
ceS-100™ is a Nano-Engineered Cementitious Slurry for Offshore Grouting and Repair Applications. Provides high early and late strength with improved crack resistance.

Product Description

ceS-100™ is a two phase, cementitious slurry consisting of GP cement and a Nano-engineered paste of SP plus carbon nanofibers. When mixed with water it produces a homogenous, highly flowable and pumpable slurry with superior early (24 hours) and ultimate (28 days) strengths. ceEntek's advanced nano-engineered system produces a high-strength grout with "best-in-class" performance, superior rheological properties, and extended lifetime durability.

Application Areas

ceS-100™ has been designed to meet the requirements of both small and large scale applications. Areas of use include:

- Offshore Grouting
- Sub-sea Repair Work
- Backfill stabilization

Please contact our technical support team for your specific projects and requirements.

Features and Benefits

- Compression strength > 70 MPa (24 hours) and > 100 MPa (28 days)
- Short mixing time
- Excellent pumpability over long distances
- Non-toxic
- Non-bleeding and non-segregating
- Cost effective for both small and large applications
- Crack resistant

Installation Guidelines

ceS-100™ has been formulated for use in temperature conditions from +2 °C to 45 °C (36 °F to 115 °F). Excellent flow allows pumping over long distances. Installations should be by trained, experienced contractors. ceEntek will assist with training to qualified parties.

Consumption

ceS-100™ is a two-phase system delivered in 25kg bags (50lbs), jumbo bags or silo together with the relevant amount of paste in pails. Mix with fresh water in either jet- or pan mixers.

Mix Components

1. GP cement
2. cePA-60D (CNF paste)
3. Potable water

Mix Component Quantities

Table 1 outlines the weight of each mix component used in the mixing of ceS-100™, for a typical batch sized in an IMER Mortarman 120 planetary mixer or equivalent planetary mixer.

The values below have been determined in order to simplify the weighing of components, as much as possible. In order to ensure the batch is mixed properly, a single batch requires a given weight of ceS-100™, based on the mixing capacity of the high-shear mixer used and the desired plastic properties of ceS-100™. When mixing a different volume than the volume in Table 1, each substituent weight is to be adjusted and verified by a ceEntek Technical Representative.

Table 1: Material quantities for 1m³ of ceS-100™

Mix Component	Weight (kg)	Weight (lbs)
GP Cement	1850	4078.55
cePA-60D	13.51	29.78
Potable water	384.25	847.13

Procedures

ceS-100™ Premix: Premix bags must be protected from moisture, freezing, and kept dry at all times. Unopened bags of ceS-100™ Premix have a shelf life of 6 months.

cePA-60D: cePA-60D must be stored in a dry place and be protected from sun and freezing. Unopened pail of cePA-60D has a shelf life of 6 months.

Mixing Procedure

Mixing: Mixing ceS-100™ requires a high shear mixer and qualified personal on-site. The number of mixers should be adjusted to reduce the waiting time between batches, depending on the volume of material to be placed. Since a wheelbarrow or buggy will be used to transport the fresh material to the pouring location, the mixers must be raised high enough to ensure that it discharges properly. A platform can also be used next to the mixer to allow workers to batch properly and safely. The mixer should be kept as clean as possible between batches in order to guarantee the performance of subsequent batches.






Mixing Sequence: The following mixing procedure has been developed and tested thoroughly at an ambient temperature of 23 ± 1 °C when using an IMER Mortarman 120 planetary mixer or equivalent planetary mixer. The mixing procedure may be adjusted to better suit the temperature conditions, based on the recommendations of a ceEntek Technical Representative. Prior to the batching operation, the mixer must be inspected and cleaned so that no foreign material impacts the fresh ceS-100™ mixing.

Different models of high-shear mixer have successfully been used to batch ceS-100™. Refer to ceEntek Technical Representative to use a different high-shear mixer.

Table 2: Mixing procedure for ceS-100™

Step	Component to Introduce	Action	Mixer Speed	Start (mm:ss)	End (mm:ss)
1	ceS-100™ premix	Introduce ceS-100™ premix the mixer			
2	cePA-60D and potable water	Dilute cePA-60D with potable water to form CNF suspension			
3	CNF suspension	Slowly introduce the CNF suspension into the mixer during mixing	Medium	00:00	01:00
4	-	Mix	Medium	01:00	06:00

Table 3: Precautionary measures

Cautions	
<p>1. All personnel involved in mixing operations are required to adhere to the PPE requirements as below.</p>	 <p>Hard Hat</p>  <p>Safety Glasses</p>  <p>Hand Protection</p>  <p>Foot Protection</p>  <p>Dust Mask</p>
<p>2. Make sure that the inside of the mixer has been pre-dampened slightly (remove any excess water) prior to the preparation of every batch on each batching day.</p>	
<p>3. The time to complete steps 1 to 4 outlined in the mixing sequence of Table 2 above may vary and must be validated by a ceEntek Technical Representative.</p>	
<p>4. Cover the mixer with plastic during mixing to help control dust emissions or alternately, use a dust collector mounted over the mixer.</p>	
<p>5. Clean and dry the mixer as best as possible between batches in order to help ensure consistency between batches. Remove any build up excess material on the mixer or mixing blades.</p>	

Curing

The curing of ceS-100™ is essential in obtaining the necessary mechanical and physical material properties. In order to properly cure the material, the contractor must cover the fresh material with formwork plywood, or plywood wrapped in a plastic film, immediately after pouring. Covering the material quickly after pouring prevents the top surface of the material from drying out. The ceS-100™ is demolded after 24 hours of casting and water-cured at approximately 23 °C (73 °F) in a humidity-controlled chamber.

Mechanical, durability and time dependent properties of ceS-100™

The following data is representative of typical values achievable under laboratory conditions. Results in the field may vary.

Table 4: Mechanical properties of ceS-100™

PROPERTIES	ceS-100™	
Compression Strength (MPa)¹	1 day	> 70
	7 days	> 90
	24 days	> 100
Density (kg/m³)²	2,200 - 2,250	
Flow³	350 – 400 mm	
Air Content (%)²	< 3	
Shrinkage (%)	Minimal	

Notes	
1	Compressive strength tests in accordance to ASTM C109
2	Density and air content tests in accordance to ASTM C138
3	Flow test in accordance to ASTM C1437