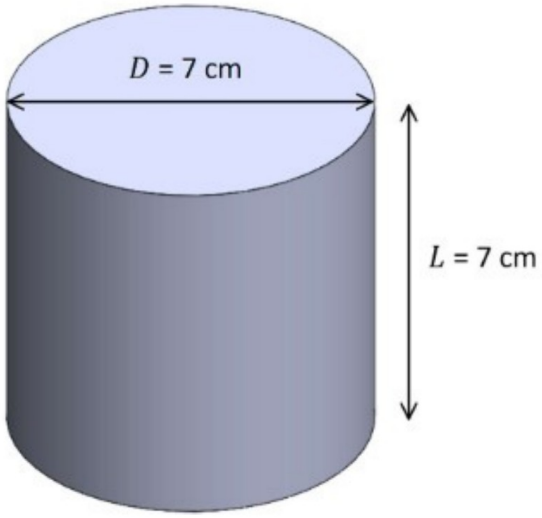
Problem 1



EES Results:

$T_0 = \textbf{ConvertTemp}(C, K, \textbf{T}(\text{Water}, P = 80\ [\text{kPa}], x = 0))$

$T_{inf} = \textbf{ConvertTemp}(C, K, 20\ [C])$ *Ambient Temp*

$h = 10\ [\text{W/m}^2\text{-K}]$ *heat transfer coeff*

$D = 7\ [\text{cm}] \cdot \left| 0.01 \cdot \frac{m}{cm} \right|$

$L = 7\ [\text{cm}] \cdot \left| 0.01 \cdot \frac{m}{cm} \right|$

$A = \pi \cdot D \cdot L$ *area*

$\rho = \rho(\text{Water}, P = 80\ [\text{kPa}], x = 0)$

$m = \rho \cdot \frac{\pi}{4} \cdot D^2 \cdot L$

$C_V = \textbf{Cv}(\text{Water}, P = 80\ [\text{kPa}], x = 0) \cdot \left| 1000 \cdot \frac{J}{kJ} \right|$ *Heat Cap*

$dTdt = \frac{h \cdot A}{m \cdot C_V} \cdot (T_0 - T_{inf})$ *solving eq*

SOLUTION

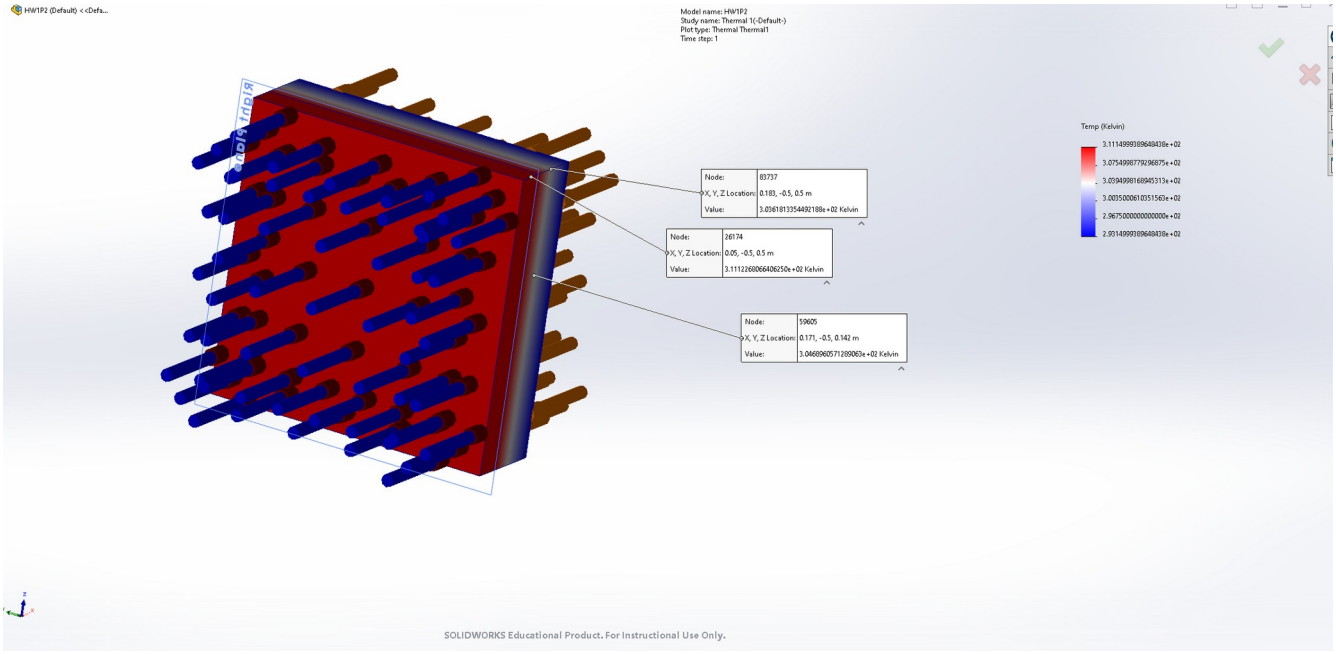
Unit Settings: SI C kPa kJ mass deg

$A = 0.01539$ [m^2]	$C_V = 3802$ [J/kg-K]	$D = 0.07$ [m]
$dTdt = 0.01147$ [K/s] {0.01147 [C/s]}	$h = 10$ [W/m^2-K]	$L = 0.07$ [m]
$m = 0.2594$ [kg]	$\rho = 962.9$ [kg/m^3]	$T_0 = 366.6$ [K]
$T_{inf} = 293.2$ [K]		

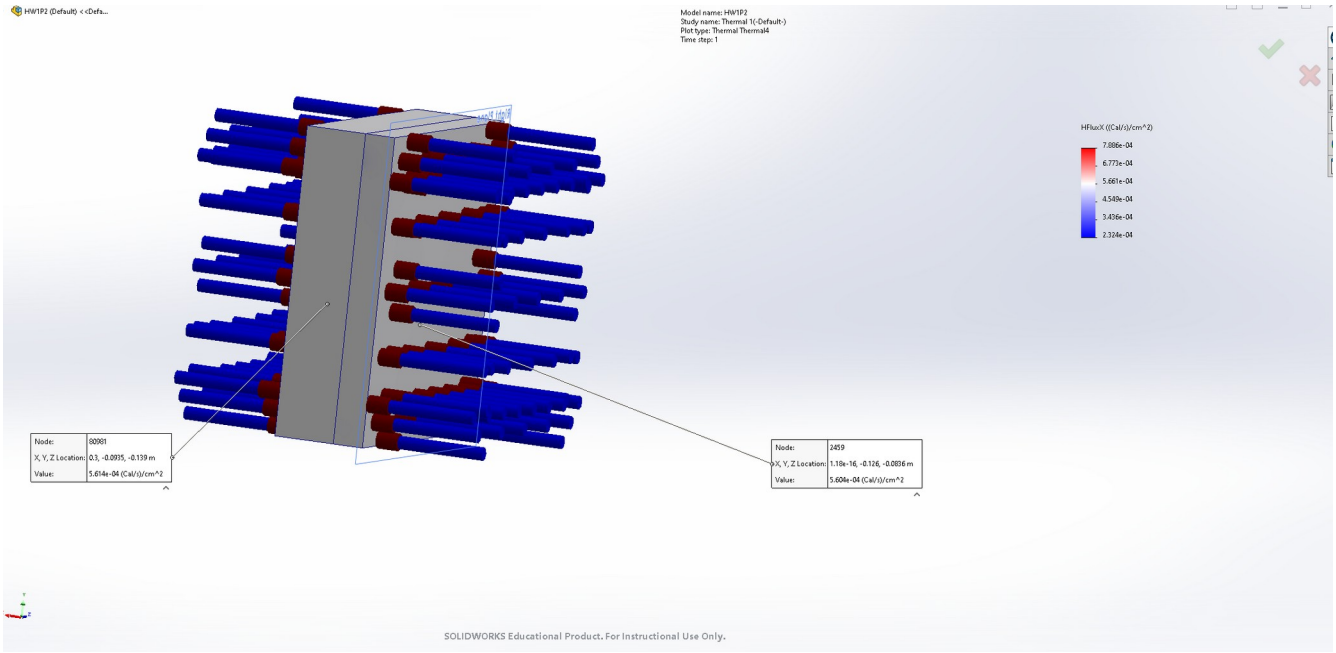
No unit problems were detected.

PROBLEM 2

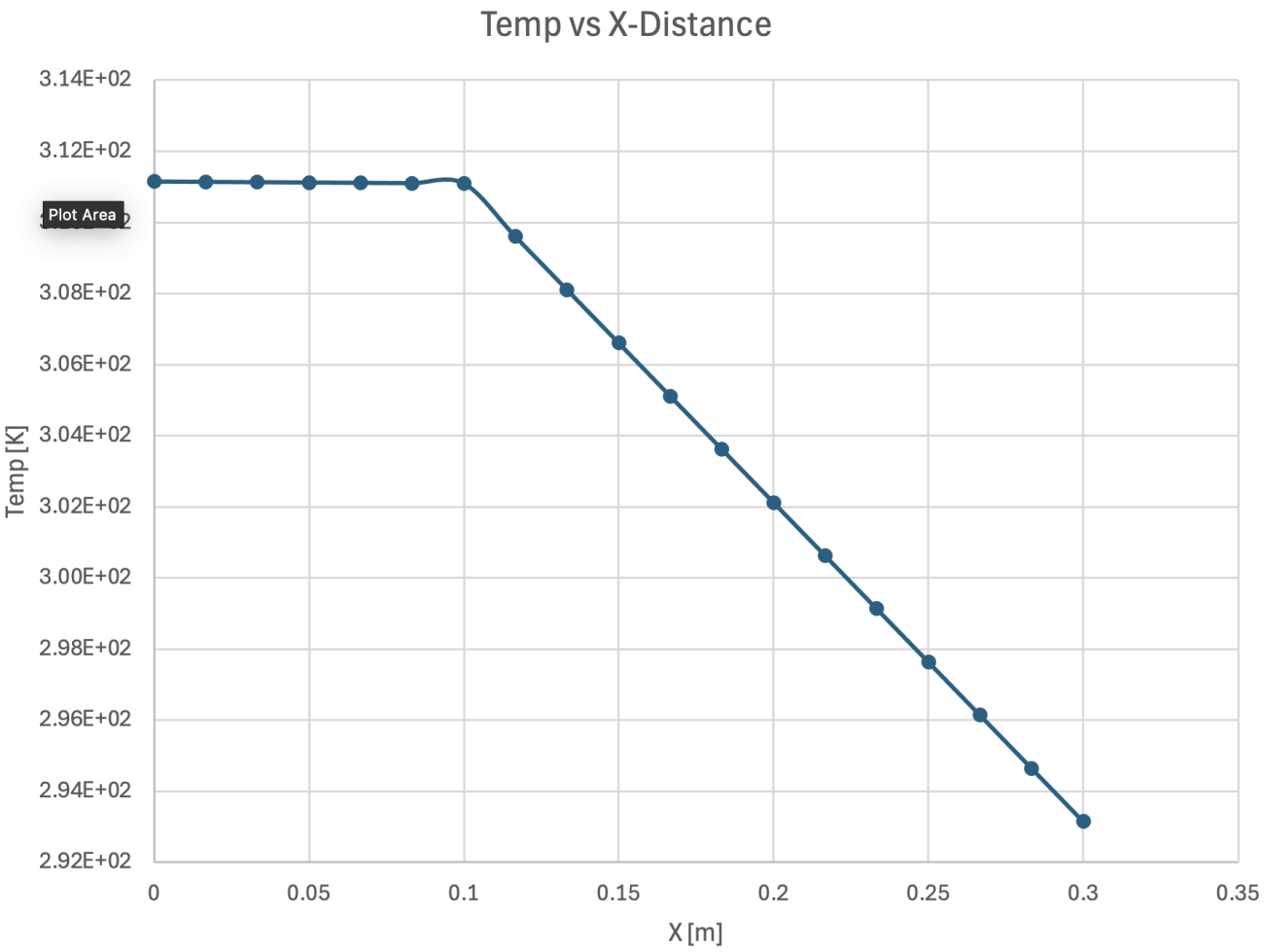
simulation:



Flux:



Graph:



Explanation:

Different materials have different heat-capacities/specific-heat values that affect the rate at which temperature changes. The slope is near flat for the steel because of its high Cv value.