

COMA-Meter

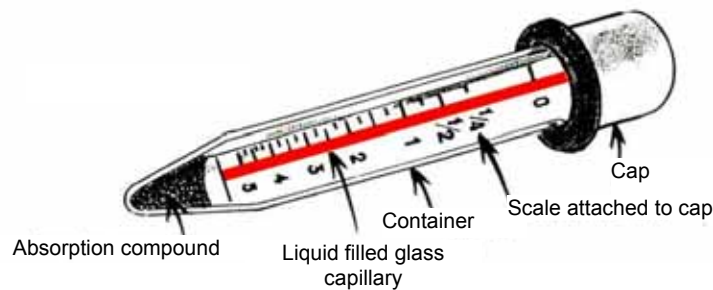
Purpose

The **COMA-Meter** (COncrete MAaturity-Meter) is used to measure the maturity of newly cast concrete at a depth of 80 mm from the surface for the following purposes:

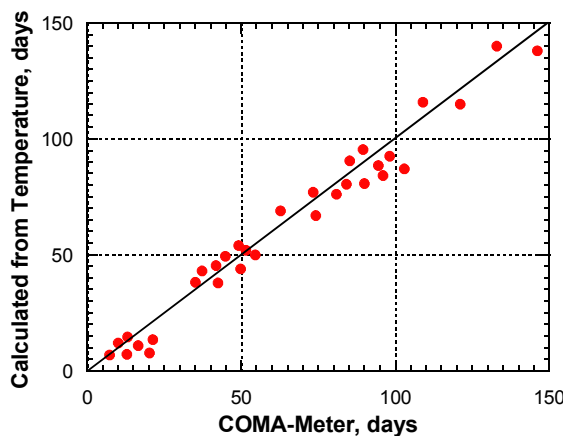
- Estimating the compressive strength at an early age using a pre-established strength-maturity relationship (see pg. 32 for illustration)
- Timing of pullout testing with **LOK-TEST** for early-age strength measurement
- Evaluating the effective in-place curing temperature

Principle

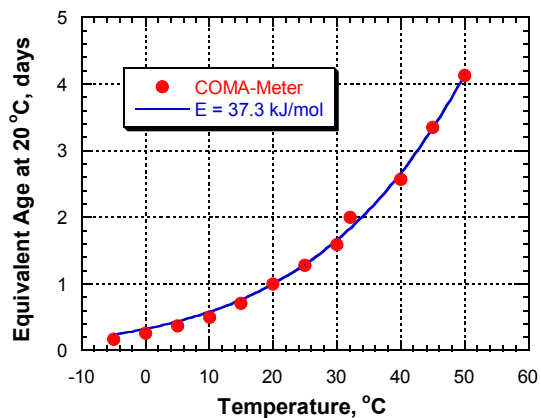
A glass capillary contains a liquid for which the rate of evaporation varies with temperature according to the Arrhenius equation, which is the same function that is used to determine maturity of concrete from its temperature history (see pg. 75). The closed capillary is placed on a card with a calibrated scale indicating maturity in equivalent age at 20 °C. The card is attached to a cap that fits into a transparent container. After the concrete is cast, the capillary tube is snapped at the zero mark on the scale, the cap is pushed into the container, and the container is inserted into the fresh concrete.



The temperature within the container will stabilize quickly with the temperature of the surrounding concrete. The liquid in the capillary tube evaporates at a rate determined by the temperature and time. The level of the liquid, readable on the scale, measures the maturity of the concrete stated in M_{20} units, which is the number of equivalent days of curing at 20 °C.



Comparison between **COMA-Meter** maturity and maturity calculated from temperature readings
(Source: Möller, G. "Evaluation of COMA-test," Report 8335-1983, CBI, Stockholm, Sweden)



Maturity calculated by Arrhenius equation with activation energy of 37.3 kJ/mol compared with **COMA-Meter** readings after one actual day at temperatures between -5 °C and 50 °C

Resolution and Accuracy

The measuring ranges of the two types of **COMA-Meters** are 0 to 5 M_{20} days for the **COMA-5** and 0 to 14 M_{20} days for the **COMA-14**. The scale allows the maturity to be estimated to within $\pm 0.1 M_{20}$ days. The meter is accurate to within $\pm 5\%$ compared with maturity values calculated from temperature readings as shown on the previous page. The activation energy E for the **COMA-Meter** is about 40 kJ/mol.

Application

The basics steps in using the **COMA-Meter** are shown below.



Break glass capillary at 0 mark



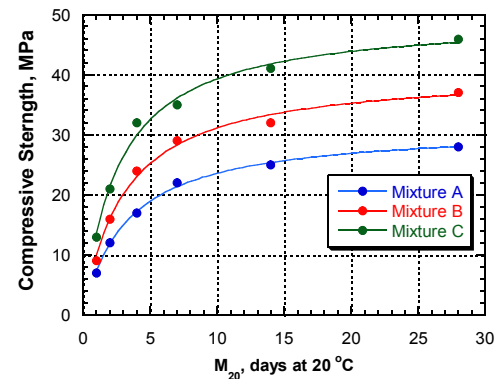
Insert meter into fresh concrete



Pull out card and read maturity days at 20 °C (M_{20})

Strength-Maturity Relationship

In order to estimate the in-place strength, the **strength-maturity relationship** for the concrete mixture needs to be developed beforehand. The detailed procedure is given in ASTM C1074, but basically a set of standard specimens are made in the laboratory. A COMA-Meter is installed in two specimens. At ages of 1, 3, 7, 14, and 28 days, at least two replicate specimens are tested for strength and the average maturity is recorded. The strength-maturity data are plotted and a best-fit curve is determined and used for estimating the in-place strength. The plot on the right shows examples of strength-maturity curves for three concrete mixtures.



Ordering:



COMA-5

Pack of five 0 to 5 M_{20} days **COMA-Meters**



COMA-14

Pack of five 0 to 14 M_{20} days **COMA-Meters**