



Williams Notaro & Associates, Inc.

MECHANICAL, ELECTRICAL, PLUMBING & FIRE PROTECTION CONSULTING ENGINEERS

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UPS Battery Maintenance and Proper Care by Enrique H. Rodriguez

An uninterruptible power supply (UPS) is a device which maintains a continuous supply of electric power to connected equipment by supplying power from a separate source when utility power is not available. Since the batteries are the most vulnerable part of a UPS system, understanding causes of battery degradation and performing maintenance measures are essential in ensuring the life of the batteries. And with the recent power outages in our area, it is important to understand that a UPS system failing on a critical load because of dead batteries can be very expensive to replace. With proper care and regular maintenance of UPS system batteries, your UPS will function properly for the entire battery life cycle.

There are many factors to consider that affect the expected life of a valve regulated lead acid (VRLA) battery (typical to computer equipment UPS systems). Temperature is directly related to battery performance and life cycle. Most VRLA batteries are designed for indoor use at a temperature of 25°C (77°F). Humid or wet conditions could corrode the battery terminals, as well as create a potential shock hazard. Hot or cold temperatures and frequent variations in temperature will decrease battery life significantly. Ventilation is also a concern, since VRLA batteries release a small amount of hydrogen



VRLA battery string

which, if built up over time, could create a potential fire hazard or explosion.

The load on the UPS is also an important factor to consider. High loads on the UPS will cause the batteries to discharge at a faster rate. If the outage time is long, the batteries could go into a deep discharge state, which would reduce the battery life of VRLA batteries. UPS batteries are designed for a limited amount of deep discharges before failure. Testing the batteries after

a prolonged outage will determine if they are still within operable standards. If and when a battery is to be replaced, an entire series of batteries should be replaced all at once because a weak battery will wear down the entire string.

Overcharging can also be detrimental. Overcharging the batteries will not only damage them, but also create a dangerous situation that could cause an explosion by accelerating the rate of hydrogen discharge from the batteries. Installing the correct charge controller to match the battery array and the application will increase the chance of a full life cycle for the batteries.

Checking the connections of all the batteries in the array and cleaning the terminals on a regular basis will avoid premature failure due to corrosion. A good maintenance program should include cleaning, checking, and testing the batteries on a monthly basis. Another precaution is to install a battery monitoring system which measures voltage, impedance, charge, and discharge current, and can log these measurements and model the battery during its life cycle. This will provide the right information to indicate if a battery or series of batteries are still in good operating condition.

By implementing a monitoring and maintenance program for your UPS batteries, you will maximize the UPS system's reliability, battery life, and reduce your replacement costs.



Enrique H. Rodriguez
Electrical Engineer

Enrique Rodriguez is an electrical engineer with Williams Notaro & Associates, Inc. and holds a Bachelor of Science in Electrical Engineering from Virginia Polytechnic Institute and State University. He has performed electrical design work and energy evaluations for such clients as Raytheon, Boeing, Beacon Capital Partners and Navy Federal Credit Union.

Win \$100 Gas Card



Every season we feature a photo on our web site that illustrates the importance of including Construction Administration in the Engineering scope of work. Even small, seemingly unimportant installation deficiencies can cause poor system performance, increased maintenance, or reduced equipment service life. Visit our web site at www.wnainc.com and enter the Installation Blooper Contest. Correct respondents are automatically entered to win a \$100 gift card to Shell Oil. Our next winner will be chosen on August 1 so enter today.

Last Contest Winner

Congratulations to Roy Dingus, Facility Manager with the Department of Terrestrial Magnetism of the Carnegie Institution in Washington, DC.



He correctly identified the installation blooper in our Spring contest and enjoyed a \$100 Shell Oil Gas Card.

Enter our Summer contest at www.wnainc.com and you could be the next winner of a \$100 Shell Oil Gas Card. Drawing will be held on August 1.

Last Contest

Our last contest featured a “creative” solution by a contractor in which sprinkler piping was installed through supply air ductwork (see photo below). This blooper resulted in increased pressure drop in the ductwork system, reduced air flow, poor HVAC system performance and higher energy consumption. This practice should never be employed as a means to resolve conflicts between ductwork and piping or conduit.

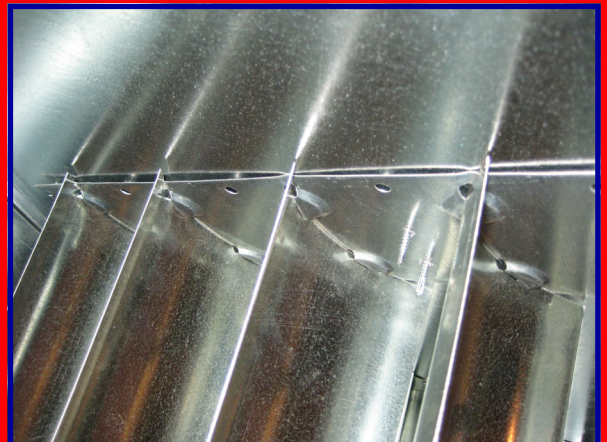


Unfortunately, these type of installation mistakes are more common than people realize and can have a huge negative impact on the performance of the HVAC system. Minimize oversights by including Construction Administration in the Engineering scope of work.

Did You Know?

That turning vanes in ductwork elbows are an often overlooked design detail, but can have a significant impact on the efficiency and operation of an HVAC system.

- ◆ Turning vanes are installed across the throat of mitered 90 degree elbows to lower the static pressure drop through the elbow.
- ◆ There are two basic types of turning vanes: double and single thickness.
- ◆ ASHRAE testing confirms that single thickness vanes have approximately half the pressure drop of double thickness vanes of similar spacing and sizes. Some proprietary “airfoil” types are better than standard double thickness vanes, but still do not match the lower pressure drop of single thickness vanes.



- ◆ A single splitter vane in a radius elbow can cut the pressure drop in half compared to an elbow without one. Multiple splitter vanes reduce the pressure drop even further.
- ◆ Lower ductwork pressure drops result in less required fan power, better system performance, and lower operating costs.

On your next project, insist on using single thickness turning vanes and splitter vanes in your ductwork elbows. You will have a quieter and more energy efficient system.