

# BUILDING ON THE FOUNDATION OF TOMORROW SINCE 1986



## New Wind Loading Requirements Drive Up Foundation Size/Cost



It's now common to discover two adjacent jurisdictions within the same state having different wind loading requirements for new construction. In Michigan, many jurisdictions have recently adopted 120 mph wind

loading, while others maintain 90 mph loading. On a recent project in West Virginia, the client originally had large concrete foundation footings designed for a prefabricated metal building to provide sufficient resistance to uplift and lateral wind pressure at 90 mph wind loading. However, the local building department rejected the engineer-stamped design, instead requiring a design for 120 mph wind loading. Structural Foundations and Haengel & Associates Engineering provided an economical foundation alternative designed for the 120 mph wind loading requirement.



A 120 mph wind creates a force on a flat vertical surface of approximately 36.9 pounds per square foot (psf), which is about 78% more force than the approximately 20.7 psf created by a 90 mph wind. While the wind loading of a building cannot be simplified to just flat vertical pressures, as building shape and exposure are integral considerations, keeping all building attributes constant, higher wind loading will increase foundation size and cost, sometimes dramatically. Building types especially needing larger foundation systems to meet higher wind loading requirements are those of relatively light weight and having high-bay overhead doors. Foremost among these types are prefabricated metal buildings, which rely on their foundation systems to supply sufficient deadweight for uplift resistance. For these buildings, any increase in wind loading must be countered with an increase in foundation size.





The most common approach to constructing foundations for prefabricated metal buildings is the use of a traditional concrete spread footing. The total installed cost of 4,000 psi concrete, including excavation, form work, rebar, finishing, and associated labor is commonly \$300 to \$350 per cubic yard. Concrete can be economical for prefabricated metal buildings in good soil conditions and 90 mph wind loading requirements. However, in higher wind loading requirements and especially where poorer soils are present, concrete spread footings can become unacceptably expensive.



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Working together, Structural Foundations and Haengel & Associates Engineering have developed a variety of hydraulically-installed steel foundation designs that are suitable for the high uplift loads and other structure loads common to prefabricated metal buildings. Each foundation is sited beneath a column location and has uplift capacity calculated from the bearing capacity that is verified during the hydraulic installation process. Individual steel foundations can provide uplift resistance in excess of 100 kips in smaller sizes and over 300 kips in larger sizes, even in poor soil conditions. For project sites with 120 mph wind loading requirements and poor soils, the total installed cost of the Structural Foundations system saves 25% to 50% over the use of concrete spread footings, while achieving even greater savings over the use of helical piles and H-piles. Additionally, the use of the Structural Foundations' system provides a steel structure for attaching the metal building framework, either by welding or fastening to a bolt pattern, and also enables building erection to occur in tandem with foundation installation.

While concrete spread footings have much merit and favorable economics for supporting prefabricated metal buildings in lower wind loading scenarios and stiff soils, we recommend consideration of the hydraulically-installed steel foundation system as a more economical

and time-saving alternative for 120 mph wind loading and / or in poor soils.

## High-Capacity Steel Foundations for Buildings, Industrial Structures, and Retaining Walls

Wherever you would use deep foundations, piles, pile alternatives, or large concrete pours, consider Structural Foundations. With Haengel & Associates, Structural Foundations engineers and hydraulically installs high-capacity steel foundations saving up to 50% in cost and valuable time. [READ MORE](#)



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