



# Effects of Noise and Importance of Low Sound Solutions

# The Effects of Noise

Noise is defined as any sound that is loud, undesired, unpleasant, or that causes disturbance. When this noise is a part of our environment, with the exception of industrial workplace sources, it is often referred to as community noise or noise pollution. High noise levels can have very adverse effects on the human body, including hearing loss, loss of productivity, interference with communication, increased stress, sleep deprivation, and even cardiovascular disturbances and illness. The severity of these effects is dependent on the intensity and duration of the noise.

To protect the population against unacceptable exposure to noise, governing bodies create policies and enforce sound limits and standards. Sound ordinances and noise laws vary widely among municipalities, while regulation and enforcement of sound limits remains at the local level. Local regulations for sound should be verified, but these limits represent the minimum requirements. For applications requiring higher standards, the expertise of an acoustical consultant can be employed to determine the sound specifications for your project. Some examples of the need for more stringent standards can be seen in areas of health care and education.

## HEALTHCARE FACILITIES

In recent years, attention has been raised regarding the importance of acoustics in healthcare environments. This includes both the right to patient privacy, as well as providing an acceptable environment for patient wellbeing and recovery. Version 2.0 of the “Sound & Vibration Design Guidelines for Health Care Facilities” was released in 2010 and is the referenced standard for the 2010 FGI-ASHE Guidelines for Health Care Facilities which has been adopted, all or in part, by 42 states and 7 federal agencies.



## SCHOOLS

The ANSI/ASA S12.60 Classroom Acoustics Standard was developed in 2002 due to extensive research indicating background noise and reverberation can severely hinder learning, especially in young children who are still developing skills in language and comprehension. The most recent revision of the standard was released in 2010. Several states, local jurisdictions, boards of education, and other nations have adopted directives on classroom acoustics.



## LEED®: LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN

LEED® was created to define the “green building” by establishing a common standard of measurement, all while raising consumer awareness of green building benefits. A voluntary system, LEED promotes whole-building design practices as it recognizes environmental leadership in the building industry. LEED 2009 recognizes the importance of acoustics by including acoustic requirements and credits to both LEED for Healthcare (2 credits) and LEED for Schools (prerequisite). Pilot Credit 24 for acoustics (1 innovation credit) is currently available for new construction and commercial interiors projects. For more information on LEED, refer to the USGBC website at [www.USGBC.org](http://www.USGBC.org)

## IMPORTANCE OF LOW SOUND DESIGN

Recognition for the importance of sound restrictions is growing and can be a very important design criterion for any project. Considerations for sound should be made during the design process. With proper analysis and planning, violations of sound ordinances and subsequent retrofits can be prevented, environmental quality can be improved, and quality of life can be enhanced. Not only is the risk of litigation and subsequent expenses mitigated, but an increase in quality of life leads to increased productivity and health for both occupants and neighbors.

## BAC SOUND FEATURES AND OPTIONS BY PRODUCT LINE

Offering the widest selection of sound mitigating options in the market place, BAC can provide the most cost effective option to meet any sound requirement.

Unit	Cooling Towers						Closed Circuit Cooling Towers					Hybrid	Evaporative Condensers						
	3000	1500	PT2	VT0/VT1	VTL	FXT	PfI	FXV	FXV Dual	VF1	VFL	HXV	CXVT	CXVB	PC2	VCA	VC1	VC1-C	VCL
<b>Standard Features</b>																			
Axial Fan Unit	✓	✓	✓			✓	✓	✓	✓			✓	✓	✓	✓	✓			
Centrifugal Fan Unit				✓	✓					✓	✓						✓	✓	✓
Single-Side Air Intake Unit		✓		✓	✓			✓		✓	✓	✓		✓		✓	✓	✓	✓
Ducted Applications				✓	✓					✓	✓						✓	✓	✓
<b>Sound Options</b>																			
Whisper Quiet Fan	✓	✓	✓				✓	✓						✓					
Low Sound Fan	✓	✓	✓				✓	✓	✓			✓	✓	✓	✓				
Intake Sound Attenuation	✓	✓		✓	✓			✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
Discharge Sound Attenuation	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓			✓	✓	✓
Water Silencers			✓				✓								✓				
BAC VFD Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BALTI GUARD™ Fan System	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓

# A Practical Approach

BAC can provide EVERY solution for sound reduction.  
Consider any of the following:

## Oversized Unit with Reduced Fan Motor Size

Utilizing a bigger box size unit with reduced fan motor size can reduce sound to acceptable levels. In addition to lower sound, this solution reduces energy consumption, system wiring, switch gear cost, and starter costs. With the reduction in sound levels and energy consumption, oversizing equipment is a very environmentally conscious approach to reducing sound.

## High Solidity Axial Fans

Adding a high solidity fan decreases sound levels by decreasing fan speed, which proportionally decreases sound levels. BAC offers three fan options for reduced sound pressure levels.

**Standard Fan** - All BAC standard fans are selected to optimize low sound levels and maximize thermal performance.

**Low Sound Fan** - The Low Sound Fan option reduces sound levels up to 9 dBA and has been certified in accordance with CTI Standard STD-201.

**Whisper Quiet Fan** - For the most extreme sound limitations, BAC's Whisper Quiet Fan can reduce sound 10-20 dBA. See page 5 for more information.

## Intake and Discharge Sound Attenuation

Factory designed, tested, and rated sound attenuation is available for both the air intake and discharge. Adding sound attenuation dampens the sound propagating from the unit.

## Water Silencers

The water splashing noise produced in induced draft counterflow cooling towers can be the dominant source of sound at short distances. Water silencers reduce this noise to nearly negligible levels.

## Single-Side Air Intake Units

Particularly sound-sensitive areas can be accommodated by facing the back panel to the sound-sensitive direction, reducing the propagation of sound.



Whisper Quiet Fan Installation

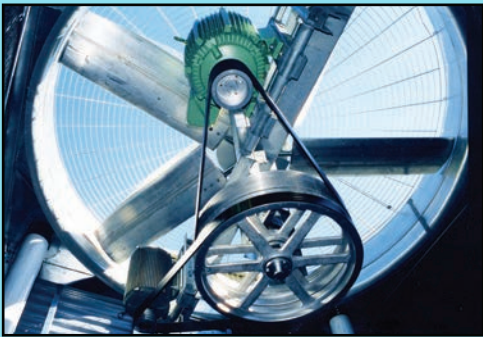


An Evaporative Condenser with Full Sound Attenuation



Series V Centrifugal Fan Single-Side Air Intake Unit with Full Sound Attenuation

# to Sound Mitigation



BALTI GUARD™ Fan Drive System



VFD Controls



Barrier Walls Being Erected Around FXV Dual Air Intake Units

## Centrifugal Fan Units

Centrifugal fans have inherent low sound characteristics. The ability of centrifugal fan units to overcome higher static pressures allows for the units to be ducted. Ducting shields blade noise to further reduce sound.

## Variable Frequency Drive (VFD) Controls

The human ear picks up sharp variances in sound levels more effectively than a gradual change, so the sound generated from a unit cycled on and off is much more noticeable compared to the sound of a unit continuously operated. The “soft-start” feature provided by a VFD minimizes the start-up sound. Additionally, VFDs provide smooth acceleration to maximum speed. These features blend the evaporative cooling equipment sound levels into the background and make the units less noticeable to neighbors and building occupants.

## BALTI GUARD™ Fan System

The BALTI GUARD™ Fan System consists of two standard motors and drive assemblies. A full size motor (sized for the design conditions) and a lower horsepower motor (sized at approximately one third the horsepower of the standard motor) are connected to the same fan shaft. When operating the BALTI GUARD™ Fan System with the low horsepower motor, fan speed is reduced, leading to sound level reductions of approximately 6-8 dBA. Since periods of reduced load often coincide with requirements for lower sound levels, such as at night, the BALTI GUARD™ Fan System can often provide the desired sound reduction and is a convenient solution for meeting the needs of sound sensitive installations.

## Barrier Walls (Provided by Outside Sources)

Barrier walls dampen the noise from evaporative cooling equipment to minimize sound transmission. Barrier walls can also provide value by concealing the unit from view. Layout requirements should be taken into consideration during design to ensure that the unit has an adequate supply of fresh ambient air. BAC recommends working with an acoustical consultant in conjunction with your local BAC Representative to achieve specified sound requirements, while maintaining unit efficiency.

# BAC Whisper Quiet Fans

## The Ultimate Low Sound Solution



### **Series 3000 and PT2 Cooling Tower Whisper Quiet Fan** 10-19 dBA Sound Reduction

The optional Series 3000 WQF is made up of high solidity fan blades fastened to a hub-plate with U-bolts for simple blade pitch adjustments. All fans come standard with blade leading edge protection and an integral shaft. The single-piece blades reduce stress concentrations at mechanical joints and provide added durability. The fiberglass reinforced polyester, molded blades are non-corrosive and chemical resistant. These features result in a low maintenance, highly reliable fan that can meet the strictest sound requirements. Furthermore, Series 3000 Cooling Towers have decreased water sound compared to induced draft counterflow units. Designed with two solid casing walls, units can be strategically positioned to reduce sound propagation to noise sensitive areas.



BAC maintains the widest selection of sound mitigating options in the market place. For the most demanding projects, BAC offers Whisper Quiet Fan (WQF) options on five different product lines to reduce sound to ultra low levels. BAC's Whisper Quiet Fans are specially designed and selected for each unit to provide drastically decreased sound levels, superior dampening properties, and maximum energy efficiency.



**PT2 and PFi Units**  
**Whisper Quiet Fan**  
**12-15 dBA Sound Reduction**

The newest addition to BAC's complete line of sound reduction solutions is the Whisper Quiet Fan for the PT2 and PFi units. This single piece, high solidity fan is made from chemical resistant fiber reinforced polyester (FRP) and comes standard with blade leading protection. As a single piece fan, the non-corrosive blades are permanently pitched and require minimal maintenance. Water silencers are available to mitigate water noise that can be a dominant sound source at short distances from induced draft counterflow cooling towers and are highly recommended on the PT2 and PF2 WQF units to achieve the full benefit of the fan's low sound capability. The PT2 and PFi are also an outstanding alternative for applications with layout restrictions.



**Series 1500 Cooling Tower,**  
**FXV Single Air Intake Closed Circuit Cooling Tower,**  
**and CXVB Evaporative Condensers**  
**Whisper Quiet Fan**  
**10-14 dBA Sound Reduction**

These Whisper Quiet Fan options are made up of adjustable pitch fan blades with extremely efficient blade profiles. The flexible connection between the blades and the hub is made using a special high tensile steel element, is not affected by severe atmospheric conditions, and requires minimal maintenance. Vibration is drastically reduced, which reduces stress on the fan blades and helps to avoid resonance conditions, even when used on a VFD. These models have a single-side air intake providing the ability to face the back panel to the sound-sensitive direction, further preventing propagation of the already extremely low sound levels.



**BALTIMORE  
AIRCOIL COMPANY**

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## COOLING TOWERS

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### CLOSED CIRCUIT COOLING TOWERS

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ICE THERMAL STORAGE

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### EVAPORATIVE CONDENSERS

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HYBRID PRODUCTS

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## PARTS & SERVICES



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