Flying HIGH

BY CHRISTOPHER PITT, S.E., P.E.

The University of Oregon Ducks get a boost from their new football complex.

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AS ONE OF THE TOP college football programs in the country, the University of Oregon is constantly upping its game.

The new, privately funded 145,000-sq.-ft Hatfield-Dowlin Football Performance Center has further empowered the already formidable Ducks with groundbreaking facilities to help ensure the program maintains its competitive edge.

Made possible by a devoted set of donors, most notably Nike founder Phil Knight and his wife, Peggy—whose mothers are the namesakes of the facility—the complex is intended to serve as a lasting legacy and a clear proclamation of strength and innovation. The dramatic steel cantilever looming overhead on the approach to the Ducks' Autzen Stadium is one of many bold design features that evoke the strength of the athletics program and the structural system that supports them.

Mirroring the efficiency and precise design of Oregon's hallmark "Blur" offense, the complex provides world-class training, teaching, office and nutrition services to the team and staff. Within its sleek exterior are a spacious weight room, coaching staff offices, the "War Room," team meeting theaters, position-specific training rooms, locker rooms, practice fields, dining facilities and a players' lounge.

The design team, including architect ZGF Architects and structural engineer KPFF Consulting Engineers, worked tirelessly to ensure a peerless complex. Prominently featured in major elements and small design moments throughout the center, the 850 tons of structural steel used for the project enables floor cantilevers of up to 50 ft, the intricate façade and the precise edges of the players' walk (commemorating every football letterman in the university's history).

Another Day at the Office

The most innovative and technically challenging structural component in the complex is the three-story "Office Bar." Housing coaching staff, recruiting offices and the players' lounge, this area is structurally similar to a bridge; the bottom hovers approximately 40 ft above an exterior plaza that serves as the players' walkway to the practice fields. The 35-ft-wide structure is approximately 235 ft long and is supported by two steel-clad stair cores with plan dimensions of 22 ft × 12 ft and 22 ft × 17 ft. The stair cores are located 50 ft and 40 ft from the north and south ends of the building, respectively, resulting in impressive cantilevers at each end and a central span of almost 120 ft. Along the top floor, steel trusses run along the east and west façades to enable this

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long, slim suspended structure. This strategy also permits column-free space throughout the building, with maximum transparency along the fully glazed west face, which directly overlooks the new practice fields. The trusses are composed primarily of W24 top and bottom chords with W12 diagonals tied together with fully welded connections. The truss diagonals are left exposed along the length of the player's lounge, where the gusset-free welded connections create the cleanest appearance possible as the diagonals disappear seamlessly into the floor and ceiling. The lower two floors of the office bar are hung from the bottom of the trusses using high-strength steel rods.

The top-story trusses in the office bar were designed as warren trusses, a configuration that maximizes shear stiffness. This approach optimized the vibration response of the structure and permitted a column-free space, which was preferred by the architects. The vibration response of the structure was analyzed extensively to ensure acceptable behavior, including calculations that considered occupants who were part of a collegiate football program and would have a higher-than-average anticipated weight.

The office bar trusses are located outboard of the concrete stair cores by up to 6 ft., 6 in., demanding significant outrigger beams to deliver the truss reactions to the concrete core. Continuous 30-in.-deep built-up steel outrigger beams running continuously between the trusses were cast into the concrete core walls to provide a direct and robust load path. The outrigger beams are composed of up to 3-in.-thick × 20-in.-wide plate flanges connected by two web plates located 6 in. apart.

In the Box

Connecting the east side of the office bar to the adjacent teaching box building at each level posed an additional design challenge. A 24-ft-wide steel-framed skybridge spanning approximately 48 ft connects the two structures just south of the office bar's northern stair core. The resulting 24-ft-wide diagonal-free opening near the end of the central truss span is accomplished through the use of a three-story-tall Vierendeel truss composed of fully-welded W30×357 horizontals and verticals, connected to the single-story warren trusses on each side to form a continuous structure.

While the building core walls were designed to provide adequate independent seismic resistance, a parallel seismic analysis was performed to consider how frame action between the core walls and steel trusses might affect the behavior of the structure. As a result, the steel trusses and outrigger beams were designed to provide adequate strength and resilience to ensure acceptable seismic behavior while maintaining vertical load-carrying capacity.

The erection of the office bar trusses was accomplished by fabricating and installing truss lengths of up to 100 ft at each end of the building, centered approximately on the cores and temporarily supported using bolted connections to the outrigger beams while the final welded connections were completed. Once the end segments of the truss were erected, the remaining middle spans were lifted and attached to the end segments, completing the trusses. The remaining structure for the levels below was then hung from the trusses without the need for shoring.

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The new complex, with Autzen Stadium in the background.

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Sunglasses for a Building

The striking appearance of the office bar is augmented by the unique glazing feature known as the "sunglass wall" on the west façade. The sunglass wall is composed of a series of intermittent exterior glass panes alternating position across three planes. Offset from the building skin by several feet, the sunglass wall hangs from cantilevered HSS beams that extend from the roof, providing a significant expression of dimensionality and creating fantastic shadow patterns while shading the interiors.

The adjacent teaching box is the largest building mass on the site. Five stories tall, it accommodates the lobby, dining hall, media and scouting facilities, locker rooms, position classrooms, meeting rooms and the team theaters. The building features a two-story-tall, 28-ft cantilevered portion at the upper two levels, hung from 5-ft-deep custom steel plate girders at the roof. The upper three levels of the building are framed primarily with composite steel beams and columns that were analyzed extensively to ensure acceptable vibration performance. While the teaching box building's primary structure has regular columns and is thus more conventional than the office bar, it features a highly variable façade including myriad support and loading conditions. Numerous vertical and horizontal cladding fins extend out from the building façade, providing shading and delineating the rectilinear frames that define the building's exterior. The frames are supported by cantilevered HSS framing extending out from the primary structure at various elevations, enhancing the three-dimensional character of the building skin. The outside face of cladding steps in and out of plane between the various frames, lending the appearance that the building was constructed from a number of block-shaped elements fit together. Much of the building façade is composed of unitized curtain wall, a prefabricated cladding system that allowed for a sleek appearance with precision architectural design while meeting the building's stringent energy efficiency requirements and accommodating a rapid construction schedule.

The Hatfield-Dowlin Football Performance Center represents a significant investment in the future of the athletics program at the university and promises to attract recruits from around the country. And the university sees the facility itself as a sparkling new steel trophy case for the Ducks. ■

Owner
University of Oregon/Blue Ribbon Sports

General Contractor
Hoffman Construction Co., Portland

Architect
ZGF Architects, Portland, Ore.

Structural Engineer
KPFF Consulting Engineers, Portland

Steel Fabricator
Metals Fabrication Co., Inc., Spokane, Wash. (AISC Member/AISC Certified Fabricator)

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Erecting a truss.