

Conclusions from the Centennial sound study

1. "Green" paddles do not make measurable difference in sound levels....

P. 70: "There has been an effort in the pickleball paddle industry to move to quieter designs and most players are already using this "green list" equipment as it is referred to. Measurements by Spendiarian & Willis at a number of pickleball facilities have found that the mean sound exposure level of paddle impacts, when normalized to distance and ground type, is very consistent. This indicates that, in aggregate, most players are either using essentially the same equipment or that there is not a significant acoustical difference in the equipment used. During Spendiarian & Willis Acoustics & Noise Control LLC 70 of 77 testing where the make and model of the paddles in use have been recorded, it has been found that most players were using green list paddles. At the present time green list paddles should not be considered a noise control measure since most players are already using this equipment anyway."

2. Pickleball noise is a persistent, impulsive sound that is significantly different from tennis noise and other non-impulsive noises.

P. 38-40: "It should be clear from the above list of references that pickleball constitutes a significant change in the acoustic environment of the area surrounding the courts in comparison to tennis and must be planned for accordingly. In particular, the impulsive sound produced by the impact of the hard plastic ball on the paddle can cause significant noise impact for those living near the courts".

P. 40: **Characteristics of Impulsive Sound:** "Persistent impulsive sounds create annoyance because they are similar to sounds that contain important information about our environment such as footsteps, a door opening, a tap at the window, or speech. We are sensitive to these types of sounds because they alert us to events occurring nearby that we may need to respond to. Continuous false alarms such as the popping sound created by pickleball paddle impacts make it difficult to relax, concentrate, or sleep soundly without disturbance as each time a pop is heard it draws the attention, creating distraction."

3. Setbacks are the most important tool in sound abatement:

P. 65: A noise abatement plan begins with sufficient setback to noise sensitive areas to make abatement treatments effective. Any given noise abatement treatment will produce a limited amount insert loss or attenuation. A noise abatement plan for a site generally consists of a number of different treatments that work together to achieve an acceptable sound level in the surrounding area. Any deficit in the amount noise reduction achievable through mitigation treatments must be made up for in setback. In short, the setback is what makes the rest of the noise abatement plan possible.

4. Noise levels within 150 feet of a court require site specific noise abatement:

P. 65: "One approach to setbacks is to simply prescribe a minimum setback with regard to all residential land uses. ... This approach has the advantage of being easy to understand and apply; however, there are some situations where it may not be possible to create an effective noise abatement plan at 150 feet due to elevation differences or multi-story housing that make sufficient shielding by a sound wall impractical or impossible. In some special cases it may be possible to mitigate pickleball courts closer than 150 feet. Thus a 150 foot setback requirement would be overly restrictive in these applications. ... Pickleball courts within 100 feet of residential land uses have proven to be problematic resulting in lawsuits, strict limitations on usage, and court closures. Courts within 150 feet of residential land uses require careful noise abatement planning using modern methods of noise assessment for highly impulsive sound such as ANSI S12.9 Part 4 described in previous chapters and strict adherence to design specifications."

5. Sound barriers may trap and directionalize the pickleball sounds and consequently, such barriers must address all surrounding properties, and materials that absorb sound may also be needed.

P. 66: "A common problem encountered when designing a noise barrier system for pickleball courts is the need to shield homes on opposite sides of the courts. ... If this layout cannot be avoided by changing the relative positions of the two walls, sound absorption will be needed on the interior surfaces to control acoustical energy buildup. ... Carsonite is a sound wall system with integrated sound absorption. It is commonly used for noise mitigation along roadways and absorbs well at 1,000 Hz, the critical frequency for pickleball paddle impacts.

AudioSeal is an outdoor sound absorbing blanket material that can be attached to a fence. It does not absorb as well as the Carsonite at higher frequencies, but still performs adequately."

6. Noise abatement is needed for properties within 350 feet of a pickleball court.

P. 72: Courts located within 350 feet of residential properties in most cases require noise abatement. "Pickleball court sites within 500 to 600 feet of noise sensitive areas should be reviewed by a qualified acoustical engineer in the site selection phase of the project. In the case that the ground between the pickleball courts and receiving property is water this distance may extend 800 to 1,000 feet in some cases. Courts located within 150 feet of homes require careful and often extensive noise abatement design to avoid complaints. Placing open air pickleball courts within 100 feet of residential properties is not recommended."

p. 72: In order for a noise barrier to be effective it must be able to block the line of sight from the sound source to the receiving land use. "Pickleball paddle impacts can occur from near the elevation of the playing surface to a height of about 8 feet above it."

Conclusions of the study

P. 74-75: A combination of setbacks and noise abatement is needed for pickleball court noise management.

"11.1 Best Practices in Noise Assessment and Regulation.

... The group of ANSI standards in S12.9 represents the current best practices in community noise assessment. The measurement methodology and sound classifications in Part 4 of the standard (harmonized with International Organization for Standardization standard ISO 1996) have been implemented under European Union Directive 2002/49 and in a number of Asian countries. ANSI S12.9 Parts 4 and 5 have been used as the basis for the recommendations in this document.

11.2 Characteristics of Pickleball Sound.

The most notable sounds from pickleball courts are the popping sound produced when a pickleball contacts a paddle and speech. It is the popping sound of the paddle impacts that produces the greatest number of noise complaints. This sound has been classified as highly impulsive for the purpose of noise assessment under ANSI S12.9 Part 4.

11.3 Noise Impact Assessment of Pickleball.

... Measurement procedures based on the adjusted sound exposure level according to ANSI S12.9 Part 4 have been described as a more accurate methodology for noise impact assessment of pickleball.

11.4 Noise Abatement Planning.

Setbacks are an important first step in mitigating pickleball courts. A noise abatement plan usually consists of a number of treatments that each contribute a certain amount of noise reduction. Any difference between the total noise reduction of the abatement treatments and that required to meet target sound levels must be made for with setbacks. Topography and multistory structures near the courts will also influence the amount of setback required. In order for a noise barrier to be effective it must block the line of sight from the sound source to the point of observation. Upper level bedroom windows and decks that are

able to overlook the noise barrier will not be shielded and will likely experience a greater noise impact than at ground level. ...

11.5 Site Planning.

Site review and feasibility analysis for pickleball begins by looking at available setbacks and sight lines. This will determine what noise abatement treatments may be needed and whether they can be effective on a particular site.

Topography and the presence of nearby multistory housing are also important considerations that may affect required setbacks. The noise impact assessment of impulsive sound is a complex task that should be done using modern standards and best practices by an acoustical engineer with experience in psychological acoustics and signal analysis."