

## RECOMMENDED CONCRETE PROPERTIES FOR FREEZE/THAW , SALT, AND SULFATE EXPOSURE

FREEZE / THAW RESISTANT AIR CONTENT		
Nominal Maximum Aggregate size (in.)	Severe Exposure (Exposed Flatwork)	Moderate Exposure (Exposed Dry Vertical Work)
1 1/2 Inch	5.5	4.5
1 Inch	6.0	4.5
3/4 Inch	6.0	5.0
1/2 Inch	7.0	5.5
3/8 Inch	7.5	6.0
Typical Industry Air Content Tolerance +/- 1.5% From Recommended Air Content		

FREEZE THAW RESISTANT MAXIMUM WATER / CEMENTITIOUS RATIO		
Type of Structure	Structures wet or frequently exposed to freezing and thawing	Structures exposed to ponding water, ponding deicing chemicals, or sulfates
Flatwork such as colored concrete, gutters, drainage structures, and thin sections	0.45	0.40
All other Structures	0.50	0.45
28 Day Compressive Strength - PSI	4000	5000

SEVERITY OF POTENTIAL SULFATE EXPOSURE				
	Negligible	Moderate	Severe	Very Severe
Water-Soluble Soluble Sulfate (SO <sub>4</sub> ) <sup>(1)(2)</sup> (percent)	0.00 to 0.10	>0.10 and <0.20	>0.20 and <2.00	>2.00
Sulfate (SO <sub>4</sub> ) <sup>(1)</sup> in Water (ppm)	0 to 150	>150 and <1500	>1500 and <10,000	>10,000
Type of Cement	No special requirements	Type II & Fly Ash/Pozzolan/Slag IP(MS) Type V & Fly Ash/Pozzolan/Slag	Type II & Fly Ash/Pozzolan/Slag IP (HS) Type V & Fly Ash/Pozzolan/Slag	Type V & Fly Ash/Pozzolan <sup>(3)</sup> /Slag <sup>(4)</sup> (Consult with Engineer and Ready Mix Supplier before use)
Water to Cementitious Ratio	No special requirements	0.50 Maximum	0.45 Maximum	0.40 Maximum

1.	Determined in accordance with ASTM C 1580
2.	Sulfate expressed on SO <sub>4</sub> is related to sulfate expressed as SO <sub>3</sub> , as given in reports of chemical analysis of Portland cements as follows: SO <sub>3</sub> % x 1.2 = SO <sub>4</sub> %
3.	Fly Ash or pozzolan proportion should be between 25 and 35 % by mass of the total cementitious material
4.	Slag proportion should be between 40 and 70 % by mass of the total cementitious material unless a ternary mix
5.	Natural pozzolans, fly ash, slag and blended cements may be qualified in accordance with ACI 201.2R and ASTM C1012

Note: The recommendations are only guidelines and no warranties are expressed or implied by the SNCA or its members. ACI, ASTM, and local design standards should be followed.