Dust Devil

OCTOBER 2016 NEWSLETTER OF THE CENTRAL ARIZONA CHAPTER OF ASHRAE

CALENDAR

OCTOBER
11 11:30 Chapter Meeting / Radisson

NOVEMBER
7 5:30 Chapter Meeting / Radisson

DECEMBER
13 11:30 Chapter Meeting / Radisson
15 6:00 Holiday Social / The Duce

JANUARY
10 5:30 Chapter Meeting / Radisson

FEBRUARY
14 11:30 Chapter Meeting / Radisson
16 2:00 Annual Tabletop Product Show / El Z

MARCH
10 7:00 ASPE Golf
14 5:30 Chapter Meeting / Radisson

APRIL
7 6:30 Annual Golf Tournament / TBD
11 11:30 Chapter Meeting / Radisson

MAY
9 5:30 Chapter Meeting / Radisson
16 11:30 ASPE / Aunt Chiladas

JUNE
(9) 7:00 Annual Chapter Awards Dinner / TBD

SEPTEMBER
12 5:30 Chapter Meeting / Radisson

BEAU TURNER
CHAPTER PRESIDENT 2016/17

My number one goal this year is to increase meeting attendance by picking topics that are interesting to our membership, such as our presentation on conditioning canabis grow rooms. Other topics we're looking to cover this year include ethics, panel discussion on the building process, BIM coordination, among many other topics. We are always looking for other great meeting topics. Please feel free to email me any suggestions.

We're looking forward to hosting more Young Engineers in ASHRAE this year. There will be at least 4 events this year and we will most likely be returning to The Yard for another bags tournament.

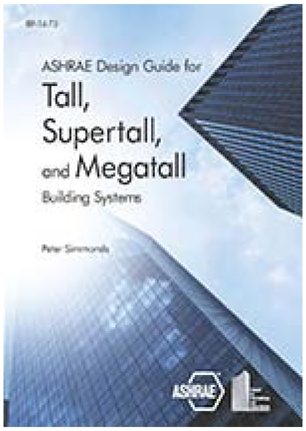
Please consider submitting a project or colleague for one of our annual Chapter Awards. Avoid the rush! As an industry, we want to encourage good behavior, and recognition is essential.

I'd like to thank all of the volunteers that make our Chapter so great, without volunteers there would be no local ASHRAE community. If you are interested in getting more involved in the Chapter please let me know. We are always looking for more volunteers and there are always new positions opening up! bturneraz@gmail.com

LOOK AHEAD: NOVEMBER TOPIC

John Benson from Pearson Engineering will be presenting on HVAC controls and a little bit on electricity. John has been working with HVAC controls since they were invented and has seen every iteration of them. His presentation will cover PID, floating, and two position control loops as well as the history of HVAC controls. He will also discuss the "mysterious" side of electricity and explain how kW, kWh, and demand charges affect HVAC controls.

FROM THE MOTHERSHIP:



TRICK QUESTION: WHAT'S THE DIFFERENCE BETWEEN 4 AND 8?

Naturally, it's a trick answer: about a million bucks.

The numbers 4 and 8 are in feet per second (fps), and the topic is copper piping design. Ouch. The dollar amount? Current value of the jury award. Double ouch. The project was ("was" because the bluff was falling into the sea, a process no doubt complete by now) a condominium (22 of them) on a beautiful view by the sea, at the height of the condo-then-sue fiesta in California, about 1988. The design topic has not died of old age.

The design was a combo space heating and plumbing hot water piping system, but the basic principles apply to all copper pipe: slow down, don't move too fast, you got to make the copper last. Speed kills.

Copper pipe forms a protective layer, mostly oxide, very easily and quickly, so we don't see much "bright copper" (except during soldering) on projects. Unfortunately, while the copper oxide is rather robust against further oxidation, it's rather delicate against physical wear and tear with particulates. The official name for the phenom is "erosion / corrosion". Particulates at sufficient velocity scrape off the oxide layer, and then the new bright copper oxidates again, and then the particulates….you get the idea.

The ingredients to the problem are particulates, temperature, velocity and time. Particulates are very hard to avoid, temperature is driven by design necessity, and time takes us all, so velocity is the primary cautionary element.

Velocity is not quite as straightforward as you might think. Irregularities in piping (rough surfaces, cut ends) and changes in direction (ells, tees) will cause turbulent flow, and cavitation. Turbulence can cause local velocity variations, higher and lower than the apparent overall velocity. Cavitation can occur where irregular flow causes low pressure that flashes the water (see IPC Commentary edition, Figure 604.1(3)).

Bottom line: if the velocity is too high, the pipe wall steadily loses copper until a little hole appears, and we have what we like to call a "leak". It can be a pain if it starts happening all over a system.

Although the IPC description is handy, the phenom is not limited to plumbing (nor, strictly, to copper if the velocity is high enough). HVAC applications have a weak point: heat exchanger (e.g., coil) U-bends. These are often formed by bending thin-wall copper rather than using formed ells, and this further thins the outer radius of the copper, right where you might expect to find high velocity. (Turns out, copper tubing for heat exchange is about 25% the wall thickness of distribution piping.)

What we found at the condo was relatively high temperature (which accelerates the process dramatically) because the water was used for space heating; continuous operation of the pump for plumbing hot water circulation (it was a big pump, sized for space heating, not recirc); sand (courtesy of the public water system); oxygen (every time hot water was used, more oxygen would come into the system). Then, the installation somehow didn't get the balancing valves at the foot of each riser (multifloor stacks), and the space heating temperature control was via fan on/off (the heat coils were under continuous flow). The perfect storm. All the things you didn't want in one nice package.

It took about two years for the leaks to start; within 18 months of the first leak, 80% of the heating coils had failed (thin wall, small diameter) and half a dozen 3/4" elbows at the foot of the recirculation stacks had pinholed. We diagramed the piping system, color coding the velocities, then superimposed the leak locations. It showed that the "red zone" (8+ fps) had most of the failures, and the earliest ones. But the most recent failures were encroaching in the "yellow" areas (4—8 fps). Plotting failures vs time, the curve was exponential. While the jury did not applaud, they did award 100% on the mechanical claim.

What do we take away? NACE (National Association of Corrosion Engineers) recommends 4 fps upper limit on copper pipe velocity. IPC, in its discussion of manifolds (Table 604.10.1) states 4 fps for 1/2" pipe. IPC (Figures E103.3(x)) rather cryptically calls for limits of 5 fps and 8 fps (which turn out to be hot water and cold water limits). Other commentaries suggest as low as 3.5 (admittedly, in metric….does that count?).

Me? 3 fps and don't look back.

What happened to the condo? They didn't get enough money to actually repair the dozen or so things wrong (e.g., all the nails were galvanized, and rusting away due to salt air; the parking garage deck rebar had separated from the concrete; the cliff was falling into the ocean). I never got to the final chapter because I avoid clients who already have a lawyer. I ran.

THE HISTORY CHANNEL

History of the Chapter's Gavel.

The Chapter's gavel, which has been used to call the Chapter meetings to order for over 50 years, has traditionally been passed down from the outgoing President to the incoming President.

The gavel was presented to the Chapter in 1953 by the West Texas Chapter. Back then, our chapter was still called the Arizona Chapter and was a part of ASHVE (American Society of Heating and Ventilation Engineers).