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A Greener Field: The Weston Field Project and LEED Certification

Introduction

The home of the Williams College Football, Track, Field Hockey, and Lacrosse teams is slated to receive a massive makeover beginning in November of 2008, with a completion date set in time for the fall 2009 season. Weston Field, which sits across Latham Street from the Facilities building and Towne Field House at the southern end of campus, currently features a standard 360 by 160 foot grass field encircled by a quarter-mile track with bleachers on both sides, and the recently constructed Lamb Field adjacent to the west. In the course of the upcoming project, both the field and the track will be resurfaced, and rotated counterclockwise to sit parallel to Lamb Field. A new building housing locker rooms, trainers' facilities, public restrooms, and a press box will be erected between the two fields. The Peck grandstand will be moved to the eastern edge of the complex, and new bleachers will drape both sides of the central structure for spectators to enjoy the games.

At the same time, the issue of climate change has been rapidly gaining awareness worldwide, and especially among a dedicated core of students, faculty, and administrators at Williams College. In January of 2007, the College's President set an aggressive greenhouse gas emissions goal of 10% below the school's 1990-1991 levels by the year 2020. In keeping with this broader effort toward environmental sustainability, the

College is also aiming for Leadership in Energy and Environmental Design (LEED) certification by the United States Green Building Council (USGBC) in many of its new building projects. The North and South Academic Buildings already under construction should earn silver status, and the Weston Field project is aiming for the same. However, this particular project is also highly unique, and it will require some creative solutions and a high level of commitment to ensure a truly green classification.

History

Weston Field opened in 1875 and has served continuously since then as the site for football games. A press box was first erected in 1953 with bleachers being added in 1972. Both were rebuilt in 1984, and have functioned until now in their current capacity on the east side of the football stadium. The modern running track was installed in 1987, and has required 3 repairs, most recently to rectify drainage issues in 2006. The varsity baseball diamond was moved from the site in 2004 to make room for the Renzie Lamb synthetic turf lacrosse and field hockey facility (see Figure 1).[1]

Soon after the track was recoated in 2006, it became apparent that further work was needed to address its long-term viability for competition. Poorly drained stormwater continued to seep beneath the rubber compound and compromise the flatness and integrity of the surface. The football field also suffered from poor drainage, which left pockets of inconsistent grass that frequently allowed divots to form. In turn, those holes led to an increased rate of injury from cleats getting stuck in them and bodies giving out.

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[1] Williams College, *Facilities: History of Construction Projects*, http://www.williams.edu/admin/facilities/propertybook/const_proj.php.

Additionally, the small and dirty restrooms were inhospitable to spectators, and the bleachers were not up to date with the current safety code. Furthermore, the football team could not practice on-site for fear of damaging the grass, and it was relegated to the Cole Field House at the other side of campus for locker rooms, where players could not even fit their shoulder pads into their allocated spaces. Lastly, an embarrassing phenomenon called "walking the gauntlet" had been noted, whereby visiting teams on their way from the Lasell locker rooms to the field were forced through the narrow passageway between Chandler and the Heating Plant while being verbally harassed by the hometown fans. For this confluence of reasons, as well as the added incentive of a highly visible site for parents and alumni, the College decided to undertake a $17.6 million project to renovate and rebuild the whole facility with the exception of Lamb Field.

Proposal

A new 25,000 square-foot field house will sit at the center of the new complex to serve the teams, trainers, officials, members of the media, and spectators. The building will be shaped as an elongated rectangle with the home football team locker rooms occupying a large space at one end, and spectators' restrooms situated at the other end for easy public access. Owing to attendance differences, the bleachers on the east side, toward the football field, will cover almost the entire façade, while those on the west side, toward the field hockey and lacrosse field, will be narrower in order to allow some sunlight into the interior spaces (see Figure 3). Similar to the design of the current press box, the new one will be on the upper level of the building, encased in glass and looking

out over the bleachers to the fields in each direction (see Figure 2). The new field will feature a 2-inch thick synthetic turf football surface with a polyurethane-based track around the perimeter, both of which will be partially composed of recycled material.[2] The current student parking lot at the northwest corner of the site will be relocated to behind Mission Park in order to make room for a new track and field throwing area. Parking at the Taconic Golf Course will be extended northward to add spaces for employees and event spectators. An additional handicapped and emergency vehicle lot will be constructed so that those in need will have closer access to the building (see Figure 4). Lastly, and most importantly given the historical issues, a new stormwater drainage system will be put in place to collect and control the runoff so that the competition surfaces remain dry and the local watershed is sufficiently protected.

Beyond the basic proposal, however, the College has also committed itself to earning LEED certification for the project. This impetus has arisen in part as a result of the aggressive greenhouse gas emissions goal the President and the Trustees set last year, and also due to the rising viability and public awareness of the environmentally friendly building standards the USGBC established in 2000. As a physical center of higher learning with over 2,500 students, faculty, and staff, Williams by necessity has a large expanse of dorms, dining halls, offices, and other facilities that now totals 2,298,096

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[2] A recent report published by the organization Environment and Human Health found that the recycled rubber content in modern artificial surfaces leaches volatile organic compounds into the air and ground water, with resulting health concerns documented. This is a potentially alarming effect that the College will want to avoid, and these claims should thus be investigated further. Environment and Human Health, Inc., *Artificial Turf: Exposures to Ground Up Rubber Tires - Athletic Fields, Playgrounds, Garden Mulch*, http://www.ehhi.org/reports/turf.

square feet.[3] Furthermore, given that the College dates to 1793, and that it has grown gradually over the years, its buildings tend to be smaller and more spread out from one another, which contributes to general inefficiencies associated with sprawl. And yet many of the older buildings are regularly deemed insufficient for our modern needs, thus contributing to almost continual construction projects on campus. All of these factors present a considerable challenge because, based on nationwide averages, buildings account for 39% of all energy consumption and 39% of greenhouse gas emissions.[4] As such, every new square foot of enclosed space will make it increasingly difficult to meet the President's reduced greenhouse gas emissions target in 2020.

The emergence of LEED certification standards as a widely accepted benchmark of environmental sensitivity in the construction industry has dovetailed nicely with the College's new mission. Increasing awareness of what "green building" means among the general public has stimulated demand, and the construction industry has responded with solutions that facilitate adoption of the standards. From the College's perspective, having LEED certified buildings on campus would provide a compelling draw for students, parents, and alumni who are interested in healthy working spaces and overall environmental awareness at an educational institution. Furthermore, its lofty position within academia makes it incumbent upon Williams to assume a mantle of leadership and set an example for other schools, corporations, and municipalities to follow.

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[3] Williams College, *Sustainability at Williams: Buildings*, http://www.williams.edu/resources/sustainability/buildings.php.

[4] United States Green Building Council, *Green Building Research*, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1718.

Thus a decision was made last spring, after the planning process was already completed, to retroactively seek LEED certification on the North and South Academic building, as well as on most projects in the future. Weston Field was the next project in line, which therefore allowed it to be designed from an early stage with the LEED standards in mind. Still, it deserves mention that LEED certification alone will not ensure achievement of the College's greenhouse gas reductions. The construction standards are only a piece of the overall sustainability plan, but they will help commit the school to a more stringent and forward-thinking mentality about its overall footprint and about its use of natural resources.

Green Challenges

As laid out in the building program, the Weston Field facility presents two central hurdles pertaining to its intended seasonal use. Being a peripheral campus site for sports that are only played in the spring and fall seasons, the building will be largely unoccupied in the winter and summer months. Although some expense will still be necessary to maintain a baseline temperature and level of humidity, the seasonal usage is a blessing for the heating and cooling costs during those extreme seasons (see Figure 7). Beyond ordinary air handling though, the building's intended use extends the timeframe of financial payback for many of the most promising renewable energy options. Whereas a 7.2-kilowatt array of photovoltaic panels has been installed on the roof of the Morley Science Center, providing consistent electrical power on sunny days for that building's regular consumption, any array on the new Weston Field House would only produce optimum power during the unoccupied summer months. Those unused kilowatts, which

cost 13 cents per hour at current market rates, would then be funneled back to the electrical grid for a payback of about 4 cents per hour. That price structure would create a lengthier financial payback period given the intended electrical usage at the site.

The building also runs up against its practical utilization in terms of demand for hot water. With the combination of its primary functions being to house team locker rooms and public bathrooms, the Field House will be a major consumer of water. But again, the implementation of either solar hot water or a greywater system is unfeasible because of the facility's design and usage. Evacuated tube solar collectors, similar to the ones deployed on the roof of the Fort Hoosic dorm to assist in providing hot water to 13 students, would not work well at Weston Field because usage will be highly intensive and irregular, occurring only during team practices and games, which would outpace the ability of the system to provide any meaningful volume of hot water. Greywater systems typically capture water for reuse in toilets and for irrigation purposes, which would seem to be an option given the high level of shower usage. But in this case storage would be difficult during the off-season and low-use periods, and the artificial composition of the surrounding surfaces obviates any need for irrigation.

LEED Certification

Beyond the broader challenges of marquee environmental design such as the use of renewable energy and recycled water systems, a silver LEED certification is still possible on the Weston Field project. Broken down into six categories of analysis, the certification standards are highly detailed and far-reaching, which is both restrictive and facilitating at the same time. Williams will be required to remain diligent and steadfast to

its goals, and will not be allowed to sacrifice too many sustainable features, while it will enjoy the freedom to maneuver around which credits it seeks in order to best reflect the school's needs. This is a hallmark of the LEED system, but the criticism remains that relatively cheap credits can be attained without making the real sacrifices necessary to erect a truly green structure. As the Weston Field project stands today, the most fundamentally meaningful credits lie in the hotly debated decision of whether or not to install of a photovoltaic array on the southern and western roof.

1. Sustainable Sites

There are 14 points available within this section, four of which are readily attainable on the Weston Field project. The Site Selection, Development Density, and Stormwater Quality Design credits will all be satisfied. In addition, the Alternative Transportation credit is within easy reach, provided that racks are supplied to hold 7 bicycles in accordance with the building occupancy of 135 people. Beyond those credits, there is also the potential to achieve a point for the Heat Island Effect on the roof, but it will require the installation of a material with a Solar Reflectivity Index of 29 or greater and possibly some sacrifice of aesthetics. The Stormwater Quantity Design credit is difficult to achieve because of the near imperviousness of the site's clayey soil, although this may be attainable given the underground retention system and landscaped rain gardens that will be put in place to protect Christmas Brook on the north side of the site (see Figure 4). Another complex issue is the Light Pollution credit because floodlights are required so that the teams can practice at night when daylight savings time is not in

effect. Other credits within this section pertain to daily parking and fuel-efficient vehicle use, which will not apply to this facility.

2. Water Efficiency

Weston Field will score 3 of the 5 available points in this section. Water use itself will be reduced 34% from the code baseline through the installation of low-flow fixtures and appliances, from an allowance of 373,000 gallons to 244,816 gallons. Typical landscaping usage will be reduced by 50%, largely due to the replacement of a grass field with the artificial surface. There may also be an opportunity for an additional point in this section as long as the field's cleaning system, which is required by NCAA safety regulations, does not qualify as an "irrigation" system. After that, the only outstanding water efficiency credit will be from the lack of an innovative wastewater treatment system, the reasons for which having already been explained above.

3. Energy and Atmosphere

The facility should do very well on this section of the certification standards, earning 14 of a possible 17 points. As currently modeled, the Field House will save between 24.5% and 35% of the baseline building performance rating, and will receive between 5 and 7 certification points as a result. For comparison purposes, its total electric consumption is projected to be less than any other athletic building on campus

(see Figure 5), but it will still lag just behind the Lasell Gymnasium in terms of efficiency as a function of square-footage (see Figure 6).[5]

Much of the total energy savings over the baseline value rests upon the College's continued commitment to install the proposed 22-kilowatt photovoltaic array. Moreover, with respect to LEED, the solar panels effectively count twice because a building can earn points for having renewable energy on-site, and then again when they are factored into the total amount of energy use the project saves. In this case the panels alone are responsible for 5 LEED points, according to preliminary energy models.

This all comes back to the central issue of up-front cost versus long-term payback, and is a highly contentious issue between the College's construction managers and its environmental constituents. One supporting example exists from the recently constructed Off-Site Library Shelving Facility. A 26.88-kilowatt photovoltaic array is being installed there, for which the Massachusetts Technology Collaborative awarded Williams a $92,670 grant to help defray the $300,000 cost.[6] That incentive will reduce the per-kilowatt cost from just over $11,100 to roughly $7,700, and create a 30% savings. In the case of Weston Field, there will also likely be an opportunity for a grant to alleviate some of the installation cost, and thus make it an even more attractive option than it initially appears on paper at this time.

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[5] The data on existing buildings were compiled from the Williams Sustainability web site, and compared with an early energy modeling report for the Weston Field House from June 14, 2007. As such, the Weston Field House numbers are primarily used for the purpose of a broad comparison, and should not be understood in way as being factual. Williams College, *Sustainability at Williams: Electricity Use by Building*, http://www.williams.edu/resources/sustainability/electricity_buildings.php.

[6] Williams College, *Sustainability at Williams: Latest News*, http://www.williams.edu/resources/sustainability/news.php

Despite any potential for grants, however, criticism still abounds due to the orientation and rectangular plan of the building, which will create only a small surface area on the roof that actually faces due south. Estimates indicate that less than 10 kilowatts of panels can be placed on that part of the roof, requiring more than half the proposed panels to face west. This potential loss of efficiency should be accounted for in the energy modeling, and a full analysis of the costs and benefits, both financial and with regard to LEED certification should be made.

Beyond the solar panel issue, other possible points within this section fall under the Enhanced Commissioning, Enhanced Refrigeration Management, and Measurement and Verification credits. Each of these should be attainable, with the latter only requiring follow through toward the end of the building phase. There is also a Green Power credit in this section, but the College has not yet determined whether it will commit to offsetting its emissions through third-party mechanisms such as Renewable Energy Credits.

4. Materials & Resources

The goals within this section of LEED certification have largely been adopted within all Williams College construction projects, as seen in the new academic buildings as well as in the off-site facility. Weston Field will earn credits for extracting, processing and manufacturing 20% of its materials regionally, for using 10% recycled material content, and for diverting 50% of its construction waste from the disposal. Since the building will be comprised of precast concrete panels, with wood used only sparingly, the project could also easily earn the Certified Wood credit with only slightly added cost.

5. Indoor Environmental Quality

Much of this section also has been adopted into current building standards on the Williams campus, and as such will qualify the project for 9 points. Among those satisfied are the use of low-emitting finishing materials, installation of an outdoor air delivery monitoring system, adoption of an Indoor Air Quality Management Plan during construction and before occupancy, as well as occupancy sensors for lighting, and thermal controls for individual comfort. One credit hinging on a third-party ventilation assessment is still available here, as are two more depending on whether the USGBC will grant the College a waiver based on the claim that the building does not need air conditioning for thermal comfort because it will be unoccupied in the summer months.

6. Innovation and Design Process

In this freeform section, the College will seek two credits based on the environmentally friendly techniques it uses to clean its buildings interiors, and maintain exterior landscaping features. It will also earn a point for hiring an accredited LEED professional, in the name of Tillou Engineering, and may choose to seek one more based on the inclusion of an educational component of green design in the final plans.

Enduring Issues

Following construction and the many decisions surrounding LEED certification, one major enduring environmental issue will still remain: the recycling of waste at Weston Field sporting events. The carefree attitude adopted by fans coupled with the proliferation of individually packaged concession items makes awareness and compliance

with this issue exceedingly difficult. Williams is not alone in this challenge, but its vaunted position as a leader in education and on environmental issues requires that it set an example for the future. To put it simply, after the project is finished and LEED certification is attained, it will have been a largely futile effort if the facility's occupancy practices fail to live up to the lofty standards assumed during its construction phase.

For this reason, the College must begin to outline the fundamental structure of a waste management policy for the site, and especially for during the events themselves. One example it might look to is the Boston Red Sox, who have committed themselves to providing visible receptacles that make it easier for fans to separate their garbage. The have additionally contracted with their food service providers to simplify the waste stream and to use more sustainable serving materials. Lastly they have enlisted local students to raise awareness among the fans by moving around the stadium with smaller versions of the recycling receptacles for quick disposal.[7]

The three elements of the Red Sox new recycling policy would be simple for Williams to adopt with a slight amount of forethought and coordination with dining services, and especially given the number of environmentally conscious students on campus. Furthermore, the impetus of a new sports complex and a gleaming new structure could bolster campus-wide support for turning over a new leaf with regard to event waste management. Most importantly, the implementation of a successful recycling policy will perpetuate the ideals that drove LEED certification and the College's overall effort towards a more sustainable future in the first place.

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[7] Natural Resources Defense Council, *Red Sox Team Up With Natural Resources Defense Council to Make Fenway Park Even More "Green,"* http://www.nrdc.org/media/2007/070920e.asp.

Conclusions

The Weston Field project encapsulates the beauty of the LEED certification process, while also shedding light on its potential pitfalls. At the heart of the issue is the challenge to construct the built environment so that it interacts with the natural one in a healthier and more sustainable manner. The old Weston Field facility was in need of significant repair and renovation for many reasons, which caused the College finally to take action. However, owing to its program of seasonal usage, the building presents hurdles for the dedicated implementation of any headlining environmental features. LEED silver status is still attainable, but the school must commit itself to that level of accountability in spite of the ongoing debate over the relative worth of solar panels. Any array will pay off in the long-term, and the up-front cost will most-likely be reduced through a grant like the one received for the new Library Shelving Facility. Most importantly though, these photovoltaics will be in a very visible location and thus serve as a model for how Williams is leading the push toward reduced energy consumption in the future. Lastly, this new complex should address the challenge posed by recycling at sports events and implement a more efficient policy for the future, so that it can truly live up to the high environmental standard set forth at the very beginning of the Weston Field project.

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Figure 1

Figure 2

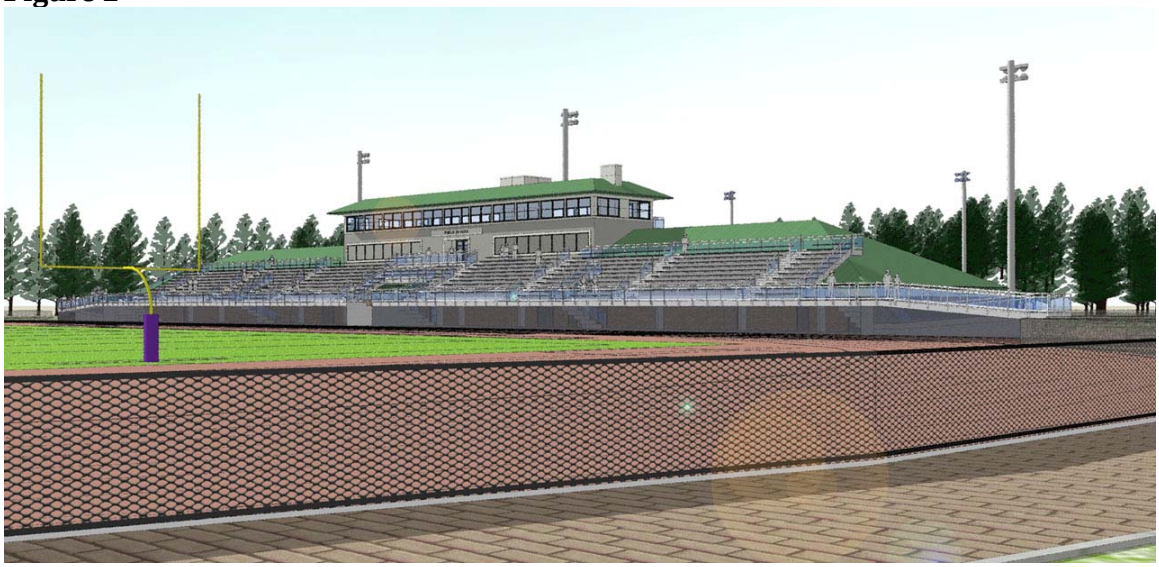


Figure 3

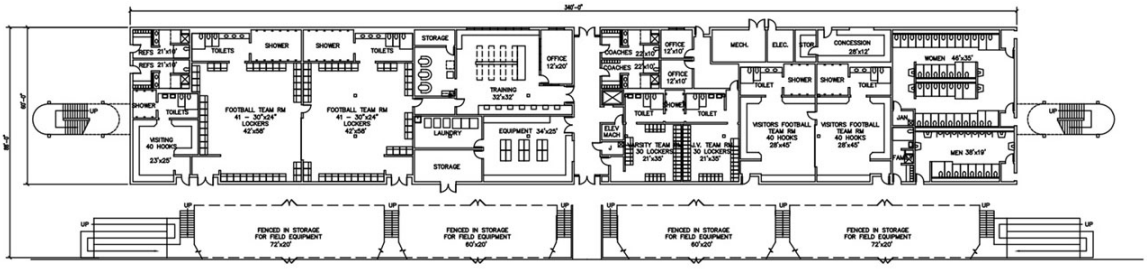


Figure 4

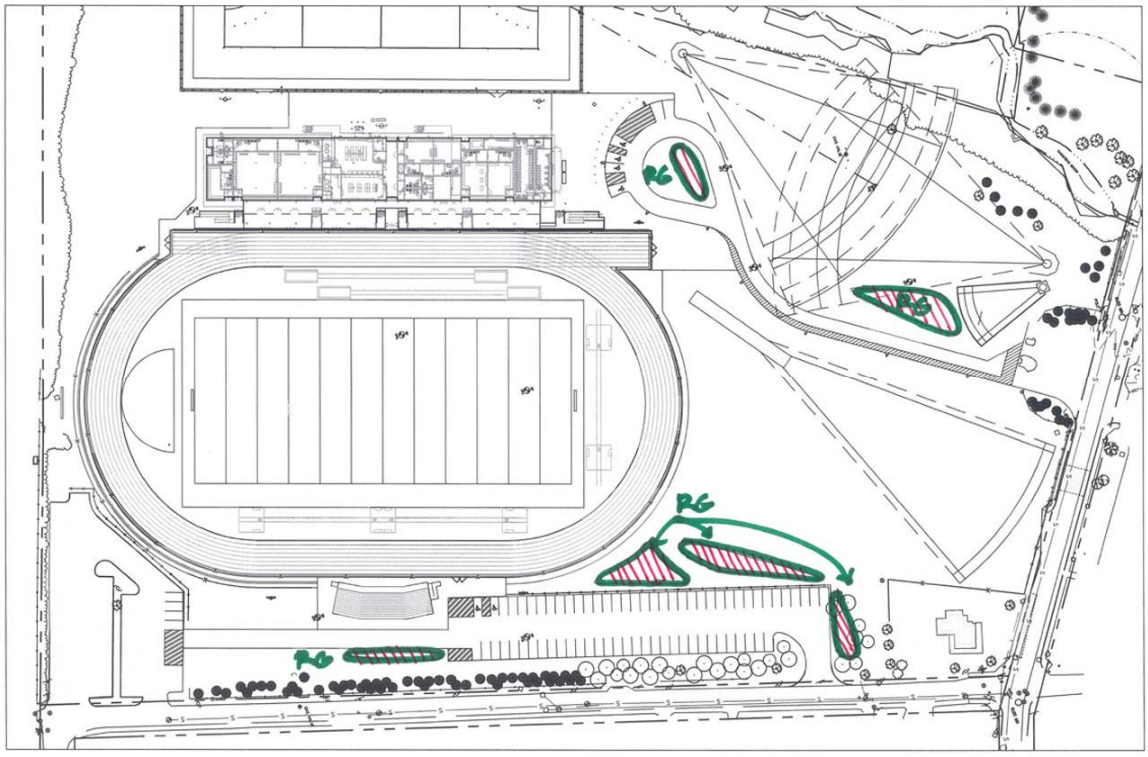


Figure 5

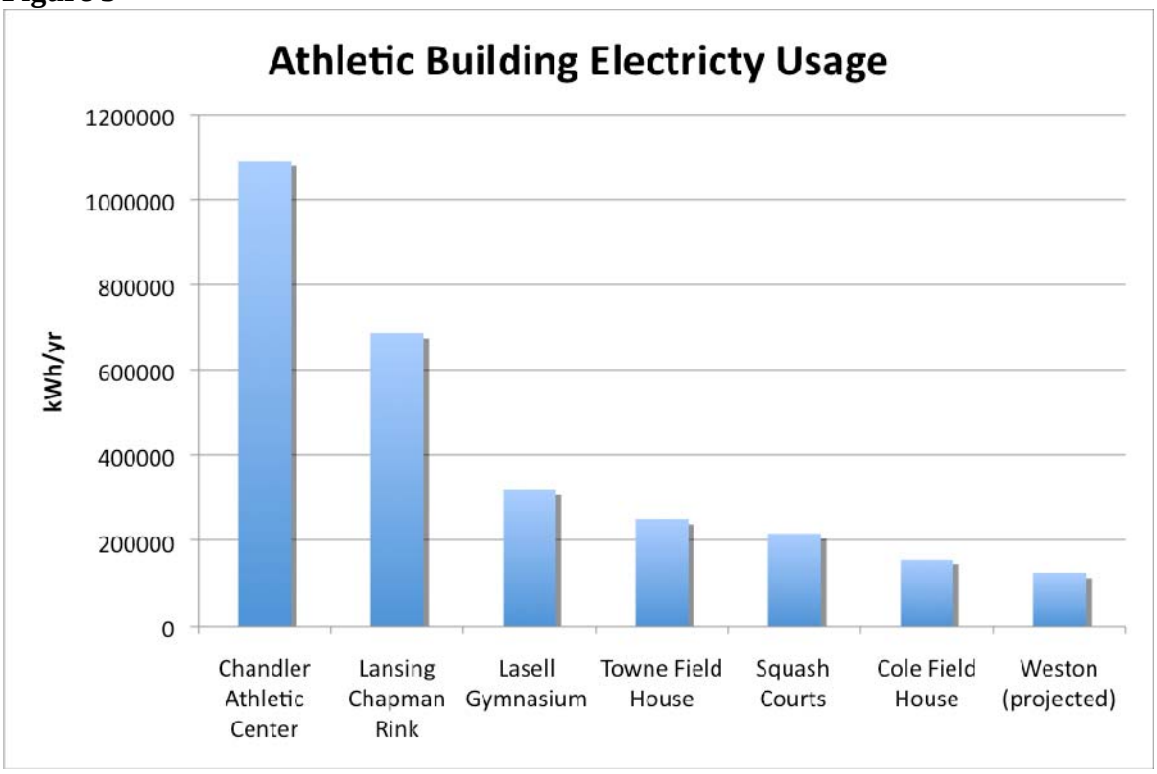


Figure 6

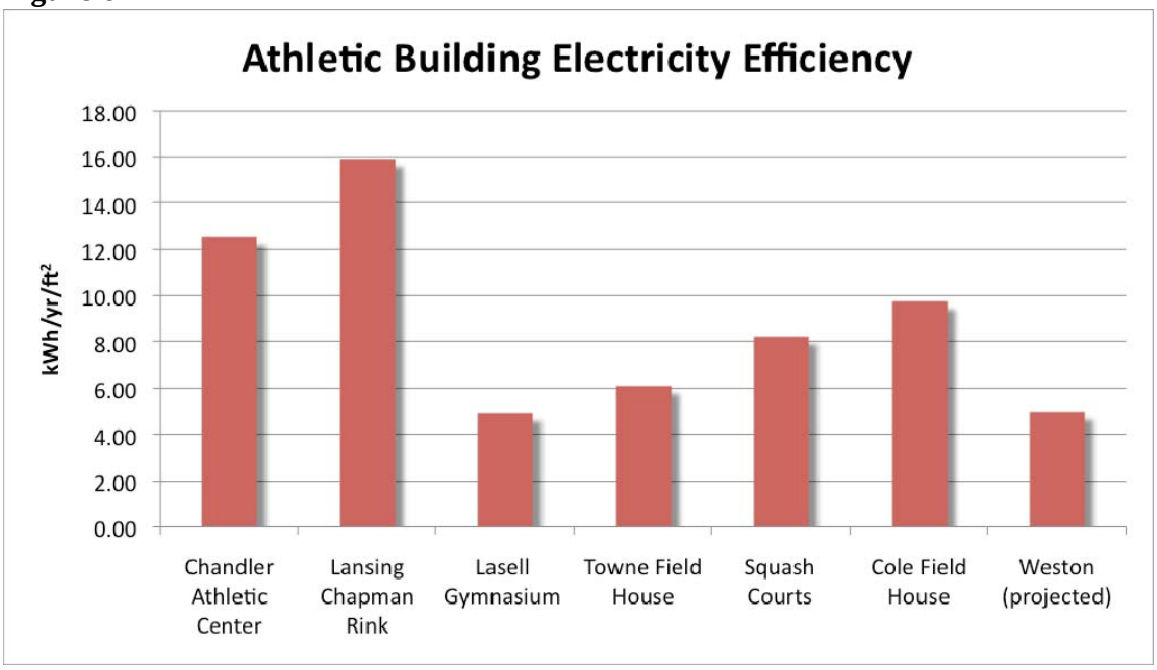
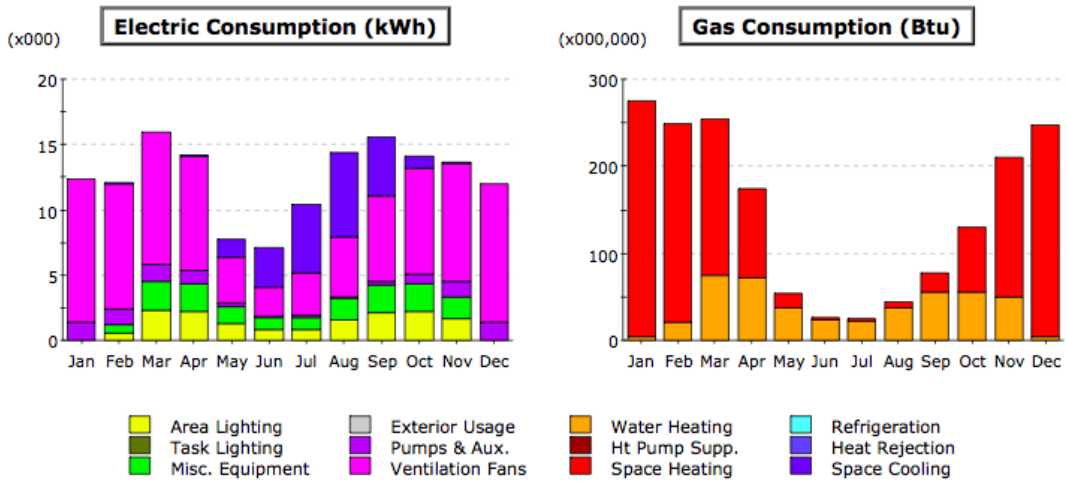


Figure 7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Task Lighting
Misc. Equipment
Exterior Usage
Pumps & Aux.
Ventilation Fans
Water Heating
Ht Pump Supp.
Space Heating
Refrigeration
Heat Rejection
Space Cooling