Knowing Your Site from Every Angle

By Andrew Bayne Posted June 1, 2022 In Feature Articles

In the tremendously busy Greater Toronto Area construction industry, design consultants are often asked to provide design proposals in short order for developments that are based on limited information, minimal reporting, and only a handful of vague assumptions, ahead of ever being able to get their feet wet in the schematic design phase of the project.

Through structural consulting services at RJC Engineers (RJC), in preparation of the initial scope of work and considering the skeletal framing design to support a building, little is known at the project's onset. Therefore, it's vital to know the site to clearly define an accurate scope of work, deliver exceptional client service, and to avoid as many unforeseen design issues as possible. Getting to really know and understand your site from every possible angle and as early as possible is the only way to properly define an accurate scope of work to mitigate project costs and schedule challenges.

Let's take a look at the site plan angle. Most often defined by street intersections, local municipalities come with their own bylaws and codified climatic data, which affect the project's structural design scope. Above-grade, the same building, but on entirely different sides of a street, can have different prescribed seismic, snow, rain, and wind climatic design loads and design criteria, have unique sustainability criteria for gravity

loading associated with floor and cladding assemblies, or even have massing height, sightline, shadow, or setback limitations. Such design considerations which impact design can often bias the structure to more complicated framing setbacks through multiple floors, increasing and complicating the design scope while continuing to address constructability and economy.

But what about getting an accurate view of the site from the underground? Below-grade geology may very well offer the most unknowns for a project site, so having clear knowledge of what can be expected through first-hand working experience and expert relationships to determine potential early complications in developing a structural scope is paramount. Local, professional site knowledge helps to anticipate what additional scope of work may be most practical for soil investigation, which should not always just be "one and done." Local site knowledge also helps to identify foundation solutions that could result from planned excavation depth and founding elevations for local soil stratigraphy, capacity, groundwater elevations, and soil permeability as a start. An early understanding of whether ground improvement is an option for a site can help support the overall success of a project while also clarifying the scope of project work. This understanding can help mitigate underground project works. It's often a more cost-effective solution to consider ground improvement over more traditional methods like dig-replace of poor soils or deep foundations. Regardless of low rise or high-rise development, consideration of such below-grade site constraints may limit development density while increasing design scope and associated building costs.

But what about looking at all of this from a site legacy angle? Aside from the potential geological formations and high-level municipal boundaries, at a much more micro level, it's important to understand what structures currently exist or did exist in the past, on or near a project surrounding the site. How many different structures and possible ownership parties may have to be involved, and what are the ramifications of which existing buildings on site will need to be demolished or preserved is essential in developing a clear and accurate scope of work. Adjacent structures can seriously affect any planned development, especially as a result of partial demolition and retention of existing portions of buildings that may or may not be subjected to heritage conservation plans. Determining exactly how to incorporate retained buildings, or ensuring that they are completely demolished is a key consideration.

Aside from any on-site legacy issues and existing buildings, adjacent buildings may result in zero lot line conditions or potential excavation undermining, which increases new associated above and below-grade framing complexities, especially when compounded by constructability constraints surrounding shoring offsets and building along property lines. In addition, future adjacent redevelopment often comes to light through early works, so knowing the local development plans, height restrictions, or adjacent site complications that may induce different wind or snow patterns can further define and expand project scopes.

The view from the outside of your site is another very important angle to consider. Knowing what surrounds the development site helps build an understanding of early complexity, even if not directly related to the proposed project works. For example, adjacent rail lines above and subway lines below grade can restrict certain structural solutions or create framing complexities to offset or concentrate support-induced reactions. Likewise, adjacent buried civil, mechanical, and electrical service corridors can often have the same increased complexity results, with many streets full of overlapping and interwoven utilities. In some instances, this infrastructure can even cross portions of the site, compounding unique framing scope around imposed easements, set backs, and further define regions of the site unavailable to utilize.

But what about the constructability angle? Understanding of how construction on a specific site may take place and what design limitations may be imposed on the structure further helps refine an early scope of work. Considerations include above-grade services, potential access, further support acknowledgment of temporary loading conditions, staging, potential top-down construction on restricted sites or portions of the building, or the anticipation of other additional third-party constructability means and methods.
And, what about the accessibility of your site? Often, without many supporting drawings available during initial reviews of a project being considered, a high-level understanding of local traffic service routes, movement, and associated vehicular weight needs to be accounted for, which may affect the entire structural design scope. Assumptions on fire, truck, garbage, delivery routes, and other vehicular traffic, including parking and ramping, is critical for not only accessing the project site but also for where framing geometries of the building may need to be alerted to accommodate access. Suppose that the site is planned to be in a commercially sensitive area. In that case, the development could lead to not only more truck access but also open commercial and mixed-use layouts and occupant use through lower levels of the building and consideration of unique tenant loadings, framing, and ultimately access, which can alter early framing strategy assumptions and the design scope accuracy.

With very few ideal development sites available in our metropolitan centers, a structural solution that works well on one site may be different for the same building on another site, where rarely a planned identical building is ever truly identical structurally. Striving to provide an economical design for a client goes hand in hand with keeping the design as simple as possible. With site constraints limiting the most obvious of structural simplifications, knowing your site from as many angles as possible ahead of putting pen to paper helps to foster more creative and practical solutions that work well with potential site restrictions. It is essential to developing an accurate initial scope of work, and to ultimately help deliver a successful project for everyone involved.

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