Canadian Audiologist

The Official Publication of the Canadian Academy of Audiology

Good Old dBA

Published April 17th, 2014

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I am sure you were asking yourself why sound levels are expressed most of the time in dBA, sometimes in dBC and never in dBB. And what those A, B, or C means, anyway.

Let's try to answer some of those questions.

A Little Bit of History

To paraphrase the Bible, In the Beginning ... there were no audiometers, nor even audiologists (can you imagine?). The doctor (who was not even a GP and used to pay visits at homes) will lean a little bit towards your left ear and ask you for your name. Then he will lean towards the other ear and ask where you live. If you managed to answer both questions correctly, he will tell you that there is nothing wrong with your hearing and send you home, without asking for your health card.

Then, back in the 1930s, the electronic tube appeared and all hell broke loose. There appeared pure tone generators and people discovered that hearing was something really complex. In the USA, Fletcher and Munsen managed to graph the variation of the loudness at the different frequencies and levels, to the applause and amazement of scientists and practitioners alike. Whether this can be assumed to be the birth of the modern audiology, it can be discussed, but no doubt, it was a gigantic step in the right direction.

Science and Applications

So, we found out how the ear responds to different frequencies and levels. Now, scientists decided that it will be nice to have an instrument (sound level meter) where the meter could somehow indicate the level of the sound. That was done and everybody was happy: the sound level meter (SLM) measured the sound level and expressed it in dB. The device consisted basically of a microphone, an amplifier an attenuator, and an instrument.

Fine and dandy. But what about the loudness: we knew that 60 dB at 1000 Hz didn't sound as loud at 500 Hz, or at 4,000. As per the Fletcher and Munsen's graph, there are large differences. So, why not make an instrument where the reading will be proportional to the loudness of the pure tone at different frequencies? Well, that was too much to ask from an instrument (even today a loudness meter is kind of a sophisticated device). So, an interim solution was a device with three filters that could be placed on the path of the electric signal. The first will make the SLM mimic the loudness of a sound of approximately 45 dB, the second of 75 and the third, of 120 dB. They were denominated “A,” “B,” and “C” and the result of the measurement using those filters is what we call dBA, dBB, and dBC.

We are still talking of ancient history and of a device that besides being big and bulky and being built using vacuum tubes, was used by scientists with little practical application.

Some 15 years later, people became very interested in occupational hearing loss and hazardous

noises (and they are still). At that time the hazard assessment used to be done using a device called frequency analyzer, something bulky, expensive and difficult to interpret the results. There was a need for a device that could be light, inexpensive, and that could provide readings proportional to the noise hazard.

And sure enough, there was one available: they found that the good old dBA sound level was proportional not only to the hazard to hearing, but also to annoyance. In summary, there was a device that could be used by the safety personnel, by the technician and by the industrial hygienist alike.

In the end, the dBA was brought to use by a wide variety of practitioners. But that was not the end of ABC story. With time, there was a need for a simple way of rating the attenuation of hearing protectors. That is how the Noise Reduction Rating (NRR) was created. But to be used, the sound level in the environment has to be measured in ... dBC.

In summary, we measure in dBA when assessing noise hazard and annoyance and in dBC, when determining the sound level under a hearing protector.

And what about the dBB? Well, so far, it is still waiting for some application and not being used at all at the present.

dBA today

Shall we say dBA reign from sea to sea? Well, in a way, yes! National and international standards, provincial and municipal regulations all around the world, that deal with hazard and annoyance, they all require noise levels to be measured in dBA.

Does it mean that the book is closed and that dBA applies to all situations? Definitely not! When measuring in dBA, the acoustical energy at low frequencies (below 500 Hz) is largely ignored. This is OK for most situations derived from industrial and transportation activities. However, an excess of low frequencies, such as those that are not readily perceived as noise, may be quite annoying. One example is the noise from wind generators. Although not universally accepted, there are complaints of annoying noises with sound levels that are below the accepted limits. A similar situation has been found in the vicinity of large power transformers as well. Finally, there is the case of large compressors used by the gas and petroleum industries, which generate high levels of low frequencies that are annoying. Studies are underway to come up with corrections for situations like those described above.