

**White Paper by: Trent Technologies, Inc.
Engineering Research & Development**

***Commercial and Public Buildings
are seldom
Healthy and Sustainable***



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The health and sustainability of buildings are affected by many factors. Water is perhaps the most insidious of these. In the wrong places such as floors, carpets, walls, furnishings, etc., water promotes the growth of mold and other health-threatening contaminants. In these places, it also causes damage that degrades building sustainability.

The adverse effects that water can impose on building health and sustainability are well known and documented in the literature. In general, the industry has devised means to control water and overcome these effects.

One major exception is the water condensed inside the air conditioning system. The means commonly used for controlling and removing this water is ineffective and incompatible with healthy and sustainable buildings. At issue is the current practice of using the failure-prone condensate trap as a seal in the drain system. How the condensate trap (p-trap) affects indoor air quality, and therefore building health, is well summarized in ASHRAE Standard 62-89R, a paragraph from which is included in the sidebar. The importance of a contaminate-free air conditioning system cannot be over emphasized, since all the air in a conditioned space passes through the system several times per hour.

The damp surfaces resulting from trap failures enumerated in the sidebar are not only sources of internal contamination; they also cause damage to the air handler and downstream ducting. And, drain pan overflow, another result of the p-trap failures identified by ASHRAE, frequently causes damage to the building and building contents.

The failed p-traps depicted in Figure 1 are commonplace throughout the country. The contamination and damage they cause are illustrated in Figure 2.

There is no denial that the conditions depicted in Figures 1 and 2 are commonplace, although the cause is often disputed. For example, many in the industry incorrectly attribute these contaminating and destructive conditions, not to the failure of p-traps, but to the failure of the building owner to maintain them. As described in the sidebar, p-trap failures are so numerous and frequent that successful maintenance

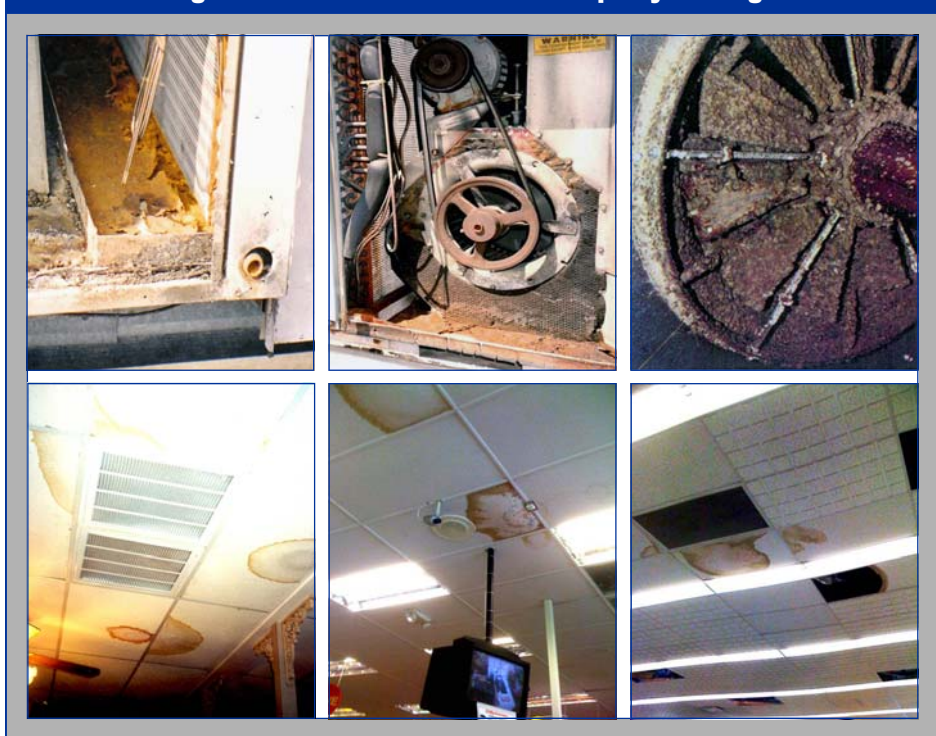
ASHRAE Standard 62-89R
[American Society of Heating, Refrigerating and Air Conditioning Engineers]

5.6.4 Drains and Drain Pans. *Condensate traps exhibit many failure modes that can impact on indoor air quality. Trap failures due to freeze-up, drying out, breakage, blockage, and/or improper installation can compromise the seal against air ingestion through the condensate drain line. Traps with insufficient height between the inlet and outlet on draw-through systems can cause the drain to back-up when the fan is on, possibly causing drain pan overflow or water droplet carryover into the duct system. The resulting moist surfaces can become sources of biological contamination. Seasonal variations, such as very dry or cold weather, may adversely affect trap operation and condensate removal.*

Figure 1 - Failed P-Traps, Typical



Figure 2 - Contamination and Property Damage



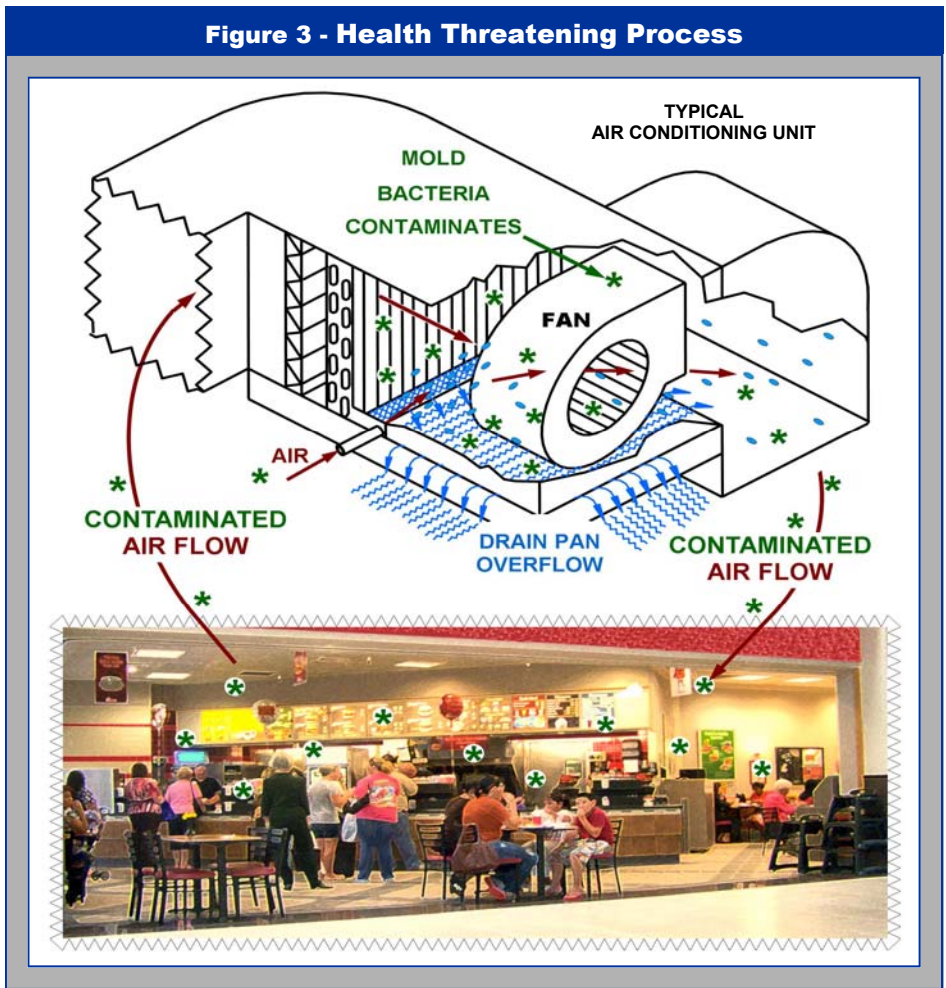
is, in a practical sense, virtually impossible, because it requires:

- Frequent trap priming in dry winter months and prior to start of each cooling cycle;
- Periodic and frequent cleanout of debris and algae growth in the trap;
- Protection against freeze destruction in cold weather in outside locations;
- Suitable p-trap geometry, which must match the internal pressures—designers often specify only that “drains must be trapped.”

The intended purpose of the p-trap is to provide a drain seal that ensures successful removal of condensate and prevent the ingestion of potentially contaminated outside air. When it fails, which is often, the p-trap does neither. Figure 3 illustrates how these p-trap failures cause damage to the air conditioning system and promote the growth of mold and other unhealthy organisms. It also illustrates how these health threatening pathogens are transported into occupied spaces.

It is highly likely that most of your air conditioning systems are equipped with p-traps in the condensate drain lines. If so, your buildings are undoubtedly experiencing unnecessary maintenance and operating cost along with health threats to occupants.

Millions of such systems are in use throughout the country, imposing un-



ecessary burdens on building owners and precluding the possibility of truly healthy and sustainable buildings. Fortunately, in selecting condensate drain systems, there are alternatives to the

common p-trap drain seal:

1. P-trap with added features
2. Condensate pump
3. Pneumatic flow control system

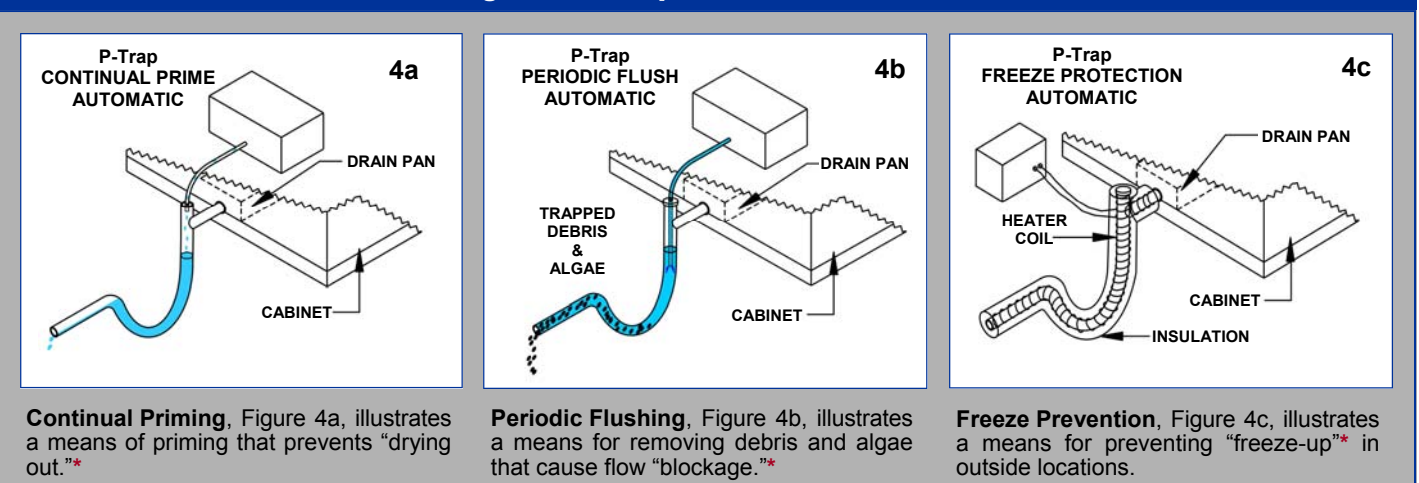
(CostGard™ Condensate Drain Seal System—discussed later)

P-Trap With Added Features

Figure 4 below illustrates how a p-trap might be modified to prevent drying out, blockage and freezing. Unfortunately, each of these added features introduces a new set of failure modes as a result of moving parts—valves, sensors, relays and actuators—and acceptable reliability in these applications is highly questionable.

**Failure modes identified by ASHRAE in the sidebar*

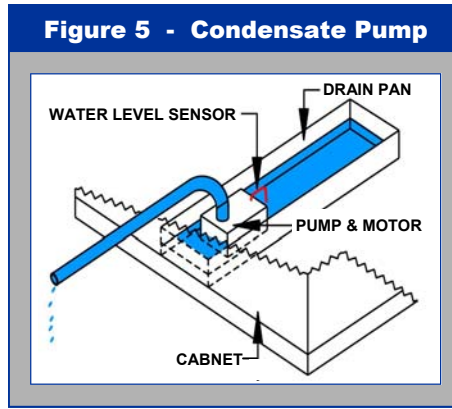
Figure 4 - P-Trap With Added Features



Condensate Pump

The condensate pump, Figure 5, is free of many of the failure modes that affect the condensate p-trap, but it exhibits a different set of failure modes due to moving parts:

- The pump impeller may become overloaded and stalled by debris;
- The small motor is subject to failure; and
- The water level sensor necessary for turning the motor on and off is also subject to failure.



The condensate pump is seldom used as a p-trap replacement. It is most commonly used where the plumbing drain is located above the drain pan and a pump is necessary to raise water to that level.

CostGard™ Condensate Drain System

The **CostGard™** Condensate Drain System, which includes a pneumatic seal, is free of all the failure modes common to p-traps and condensate pumps. Its performance is not magic*, it just seems that way. Here is how it works:

The system uses air instead of water to form the drain seal; a feature which prevents the ingestion of outside air, eliminates flow blockage and ensures reliable drainage of condensate.

How it forms the seal against outside air ingestion—during winter operation and at startup—is illustrated in Figure 6a.

During cooling operation when condensate is present, the air that forms the drain seal flows counter to the condensate and, creates a turbulence which ensures that debris which blocks conden-

sate flow is flushed from the system. Figure 6b illustrates that operation.

During winter operation, seal freezing is avoided since the **CostGard™** Condensate Drain Seal does not retain water.

Figure 6c shows a typical installation.

This drain system has no moving parts, it is self-regulating, self-cleaning, and virtually maintenance free.

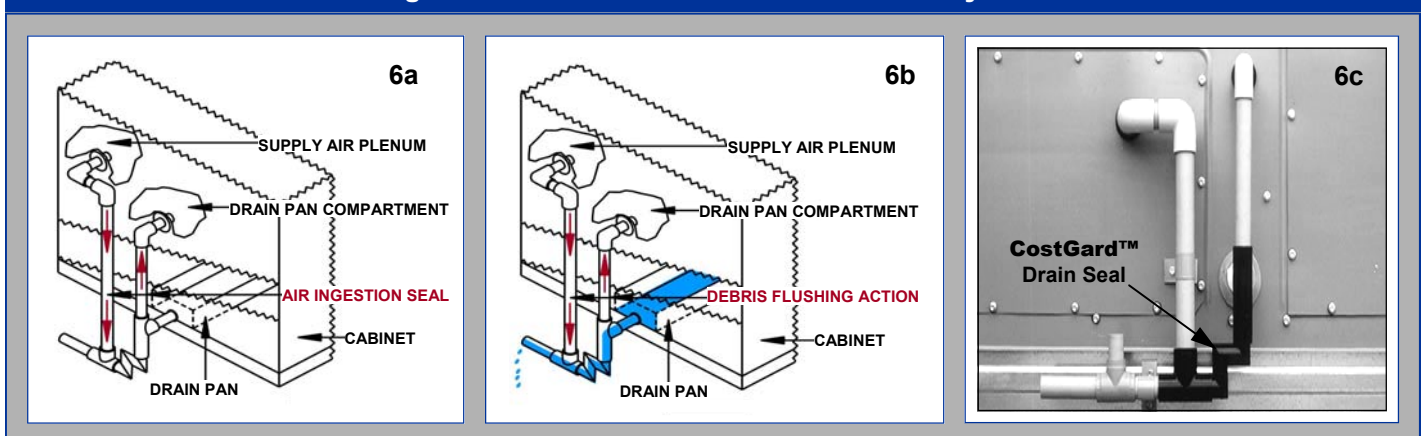
Tens of thousands of **CostGard™** Condensate Drain Systems are in use throughout the country, including every state in the United States. Users include public schools, universities, hospitals, commercial and industrial companies, and the federal government. Not one has failed to operate successfully.

In addition to reducing the health threat to building occupants and the high cost of maintenance, the **CostGard™** Condensate Drain System reduces building life-cycle costs by increasing equipment life and preventing damage to buildings and building contents.

And, it costs less than a typical service call, not including the damage caused by a failed p-trap. For more information about the **CostGard™** Condensate Drain System call us at 903-509-4843 or visit our website at www.TrentTech.com.

**Any sufficiently advanced technology is indistinguishable from magic.*
— Sir Arthur C. Clarke —

Figure 6 - CostGard™ Condensate Drain System



Authors:

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Paul D. Trent, BS; President, Trent Technologies; Background: 30 years business management and marketing, more than 10 years development and marketing of condensate drain systems.

ANSWERS TO SOME LOGICAL QUESTIONS

Specifically, what benefits do **CostGard™** Condensate Drain Seals offer?

- Increased equipment life—estimated at more than 30% (less frequent replacement)
- Reduced maintenance (virtually maintenance free)
- Reduced damage to buildings and building contents
- A more healthy environment for employees, customers and other building occupants

Who are the benefactors?

- The building owner and building occupants are the only benefactors

Who are the non-benefactors?

- Local outside contractors: Loss of business due to reduced need for maintenance, equipment and building clean up, and repair services.
- Equipment manufacturers: Longer equipment life reduces sales
- Designers: Increased equipment life extends the time between system redesign (reduced frequency of design efforts)

From what sources is this product available?

- The **CostGard™** Condensate Drain Seal Kits are available, for all types of air conditioning units, new or existing, from Trent Technologies, Inc. Tyler, TX
- Condensate Drain Seal System Kits are available through Carrier, Lennox, and York when ordered with new equipment

What evidence of user satisfaction can you provide?

- A maintenance supervisor for a Texas school district whose buildings are equipped with several hundred air conditioning units had this to say: *“In the 8 years we have been using the CostGard Condensate Drain Seal System we have not had a single condensate drain pan overflow—a major change from the past.”*
- An internal memo of a large commercial user with more than 30,000 **CostGard™** devices installed includes the following: ... *“ in the 2-3 yrs. we have been getting the RTUs with the Trent CostGard drains on them, the evaporators are the cleanest we have ever seen them! There is little residue and dirt, but nothing like the old style trap that just clogged up in summer and froze in wintertime. The pans have been clean for the most part and that has helped to eliminate quite a few emergency calls regarding water flowing back into the stores from clogged drains and overflowing evaporator pans. They truly are paying for themselves. . . ”*

How do I switch to **CostGard™** Condensate Drain Seals on my air conditioning units?

- **For new or remodeled buildings:** Tell your architect and mechanical designer to specify the **CostGard™** Condensate Drain Seal (instead of a p-trap) for all condensate drain systems. If the designer is unfamiliar with this drain seal, we can provide the information needed including a typical specification.
- **For existing buildings:** Tell your maintenance personnel or mechanical contractor to contact us. We can provide the product and installation instructions for units supplied by most major equipment manufacturers. Carrier, Lennox and York can provide the **CostGard™** Condensate Drain System Kits for some of their more recent models.

How can I get more information?

Contact Trent Technologies, Inc., at:
Phone: (903) 509-4843
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CostGard™ Condensate Drain Seal System

Some well known Users

Lockheed Martin

The Boeing Company

Ford Motor Company

Walgreens Company

Kohl's Department Stores

Kum & Go Convenience Stores

The Hawaiian Electric Company

University of Texas System

University of North Carolina – Wilmington

Smithsonian Institution – American History Museum

The White House – Eisenhower Executive Office Building

U.S. Embassy - Kabul, Afghanistan

Tens of thousands of **CostGard™** Condensate Drain Systems are in use throughout the country, including every state in the United States. Users include public schools, universities, hospitals, commercial and industrial companies, and the federal government. Not one has failed to operate successfully.

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