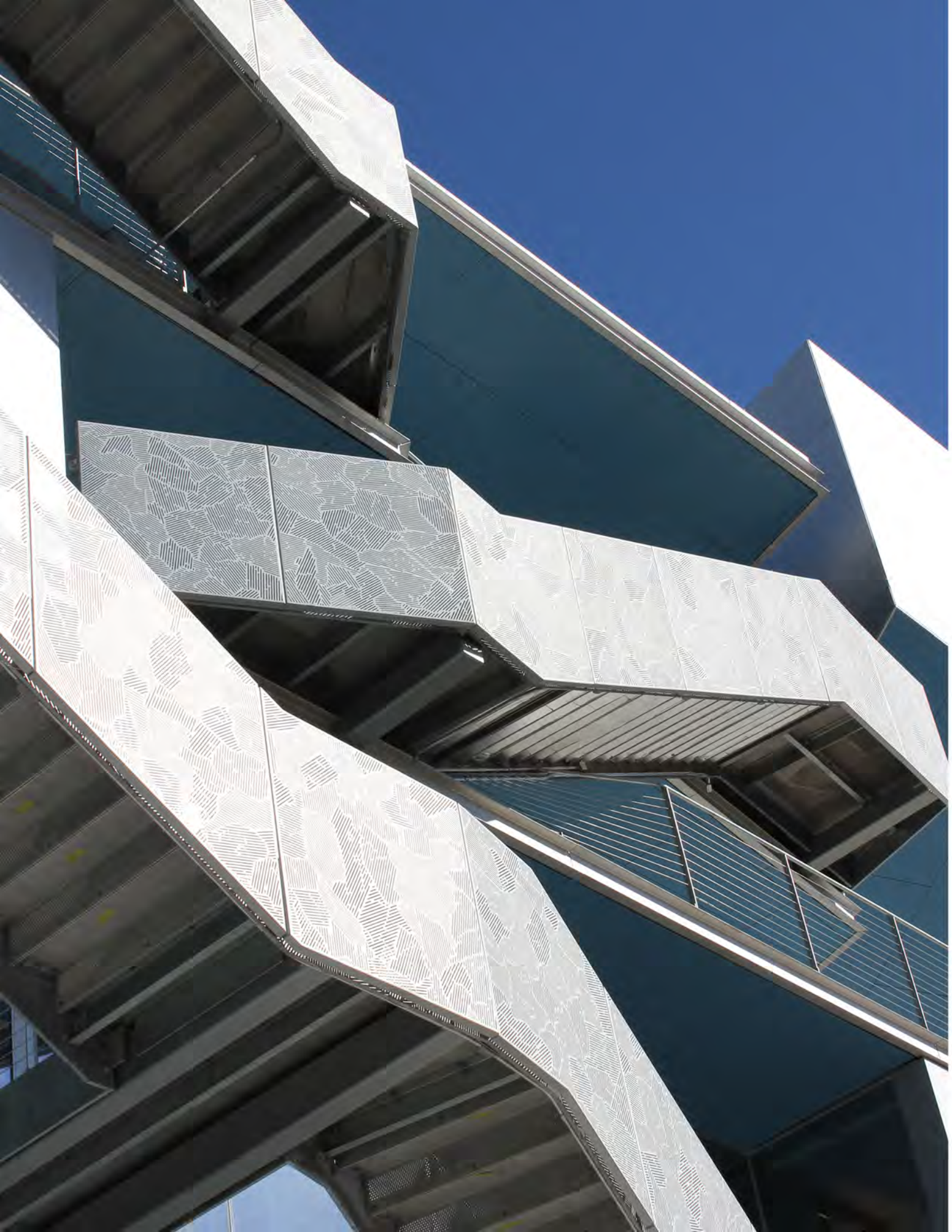


Iwan Baan

Facing Terraces and external stairs emphasize the structure's "lines in space" concept, inspired by field-play diagrams used in sports.

Campbell Sports Center at Columbia University

Resting on steel point foundations, a new athletic facility is inspired by the crisscrossing lines of field-play diagrams and creates a gateway to the university's Inwood sports complex.

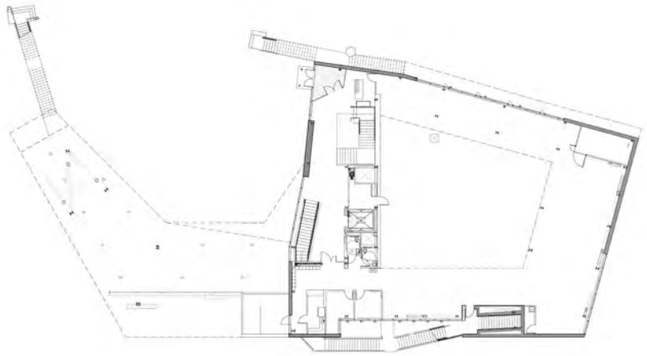
LOCATED IN THE INWOOD NEIGHBORHOOD at the northernmost tip of Manhattan, the Baker Athletics Complex has been the home of the outdoor sports programs at Columbia University for decades. The complex seemingly had it all: a football stadium, soccer fields, tennis courts, two baseball fields, even a physical fitness center built in the mid-1970s. What was lacking, up until recently, were offices for the varsity sports athletic staff as well as meeting rooms for larger gatherings. Since the complex is a few miles distant from the main campus, there was also a need for study rooms and strength building facilities for the student athletes plus a hospitality suite to support event activities.

Recognizing these needs, the university commissioned Steven Holl Architects of New York to develop a building that could fit into the overall complex and become a focal point for the facilities already there. Together, they determined that the corner of West 218th Street and Broadway—where Broadway crosses with Tenth Avenue and the elevated tracks of the 1 subway line—was an ideal opportunity to both shape an otherwise obscure urban corner and to create a new anchor for the overall sports complex.

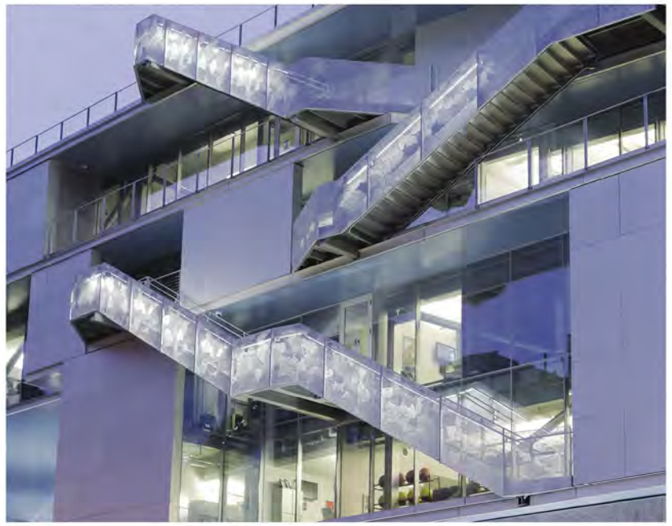
Steven Holl, well known for insightful designs, saw the building as serving the needs of the whole athlete. He states that the 48,000-square-foot Campbell Sports Center "aims at serving the mind, the body, and the mind–body for aspiring scholar–athletes." Inspired by the diagrams used in field sports that define "points on the ground, lines in space," his building design developed from "point" foundations on the sloping ground and exposed terraces and external stairs that serve as the "lines in space." By extending five stories upward from Broadway it connects the elevated playing fields with the lower streetscape while giving views from the upper levels over the fields and Manhattan. One of the main design features is the creation of an elevated narrow extension of the building that is described as an "arm" that reaches around from the third level and down an exterior stairway to the athletic fields. In the process it creates open space below that serves as a covered portal or gateway to the athletic fields for spectators.

Olaf Schmidt, associate in charge of the project for Steven Holl Architects, saw the need to combine this intricate design intent with the practical construction requirements right from the beginning. "Up-front coordination was very important as the way to bring all ideas and all parties to the table." This began with the decision to use all-steel structural framing for the project in order to provide the flexibility and versatility needed to meet the design intent and the sloping site. The elevated "arm" of the building was a particular feature that grew from strong collaboration between all of the parties involved. The original structural design had more columns exposed under the arm to support it but the architect asked if that could be modified to use fewer columns. Pat Arnett of structural engineer Robert Silman Associates led his engineering team to experiment with designs that removed more and more of these columns across six different designs. In the end, he points out that, "Everyone agreed on a design that includes more trusses and fewer columns. This whole elevated section of the building functions more like a bridge. The design achieved lateral stability by using moment connections and some angled columns that all worked together to transfer the loads." To help minimize columns in this area, one portion is supported in tension from the upper structure using a solid round 4-inch steel bar with custom connections at the top and bottom. "This was an unusual and unique solution that worked quite well in this case," says Arnett.

The rest of the building relied on some innovative steel structural design as well. In essence, the engineers established a few lines of structure that ran through the building and determined where they could put lateral bracing in between. The structure was held back from the exterior, meaning that the floors were cantilevered out 2 or 3 three feet depending on the location. It was these floors that required considerable attention to detail and coordination since they were framed with steel beams that supported pre-cast concrete plank. The design intent was to have the concrete plank sit flush with the top of the steel beams and then pour over it a 3-inch concrete topping that would remain exposed as the finished floor of the building. These A992 steel beams ranged in size from W12 to W24. Then, A36 plates and angles were connected to the web or the bottom flange to secure the 12-inch-thick concrete plank in place at the proper elevation. The varying geometry of the building was the reason for the variations in the steel sizes, but it



Left A plan of the center's fifth floor.
Center The building shapes an urban corner on Broadway and 218th street.
Bottom Extending over a stepped landscape, blue soffits heighten the openness of the urban scale portico to the Baker Athletics Complex.
Facing The 48,000-square-foot facility houses strength and conditioning spaces, offices for varsity sports, theater-style meeting rooms, a hospitality suite, and student-athlete study rooms.



meant that every concrete plank and connection to the steel were drawn and heavily coordinated and reviewed by the designers, the steel fabricators and the concrete plank supplier all under the oversight of the construction manager and engineers.

The main weight room on the second floor of the building also posed a structural challenge that was readily met. The weight room is a two-story atrium space ringed by views from the upper level. The loads from the floors above it needed to be transferred around this open space, so a massive 54-inch deep plate girder with 18-by-4-inch flanges was used to meet the need. The structure is exposed and expressed in this space, so it seems only fitting to everyone that this plate girder resembles a giant barbell in appearance and is quite consistent with the weight room use.

The metal building facade is an elegantly designed arrangement of open joint aluminum rain screen panels accentuated with metal covered exterior stairs. The panels were installed with narrow ¼-inch gaps and secured to conventional construction behind. The architect and curtain wall consultant W.J. Higgins worked directly with the fabricator to create these custom panels from ¼-inch raw aluminum flat plate. Each panel was sanded to create the desired appearance and then received a clear anodized finish. Panels that cover over the exterior stairs were finished in the same manner but perforated to create a lighter appearance in contrast with the solid rain screen panels. The exposed exterior structural columns were painted to carefully match the coloring and sheen of the sanded aluminum such that the total building presented a unified appearance. Olaf Schmidt says he was particularly pleased with the overall end result finding that, "The aluminum rain screen panels and stair panels accommodated the design very well. These different pieces ended up matching in appearance quite well due to the careful work of the fabricators."

The large aluminum soffit areas under the upper sections of the building are finished in Columbia blue. While this gives an appropriate nod to team spirit and loyalty, it also provides a design feature that works particularly well at night when the building lights are on to showcase the color. Extending over the stepped landscape, these blue soffits heighten the openness of the urban-scale portico and provide the facility with a long-lasting and easy-to-maintain surface.

Due to the early coordination and collaboration of everyone involved in the project, the steel framing went up quickly and the precast concrete floor sections were set into place without delay. This was a significant achievement since the installation sequencing of the steel beams and concrete plank had to occur so that one didn't preempt the other in the process. Despite the building's intricate geometry, its structure was framed and ready for enclosure in a matter of months.

Since its completion, the building has been described as appropriately raw and rough on the inside and refined on the outside, with crisp detailing. "In terms of the execution it was very careful," says Schmidt, who saw it progress from the earliest stages through to its opening. Of course, the biggest fans of the final outcome are the coaches, athletic director, and student-athletes of Columbia University as they begin to use their winning new facility.

Top: Steven Holl Architects; center and left: Iwan Baan

Iwan Baan

CAMPBELL SPORTS CENTER AT COLUMBIA UNIVERSITY

Location: **W. 218th Street at Broadway, New York, NY**
Owner: **Columbia University**, *New York, NY*
Architect: **Steven Holl Architects**, *New York, NY*
Structural Engineer: **Robert Silman Associates**, *New York, NY*
Mechanical Engineer: **ICOR Associates**, *Iselin, NJ*
Construction Manager: **Structure Tone Inc./Pavarini McGovern**, *New York, NY*
Curtain Wall Consultant: **W.J. Higgins**, *Wasau, WI*
Structural Steel Fabricator: **Weir Welding**, *Carlstadt, NJ*
Structural Steel Erector: **North American Iron Works Inc.**, *Ridgewood, NY*
Miscellaneous Iron Fabricator and Erector: **Post Road Iron Works**, *Greenwich, CT*
Architectural Metal Fabricator and Erector: **City Glass Co.**, *Bayonne, NJ*
Ornamental Metal Fabricators and Erectors: **City Glass Co.**, *Bayonne, NJ*; **Post Road Iron Works**, *Greenwich, CT*
Metal Deck Erectors: **North American Iron Works Inc.**, *Ridgewood, NY*; **Weir Welding**, *Carlstadt, NJ*
Curtain Wall Erector: **City Glass Co.**, *Bayonne, NJ*