

## SIGNAL HILL PROFESSIONAL CENTER

Manassas, Virginia • Morabito Consultants



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Study of Alternate Structures Report  
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### EXECUTIVE SUMMARY

Like most suburban office building in Northern Virginia, the Signal Hill Professional Center, a four-story office structure in Manassas features composite steel construction for both the office building and its corresponding underground parking garage structure.

In order to assess the competence of this composite system, it was compared to various design alternatives, including:

- Non-composite Steel Beams
- Precast Concrete Floor Planks
- Steel Joists
- One-Way Concrete Slab
- Concrete Pan Joists
- Two-Way Concrete Slab
- Trus-Joist Manufactured Wood Joists and Girders

A standard 20'-0" x 30'-0" bay was analyzed for both office loads and parking structure loads, using specifications from various manufacturers, the Concrete Reinforcing Steel Institute Handbook, and the Precast Concrete Institute Handbook to simplify alternative structure design processes.

Considering that building weight and architectural layout are not major considerations, economy from easy and fast construction, material availability, and an overall shorter building height from narrower floor section depths shows that:

- The simplest redesign would be a steel composite system where infill beams span in the longer 30'-0" east-west span. Though the longer beams are much larger to primarily account for deflection, this creates a significantly narrower floor section depth in both the office building and parking structure at the expense of less space under the floor slab for additional engineered systems.
- Steel Joists produced a narrow floor section depth and light bay weights; however, fireproofing and mechanical placement must be explored further.
- The most viable concrete system would be Pan Joists spanning in both directions. This creates one of the thinnest floor section depths and is one of the lightest concrete systems, at the expense of slightly more complicated construction and less space for additional engineered systems.
- Precast Concrete Floor Planks resting on a non-composite steel structure would be a good way to improve quality through prefabrication and produces a relatively light and thin floor system.
- TrusJoist Manufactured Wood Joists and Parallam Girders, though featuring one of the largest floor section depths and closest beam spacing, could add an element of architectural interest to the interior architecture and are 60% lighter than the current system. Further analysis with respect to serviceability would be necessary before implementing this unconventional system.
- A one-way concrete slab is a possibility though it is heavier and does not significantly reduce floor section depth.
- A two-way slab would be possible only if the column layout were redesigned to feature smaller bays.