

MATURITY METHOD FIELD MONITORING-RESOURCE

1. SCOPE

1.1. The maturity method is a simple technique for predicting concrete strength in lieu of conventional cylinders. Certification is required of all individuals utilizing the maturity method. Individuals certified for NDOR Maturity Method Field Monitoring will know the basic use and terminologies associated with the maturity method.

2. SUMMARY OF MATURITY METHOD FIELD MONITORING

2.1. This maturity Method field monitoring resource has been prepared to review the installation of wires, monitoring concrete placement temperatures, calculating the Time-Temperature-Factor (TTF) and the documentation of data.

3. SIGNIFICANCE AND USE

3.1. The maturity method is a simple technique for predicting concrete strength in lieu of conventional cylinders, based on the measurement of time and temperature history. A relationship prior to construction is established between mix strength and time-temperature history to estimate reliable real time in-situ strength.

4. EQUIPMENT NEEDED FOR FIELD MONITORING

- Maturity meter or digital hand held thermometer
- Type T mini-connecters and Type T thermocouple wire
- Screwdriver and wire snips for wire preparation
- Electrical tape or duct tape
- Wooden stake or steel rebar, sledge hammer (Use when tie bars or dowel bars aren't present)
- Paint, Ribbon, cone, cylinder mold (For the protection of the wires)

5. WIRES INSTALATION

- a. Prepare two wires for installation
- Strip the wires and twist the ends together
- Temperature errors occur typically because of three reasons
 - Wire breaks where the two wires are twisted together
 - Wires in the mini-connector are touching
 - Wires in the mini-connector are not connected to the correct pole
- b. Both wires can be installed in the first patch or place one in the first and one in last
- c. Wires can be installed to tie bars, dowel bars or to a wooden stake
 - If installed to metal make sure the end of the wires is not in contact with the metal
 - If installing wires to a wooden stake have a clearance of at least one foot from any adjacent concrete.
 - Install the wires at approximately mid depth of the concrete placement.
- d. Check the wires after installed and before concrete arrives, take a temperature reading.

6. TEMPERATURE READING

- a. Within ten minutes after concrete has been placed, take an initial temperature reading. It is taken in Celsius and read to the nearest whole number. Record this for future calculations.

7. HAND CALCULATED METHOD (TTF)

- a. Calculate the TTF. This can be read from a maturity meter if used. This method of calculating the TTF by hand shall be performed at each age that a set of cylinders are tested. The Nurse-Saul Equation (Equation 1) is used by NDOR for calculating the TTF by hand calculation.

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

M(t) = Time Temperature Factor (Maturity) at age Δt
 T_a = Average temperature of the concrete during time interval Δt
 T_o = Datum temperature (-10° C)
 Δt = A time interval (Hours)

Equation 1. Nurse –Saul Equation

Example 1: The initial temperature of concrete is 20° C when placed, and 3 hours later it was 50° C.

- $T_a = (20 + 50) / 2 = 35$
- $T_o =$ always add **10** to the average. When subtracting a negative number add it.
- $\Delta t =$ elapsed time is **3** hours since the initial temperature was taken

$$M (TTF) = \sum (35 + 10) \times 3$$

$$M (TTF) = \underline{135}$$

- b. The Inspector will enter project information into the sitemanager templates. On the Tests tab, choose the template “Pavement Repair (Maturity Tests) - Field” for PR concrete. For HE, paving concrete and structures choose the template “Mainline Pavement/Structure Maturity Report - Field”

Perform calculation here: