Located in the heart of downtown Seattle, Viktoria is a 25-story upscale residential tower with 249 apartment units, six levels of parking (above grade), and retail space. The owner’s desire was to create a high-end urban environment with spacious layouts and minimal structural obstructions.

STRUCTURAL FRAMING SYSTEM
As with all structures, other construction options always exist, however, the residential use of the building dictated the use of cast-in-place (CIP) flat plate concrete and thus other the options were not considered. Viktoria is very unique in that this upscale apartment tower has no internal columns, creating complete freedom in the interior design of every living unit, as well as the lobby, retail, and parking below.

UNIQUE STRUCTURAL AND/OR ARCHITECTURAL DESIGN FEATURES
There were several design and construction challenges, the first of the challenges was to find a structural solution to maximize the usable square footage in a tight building footprint. CKC, the structural engineer, proposed a unique solution to eliminate all internal columns. By thickening the slab from 8'/2" to 16" for a distance of six’ around the core perimeter and to create a unique “drophead”. All internal columns became unnecessary and slab spans of nearly 40’ from the central core to the exterior glass line were made possible, providing completely open living units and parking layout without structural obstructions.

Close communication between the general contractor and structural engineer was a key to the successful implementation of Viktoria’s unusual core design. The structural engineer minimized the constructability challenge by creating a buildable design and working synergistically with the contractor. Due to close proximity to the adjacent buildings, the structural engineer minimized the loads at the building perimeter to avoid settlement effects. The structural design also minimized sideways motion during an earthquake to eliminate the possibility of contact with the surrounding buildings. State-of-the-art non-linear analysis tools were used to predict building drift and diaphragm deflection limits.

REASONS FOR CHOOSING REINFORCED CONCRETE
• Column-Free Layout. An innovative two-way slab system that eliminated all internal columns was implemented and provided completely open interior space in all units, maximizing interior design flexibility.

• Efficient Shear-Wall Core. With no interior columns, the core substantially supported the majority of the building’s dead load. This significantly reduced the net uplift forces at the core under overturning from wind and seismic loads. As a result, core wall reinforcing quantities dropped by over 12%.

• High-Strength Reinforcing Steel. The structural design effectively combined ASTM Grade 60 and Grade 80 reinforcing steel (rebar) to minimize rebar tonnage and maximize constructability. Grade 80 was used in the foundation mat, shear wall boundary elements, and column ties, Grade 60 was used elsewhere. The bottom line was an efficient structural frame that successfully combined high strength reinforcing steel (rebar) with a unique structural system, resulting in all project objectives being met or exceeded.