“Instead of a brick urban wall, we envision...a porous membrane made up of four or five individual building.” - Steven Holl

Nathan Steeber
Simmons Hall, designed by Steven Holl and architects, is an undergraduate dorm that holds 350 students. In addition, it also contains a night cafe, street level dining, and an 125-seat theater. The building is 382 feet long and ten stories tall. Each single room or the dorm contains a grided pattern of nine operable windows. The depth of these windows 18” into the wall provides shade from the hot summer’s sun and allows ample heat gain in the winter. One explanation for the different colors coated on the head and jamb of the windows is to denote the different houses within the building. Another deals with stress which will be discussed along with structure. The colors are very visible from some angles and not as visible from others.
The model at the bottom was an early model depicting the sponge or porous concept idea behind Simmons Hall’s design. The porous parts of the building serve as atria to allow ventilation to flow up through the building and to serve as a common area for students to gather. Shown here are two atria within the building.\(^2\)
Much of Holl’s idea for Simmons Hall can be traced to a single word—“porosity.” The idea was supposedly inspired by the sponge he was bathing with one morning. The Sponge concept allows for the transformation of the building into a series of programmatic and bio-technical functions. Sculptural fluid spaces within the building connect residential houses vertically and promote student interaction. These large porous sections also serve as “lungs” for the building by allowing light to enter and serving as a means of vertical ventilation.
Model of Simmons Hall before construction began.

You can see through the floor plans that similar holes begin to link floors together vertically within the different houses in the building. You can also begin to see how systems work together as a whole.

Floor Plans
Although it was not an integral part of Holl’s original design, Simmons Hall is made of precast concrete panels that form an exoskeleton and bring the buildings heavy structure to the exterior. This solution was made possible by the structural engineer, Guy Nordensen, who created a high-strength pre-cast system specifically for this building, known as Prefcon. Prefcon is essentially a bearing wall that allows the regular patterns of windows on a small scale and large openings/cantilevers on a larger scale. These 10 x 10 or 10 x 20 foot panels work as a rigid frame and Vierendeel truss, to carry lateral forces and gravity.
A Vierendreel truss is a special truss developed in 1896. This sort of truss consists of a rigid upper (fixed connections between chords and webs) and lower beam connected by vertical beams. This truss is seen a lot in bridges, but has been seen in buildings as well. (Ex: the World Trade Center Twin Towers). This design is a unique design and a perfect selection for Simmons Hall because the rectangular openings in the truss allow for the 5000+ windows on the building.
Simmons Hall was designed to float as a result of an unreachable bedrock and the unstable soil. To achieve this a 4’ concrete matt foundation was created for the building to sit on. In addition an amount of soil equal to the entire weight of the building was excavated and the building replaced it to fool mother nature into thinking nothing happened. From the concrete matt, the Prefcon pieces were built upwards. As mentioned before, they were made into 290 pre-cast panels and were lifted into place and attached together. The joints were made extremely strong so that the members would yield before the joints would. To do this spliced sleeve joints with 1-inch dry-packed grout was used to connect pieces vertically, and wet joints and bar-lock couplers were used to connect pieces horizontally. It doesn’t end there. Not all the panels are the same. The colors of the windows correlate to the stress within them. Each color (blue, green, yellow, orange, & red) represents the size of the reinforcing steel needed in the concrete (5, 6, 7, 8, & 9/10 respectively). This idea was created as a result of computer generated stress models that showed parts of the building that would be overstressed. Even with these higher strength steel bars, there are some parts of the building where the panels had to be sealed as a result of accumulating stresses.
The interior structure of Simmons Hall consists of two rows of columns running the length of the building. They run along the walls of the central corridor so as not to interrupt the open spaces. Although these columns exist, they are not as important as the Prefcon. The interior columns are necessary, but the Prefcon carries most of the weight of the structure.  

Along with beams and slabs, the Prefcon and columns work to resist lateral loads. First of all, the Prefcon resists a majority of the lateral loads because of its stiffness. However, the loads are still transferred through the Prefecon into the ground and to the interior columns and then into the ground. The floor slabs also work as a diaphragm to resist lateral forces. The diagram to the left shows a shear diagram of the entire building caused by gravity and lateral loads.
Works Cited


