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Table 1 – Measured Thermal Material Properties of Mass Concrete

Concrete Temperature, °C [°F]	Specific Heat, J/kg·°C [Btu/lbm·°F]	Diffusivity, m^2/hr [ft^2/hr]	Conductivity, W/m·K [Btu/ft·hr·°F]
10 [50]	1057 [0.250]	0.0039 [0.042]	2.67 [1.59]
37.7 [100]	1133 [0.268]	0.0035 [0.038]	2.59 [1.54]
65.5 [150]	1209 [0.286]	0.0033 [0.035]	2.55 [1.52]

Table 2 – Mass Concrete Mix Compressive Strength and Elastic Properties – 6 x 12 in Cylinders

	3-day	7-day	28-day	56-day	180-day	1-year
Compressive Strength, MPa [lb/in^2]	6.9 [1000]	9.9 [1440]	15.4 [2240]	18.0 [2620]	24.0 [3490]	30.4 [4410]
Elastic Modulus GPa [psi x 10^6]	18.0 [2.61]	23.3 [3.39]	25.1 [3.64]	28.5 [4.14]	31.1 [4.51]	34.4 [4.99]
Poisson's Ratio	0.17	0.22	0.21	0.18	0.21	0.20

Table 3 – Mass Concrete Mix Compressive Strength and Elastic Properties – 10 x 20 in Cylinders

10x20	28-day	56-day	180-day	1-year
Compressive Strength, MPa (lb/in^2)	15.0 [2170]	18.8 [2720]	23.8 [3450]	28.9 [4200]
Elastic Modulus GPa (lb/in^2 x 10^6)	23.2 [3.36]	26.5 [3.84]	28.5 [4.13]	34.0 [4.93]
Poisson's Ratio	0.15	0.19	0.20	0.20

Figure 1 – Aerial Photograph of Hinze Dam Spillway Prior to Construction

Figure 2 – Aerial Photograph of Hinze Dam Spillway during Construction

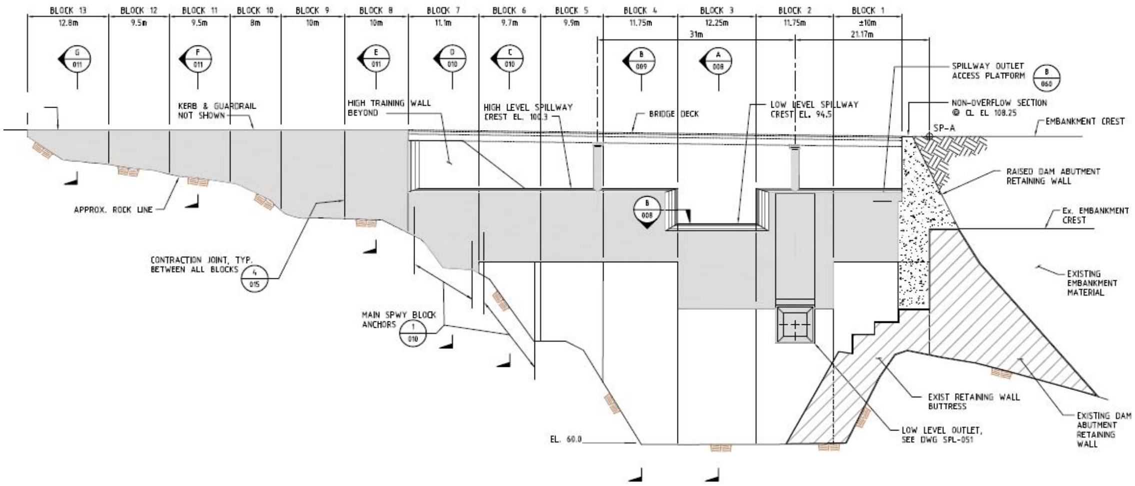
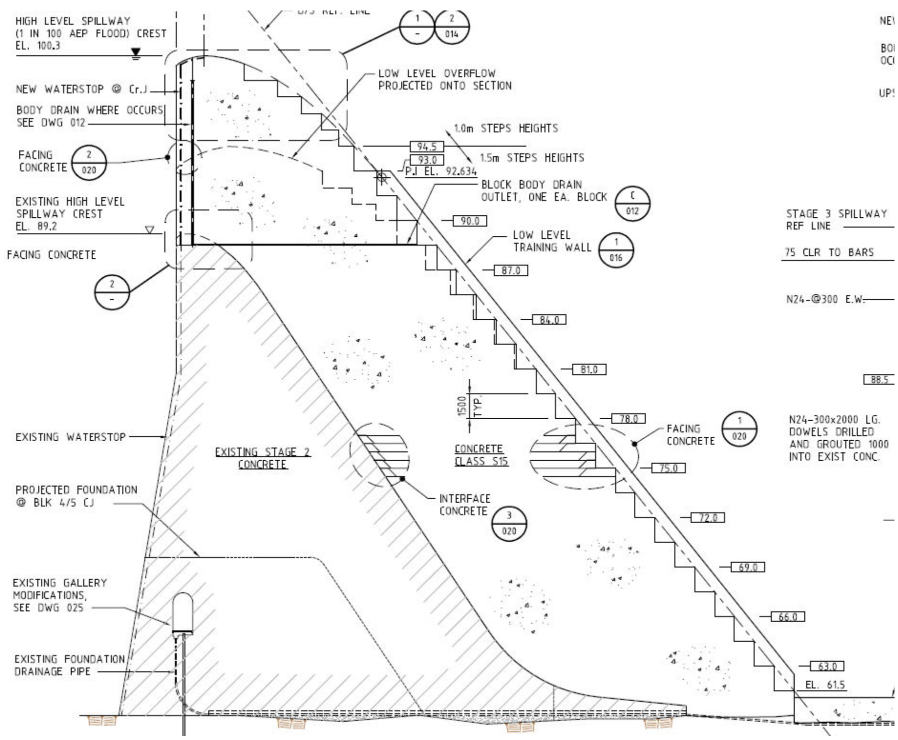


Figure 3 – Upstream Elevation of Stage 3 Spillway Raise



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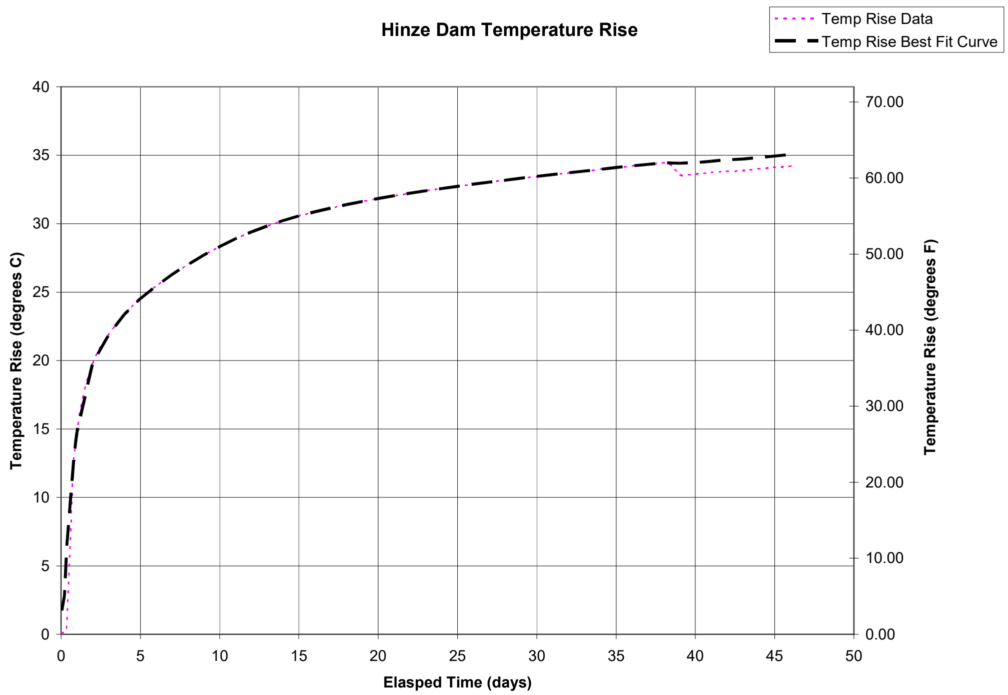

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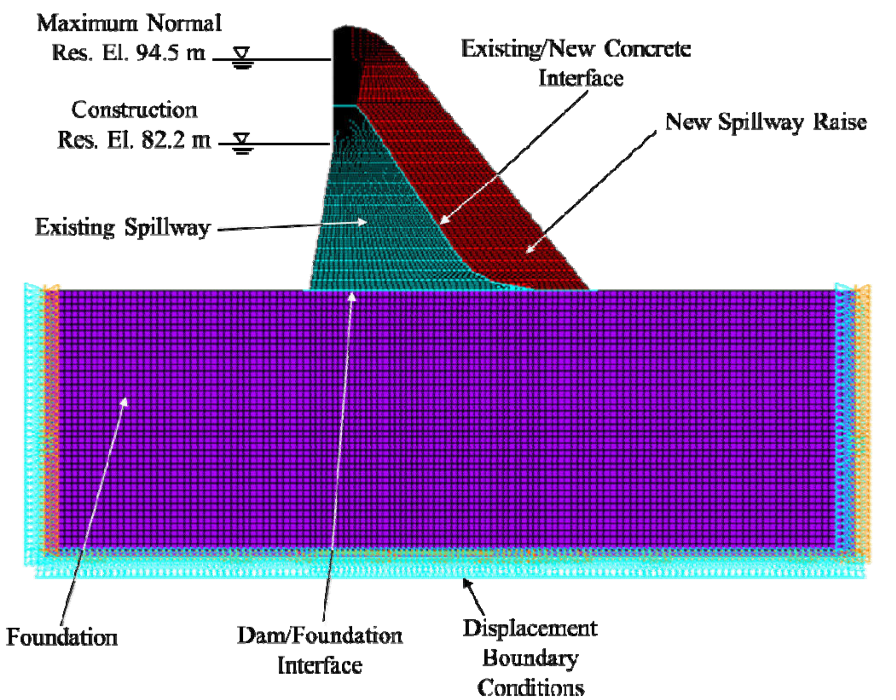
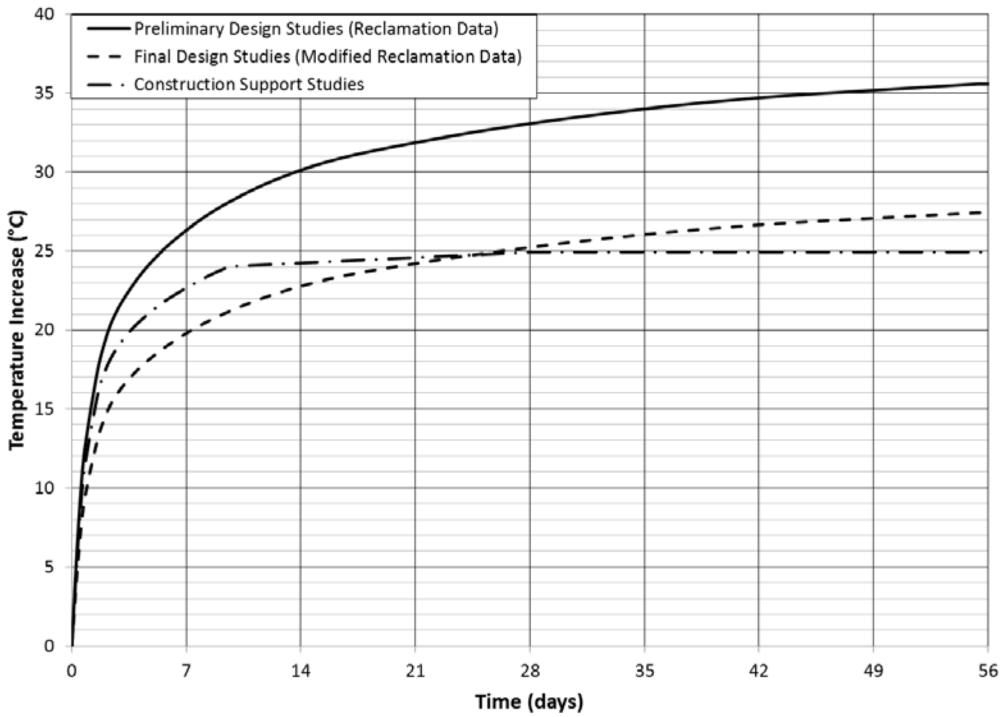


Figure 6 – FE Model of Spillway Maximum Section



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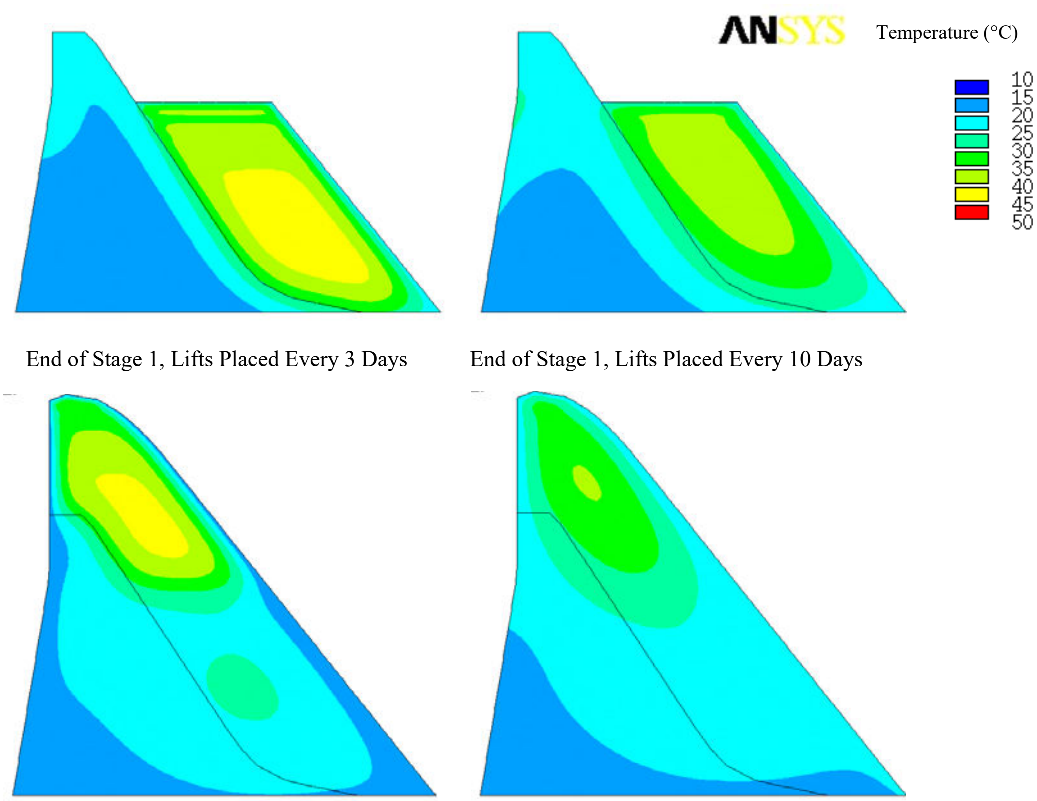


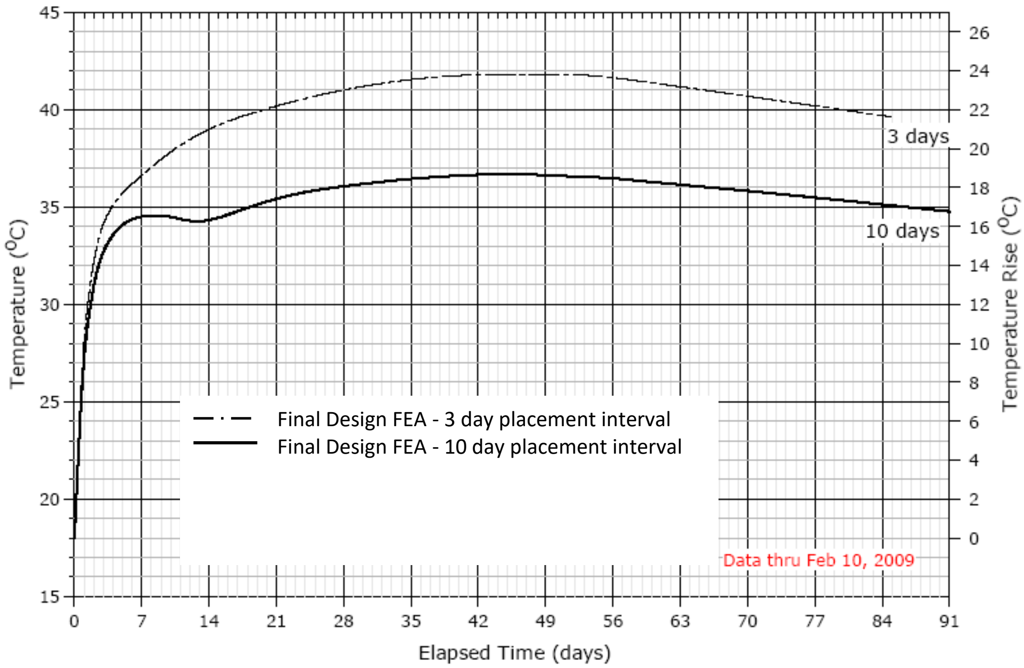
End of Stage 1, Lifts Placed Every 3 Days

End of Stage 1, Lifts Placed Every 10 Days

End of Stage 2, Lifts Placed Every 3 Days

End of Stage 2, Lifts Placed Every 10 Days

Figure 8 – Temperatures Computed in Final Design Studies



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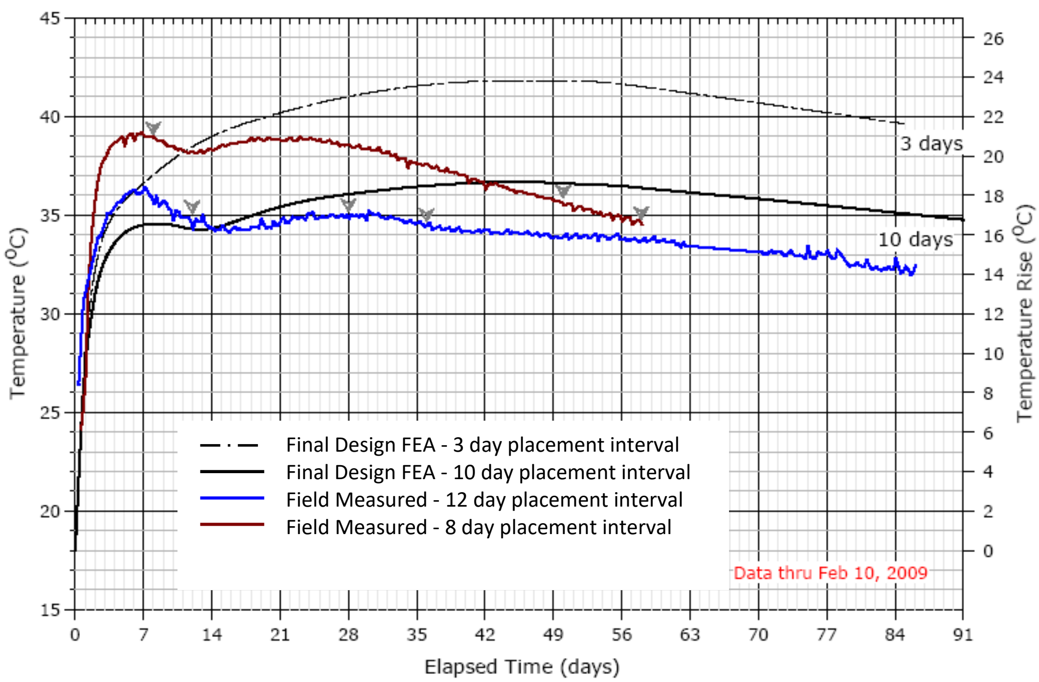

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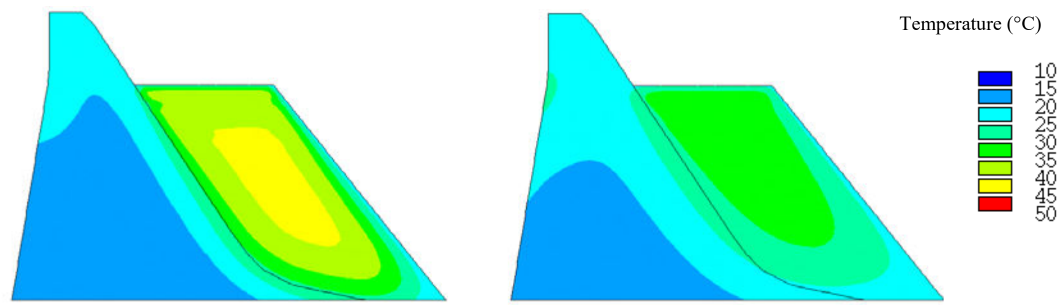
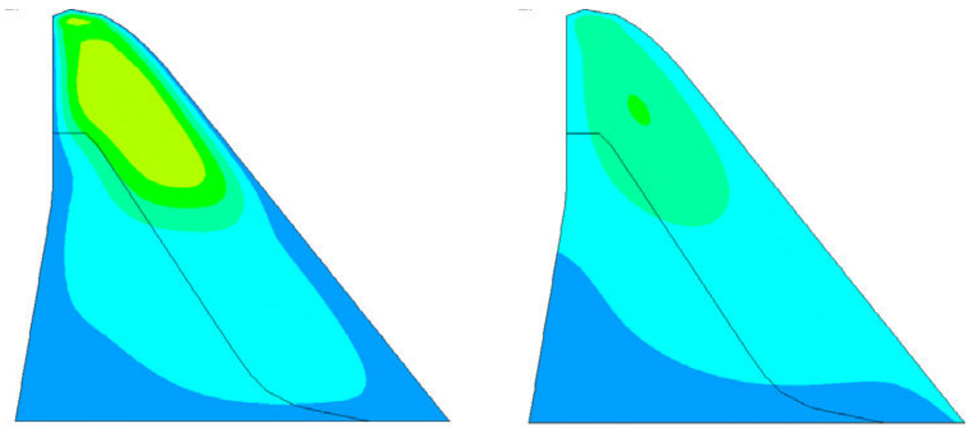


End of Phase 1, Lifts Placed Every 3 Days　　End of Phase 1, Lifts Placed Every 10 Days



End of Phase 2, Lifts Placed Every 3 Days　　End of Phase 2, Lifts Placed Every 10 Days

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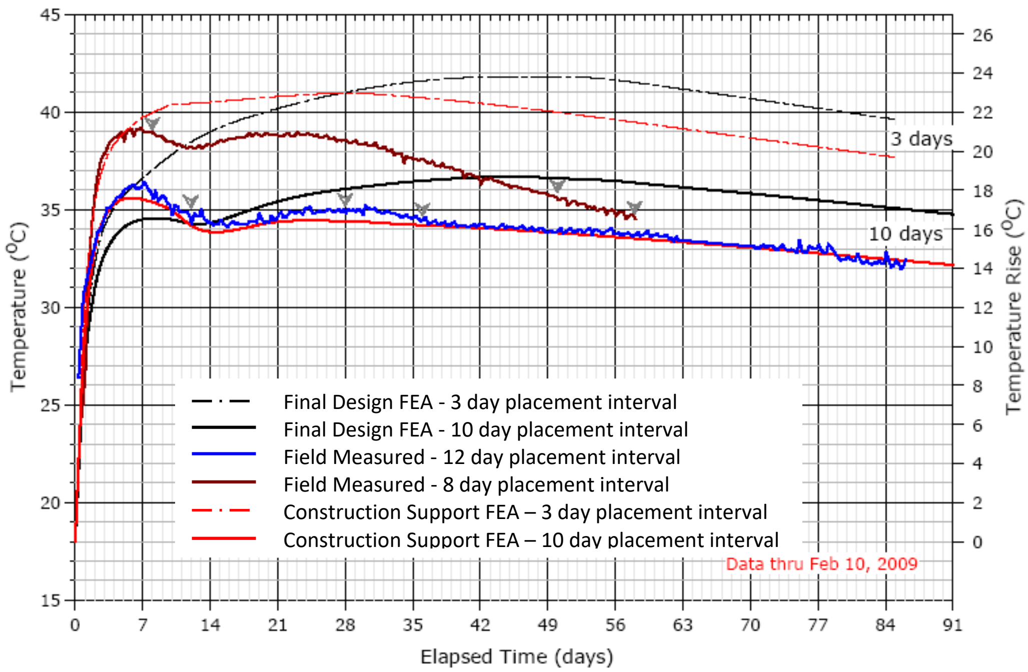

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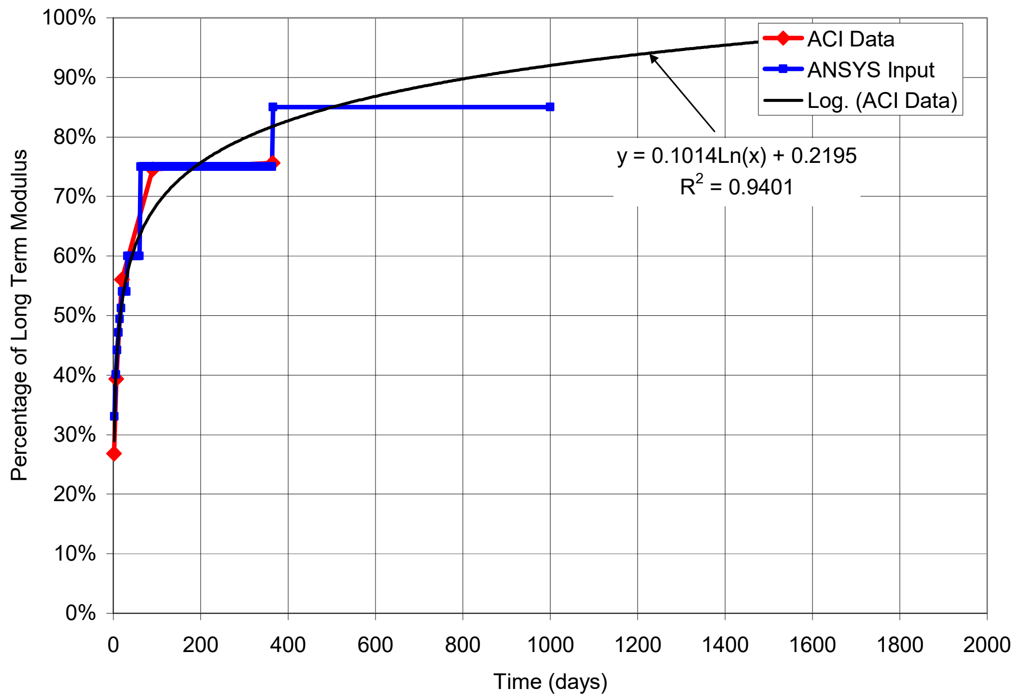

Figure 13 – Variation of Modulus of Elasticity with Time