



# “Green-Up” HVAC & Cooling Tower Systems

## While Obtaining More LEED NC & EB Credits

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With ever increasing emphasis on reducing our “carbon footprint”, business leaders, architects, engineers and commercial building owners are seeking ways to drive and support business growth by developing sustainable facilities that incorporate environmentally friendly technologies and maintenance practices that deliver measurable energy saving results. However, as is too often the case, the desire to go green doesn’t always square-up with the financial realities of getting there quickly; hence an incremental approach is usually the best way of integrating sustainable technologies and best practices. Simply said, businesses undergoing new construction and / or with existing buildings have a responsibility to take an incremental approach to achieving optimal sustainability because trying to “eat the elephant” all at the same time can have an impact on the financial health of the business.

So where should a company begin?

- First and most important, it requires a commitment by top management in the form of establishing a “Green Vision” for the company – a vision that everyone can rally around and participate in.
- Second, every department in the organization must participate by identifying processes and technologies (both large and small) that may effectively contribute to the vision.
- Finally, supporting those ideas that are manageable & measurable and that move the company toward realizing the “Green Vision”.

As most facility managers & engineers know, one of the key areas that can significantly contribute to the Green Vision is in HVAC operations. Installing high efficiency equipment, deploying technologies and maintenance practices that help keep equipment clean and using building control systems are just some of the ways to realize big energy savings, while optimizing indoor comfort and process cooling efficiency.

### **HVAC Maintenance is Vital to the Environmental and Operational Health of all Facilities.**

For those seeking LEED green building certification for new or existing buildings (*LEED-NC or LEED-EB*), it is important when evaluating HVAC equipment (old or new) that the maintenance requirements also be examined; if maintaining the equipment is time consuming, unpleasant or difficult, then maintenance of that equipment is more likely to be delayed or not performed; this results in the equipment becoming increasingly inefficient, running longer to achieve set temperature points, consuming more energy and costing more to operate. Three very important points to remember:

1. LEED certification is not just about meeting initial building performance standards – it’s about sustaining optimal building efficiencies and performance.
2. Clean HVAC equipment will run efficiently and dirty equipment won’t (high efficiency equipment is highly efficient only when clean).
3. Integration of maintenance friendly technologies and processes is crucial to facilitating effective maintenance.

### **Deploying Technologies That Have Real Impact**

When designing new building systems or looking for ways to upgrade existing ones, it is important to identify technologies that can provide broad impact in achieving building performance goals. One such technology that has broad implications on HVAC efficiency and

maintenance is Air Intake Filter technology (commonly known as Cottonwood Filter Screens). These common sense filters easily mount over the intake opening on air cooled chillers and condensers, cooling towers, rooftop units, air handlers, louvers and is designed to help prevent mechanical equipment fouling by stopping debris on the outside of the equipment. Unlike window and bug screen, shade screen and other commercially available mesh and filter products that can harm equipment by restricting air flow, Air Intake Filter Screens are designed and engineered for use on low to high volume / high velocity air movement systems. Furthermore, they are nearly invisible to the airflow with extraordinary low impact on static pressure (less than 1/10” w.g. @ 600 fpm) and they are easy to clean.

**How Air Intake Filter Screens Can Help You to “Go Green” and Get LEED (NC) and LEED (EB) Certification Points in Multiple Categories.** (Note: Following are guidelines – Credits are awarded by USGBC)

### **Sustainable Sites – (EB) Credit 1 (SS Credit 1.1 & 1.2)** **Plan for Green Site and Building Exterior Management –**

Because Air Intake Filter Screens stop debris before it enters the system, HVAC and cooling tower systems stay clean throughout the season; reducing / eliminating the need for traditional water dependant pressure washers and cleaning chemicals which can expose workers and make its way into the storm and ground water systems during run-off. Further, Air Intake Filter Screens are environmentally friendly and durable and only require a broom, brush or shop vacuum for cleaning; even rain will naturally rinse the filters clean when the fans are cycled off. Additionally, they don’t require removal and handling during cleaning and their use helps keep birds, insects and animals from entering through air intake openings, thus contributing to environmentally friendly pest management programs.



**Traditional coil cleaning methods utilize cleaning chemicals and power washers which generates run-off that can enter storm sewers or run off onto the ground.**

### **Water Efficiency – (EB) Credits 3.1 & 3.2** **Water Use Reduction –**

Since HVAC systems equipped with Air Intake Filter Screens prevent debris from getting into condenser coils in the first place, they require little or no water for cleaning. All that is needed to clean the filters is a broom or brush - thus conserving water and contributing to overall building water reduction goals.



**Air Intake Filters mount to the outside of the equipment over the coils where it stops debris from entering – debris is visible, accessible and amazingly easy to clean.**

When applied to cooling towers, it is important to remember that most debris loading results from airborne matter versus waterborne; hence, systems with side stream water filtration will only manage debris after it gets into the system and only once it has settled in the sump. In contrast, Air Intake Filter Screens stop most airborne debris at the point of entry thus protecting the entire loop (fill, sump, strainers, chiller, and heat exchangers). When used in combination with side stream water filtration, Air Intake Filter Screens enable water filters to operate for longer periods of time between water consuming backwashes. It is important to note that if waterborne matter (in solution or precipitated out of solution) is a problem, Air Intake Filtration is ineffective at solving the problem, hence water filtration in combination with a chemical or chemical free water treatment system is usually the best solution.

Another common cooling tower problem occurs when debris plugs the solenoid blow-down valve during the blow-down cycle - causing it to stick in the open position. When this happens, it drains the sump and causes make-up water to run continuously until the problem is discovered and the valve is cleared. This condition also causes continued demand for water treatment chemicals that get automatically dosed into the sump, and then goes straight down the drain causing premature depletion of the water treatment chemicals. The end result of this condition is higher chemical cost, high chemical concentrations hitting the sewer system, excessive water consumption and higher sewer costs. Installing Air Intake Filter Screens will stop debris before it can cause this problem.



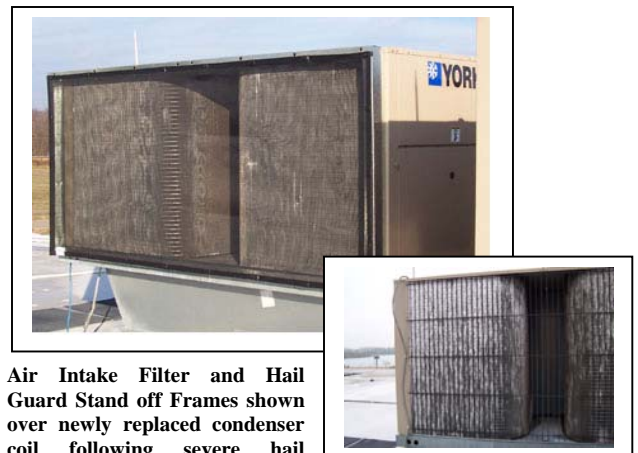
**Air Intake Filters Protecting Large Cooling Tower**

From a health and safety perspective, preventing bacteria growth in cooling tower systems is critical to ensuring a healthy work environment. Traditional bacteria prevention methods call for the use of biocides in dosage levels that prevent bacteria from getting a foothold in the cooling tower. However, when bio loads exceed the chemical dose's ability to provide control, bacteria (including Legionella) can get a foothold causing the tower to become a health hazard. When Air Intake Filter Screens are applied, they significantly reduce bio-loads (which provide nutrients for bacteria growth) and help to optimize chemical water treatment effectiveness. Further, as bio loading is reduced, the amount of water treatment chemicals can also be reduced (by up to 50%) while still

keeping the tower biologically safe. When used in conjunction with “chemical-free” water treatment systems, Air Intake Filter Screens help facilitate optimal performance by reducing the amount of debris which must be managed. In short, use of Air Intake Filter Screens in combination with chemical or “chemical-free” water treatment systems helps to deliver water quality that neither water treatment systems nor air filtration can deliver independently.

**Energy & Atmosphere – (EB) Credit 3.2**  
**Building Operation & Maintenance**

Having a preventative maintenance program that lays out the maintenance process and requires documentation and review is crucial, because it is the road map that provides the detail of the work to be performed - however, that is not enough - the key is to streamline the maintenance process by taking the “hassle” out of the work that must be performed so the work actually gets done in a timely fashion rather than being delayed. Air Intake Filter Screens support this notion by significantly reducing the mechanical cleaning effort by up to 70% enabling maintenance engineers to quickly and easily clean the equipment. Keeping mechanical equipment clean enables it to perform at optimal levels and contributes to the broader building performance goals. When used with hail guard stand-off frames, Air Intake Filter Screens provide further protection against the occasional hail storm which can damage and destroy the equipment. Fouled or damaged coils reduce air movement through the coils, thwarts heat rejection, causes head pressure to rise, reduces cooling capacity, causes equipment to run longer to reach temperature set points and increases energy consumption.



**Air Intake Filter and Hail Guard Stand off Frames shown over newly replaced condenser coil following severe hail damage as shown to the right.**

**Indoor Environmental Quality – (NC) Credit 3.1 & 5 and (EB) IEQ Credits 10.3 & 10.6**  
**Indoor Chemical & Pollutant Source Control –**

When Air Intake Filter Screens are used on air handling units with internal filtration (pleated filters, roll media filters, panel filters, HEPA filters, etc) they will prevent pre-mature face-loading and fouling of the internal filters. Today, most maintenance programs call for quarterly filter changes, however, during the spring and summer months, cottonwood seed and other airborne matter is in relatively high concentration and can load internal filters in 1-2 weeks or less. When filters become face loaded, it increases the fan power draw, and/or decreases airflow. Furthermore, when filters become fully face loaded static pressure will rise - ultimately leading to tearing or collapsing of the filters. Unfortunately, prematurely fouled and/or damaged filters often continue in operation until the next scheduled change - all the while allowing unfiltered air to compromise the equipment and indoor air quality. Whether being applied to HVAC equipment in new constructions projects or, installed on existing building equipment, protecting internal filters against face loading will result in better performance and longer service life. Furthermore, extending filter life helps to reduce the waste making its way to the landfill or special handling and disposal as hazardous waste.



**Louver Filters Protecting  
Internal Filters on Air Handling Unit**

Additionally, Air Intake Filter Screens reduce chemical cleaning and site storage. As a result, it contributes to emissions reduction goals and helps prevent exposure of maintenance workers and building occupants to potentially hazardous chemicals that could adversely impact health, air quality, building finishes, building systems, and the outdoor environment.

**Innovation & Design - Credits 1.1 – 1.4:**

**(NC) Innovation & Design Process**

**(EB) Innovation, Upgrades, Operations and Maintenance**

Use of Air Intake Filter Screens provides added environmental benefits beyond those delivered by the mechanical equipment they protect. This is illustrated by recognizing that high efficiency HVAC equipment will only deliver highly efficient results if it remains clean – When considering the choices for keeping the equipment clean (cleaning chemicals & water consuming power washers or, non-chemical, non-water consuming air intake filter screens), use of Air Intake Filter Screens enable the equipment to operate at sustained high efficiency levels without premature fouling. It is the synergy of the filter screens in combination with the high efficiency equipment that helps promote sustained high efficiency performance. Further, because Air Intake Filter Screens can be configured in a wide variety of ways, they can provide innovative solutions to otherwise difficult air intake solutions.

So, whether your goal is to simply “Green-Up” existing HVAC equipment, upgrade to high efficiency equipment, streamline and reduce maintenance cost or, achieve LEED certification, use of Air Intake Filter Screens is a common sense technology that will support your company’s HVAC equipment, maintenance and energy saving goals ■

**LEED Point Guideline Summary  
Air Intake Filter Screens**

**Sustainable Sites (EB)**

**SS Credit 1.1 & 1.2 - Plan for Green Site and Building Management – Purpose:** to encourage grounds/site/building exterior management practices that have the lowest environmental impact possible and preserve ecological integrity, enhance diversity and protect wildlife while supporting building performance and integration into surrounding landscapes. Potential technologies & strategies include green cleaning and maintenance practices and materials that minimize environmental impacts in the green building exterior management plan. Also advocates use of Integrated Pest Management which calls for minimizing the use of pesticides and use of commonsense strategies to reduce sources of food, water and shelter for pests in buildings and on the grounds. **Point:** *Use of Air Intake Filter Screens reduces the need for water and HVAC cleaning chemicals that can enter the storm and groundwater during run-off – Further, when placed over air intake openings they help prevent entry of airborne debris as well as insects, birds and other wild life.*

**Water Efficiency (EB)**

**WE Credits 3.1 & 3.2 – Water Use Reduction – Purpose:** maximize fixture potable water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems by using strategies and systems that in aggregate produce a reduction of fixture potable water. **Point:** *Air Intake Filter Screens can significantly reduce water use for HVAC cleaning and water filtration flush backs on cooling towers.*

**Energy & Atmosphere (EB)**

**EA Credits 3.2 – Building Operations & Maintenance: Building Maintenance – Purpose:** support appropriate operations and maintenance of buildings and building systems so they sustain building performance goals over time. **Point:** *Use of Intake Filter Screens significantly reduces HVAC maintenance time and effort thus encouraging regular maintenance and ensuring HVAC systems operate at sustained high efficiency levels.*

**Indoor Environmental Quality (NC) (may also apply to EQ Credit 3.1)**

**EQ Credit 5 – Indoor Chemical & Pollutant Source Control -**

**Purpose:** minimize exposure of building occupants to potentially hazardous particulates and chemicals. **Point:** *Air Intake Filters protect condenser coils and air handling units so chillers and AHU filtration perform at sustained high efficiency levels – Supports IAQ initiatives.*

**Indoor Environmental Quality (EB)**

**IEQ Credits 9 – Contemporary IAQ Practice – Purpose:** enhance IAQ performance by optimizing practices to prevent indoor air quality problems, correcting IAQ problems when they occur and, maintaining occupant well being. **Point:** *Air Intake Filter Screens help keep HVAC & Cooling Towers clean so they don’t lose efficiency or fail due to fouling. Compared to traditional cleaning methods, Intake Filter Screens streamlines the maintenance process, reducing time & effort needed to keep systems clean - promotes optimum maintenance practices.*

**Indoor Environmental Quality (EB)**

**IEQ Credits 10.3 – Green Cleaning: Low Environmental Impact Cleaning Policy – Purpose:** reduce exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particle contaminants, which adversely impact air quality, health, building finishes, building systems, and the environment. **Point:** *Intake Filter Screens keep HVAC systems free of debris thus significantly reducing the need for HVAC cleaning chemicals – When cleaning the filters they only require a broom, brush or shop vacuum. The result is fewer chemicals to store, fewer emissions, fewer chemicals down the drain and reduced human chemical exposure.*

**IEQ Credits 10.4 & 10.5 – Green Cleaning: Pest Management Policy – Purpose:** reduce exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particle contaminants, which adversely impact air quality, health, building finishes, building systems, and the environment. This category promotes the use of Integrated Pest Management Techniques using safer alternatives to chemical pesticides while preventing economic and health damage caused by pests. **Point:** *Intake Filter Screens help protect all air intake openings from the entry of insects, birds and other pests while providing protection against natural airborne debris.*

**Innovation and Design Process (NC)**

**ID Credits 1 – 1.4 – Innovation in Design – Purpose:** to provide design and project teams the opportunity to earn points for exceptional performance above the requirements set by the LEED (NC) Rating System and/or innovative performance in Green Building categories not specifically addressed in the rating system. **Point:** *Intake Filter Screens are not specifically addressed in any category, however, their use provides HVAC system enhancement that may qualify for points in this category.*

**Innovation in Upgrades, Operations & Maint (EB)**

**ID Credits 1.1 - 1.4 – Innovation in Design – Purpose:** provide building operation and upgrade teams with the opportunity to be awarded points for additional environmental benefits achieved beyond those already addressed by LEED for Existing Buildings Rating System. **Point:** *Intake Filters provide HVAC enhancements and supports sustained high efficiency equipment operation.*

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