



ULTRA-HIGH
PERFORMANCE
CONCRETE

Product Performance & Durability Testing

Envel™ panel systems are produced with Ductal® Ultra-High Performance Concrete by Lafarge, the most widely researched and tested UHPC material in the marketplace today. Research & development of Ductal® began more than 20 years ago at the Lafarge Research Center in Lyon, France -- the largest building materials laboratory in the world.

The result of this research was a technological breakthrough in cementitious materials. Ductal's integrated fiber matrix means that it has extremely low porosity and permeability, thereby attributing to its superior durability, ductility and strength. (Compared to conventional concrete, it has 6 to 8 times more compressive strength and up to 10 times more flexural strength.) The benefits are many: excellent resistance to abrasion, impact, chemicals, freeze-thaw, carbonation and chloride ion penetration. It is extremely moldable too; ideal for a vast range of architectural and structural precast elements that are thin and lightweight, with enhanced surface finishes.

Over the years, Ductal's performance characteristics have been further tested, validated and certified by numerous independent academic and industry organizations - including the esteemed "CSTB"/Centre Scientifique et Technique du Bâtiment (Scientific and Technical Center for Building) in France.

Additionally, Envel™ panels made with Ductal® have undergone independent / extensive tests here in the United States to establish and validate its superior performance and durability characteristics. This document outlines a number of tests conducted by CTL & ATI-Intertek:

Standard	Description	Performance
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens	18,000 psi
ASTM C496	Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens	2,100 psi
ASTM C293	Standard Test Method for Flexural Strength of Concrete (3 point loading)	1,700 psi
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete	4.60%
ASTM C418	Standard Test Method for Abrasion Resistance of Concrete by Sandblasting	Abrasion Coeff. Loss .21 cm ³ /cm ²
ASTM C531	Standard Test Method for Linear Shrinkage and Coeff. Of Thermal Expansion	5.71E-06
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing (301 cycles)	Length Change% /.020 Mass Change% .04 Relative Dynamic Modulus 96%
ASTM C1185 Section 11	Water Tightness 1/2" Thick Panel	No Water Droplets Present
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials	Flame Spread 0 Smoke Dev. 0
ASTM E488	Freeze Thaw Conditioned Samples / Tensile & Shear Evaluation. 1/2" Thick Panel, 13mm Keil Anchor	Tensile 390# / Shear 800#

