What would it mean to make space inspired by the sounds of a particular place. The sounds are natural and man-made heard on the site the place is Virginia Polytechnic Institute and State University’s campus. I designed a series of outdoor spaces that reflect sound, and provide a structure where people can add to the sounds of campus.

This project creates space that facilitates acoustic activities of a university. The walls reflect and focus sound due to their material and geometry. Sound is treated as a building material, used to help form the spaces that are visibly bounded by concrete and plywood. Concrete walls and plywood floor will alter the acoustic activity on the site; the acoustic fabric will be constantly changing providing unique moments for people to discover as they pass through the site.

Sound: a vibration in an elastic medium, such as air or water.
"You can't make sound become hard and solid, but you can make it seem to stand still, as if hovering in place, so that you can walk around inside its acoustic structures."
Frequency: the rate of repetition of a periodic event.
Pitch: the subjective response of human hearing to frequency.
Wavelength: the distance a sound wave travels during one cycle of vibration.
Structure-borne sound: sound energy that can travel through building materials.
Free field: when sound waves are free from the influence of reflective surfaces.
Reflection: the return of a sound wave from a surface.
The site is at the northeast end of the drillfield on Virginia Tech's campus in Blacksburg, Virginia. At the intersections of the road circumcasing the drill field and the straight road running tangent to it are two triangular shaped green-spaces. They sit between the town and campus from east to west, as a permeable boundary between academic and social life. People rarely spend more time here than the minute it takes to walk across the site. This area of campus is highly populated in the morning as students and professors are going to classes, and at the end of the day, but most of all in the afternoon as people head to town for lunch. At other times the noise of the bus waiting at the stop overpowers all other acoustic activity present on the site. Once the buses part the site is rather quiet, I always felt as if it was holding its breath until the next throng of passengers. The acoustic life of the site goes through this cycle, experiencing similar sounds at the same time each day.
A line is an infinite series of points. Space can be defined by lines. I propose that the series of points is created with sound. Points of sound will be focused by reflecting natural sounds from the site off of concave and convex concrete walls to a series of focal points. Thereby defining and emphasizing space with lines of sound. The design development led to a set of drawings showing the dimension of circles that create the desired focal points. Segments of circles are realized in the form of walls. The walls are oriented in a way to acoustically connect with the surrounding area, the bell tower, the drill field, the bus stops, and the plaza in front of the library.

A change in the material of the ground signals pedestrians that they have entered the acoustically dense spaces. All of these elements acting simultaneously cause an acoustically active environment, constantly changing the nature of this place.

Sound has the ability to make us more aware of our surroundings. A solitary person may feel less alone in an acoustically active environment, than in an acoustically dead environment. In this I found potential to use sound as an architectural material to heighten the intention of the space.
Concave reflector: can focus sound, causing hot spots and echoes.

remnant of circular arc

bending of material
acoustic qualities of the ground plane
Flutter echo: caused by the repetitive interreflection of sound energy between opposing parallel or concave sound-reflecting surfaces.

“A curve acquires its meaning through its contrast with straightness.” The ground is composed of straight lines, the walls of circular arcs. Where the straight line meets the arc is a tangent point. In the point on the wall where the tangent is cut an 8” slit the height of the wall. The band of light passing through the wall makes the tangent point more evident than it would have been and adds a dramatic lighting effect to the acoustic activity.
Focusing: concentration of sound energy in certain areas.
Transmission loss: a measure of how much sound energy is reduced in transmission through materials.
Flanking: sound energy can bypass constructions through indirect paths.
Absorption coefficient: the effectiveness of a sound-absorbing material, values from 0 to 1, 0 being the most reflective.

<table>
<thead>
<tr>
<th>Material</th>
<th>125 Hz</th>
<th>250 Hz</th>
<th>500 Hz</th>
<th>1000 Hz</th>
<th>2000 Hz</th>
<th>4000 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>concrete, rough</td>
<td>0.01</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>concrete, polished</td>
<td>0.10</td>
<td>0.05</td>
<td>0.06</td>
<td>0.07</td>
<td>0.09</td>
<td>0.08</td>
</tr>
<tr>
<td>glass</td>
<td>0.35</td>
<td>0.35</td>
<td>0.18</td>
<td>0.12</td>
<td>0.07</td>
<td>0.04</td>
</tr>
<tr>
<td>grass</td>
<td>0.11</td>
<td>0.16</td>
<td>0.60</td>
<td>0.69</td>
<td>0.92</td>
<td>0.99</td>
</tr>
<tr>
<td>plywood</td>
<td>0.26</td>
<td>0.22</td>
<td>0.17</td>
<td>0.09</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>steel</td>
<td>0.05</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.07</td>
<td>0.02</td>
</tr>
</tbody>
</table>

"We see the light [architecture] reflects and thereby gain an impression of form and material. In the same way, we hear the sounds it reflects and they too give us an impression of form and material."
situation of the individual
semantic - meaning
"One who has half risen to the sound of a distant train at night, and through his sleep, experienced the space of the city with its countless inhabitants scattered around its structures, knows the power of sound to the imagination: the nocturnal whistle of a train makes one conscious of the entire sleeping city. Anyone who has become entranced by the sound of water drops in the darkness of a ruin can attest to the extraordinary capacity of the ear to carve a volume into the void of darkness. The space traced by the ear becomes a cavity sculpted in the interior of the mind."
This book was created using Adobe InDesign.
Images on pages 3 - 11 are digital photographs taken of the full scale construct built with concrete masonry units.
Drawings on pages 16, 17, 22 - 23 were hand drawn with graphite on bristol paper 22 x 30.
Drawings on pages 15, 17, 19, 21, 25, 26 - 23, 36, 38, 40 were drawn with AutoCAD and edited in Adobe Illustrator.
Images on pages 24 - 25 are digital photographs taken of the site with chalk lines drawn on the grass.
Images on pages 37, 39, 41, 43, 45 are digital photographs taken of a site model. The site model is spackle, bass wood and chip board.

I would like to thank Tom McNamara for his help with the construction and realization of this project.
1 All definitions: 
   Egan, Architectural Acoustics.
   Kahn, Noise, Water, Meat 158

Bibliography:
