

# a·'ku·stiks

[n. pl. defining sound for the next generation]

## Memorandum

To: Amanda Lewkowicz – Quinn Evans

Alyson Steele – Quinn Evans

From: Russ Todd

Date: March 25, 2021

Re: Hirshhorn Museum Sculpture Garden - Inner Partition Wall

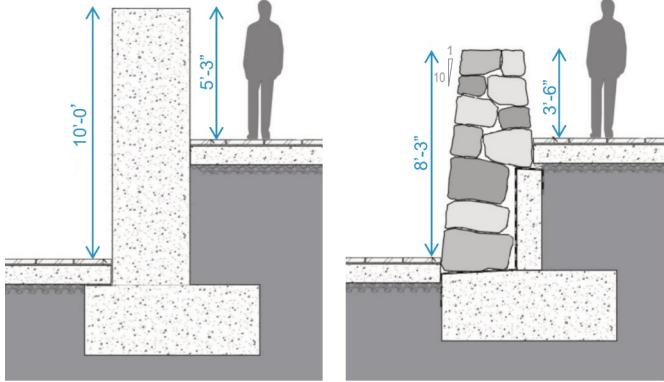
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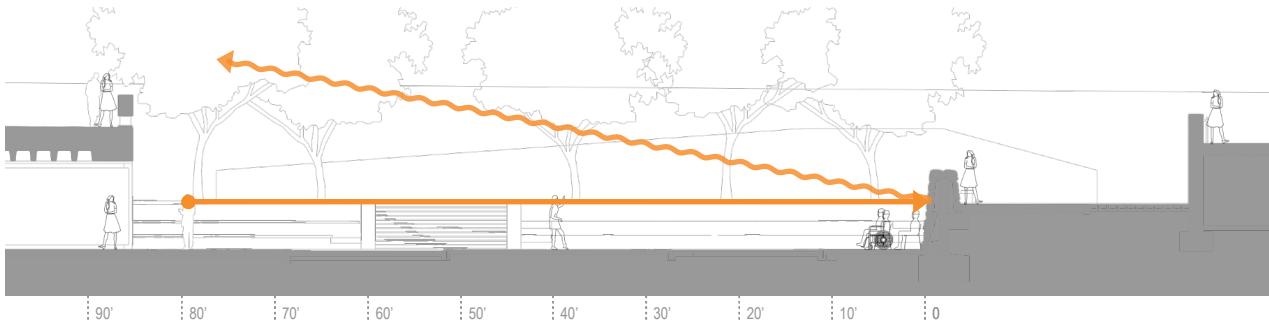
This memo summarizes analysis that was completed as part of schematic design in Fall 2019. Based on our review of Hiroshi Sugimoto's proposed angled stacked stone inner partition wall to replace the existing vertical concrete wall in the Hirshhorn Museum Sculpture Garden (see figure 1a), we offer the following acoustical observations:

1. **Vertical vs. Angled Surface:** The existing, flat vertical concrete wall will introduce specular acoustical reflections into the Central Garden and Reflecting Pool. Depending on the location of the sound source and listener in the Central Garden, the acoustical reflection may be late arriving compared to the direct sound from the sound source to the listener. Late arriving acoustical reflections can result in a reduction in intelligibility or clarity of the direct sound and in certain cases may be perceived as a separate sound event from the direct sound, often called an acoustical "echo". With the introduction of the proposed angled stack stone wall, the angled surface of the proposed wall will redirect reflected sound upwards and away from the Central Garden and Reflecting Pool (see Figure 1b). Given the interests in flexibility of stage and audience arrangements in the Central Garden and Reflecting Pool, the angled stone wall offers a means to avoid late arriving specular acoustical reflections that would be present with a vertical wall.
2. **Flat vs. Articulated Surface:** Unlike the existing vertical flat concrete wall, the proposed angled stacked stone wall has inherent surface articulation created by facets in stone surfaces and varied placement of the stones (see Figure 2b). The result is an articulated surface that will result in more diffusive and less specular acoustical reflections (see Figure 2a). The existing vertical flat concrete wall has a lesser degree of surface articulation or shaping that reflects sound in a more specular manner. Specular acoustical reflections can be perceived by listeners as being "harsh" and are best avoided in listening environments.
3. **Height:** The lowered height of the proposed angled stacked stone inner partition walls (from 5' to 3.5') enables improved sight lines to the entirety of the Central Garden and Reflecting Pool performance area (see Figure 3). Line-of-sight vs. obstructed line-of-sight results in improved acoustical connection between listeners on the elevated Allee to the performers below.

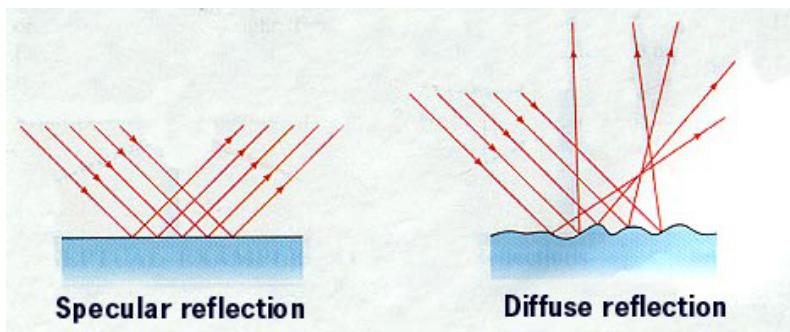




1a. Existing versus Proposed: (Left) Existing inner partition wall section. (Right) Proposed inner partition wall section.



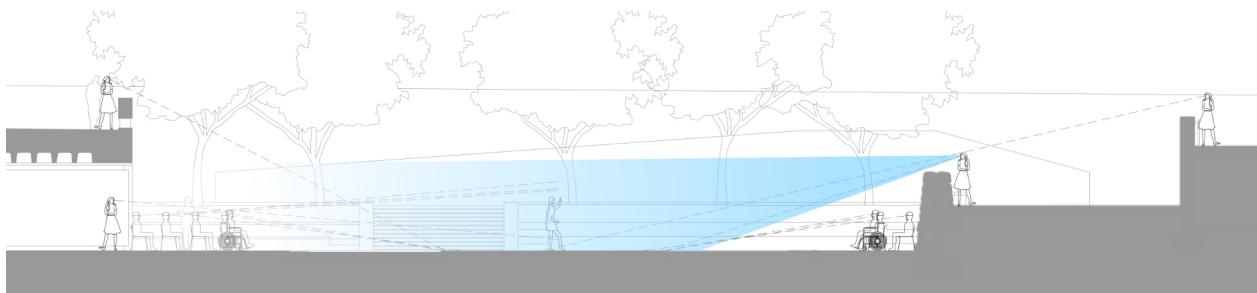
1b. Section diagram showing redirected specular sound off the proposed inner partition wall.



2a. Specular versus diffuse reflection. Source: [http://www.physics.louisville.edu/cldavis/phys299/notes/lo\\_reflection.html](http://www.physics.louisville.edu/cldavis/phys299/notes/lo_reflection.html)



2b. Surface. (Left) Detail image of the relatively flat existing, concrete wall. (Right) Detail image of the articulated stacked stone wall mock-up.



3. Section looking west showing sight lines from the Allee towards the Central Gallery.