

A photograph of a telecommunications tower with multiple antenna arrays and a yellow drone flying in the sky to the right.

The Visual, Virtual Difference

Johnson Broderick Engineering, LLC Assess the Value of Precision Graphics-Enabled Tower Analysis

Structural tower analysis has long been a tedious and somewhat complicated process requiring multiple iterations and considerable research and analysis to achieve optimal results. While specialized programs have helped deliver quality results, they have not evolved nor improved the methods.

Aaron Broderick, Principal of Johnson Broderick Engineering, LLC, believes it's time for engineers to adopt a visual approach to modernize tower analysis. He explained, *"Older programs are kind of a black box that are fed information and spit out results. There's no visual reference to where antennas or feed lines are located or what the equipment looked like and limited foundation analysis capabilities."*

For Eugene, Oregon-based Johnson Broderick Engineering, LLC, advancements in visualization as well as expanded analytics are forever changing the tower analysis approach.

Visual Differences

Johnson Broderick Engineering, LLC, has a long history of structural and civil engineering services with a specialty in structural analysis of new and existing towers and telecom system services for public and private entities in the Pacific Northwest and Northern California. The firm invested in OpenTower Designer from Bentley Systems in April 2020.

Designed for engineers and owner operators, OpenTower Designer is purpose-built for tower design, modification, management, and maintenance. It's fully equipped with seismic and wind load generators that can handle varying load combinations. Features and functionality include the ability to make tower modifications, precisely position equipment, conduct multiple scenario evaluations and perform foundation checks and connection designs. The solution supports the design of tower and foundations for tower legs and guy support points, including pad-pier, drilled pier, guy anchor foundations and mat foundations per the Telecommunication Industry Association (TIA).

For Broderick, the big difference is the realistic graphics. He explains, *"OpenTower Designer's rich graphics present every detail visually very nicely and provides an interactive user interface that you can delve into, which offers an approachable way to see what appurtenances are on a tower, including face and elevation."*

Fast Facts

Company:

Johnson Broderick Engineering, LLC

Location:

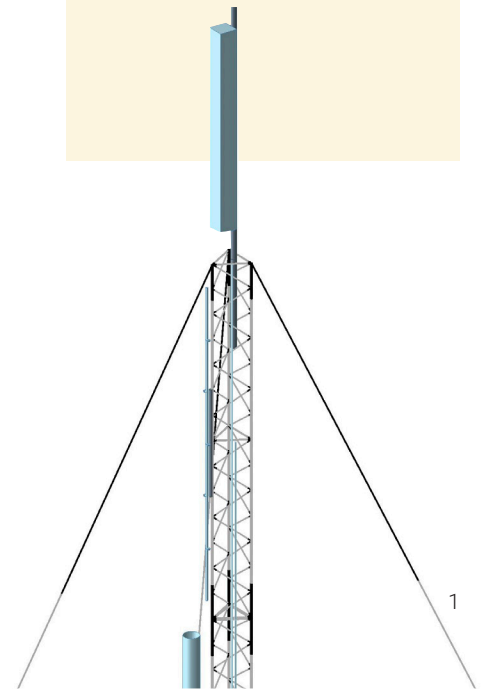
Eugene, Oregon

Benefits:

- Accurate graphical representations of towers
- Ability to optimize analysis by evaluating multi-variable simulations
- Integrated solution, including tower, mount, and foundation analysis

Products used:

- OpenTower Designer



The program is designed to generate intermediate results throughout the analysis for review, which Broderick says, are easy to sort through if I need the tension in a diagonal for connection design, or review specific force levels in bracing members, for example.

"I can generate reports and fine-tune components, as needed," he continues. *"And it's all available with the click of a mouse—very different from traditional tower analysis applications that were difficult to extract details beyond the prepared numerical report. Previous tools were powerful, but hard to trust because you didn't know what you were getting."*

Solid Underpinnings – Highlight an Integrated Workflow

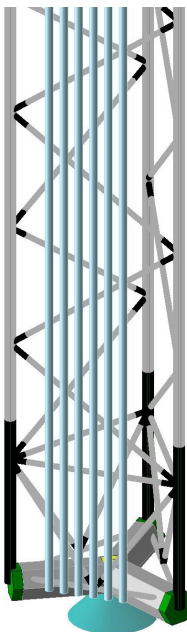
Of particular use to Broderick is the foundation analysis tool, which is designed to evaluate the most common foundation types (e.g., mat, drilled piers, guyed anchors) as well as the associated structural requirements for each.

Broderick says, *"The foundation analysis module is robust and incorporates a completely integrated method to evaluate different foundation types for adequacy."*

Typically, foundation tools can only run one case, but OpenTower Designer automatically handles multiple forces and load combinations based on code requirements and has the ability to streamline the workflow by integrating foundation engineering with the tower analysis.

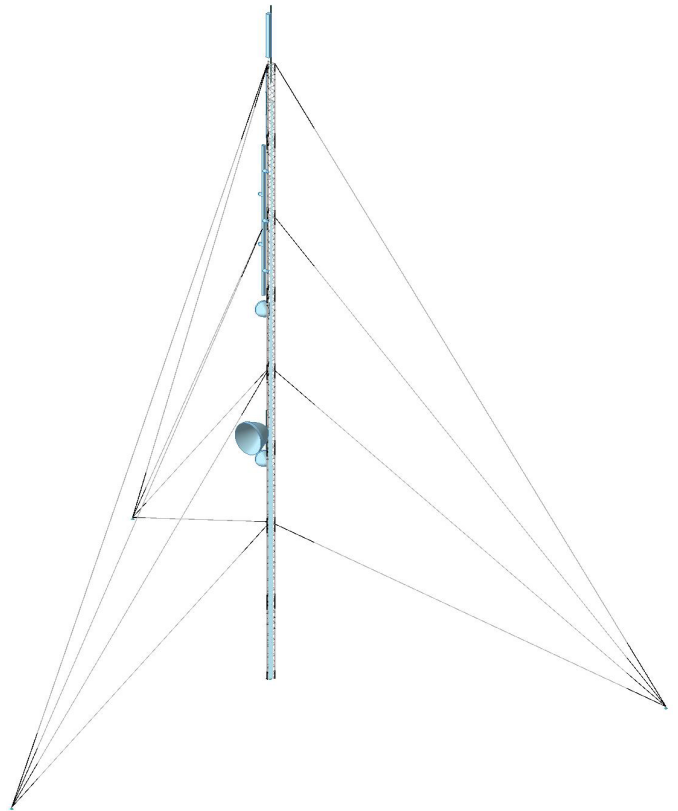
"That's a nice little bridge capability," he says. *"And we could model unusual tower configurations with ease."*

In a recent study, the engineering team needed to analyze a guyed tower's capacity with a 20-foot pipe embedded 5 feet into the centroid of the tower with phillystrand guy wires at the top level. He confirms, *"That's not a common scenario, but OpenTower Designer did it with ease. The client provided the data, I plugged it into the application and quickly verified that both the tower and the foundation designs work."*



As well, Broderick believes the mount analysis tool will be invaluable when it comes to analyzing heavier antennas that are beginning to emerge. The OpenTower Designer solution incorporates the new TIA standard (222-H) that requires analysis of mounts at 30-degree intervals.

He notes, *"With most tower analysis applications, we have to input those interval calculations one by one. This program does all of them automatically, enabling quicker delivery, and better results."*



As well, Broderick says, the application offers a unique method of creating the history of a tower. While typical current analysis is based on previous analyses, OpenTower makes it possible to create a base tower model from which different work orders can be created. He continues, *"These work orders can reflect various analyses on the same tower over time, allowing a series of previous tower loadings to be created in the same file, instead of relying on discrete analyses spaced out over years that causes difficulties in file management and being prone to human errors."*

Within individual work orders, different scenarios can be created to reflect different loading configurations on the same tower. For example, if two carriers want to see what overstresses might occur if the other carrier adds or removes an appurtenance. *"It mimics a 4D environment with the history of tower modifications and work orders enabling one-source of truth. It's a real innovation that industry can take advantage of,"* says Broderick.

"Bottom line, the program is easier to use, streamlined and visually pleasing to the eye, and especially invaluable to us is the technical support, our questions about the program are answered with an email or a phone call that day, often within the hour. The support staff are both tower design engineers and programmers, so they are able to explain how to use existing features and functionality and develop new capabilities on request."

He concludes, *"This program is a massive departure from previous applications."*