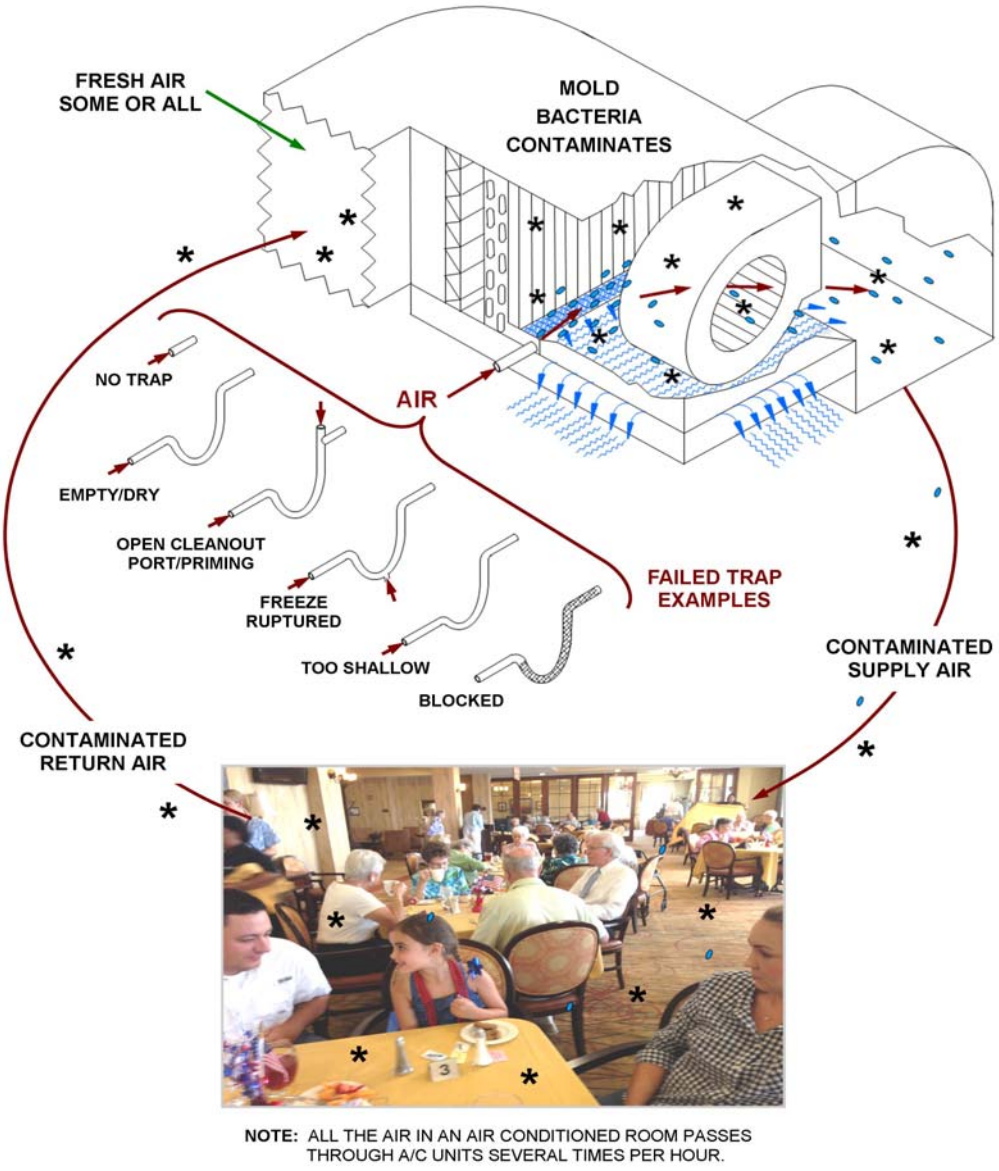
Improved HVAC Systems

- ***Decreased Maintenance,***
- ***Lower Life Cycle Costs,***
- ***Better "IAQ" Indoor Air Quality***



NOTE: ALL THE AIR IN AN AIR CONDITIONED ROOM PASSES THROUGH A/C UNITS SEVERAL TIMES PER HOUR.

Failure to remove condensate from air conditioning systems poses a major, and rarely challenged, threat to building damage and occupant's health. The commonly used condensate drain system is a unique component in the air conditioning system. It is an interface between the air handler and the facility drain receptor. Designers, vendors, contractors, and others offer differing levels of design guidance, but no industry entity accepts responsibility for its operation and performance. Accordingly, by default, facility managers are burdened with system failures along with the accompanying health threat and property damage, which are frequent and costly. A simple and economical remedy to these problems is available.

The Problem

The most commonly used condensate drain system includes a water trap, which exhibits so many failure modes that reliable operation is rare.

The propensity for traps to fail is well known in the industry. More than 20 years ago the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) published the following statement in their Standard 62-89R:

> ***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.*

The Industry Standard System

Despite the numerous failure modes common to the condensate trap, it is an integral part of the drain system now accepted as the "industry standard." The success of this system depends upon the best possible trap design and effective maintenance by the building operator. But, there is no standard or useful guidance for performing either of these functions. The widely applicable national, and many local, plumbing codes state only that HVAC drain systems shall be trapped, leaving detail design to others. Drain systems like those shown in **Figure 1** are the results. Each of these systems meets applicable codes; that is, they are trapped. Successful maintenance is impossible, since none can effect successful condensate drainage.

Figure 1. Typical trapped systems that meet industry codes

Most HVAC units in this country are equipped with the "industry standard" drain systems. The frequent and untimely failures of these systems impose costly burdens on building owners in terms of health threats, property damage, service calls, maintenance effort, equipment life, and life cycle cost. The photographs in **Figures 2** and **3** illustrate the property damage caused by the failure of "industry standard" drain systems. The impact of these failures on health is appreciated only when it is realized that all air in the conditioned space passes through the contaminated air handlers several times per hour.

Figure 2. Damaged and health threatening air handlers caused by failed drain systems

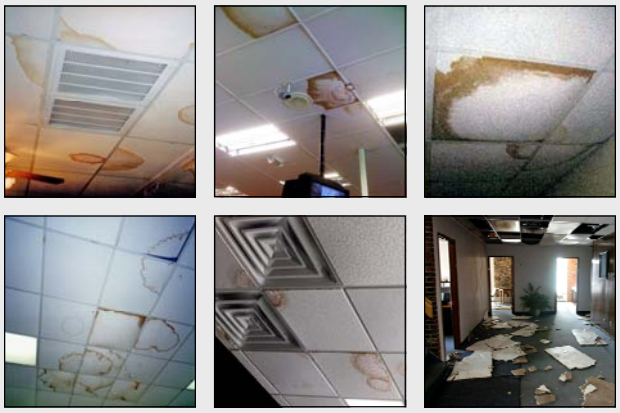


Figure 3. Damaged and health threatening building elements caused by failed drain systems

Best Possible Trapped System

Even systems with the best possible trap designs experience expensive and often impractical maintenance issues. Each trap must be:

- monitored carefully and cleaned frequently to prevent blockage and overflow;
- primed prior to each startup for summer cooling;
- primed several times during non-cooling operation; and
- primed with an antifreeze fluid in cold outside locations.

The effort and cost to perform these required maintenance operations are so extensive that it is seldom attempted.

A Successful Drain System

Failures caused by the "industry standard" condensate drain systems have been identified, and a drain system which eliminates all these failures has been developed.

In keeping with the savings it provides building owners, the system has been named: CostGard™ Condensate Drain System. A typical installation on a rooftop unit is shown in **Figure 4**.

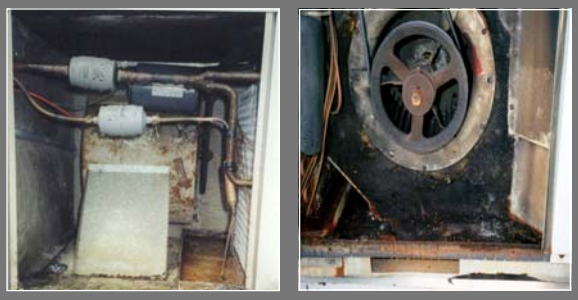
Figure 4. Typical installation of a CostGard™ Condensate Drain System

Tens of thousands are in operation, in all types of climates—hot & humid and cold & dry—some for more than 20 years. Not one has failed to perform successfully.

Successful operation of the system, and its wide acceptance, is gratifying. But, from a technical standpoint, it is even more pleasing to view field evidence that it performs as intended. **Figure 5** provides that evidence.

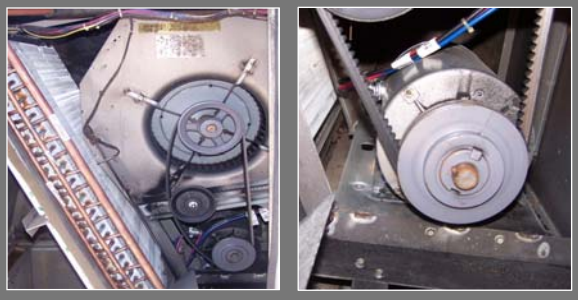
INTERNAL VIEW OF ROOFTOP UNITS

Industry Standard drain systems after less than **10** years of operation



Commercial Building | School Building

CostGard™ Condensate Drain Systems after more than **13** years of operation



Surgical Eye Clinic | Surgical Eye Clinic

Figure 5. Effect of drain systems on internal contamination and damage of rooftop units operating for extended periods of time

The CostGard™ Condensate Drain System eliminates all the problems common to the "industry standard" drain system. The video hyperlink and/or QR code below review the various trap failure issues and demonstrates how the system eliminates them. Also included in the video is a partial list of users and hyperlinks to information needed for architects and designers to specify the new condensate drain system.

VIDEO: *Sustainable Green Buildings*

Documents on Related Topics – Hyperlinks and QR Codes:

Table 9.2 Summary of common condensate drain seals options

Drain Seal Options	Potential Failure Modes								Maintenance				Selection Factors					
	Poor Design	Poor installation	Dry Trap	Blockage	Freezing	Clearout Open	Mechanical	Electrical Controls	Manual Prime & Flush	Electrical	Mechanical	Replacement of Parts	O&M Burden	Failure Risk	Requires Water Source	Requires Power Source	Requires Auxiliary Drain	First Cost[a]
P-trap	●	●	●	●	●	●			●				high	high			●	$20
P-trap with additions	●	●				●	●	● ●		●	●	●	med	high	●	●	●	$200-1,000
Condensate pump	●	●		●			●	● ●		●	●	●	low	med low		●	●	$50-100
Pneumatic flow control		●											virtu-ally nil	virtu-ally nil			●	$100-$300

[a] Estimated cost at time of publication of manual based on ¾-inch drain line

[Comparison of Condensate Drain System Performance](), By: Dr. Diana Glawe, Associate Professor of Engineering, Trinity University, San Antonio, Texas, 2013.

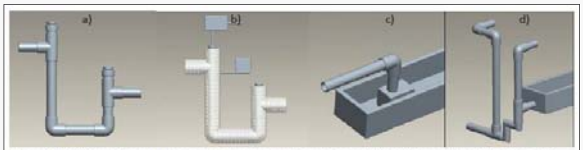


Figure 9.3 Schematics of common condensate drain system seals for HVAC systems: (a) p-trap, (b) p-trap with additions, (c) condensate pump, and (d) pneumatic seal

New Drain Seal Replaces The P-Trap *Facilities Design and Management,* (2000, November) *46-48.*

Some Users you will recognize.

CostGard™

Condensate Drain Systems

A solution developed by Trent Technologies,
a privately held engineering research and development company.

In use over 20 years with no failures.

More information can be found at:

TrentTech.com

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