

## Maturity Measurement

### The Concrete Maturity Method

The concrete maturity method is a proven strength estimation technique (ASTM C 1074) that accounts for the effects of time and temperature on the strength development of in-place concrete. This method gives a continuous estimate of concrete strength during the curing period and can be used to:

- **accelerates construction & reduces formwork costs** by allowing early stripping & stressing
- **eliminate** the need for **expensive curing** after formwork removal
- **reduce** the **disruptive curing** time on flat work by proving concrete has reached a self cure state (defined by strength)
- **improves safety** by giving a simple means of accurately gauging strength of critical elements before support removal (eg tilt up, suspended slabs)

Application involves:

- 1) the development of strength-maturity relationship
- 2) measuring the Maturity of insitu concrete to give an instant and accurate assessment of insitu strength.

### Generating The Strength/Maturity Calibration Curve

The strength-maturity relationship is generated in the laboratory by first preparing cylindrical specimens made from the same mix-design that will be used in the field. Two specimens are instrumented, e.g. by intelliRock maturity loggers (figure 1), to record the time-temperature history and calculate the maturity while sets of 3 cylinders are typically crushed for strength.

When the compressive strength will be achieved within 7days develop the relationship at roughly 50%, 75%, 100%, 150%, 200% and 400% of the maturity value corresponding to the anticipated required strength. At greater than 7days use points at 25%, 50%, 75%, 100%, 150% and 200% (figure 2). Finally, a graph of maturity versus strength is generated (this can be done using the spreadsheet that comes with the intelliRock maturity reader).

### Measuring Maturity and Strength in The Field

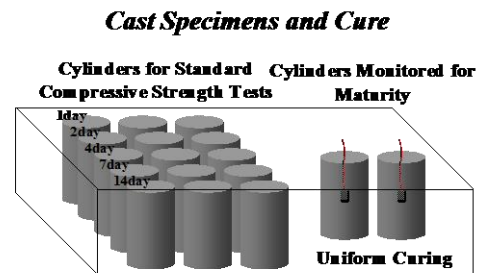
The time-temperature history of the concrete insitu is now recorded and integrated over time. Using intelliRock maturity loggers this is extremely simple as the temperature gauge,

temperature/time logger and the maturity integration are all undertaken in a 35mm long x 30mm diameter cell that is embedded in the concrete. A wire is taken to the surface where the maturity reader can be plugged in at any time to download or simply read off the maturity and hence strength (figure 3).

Figure 1 – intelliRock Reader and Logger



Figure 2 – Generating the Calibration Curve



### Test Specimens & Establish Strength Maturity Relationship

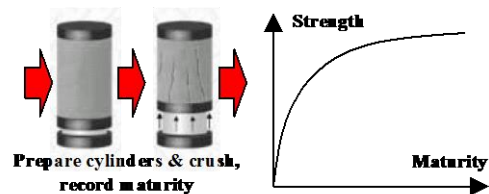
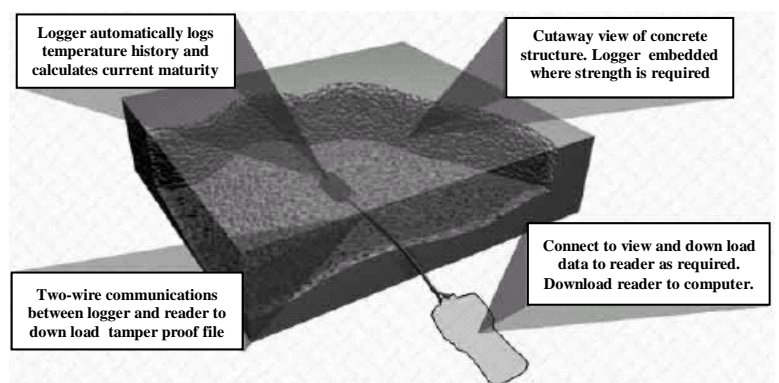


Figure 3 – Measuring Maturity/Strength Insitu



## Application for Maturity Monitoring

Maturity monitoring gives insitu strength but that strength can be used to determine if the structure is “cooked” from a load or durability perspective. The key difference is that for load the strength of the bulk concrete is required and for durability the strength of the cover zone is required.

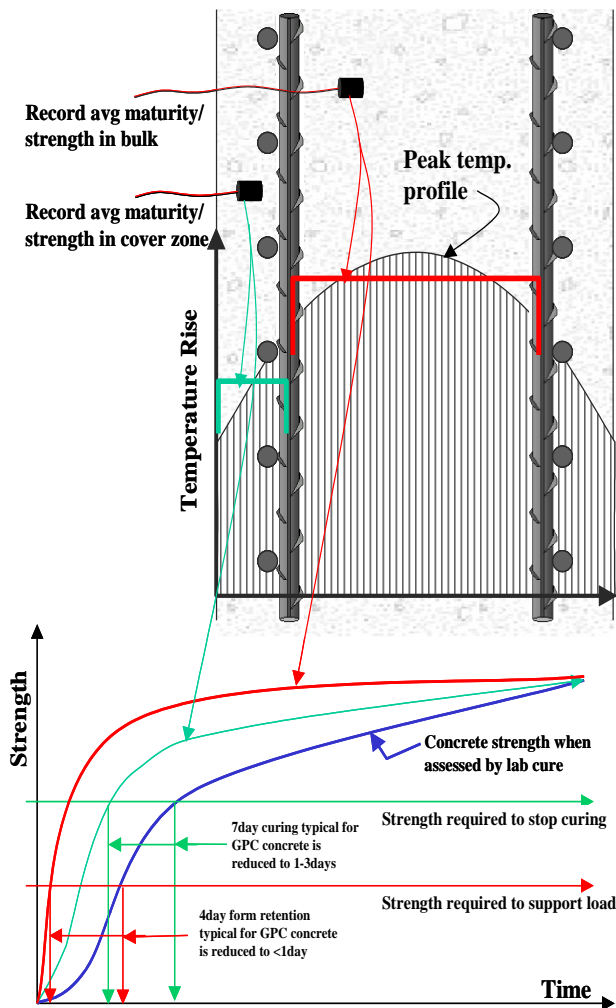


Figure 4 – Maturity across a Wall

## intelli-Rock Loggers

Logs temperature time only.

- Temperature accuracy +/-1°C
- Nurse Saul or Arrhenius calculation
- Operating temperature -18°C to 85°C
- Battery last for 6-12mths from turning logger on
- Logs for period specified but data retained while batteries last
- Weight 80gms

## Background

Engius developed the intelliRock Maturity logger in 2002. It won the 2003 World of Concrete award for innovation and has seen rapid growth and adoption on many major US projects in a short time. The reason? It is a simple and extremely cost effective device.



Type	Code	Operation	Re-use
Maturity	MAT-02-15M28D-8FT	Maturity and Temp Logged every 15min for 28 days	No
	MAT-02-30M28D-8FT	Maturity and Temp Logged every 30min for 28 days	No
Temp	TPL-02-1H180D-4FT	Temp logged every hour for 180 days	No
Precast	PCL-02-3H7D-50X	External Logging box for Precast Sensor Logs every 3hrs for 7days	50 times
	PCL-S4	Precast Sensor	No
Humidity	HML-02-1H3D25XS	Logs Humidity every Hour for 3days or until stability	25 times
	HML-02-1H7D15X	Logs Humidity every 3hours for 7days	15 times
Re-usable	TRL-02-1H2D-15X-4FT	Logs temp every hour for 2 days	15 times
	TRL-02-3H3D-15X-4FT	Logs temp every 3hours for 3days	15 times

PCTE, known for their introduction of leading edge concrete technology has been appointed as the exclusive distributor.

## Other Equipment

The full Proceq range of equipment is available for insitu nondestructive concrete measurement, including Schmidt Hammers, Covermeters, Half Potentials, Resistivity, Ultrasonics and Permeability. We also strain gauges, corrosion rate monitoring equipment, Ground Penetrating Radar, and Impact Echo.