Application of Maturity Meter on Thin Members

Er. Sahil Balasaheb Kurhade

Department of Civil Engineering, Vishwakarma Institute of Information Technology, Pune

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Abstract - *The rate of strength gain in concrete is an important parameter in construction project .The strength gain can be calculated by cube testing method or using maturity meter. In our project we have used maturity meter to check the strength gain of member like square manholes. Also, to see the position placement of sensors of maturity meter. The results obtained of temperature time variations from three different sensor locations are juxtaposed and a correlation factor is obtained so as to find the effect of sensor positions on the temperature time variations so obtained.*

Key Words: *Maturity, in placed concrete strength, Concrete, Thin members, Thermal history, Compressive strength*

INTRODUCTION

Conventional method of cube testing is predominantly used in evaluating strength gain in concrete members of a structure. But the change in insitu and laboratory conditions can cause errolous value of strength as compared to insitu strength gain in actual concrete member on site. Comparatively maturity method is less time consuming and also gives actual strength gain in concrete members in real time as sensors are placed in concrete members while casting. Maturity method is based on rudimentary assumption that "Given mix of concrete at given maturity index has a fixed compressive strength". Maturity method can also be used to save time by determining the strength gain in concrete pavements instead of determining strength gain at standard time intervals for early opening to traffic.

Maturity method is a relatively simple and non-destructive approach in determining in-placed strength of concrete. Maturity meter gives compressive strength of a concrete member in real time. Maturity method relates compressive strength of a member to its temperature time history. Maturity value (maturity index) for a given time is calculated based on the temperature time at that point. Famous Nurse-Saul maturity function is expressed below:

$$M = \sum_{0}^{t} (T - T_o)\Delta t$$

Where:

M = Maturity index, (°C-hours) commonly known as Temperature-Time Factor

To = Datum temperature

Δt = Time interval (hours or days

T = Average concrete temperature, °C during the time interval Δt

t = Elapsed time (hours or days)

Objective:

The purpose of the project is to determine the effect of sensor position on the temperature time variation in thin members obtained on maturity meter.

Project Methodology:

1. Material testing and concrete mix design for M30 grade of concrete.
2. Casting of square manholes of 400mm *400mm dimensions with external vibration provided to avoid any air trapping.
3. Placement of non-sacrificial sensors at edges and mid center of the casting.

Fig: square manhole cover

fig. Maturity meter setup

4. Cube casting of same grade of concrete use simultaneously so as to determine strength gain using UTM.

5. Manhole covers and cubes casted are cured of 14 days with cube testing done at 1, 3, 7 and 14 days.

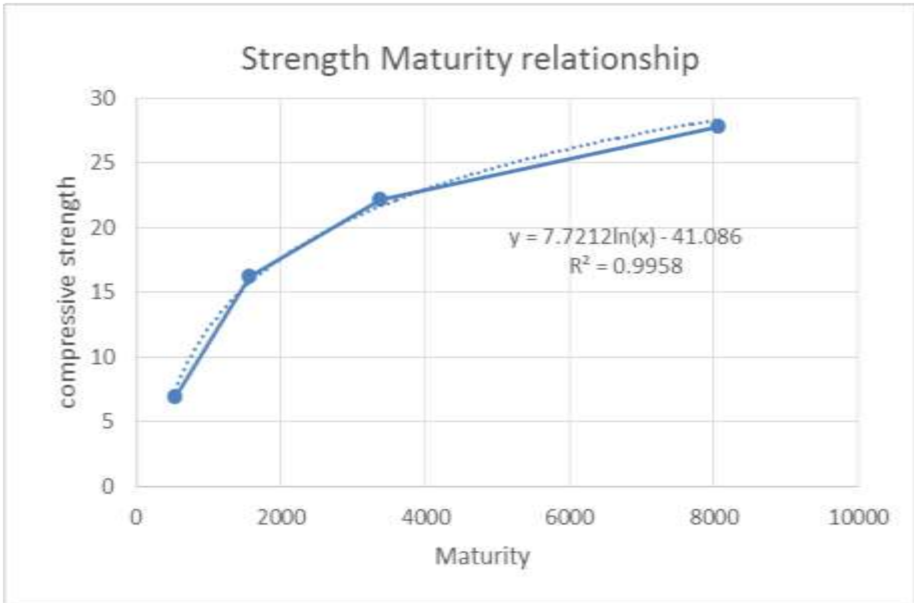
6. Data received from different sensors (temperature variation with real time) is then used to calculate maturity index at that time.

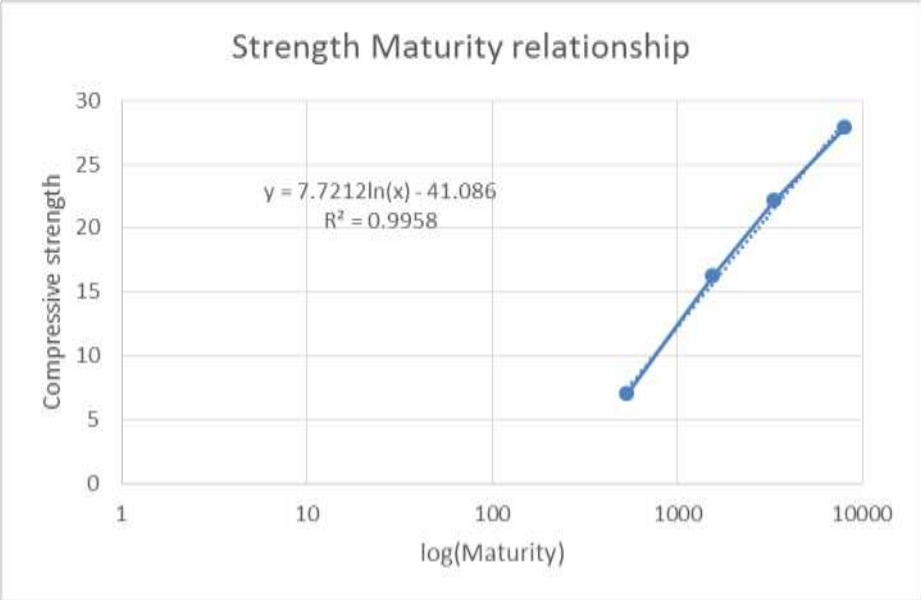
7. Correlation factor is then calculated for these temperature time variations obtained from different sensors.

Results and Discussion:

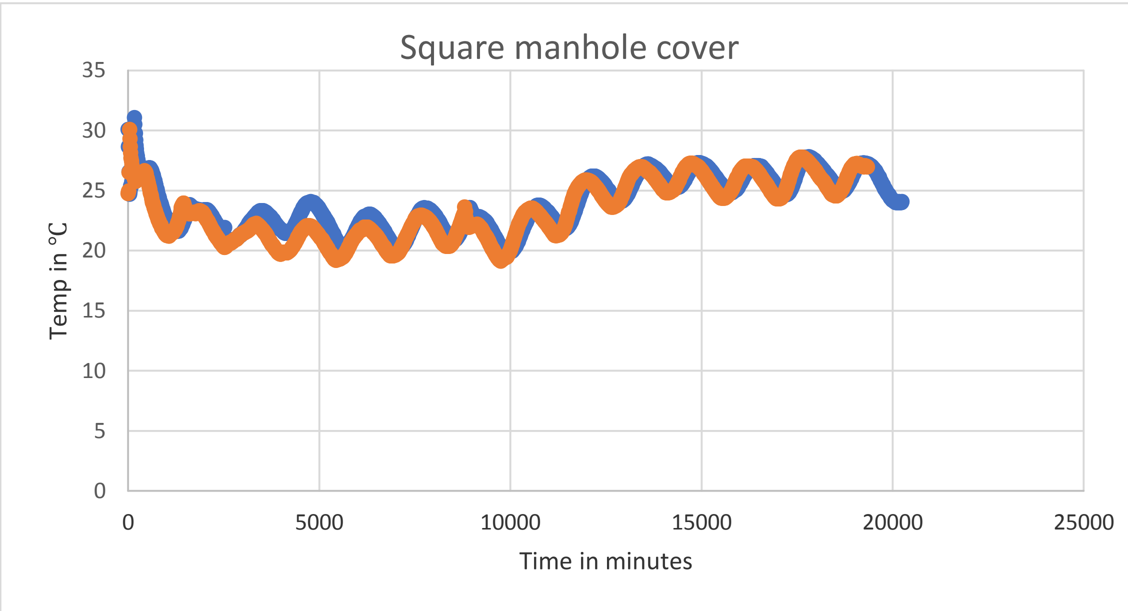
The results obtained are compiled as below:

1. Slump value is 100mm
2. Strength gain vs maturity variations are plotted as below





3. Temperature time variations for three different sensor positions:



4. Correlation factor of temperature time variations: Square manhole: 0.921

5. The correlation factor is superior to the standard requirement of 0.75

CONCLUSION

In the experimental study the correlation factor so observed for square is superior to the standard requirement and thus it can be inferred that the sensors can be placed anywhere in square manhole cover and does not affect the temperature time variation to be obtained in maturity method.

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