MARLEY®

thermal science

Sound Power Impacts

PER CTI CODE REVISION

Cooling tower sound levels have become an increasingly important factor in tower selection. Population growth in urban areas has led some municipalities to additional regulation of sound sources. The most common code for measuring and reporting cooling tower sound in North America is Cooling Technology Institute (CTI) ATC-128, Test Code for Measurement of Sound from Water-Cooling Towers. This code was revised in November 2019, altering the formula used to calculate sound power level. CTI participants mutually agreed to adopt the revised sound power method, effective September 1, 2020.

CTI ATC-128 code prescribes the equipment and test procedure for measuring cooling tower sound. Factory assembled products are governed by Section 8 Sound Measurements for Small Towers. The code defines sound pressure measurements on all four sides and overhead. Measurement locations are 1.5 and 15 meter (5 and 50 feet) distance from all five faces of the unit. Sound power is calculated from the 15 meter sound pressure measurements.

Some background is helpful to understand the distinction between sound pressure and sound power. A light bulb analogy is one common way to differentiate the two. An observer perceives less light or sound the further they are from a source. The distance dependent value is sound pressure level. Wattage of the light bulb is the same, regardless of location relative to the observer. The same characteristic is true of sound power—it does not vary with distance.

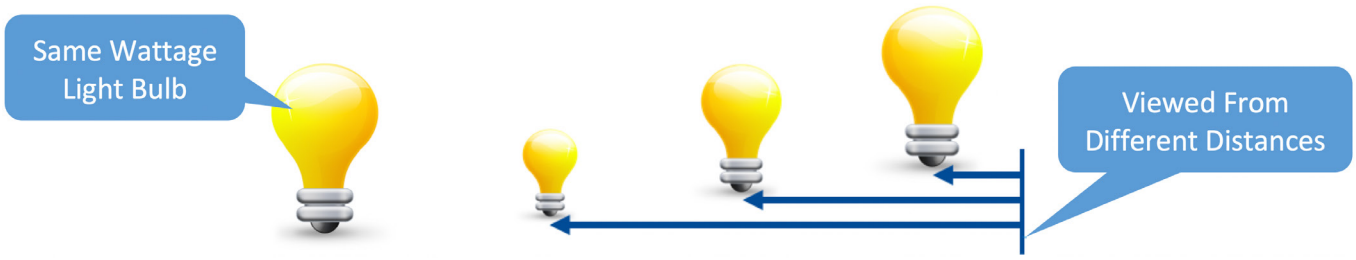
Electricity draw on the light bulb is a simple way to determine its wattage, but quantifying sound power of a cooling tower is not that easy. Sound power level cannot be measured directly and requires a calculation.

Sound Power Level

1. The amount of sound generated by a source
2. Expressed in dB, referenced to 1×10^{-12} W
3. Does not vary with distance from a sound source
4. **Calculated**

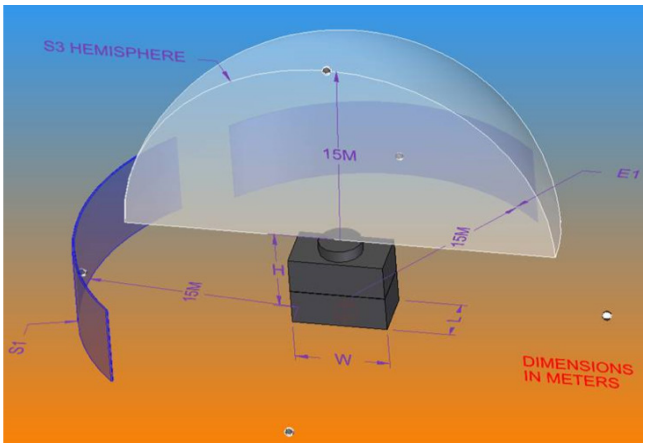
Sound Pressure Level

1. The level of sound at a specific location
2. Expressed in dB, referenced to 20×10^{-6} Pa
3. Varies with distance from a sound source
4. **Measured**



The November 2019 revision of CTI ATC-128 did not change anything regarding sound pressure level measurements. It merely changed the formula for sound power level, including the emission surface definition. Previous version of the code applied a simple 15 meter radius hemisphere as the entire emission surface. The November 2019 revision changed this to an overhead hemisphere, starting at top elevation of the unit, plus a quarter cylinder segment for each of four sides. The image below depicts these surfaces with representative 15 meter sound pressure measurement (microphone) locations marked.

This change was initiated as a collaborative effort within CTI. While CTI ATC-128 is prevalent in North America, sound power associated with the previous version of ATC-128 was frequently lower than other sound test codes used internationally. After studying test results for many different products and configurations, a satisfactory revision was identified. Resultant sound power now aligns more closely with other codes, such as ISO 3744 hemispherical method. The new ATC-128 formula uses the same 15 meter sound pressure levels, so legacy sound pressure data is still applicable. In other words, the revised code does not require any new sound pressure measurement locations.



SPX Image Microphone Location (TYP of 5)

Typical impact falls between 0 and +3 dBA when comparing sound power calculations—November 2019 revision of ATC-128 versus previous version of the code. It's important to remember that the code revision does not alter sound pressure levels. Only reported sound power level may change, according to the revised emission surface and formula. This means that a product with unchanged sound pressure levels is not louder. A higher sound power value, given the same 15 meter sound pressure levels, is simply a byproduct of the new mathematical formula.

Frequently Asked Questions

What is different?

November 2019 revision of CTI ATC-128 test code changed the mathematical formula for calculating sound power.

Why did the test code change?

Single-cell sound power will more closely align with other international test codes, such as ISO 3744 hemispherical method.

What is the impact?

Product sound pressure levels are unchanged. Only sound power may be different, due to formulas in November 2019 revision of CTI ATC-128. Typical sound power impact falls between 0 and +3 dBA after the change.

When is the change effective?

Revised sound power is effective September 1, 2020. After the change, sound reports generated from UPDATE™ tower selection software will note the relevant ATC-128 revision for clarity.

How do I compare sound results?

CTI participants agreed to implement the revised sound power formula by September 1, 2020 (ref. CTI press release). Products with similar configuration and dimensions, and comparable sound pressure levels at 15 meters, result in the same overall sound power level. Verify that all sound reports reference the November 2019 revision of CTI ATC-128.

References & Other Resources

CTI Press Release https://www.coolingtechnology.org/single-post/2020/08/06/CTI-Announces-Updated-Sound-Rating-Method
CTI code available at https://cti.org/pub/cticode.php
Understanding and Evaluating Cooling Tower Sound Levels https://spxcooling.com/library/understanding-and-evaluating-cooling-tower-sound-levels-among-manufacturers/

SPX COOLING TECHNOLOGIES, INC.
7401 WEST 129 STREET
OVERLAND PARK, KS 66213 USA
913 664 7400 | spxcooling@spx.com
spxcooling.com

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