



## GatorBar Substitutions for Steel in Slab-on-Grade and Flatwork

My name is Matt Kero and I am the VP of Engineering with Neuvokas. I am a member of the ACI 440 committee that develops the standards for composite rebar and I am a member of the ASTM D30 committee that develops specifications for composite rebar. These standards and specifications have been developed to govern material properties that are acceptable and define how composite rebar should be used in a variety of structural and nonstructural applications. Our product, GatorBar, has ICC-ESR 4526 that certifies our product quality and material properties meet the industry standards. The purpose of this letter is to explain why #3 GatorBar can replace #4 steel and why #4 GatorBar can replace #5 steel in slab-on-grade applications.

In slab-on-grade design there are a variety of variables but it should be noted that the primary purpose of reinforcement in this application is crack control. Reinforcement does not eliminate cracking and the reinforcement is there to ensure cracks stay together. The literature shows that the material properties of composite rebar, specifically the high strength and lower tensile modulus, when compared to steel will reduce the internal stresses formed during the curing of concrete. This results in less cracking and greater flexibility of the concrete system.

The primary equation that we use for reinforcement ratio in slab-on-grade applications is the ACI Drag Equation (summarized below).

Utilizing equation, A-2b of the ACI 440.1R-15 a slab can be designed for shrinkage and temperature reinforcement. This equation has been modified for composite rebar using an allowable amount of strain and the allowable stress. The variables in this equation include coefficient of subgrade friction, distance between joints, the dead weight of the slab, and the elastic modulus of the FRP reinforcement.

$$A_{f,sh} = \frac{\mu Lw}{2(.0012 * E_f)} \quad \text{Equation A-2B of ACI 440.1R-15}$$

This equation plus the experience we have with over 150,000,000 feet of product installed across the United States led to the slab-on-grade recommendations listed below.

- 4" concrete – 24" to 30" #3 GatorBar
- 6" concrete – 18" to 24" #3 GatorBar or 24" to 30" with #4 GatorBar
- 8" concrete – 12" to 18" #3 GatorBar or 18 to 24" with #4 GatorBar

There are differences in concrete design that can be based on geographic regions, but in most cases this is a size down replacement of steel rebar.

Best Regards,

Matt Kero VP of Engineering