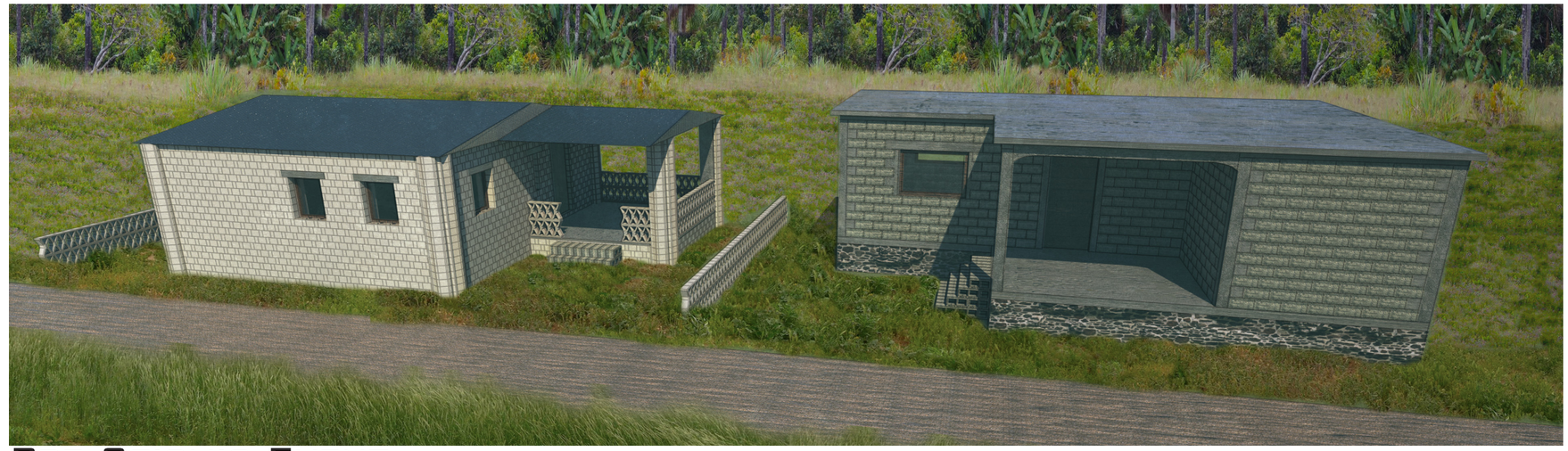
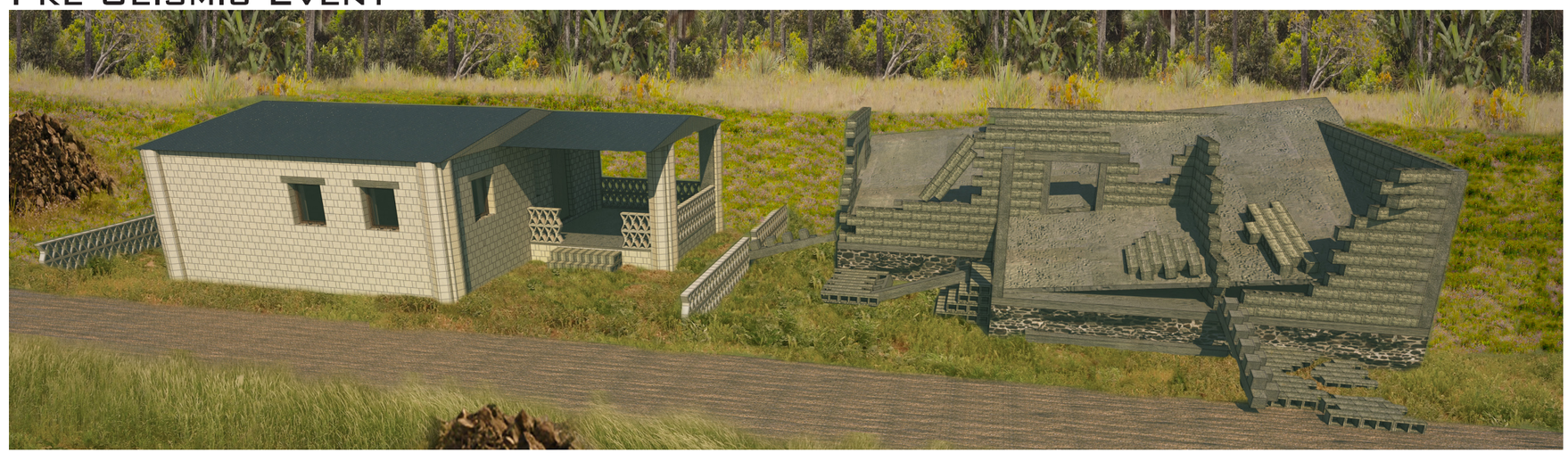
Seismic-Block

There are many different methods of post-disaster reconstruction around the world, utilizing many different building materials. Wood, concrete, and steel are among the most common materials used when rebuilding, however the performance of these is heavily dependent on its design. Unfortunately, many areas plagued with recurrent natural disasters are very poor, and cannot afford to have a professional help them rebuild. Along with this, materials that would be much more suited to the task, such as steel, are very expensive and require professional training to work with. This leaves many disaster-stricken countries with limited options, often using cheaper materials such as wood or concrete to rebuild. The use of concrete most often comes in the form of a typical Concrete Masonry Unit. These are very cheap and easy to mold, making them among the most used for post-disaster structures in areas such as Haiti. These units are relatively effective, however when introduced to extreme forces such as an earthquake they buckle and break quickly, leaving devastating effects. In order to improve the performance of these units, we have looked at the shape and how these units connect. We decided to use a triangulated form since it is more effective in combating forces in multiple directions, as well as being proven in seismic events. With this shape, we were also able to link these units together to create a more unified mass with all the individual pieces working together to resist load. This directly combats a CMU walls tendency to buckle under point loads, by spreading the force throughout multiple units instead of relying on mortar to hold the wall together. The addition of reinforcing material on the interior of the units adds even more potential for a variety of uses for this system, such as retaining walls, storm shelters, and bunkers. Along with structural performance, this triangulated form is also more aesthetically pleasing.



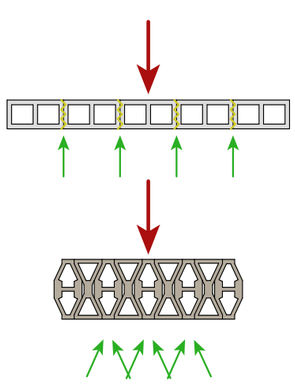
Pre Seismic Event



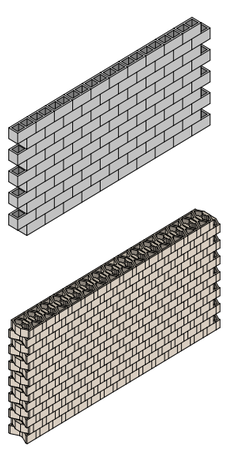
Post Seismic Event

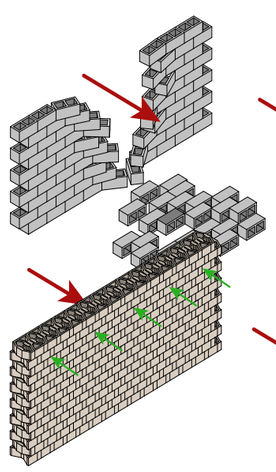
Perpendicular Forces & Stresses

Stress Handling

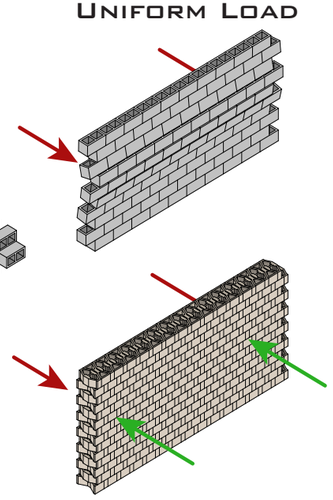


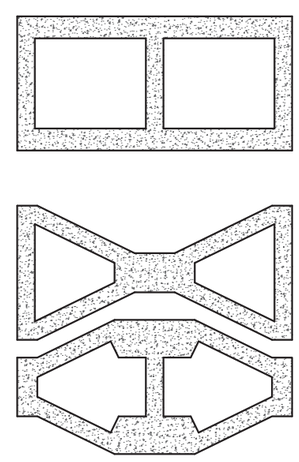
Point Load





Uniform Load





Standard Block

Mass = 3.5278 Kg
Fn = 3.5278 Kg x 9.8 m/s2 = 6.91448 N
6.91448 N x cos(90) = -15.4909982 N
Fk (Friction) = 0.2 x -15.4909 = **-3.908 N**

Density = 479.3206 Kg/m3

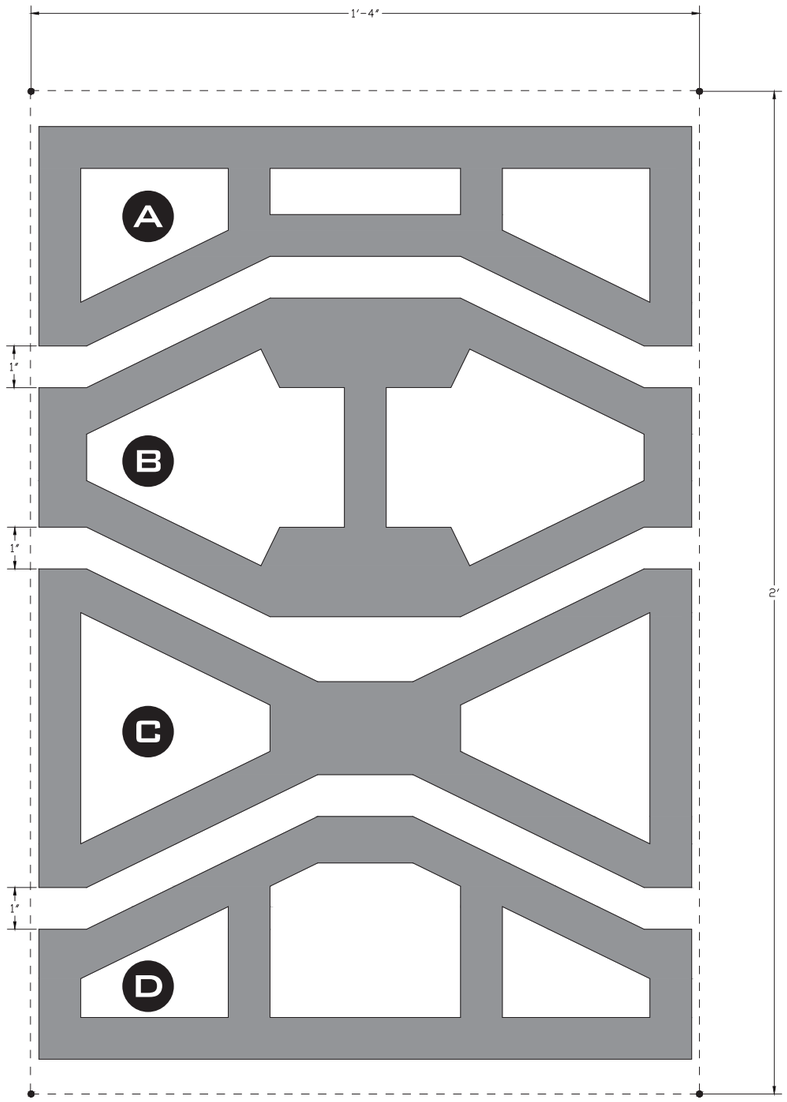
Seismic Block

Convex Wall Block:
Volume: 0.00431548 m3 x 479.3206 kg/m3 = 2.0685 kg
Fn = 2.0685 kg x 9.8 m/s2 x sin(154) = -1.2552
Fk (Friction) = -1.2552 fn x 0.2 = **-0.251 N**

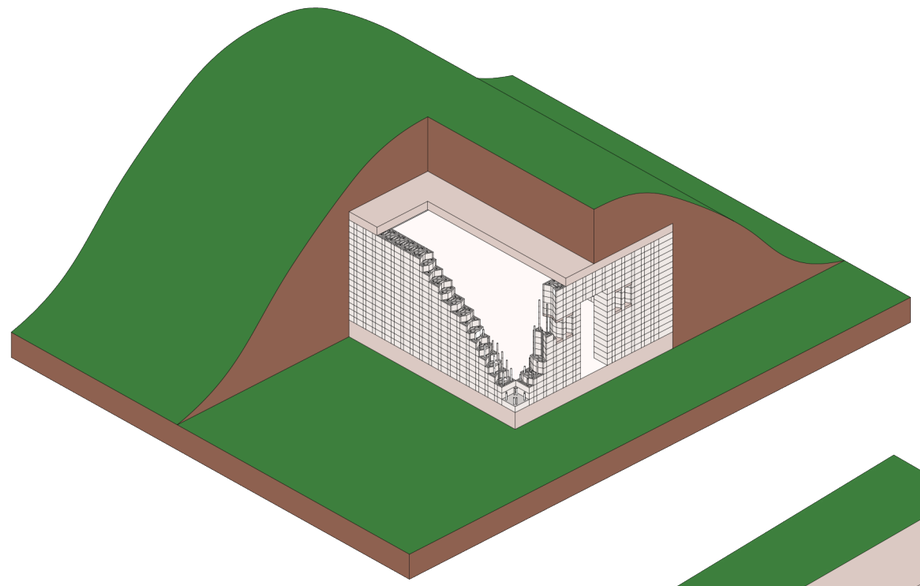
Concave Wall Block:
Volume: 0.00461281 m3 x 479.3206 kg/m3 = 2.2110 kg
Fn = 2.2110 kg x 9.8 m/s2 x cos(154) = -21.6263
Fk (Friction) = -216.2638 fn x 0.2 = **-4.325 N**

For our Friction Factor we assumed a value of 0.2 because that is the friction relating to a seismic event. When comparing the friction relationship between a standard block and ours, we have a higher friction allowance. This is due to the fact that unlike standard blocks which connect perpendicular to each other, our blocks weaves together. With this weaving, we are able to connect the over all friction of the blocks together to create a stronger wall in the event of seismic activity. Therefore we can conclude that our bricks, unlike standard block, will hold up to stresses at a higher capacity and still retain strength.

Dimensions Within Mold

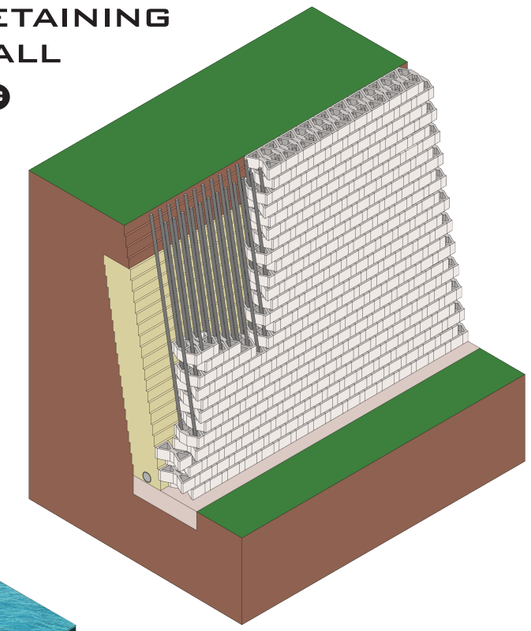


Additional Applications



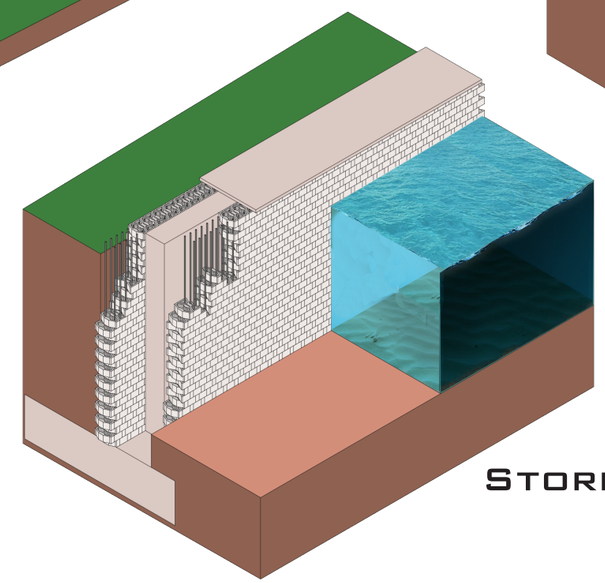
Levee & Sea Wall

B C



Retaining Wall

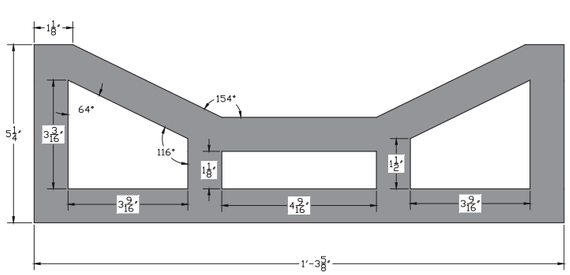
B C



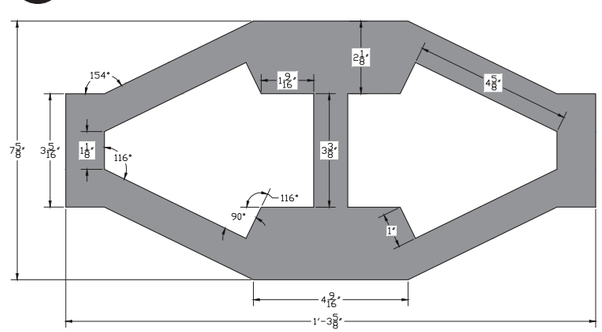
Bunker & Storm Shelter

A B C D

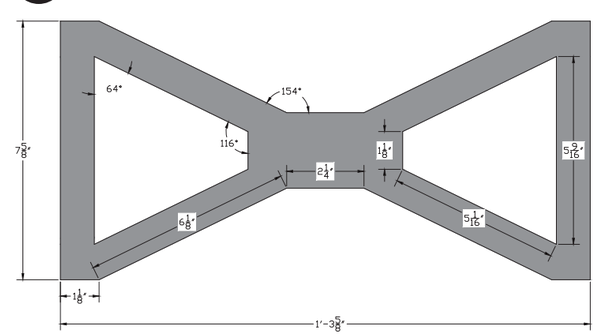
A Wall End Convex Column Piece



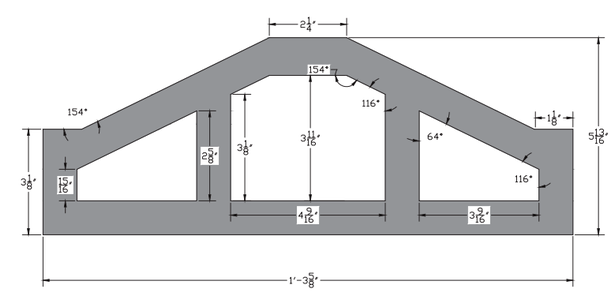
B Convex Wall Module



C Concave Wall Module

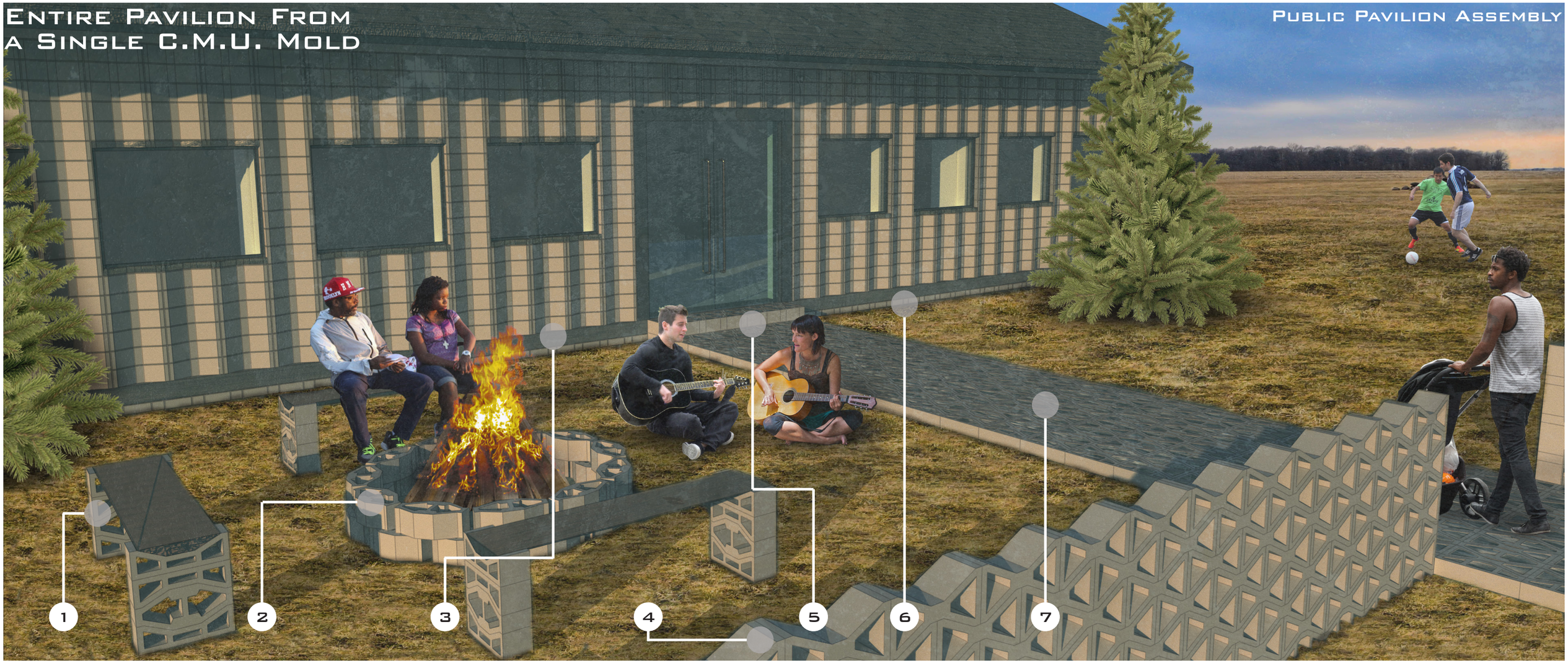


D Wall End Concave Column Piece



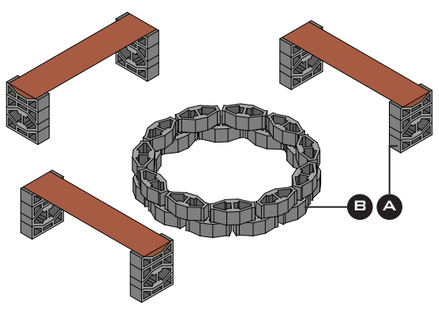
Entire Pavilion From a Single C.M.U. Mold

Public Pavilion Assembly

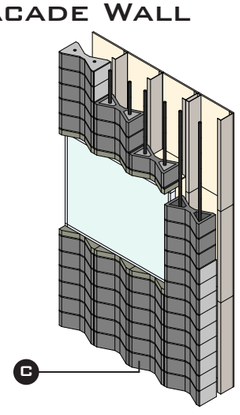


Different Uses

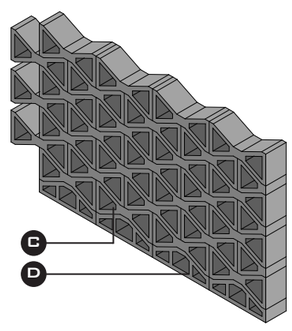
1 & 2 Fire Pit Options



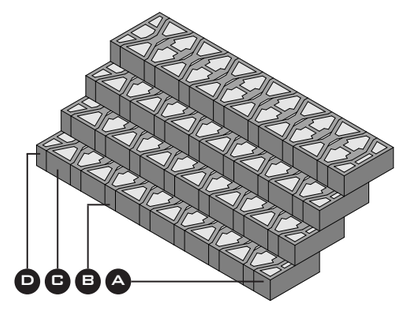
3 Facade Wall



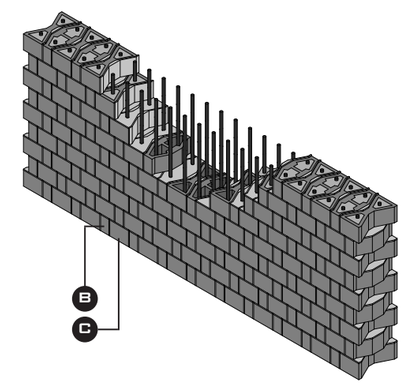
4 Picket Fence



5 Exterior Stairs



6 Foundation Wall



7 Exterior Walkway