A High Performance Mineral Reinforcement for Fiber Reinforced Concrete

• Improved early age strength
• Reduced micro-cracking
• Increased flexural and compressive strength
• Superior ductility and fracture toughness
• Greater shrinkage resistance
• Excellent extension to macro fibers and textiles
• Ease of mixing and construction
• Sustainable replacement/reinforcement on a micro scale
• Naturally occurring and safe

NYCO wollastonite

Reduction in Plastic Shrinkage Cracking

Control
NYAD G® (15% Portland Cement Replacement)
Benefits in Fiber-Reinforced Concrete

- Wollastonite, when used as a Portland cement replacement up to 15% of the total cement results in progressive strength gains.
- The addition of wollastonite affects workability, but with use of superplasticizers, the mixing process becomes as similar as regular concrete.
- In comparison with a control mixture, wollastonite (NYAD G® and MG) increases the flexural strength (peak load) by 30% and compressive strength by 15%, for early strength gains. Additional 27% for flexural strength are gained during the 28-day curing; no change is introduced for the compressive strength. While the compression strength is only increased by 15%, the structural integrity preserved is much higher.
- In comparison with a control mixture, wollastonite (NYAD G® and MG) increases the total toughness by as much as 60% for early strength gains and an additional 9% for the 28-day curing. Wollastonite fibers help in bridging the cracks, thereby dissipating the energy from the loading and making the specimen more ductile.
- In comparison with a control mixture, wollastonite (NYAD G®) reduces the length of cracks during plastic shrinkage by a factor of 2, area of cracks by a factor of 3, density of cracks by a factor of 2 and width of cracks by a factor of 1.
- Testing in FRC is being done to determine optimal % partial replacement of macro fibers with wollastonite to achieve best balance of crack resistance and strength properties.

Crack Properties | Control | NYAD G® | NYAD® MG
--- | --- | --- | ---
Total Length of Cracks (mm) | 955 ± 45 | 493 ± 90 | 681 ± 66
Total Cracking Area (mm²) | 303 ± 35 | 94 ± 26 | 178 ± 23
Density of Cracks (mm⁻¹) | 0.10 ± 0 | 0.05 ± 0.01 | 0.07 ± 0.01
Area Fraction of Cracks | 0.03 ± 0 | 0.01 ± 0 | 0.02 ± 0
Average Width of Cracks (mm) | 0.32 ± 0.05 | 0.19 ± 0.02 | 0.26 ± 0.06

Plastic Shrinkage Crack Morphology (up to 15% dosage)

Resistance Curves of Representative Specimens With 10% and 15% Dosage Cured For 7 Days