

Architectural Significance in Metal Buildings: An Educational Series

BOSTON SPORTS INSTITUTE

A Steward Family Facility

Wellesley, MA

Created in coordination with Dacon Corporation,
ESG Associates, Inc. dba EDGE Sports Group, and
BARNES buildings & management group, inc.

Photo courtesy of EDGE Sports Group





Photo courtesy of EDGE Sports Group

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PROJECT DETAILS

Building: Boston Sports Institute, A Steward Family Facility

Location: Wellesley, Massachusetts

Client/Owner: EDGE Sports Group and the Town of Wellesley

Size: 130,000 square feet

Site: 8 acres

Budget: \$26.3 million

Completion: Fall 2019

Architecture, Architectural Engineering & General Contracting: Dacon Corporation, PDA Associates, Inc.

Structural Engineering: DeSimone Consulting Engineers

HVAC Engineering: Environmental Systems, Inc.

Electrical Engineering: Rivers Electrical Corporation

Civil Engineering and Landscape Architecture: Allen & Major Associates, Inc.

Geotechnical Engineering: McArdle Gannon Associates, Inc.

Metal Building Engineering and Construction: BARNES buildings & management group, inc.

Metal Building Manufacturer: Metallic Building Systems (primary and secondary steel framing, roof)

Metal Panel Manufacturer: Metl-Span, LLC (insulated metal panels)

Ground Improvements: Hayward Baker, a Keller company

Specialty Pool Engineering and Installation: Weston & Sampson, Myrtha Pools

Fire Protection Engineering: Platinum Fire Protection

Plumbing Engineering: GCI Builders, Inc.

Acoustical Engineering: Cavanaugh Tocci Associates, Inc.

Refrigeration: Independent Mechanical Contractors, Inc.

Ecological Science: BSC Group

Energy Modeling: Demand Management Institute



Photo courtesy of Dacon Corporation

PROJECT DESCRIPTION



Photo courtesy of Dacon Corporation

Overview

The Boston Sports Institute (BSI) in Wellesley, Mass., is a 130,000-square-foot, mixed-use sports and recreation center that provides professional-grade practice facilities for athletes of all ages and abilities living in and around this New England town. It averages more than 800,000 visitors each year with its core users ranging from community youth and adult sports groups to organizations that train and educate young, elite athletes. (1)

BSI features two NHL-regulation ice rinks, a fieldhouse with an indoor synthetic turf field and an elevated track, a competition swimming pool, a warm-up pool, sports medicine and athletic training facilities, tutoring and other educational classrooms, and related commercial, office and auxiliary facilities. (2)

The total project cost for BSI, including site development, building design and construction, was \$26.3 million. It took 18 months from construction start to occupancy, although developer Brian DeVellis, president of ESG Associates, Inc. dba EDGE Sports Group (ESG), said the actual construction time frame would have been closer to 10 months if some unforeseen circumstances hadn't arisen. For example, Merrimack Valley gas-line explosions led the state to halt all gas tie-ins until the lines were repaired. (3) ESG also experienced delays related to installing traffic signalization during the winter.

History & Community Engagement

Planning for this project began in 2008 when Wellesley town leaders and volunteers began working toward establishing a recreation center that would be privately

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**- Brian DeVellis, President
EDGE Sports Group**

built and operated by a third party on town-owned land. (4) While rent from the developer was expected to provide a new source of income for the town, the major objective was to provide market-rate recreational activities for a wide range of individual athletes and sports groups with priority scheduling provided for Wellesley school and youth athletic programs.



Photo courtesy of EDGE Sports Group

The town acquired an 8-acre site in 2014 and, in August 2015, issued a request for proposal (RFP) to private developers that were interested in improving the site, constructing the recreation center, and operating this facility once it opened. The town’s advisory committee for this project reviewed and rejected the three initial proposals that it received. Committee members then rewrote the RFP to obtain more detailed financial and scheduling information and reissued it in March 2016. ESG received a Conditional Notice of Award three months later. Subsequently, the town of Wellesley negotiated a public-private partnership with ESG, which then became responsible for site mitigation and improvements, building construction and leasing. In addition, as a long-term lessee, ESG manages BSI. The town of Wellesley owns the land and receives priority scheduling for local sports organizations.

Bringing this project to fruition involved the efforts of nearly 150 volunteers, numerous committees and boards, and multiple public meetings. It also required town planning staff and leaders to create a Commercial Recreation Overlay District. (5)

Feasibility Study

Since ESG’s responsibilities included site mitigation and improvements, DeVellis hired Allen & Major Associates, Inc. (A&M) to analyze the site and Dacon Corporation (Dacon) to identify key development risks and related costs.

A&M’s civil engineers worked with Dacon’s architects and the steel construction specialists from BARNES buildings & management group, inc. (BARNES buildings) to provide initial concepts and an estimated budget.

Jennifer Luoni, director of architectural operations for Dacon, said completing the feasibility study was a critical first step because the bulk of the challenges were presented by the site, which was partially located in a 100-year flood zone and had a high water table, poor drainage and a limited amount of space available for construction operations.

“Soils drive what kind of foundation you can have, whether you need ground improvements or not,” she said. “They can make or break a project. You can spend as much fixing the soils as it costs to put up a building. In this case, instead of putting in a huge foundation system, we did ground improvements that included rammed aggregate piers.” (6)

Planning & Design Priorities

Based on the preliminary price provided in the feasibility phase and Dacon’s capabilities, DeVellis hired this design-build firm to assemble the multidisciplinary team needed to deliver a cost-effective, attractive, energy-efficient building that was also flexible, durable and universally accessible. Dacon, in turn, retained BARNES buildings as its steel construction specialist.

Constructing this large-scale building with such diverse functions on a complex site required expert planning and coordination. The steel construction crew had to erect the building frame over a huge hole that had been dug to install the pools in the natatorium. Due to the high water table, a dewatering pump ran continuously and there was limited space for staging materials and equipment for construction.

Luoni said the client’s goal of integrating a repurposed 50-meter, 2012 Olympic trials swimming pool further complicated the construction process. Engineers from Weston & Sampson worked with staff from Myrtha Pools to create a 25-yard competition pool with a movable, 4-foot bulkhead and a smaller, three-lane warm-up/therapy pool. The pool shells were shipped to the site and Dacon designed the required infrastructure to be built around them. “The [competition] pool’s liner needed to

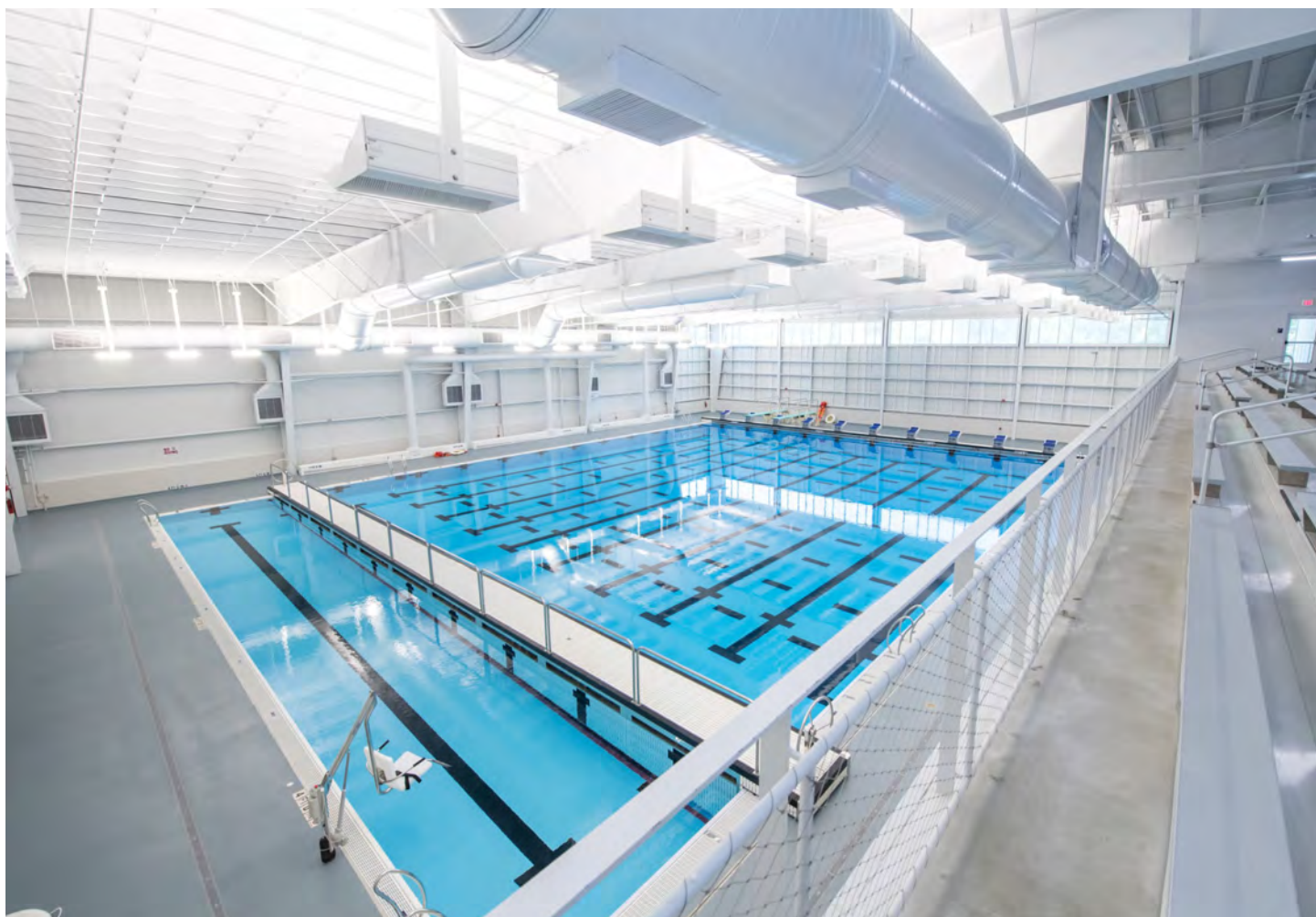


Photo courtesy of EDGE Sports Group



Photo courtesy of Dacon Corporation

go in before the walls due to its size...but to be able to install it and not have it collapse from the pressure of the surrounding earth, the pool needed to be filled," Luoni explained. "That meant our team had to find a way to construct the rest of the building around the pool."

BARNES buildings addressed these planning issues by bringing the architecture/engineering (A/E) team to the metal building manufacturer's facility in Houston, Texas. "A major benefit that metal buildings offer is that they are custom-engineered and fabricated off-site," said Tony Barnes, president of BARNES buildings. "They arrive

ready to install, making construction safer and easier to accomplish on a tight site. Still, careful sequencing of construction activities remained crucial for the success of this project."

"We sat down and hammered out critical details in advance before design started," elaborated Marty Barnes, CEO of BARNES buildings. "Having the building delivery detailed, sequenced and organized allowed us to identify pieces and assemble the structure more easily. We built the frames on-site and hoisted them into position with large cranes, which was especially beneficial over the excavation."

Architect's Statement

"This was always going to be a metal panel building regardless of the structural system we used because insulated metal panels (IMPs) create an all-in-one exterior skin with a vapor barrier," Luoni said. "We used the panels in different orientations and colors to jazz up the design. Having curtain-wall sections jutting out of the front and rotating some of the panels horizontally helped break down the scale of the building."

Dacon's architects selected gray-, white- and sandstone-hued IMPs, she continued, because the town's leaders didn't want the building to be so flashy that it would distract drivers. The color palette was also chosen because of the high-traffic location. "We ruled out an all-white or all-light-colored exterior because the front façade faces Route 9 and the dirt from exhaust and dust would have been obvious rather quickly," Luoni stated.

The ability to use engineered steel framing to create large spans with a minimum number of columns was also important. While some columns were needed for the natatorium, ice arena and fieldhouse, Luoni described how large-span capabilities also enabled the architects to create one of the building's most distinct features: the spacious main concourse. "It is sized to handle a lot of people," she said. "As a user I appreciate this because there is plenty of room for athletes to move through it with their bags and equipment."

The BSI rinks don't have windows, to avoid energy loss as well as sunlight and glare that would affect rink operations. Luoni explained that there is "a lot of glass" at the main entry to allow daylight to filter down the concourse and up the adjacent staircase. "Because of the limited number of columns needed for an engineered metal building, you can achieve these wide-open spaces. The concourse and the terrazzo staircase are very nice architectural focal points."



Image courtesy of Dacon Corporation

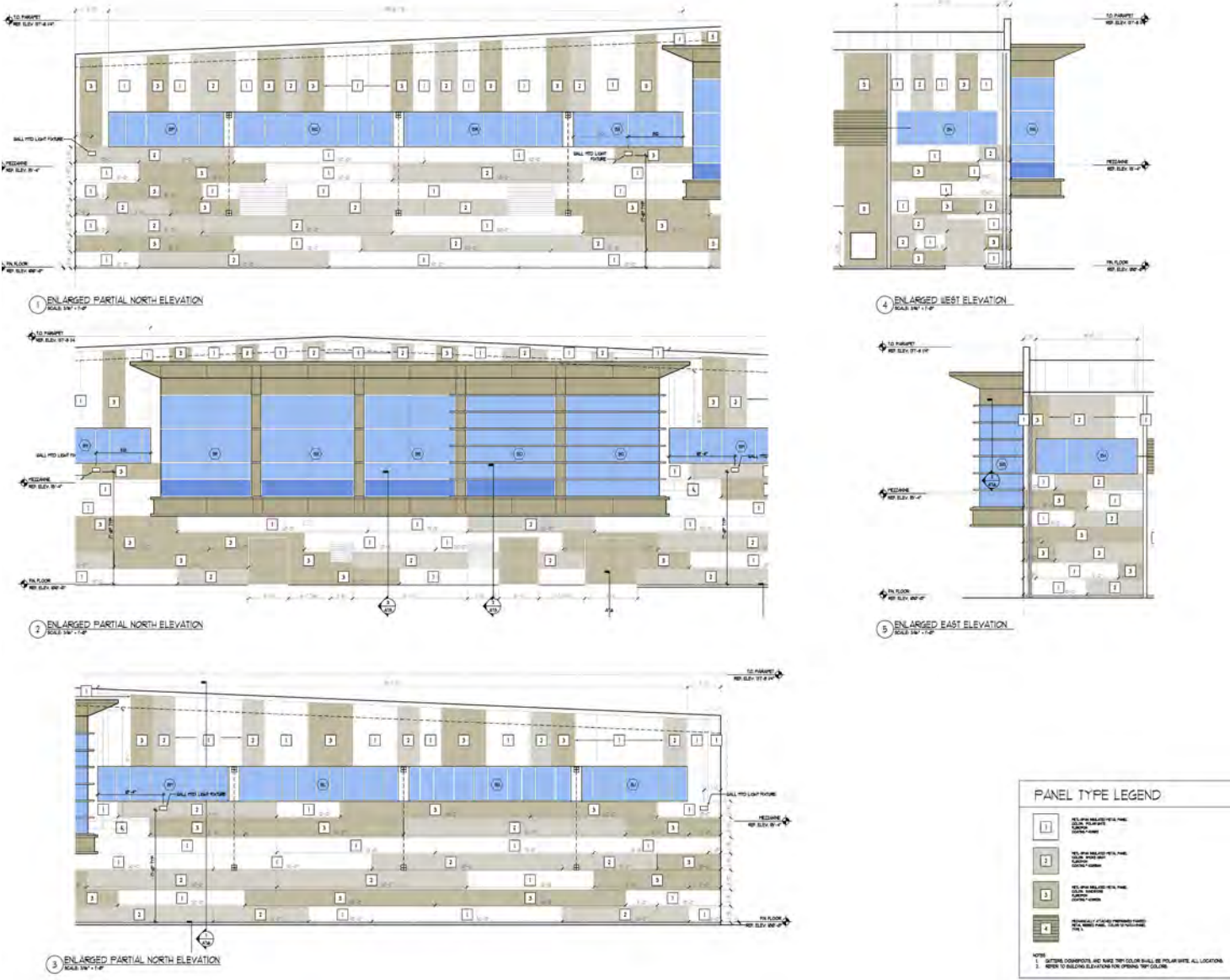


Image courtesy of Dacon Corporation

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- Jennifer Luoni, Director of Architectural Operations
Dacon Corporation

PROJECT GOALS & OBJECTIVES

According to DeVellis, all of ESG’s sports centers are unified by a holistic concept called “the sports ecosystem,” which is everything surrounding an athlete—from sports and recreation facilities to the services provided by an academic tutoring center, sports medicine clinic and strength training and conditioning space.

“Everybody at some point is either an athlete or loves an athlete or is a spectator, so the demand for these facilities is high,” DeVellis said.

Steward Health Care System, which acquired naming rights for BSI in 2021, owns and operates Boston Sports Performance Center (BSPC), an on-site clinic staffed with strength and athletic trainers, physical therapists and sports medicine physicians who provide health and wellness services across a continuum of care—from injury prevention through treatment of medical incidents, rehabilitation and maintenance. BSPC also offers programs for underserved populations, such as the “Tactical Athlete and First Responder Program” that provides medical screening and specialized training to help fire and rescue, law enforcement and emergency personnel avoid on-the-job injuries.

“Injury prevention includes things like concussion awareness, yoga, and understanding the value of good nutrition and sleep,” DeVellis said. “We extend this to the families, too, because family members play a role in how well an athlete trains and performs.”

BSI’s other tenants include Inspirica, a tutoring and test preparation company and Total Package Hockey (TPH), an educational and athletic training organization for elite youth hockey players. (7,8) BSI also has a fast-food restaurant and a hockey gear pro shop.

This wide range of functions has led to BSI operating 17 hours per day, seven days a week. The extended-hour schedule and inclusion of energy-intensive ice rinks and pools strongly influenced the project’s goals and objectives, which were to optimize energy efficiency and ensure the sports center was easy to maintain, durable and universally accessible. Wellesley’s advisory committee also emphasized the importance of including as many “green” features as possible.



Photo courtesy of Dacon Corporation



Photo courtesy of Dacon Corporation

1. Optimize energy efficiency

In addition to ESG's practical reasons for conserving energy to keep operating costs in check, the town of Wellesley set ambitious energy-efficiency standards when it became a "Stretch-Code Community" in 2011. (9) In contrast to the prescriptive requirements that are traditionally presented in building codes, the Massachusetts Stretch Energy Code emphasizes energy performance. Thus, the new sports center was required to demonstrate at least a 10% improvement over baseline energy code requirements. (10)

The project team used a multipronged approach to achieve this objective, which included designing a well-insulated and well-sealed building envelope, developing a strategic space layout, and installing energy-efficient systems and equipment.

A well-insulated, well-sealed building envelope

According to Luoni, the project team chose metal roofing systems and IMPs to achieve a well-sealed and insulated building envelope. BSI features 58,000 square feet of IMPs that were used to construct exterior walls and part of the roof over the natatorium.

"A lot of analysis went into the decision to use IMPs for a portion of the pool's roof," Luoni said. "We did this to maintain the proper interior environmental conditions and make sure that the correct insulation values carried through the material on both sides. Pool areas are warm and humid, but it gets very cold in Massachusetts during the winter. Designing part of the roof to be flat also made it possible to mount HVAC equipment onto it, which was important because this facility has a tight site. The panels interlock and support themselves to some degree. All we needed to do was use interior columns with purlins to give them a little more support."

In addition, special attention had to be given to all sealing details because of the two very extreme and different interior environments that coexist in the sports center: ice rinks require a chilly 55° F temperature and a 48% humidity level while pool areas need a warm 82° F with 60% humidity. (5)

Dacon's decision to place 36 large HVAC units on the rooftop also required close coordination between BARNES buildings and the HVAC contractor because there was zero tolerance for error. All equipment-supported steel and roof curbs had to be constructed in exact locations to fit the specifications of each unit.



Photos courtesy of Dacon Corporation

Strategic space layout

Since engineered metal building systems offer construction flexibility, Dacon’s architects were able to develop a strategic space layout for BSI to further optimize energy use. “We located the ice rinks, pools and field house on the corners with moderately heated/air-conditioned public spaces between them,” Luoni said. “This made it easier to maintain proper temperature and humidity levels throughout the sports center.”

Energy-efficient systems and equipment

According to Dacon’s engineers, BSI has LED lighting throughout, uses high-efficiency water heaters for both domestic water and ice resurfacing, and employs a state-of-the-art ammonia refrigeration system for the ice rinks. The ammonia chillers have a higher first cost but use approximately 18% less electrical energy than other cooling units. (11)

In addition, thermal energy extracted by the chillers is gathered through heat reclamation loops and used to heat the pools. While the amount of thermal energy available varies seasonally, in the winter it can offset 100% of the

natural gas needed to heat pool water. These energy conservation measures combine to reduce BSI’s annual energy use by 23% compared to similar facilities. (10)

2. Create a durable, easy-to-maintain building

Durability was also a key consideration for the design and construction of BSI. “These institutional buildings must resist impacts,” DeVellis pointed out. “You have a million kids running through them with hockey sticks and basketballs. We don’t have mahogany-and-gold-plated chair rails. These buildings are metal and concrete and durable as hell.”

DeVellis said ESG has used metal building systems for all five of the buildings it owns—and three more that are under development—because the large clear-span spaces are easy to maintain. “Routing 8-inch gas lines and heat exchange pipes is a lot simpler with a clear-span building. You can hang these instead of having to break through walls. Maintenance and improvements for these systems are also easier to complete because the mechanical system components are in the open,” he added.

3. Create a universally accessible sports center

“This is the most accessible facility that we’ve done—and each one we build gets a little bit better than the last,” DeVellis said. “Sports facilities have always been the outlier. Hockey rinks, for example, haven’t been a model of accessibility. BSI is one of the only New England hockey facilities that has a fully accessible sled-hockey rink.” Instead of the half-wall that typically separates hockey players and coaches from action on the ice, BSI’s rink has a clear sheet of plexiglass for protection. The benches can be removed, and the game can be viewed from a seated position. All hockey players have barrier-free access because they can enter and exit the ice on level ground. The pools and rinks are also equipped with lifts to make them accessible for swimmers who require wheelchairs. Wide decks that surround the pools also make it easier for people using mobility devices to move around and there is room for guide and support dogs to remain near their owners. (12)

Like other commercial buildings, BSI’s design includes elevators, ramps and ADA-compliant bathrooms, doors and walkways that meet code requirements. However, it also includes thoughtful details, such as locker-room wall hooks that are mounted so they can be reached from a seated position and deep benches surrounded by ample space for those athletes who may need extra room to get dressed.

4. Incorporate green features

Wellesley’s advisory committee also emphasized the importance of including as many “green” features as possible. So, BSI’s 102,000-square-foot roof and the building’s electrical system were designed to support a 900kW solar array that was installed in 2022. (5) ESG and Wellesley Municipal Light Plant (WMLP) negotiated a lease agreement to have WMLP install and own the solar array. The power generated by this renewable energy system is expected to double the town’s photovoltaic electrical supply, significantly reducing electrical-grid demand and carbon emissions. (13)



Photos courtesy of EDGE Sports Group

RELEVANCE FOR STUDENTS



Photo courtesy of Dacon Corporation

Luoni stressed the importance of advance analysis and planning. “Without doing a full set of drawings, we determined if this project could be financially and logistically feasible,” she said.

BSI illustrates one of Dacon’s core values, she added. “Our founders believed that simple products can be used in innovative ways to make buildings look good. Metal building systems provide different options for creating a cost-effective solution for clients. You can clad the exterior with sandwich panels, you can use single-skin metal on the back, and you can also create metal buildings that are clad with other materials. Don’t assume you need to use the most expensive products to achieve a high-quality design,” Luoni said.

She concluded by stating how important she feels it is for architects to continually learn from others. “A truly successful architect,” she emphasized, “is able to understand and coordinate the work of all the other professions and trades—from what is under the ground to what is behind the walls and above the ceilings. To do this, you need to learn from the people in the field. How you erect something can have a huge impact on the design of a building. Harness what you can from the people who are actually doing the building. You will gain a valuable field perspective and the respect of the people executing your design.”

Practical Application

1. The indoor pool facilities at BSI required special attention to achieve and maintain proper temperature and humidity levels. It is important to prevent condensation while providing interior climatic conditions that are comfortable for swimmers, coaches and spectators. Download the Condensation Fact Sheet produced by the Metal Building Manufacturers Association. (14) After reviewing this document, describe how you would address the sealing details to make sure the vapor barrier performs properly. What other steps would you recommend to prevent condensation and corrosion?
2. The town of Wellesley’s advisory committee encouraged ESG to integrate as many green features as possible into the development of BSI. This included the installation and operation of a solar array. Investigate other ways that metal building systems can contribute to achieving a client’s and/or community’s sustainability goals. In what ways are metal buildings well-suited for accommodating renewable energy technologies, such as solar power generation? Why is metal roofing considered a near-perfect platform for solar panels? What other characteristics of metal buildings can contribute to meeting sustainable performance standards set by green certification programs such as LEED?



Photos courtesy of Dacon Corporation

3. As the list of project team members indicates, close collaboration and expert coordination of design and construction activities were essential for the success of this project. In what ways does metal building technology facilitate the design-build, integrated delivery process?
4. A wide range of activities occur simultaneously in BSI, making noise levels within and between spaces a common concern. To better understand how insulation influences sound transmission in a metal building, refer to the study, "Acoustical Performance of Insulated Metal Building Roof and Wall Assemblies." This comprehensive guide provides acoustic information for standard metal building ceiling and wall assemblies. It begins with a look into what metal building insulation consists of and how it is used before explaining what the different terms and acoustic ratings stand for. It documents the ratings for sound transmission class (STC) and outdoor-indoor transmission class (OITC) on standard metal building ceiling and wall assemblies. The bulk of the guide consists of images and descriptions of assemblies and corresponding test results. It is available for free download at <https://mbma.us13.list-manage.com/subscribe?u=4eda9f055e343066e3ec7b6a8&id=91e1b6648c>. In what ways can insulation be used to influence sound transmission within BSI?



Photo courtesy of EDGE Sports Group

RESOURCES/RELATED READING

Print/Online Resources

- [Understanding LEED for Green Metal Buildings - MBCI Site](#)
- [MBMA Case Study - Roofing and Solar](#)

Video Resources

Over 50 videos highlighting metal building architecture, engineering, design and application can be accessed on the [MBMA Media](#) YouTube channel. We recommend you begin your educational process with the following programs:

- [How It's Made: Metal Building Innovations Are Revolutionizing Low-Rise Commercial Construction](#)
- [How It's Built: Metal Building Construction Raises the Bar for Low-Rise Commercial Structures](#)
- [An Introduction to Metal Building Systems](#)
- [Metal Building Systems 101](#)

Additional Videos

- [Boston Sports Performance Center Overview \(YouTube\)](#)
- [Boston Sports Performance Center - The Future is Here! \(YouTube\)](#)

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