

**ALDOT-456**  
**Procedure for Determining an Age-Dependent Maximum In-Place Temperature Differential for Use in Mass Concrete Construction**

**1. Scope**

This procedure establishes the method for establishing an age-dependent maximum in-place concrete temperature differential for a given concrete mixture.

**2. Referenced Documents**

2.1. AASHTO T 336 Standard Method of Test for Coefficient of Thermal Expansion of Hydraulic Cement Concrete

**3. Procedure**

3.1. Determine the coefficient of thermal expansion (CTE) for the concrete mix design, in accordance with AASHTO T 336.

3.2. Calculate the concrete CTE modification factor,  $F_{CTE}$ , using Eqn. 1:

$$F_{CTE} = \frac{6.95 \times 10^{-6} \text{ in./in./}^\circ\text{F}}{CTE_{\text{measured}}} \quad (\text{Eqn. 1})$$

where,  $CTE_{\text{measured}}$  = measured concrete CTE (in./in./ $^\circ\text{F}$ )

3.3. Calculate the age-dependent maximum concrete temperature differential,  $\Delta T_{\text{max}}(t)$ , using Eqn. 2 and the table in Appendix A.  $\Delta T_{\text{max}}(t)$  should be calculated for each age shown in Appendix A.

$$\Delta T_{\text{max}}(t) = F_{CTE} \times \Delta T_{\text{value}}(t) \quad (\text{Eqn. 2})$$

where,

$\Delta T_{\text{max}}(t)$  = age-dependent maximum in-place concrete temperature differential ( $^\circ\text{F}$ )

$F_{CTE}$  = concrete CTE modification factor (unitless)

$\Delta T_{\text{value}}(t)$  = age-dependent maximum temperature differential values ( $^\circ\text{F}$ )

APPROVED  
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### Appendix A - Age-Dependent Maximum Temperature Differential Values

Concrete Age, $t$ (hours)	Maximum Temperature Differential Value, $\Delta T_{value}(t)$
12	32 °F {18 °C}
24	35 °F {19 °C}
36	37 °F {21 °C}
48	38 °F {21 °C}
60	39 °F {22 °C}
72	40 °F {22 °C}
84	41 °F {23 °C}
96	41 °F {23 °C}
108	42 °F {23 °C}
120	42 °F {23 °C}
132	42 °F {23 °C}
144	43 °F {24 °C}
156	43 °F {24 °C}
168	43 °F {24 °C}