EASTERN MEDITERRANEAN UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

MATERIALS OF CONSTRUCTION LABORATORY

CIVL 484 REPAIR & MAINTENANCE OF CONCRETE

GAZIMAGUSA

EXPERIMENT NO : #6

NAME OF THE EXPERIMENT : Concrete maturity test

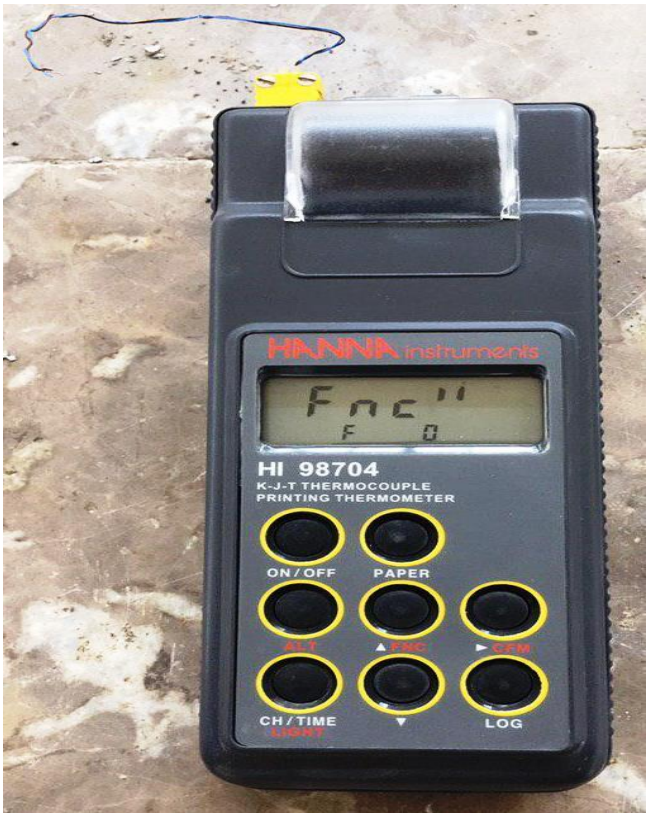
ASTM CODE : C1074-17

I. Objective and Scope

Determination of the strength of in place concrete is obviously important to contractors .for instance they can use it for determination of when to strip forms or when to post tension or remove shores and all of them are based on reaching a minimum level of concrete strength. And any delay or premature action could have drastic result such as increase in cost or structure collapse.
The maturity test is a non-destructive test. It is a simple technique for predicting concrete strength based on the temperature history of concrete.
The general principle of the test is based on increasing the strength of cement due to hydration and the amount of cement hydration is depend on how long the concrete has cured and at what tempreture.so in general, maturity is a measure of how far hydration has progressed.

II. Apparatus

2 Concerete specimens , concrete maturity, tempreture and moisture measurement device



III. Test Procedure

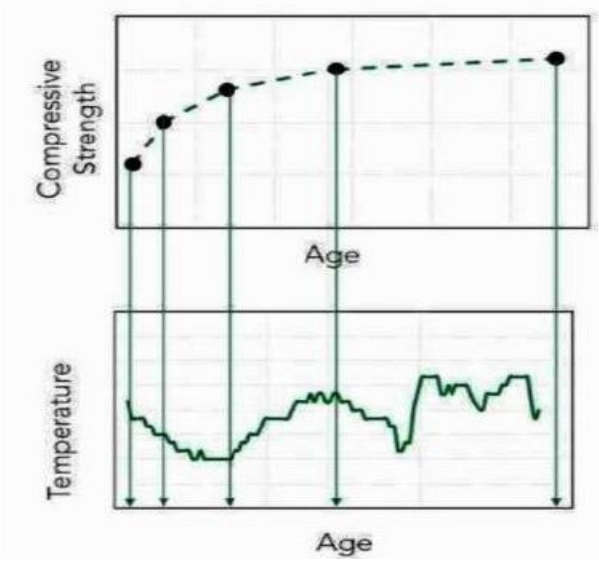
1. Prepare the fresh concerete specimen the mix proportion and constituents of concrete should be similar to those of the concretewhose strength would be estimated using this practice.
2. After the specimens are molded, embed temperature sensors to within 615 mm of the centers of at least two specimens . After inserting the sensor, tap the side of the cylinder mold with a rubber mallet or the tamping rod so that the fresh concrete comes into contact with the sensor. After tapping is completed, connect the sensors to a maturity instrument or to a temperature-recording device.

3. Moist cure the specimen into water bath or moist room.Turn on the device and set the device for desired interval rempreture recording (it is better to set the time interval for every half an hour for first 48 hours and for the rest it should be set on every one hour and The temperature recording device shall be accurate to within +_ 1°C.)
4. At each test age, record the average maturity index for the instrumented specimens. If maturity instruments are used, record the average of the displayed values.
5. If temperature recorders are used, evaluate the maturity index according to equation in the calculation part of report. Unless specified otherwise, use a time interval (Δt) of 1⁄2 h or less for the first 48 h of the temperature record.

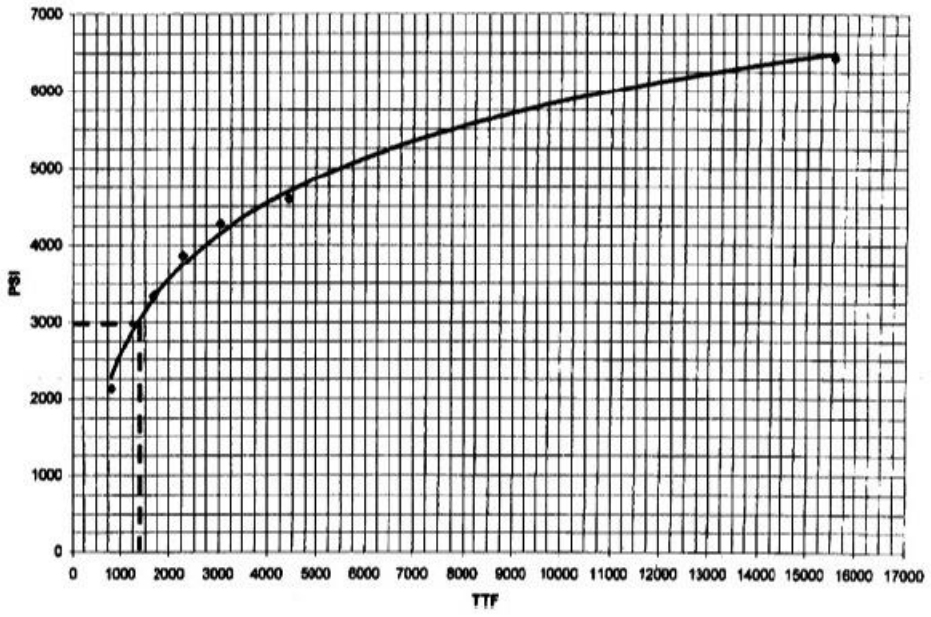
6. Perform the test at the ages of 1 ,3 ,7 ,14 and 28 days

7. The device will calculate the average maturity index so at each stage of age record the average maturity index for specimen.

8. Plot the age-tempreture graph from the device and adjust it on age-compression graph as it shown on the below.



NOTE: once we obtain the average value for the maturity index , on the plot paper draw the best fit curve (strength –maturity relationship graph) through the data which we obtained and respectively find the compressive strength from the plot.



IV. Calculation:

İn order to calculate maturity index from the measure tempreture history of the concrete we use following formula:

$M(t) = \sum (T_a - T_0) \Delta t$

Where :

$M(t)$ = the temperature-time factor at age t, degree-days or degree-hours,
Δt = a time interval, days or hours,
Ta = average concrete temperature during time interval, Δt, °C, and
To = datum temperature, °C.

NOTE: *Hydration can take place at minimum of -10°C, below this water crystals (ice) do not react with cement.*
so Datum Temperature = -10°C

NOTE: Acceptable devices include commercial maturity instruments that monitor temperature and compute and display either temperature-time factor or equivalent age.
Some commercial maturity instruments use fixed values of datum temperature or activation energy in evaluating the maturity index; thus the displayed maturity index may not be indicative of the true value for the concrete mixture being used.
Alternative devices include temperature sensors connected to data-loggers, or embedded digital devices that measure, record, and store temperature data as a function of time. The temperature data are used to calculate the maturity index according to previous equation.