TECHNICAL BULLETIN # 12

Suitability of Insulated Coolers for Concrete Field Test Cylinders Initial Cure Period

Insulated coolers are often used as curing boxes for concrete field test samples, but can they be relied upon to store concrete test specimens used as a basis for acceptance, in a temperature and moisture controlled environment, free from any physical disturbance, in full compliance with CSA A23.2 -3C during the initial cure period?

Trials conducted in Alberta show that in many different environmental conditions, without additional control provisions, these coolers may not always provide an adequate initial curing environment that meets the requirements of CSA.

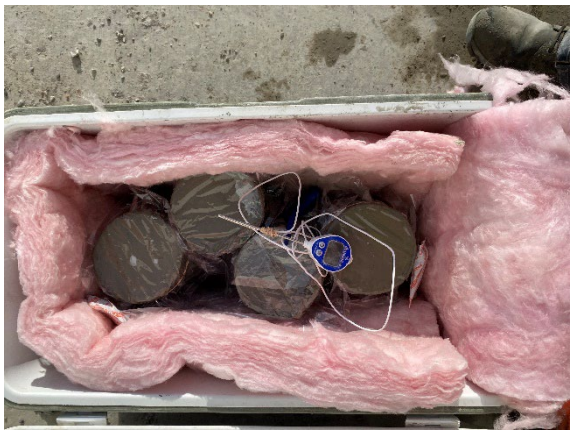
In the following examples, temperature data loggers were used to record the internal cooler temperature. External Ambient temperature was recorded with a regular digital max/min thermometer.

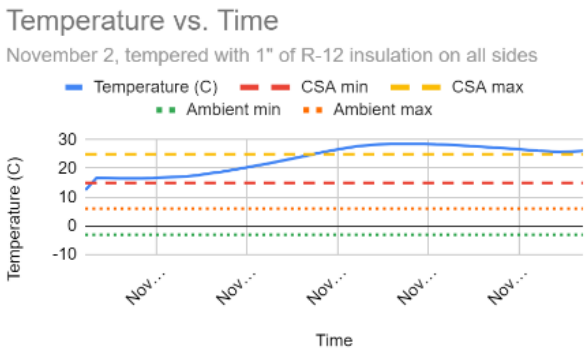
Example 1 – Cooler with BAT Insulation

Ambient min/max: -3 C / 6 C

Cooler min 12.5

Cooler max 28.6





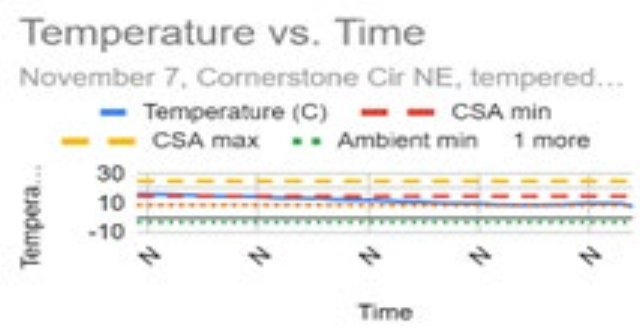
Insulation covering the cylinders was not enough to keep the temperature around the cylinders in spec when the ambient temperatures outside were cool.

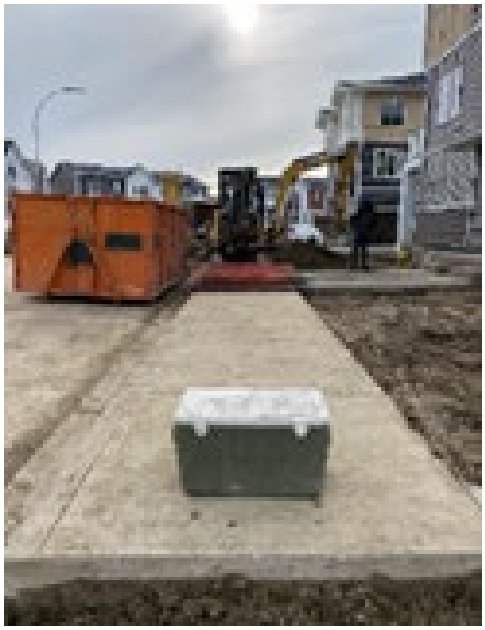
Example 2 – Cooler on site with water

Ambient min/max: -3 C / 9 C

Cooler min 8.9

Cooler max 16.4





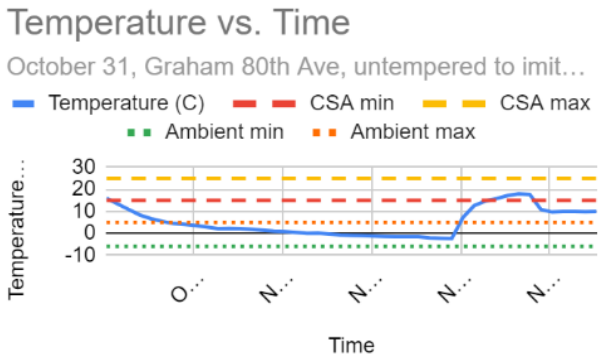
The cooler was filled with warm water to the height of the cylinder moulds. However, due to cooler ambient temperatures overnight, the cooler water temperature was not maintained above the standard minimum of 15C.

Example 3 – Cooler with only cylinders

Ambient min/max in Calgary: -6 C / 5 C

Cooler min -2.4

Cooler max 17.9

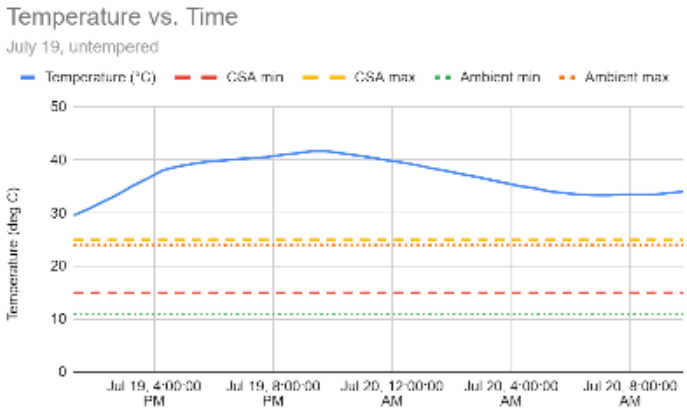


Storing cylinders in the cooler with no other measures taken was not sufficient to meet the standard minimum 15 C, when the ambient temperature outside fell below freezing.

Example 4 – Summer

Ambient min/max in Calgary: 11 C/ 24 C

Cooler min 29.6 Cooler max 41.7



With no additional provisions were included. The heat generated from the hydration of the cylinders couldn't escape and the temperature inside the cooler exceeded the standard maximum initial cure limit of 25C.

Summary

When selecting containers to provide controlled temperature initial cure environments, any system must be validated throughout a range of ambient conditions, test specimen loading rates, and exothermic heat generation profiles of the mix designs of the specimens to be stored.

Testing must be done to confirm that field storage container can maintain the space immediately surrounding to the test specimens within the standard initial curing temperature range of 15C to 25C for the full duration of the curing period over the full range of ambient conditions forecast to be encountered.

Supplemental heating or cooling provisions may need to be custom configured that are commensurate with the efficient management of the anticipated ambient conditions during the initial curing time period. Modifications may have to be made to the coolers to ensure they can meet the CSA curing requirements. Temperature data loggers should be used to confirm these requirements have been met.