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## New Meadowlands Stadium, USA

### Case Study 69

The New Meadowlands Stadium in New Jersey was designed and constructed according to comprehensive sustainability objectives to become one of the greenest sporting venues in the US.

### Aspects of Sustainability

This project highlights  
the following:

#### Social Aspects

Human Resources  
Corporate Community  
Involvement  
Business Ethics  
Health and Safety

#### Environmental Aspects

Energy and Climate  
Materials  
Ecosystems  
Local Impacts

#### Economic Aspects

Project Selection  
Supply Chain  
Value Added



### Project Introduction

The New Meadowlands Stadium in East Rutherford, New Jersey, is part of the Meadowlands Sports complex. The multi-purpose stadium is home to the New York Giants and New York Jets NFL (National Football League) teams and is used for open-air concerts and for other sporting events, such as international soccer and college football games. The stadium was constructed to replace the Giants Stadium, which had narrow concourses, inadequate public toilet facilities, insufficient concessions and few luxury suites. The New Meadowlands Stadium addressed each of these issues to ensure that the stadium is functional and modern.

Skanska USA Building and Skanska USA Civil constructed the US\$ 1.6 billion design-build project for the New Meadowlands Stadium Company, which is the stadium's principal owner. The project was completed in April 2010, over 4 months ahead of schedule. The open-air stadium

is in the shape of a rounded rectangle and has a distinctive outer skin of aluminum louvers. The 204,000 m<sup>2</sup> stadium has double the floor space of the Giants Stadium and a spectator seating capacity of 82,500. The venue also includes 217 luxury suite boxes and five premium lounges with on-field patios. The stadium has excellent spectator sightlines and has set new standards for modern sport arenas in terms of unique amenities and state-of-the-art electronic systems, which are managed from a central command center. The project also involved the demolition of the old Giants Stadium, and site restoration and improvement works, which included the construction of a 60 m wide plaza around the stadium, 15,000 parking spaces, access roads, pedestrian walkways and underground utilities for the stadium.

A partnership was established with the Environmental Protection Agency (EPA), which helped set stringent sustainability objectives

throughout the construction and operation of the stadium. The partnership includes long-term strategies to incorporate environmentally responsible materials, reduce air pollution, conserve water and energy, and reduce waste. The New Meadowlands Stadium Company reports directly to the EPA, which monitors the stadium's sustainability performance.

## Contributing Toward Sustainable Development

The state-of-the-art New Meadowlands Stadium is equipped with a range of features that promote the efficient use of energy and water. The multi-purpose stadium is functional and flexible, was designed to optimize disabled accessibility and promotes high quality indoor environments for occupants. The stadium was also designed to contribute toward sustainable urban planning, promote good stormwater management and minimize light pollution. During construction, Skanska cooperated closely with site neighbors to minimize disturbance and implemented numerous safety initiatives. Local construction employment, subcontractors and materials were prioritized and a project to promote small, disadvantaged, minority and women-owned enterprises was carried out. Air pollution, dust, and construction and demolition waste were minimized to reduce the environmental impacts of construction. The project also incorporated a significant proportion of recycled and environmentally certified construction materials.

## Social Aspects

### Neighbor cooperation

Skanska constructed the project in consideration of ongoing Meadowlands Sports Complex operations and three neighboring construction projects. The Meadowlands Racetrack, Meadowlands Sports Arena and the Giants Stadium, which was situated 9 meters from the new stadium, all conducted normal operations during construction. There were also three other major construction projects progressing simultaneously at the Meadowlands Sports Complex involving a new railroad project, the new Giants training facility and the Xanadu development. Skanska coordinated construction work with the New Jersey Sports and Exposition Authority (NJSEA), which oversees the Meadowlands Sports Complex. All site utility and road works, including the relocation of the Giants

Stadium's electric and telecommunication services, were completed in between NFL seasons.

### Occupational health and safety

The Lost Time Accident Rate for the project was 2.9 accidents per million hours worked. Numerous safety initiatives were implemented as part of Skanska's IFE (Injury Free Environment) culture, including the stretch and flex warm up program and the Save-A-Life fall prevention awareness and training campaign. A comprehensive training program was implemented for all construction workers and foremen, which sought to instill a culture of safety throughout the team and to ensure that each worker understood their role in promoting site safety. Skanska developed a comprehensive partnering agreement with project partners to help avoid safety risks and achieve a high level of worker site safety. The agreement identified project health and safety goals, developed safety plans, and measured and learned from the process.

### High quality indoor environment

The New Meadowlands Stadium promotes high quality indoor environments by incorporating features that optimize natural daylighting and thermal comfort. Exterior curtain walls and glazed cladding systems have been included into the exterior facades to ensure extensive indoor natural daylighting. Private suites are also fully glazed, which allows natural light to penetrate to the internal corridors through glazed sidelites at the suite entrances. The stadium's mechanical ventilation systems have been carefully calibrated to optimize the thermal comfort of each indoor space. All suites are outfitted with individual fan coils, which allow the occupants to control the indoor temperature, and some suites have operable windows that allow natural ventilation.

### Functional and flexible stadium

All electronic equipment within the stadium is state-of-the-art and is connected via a digital network. Benefits of the network include, quick and efficient ticket scanning and instantaneous video highlights throughout the building. The spectator seating areas also have increased legroom and seat width compared with the Giants Stadium. The multi-purpose stadium is individualized for various events by different colored lighting. Blue lighting is used for Giants games, green for Jets games, red for concerts and white for other events. A 120 m long photographic mural and large video screens at the north and east entrances also display images and videos relevant to the event.





## **Disabled accessibility**

The stadium is designed to ensure disabled visitor access and complies with the Americans with Disabilities Act. The stadium has wide concourses, wheelchair and companion seating, and all public toilets, bars and concession stands are accessible to visitors with disabilities. The stadium is also equipped with a state-of-the-art Assistive Listening System, which assists people with hearing and visual disabilities.

## **Sustainable urban planning**

The New Meadowlands Stadium was constructed on car parking space between the old Giants Stadium and the Meadowlands Racetrack, and did not impact upon greenfield land or natural habitats. The stadium is situated in a built up urban area and is close to a range of services.

## **Promoting more sustainable transport**

The New Meadowlands Stadium has excellent public transport links and approximately 12,500 fans utilize the local public rail and bus networks to travel to the stadium on game days. The use of public transport avoids around 4,000 private vehicle journeys to the stadium. Initiatives also promote car-pooling for events at the stadium and bicycle racks have been installed to encourage visitors to cycle to the stadium.

## **Economic Aspects**

### **Local construction employment, subcontractors and materials**

During construction, there were approximately 700 workers on site each day. The entire construction workforce was from the local area. A buy local program was initiated during construction and 70 percent of project subcontractors were from the State of New Jersey, and 13 percent were from the neighboring States of New York and Pennsylvania. Over US\$ 680 million was spent locally on construction materials for the project.

### **Promoting small, disadvantaged, minority and women-owned enterprises**

Skanska implemented a project to support the establishment and development of small, disadvantaged, minority and women business enterprises (S/D/M/WBE) with the intention of maximizing the local economic benefits of the project. From the design stage and throughout the project, the project team evaluated bid packages to identify opportunities to engage with S/D/M/WBE firms. Various tools and metrics were utilized to measure S/D/M/WBE project involvement, and such firms accounted for around 30 percent of the project contractors, compared with an initial target of 15 percent. A Building Blocks training program, was also held in conjunction with the New Jersey Small Business

Development Center and Rutgers University in Newark. The training program included an eight-week course for S/D/M/WBE firms.

### **Reduced energy costs**

The New Meadowlands Stadium consumes around 30 percent less energy than the Giants Stadium. These energy savings correspond directly to financial savings for the New Meadowlands Stadium Company.

### **Building Information Modeling (BIM) during construction**

Skanska used BIM to track over 3,200 pre-cast concrete panels, which were custom made for a specific location within the stadium and were not interchangeable. Each concrete panel, which weighed around 20 tons, was fitted with a RFID (Radio Frequency Identification) tag to allow it to be tracked. BIM allowed Skanska to monitor supply chain performance in real-time, including the current production status, quality control, delivery, site preparation and installation. The technique allowed issues to be identified and resolved early in the process, reduced the construction period by 10 days and saved US\$ 1 million.

## **Environmental Aspects**

### **Reducing the environmental impacts of construction**

A Dust Mitigation Plan was implemented to ensure that airborne dust did not migrate offsite. The plan involved the use of water to dampen the site and the construction of stone base access roads. Perimeter dust monitoring was also conducted daily to ensure that dust levels did not exceed the levels agreed with the New Jersey Department of Environmental Protection. Skanska reduced air pollution from construction equipment by utilizing low sulfur diesel fuel, which reduced particulate emissions by 13 percent. All construction equipment was also fitted with engine filters, which further reduced particulate emissions by between 80 and 90 percent. The Skanska team recycled 19 tons of paper and saved 550,000 liters of water, 85,300 kWh of electricity and 36,000 liters of oil through various efficiency measures during construction.

### **Reduced carbon dioxide emissions**

Skanska and the New Meadowlands Stadium Company reduced carbon dioxide emissions by around 1.68 million tons during the entire construction process and the stadium's first year of operation.

### **Construction and demolition waste management**

During construction, 11,904 tons of waste was recycled and diverted from landfill, which accounted for 82 percent of the total waste generated during construction (not including debris from demolition). The demolition of the Giants Stadium created a 160,000 m<sup>3</sup> excavation that was filled with demolition materials, including around 100,000 tons of concrete from the old stadium. Approximately 200 tons of asphalt millings were also incorporated into the New Meadowlands Stadium. Demolition waste was further reduced by selling items from the Giants Stadium as memorabilia, such as seats, pieces of turf and the goal posts.

### **Recycled and environmentally certified construction materials**

The project prioritized recycled and environmentally certified construction materials. In total, around 60,000 tons of recycled steel was incorporated into the project, including 20,000 tons of steel from the demolished Giants Stadium. All 8,000 piles for the stadium were manufactured from either post-industrial steel scrap or salvaged unused piles from the petrochemical industry. The stadium general admission seats were manufactured from recycled materials and incorporated 560 tons of scrap iron and 51 tons of post consumer plastics. Club and suite seats were made with 30 percent post consumer plastics and 40 percent scrap iron. 13,000 m<sup>3</sup> of concrete made with cement containing pulverized fly ash from coal-fired power stations was used to construct the plaza surrounding the stadium, which accounted for 25 percent of the total concrete used on the project. Fly ash concrete can reduce the carbon footprint by up to 30 percent compared with conventional concrete. Over half of all interior finish products were environmentally certified and all carpets, interior paints, coatings, ceiling tiles, composite wood and ceramic tile adhesives contained low Volatile Organic Compounds (VOC) or recycled content.

### **Energy efficient stadium**

The stadium uses around 30 percent less energy than the Giants Stadium, despite incorporating double the floor space. The concession equipment, lighting, and heating, cooling and ventilation systems are all energy efficient and Energy-Star compliant. The stadium lighting is 84 percent efficient compared with the luminaries at the old Giants Stadium, which were 77 percent efficient. All stadium lighting, interior lights and security lighting are managed by an automated lighting





control system, which avoids unnecessary energy consumption. Energy efficient Low-E glazing has been used, which transmits 56 percent less UV light, is 50 percent better as an insulator and is 24 percent better at reducing heat gain than glazing in the old Giants Stadium.

### **Water efficiency**

The stadium uses 25 percent less water than the old Giants Stadium, which equates to annual water savings of around 40,000 m<sup>3</sup>. The use of synthetic turf, rather than natural grass, for the playing field annually saves 13,000 m<sup>3</sup> of water. Waterless urinals annually save 10,000 m<sup>3</sup> of water and low-flush toilets were installed, which consume 6 liters of water compared with 13 liters in the Giants Stadium. Low-flow showerheads were also installed, along with sensor-controlled faucets with 1.9 l/minute limits, compared with conventional faucets that use 8 l/minute. Native low-water plant species were planted and high-efficiency irrigation systems with a 95 percent efficiency rate was installed, compared with conventional irrigation systems that typically operate at 60 percent efficiency.

### **Stormwater management**

17,000 m<sup>3</sup> of porous crushed granite stone material was used around the site to allow rainwater to infiltrate the ground. The porous material consequently reduces stormwater runoff and helps to recharge natural groundwater supplies.

### **Reducing light pollution**

Stadium lighting has internal glare cut off skirts and a tighter beam spread to minimize light spill to the sky. Parking lot lighting also has zero uplighting and meets the Illuminating Engineering Society of North America's (IES) light pollution standards.

### **Recycling, composting and solid waste programs**

The stadium has the objective of reducing solid waste by 25 percent during its operation through various recycling and composting programs. Public recycling bins have been installed in the parking lots and throughout the stadium, and the stadium is equipped with the facilities to compost food waste, and separate and bail cardboard on site.

### **Learning From Good Practice**

The project established a range of long-term sustainability targets with the EPA from the outset, which helped to make the project as sustainable as possible.