
RUSSTECHNICAL NOTES

SUBJECT: Total Chloride Amounts From Concrete-Making Ingredients

DISCUSSION

When the amount of chloride ion present in each ingredient is known, it is possible to calculate the total amount of chloride present in the concrete. Below is an example of a calculation of total chloride ion content in a mix design. Also, included in this document are the published ACI 222 chloride limits and discussion about incorporating calcium nitrite corrosion inhibitor to offset admixed chlorides.

Example:

	<u>SSD Weight/Dosage</u>	<u>Total Chloride Ion by Weight of Material</u>
Portland Cement	600 lbs./yard	.004
Coarse Aggregate	1850 lbs./yard	.0072
River Sand	1250 lbs./yard	.0012
Water	31 gallons	30 ppm
Water Reducer	5 ozs./cwt.	125 ppm

Calculation:

		<u>Total Chloride Ion, lbs</u>
Portland Cement	$(600)(.004)/100 =$.0300
Coarse Aggregate	$(1850)(.0072)/100 =$.1332
River Sand	$(1250)(.0012)/100 =$.015
Water	$(31)(8.33)(30)/1,000,000 =$.0078
Water Reducer	$(5)(125)(6)(1/16)/1,000,000 =$	<u>.0002</u>

Total Chloride Ion (lbs.) In a Cubic Yard .1880

Total Chloride, % by Weight of Cement

$$(.1880/600)100 = .0313\%$$

ACI 222R-96, "Corrosion of Metals in Concrete" recommends specific chloride limits in concrete used for new construction to minimize the risk of chloride-induced corrosion. These conservative limits are expressed as a percentage by weight of Portland cement and are listed in the table on the back of this document.

Category	Chloride limit for new construction		
	Acid-soluble	Water-soluble	
Test method	ASTM C 1152	ASTM C 1218	Soxhlet
Prestressed Concrete	0.08	0.06	0.06
Reinforced concrete in wet conditions	0.10	0.08	0.08
Reinforced concrete in dry conditions	0.20	0.15	0.15

Normally, concrete ingredients are evaluated for chloride content using either ASTM C 1152, “Acid-Soluble Chloride in Mortar and Concrete” or ASTM C 1218, “Water-Soluble Chloride in Mortar and Concrete”. If the ingredients meet the requirements of the appropriate columns in the table above, then they are considered acceptable. If they fail to meet these requirements, the ingredients can be tested using the Soxhlet test method. The Soxhlet method measures only the chlorides that contribute to the corrosion process, consequently, allowing some aggregates (with a considerable amount of chloride that is sufficiently bound so that it does not contribute to corrosion) to be incorporated that normally would not have been permitted if only ASTM C 1152 and ASTM C 1218 test methods were used.

Calcium nitrite corrosion inhibitors, such as **RUSSTECH RCI**, have demonstrated that they will delay the onset of corrosion or reduce the rate of corrosion after it has been initiated. For applications involving concrete-making ingredients that exceed normal chloride limits, **RUSSTECH RCI** will inhibit the potentially corrosive affects of these ingredients. Consult your local RussTech technical service representative for recommended dosages.

