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CASE STUDY

Sewer Pumping Station Generates Energy from Wind

Bayonne, New Jersey

History

While Chicago is known as "the Windy City," the New York/New Jersey region is also home to some powerful breezes – and now wind energy generation is coming to the west side of New York Harbor.

The City of Bayonne, New Jersey is in the process of installing a 262-foot tall wind turbine to provide electricity for Bayonne's Oak Street Sewer Pumping Station. As of September 2010, construction of the wind turbine is underway at the direction of the Bayonne Municipal Utilities Authority (Bayonne MUA).

When completed, Bayonne's $5.6 million wind tower will be the biggest wind turbine in New Jersey outside of Atlantic City. This new structure is estimated to begin producing sufficient energy to power the adjacent sewage plant by November 2010.

All wind projects have significant initial capital costs, but this wind project is expected to eventually pay for itself. With an expected annual rate of return of 10%, it is estimated that the wind turbine will generate $9 million in savings and additional revenue over the next 20 years – both in cost savings as the Bayonne MUA will no longer need to buy power to run the sewer station, and in revenue from selling the excess power generated by the wind turbine (approximately $150,000 per year).

Specifications

The Oak Street Pumping Station project consists of a single wind turbine with a hub height of 262 feet and a blade radius of approximately 135 feet. Upon completion, the turbine is expected to have the capacity to power the pump station and offset approximately 1,000 tons of carbon dioxide annually.

This project requires a driven pile foundation using HP 18 x 181 sections with pile tips driven to bedrock or stiff till, or drilled caissons to achieve the stiffness and load capacity specifications of the turbine manufacturers. A concrete pile cap of about 30 feet diameter at the tower base transfers the tower loads into the piles.

Originally, Wide Flange (W14 x 193) was proposed in the engineer's design since at the time that the design was drafted, the engineering firm was not aware that Skyline Steel offered 18 inch H-pile sections. Instead of Wide Flange, Skyline Steel was able to provide the new HP18 pile, featuring lighter weight and higher capacity.

The Skyline Steel Advantage

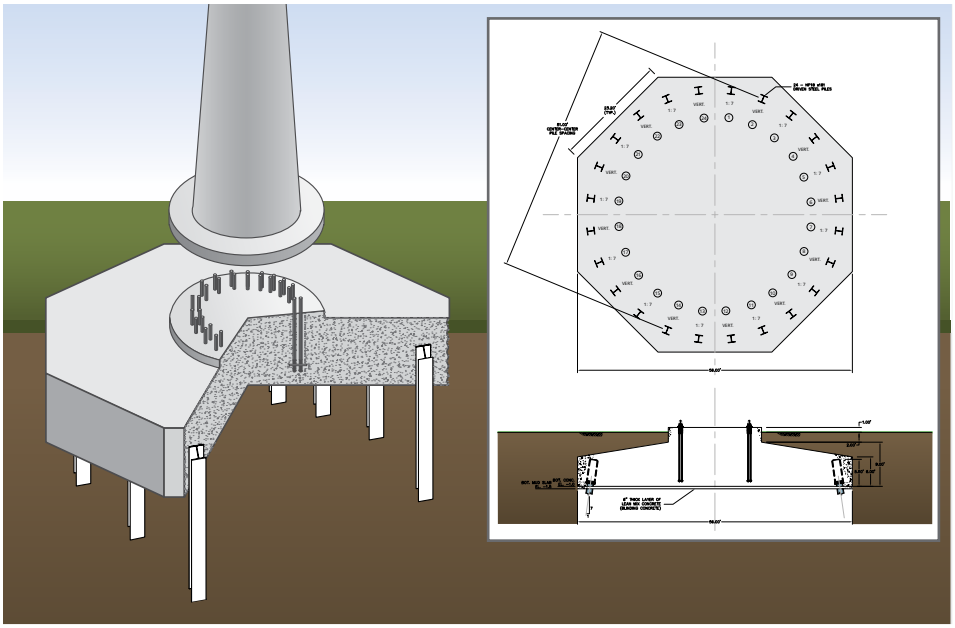
The project's general contractor, Fai-Gon Electric, chose Skyline Steel to be the project's foundation

Product Benefits

- Uniform shape delivers easy installation
- Weight per foot of the HP 18 x 181 is 7% lighter than its wide flange counterpart
- Single splice solution allows for faster beam extension
- Customized splicers enable quick field splicing, resulting in faster production rates at job site
- Increased axial capacity through greater end bearing and skin friction
- Greater bending resistance
- Points are available for hard driving conditions

CASE STUDY

Wind Energy



supplier since they had suggested the use of the larger HP18 piles and their engineer team had worked closely with the design engineers on this project. These larger sections were ideal for this project as they allowed for greater spacing between them and were better suited to the underground conditions at the site.

The type of rock found well below the surface at the project site did not have sufficient integrity or capacity for the threaded bar application that was originally considered. Skyline Steel recommended the HP18 product for the foundation instead of alternative products due to its superior anchoring ability and end bearing capacity.

A static compression load test was performed consisting of two test piles being driven to rock. The design pile load was 180 tons. The test was conducted to 200% of design or 360 tons, in accordance with ASTM D1143's "Quick Method".

Skyline Steel's engineering team worked with the project engineers to develop the final foundation design for the wind turbine, which included an alternating pattern of vertical and battered H-piles around the foundation. This arrangement provided the appropriate load capacity and suited the stability requirements of the wind turbine.

Skyline Steel's efficient network of stocking locations made it possible to quickly deliver the product to the site in the necessary quantities, and Skyline Steel's engineering team were able to draw on their existing relationships with other engineers on the project to serve as a full partner in the project's success.

Scheduling

This project was originally scheduled to be completed in July of 2010. After experiencing a few delays due to unforeseen issues, the schedule was adjusted to November of 2010.

Project Partners

Owner/Engineer
Bayonne Municipal Utilities Authority (Bayonne MUA)

General Contractor
Fai-Gon Electric

Main Foundation Contractor
HC Constructors Inc.

Piling Sub-contractor
MG Forge Construction LLC

Engineer
Hatch Mott MacDonald (HMM)

Products

Product
H-piles: HP 18 x 181
Splicers

Steel Grades
ASTM A572 Gr. 50

Quantity
24 Piles; 148 tons

Load Capacity
180 tons

Additional Reference Materials

Statistics, financial projections and other background information on the Bayonne wind turbine project were obtained in part from the following sources:

- Wind Power Pre-feasibility Report for Bayonne – May 2007. Prepared by Hatch Energy, Hatch Mott McDonald.
- *New York Times*. "Wind Turbines Are Coming to New York, and Not Just Offshore." Patrick McGeehan, August 16, 2010

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