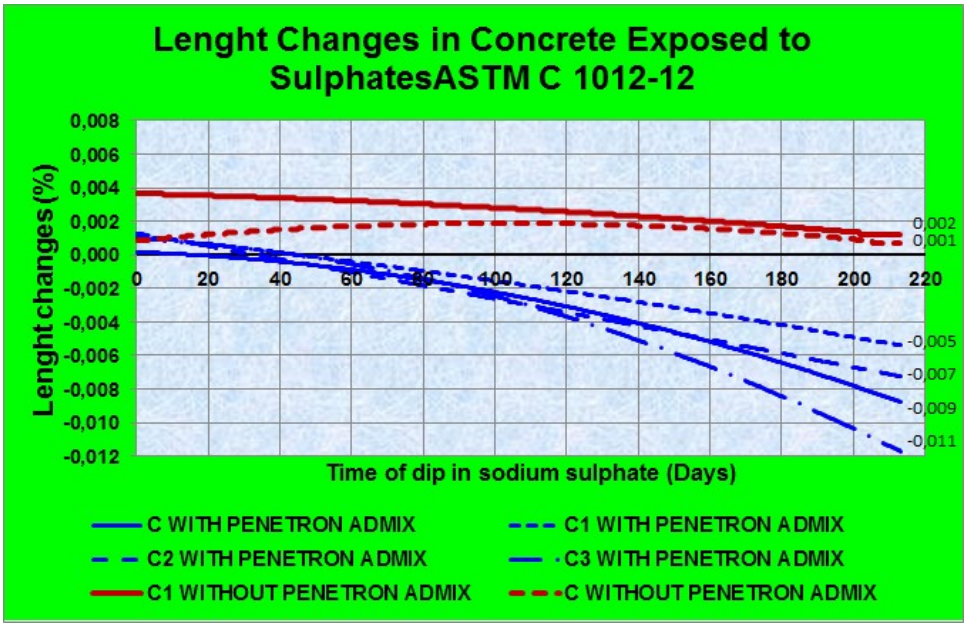
Resistance to Sulfate Attack

Penetron Admix treated concrete as compared to an untreated control

Using the ASTM C1012 (Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution) concrete specimens were subjected to a sulfate solution and the reported values in **Figure 1** correspond to the average of the specimens.

Concrete designed with Penetron Admix exhibited no length change by expansion due to sulfate attack. In the control specimens, without Penetron Admix, length change by expansion accompanied by disintegration of the control sample mass was observed throughout the entire test period.

Figure1. Changes in length of concrete exposed to sulfates per ASTM C1012



Additionally, mortar specimens with and without Penetron Admix were also subjected to testing using ASTM C1012 with the averages of the corresponding treated and untreated specimens being reported in **Figure 2**.

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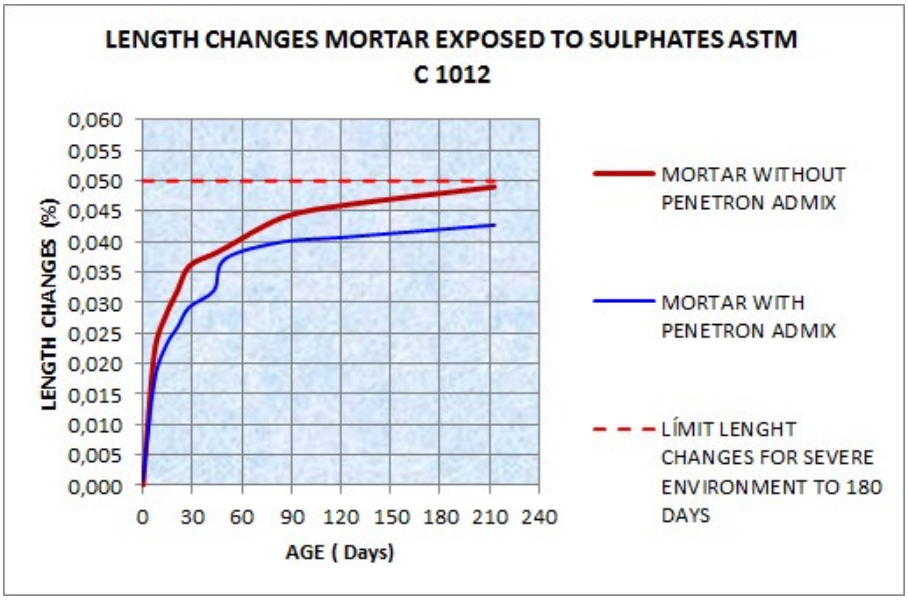
Figure 2. Changes in length of mortar exposed to sulfates per ASTM C1012



The requirements for acceptable length changes in mortars exposed to sulfates are established in ASTM C1157 and are defined as follows:

Resistance to Sulphates	MS	HS
6 months (% length change)	0.10	0.05
12 months (% length change)	------	0.10

Note:
***MS**: Moderately resistant to sulfate attack*
***HS**: Highly resistant to sulfate attack.*

Summary

In each Penetron Admix treated mortar specimen, the length changes due to the exposure to sulfate exceeded the performance standards and substantially improved sulfate resistance over the untreated control.

In each Penetron Admix concrete specimen, the length change was reduced over the entire testing period as compared to the untreated specimens which continued to expand until the end of the testing time period.

Penetron Admix treated specimens met the *Highly Resistant to Sulfate Attack (HS)* requirements.

Testing Reference - Ingeniera DICTUC, Santiago Chile