Maintenance Strategy – HVAC

This category covers a broad range of a buildings Heating, Cooling and Air Conditioning systems and sub systems. The information contained in this document are general recommendations and guidelines designed to bring attention to the importance and benefits of preventive maintenance strategies supporting quality educational environments. It is important for facility managers and maintenance staff to be aware of the specific systems asset types and maintenance required to effectively maintain the systems functionality and reliability through preventive maintenance requirements. Qualified in-house maintenance combined with certified vendor staff may be necessary to manage systems safely and effectively. Consult manufacturer recommendations on building HVAC system maintenance requirements.

Building systems are critical in any school facility. Without working systems such as lighting, heating and cooling a building would be uninhabitable. A strong HVAC preventive maintenance program is a must have in any facilities program. A solid program of preventive maintenance is absolutely paramount in protecting the asset and supporting the life of the building, not to mention providing a comfortable internal environment for occupants. The better it is maintained the more likely you are going to get the appropriate life-cycle from the system. If not it will deteriorate sooner than later.

MAINTENANCE AND REPAIR. All HVAC systems require manufacturer recommended cleaning and maintenance through both reactive and preventive efforts. Systems need this attention because high use and stresses producing minor defects are constantly at work. Regardless of the cause, the result is the same -- without routine scheduled maintenance the systems ultimately deteriorate before it is time. Preventive maintenance means the early detection and repair of minor defects, before major reactive action is necessary; it is a proper way to care for the many facets of HVAC components. HVAC systems should be routinely reviewed for proper operations, conducting minor repairs efforts and proper upkeep of sub-components supporting a safe and functional asset.

Much like the cars that we all drive, if you do not change your engine oil and replace belts and filters, rotate tires and clean it on a routine basis, the engine will lock up, the vehicle won't work efficiently or even leading to not working at all. The same holds true for a school buildings heating and cooling systems. Making small investments in maintenance to change your vehicles oil can save time and money. The same holds true for proper maintenance on HVAC systems. A good maintenance program isn't as expensive compared to what you might need to spend if your system degrades and ultimately fails due to poor preventive maintenance efforts.

Let's put this in perspective: if you have a piece of equipment that costs $10,000 to maintain and has an expected life cycle of 10 years if properly maintained, you will spend only $20,000 from first cost to replacement cost at the 10-year mark, assuming it would cost $10,000 again to replace it at the end of its life-cycle. However, if you did not properly maintain the system and it failed at the 5-year mark (due to poor or lack of maintenance), you would need to spend $10,000 to replace it after 5 years and then replace that same unit again in another 5 years if you continued to not perform maintenance. Your total cost would be $30,000. Which option would you choose? - Simply put, proper

maintenance efforts costs a lot less over the life of the equipment than to change out equipment on a more frequent basis.

Creating a plan - Two important areas at the heart of any HVAC maintenance program are 1 - The manufacturers recommended performance and maintenance tasks for each piece of equipment and 2 - the overall operation of the system in relation to the school building in which it's installed.

The first place to turn to if you have questions about how to build a successful HVAC maintenance plan should be the maintenance and operations (M&O) manuals, provided by the manufacturer. These items are invaluable in providing a blueprint for the steps necessary to maintain a buildings roof top units, swamp coolers, chillers, boilers, motors, air-handling units etc. - every piece of equipment in a building's HVAC system.

Manufacturers spend a lot of time and money testing their equipment to determine what the maintenance needs are which are then incorporated into the M & O manuals for operators reference. These maintenance manuals are designed to assist owners with creating proper preventive maintenance strategies to support the life cycle and working reliability of the systems. If you don't have the original manuals, call your manufacturer's representative with the pertinent equipment model and serial numbers, and they can get you the replacement information. This will provide the necessary information to get a successful preventive maintenance program started that is tailored to your specific building's HVAC systems.

Other Considerations: Some aspects of an HVAC maintenance plan are simple - change the oil, check/change the belts, change the filters routinely (just like your car) and keep it clean. To keep a system operating at maximum efficiency, you'll need to expend more detailed efforts beyond the basics on occasion. For example, air-handler coils need to be cleaned periodically to maintain heat transfer efficiencies. Boilers need to be cleaned annually as even 1/16 inch of soot and ash on heat-exchange surfaces in an oil-firing boiler can reduce efficiency by 10 percent. Measured fire testing and flame adjustments on boilers should be considered every three years.

Building automation systems (BAS) can be invaluable in maintenance diagnostics by greatly improving response time to maintenance issues through troubleshooting. When you have someone sitting at a PC and looking at the issues to see what is going on, most of the time technically trained staff can find out what is causing problems and correct it through the system. Building automation systems can also be linked to computerized maintenance management systems (CMMSs) driving quality operations.

HVAC Maintenance Frequencies - Once you have your plan, take the list of HVAC tasks that need to be done monthly, quarterly, semi-annually annually etc., and input them into your computerized maintenance management system, along with any of the documentation that goes with it. This will make the information easily retrievable for staff that works on the systems. A quality program should provide a comprehensive history of maintenance conducted on every piece of equipment, in addition to preventive and corrective costs incurred over time. Maintaining historical records of service being performed and when it was performed is also important to be able to see trends and better predict what should be done or adjustments in maintenance to continue to optimize performance and system reliability.

Best Practices – Placing basic maintenance stickers on your equipment is another way to keep maintenance staff apprised of the work that has been done on a system's many sub-components. A simple decal placed on the equipment that lists the last time the equipment was serviced, what was done (filter change, cleaning), and who serviced it is invaluable and easily identified through a quick visual check.

Proper skillset and training - The most finely crafted preventive maintenance program is only as good as the people who manage the process. The more you and your staff know about your facilities HVAC systems, the better it will be maintained. Hiring qualified staff who can be taught and who want to learn is important. Training efforts are also an important factor in developing a solid maintenance program.

- Train staff on every piece of equipment they encounter.
- Provide accurate M&O manuals.

- Develop formal training process and provide refresher sessions at periodic intervals to keep up with industry trends and process changes.

HVAC repairing or replacing. In any system's life-cycle from life safety systems to HVAC, there may come a time where owners will need to decide whether it's fiscally and practically feasible to continue maintaining and repairing an aging, degrading system. It's important to do a life-cycle cost analysis when determining if you should repair or replace an aging HVAC system component.

Questions to ponder – To keep the unit(s) working, do you replace the part, which will cost 'X' dollars, or do you replace the entire unit? Consider all costs in a life-cycle cost analysis - the cost of the equipment, maintenance, and even energy efficiencies. Maybe you are 10 years into the unit's life-cycle; it might have a typical service life of 15 years, but has only a little life left in it because of the way it has been maintained and operated previously. A life-cycle cost analysis will consider the current condition and efficiency of the unit.

There is no doubt, every piece of equipment will need to be replaced eventually due to use, age and historical maintenance efforts. Following a comprehensive maintenance schedule will prolong your building's HVAC systems and maintain not only a healthy facility but improve equipment reliability supporting a quality educational environment with happy, satisfied, and comfortable teachers and students.

Year over year capital dollars are reduced. Public School Facilities Managers understand the exposure they have in large capital expenditures with negligence when it comes to preventive maintenance in any building system, especially with larger HVAC systems and components such as air-handlers, large chillers, boilers, BAC's and pumping systems. It is important to be aware of the necessity, the responsibility and the manufacturer recommended maintenance efforts necessary to ensure these systems last their expected life.

Maintenance Recommendations: Proper operations and maintenance of HVAC systems and components is critical to the environmental comfort of the occupants & a properly balanced energy efficient reliable building. Detailed Preventive Maintenance tasks should be created based on manufacturer recommendations and best practices to assist in maintaining a quality working system. Accurate inventories should be maintained. Systems should be reviewed on a scheduled basis for unusual noises / vibrations or leaks / filters & belt changes / loose or exposed wires, cleanliness of coils, rust or premature deterioration of system components. Heating & cooling systems should work as designed & operate properly. Ventilation – return air vents (combustion air) should be unobstructed & no damage is present. Boiler inspection/certifications & maintenance tasks should be developed. Pressure gauges, motors and pumps should be functional. An effective PM Program, supported by skilled staff or vendors inclusive of a complete inventory will aid in proper operations & maintenance of HVAC Systems and support indoor air quality, equipment reliability and good learning environments.

Recommended Maintenance: Refer to manufacturer recommendations and/or best practices for preventive maintenance requirements. Complete assigned PM tasks in a timely manner. Daily operational review (DDC Systems); Weekly / Monthly trend log reviews to monitor equipment operation; Report damaged system elements & coordinate repair; Annual detailed review for Physical conditions (to include equipment inventory updates) to ensure system are working properly and as designed.