPACE WHERE AIR MIGHT LEAK INTO THE MECHANICAL EQUIPMENT ROOM OR INTO THE NATATORIUM!

FOUL ODORS IN THE POOL AREA

The powerful, stinging smell that is often associated with indoor pools is not the smell of excess chlorine in the water, but of chloramines. They are a product of insufficient chlorine and can result in high levels of bacteria, fungi, viruses, etc. in the pool.
Maintaining proper chlorine levels and constant pH levels will eliminate the foul odors.
Airborne chloramines also have a strong affinity to pure water such as condensate. Stagnant condensate in walls and on windows can accumulate considerable amounts of chloramines, which can make the condensate acidic and corrosive. The prevention of condensate coupled with proper pool water treatment will reduce this problem.

pH LEVELS

High pH levels (>8.0) encourage scale formation which damages pool water heaters. With low pH levels, the water is acidic and corrosive, and may damage the metal parts in pumps and water heaters.
Maintaining pH levels between 7.4 and 7.6 will ensure a long life for your pool and pool equipment.

TESTING WATER CHEMISTRY

Compliance with ANSI/APSP standards for pool-water chemistry is essential for health, air quality, and corrosion protection. Proper testing is part of this.

Pool-water test kits must be used so as to determine accurately:

- **PH LEVELS**
- **TOTAL ALKALINITY**
- **FREE CHLORINE**
- **COMBINED CHLORINE**
- **DISSOLVED SOLIDS**
- **TOTAL HARDNESS**

CORROSION

Unbalanced pool-water chemistry leads to health problems and the deterioration of the pool building and equipment. Conversely, a well maintained pool with proper water treatment and sufficient make-up air offers a healthy environment that will not cause damage to the users, mechanical equipment or the structure.

Although it stands to reason that every pool operator does the utmost to create and maintain an optimum environment for patrons and equipment, mishaps do occur. Both swimmers and equipment have been endangered by exposure to abnormal chemical levels as a result of inaccurate pool chemical treatment or improper chemical storage.

Dectron has taken all possible commercially feasible precautions to protect its DRY-O-TRON® units against the corrosion caused by accidentally high chemical levels. This means that the equipment is resistant to unbalanced pool water (high or low pH levels) and airborne oxidizing agents, such as chloramines, for a short period of time.

Major corrosion protection features include:

- Vented cupro-nickel heat exchanger water heater circuit
- HyPoxy® coated fins on dehumidifying and reheat coils
- Coating of exposed copper tubing and steel parts, such as the blower shaft
- Use of plastic, cadmium-plated steel, brass and/or stainless steel hardware wherever possible
- High-quality painted cabinet

Pool Water Chemistry Parameters Suggested by NSPI*

	POOLS		WHIRLPOOLS	
	DESIRABLE RANGE	ACTION LEVEL	DESIRABLE RANGE	ACTION LEVEL
pH	7.4 - 7.6	N/A	7.4 - 7.6	N/A
Alkalinity	80 - 100 PPM	N/A	80 - 100 PPM	N/A
Free Chlorine	2.0 - 4.0 PPM	N/A	3.0 - 4.0 PPM	N/A
Combined Chlorine	0 PPM	0.2	0 PPM	0.5
Dissolved Solids (above new water)	100 - 300 PPM	1500	100 - 300 PPM	1500
Total Hardness	225 - 250 PPM	N/A	175 - 275 PPM	N/A

*Association of Pool and Spa Professionals

CONDENSATION & BUILDING DAMAGE

The architect and contractor must coordinate with each other to make certain the building is appropriate to enclose an indoor pool. Suitable materials and construction are crucial to ensuring the building envelope will perform properly.

The pool enclosure must be suitable for year round operation at 50% to 60% relative humidity and built per the latest building codes.

DEW POINT

The designer must establish the space dew point temperature to know where to locate the vapor retarder in the wall. From the table below one can see that a typical pool design of 82° to 86°F (28°-30°C), 50 to 60% has a dew-point range of 62° to 71°F (17°-22°C). Any surface with a temperature below the dew point will condense moisture (e.g. condensation forms on a can of soda because the can's surface temperature is below the air's dew point).

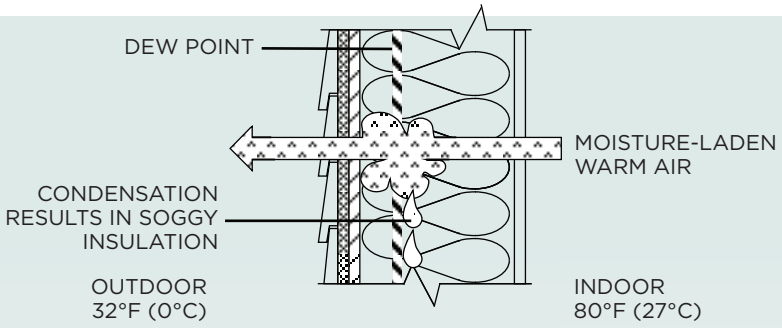
VAPOR RETARDER

The purpose of vapor retarder is to block moisture from penetrating into a wall or ceiling where it will encounter a temperature below the dew point and condense. **The vapor retarder is one of the most important components in protecting a building from moisture damage.** Failure to install the vapor retarder at the proper locations will result in condensation forming in the structure and all its consequential damage, including the possibility of structural decay and roof collapse. The vapor retarder must be sealed (taped) at all its seams and around all electrical outlets.

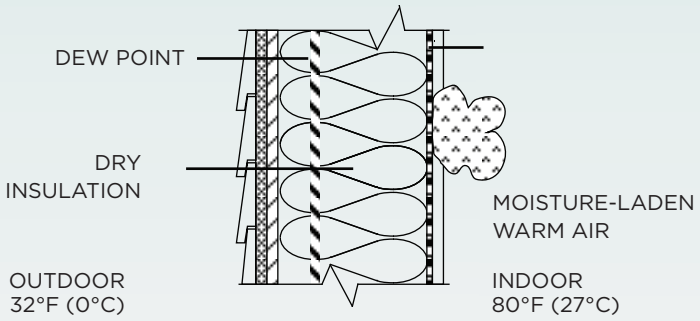
WINDOW DESIGN

Special attention should also be paid to exterior-glass components such as windows and patio doors. Due to their low insulation values, windows are usually the building element with the lowest inside surface temperature. Even a triple pane window can have an inside surface temperature below the room's dew point. Warm supply air or other heating means must be used to maintain the window and frame above dew point.

NO VAPOR RETARDER



VAPOR RETARDER



Do not build an indoor pool without a vapor retarder. Check the pool enclosure design (exterior walls and ceilings) for the proper vapor retarder location.

THERMAL BRIDGING

All other building elements that create thermal bridges must be avoided or be blanketed with warm supply air or other heating means to prevent condensation damage. Skylights are especially vulnerable to condensation because direct air supply to them is very difficult to achieve. Window frames and fire doors are also subject to thermal bridging.

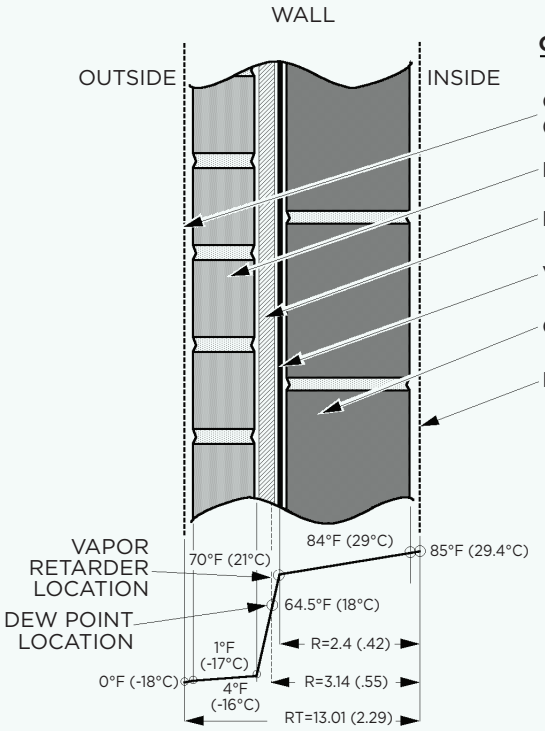
Dew Point Temperatures at Various Room Conditions*

RELATIVE HUMIDITY %	74°F	(23°C)	76°F	(24°C)	78°F	(26°C)	80°F	(27°C)	82°F	(28°C)	84°F	(29°C)	86°F	(30°C)
40	48	(9)	50	(10)	52	(11)	54	(12)	55	(13)	57	(14)	59	(15)
50	54	(12)	56	(13)	58	(14)	60	(16)	61	(16)	63	(17)	65	(18)
60	59	(15)	61	(16)	63	(17)	65	(18)	67	(19)	68	(20)	70	(21)

* It is recommended that space surface temperatures should never be allowed to approach to within 5°F (3°C) of the dew point.

Dew Point: The designer must know where it can occur

THE VAPOR RETARDER MUST BE INSTALLED ON THE WARM SIDE OF THE DEW POINT TEMPERATURE.



OUTSIDE WALL COMPOSITION	R, °F•ft²•h / Btu	R, m²•C / W
OUTSIDE AIR FILM (15 MPH (24 Km/h) WIND)	0.17	0.03
FACE BRICK 4" (10 cm)	0.44	0.08
RIGID POLYSTYRENE 2" (5 cm)	10.00	1.76
VAPOR RETARDER	———	———
CONCRETE BLOCK 8" (20 cm)	1.72	0.30
INSIDE AIR FILM (STILL AIR)	0.68	0.12
R TOTAL =	**13.01**	**2.29**

POOL ENCLOSURE AT 85°F (29.4°C) DB. 50% RH. **DEW POINT AT 64.5°F (18°C)**

R VALUE AT 64.5°F DEW POINT:

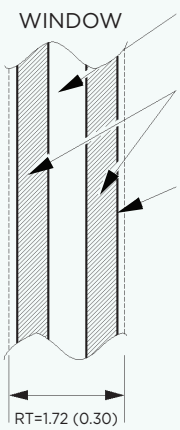
$$\frac{13.01}{85\,°F\ \Delta T} \times (85°F\ DB - 64.5°F\ DP) = 3.14$$

R VALUE AT 18°C DEW POINT:

$$\frac{2.29}{47.4°C\ \Delta T} \times (29.4°C\ DB - 18°C\ DP) = 0.55$$

NOTE: In order to move the dew point location further away from the vapor retarder, more insulation is required.

CONDENSATION WILL OCCUR ON GLASS UNLESS WARM AIR IS BLOWN AGAINST IT.



	R, °F•ft²•h / Btu	R, m²•C / W
OUTSIDE AIR FILM	0.17	0.03
DOUBLE GLAZING WITH 1/4" (6 mm) AIR SPACE	0.87	0.15
INSIDE AIR FILM (STILL AIR)	0.68	0.12
R TOTAL =	**1.72**	**0.30**

INSIDE WINDOW SURFACE TEMPERATURE

$$0°F + \left[\frac{85°F\ \Delta T}{1.72} \times (1.72 - 0.68)\right] = 51.4°F$$

$$-17.8°C + \left[\frac{47.2°C\ \Delta T}{0.30} \times (0.30 - 0.12)\right] = 10.8°C$$

NOTE: 51.4°F (10.8°C) is well below the room dew point of 64.5°F (18°C). Provide warm and dry supply air on inside window surface to prevent condensation.

CONTROLLING THE NATATORIUM ENVIRONMENT

A THERMAL FLYWHEEL OCCURS WHEN THE ENERGY LOST THROUGH EVAPORATION IS RETURNED BACK INTO THE POOL WATER.

The energy a pool loses through evaporation represents approximately 95% of its annual water heating requirement. The DRY-O-TRON® captures this heat as a by-product of the dehumidification process.

Use the DRY-O-TRON® to heat your pool water whenever possible. It's free heat!

Two unit configurations are available:

- DS SERIES
  can recycle heat to the pool water and to the room air.
- DA5 SERIES
  can recycle heat to the room air.

Both units consume the same amount of electricity annually to control space conditions. Consequently, it makes good economic sense to recycle the heat from pool water evaporation and return it to the water when feasible. Occasionally there are job site restrictions that make a water pipe connection to the unit impractical. The DA5 series is ideal for these types of applications. Whenever possible however, it makes sense to heat the pool water with the DRY-O-TRON® DS series. The payback period for piping, pumps and associated work is typically 2 to 3 years - an excellent investment.

How the DRY-O-TRON® Works

All DRY-O-TRON® units have been specifically designed to offer an all-round solution for natatorium environment control. They use a mechanical refrigeration system to dehumidify the moist air.

This results in:

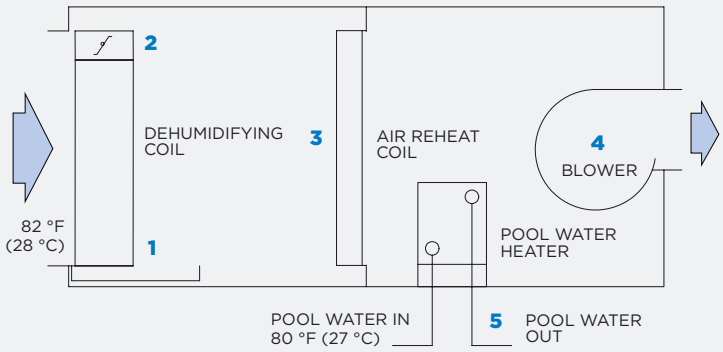
- Comfortable, dry air.
- Energy savings in water heating. (An auxiliary pool water heater is required for fast temperature recovery after backwash and turbidity reduction).
- Energy savings in space heating. (A space heating coil must be available year-round to maintain the space temperature).

This process's energy cycle is 100% efficient since all the latent heat of the moisture is converted into sensible heat for recycling. Furthermore, the electrical energy required to operate the system is also converted into sensible heat and contributes to space heating. The whole system's energy is recycled!

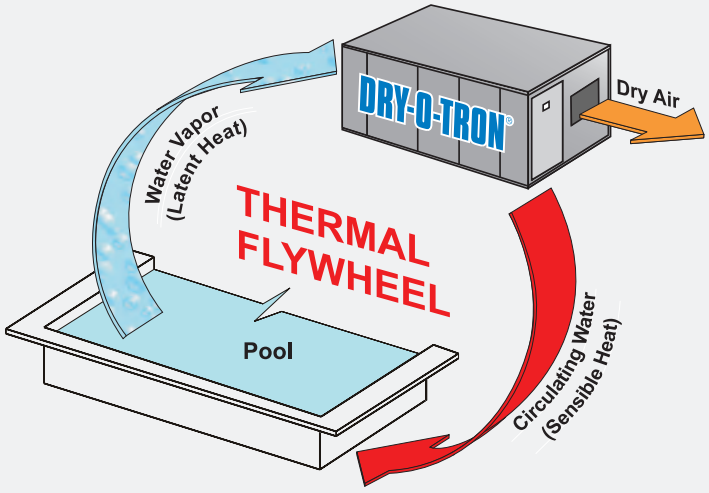
In the DRY-O-TRON®, warm humid air passes through the dehumidifying coil and is cooled to below its dew point, thereby condensing moisture. The heat captured by this process is combined with the heat generated by the compressor's power consumption. These two forms of recovered heat are then available for recycling.

The DRY-O-TRON® has the capability of simultaneously and continuously recycling heat to air and water. This ensures that a more stable natatorium environment is maintained.

DRY-O-TRON® side view section



The Thermal Flywheel



Standard Operating Temperatures °F (°C)

OPERATING MODE	1	2	3	4 DA5	4 DS	5 DS
Dehumidification	50 (10)	82 (28)	66 (19)	102 (39)	95 (35)	84 (29)
Pool Water Heating	47 (8)	82 (28)	65 (18)	N/A	82 (28)	96 (36)
Air Conditioning	50 (10)	82 (28)	66 (19)	67 (20)	67 (20)	84 (29)
A/C plus Pool Heating	47 (8)	82 (28)	65 (18)	N/A	66 (19)	96 (36)

Pool water heating by the DRY-O-TRON®, a huge bonus!

SYMBOL				EXAMPLE
Step 1	T_p	Pool Water Temperature	°F (°C)	80°F (27°C)
Step 2	T_a	Air Temperature	°F (°C)	82°F (28°C)
Step 3	ERF_{60}	Evaporation Rate Factor, Active Hours (from table on page 17, use 60% RH)	lb/h•ft² (kg/h•m²)	.036 lb/h•ft² (0.176)
Step 4	ERF_{50}	Evaporation Rate Factor, Non-Active Hours (from table on page 17, use 50% RH)	lb/h•ft² (kg/h•m²)	.048 lb/h•ft² (0.235)
Step 5	H_{60}	Number of Active Hours Per Day	h	10 h
Step 6	H_{50}	Number of Non-Active Hours Per Day 24 - H_{60} =	h	14 h
Step 7	AF	Activity Factor (see table on page 17)		0.65
Step 8	ERF_{avg}	Average Evaporation Rate Factor (H_{60} x ERF_{60} x AF + H_{50} x ERF_{50} x 0.5) ÷ 24 =	lb/h•ft² (kg/h•m²)	.024 lb/h•ft² (.116 kg/h•m²)
Step 9	A_p	Pool Water Surface Area	ft² (m²)	2,250 ft² (209 m²)
Step 10	ER	Pool Evaporation Rate A_p x ERF_{avg} =	lb/h (kg/h)	54 lb/h (24.5 kg/h)
Step 11	EC_p	Energy Consumption to Heat Pool Water ER x 8,760 h/yr x 1,100 Btu/lb (.71 kWh/kg)=	Btu/yr (kWh/yr)	520,344,000 Btu/yr (152,460 kWh/yr)
Step 12	$$$	Convert Pool Energy Usage into Annual Heating Cost		
Annual Savings **$540 / HP**		**Heat Pool Using Gas** (@ $0.90/CCF, $0.031 kWh) EC_p ÷ 100,000 Btu/Therm ÷ 75% efficiency x $/CCF = **The DRY-O-TRON® saves 80% of this cost.**	$/yr	$6,246 per year **- $4,995 !!**
Annual Savings **$1,400 / HP**		**Heat Pool Using Electricity** (@ $0.12/kWh) EC_p ÷ 3,413 Btu/kWh x $/kWh = **The DRY-O-TRON® saves 80% of this cost.**	$/yr	$18,300 per year **- $14,640 !!**

Thanks to the DRY-O-TRON®, the annual savings derived from pool water heating are significant.

ESTIMATED ANNUAL SAVINGS FROM DRY-O-TRON®'S WATER HEATING*

MODEL	10	15	20	30	40/42	50	60/62	80/82	100/102	120/122	150/152	162/164	182/184	202/204	242/244	282/284	322/324	362/364	402/404	482/484	562/564	804/808
Nominal Comp. HP	2.0	2.5	3.5	5.0	8.0	10.0	12.5	15.0	20.0	25.0	30.0	35.0	40.0	44.0	50.0	60.0	70.0	80.0	90.0	100.0	120.0	180.0
Gas	$1,080	$1,350	$1,890	$2,700	$4,320	$5,400	$6,750	$8,100	$10,800	$13,500	$16,200	$18,900	$21,600	$23,760	$27,000	$32,400	$37,800	$43,200	$48,600	$54,000	$64,800	$97,200
Electricity	$2,800	$3,500	$4,900	$7,000	$11,200	$14,000	$17,500	$21,000	$28,000	$35,000	$42,000	$49,000	$56,000	$61,600	$70,000	$84,000	$98,000	$112,000	$126,000	$140,000	$168,000	$252,000

* 75% Eff. gas @ $0.90/CCF ($0.031 kWh) and electricity @ $0.12/kWh

COMPUTERIZED MODEL SELECTION

Dectron has developed the only load calculation program (DOTS) in the industry that can model a system's entire performance. In addition to pool water evaporation, DOTS also includes the impact of spectators and outdoor air on an indoor environment. The DOTS load estimation program incorporates all the key design parameters, including ASHRAE ventilation requirements, to help guide the designer in meeting the necessary codes.

Simply fill out the data form below and send it to your local Dectron representative. They are eager to show you DOTS's capability and help engineer the system to satisfy your natatorium environmental control needs.

Project Information

Project Name .....

Project Address .....

Equipment Tag .....

Natatorium Data

Indoor Air Design Dry Bulb ..... °F (°C)

Indoor Air Design Relative Humidity ..... 50-60% RH

Pool Wet Deck Area ..... ft^2 (m^2)

Outdoor Air for Ventilation .....CFM (l/s)

Number of Spectators .....

Number of Active Hours/day ..... h

Electrical Power..... Volts.....Phase, 60 Hz

Enclosure Volume..... ft^3 (m^3)

Desired Air Changes/hour ..... 4 ..... 6 ..... 8 .....

Summer Design Dry Bulb .....°F (°C)

Summer Design Wet Bulb .....°F (°C)

Winter Design Dry Bulb.....°F (°C)

Pool Data

	POOL #1	POOL #2	POOL #3	POOL #4	POOL #5
Pool Surface Area ..... ft^2 (m^2)					
Pool Water Temperature ..... °F (°C)					
Type of Pool (private, hotel, whirlpool, etc.)					
Activity Factor					
Water Heated by DRY-O-TRON®?					

Air Conditioning Data

Cooling Load (including Outdoor Air).....

Air on Condenser/Dry Cooler .....°F (°C) Voltage

Distance to Condenser/Dry Cooler .....

Condenser/Dry Cooler..... Above ..... Below ..... Same

Water Cooled..... max EWT.....

Cooling Tower..... Closed Loop .....

Indoor Unit ..... Outdoor Unit .....

Purge Mode ..... Economizer.....

Vertical ..... Smart Saver .....

Heating Data

Heating Load (including Outdoor Air) .....

Unit Mounted..... Remote Mounted .....

Electric..... kW ..... Stages .....

Hot Water Coil ..... EWT ..... LWT ..... GPM(l/s)

Steam Coil..... psig(kPa)

Gas Boiler ..... Space Heating..... Water Heating

Exhaust Fan ..... Unit Mounted.....Remote

Air Discharge..... Top .....Bottom

Air Return..... Top .....Bottom

COMPUTERIZED MODEL SELECTION

LOAD CALCULATION

Proper equipment sizing depends on the accuracy of design condition data since water evaporation from the pool surface increases when:

- Pool water temperature increases
- Room air temperature decreases
- Room air relative humidity decreases
- Water agitation and splashing increases
- Wet deck area increases

Proper calculation of the Evaporation Rate depends on the correct evaluation of the Activity Factor. The difference in the rate of evaporation between a private pool and an active public pool is more than 100%.

Through extensive field experience Dectron has developed Evaporation Rate tables for various operating conditions. Dectron also invented the Activity Factor table of measurement, which has become the industry standard and has been adopted by all manufacturers in the industry. The Activity Factor is extremely important in determining pool water evaporation as it evaluates the change in evaporation rate due to the activity in and around the pool.

Using the right Activity Factor ensures that a DRY-O-TRON® unit will maintain the humidity level at 50% during non-active periods and will not exceed 60% during active periods. Special purpose projects, such as water slides and wave pools, require careful unit selection. Contact your local Dectron representative for assistance.

Natatorium Design Conditions °F (°C)

TYPE OF POOL	AIR TEMPERATURE	WATER TEMPERATURE	RELATIVE HUMIDITY
Recreational	75~ 85 (24~29)	75~ 85 (24~29)	50 to 60%
Therapeutic	80~ 85 (27~29)	85~ 95 (29~35)	50 to 60%
Competition	78~ 85 (26~29)	76~ 82 (24~28)	50 to 60%
Diving	80~ 85 (27~29)	80~90 (27~32)	50 to 60%
Elderly Swimmers	84~ 90 (29~32)	85~ 90 (29~32)	50 to 60%
Hotel	82~ 85 (28~29)	82~ 86 (28~30)	50 to 60%
Whirlpool / Spa	80~ 85 (27~29)	97~104 (36~40)	50 to 60%

Actual operating temperatures and relative humidity conditions should be established before design. How the area will be used usually dictates design (table above). Source: 2011 ASHRAE Handbook HVAC Applications

Activity Factor (AF)

TYPE OF POOL	ACTIVITY FACTOR
Residential	0.5
Fitness Club/Condominium	0.65
Therapy/Aquafit/Elderly Swim	0.65
Hotel	0.8
Institutional (School)	0.8
Public Pools (with family programs)	1.0
Spas and Whirlpools	1.0
Water Slides, Wave Pools, Water Cannons, Fountains	Contact Dectron Representative

Evaporation Rate Calculation*

FOR POOLS AND WHIRLPOOLS

Evaporation Rate lb/h (kg/h) = ERF x AF x Pool Water Surface Area ft² (m²)

where: ERF = Evaporation Rate Factor (table below)

AF = Activity Factor (table above)

*Based on Equation (2), Chapter 5 of 2011 ASHRAE Handbook HVAC Applications

Evaporation Rate Factor — lb/h • sq.ft. (kg/h • m²)

POOL WATER TEMP. AIR TEMPERATURE °F (°C) — RELATIVE HUMIDITY 50% / 60%

°F (°C)	86°F 50%/60%	(30°C) 50%/60%	84°F 50%/60%	(29°C) 50%/60%	82°F 50%/60%	(28°C) 50%/60%	80°F 50%/60%	(27°C) 50%/60%	78°F 50%/60%	(26°C) 50%/60%
78 (25.5)	.034/.020	(.166/.098)	.038/.026	(.186/.127)	.040/.030	(.196/.147)	.044/.034	(.205/.719)	.048/.038	(.225/.088)
80 (27)	.042/.026	(.205/.127)	.046/.032	(.225/.157)	.048/.036	(.235/.176)	.050/.040	(.245/.186)	.054/.046	(.254/.215)
82 (28)	.048/.034	(.235/.166)	.052/.038	(.254/.186)	.054/.044	(.264/.215)	.058/.048	(.274/.225)	.062/.052	(.293/.245)
84 (29)	.056/.040	(.274/.196)	.060/.046	(.293/.225)	.062/.050	(.303/.245)	.066/.056	(.313./.264)	.070/.060	(.333/.284)
86 (30)	.062/.048	(.303/.235)	.068/.054	(.333/.264)	.070/.060	(.342/293)	.074/.064	(.352/.293)	.076/.068	(.372/.323)
88 (31)	.072/.058	(.352/.284)	.076/.062	(.372/.303)	.078/.066	(.381/.323)	.082/.072	(.391/.342)	.086/.076	(.411/.362)
90 (32)	.080/.066	(.391/.323)	.084/.070	(.411/.342)	.086/.076	(.421/.372)	.90/.080	(.430/.381)	.094/.084	(.450/.401)
92 (33)	.090/.074	(.440/.362)	.094/.080	(.460/.391)	.098/.084	(.479/.411)	.100/.090	(.479/.430)	.102/.094	(.489/.450)
94 (34)	.098/.084	(.479/.411)	.104/.090	(.509/.440)	.106/.094	(.518/.460)	.108/.098	(.528/.469)	.112/.104	(.538/.489)
96 (35.5)	.110/.094	(.538/.460)	.114/.100	(.558/.489)	.116/.104	(.567/.509)	.120/.110	(.577/.518)	.122/.114	(.587/.548)
98 (37)	.120/.106	(.587/.518)	.124/.112	(.606/.548)	.126/.116	(.616/.567)	.130/.120	(.626/.577)	.134/.124	(.597/.597)
100 (38)	.132/.118	(.645/.577)	.136/.122	(.665/.597)	.138/.128	(.675/.626)	.142/.132	(.685/.636)	.146/.136	(.704/.655)
102 (39)	.144/.130	(.704/.636)	.148/.134	(.724/.655)	.150/.140	(.734/.685)	.154/.144	(.743/.694)	.158/.148	(.763/.714)
104 (40)	.156/.142	(.763/.694)	.160/.146	(.782/.714)	.162/.152	(.792/.743)	.166/.156	(.802/.753)	.170/.160	(.831/.773)

COMPUTERIZED MODEL SELECTION

WHAT IS THE ACTIVITY FACTOR FOR A PIRATE SHIP? OR WATER CANNONS AND FLOATING FISH?

Determining the Evaporation Rate Factor lb/h • sq.ft. (kg/h • m^2)

DESIGN CONDITIONS

A designer must understand the operating requirements of the customer to accurately calculate the Activity Factor and Evaporation Rate. These conditions can change drastically based on the intended use of the pool. Therapy and aquafit water temperatures are considerably higher than lap swimming. A pool room's relative humidity level should be 50% - 60%. Air temperatures normally range from 80°F - 85°F (27°C - 29°C). If the pool area serves other purposes (e.g. receptions), there may be a need for cooler air temperatures at these times.

PRIVATE POOLS are usually classified as family pools. Desired water temperatures range between 82°F - 85°F (28°C - 29°C) with corresponding air temperatures of 78°F - 80°F (26°C - 27°C). If the pool is used as an exercise or lap pool, the water temperature is usually kept between 76°F (25°C) and 80°F (27°C). The Activity Factor is normally 0.5.

WHIRLPOOLS AND SPAS have water temperatures ranging from 102°F - 104°F (39°C - 40°C) and an Activity Factor of 1.0 due to the agitation caused by the bubblers.

HOTEL POOLS are used for pleasure swimming. Here the water temperature is usually kept near 84°F (29°C). The air temperature can vary however, since the enclosure may also be used as a lobby, restaurant, bar, etc. The Activity Factor is normally 0.8.

THERAPY POOLS generally have warm water temperatures to keep the patient from being cold. Water temperatures are typically 88°F - 94°F (31°C - 35°C) with an Activity Factor of 0.65.

AQUAFIT PROGRAMS tend to have warmer water temperatures despite being an exercise application. Water temperatures can range from 84°F – 88°F (29°C - 31°C) with an Activity Factor of 0.65.

WATER SLIDES are usually included as part of an attraction. There are two types (open and covered) and each has the Evaporation Rate calculated in a different manner. Contact the factory for additional help.

OPEN SLIDES are calculated based on the wet area, which is generally half the circumference. The Activity Factor is normally 1.5.

COVERED SLIDES or tubes discharge saturated air at a velocity of 500 ft./min (2.54 m/s) from the tube outlet. The load to the space is calculated based on the area of the tube opening.

WATER CANNONS, WATER FOUNTAINS, WATER MUSHROOMS AND WATER ARCHES are special applications and the factory should be contacted to help calculate their Evaporation Rates.

WATER FALLS are very popular in hotels and residences. It is important to accurately calculate the total exposed surface area of water (as sometimes both sides are exposed to air). The Activity Factor is normally 1.5.

WAVE POOLS are another popular pool type, although no published information exists to scientifically establish Evaporation Rates. Fortunately, Dectron's experience will help the designer to develop a load based on previous successful projects.

DRY-O-TRON® SPECIFICATIONS

DRY-O-TRON® — The quality benchmark for energy recycling dehumidifiers and pool water heaters

HyPoxy® Coils
DRY-O-TRON® Quality

Dectron uses state-of-the-art computer design and model selection programs that incorporate ASHRAE ventilation requirements, to design the right DRY-O-TRON® system for every application.

Dectron's impressive double-walled enclosures comprise of:

- Welded 'C' beam frame
- Twelve-gauge base and 14-gauge enclosure
- Double-wall construction with a painted inner liner
- Hinged doors
- Double doors on the electrical panel
- Continuous raised compression gasket door seals
- Adjustable tension cam latches
- Leakproof roof with specially designed inverted 'U' channel snap seams
- Completely weatherproof
- Stainless steel hardware
- Two-inch (51 mm) insulation
- Powder-coat paint process with 1,000 hours ASTM B117 Salt Spray Test

STANDARD CASING

Heaviest gauge satin-coated steel casing construction in the industry. Electrostatically applied baked powder or epoxy paint inside and outside.

COILS

HyPoxy® coils, specifically designed and developed for DRY-O-TRON® units, accelerate the draining of entrained moisture and also act as a protective barrier for the aluminum fin e surface. The HyPoxy® coating enhances performance and extends the life of the coils.

CONTROLS

The industry's most sophisticated controls are standard on all DRY-O-TRON® units. Intricate unit-mounted sensors monitor all aspects of unit performance as well as maintain optimum space and water temperatures.

THE FEATURES

- Patented simultaneous energy recycling for smooth environment control
- Standard microprocessor control with calibrated and tested unit-mounted sensors
- Guaranteed space and pool temperature conditions - in writing!
- Designed to easily provide make-up air as per ASHRAE Standard 62.1
- Self-compensating water heating control, regardless of water flow, complete with high temperature safety interlock
- Remote operator panels
- Man Machine Ethernet Interface (MMI)
- BMS Interface (BACnet™ / MODBUS / LonWorks™)
- Fully factory tested at design conditions
- CSA certified and ETL listed
- Self-test diagnostics
- Occupied/unoccupied period program
- Corrosion-proof, sanitary drip pan
- Vented CuNi pool water heater
- Water Smart Design feature

DRY-O-TRON® SPECIFICATIONS

Quality Control

Each DRY-O-TRON® undergoes the most comprehensive quality control tests in the industry. In addition to a full performance test of all components and all modes at design conditions, each unit undergoes a 16-point design review and a 60-point quality control inspection. Dectron's extensive pre-usage testing guarantees that every DRY-O-TRON® functions at optimum conditions throughout the year.

Quality Control Acceptance Report

Dectron's uncompromising quality and performance standards extend to its after-sales service. Its 24-hour Service Support Hotline, together with its North American network of dedicated factory-certified technicians, guarantees immediate solutions to any problems that may arise.

Intertek

OPERATIONAL DATA

NOTE: To Obtain Adequate Readings, a Delay of Ten (10) Minutes is Required Between Every Operation or Adjustment

For 2 compressor units		A/C & Pool Heating	Dehumidification	Whirlpool Heating	A/C Only	A/C & Pool Heating	Whirlpool Heating
Entering Air Temperature	°F	82	82	82	82	82	82
Leaving Air Temperature	°F	82	95	82	67	66	66
Entering Water Temperature	°F	80	80	102	80	80	102
Leaving Water Temperature	°F	96	85	116	85	96	116
Pool Heater Water Flow	GPM	20	20	20	20	20	20
Whirlpool Heater Water Flow	GPM	8	8	8	8	8	8
Room Relative Humidity	%	50	50	50	50	50	50
High Pressure	PSIG	265	265	225	225	225	225
Suction Pressure	PSIG	60	60	60	60	60	60
Oil Pressure	PSIG	105	105	105	105	105	105
Sight Glass Clear	(Y/N)	Y	Y	Y	Y	Y	Y
Bulb Temperature TX Valve	°F	55	55	55	55	55	55
Compressor Discharge Temp	°F	195	195	195	195	195	195
Air Leaving Evaporator Temp	°F	50	50	50	50	50	50

APPROVED Q.C.

Installation and Service Certification Training School

At the industry's first dehumidifier training school, DRY-O-TRON® experts hold comprehensive intensive seminars on state-of-the-art design, visual applications and hands-on dehumidifier training. Programs, with varying curriculums, are tailored to satisfy the specific needs of technical and service people as well as facility managers.

Dectron Rep Training

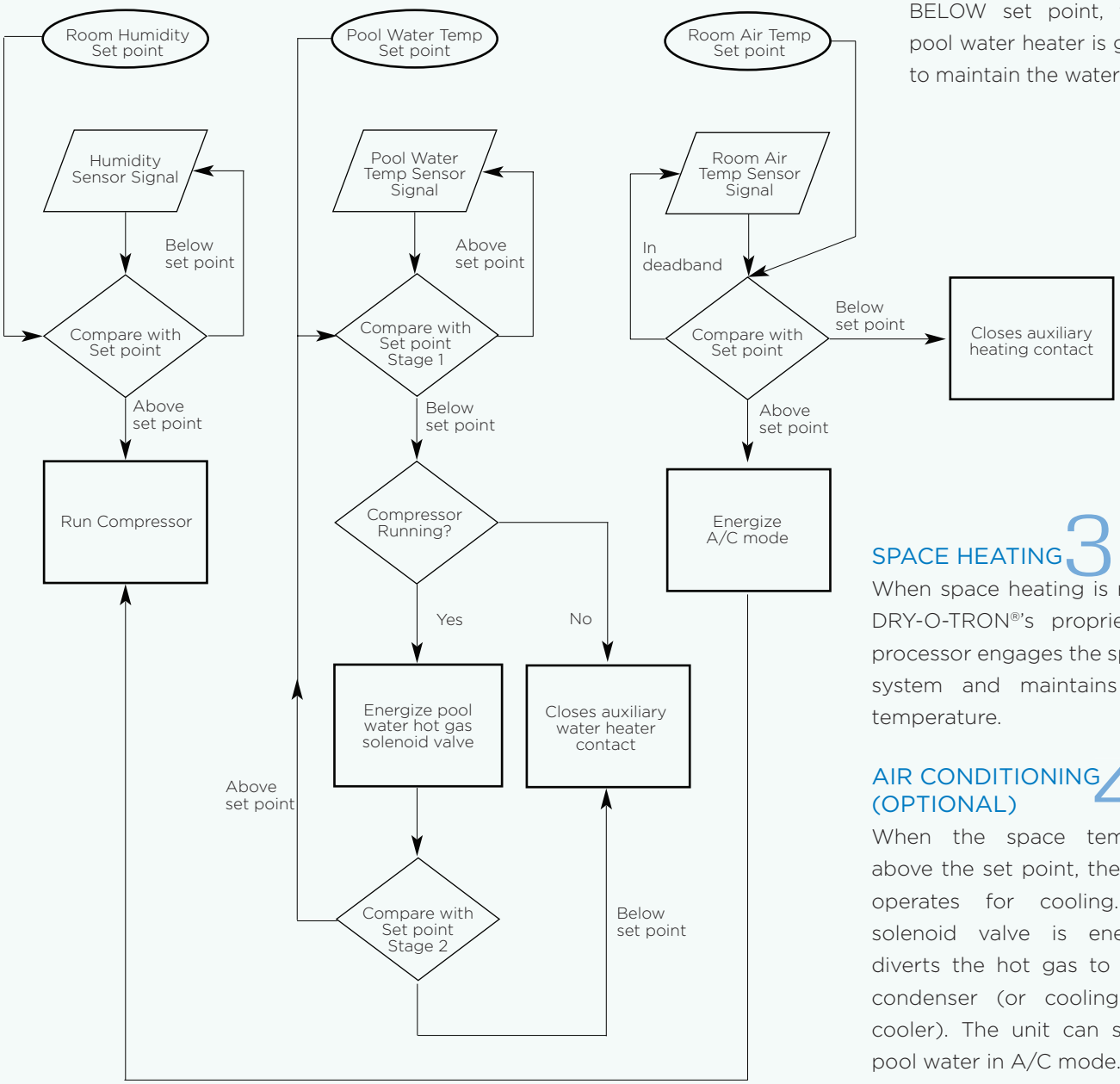
Representative sales training seminars are held periodically for incoming and veteran Dectron sales reps providing innovative technological advancements.

OPERATING SEQUENCE

Every DRY-O-TRON® has four basic modes of operation:

DEHUMIDIFICATION 1

Every DRY-O-TRON® unit's compressor automatically starts dehumidification operation when the relative humidity of the space is above the set point. Hot gas from the compressor is directed to the reheat coil unless cooling or water heating is required.



POOL WATER HEATING (UNIT WITH AUXILIARY POOL WATER HEATER) 2

If the compressor is already ope rating (dehumidification or air conditioning), its hot gas is directed to the pool water heater. If the space humidity level is BELOW set point, the auxiliary pool water heater is given a signal to maintain the water temperature.

SPACE HEATING 3

When space heating is required, the DRY-O-TRON®'s proprietary micro-processor engages the space heating system and maintains the space temperature.

AIR CONDITIONING (OPTIONAL) 4

When the space temperature is above the set point, the compressor operates for cooling. The A/C solenoid valve is energized and diverts the hot gas to the outdoor condenser (or cooling tower/fluid cooler). The unit can still heat the pool water in A/C mode.

MICROPROCESSORS

THE BRAIN OF EVERY DRY-O-TRON® IS A POWERFUL MICROPROCESSOR

SUPERVISAIRE® Controller

- Factory installed and tested.
- All sensors are factory-installed on the unit
- Backlit user-friendly interface
- Multiple language selection for menus
- Remote operator panels available
- BACnet™, LonWorks™ and MODBUS™ compatible
- Built-in local area networking capability for multiple-unit DRY-O-TRON® installations
- Graphics display optional on remote supervisory panel
- High capacity event savings and alarm log
- Factory programmable for custom applications
- Expandable design can accomodate any requirement
- Built-in diagnostics and optional data logging for easy service
- High program execution speed and efficient real time management
- Password protection provided for security purposes
- Remote BMS access to all functions available
- Self-extinguishing plastic case

BACnet™ LonWorks Modbus

HT800 Controller

- Simple installation, no other controls required
- Control panel can be remote mounted up to 1000 feet (300 m) away
- User-friendly with simple 5-key operation
- Highly reliable, precise automatic control
- Built-in diagnostics for easy service
- Controls and monitors humidity, water temperature, air temperature (heating and cooling) and ventilation
- Obtains status of all sensors and safety cut-outs
- Unit-mounted sensors

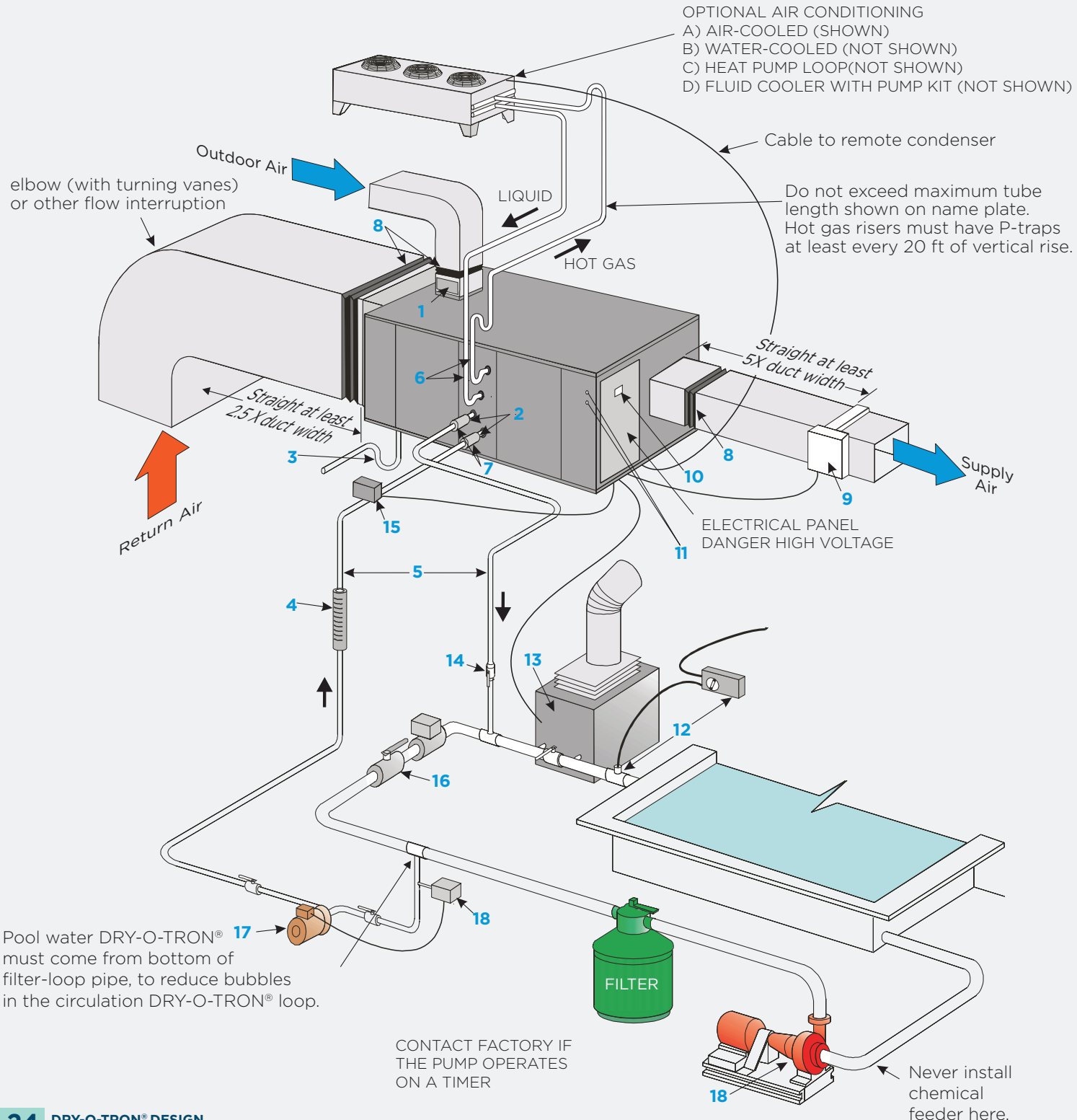
DRY-O-TRON® by Dectron

Remote access to the DRY-O-TRON® by your service company!

Dectron and its North American network of certified technicians offer 24-hour-a-day monitoring and service support from their central terminal.

DRY-O-TRON® Energy Recycling Indoor Pool Environment Control

BUILDING CONSTRUCTION MUST ACCOMMODATE THE ARRANGEMENTS BELOW.



OPERATING SEQUENCE

1. OUTDOOR AIR FILTER AND MANUAL DAMPER
   - Optional motorized damper actuator
   - Seven-day time clock
2. POOL WATER ISOLATION VALVES (BY OTHERS)
3. P-TRAP AND CONDENSATE DRAIN (BY OTHERS)
   - Must be installed and filled with water
   - Failure to install the P-trap will cause the drip pan to overflow and flood areas beneath the DRY-O-TRON®
   - Condensate to be returned to the pool via the skimmer (consult local codes)
   - Optional side connection available
4. WATER FLOW METER (BY OTHERS)
5. POOL WATER CONNECTION (BY OTHERS)
   - Water circuit components must be of non-corrosive material
   - Schedule 40 thermoplastic pipe
   - Pool water piping must be the same size as the connection on the DRY-O-TRON®
   - Increase the pipe size if the DRY-O-TRON® and the bypass (throttling) valve are more than 10 feet apart
6. AIR CONDITIONING (OPTIONAL)
   - Pipe must be the same size as the connection on the DRY-O-TRON®
   - Optional water-cooled or dry-cooler heat rejection
   - Pipe must be supported so as to prevent torques or axial or radial forces from being applied to the unit tube stubs or the condenser tube stubs. Other code requirements may also apply
7. PRESSURE/TEMPERATURE PORTS (BY OTHERS)
   - Ideal for measuring pressure drop across the water heater
   - Remote mount sensors (optional)
8. FLEXIBLE DUCT CONNECTION (BY OTHERS)
   - For vibration isolation
   - For attenuation of sound due to vibration
   - Required on any return, supply, outdoor air and exhaust connections to the DRY-O-TRON®
9. DUCT HEATER (BY OTHERS)
   - Size to cover the pool enclosure heat losses and the outdoor air load
   - Optional unit-mounted hot water, steam or electric heat
   - Controlled by the DRY-OTRON®'s microprocessor
10. OPERATOR PANEL
    - Mounted on the electrical panel door
    - Optional remote mounting (by others)
11. REFRIGERANT ACCESS VALVES
    - Service gauge connection
    - Top valve is head pressure
    - Bottom valve is suction pressure
12. AUTOMATIC CHEMICAL FEEDER (BY OTHERS)
    - Must be located in the main pool return line downstream of the DRY-O-TRON® and all auxiliary equipment to prevent corrosion and equipment deterioration
13. AUXILIARY WATER HEATER (BY OTHERS) CONTROLLED BY DRY-O-TRON®
    - Should be located downstream of the DRY-O-TRON® and before the automatic chemical feeder

      NOTE: An auxiliary pool-water heater is recommended for all installations.

      NOTE: An auxiliary pool-water heater is required for natatoriums with DRY-O-TRON® units having more than 15% make-up air or having the Economizer, Intelligent Energy Saver, or EconoPurge options.

      NOTE: An auxiliary pool-water heater is required for pools in which

      (a) the water is exposed to outdoor conditions (such as a swim-through pool), or

      (b) The water is kept at a higher temperature than the room air, or

      (c) uninsulated pool walls are exposed to outdoor conditions
14. THROTTLING BALL VALVE (CIRCUIT SETTER, BY OTHERS)
    - Install at lowest point in the discharge line
    - Adjust water flow until the outlet water temperature is 12 to 20°F above the inlet water temperature during water heating.
15. WATER PRESSURE SWITCH (UNIT-MOUNTED IN MODELS 60 AND LARGER)
    - Inhibits water heating mode during main filter backwash or in case of insufficient water flow
16. BYPASS VALVE (BY OTHERS)
    - Throttle to force water through the DRY-O-TRON® when the recommended secondary circulating pump is not used
17. SECONDARY CIRCULATING PUMP (BY OTHERS)
    - Must be suitable for pool water
    - Secondary circulating pump selection for an OPEN system and:

      a) DRY-O-TRON® flow rate

      b) Total pressure drop including:

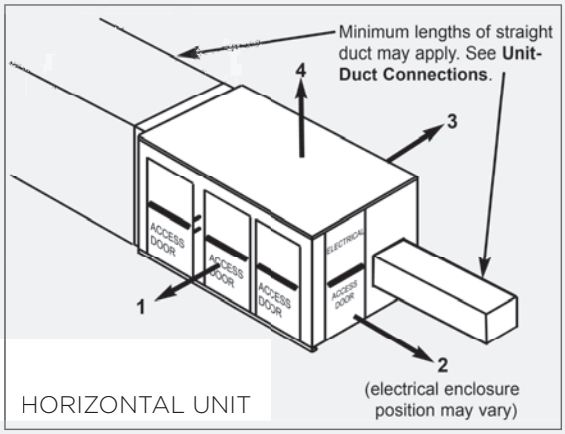
      DRY-O-TRON®, external piping, valve pressure drop and elevation difference between the pool water surface and the DRY-O-TRON®
    - Use dielectric couplings for water pump connections
    - Pump must stop during backwash
18. WATER PRESSURE SWITCH (BY OTHERS)
    - Stops the secondary circulating pump

      (a) During main filter backwash

      (b) In case of insufficient water flow in the pool water filter loop
19. MAIN FILTER PUMP (BY OTHERS)
    - Usually sized for pool water filtration and sanitation only
    - **CAUTION:** Secondary circulating pump is required if the main filter pump cannot produce the additional flow required by the DRY-O-TRON® at the necessary pressure
    - Pumps controlled by timers: contact factory for suggested piping details

Service Access Horizontal Units

Mechanical room temperature must be 60°F - 90°F (16°C - 32°C) to prevent excessive heat loss or gain. Only rooftop RS and RB units are designed to be located in unheated spaces. Units in attics and unconditioned spaces require extra insulation.



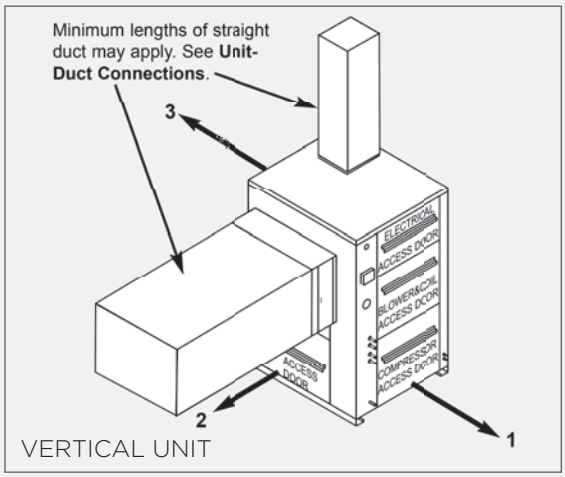
HORIZONTAL UNIT

Horizontal Units

Minimum Service Access[a] ft (m)	1	2[b]	3	4
010 through 030	2 (0.6)	3 (1)	2 (0.6)	3 (1)
040 through 062	3 (1)	3 (1)	3 (1)	3 (1)
080 through 808	5 (1.5)	3 (1)	4 (1.2)	3 (1)

[a] Access doors must be able to open to at least 90°

[b] (Canada) 1 meter
(USA) 3 ft for 230V, 3.5 ft for 460V units or per NEC Table 110.26(A)(1), whichever is greater.



VERTICAL UNIT

Vertical Units

Minimum Service Access[a] ft (m)	1[b]	2	3
010 through 030	3 (1)	2 (.6)	1.5 (0.5)[c]
040 through 062	3 (1)	2 (.6)	2 (.6)
080 through 152	4 (1.2)	3 (1)	3 (1)

[a] Access doors must be able to open to at least 90°

[b] (Canada) 1 meter
(USA) 3 ft for 230V, 3.5 ft for 460V units or per NEC Table 110.26(A)(1), whichever is greater.

[c] Recommended

Dimensional Data and Weights

Plenum Model	Dimensions[123] (Footprint)	DSV/DV5 Net Weight[4]	DSH Net Weight[4]
DSV/DV5	L x W x H (in.)	lb.	lb.
010	30 x 30 x 83	700	410
015	30 x 30 x 83	725	535
020	43 x 30 x 83	1,050	720
030	43 x 30 x 83	1,135	835
040	52 x 30 x 99	1,500	1,700
042	52 x 30 x 99	1,570	1,700
050	72 x 46 x 103	2,130	1,950
060	72 x 46 x 103	2,300	2,300
062	72 x 46 x 103	2,400	2,300
080	72 x 46 x 103	2,800	3,900
082	72 x 46 x 103	2,880	3,900

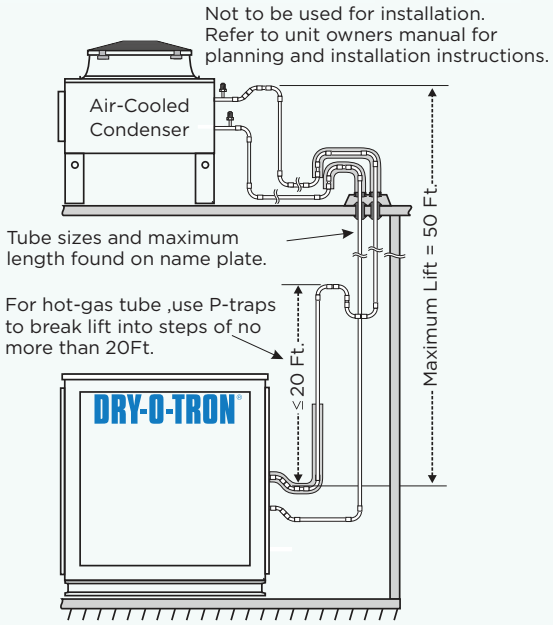
1. Certain options require larger enclosures.
2. Add 18 inches for removable filter section to "inches" for overall width.
3. Height includes removable plenum fan section.
4. For basic unit with air-cooled air conditioning. For other options, please contact factory.

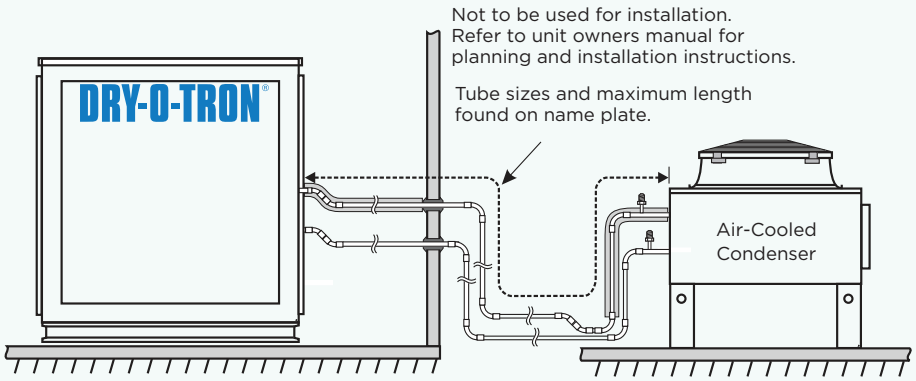
MODEL	DS SERIES		RS SERIES		DS SERIES W/DECTRON PURGE™		RS SERIES W/DECTRON PURGE™	
	DIMENSIONS[1]	NET WEIGHT[2]	DIMENSIONS[1]	NET WEIGHT[2]	DIMENSIONS[1]	NET WEIGHT[2]	DIMENSIONS[1]	NET WEIGHT[2]
	L x W x H in	lb	L x W x H in	lb	L x W x H in	lb	L x W x H in	lb
040 / 042	84 x 52 x 48	1,700	84 x 52 x 60	2,300	156 x 52 x 52	2,700	184 x 52 x 60	3,000
050	84 x 52 x 48	1,950	84 x 52 x 60	2,600	156 x 52 x 52	3,000	184 x 52 x 60	3,300
060 / 062	84 x 52 x 48	2,300	84 x 52 x 60	2,900	156 x 52 x 52	3,300	184 x 52 x 60	3,600
080 / 082	112 x 72 x 63	3,900	112 x 72 x 70	4,500	172 x 72 x 63	5,200	208 x 72 x 70	5,900
100 / 102	112 x 72 x 63	4,500	112 x 72 x 70	5,100	172 x 72 x 63	5,800	208 x 72 x 70	6,500
120 / 122	124 x 72 x 75	5,500	124 x 72 x 78	6,300	196 x 72 x 77	7,200	236 x 72 x 87	8,200
150 / 152	124 x 72 x 75	5,700	124 x 72 x 78	6,500	196 x 72 x 77	7,500	236 x 72 x 87	8,500
162 / 164	124 x 72 x 81	6,200	124 x 72 x 83	6,900	196 x 72 x 83	7,900	236 x 72 x 87	8,900
182 / 184	152 x 84 x 95	7,900	152 x 84 x 95	8,000	228 x 84 x 97	11,600	288 x 84 x 97	12,800
202 / 204	152 x 84 x 95	8,200	152 x 84 x 95	8,300	228 x 84 x 97	11,900	288 x 84 x 97	13,100
242 / 244	152 x 84 x 95	8,700	152 x 84 x 95	8,800	228 x 84 x 97	12,400	288 x 84 x 97	13,600
282 / 284	172 x 104 x 115	11,300	172 x 104 x 117	11,500	268 x 104 x 115	15,000	320 x 104 x 119	17,100
322 / 324	172 x 104 x 115	11,600	172 x 104 x 117	11,800	268 x 104 x 115	15,300	320 x 104 x 119	17,400
362 / 364 / 368	172 x 104 x 115	11,900	172 x 104 x 117	12,100	268 x 104 x 115	15,600	320 x 104 x 119	17,700
402 / 404 / 408	252 x 120 x 132	15,700	252 x 120 x 132	15,800	320 x 120 x 134	20,000	404 x 120 x 134	23,600
482 / 484 / 488	252 x 120 x 132	17,000	252 x 120 x 132	17,200	320 x 120 x 134	21,700	404 x 120 x 134	24,900
562 / 564 / 568	252 x 120 x 132	18,500	252 x 120 x 132	18,700	320 x 120 x 134	23,200	400 x 120 x 134	26,400
804 / 808	288 x 132 x 134	26,800	288 x 132 x 134	27,000	380 x 132 x 136	33,800	460 x 132 x 136	37,600

1. Conventional unit - certain options require a larger enclosure.
2. Conventional unit - additional options not included.

INSTALLATION TIPS

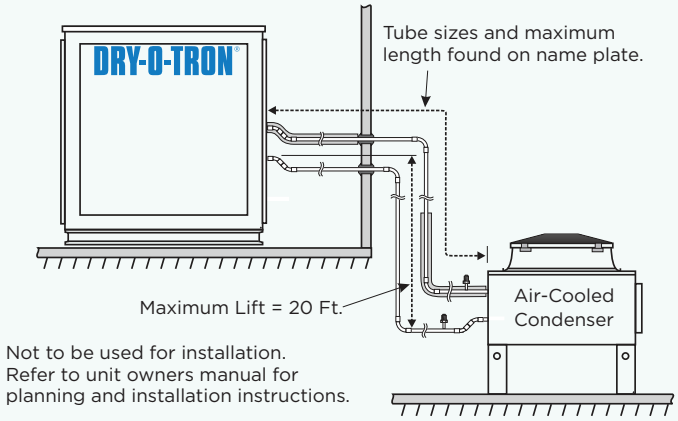
Connection to an Outdoor Air-Cooled Condenser





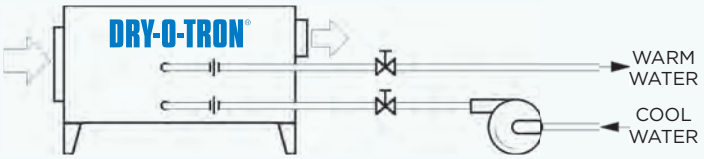
Note: Line lengths to the condenser should be minimized to reduce system refrigerant charges. Line lengths over 100 linear feet (30 m) must use the dry cooler configuration (see below).

[NOTE: APPLICABLE FOR MCC SERIES ONLY]

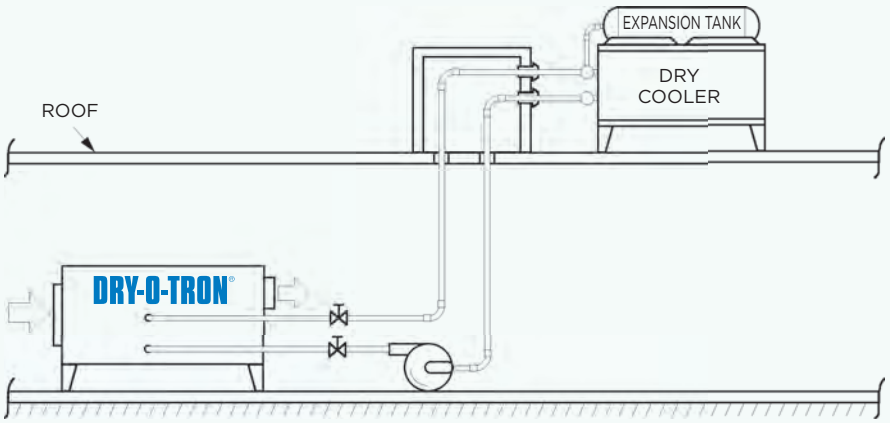


CONNECTION TO A WATER LOOP

(Cooling Tower, Geothermal, Heat Pump or Chilled Water)

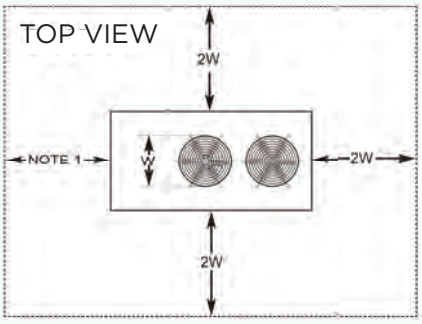


Units can be ordered for constant flow or modulating flow.



OUTDOOR CONDENSERS AND DRY COOLERS

Allow 2W free area around the entire perimeter of the unit



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