NDTitans in action

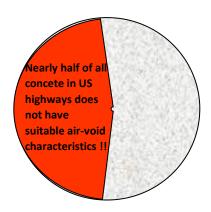
Case 12.1 AVA for air-void structure of fresh concrete

Freeze Thaw cracking



Example 1 of Freeze and Thaw cracking of the longitudinal joints of a concrete highway due to an improper air-void system in the presence of wet (saturated) concrete and freeze-thaw cycles.

Source: KDOT





Example 2 of outdoor exposure to Freezing and Thawing after 40 years. Left: Concrete with improper air-void system. Right: concrete with correct air entrainment.

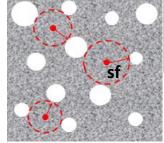
Source: PCA

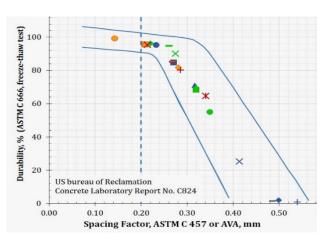
Entrapped air

Requirement: Spacing Factor "sf" < 0.20 mm of entrained air bubbles for freeze-thaw resistance

Entrained air







Relationship between durability (ASTM C 666) and spacing factor (ASTM 457)

Source: KDOT

AVA, Air Void Analyzer

Testing of fresh concrete's air void structure in max 25 minutes, at the ready mix plant or anywhere in the prodction process, not at least of the in-place concrete for QC/QA



Insertion





Stirring

Buoyancy recording

AVA-3000

0.00 0.05	0.10	Diff/100 0.15	0.20	0.25 0.3
0 +				
Start:0.00	g +5sec:0.0	0g +30sec:0.3	3g Temp:21	0°c
-				
1 -				
-				
5-				
1 1				
	1	AVA	test record	after
10-		max	25 minutes	
Minutes				
1½ 1 5				
15 0				
Resu	Its (adjusted to	correlate with ASTN	1 C457)	
l + - Chore	d length	: < 2 mm	< 1 mm	< 0.35 mm
Air-	8-concrete	: 5.1 %	4.8 %	3.9 %
20-D Air-	%-paste	: 18.3 %	17.5 %	14.2 %
	8-putty	: 15.5 %	14.9 %	12.0 %
	ific surface	: 39.3 mm-1	41.1 mm-1	
↑□ Spac:	ing Factor	: 0.122 mm	0.119 mm	
25 7	_	/		
			_	<u> </u>

Spacing factor 0.122 mm

Specific surface 39.3 mm⁻¹

Case prepared by NDTitan Claus Germann Petersen