

Use of OPUS SCM™ at high replacement level



OPUS SCM™ is Terra CO2's Supplementary Cementitious Material (SCM) solution for reducing emissions in concrete by replacing Portland cement.

For every ton of Portland cement replaced by Terra's OPUS, a 70% reduction in CO₂ and a 90% reduction in NO_x is achieved.

OPUS SCM™ provides equivalent or better performance in concrete mixes when compared to Class F fly ash. Like fly ash, OPUS SCM™ can replace up to 25% of Portland cement. OPUS SCM™ concrete mixes are cost competitive with fly ash mixes.

With an appropriate mix design, including admixtures, OPUS SCM™ can be used at higher replacement level: up to 40% Portland cement substitution can be achieved. By using concrete additives, a high replacement OPUS SCM™ mix does not compromise in performance. A 40% OPUS SCM™ concrete mix can provide compressive strengths equivalent or better than what is typically achieved in a concrete mix with 20% fly ash. This increase in replacement level reduces the carbon footprint of the concrete significantly and provides beneficial long term durability properties. Mix designs with OPUS SCM™ utilizing proprietary concrete additives are cost competitive and comparable with fly ash mixes. Concrete mixes using OPUS SCM™ also maintain or improve the workability of the concrete mix.

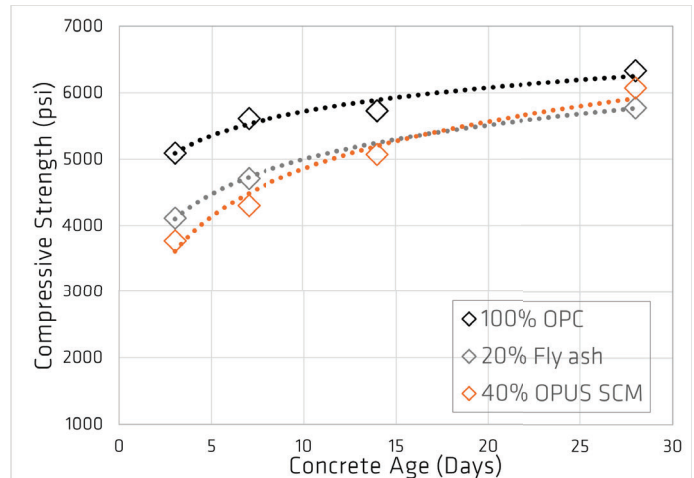
Shown on the right side is an example of a concrete mix with OPUS SCM™ verified by an accredited third party concrete lab. Three concrete mixes are compared: (i) 100% Portland cement, (ii) 20% class F fly ash replacement; and (iii) 40% OPUS SCM™ replacement. The OPUS SCM™ used here was made from granitic feedstock. All concrete mixes were air entrained and had a total cementitious content of 611 lb per cubic yard of concrete.

On an on-going basis, Terra CO2 will test OPUS SCM™ solutions made from various feedstocks and characterize long term performance.

Application Guidelines

Concrete properties depend on the characteristics of the aggregate, sand, water, and cement used, as well as the batching and curing processes. OPUS SCM™ has consistently performed well during repeated tests in laboratory conditions. Terra CO2 recommends that end-users test OPUS SCM™ in concrete mix designs using their local materials to confirm performance.

Strength of OPUS SCM™ vs. Portland cement and Class F fly ash in concrete



Summary of concrete test results

ASTM Standard	Unit	Class F Fly Ash @20%	OPUS SCM™ @40%
C138: Unit Weight	lb	145.4	142.8
C231: Air Content	%	6.0	6.8
C138: Slump	"	4	5
C403: Initial Time of Set	hh:mm	7:00	7:38
C39: Compressive Strength (@28 days)	psi	5,770	6,070