

# Verification and Validation Report for Solar Water Heating Systems Incorporating Phase Change Material

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## 1 Introduction

This document is a report on the results of a testing suite for a Solar Water Heating System incorporating Phase change Material simulator.

Detailed descriptions of the tests executed can be found in the Verification and Validation Plan document.

## 2 System Tests

### 2.1 Faulty Input

The following tests have failed by verification:

Table 1: Faulty Input Cases

No.	Input	Expected Outcome	Expected MsgID	Actual MsgID
40	$T_{\text{init}} = 45$	error: Tinit must be < 0 Tmelt	input:TinitTmelt	MATLAB:badsubscript

## 2.2 Closed Form Solution for Latent Heating

The relative error between the closed form solution for water temperature and the simulator solution was 0.0046.

## 2.3 Alternative Algorithm

When comparing the output of a simulator using the ode23 solver to this simulator (using ode45), there was zero difference in the results in all cases.

## 2.4 Comparison to Original Implementation

All tests passed with a relative tolerance of 0.002.

# 3 Unit Tests

## 3.1 Temperature Modules

All tests passed within a relative tolerance of 1e-06.

## 3.2 Energy Modules

All tests passed within a relative tolerance of 1e-08.

## 3.3 Event Modules

All tests passed within a relative tolerance of 1e-08.