

Appendix B

COMPARISON OF INDIVIDUAL MEASUREMENTS AND PREDICTIONS FOR CFAST

For CFAST, this document contains individual comparisons of measured vs. predicted quantities that are contained in NUREG 1824 Supplement 1. The results for each test from each validation set are presented in the following sections and are organized by experimental data set, then by output quantity. Refer to NIST SP 1086¹ for more details on the validation of the model.

¹Peacock, R. D. and P. A. Reneke, CFAST – Consolidated Model of Fire Growth and Smoke Transport (Version 6), Software Development and Model Evaluation Guide, NIST Special Publication 1086, National Institute of Standards and Technology, Gaithersburg, MD, 2013.

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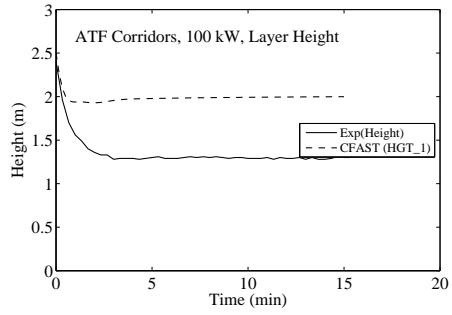
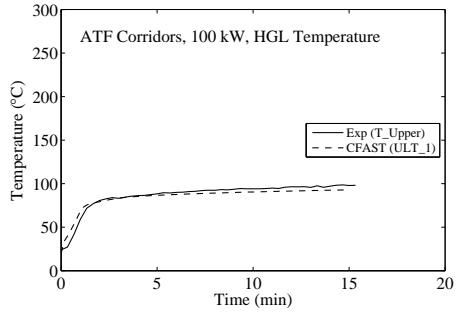
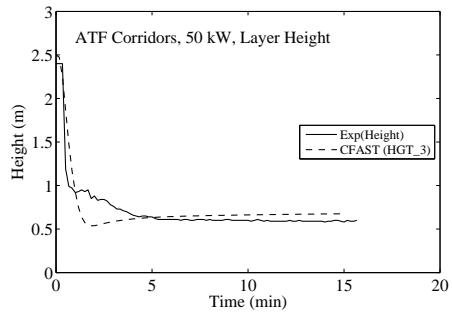
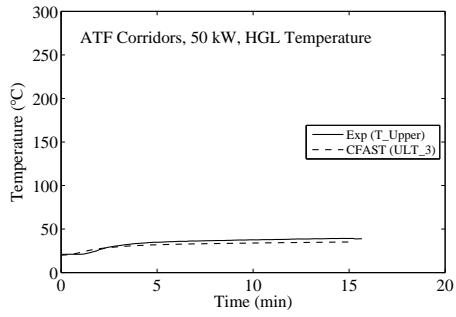
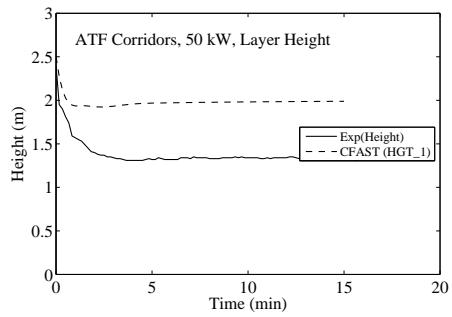
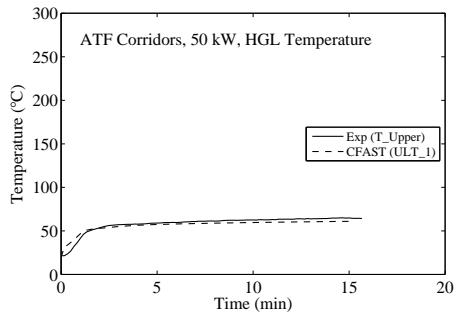
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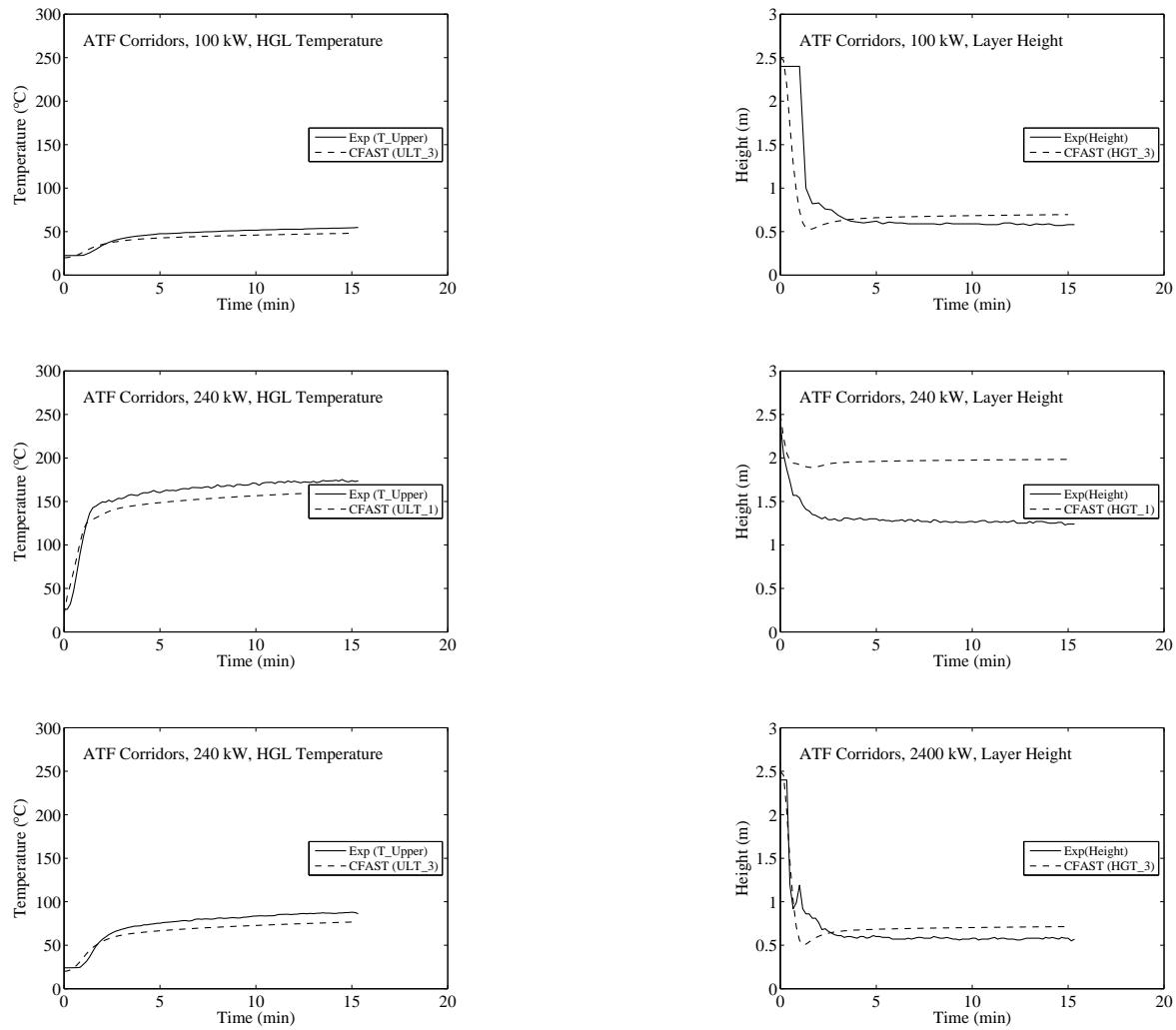
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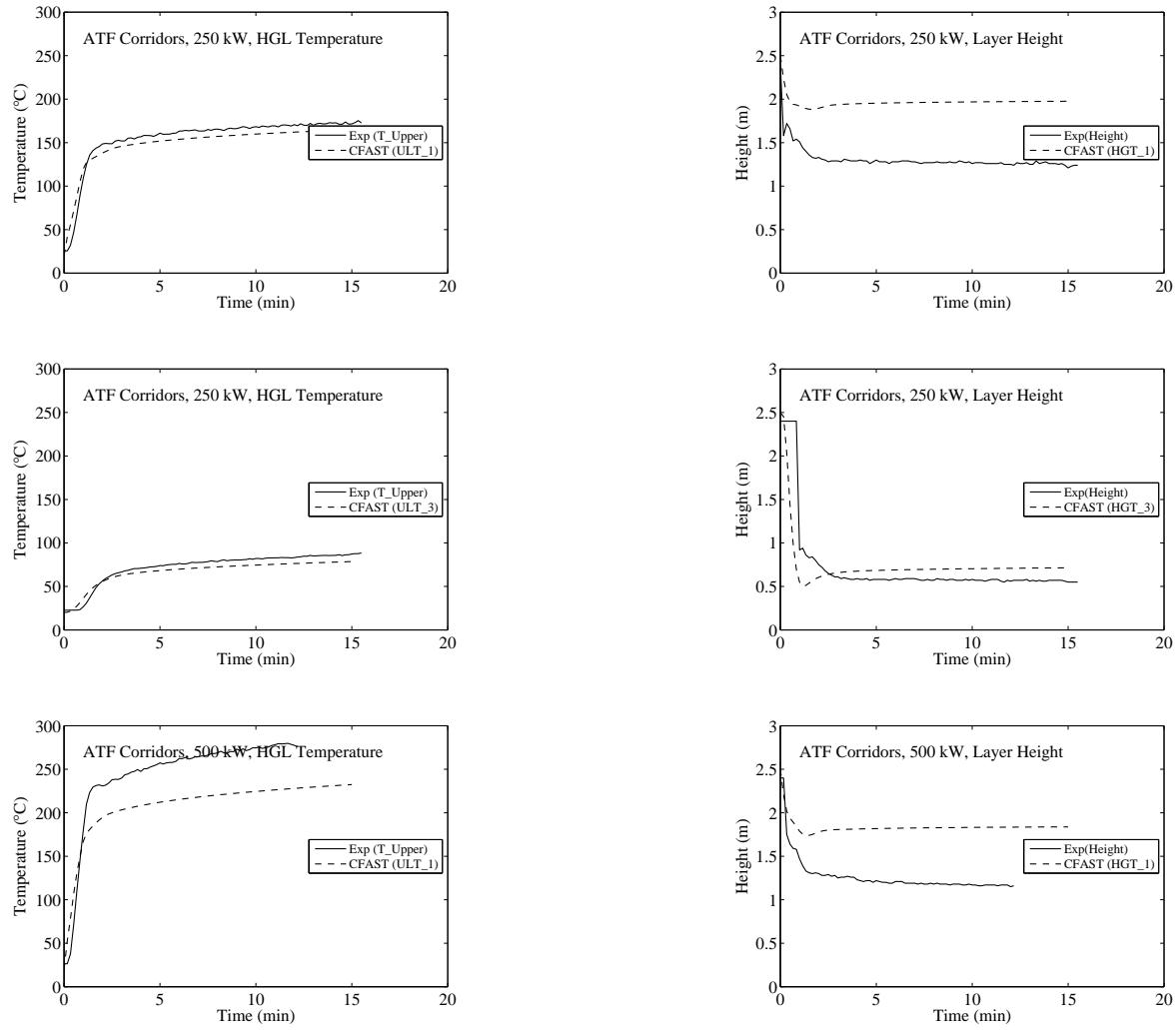
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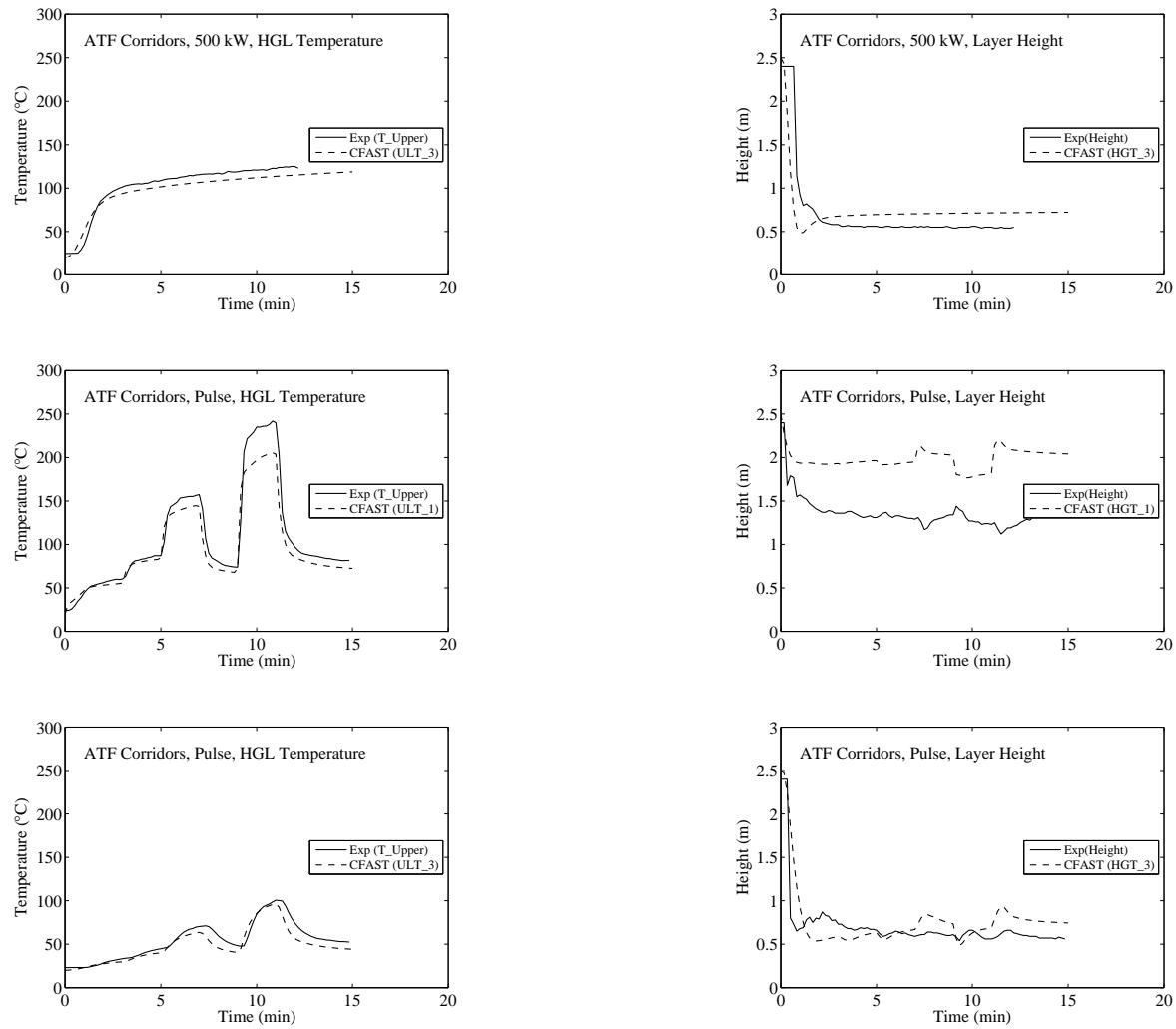
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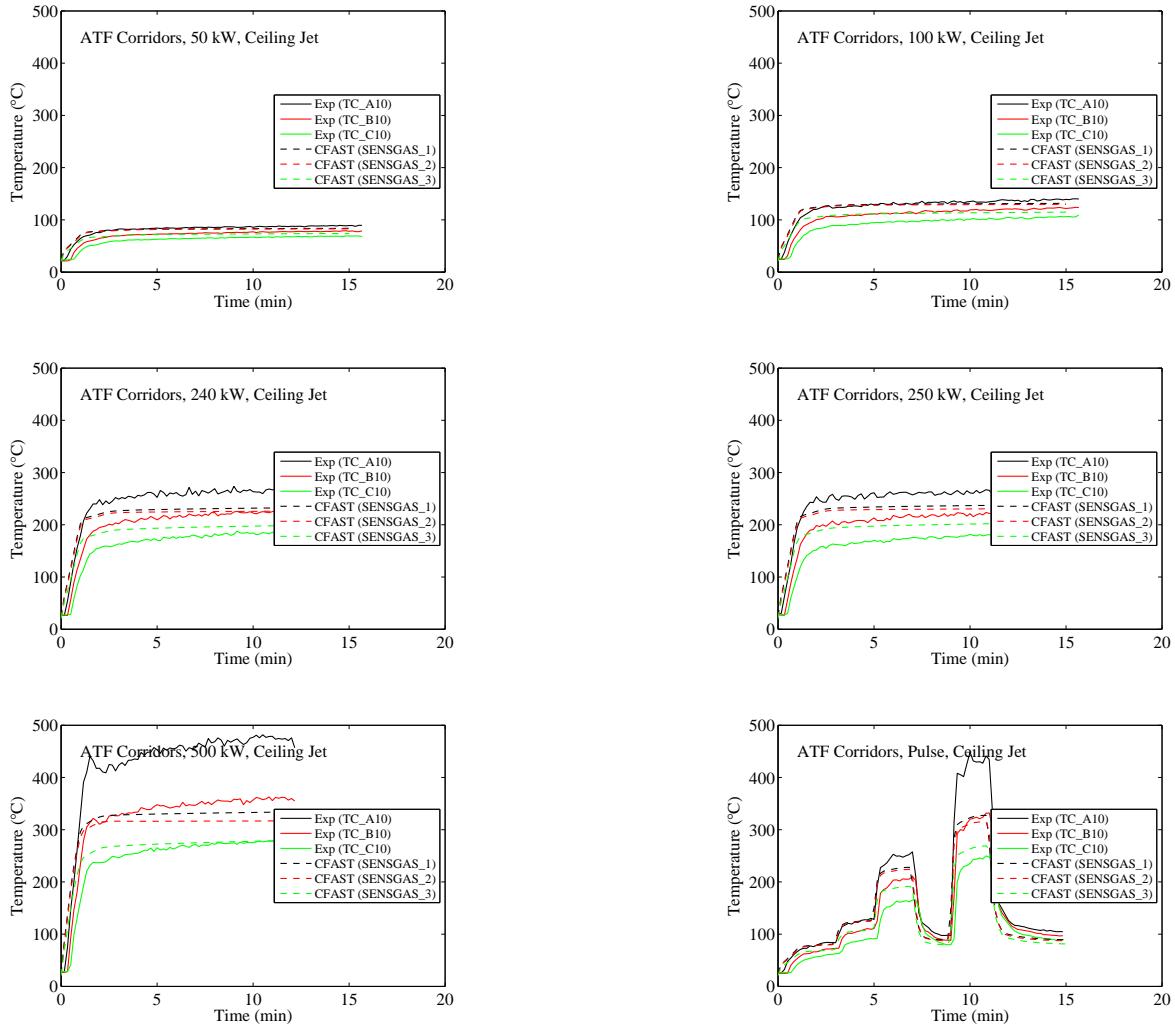






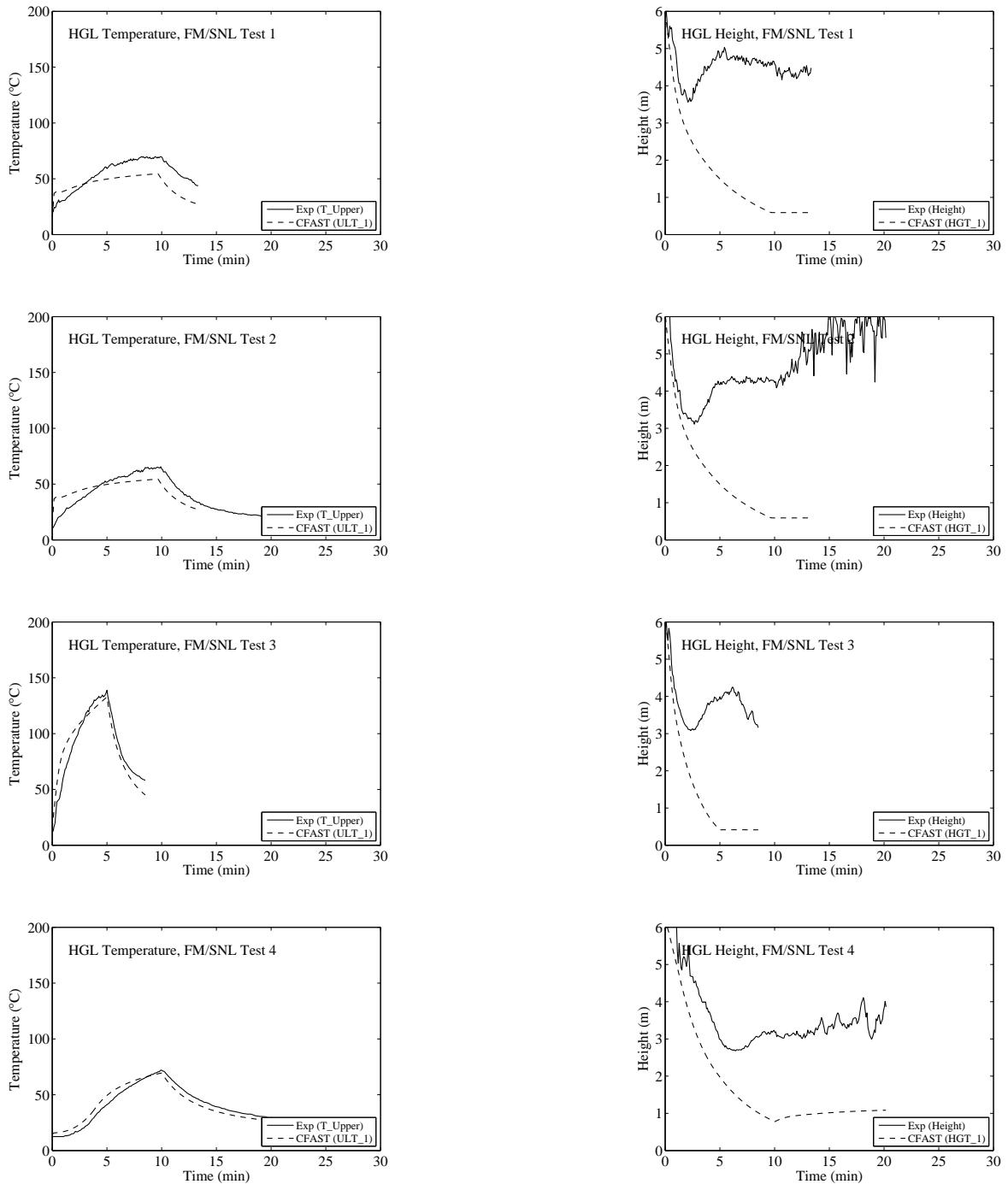


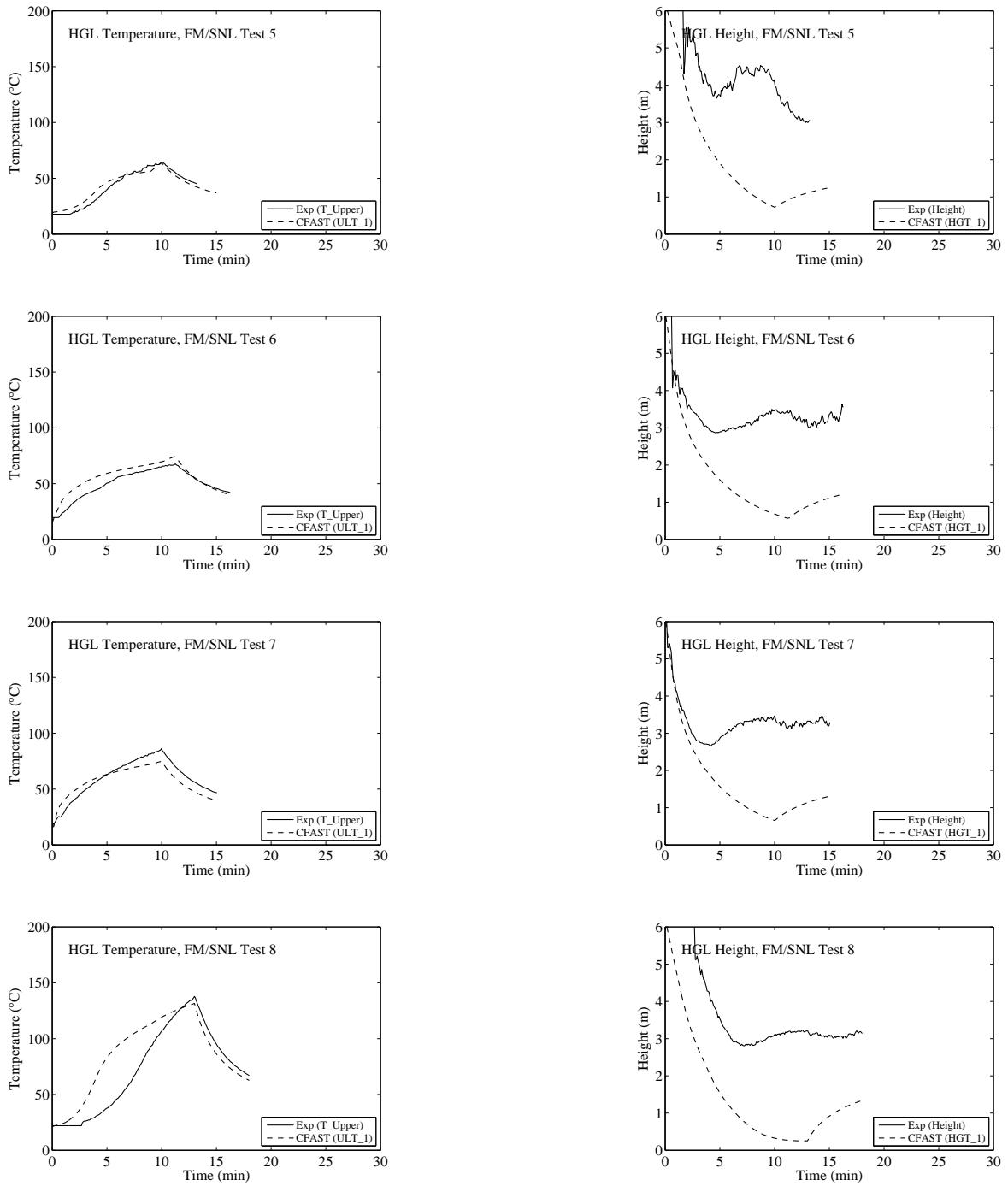
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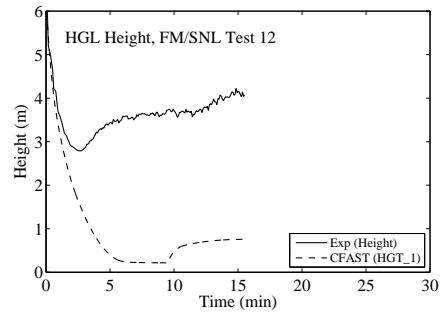
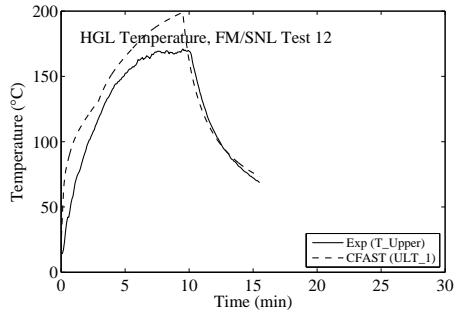
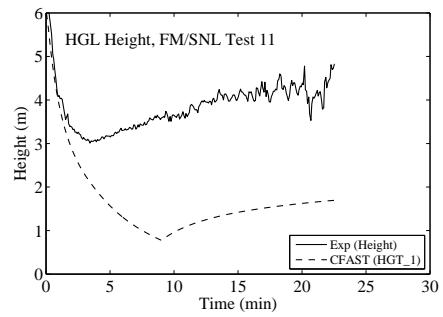
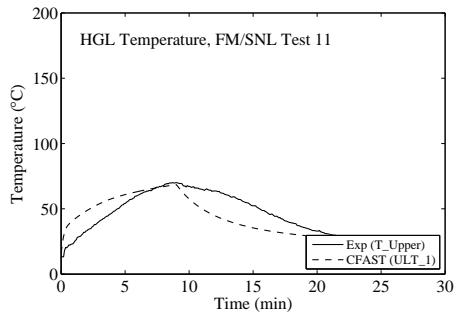
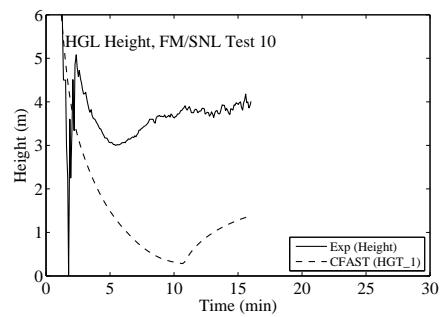
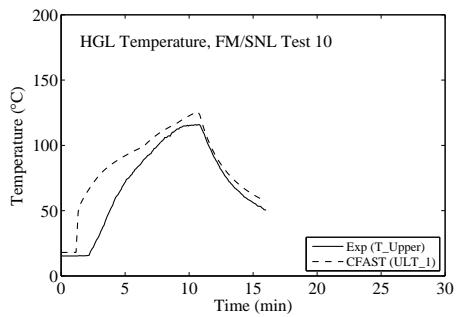
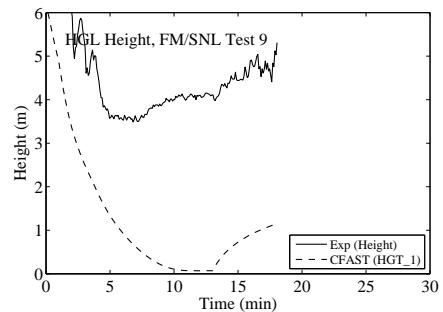
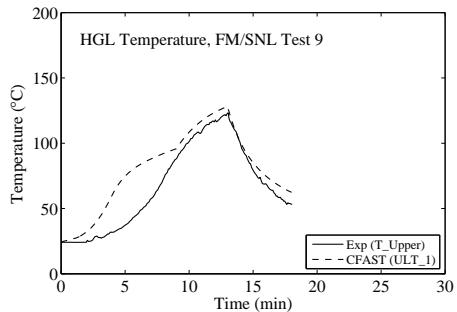


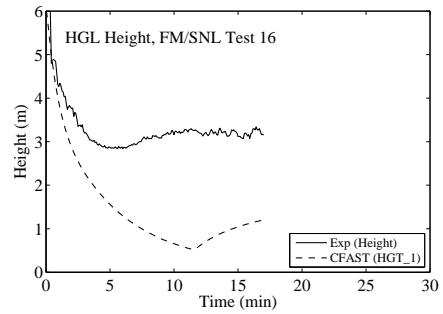
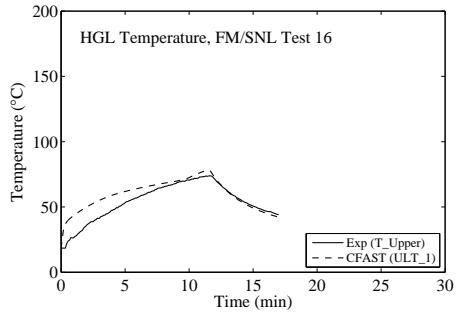
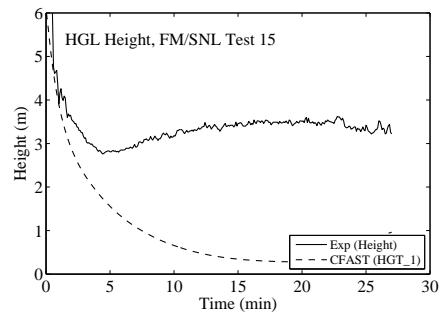
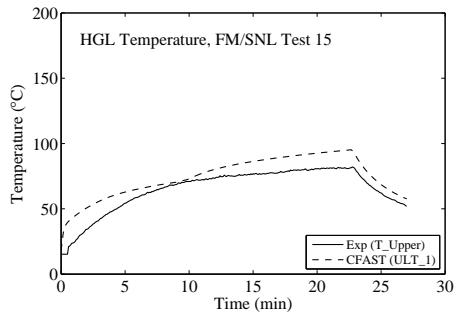
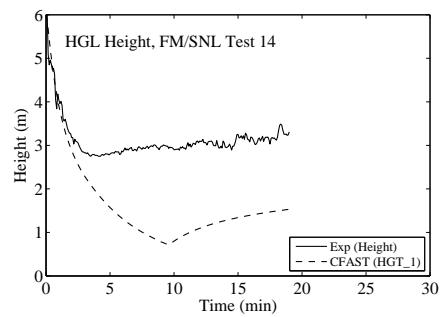
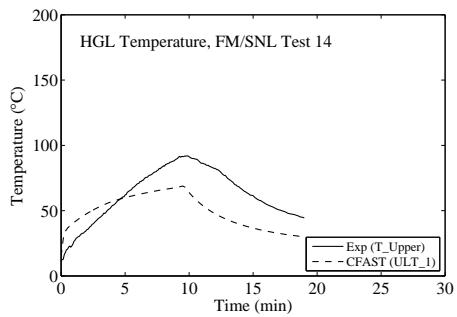
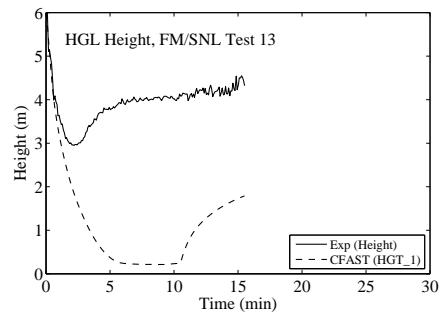
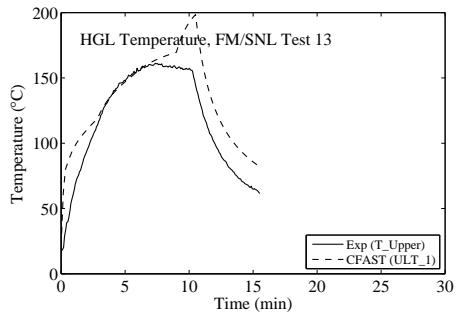
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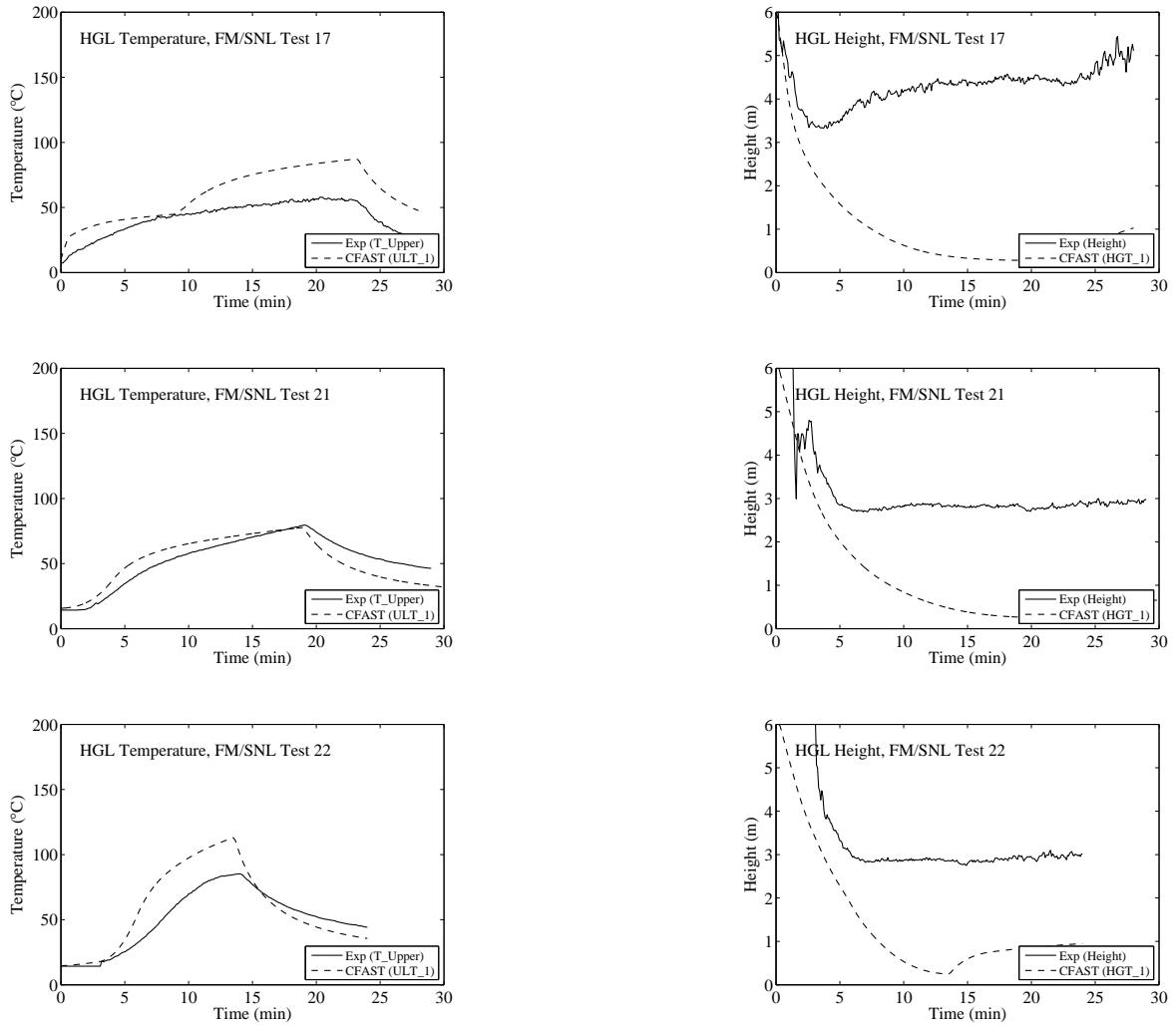
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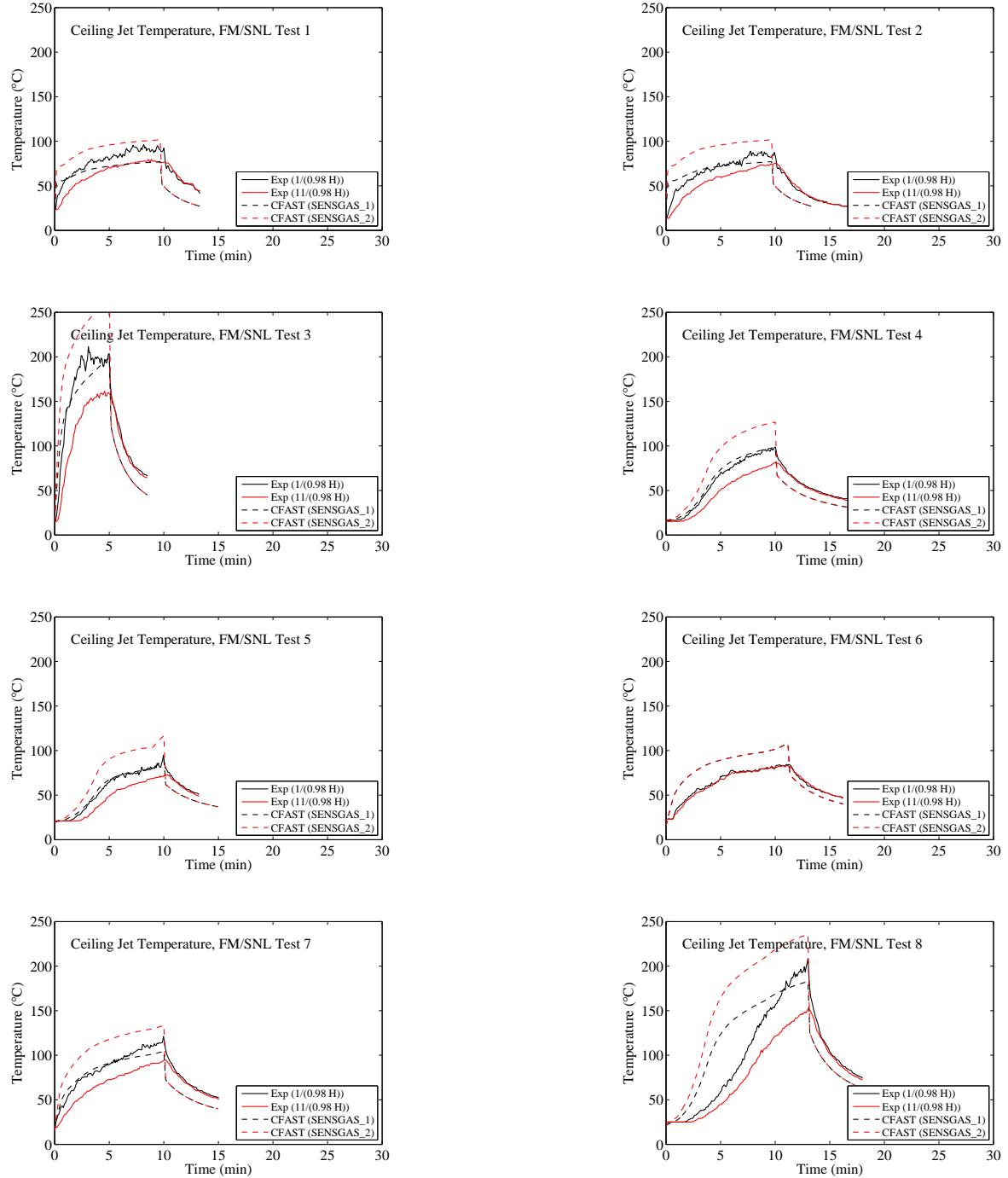


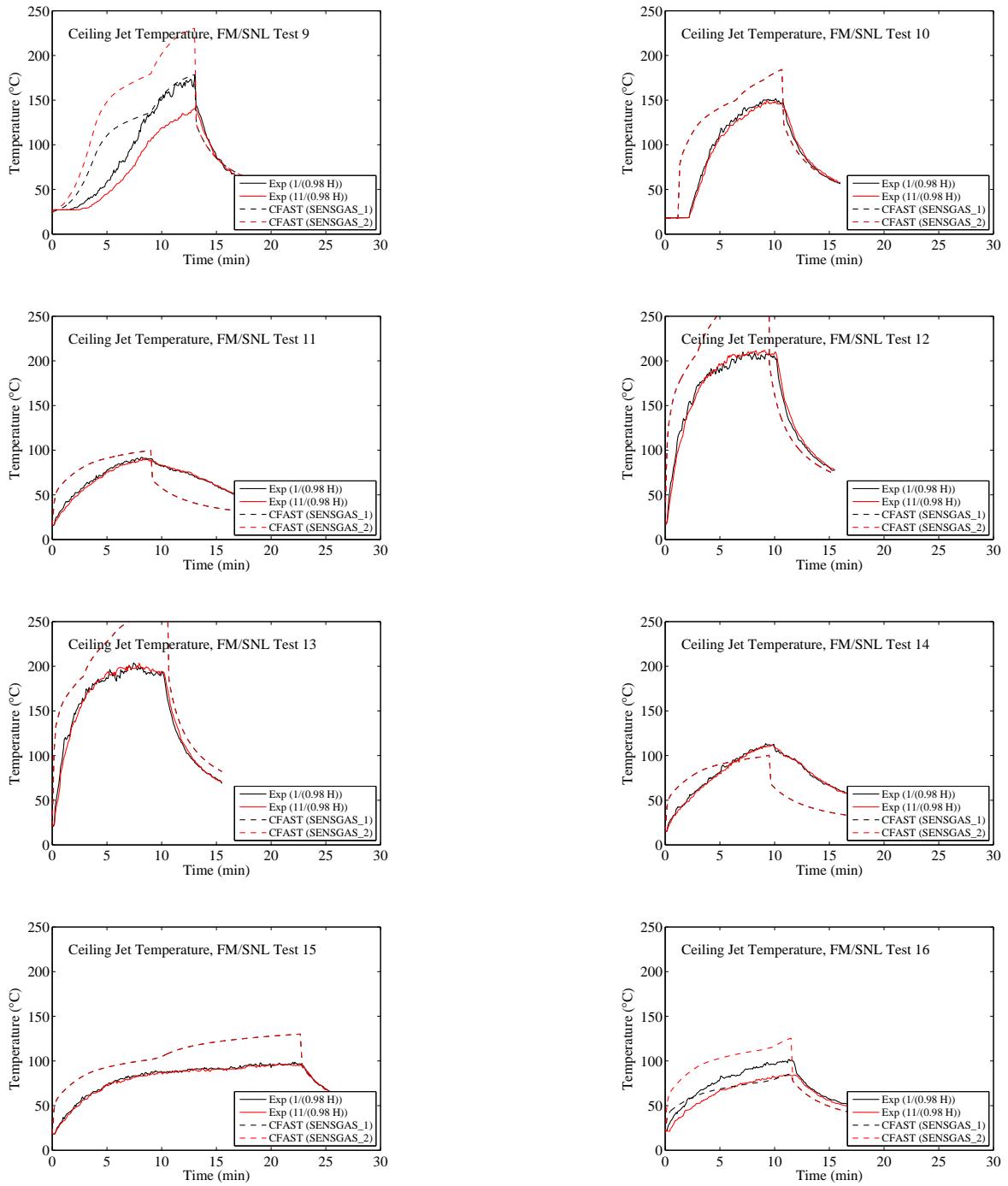


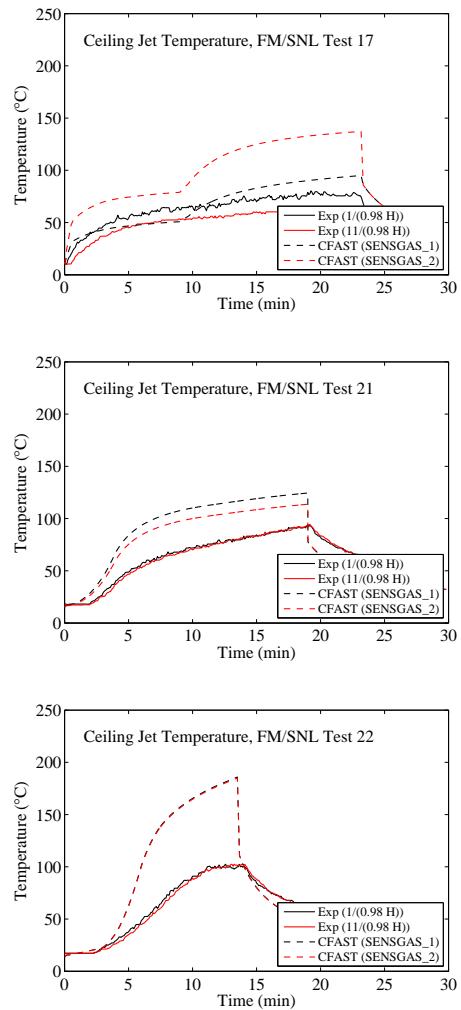




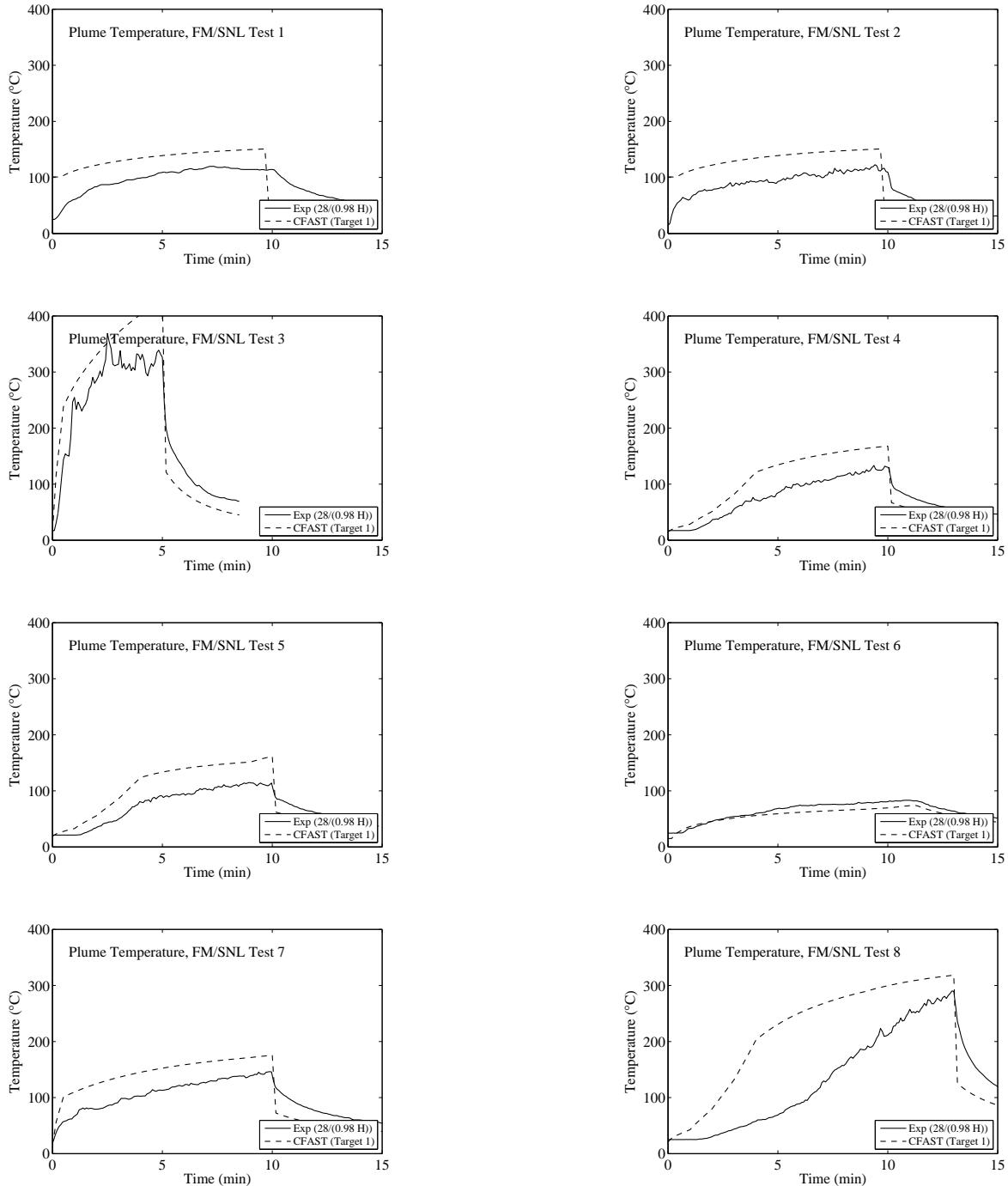
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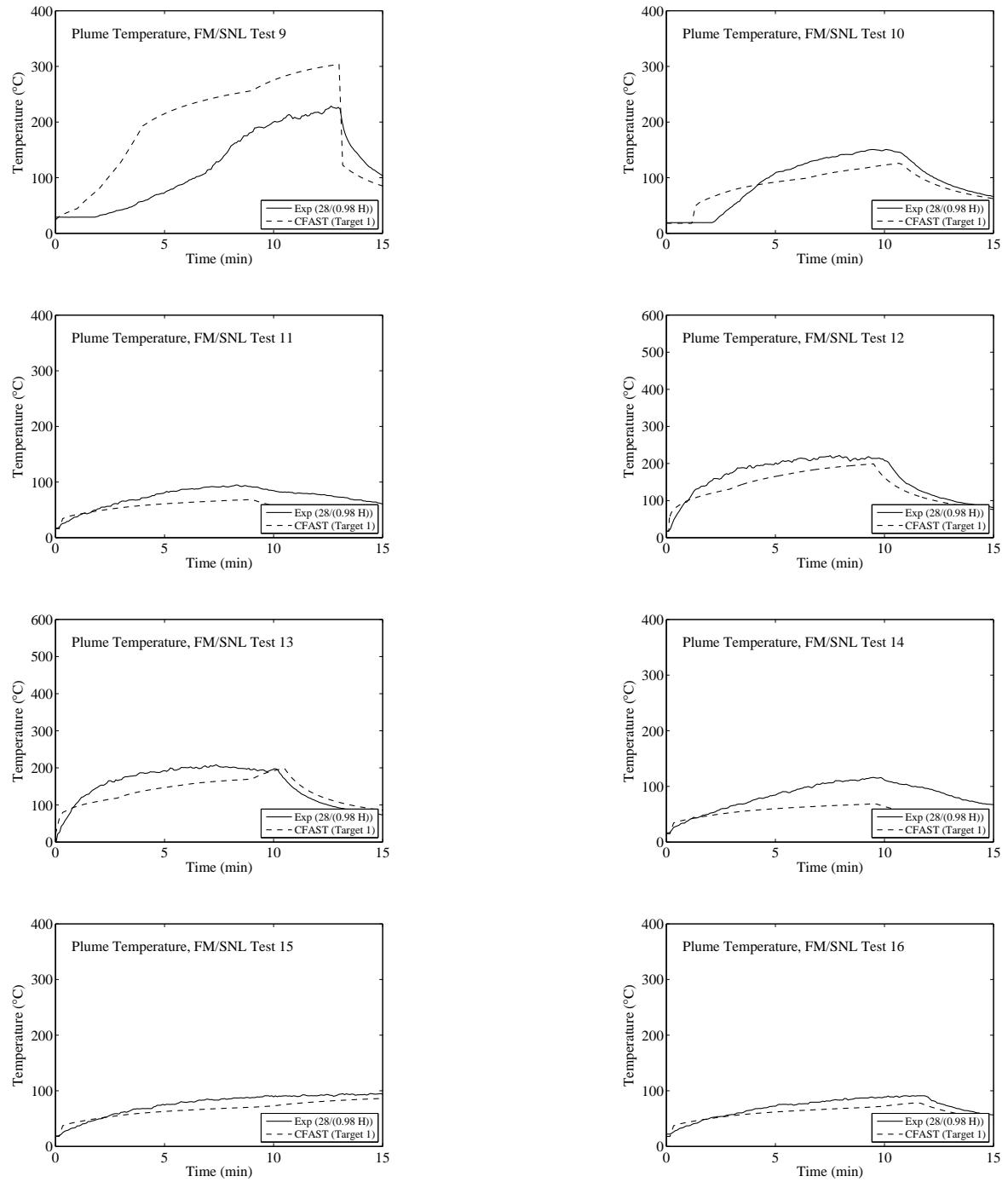


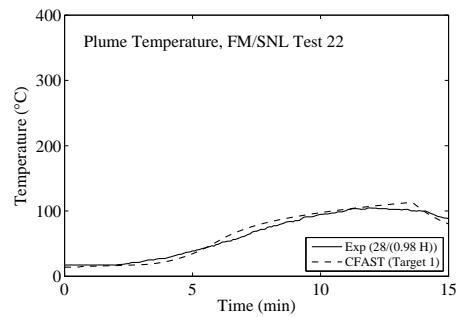
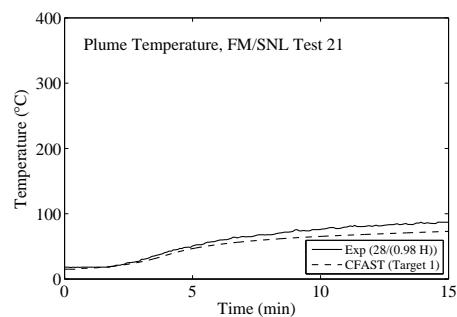
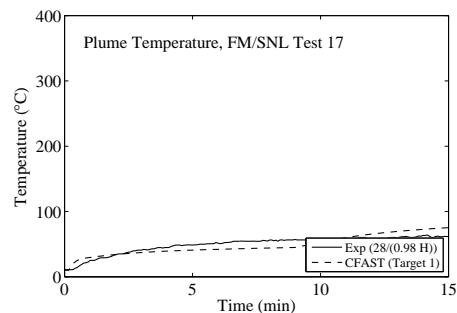




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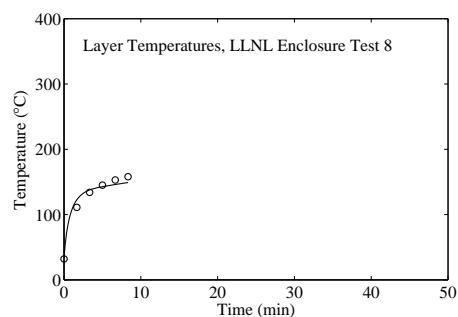
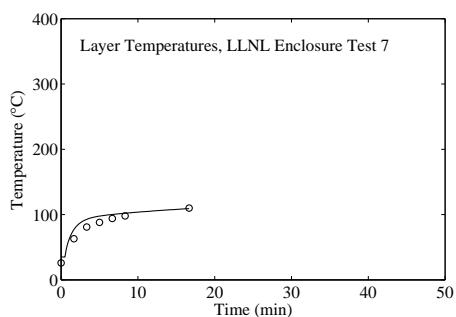
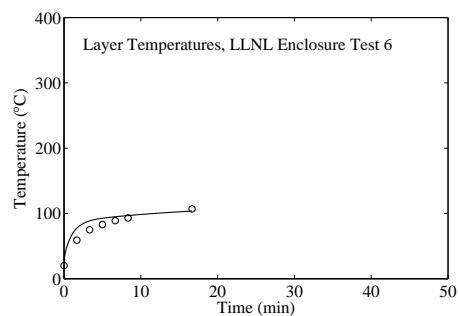
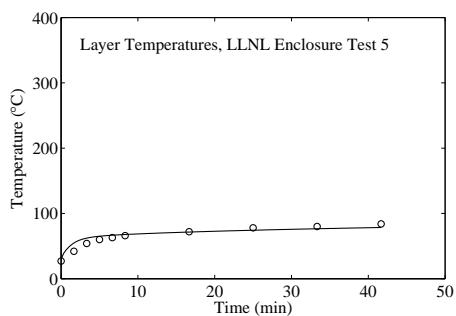
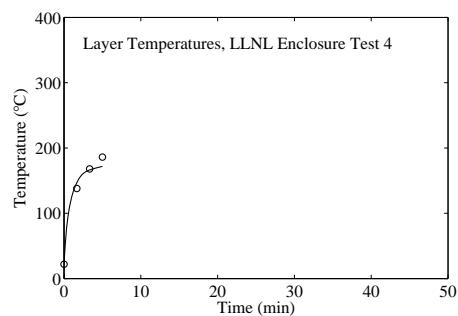
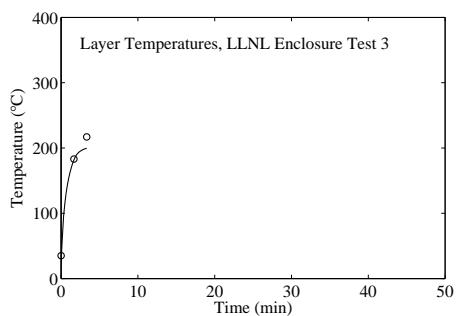
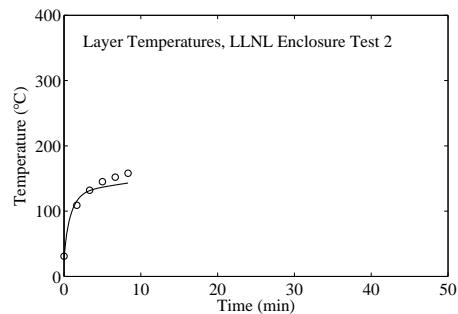
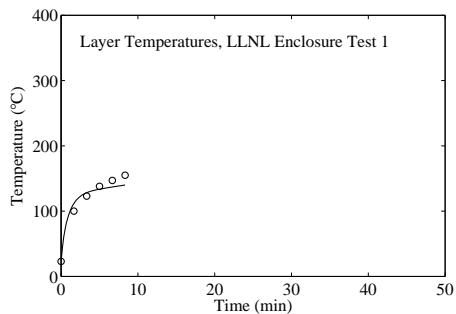


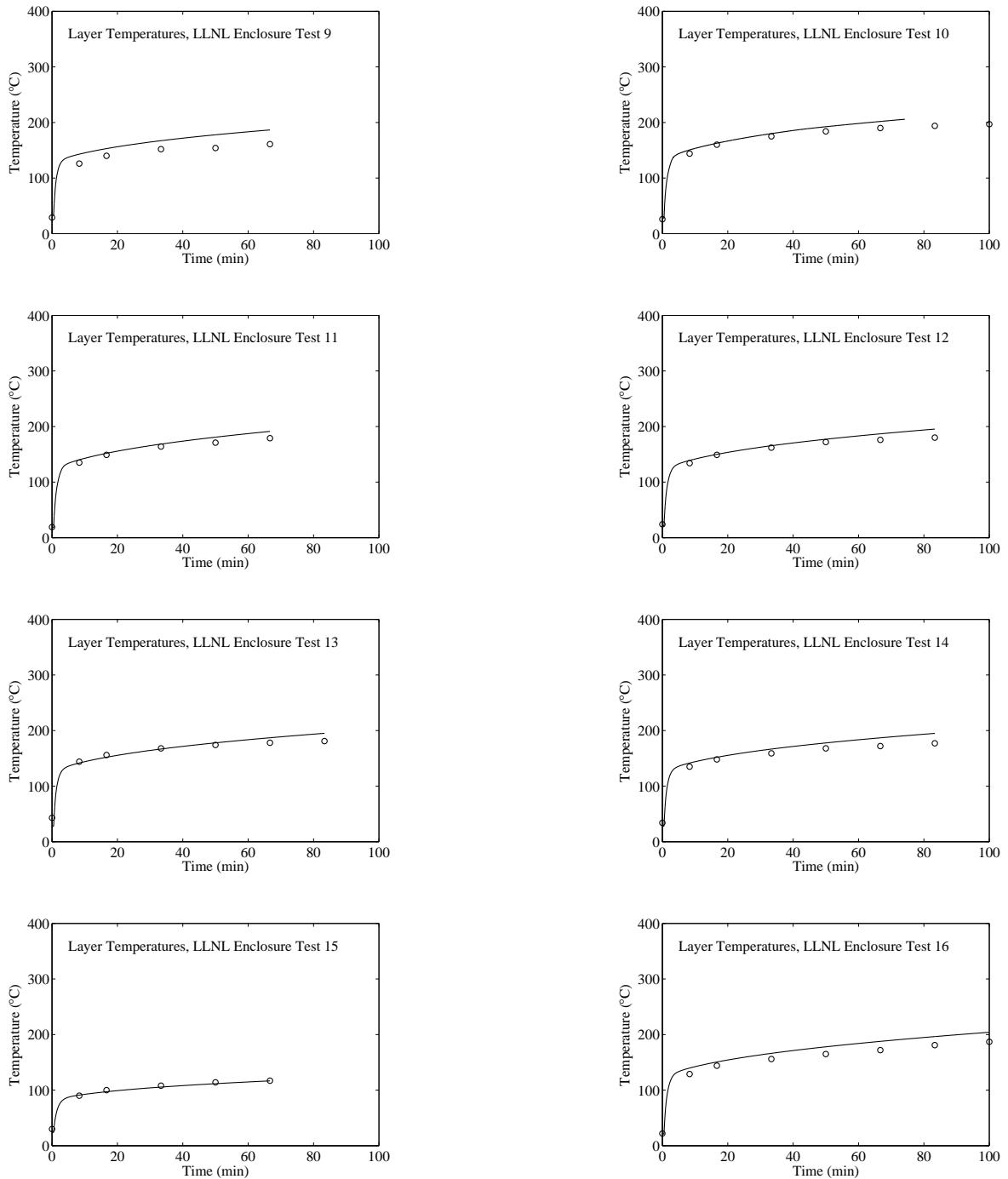


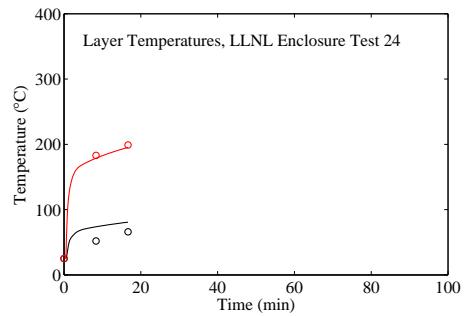
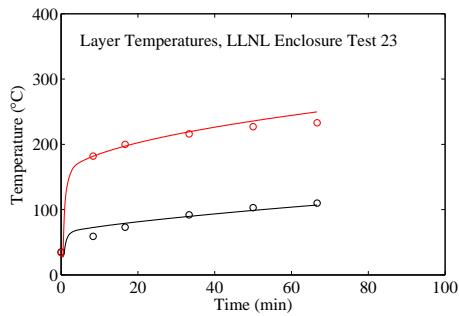
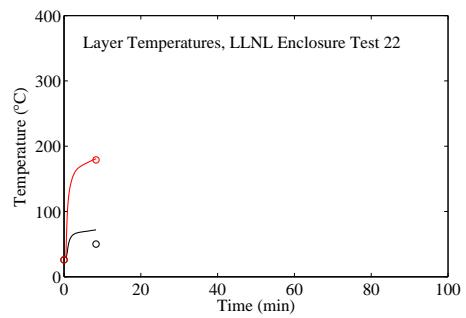
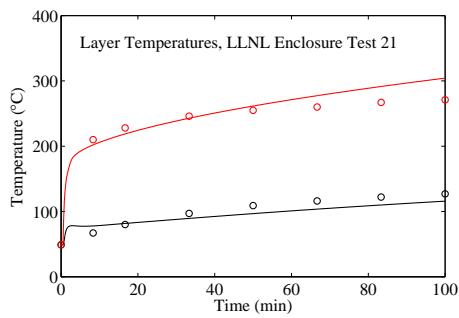
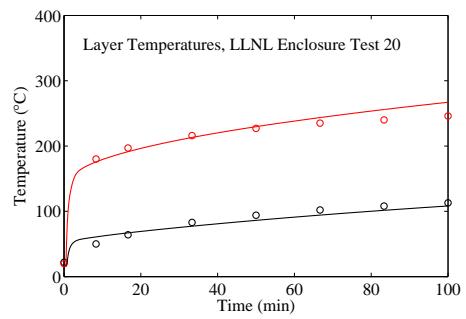
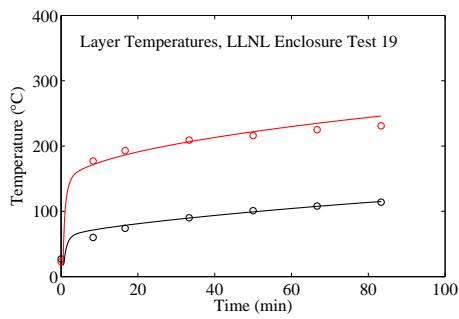
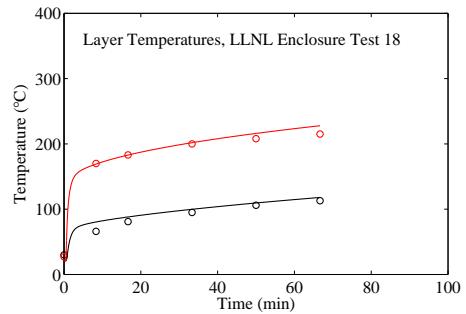
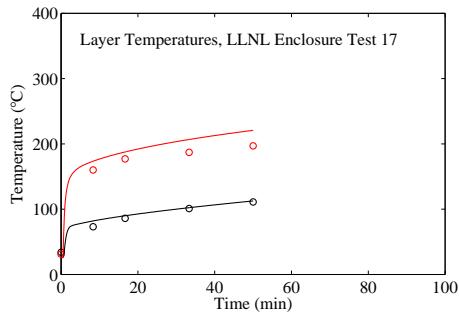


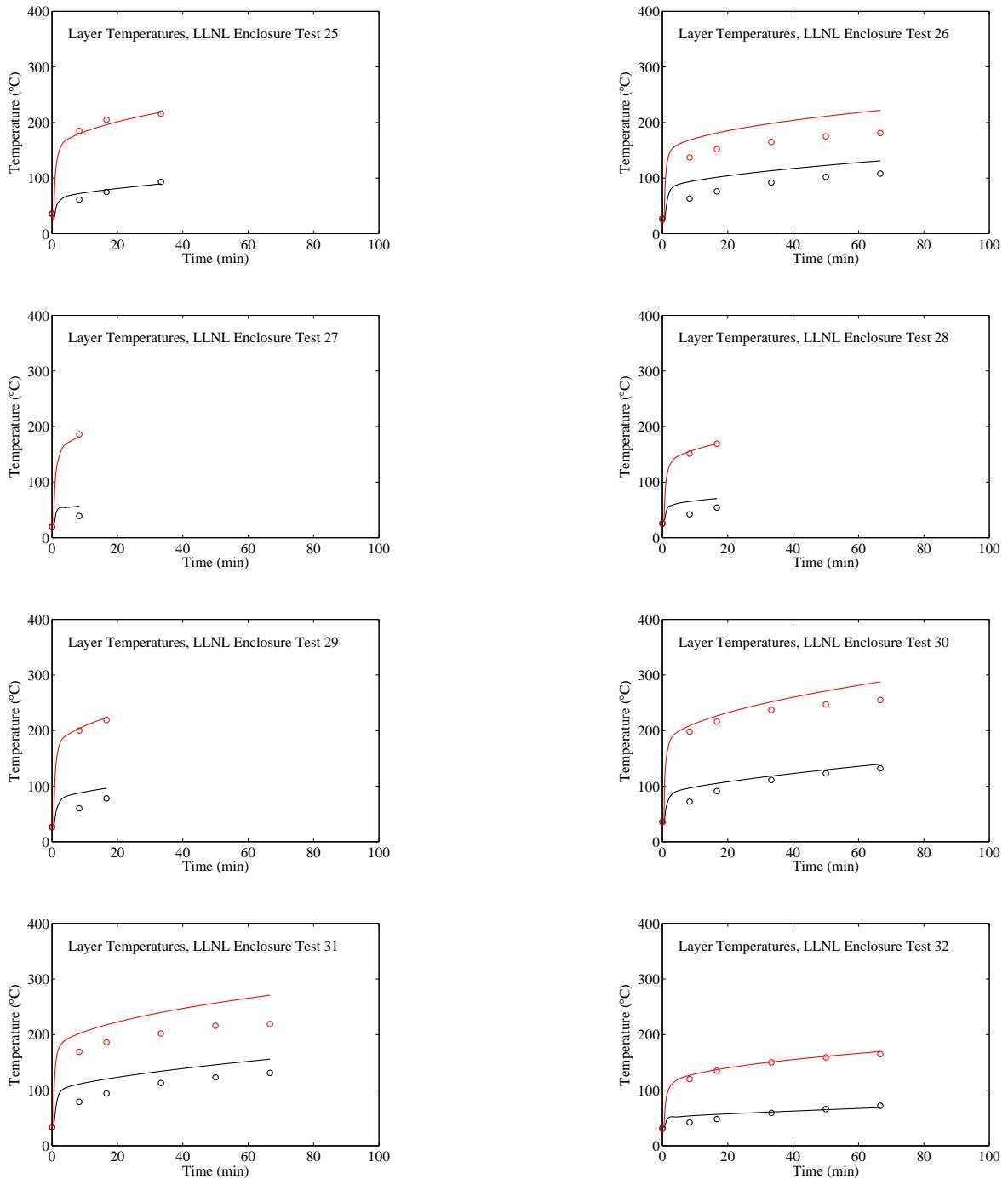
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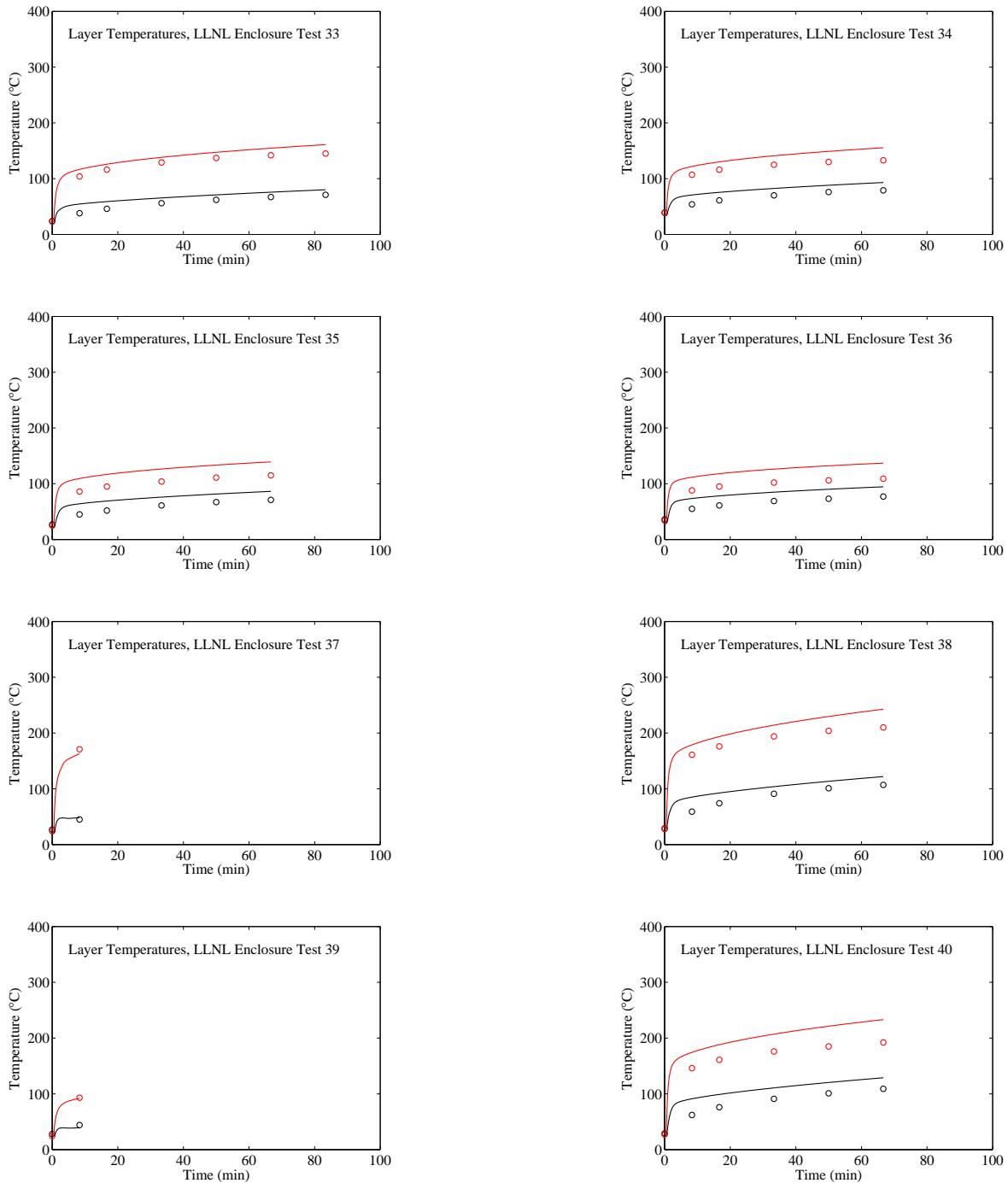
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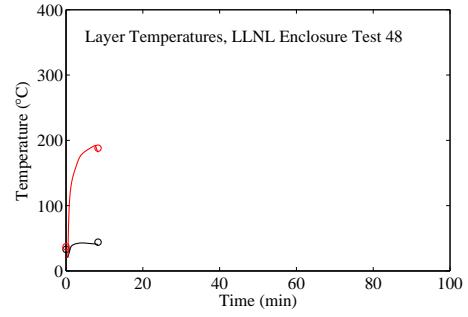
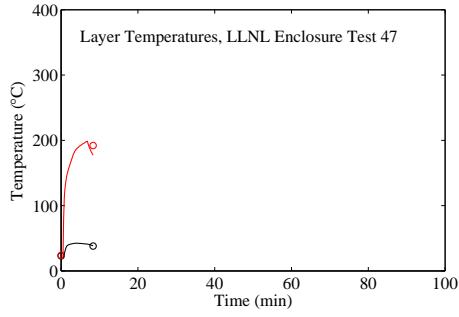
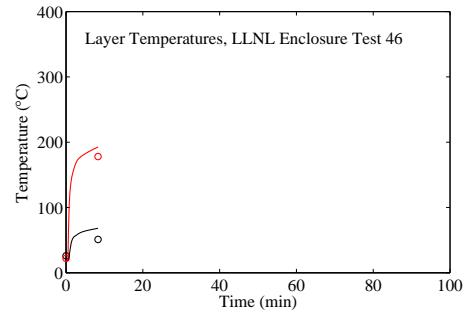
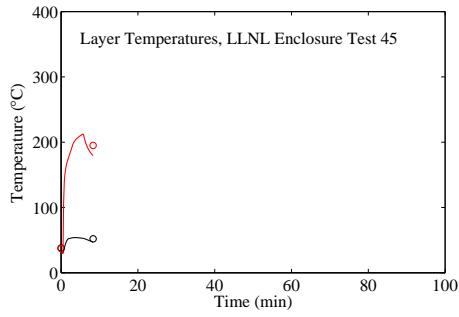
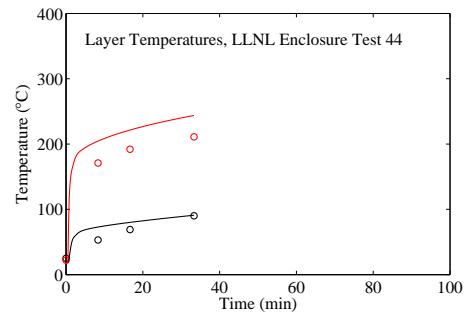
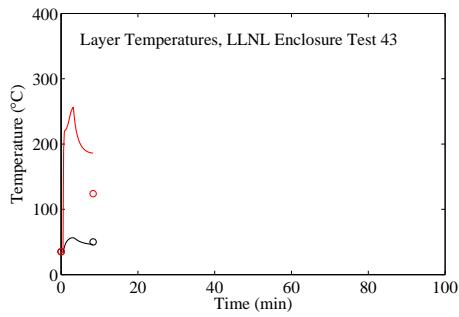
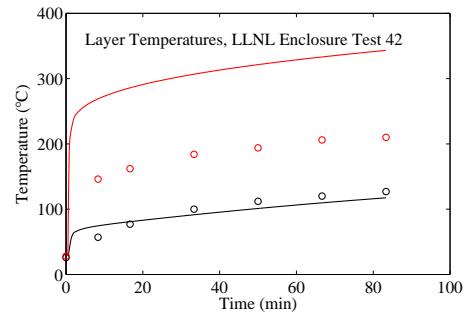
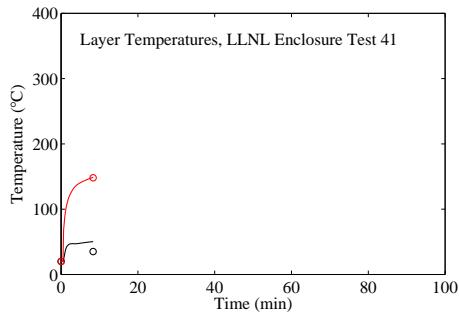


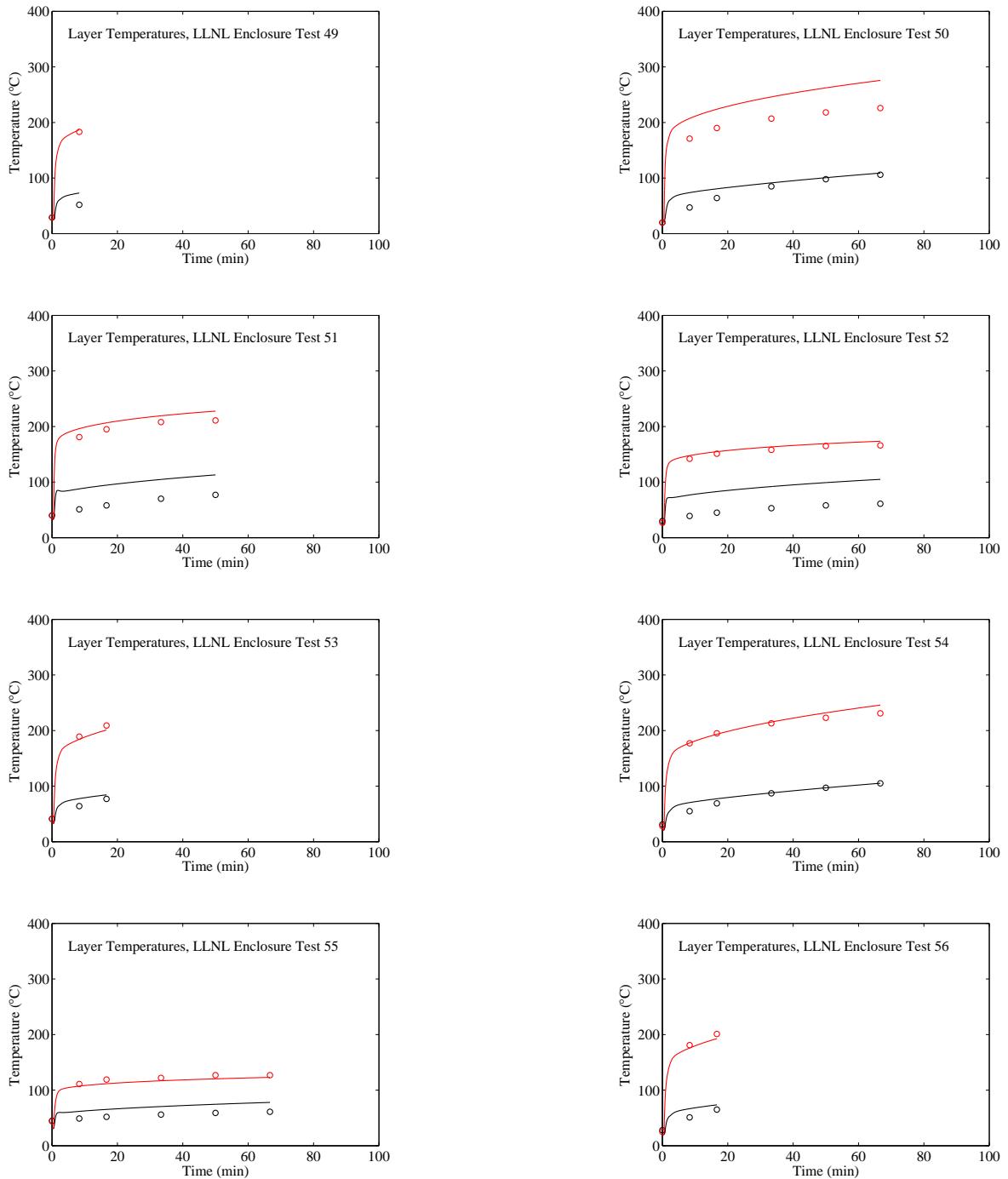


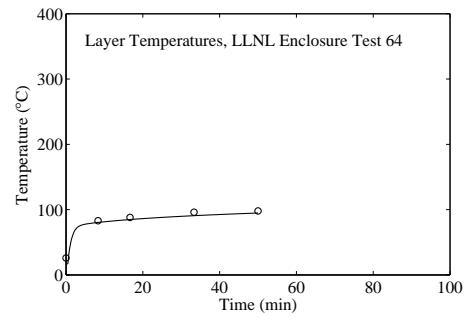
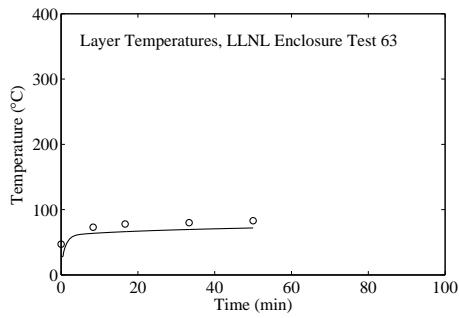
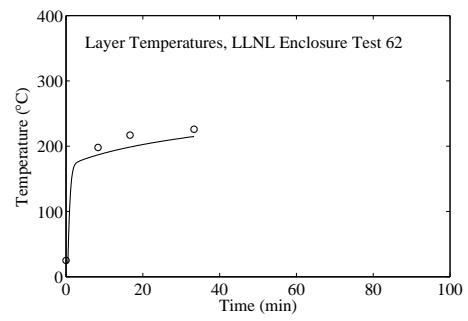
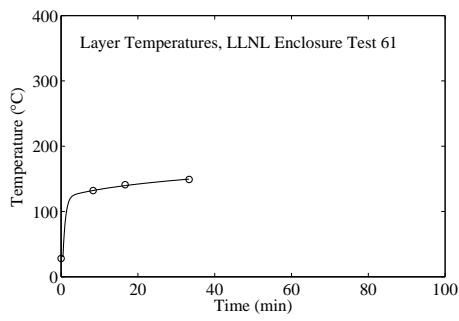
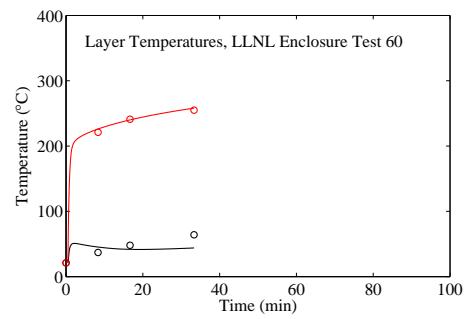
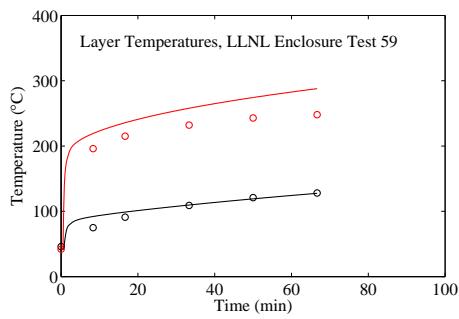
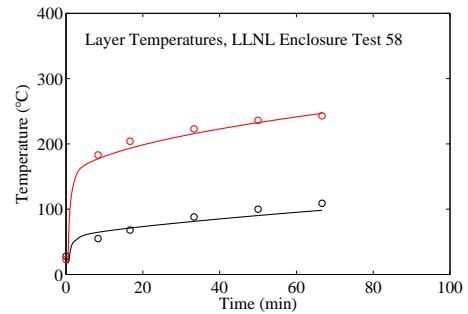
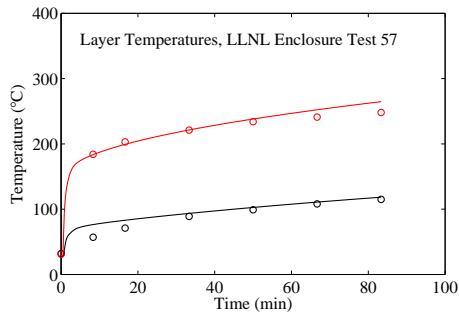






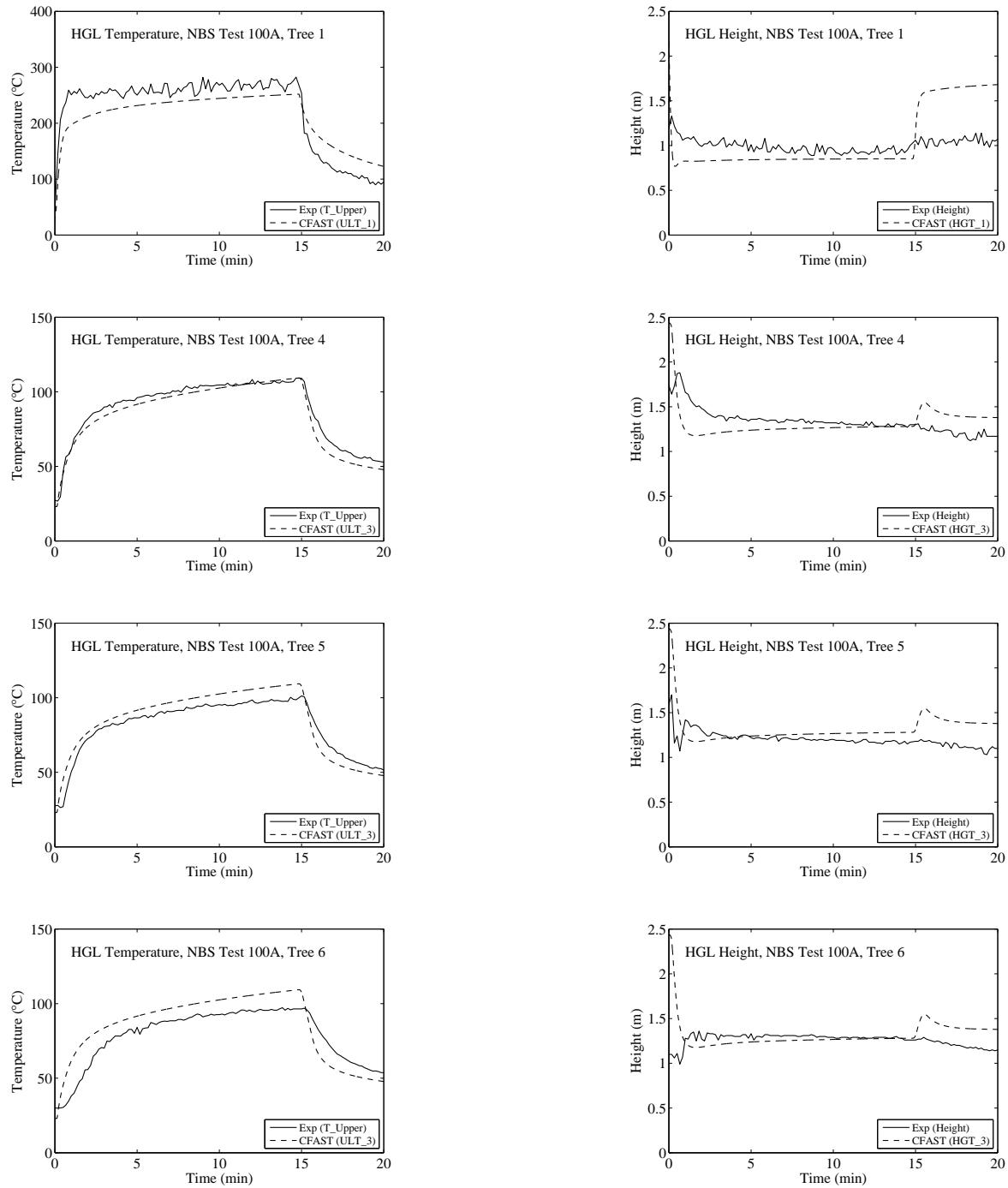




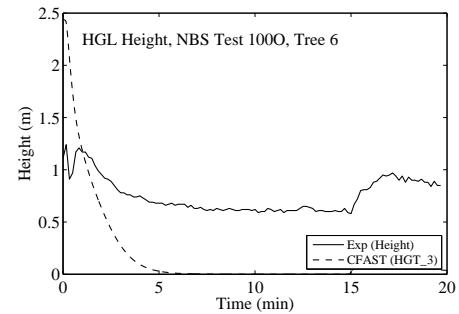
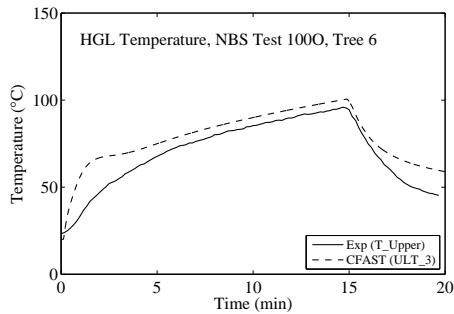
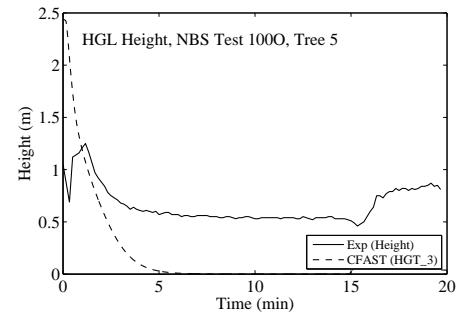
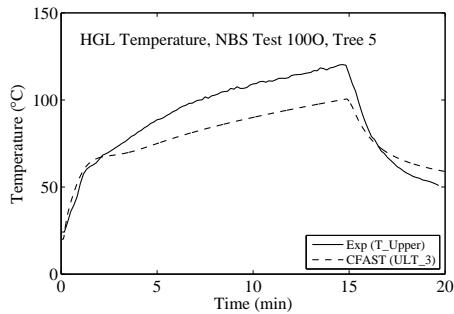
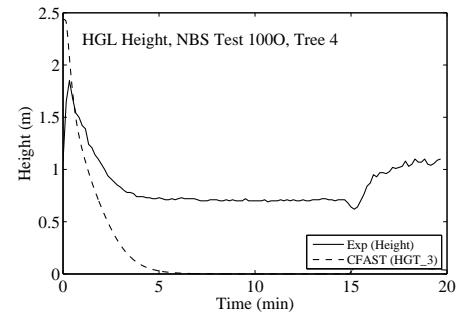
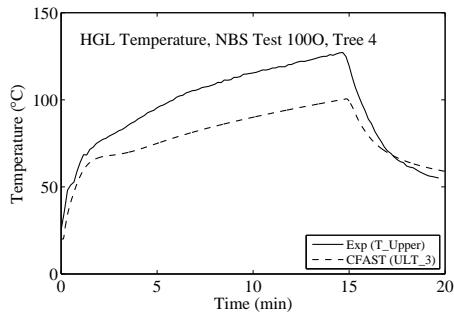
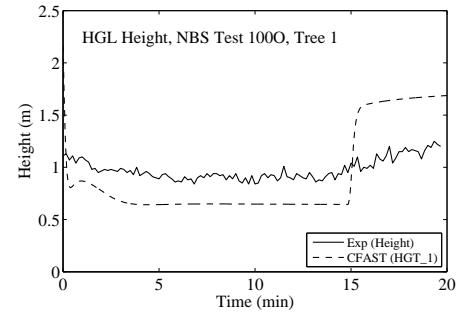
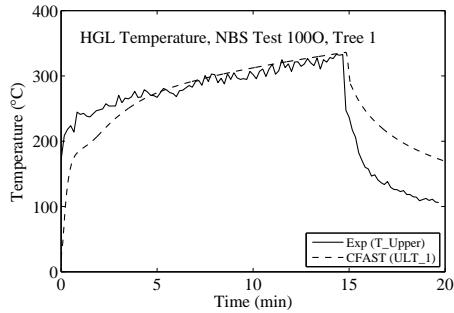


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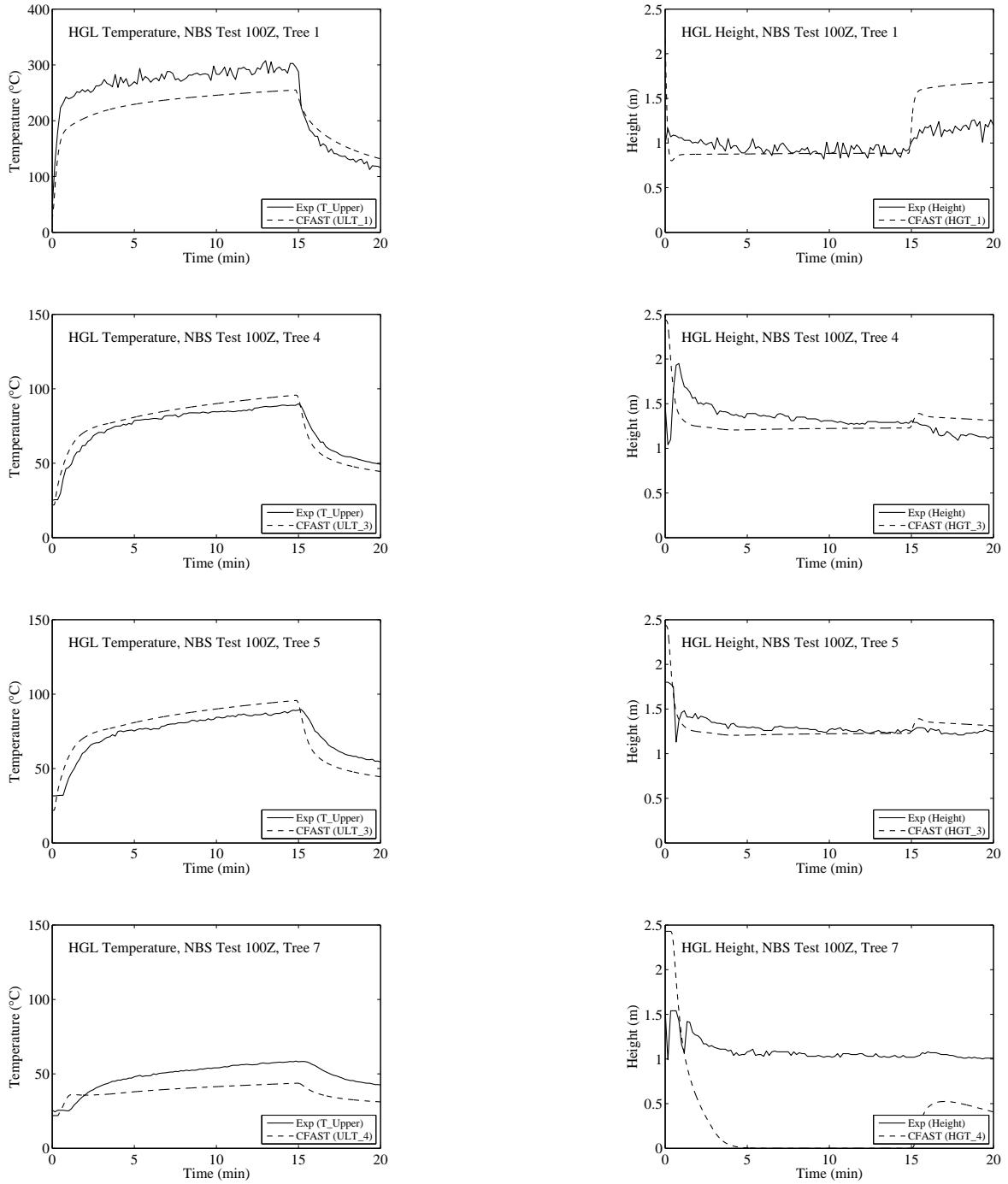
B.4.1 HGL Temperature and Depth



NBS MULTI-COMPARTMENT TEST SERIES

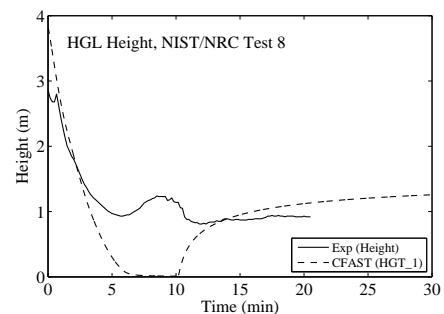
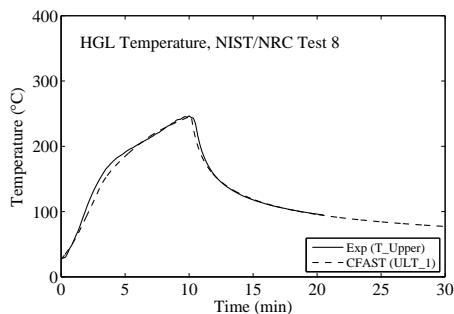
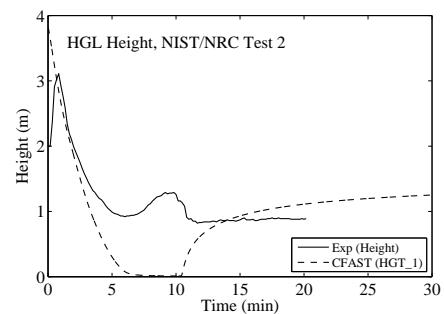
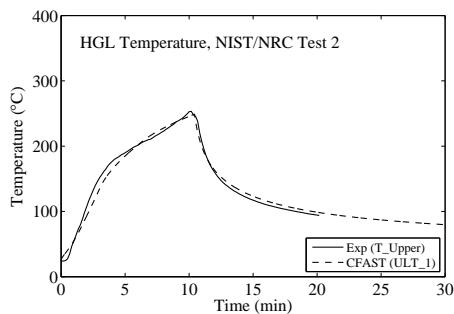
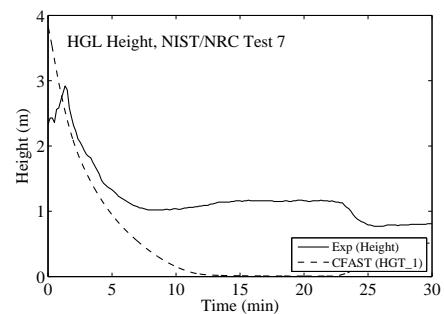
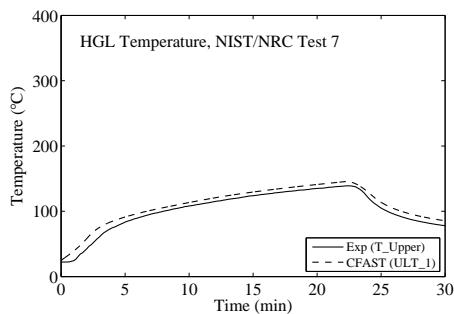
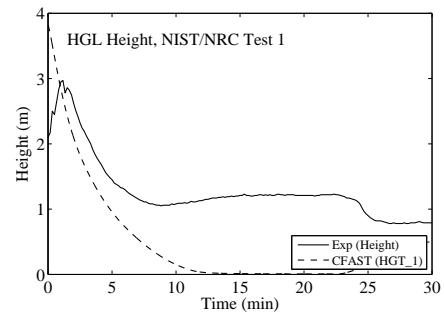
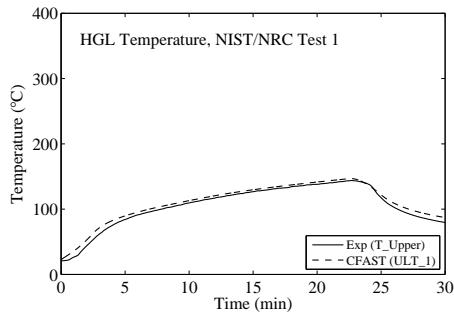


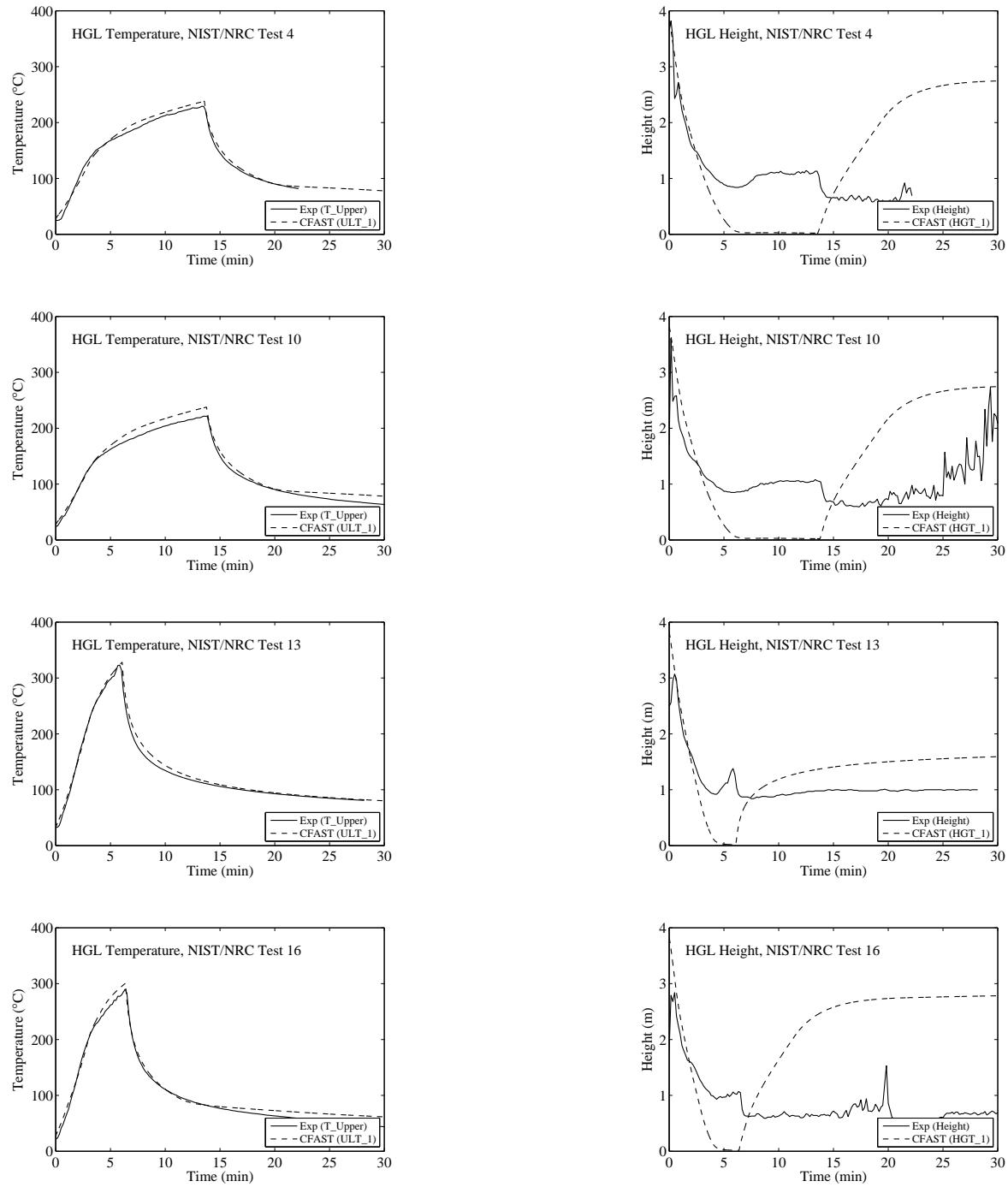
NBS MULTI-COMPARTMENT TEST SERIES

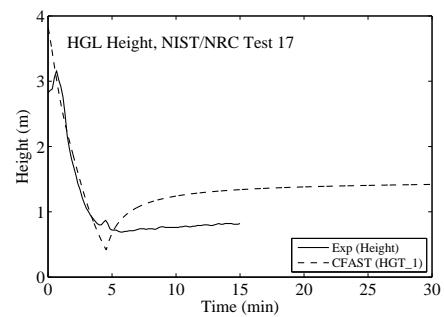
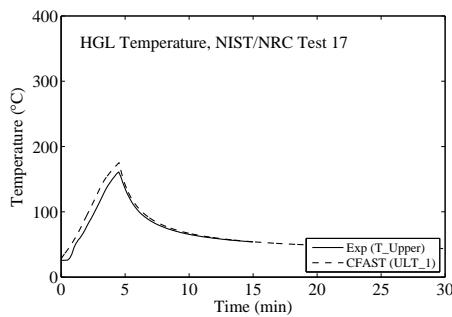


B.5 NIST/NRC Test Series

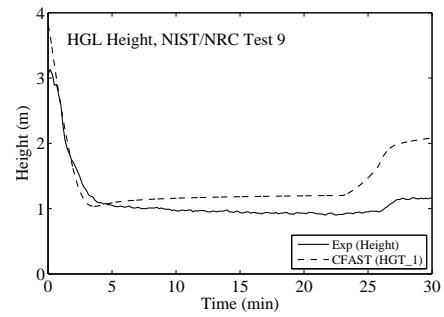
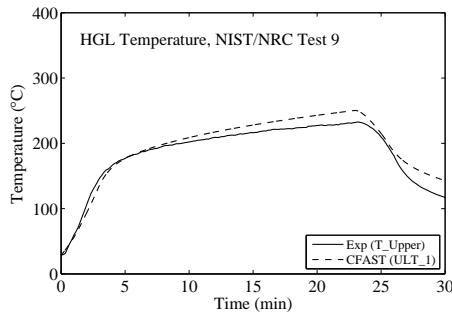
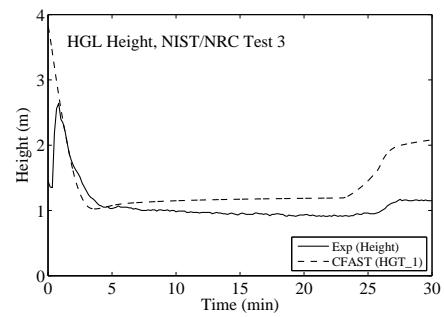
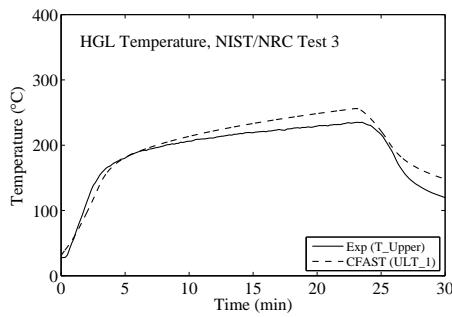
B.5.1 HGL Temperature and Depth

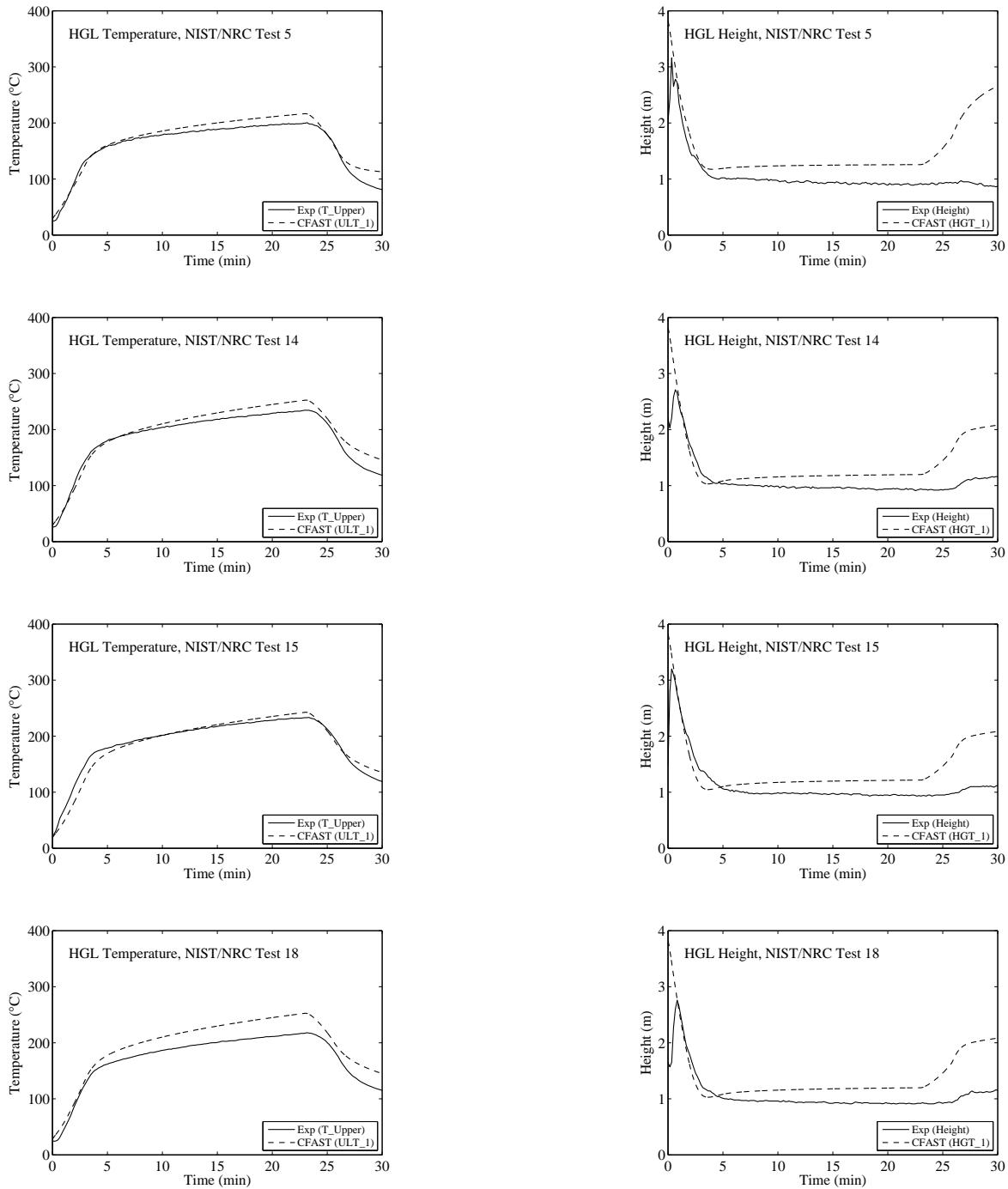




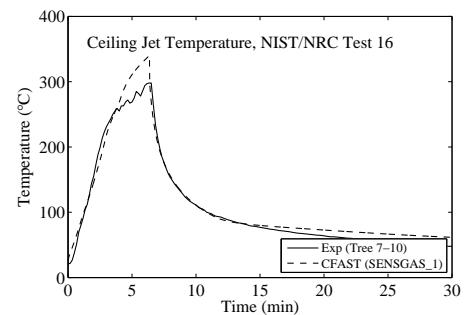
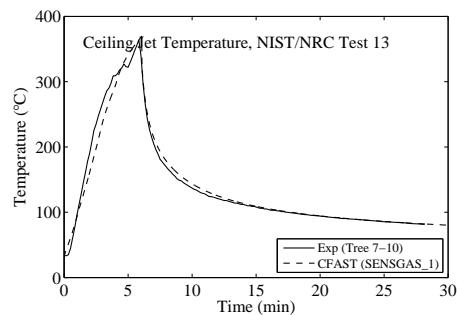
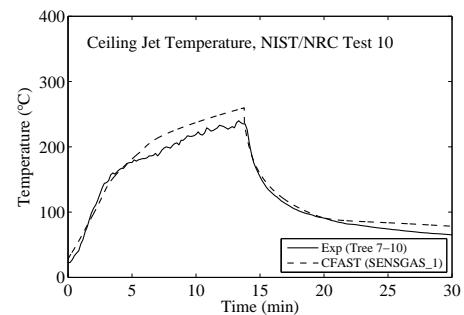
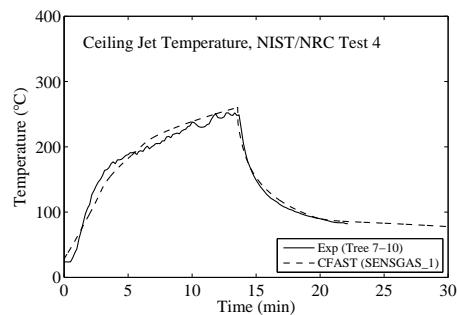
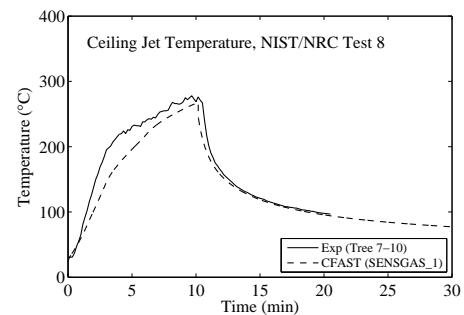
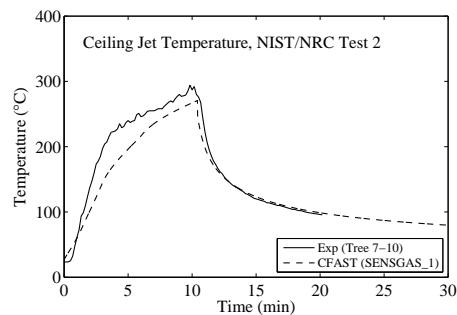
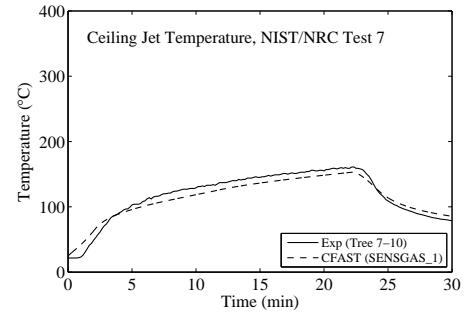
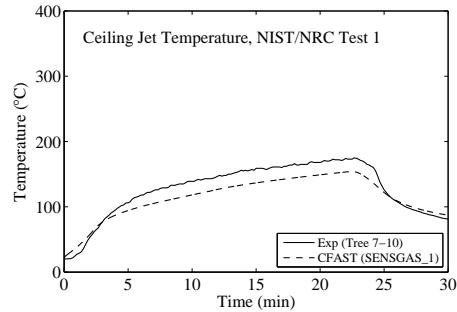


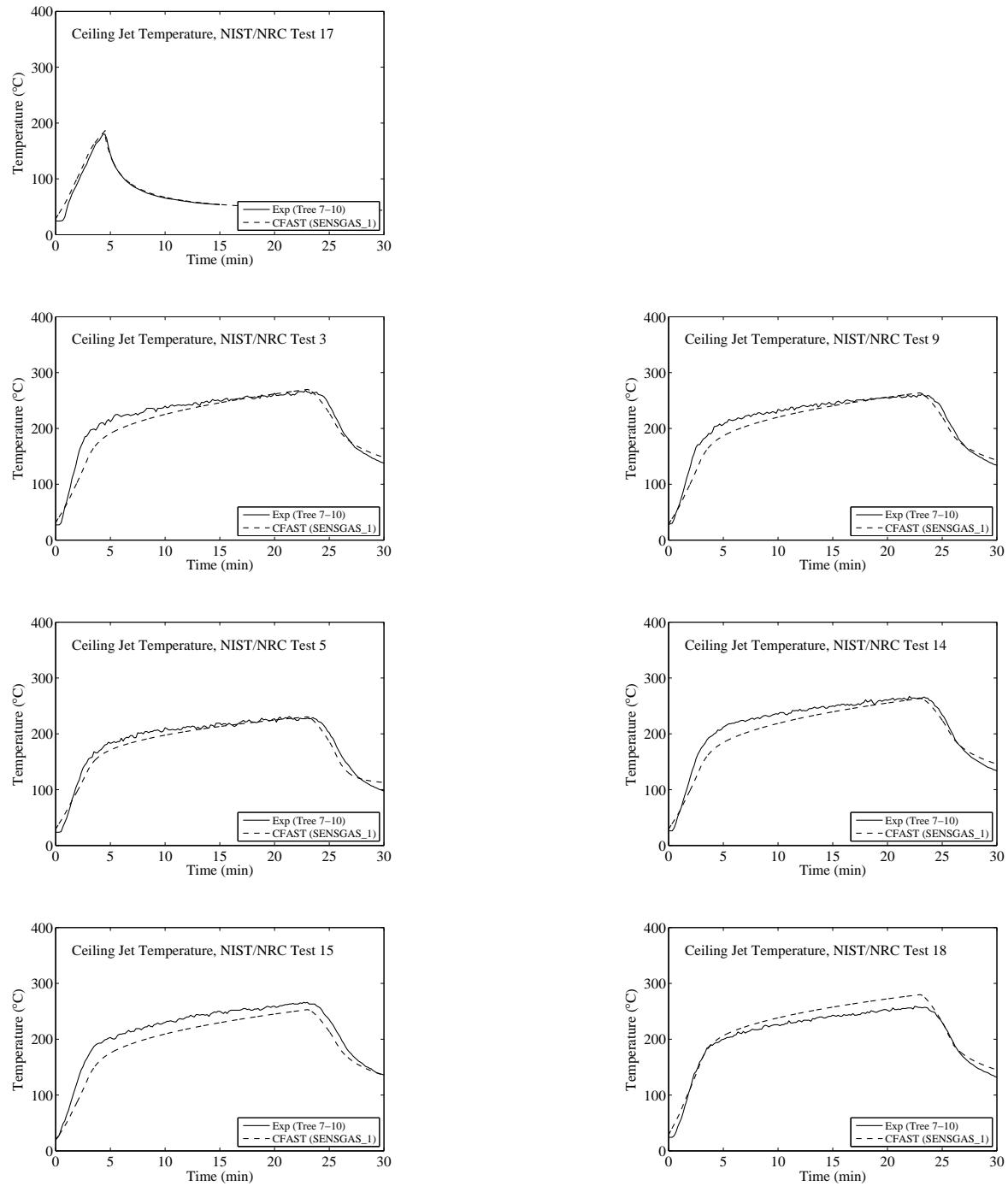
Open Door Tests to follow



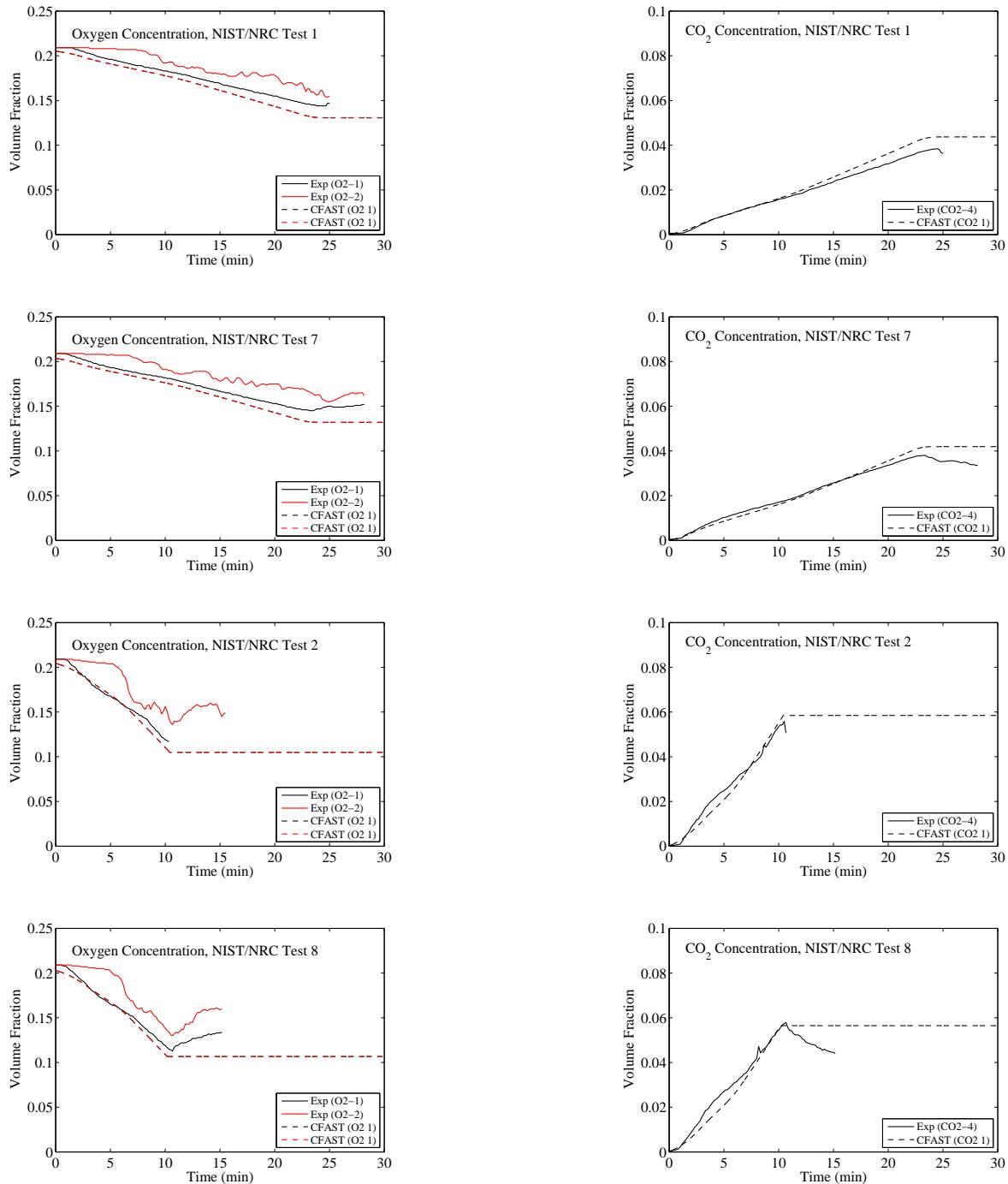


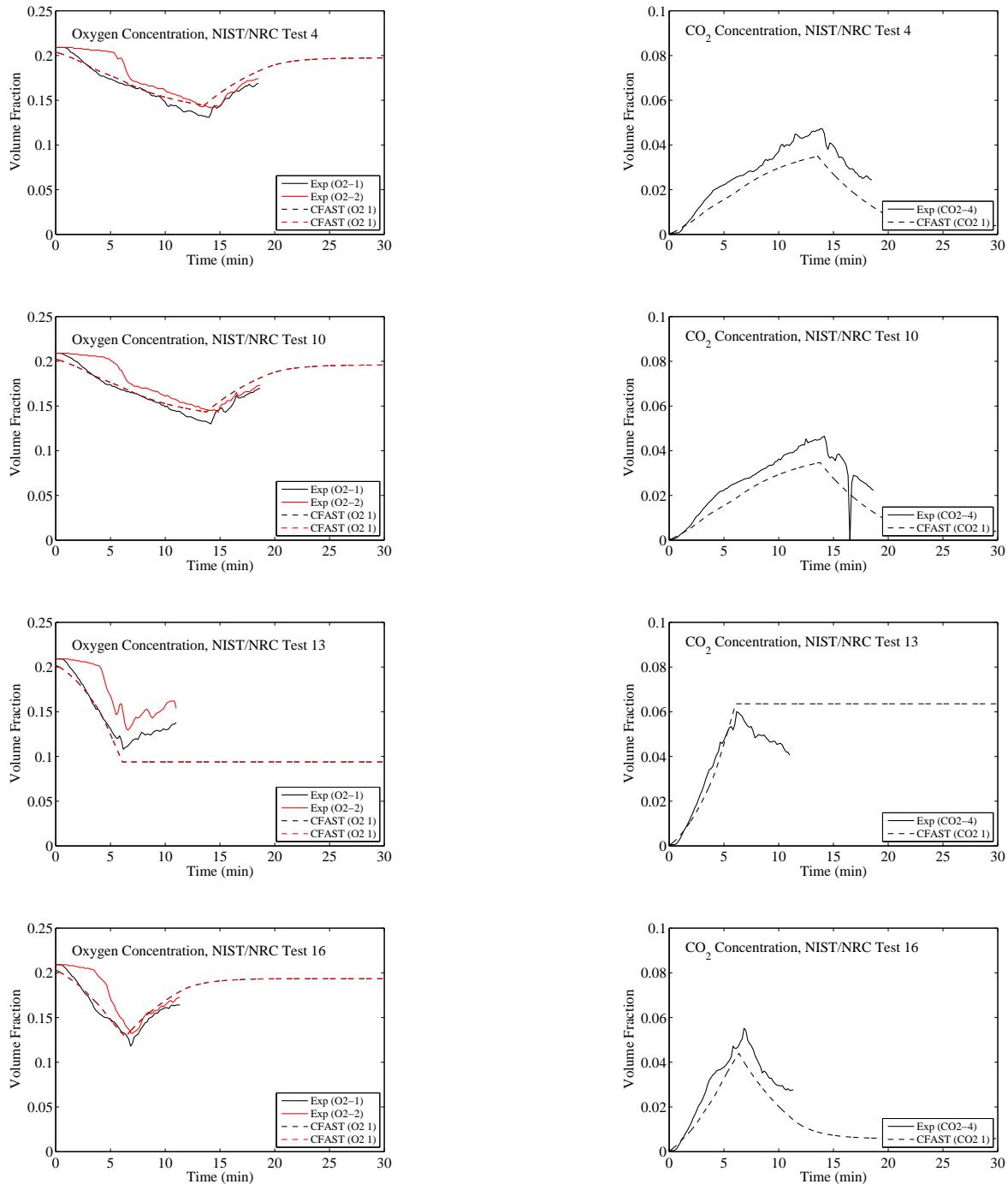
B.5.2 Ceiling Jet Temperature

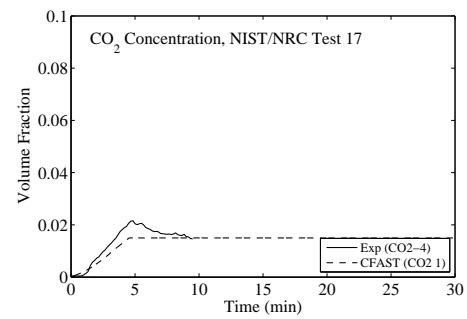
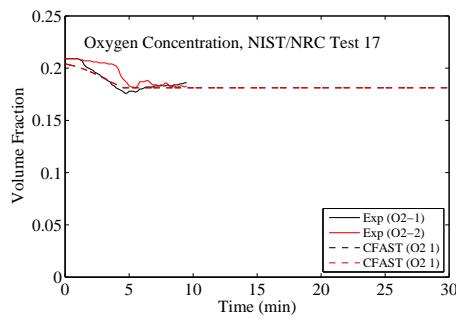




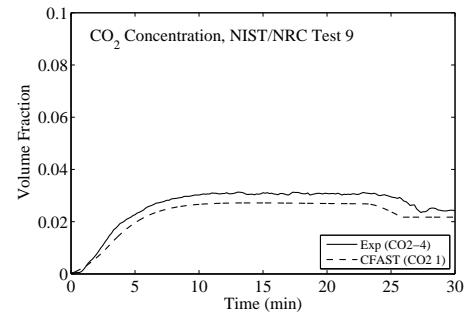
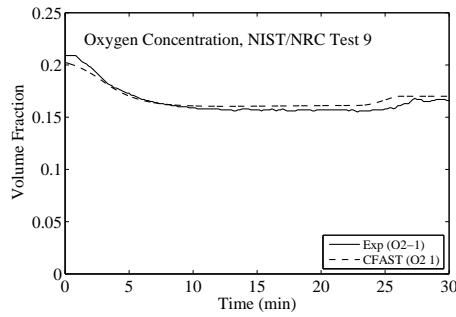
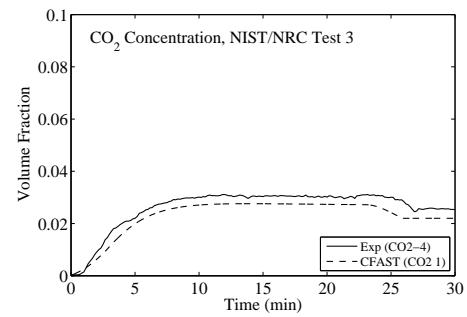
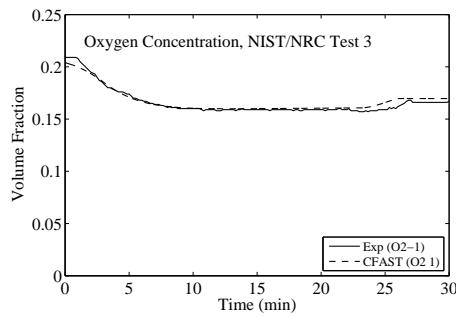
B.5.3 Oxygen and Carbon Dioxide Concentration

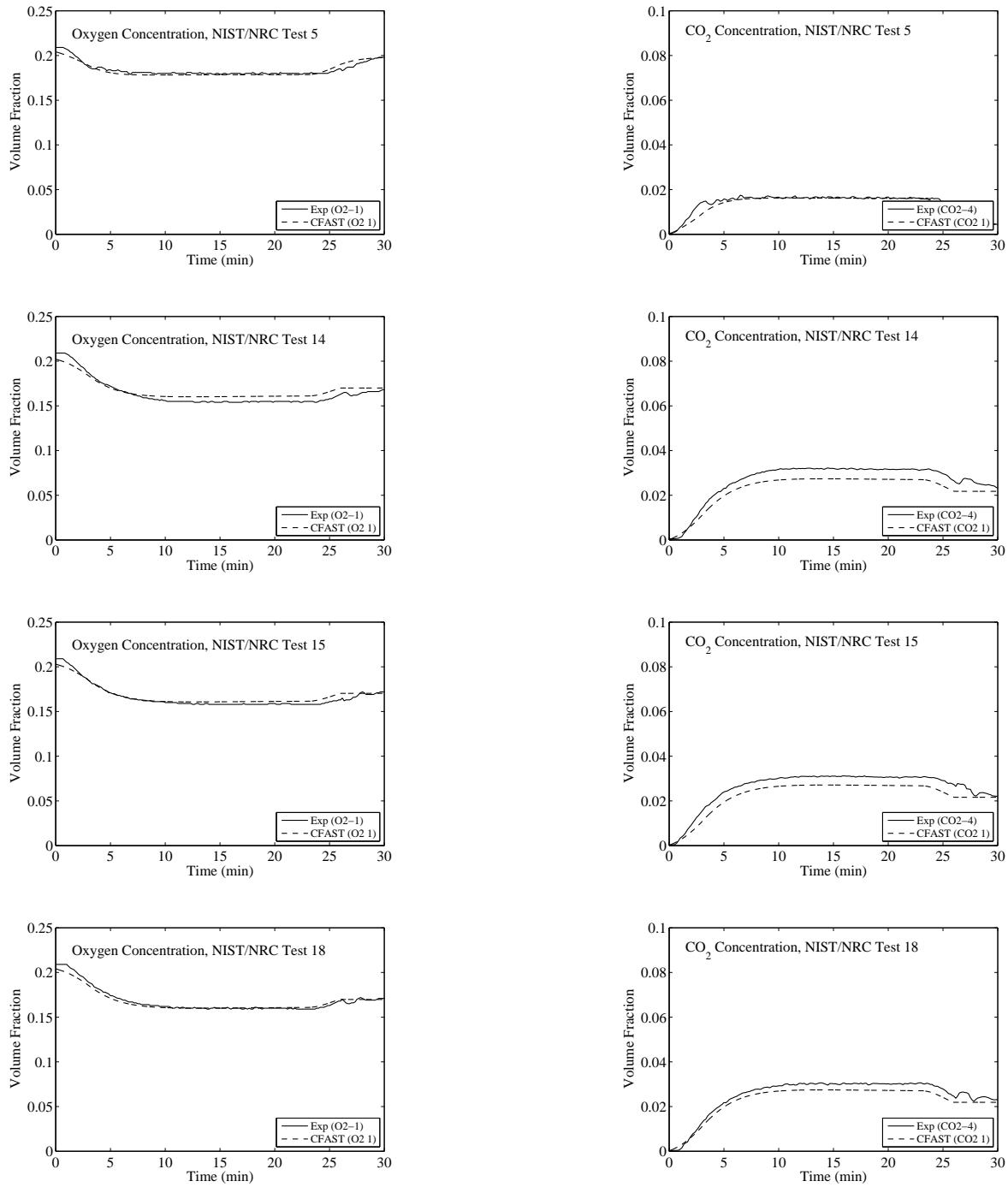




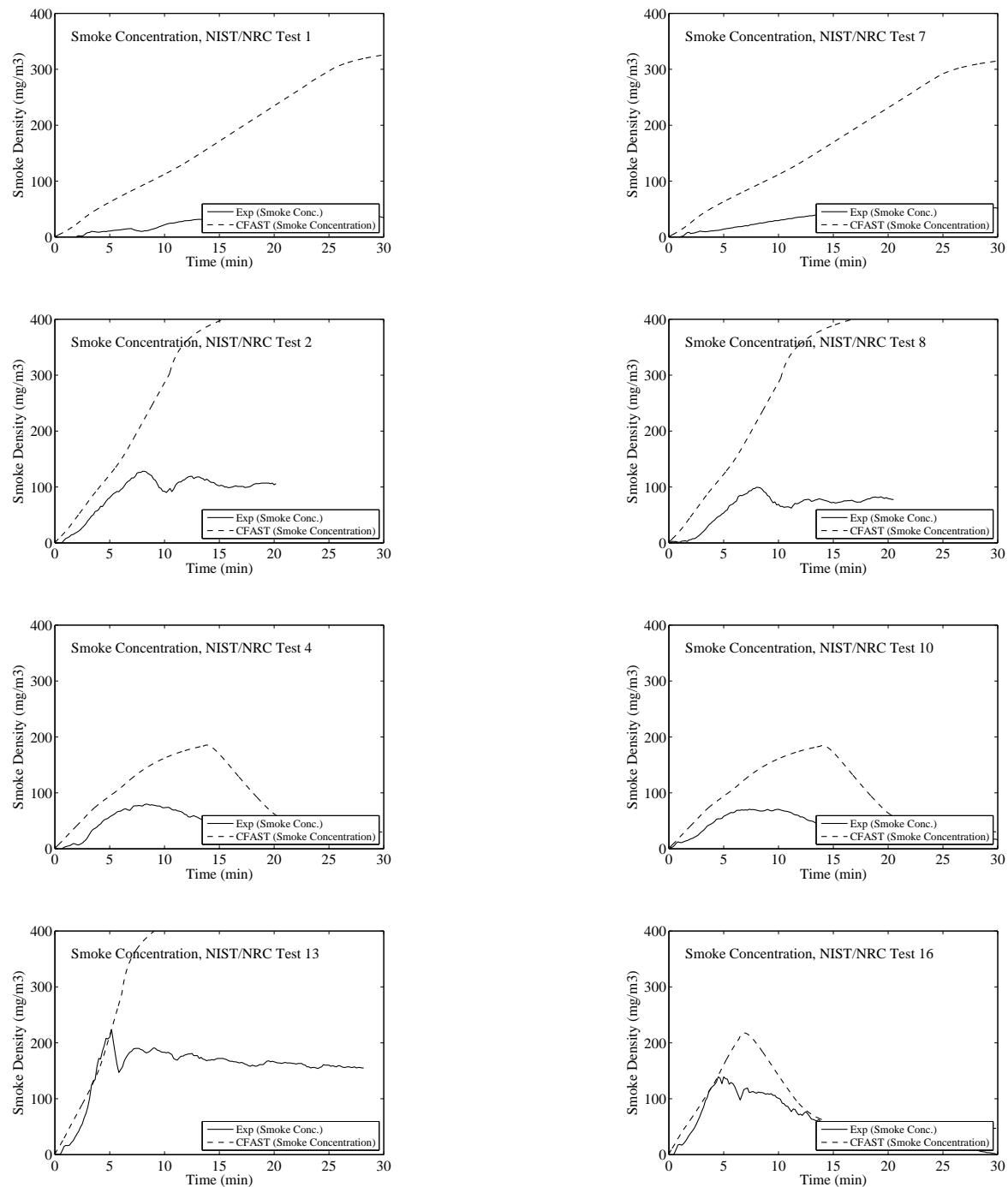


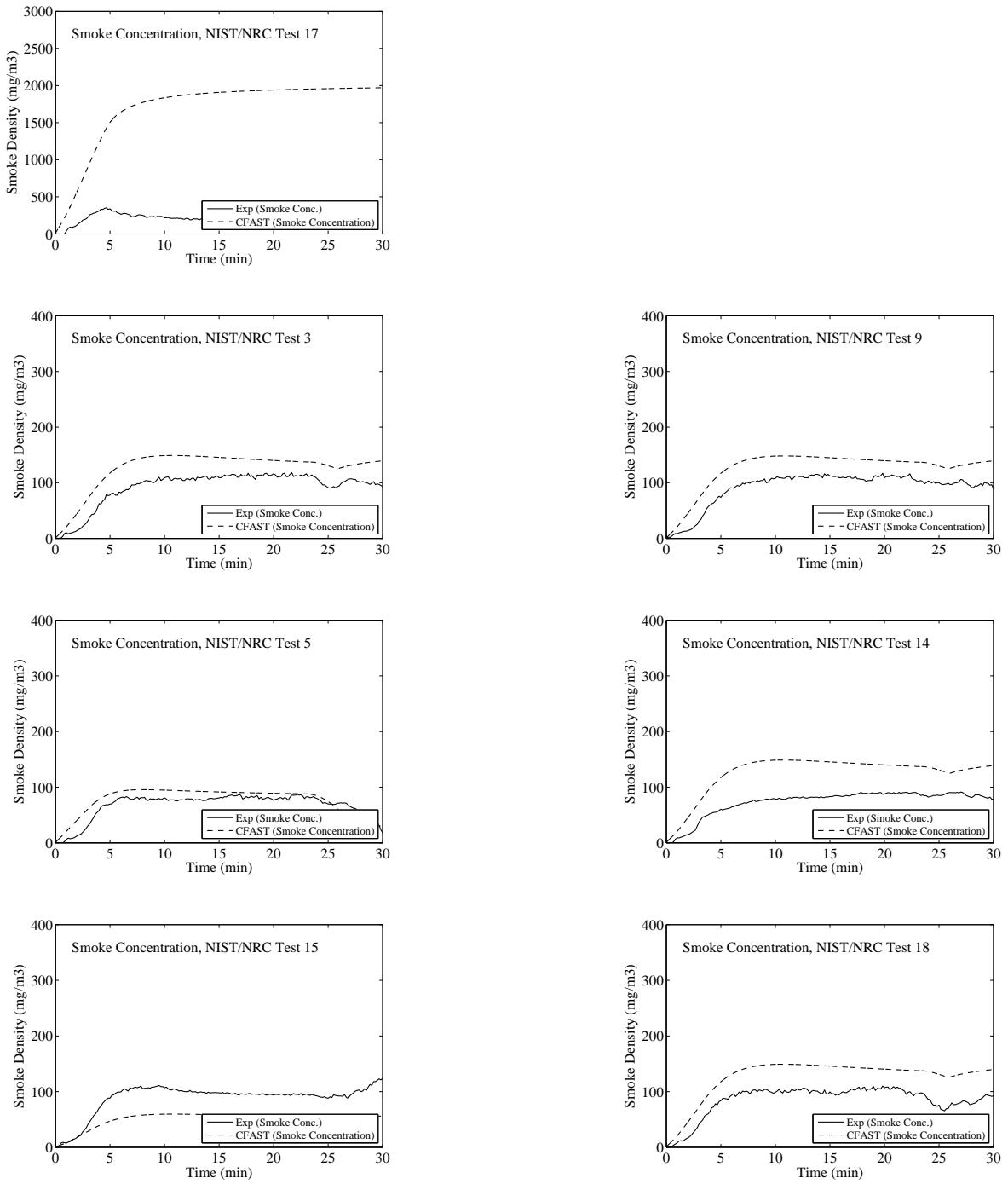
Open Door Tests to follow



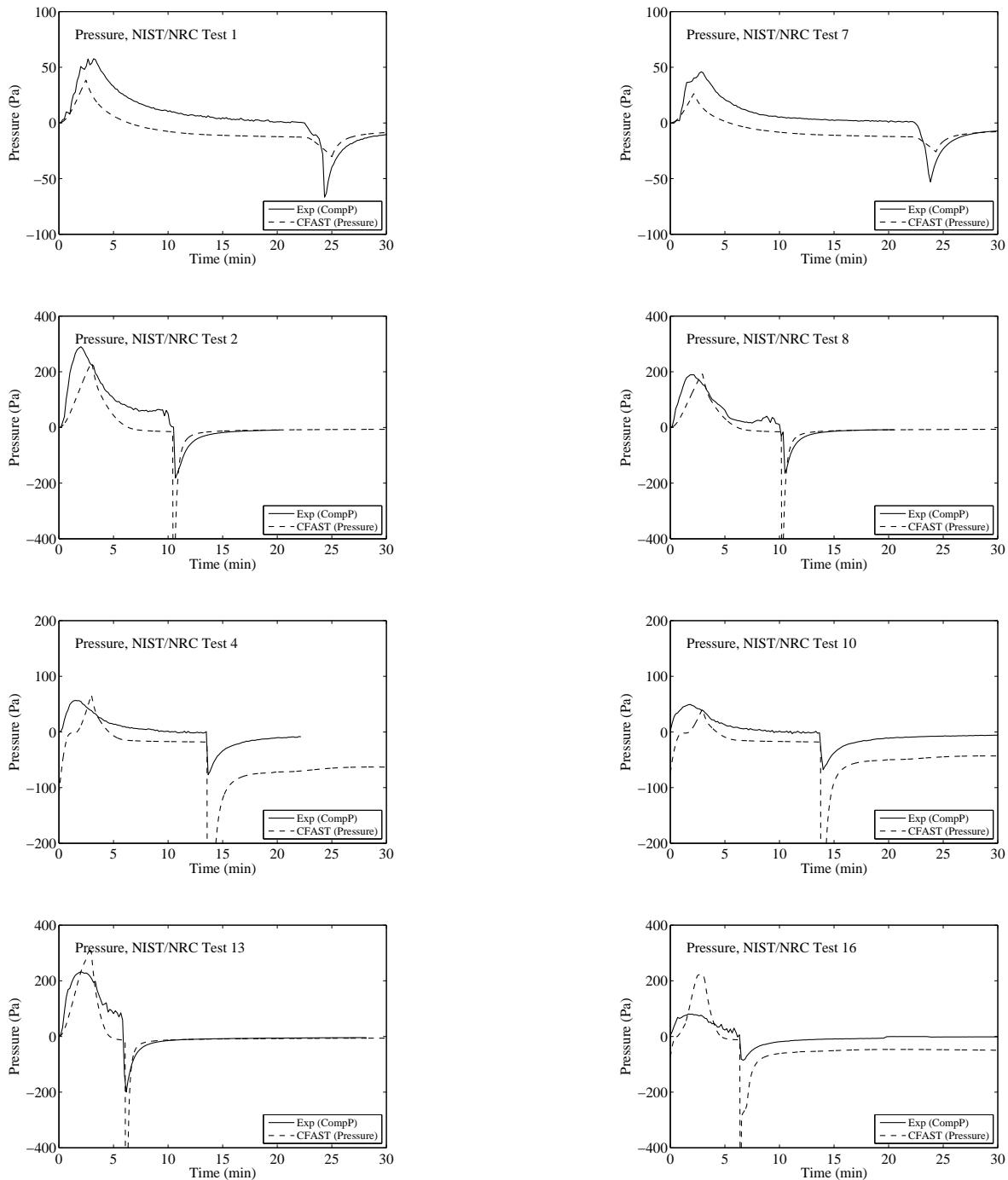


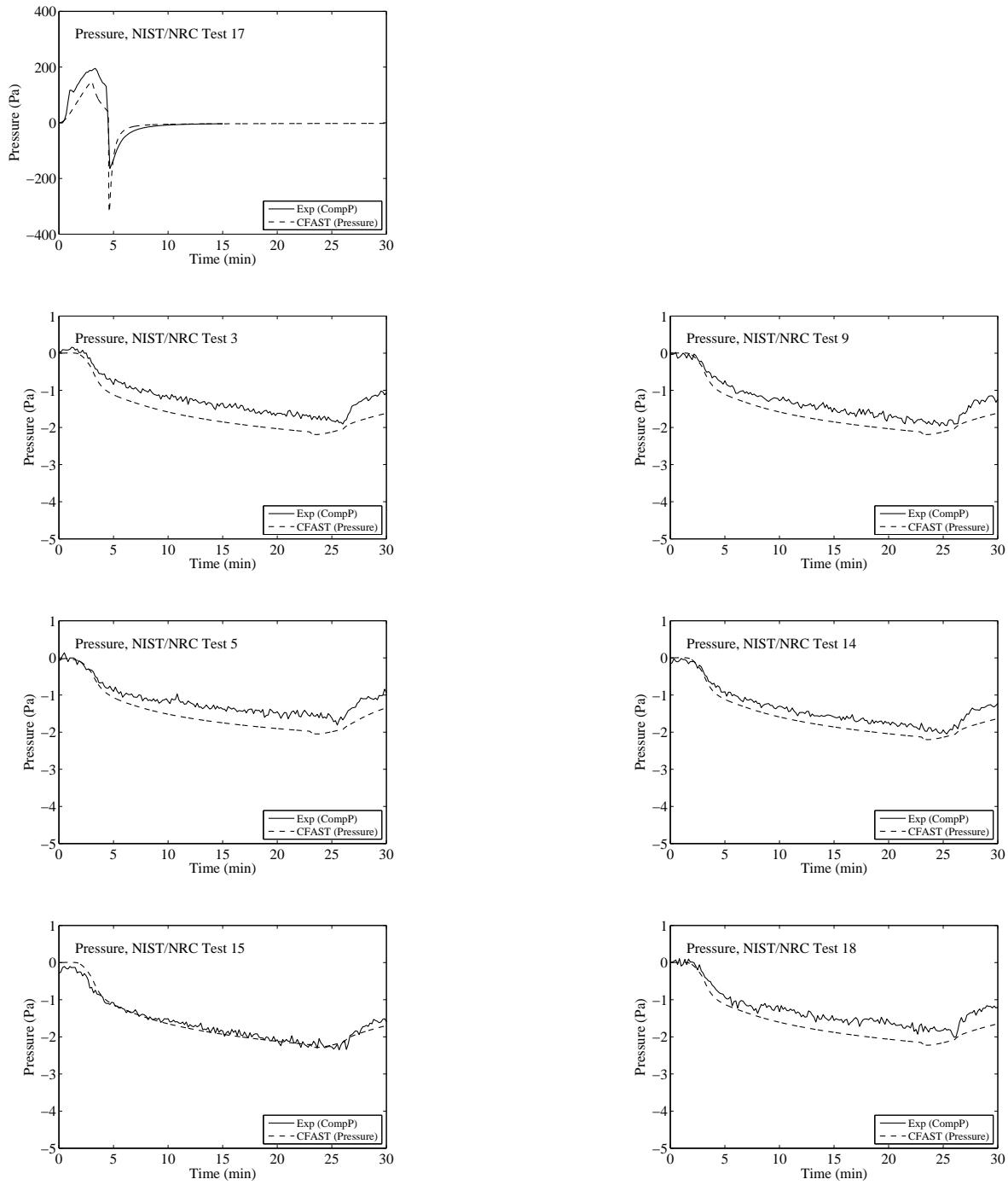
B.5.4 Smoke Concentration



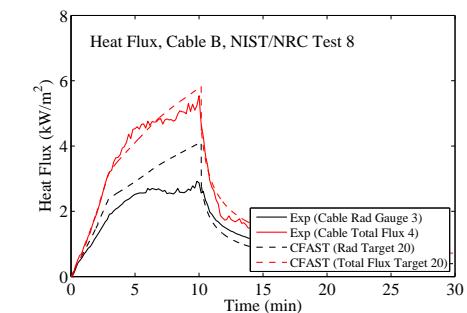
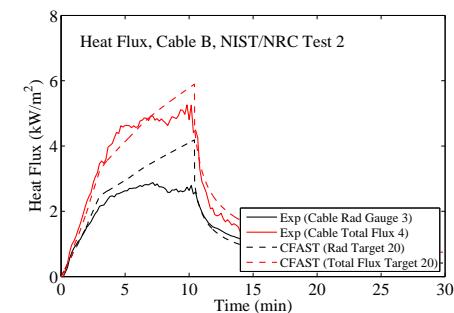
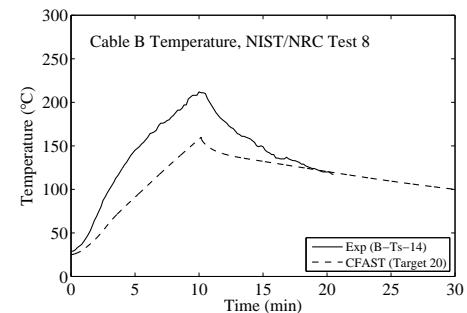
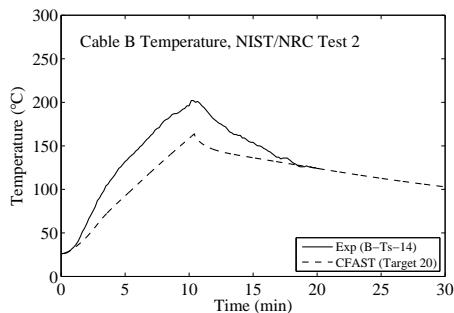
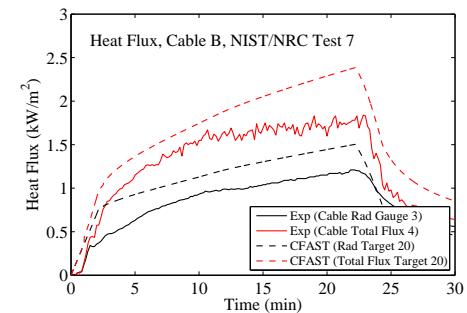
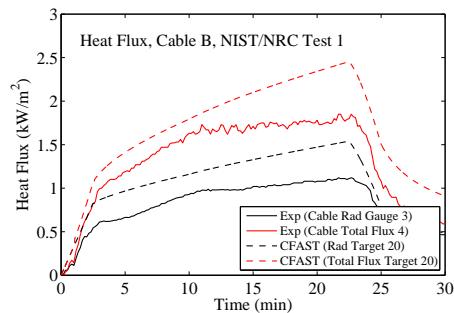
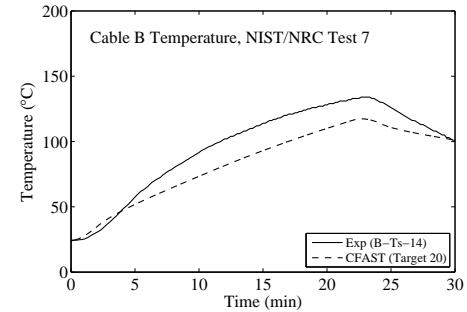
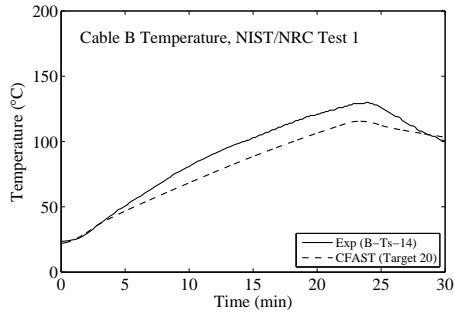


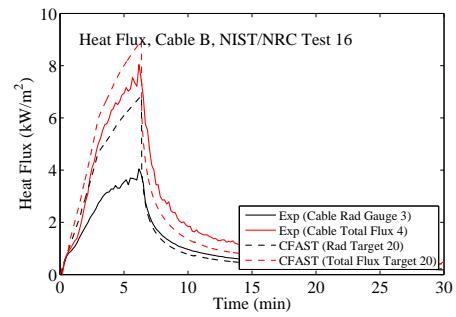
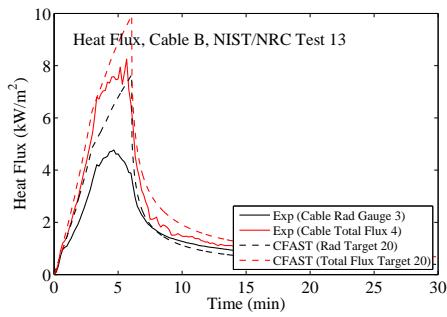
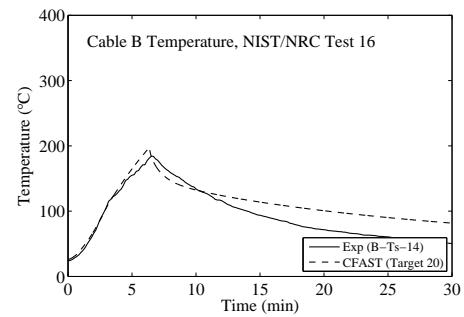
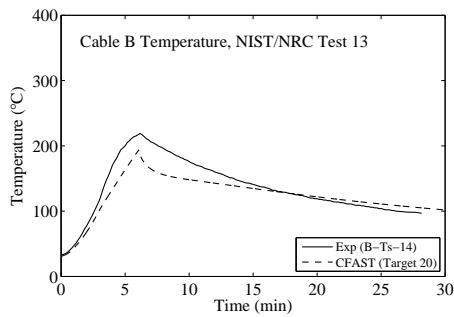
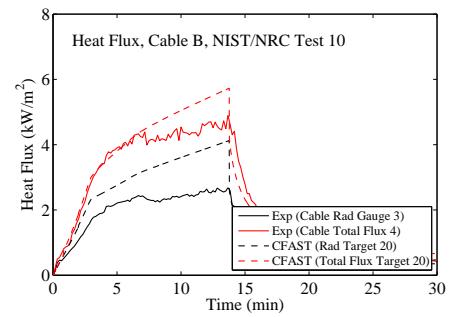
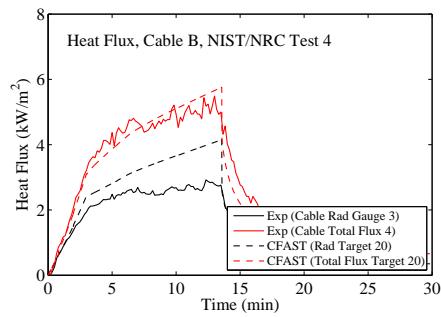
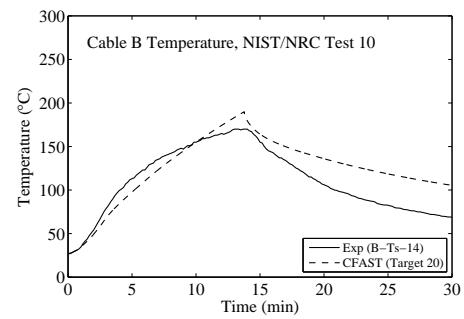
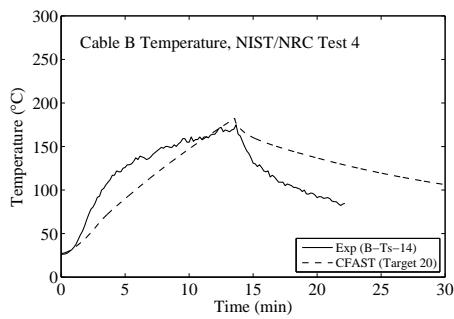
B.5.5 Pressure

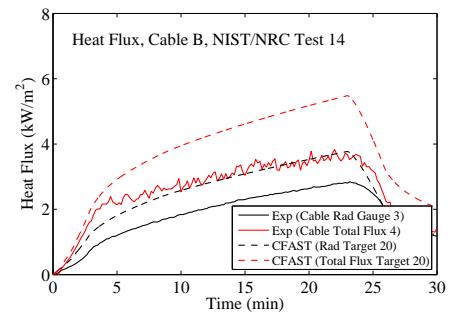
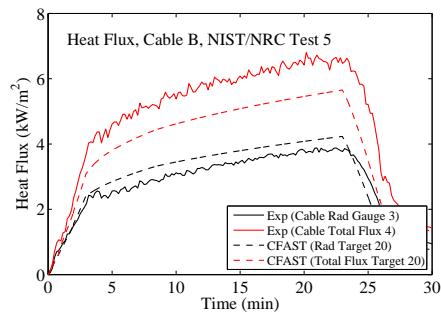
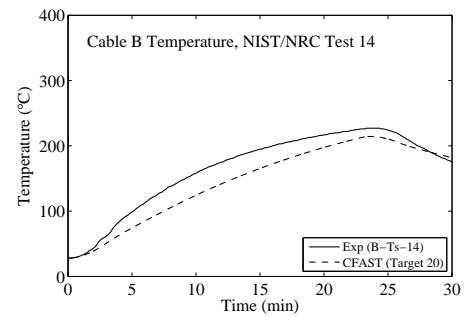
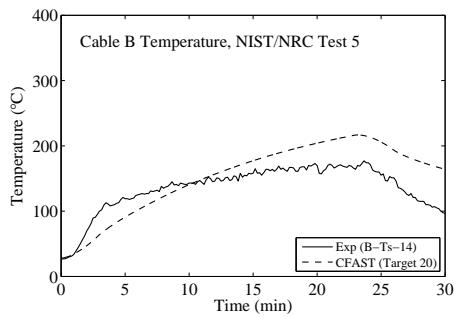
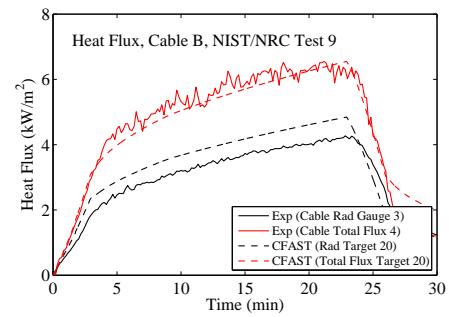
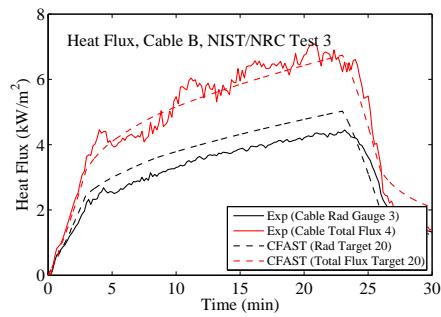
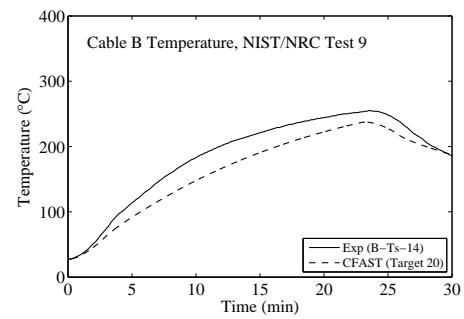
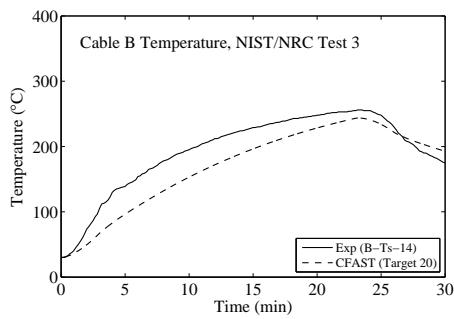


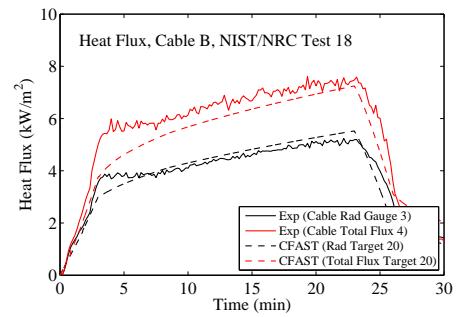
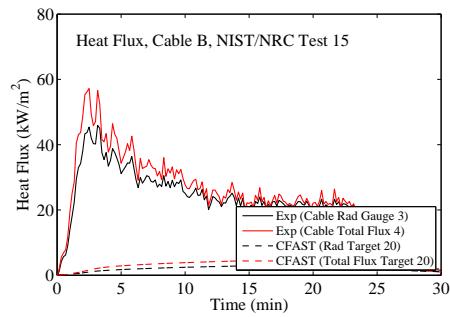
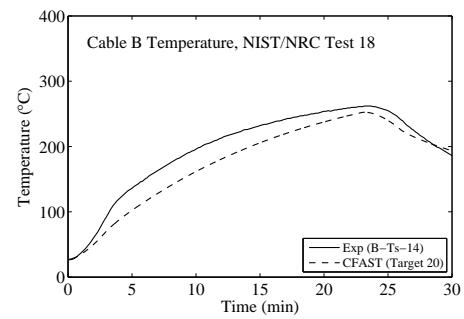
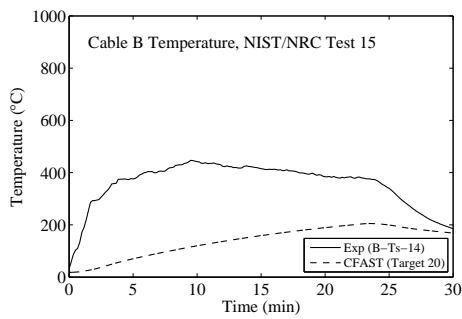


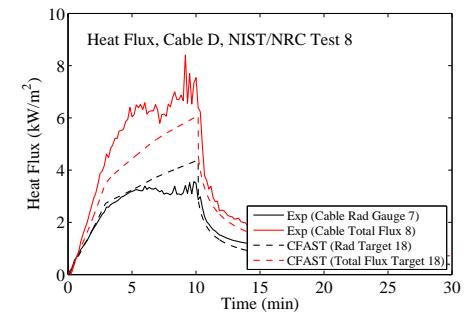
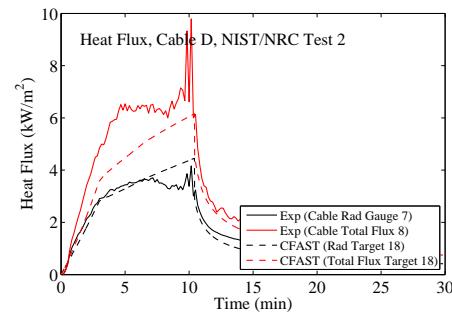
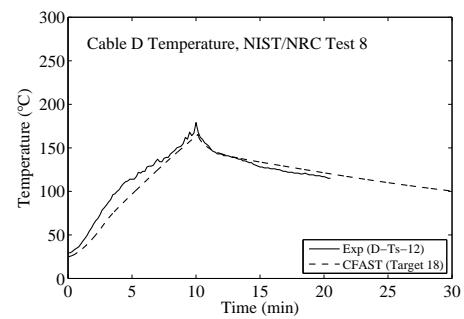
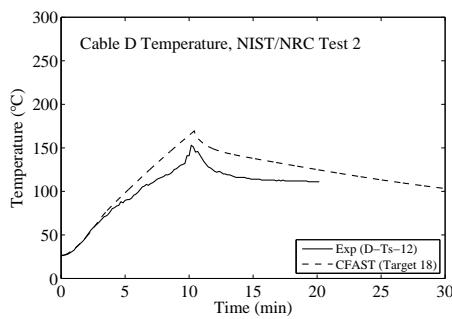
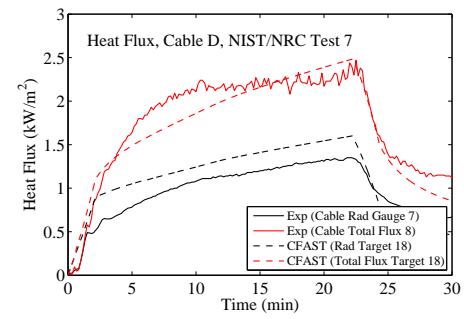
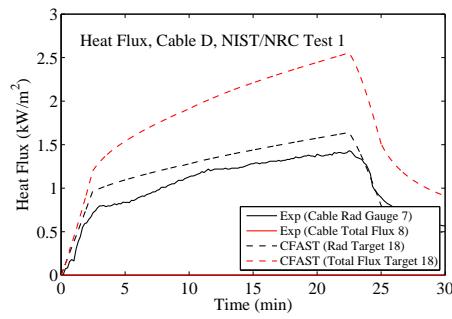
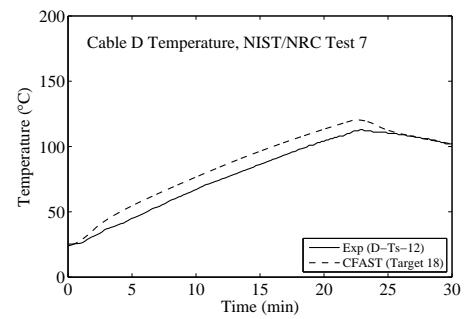
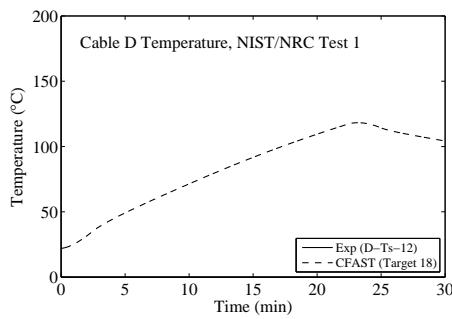
B.5.6 Target Temperature and Heat Flux

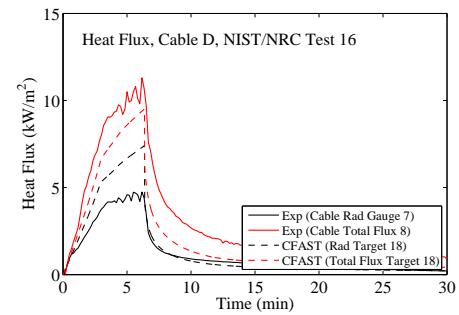
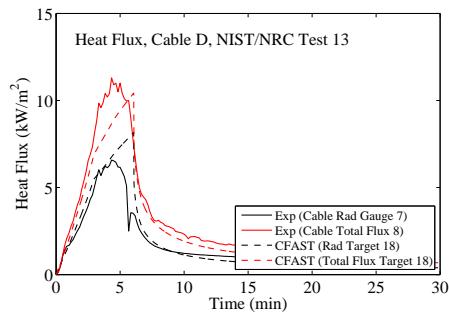
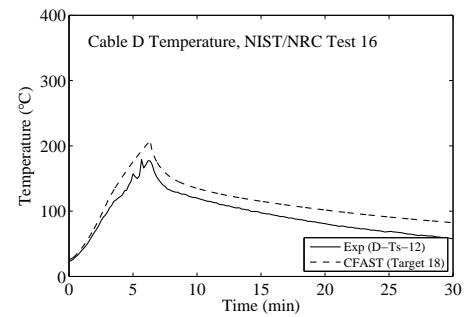
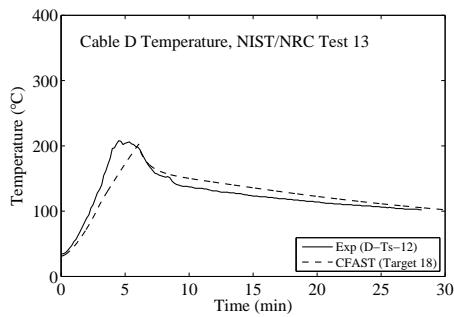
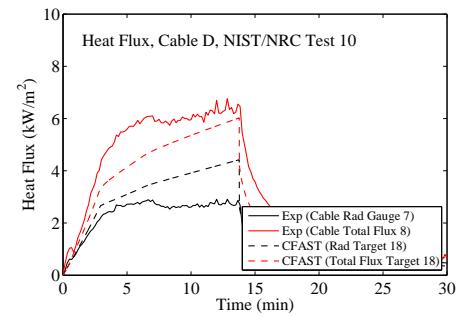
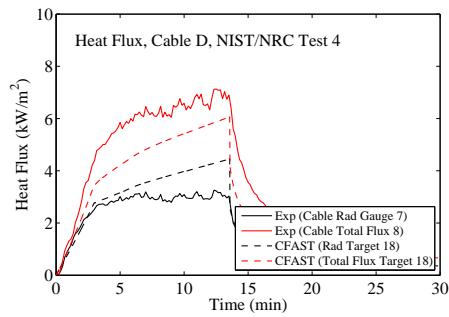
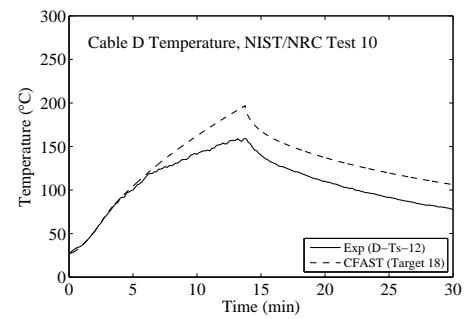
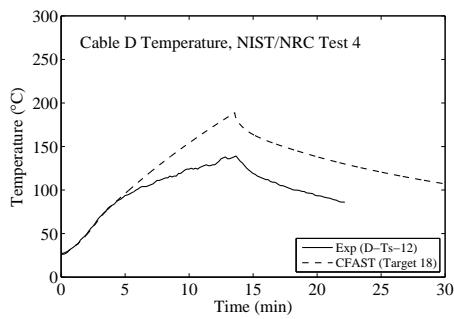


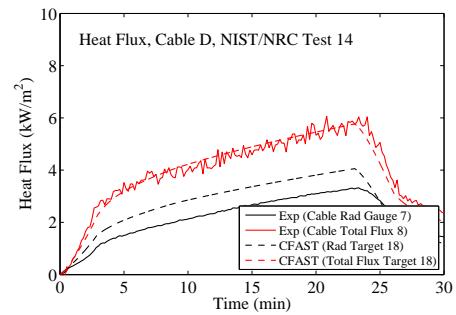
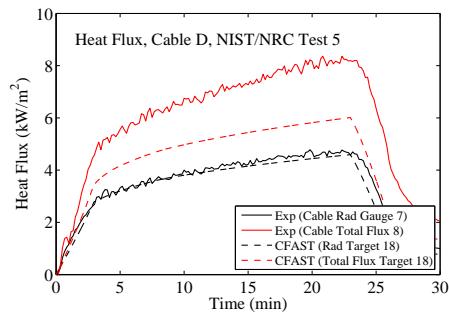
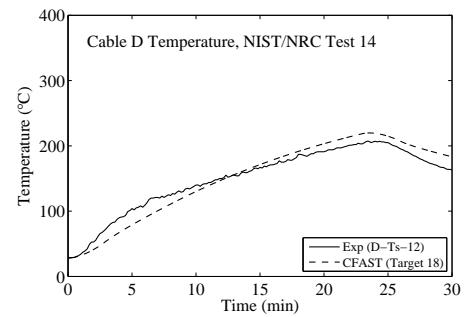
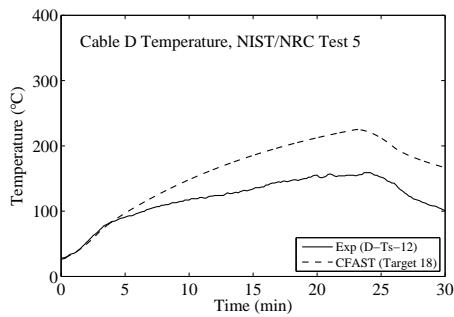
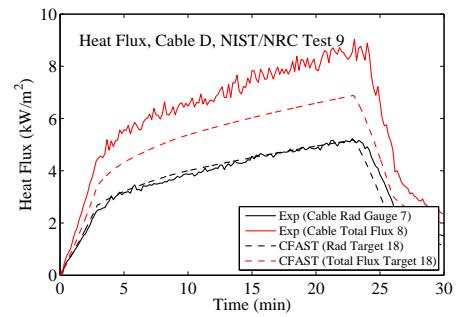
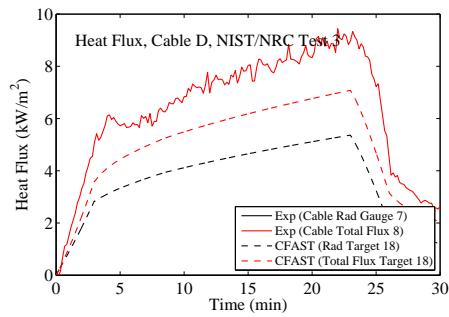
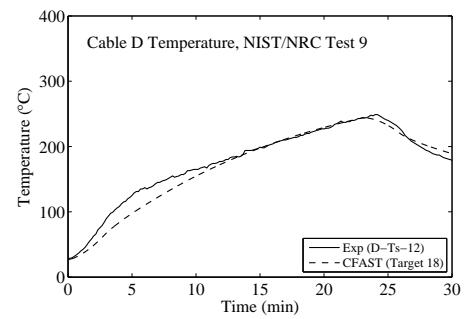
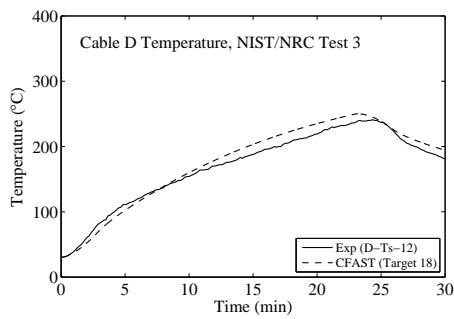


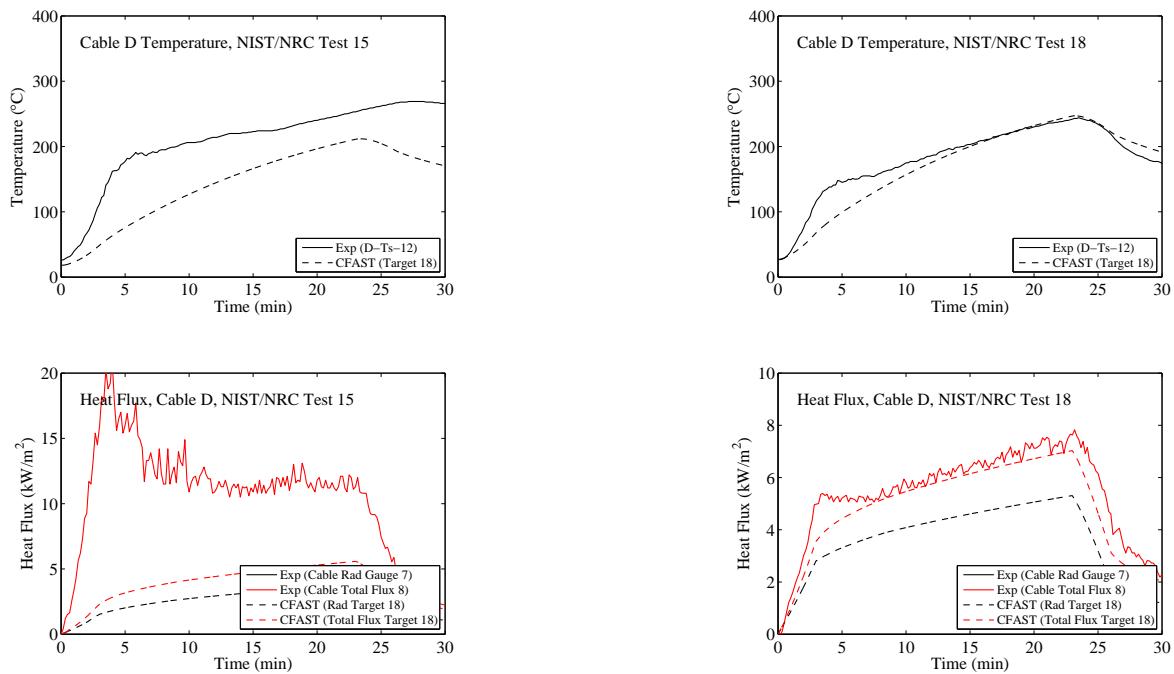


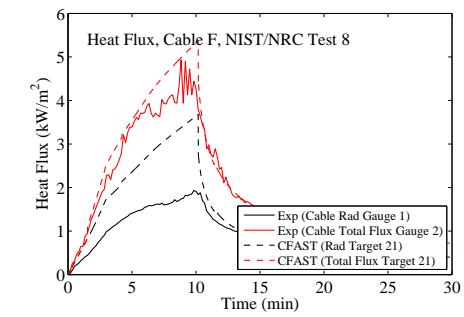
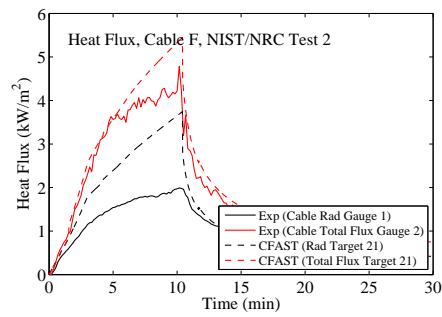
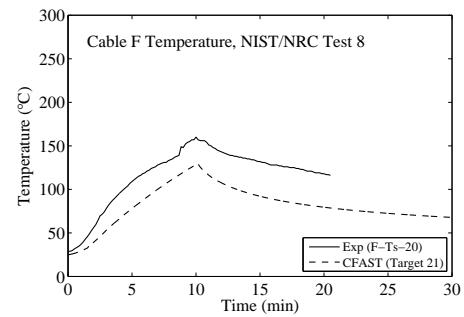
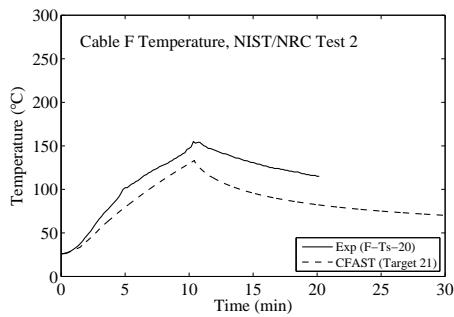
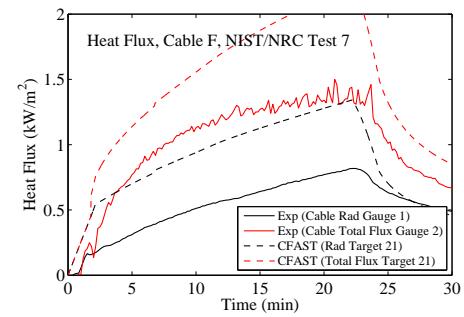
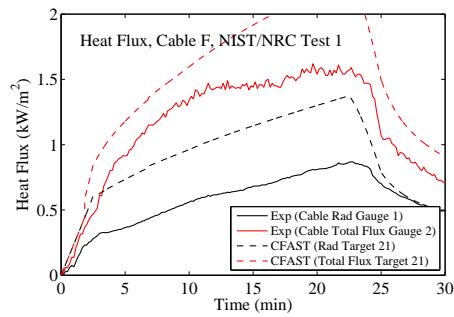
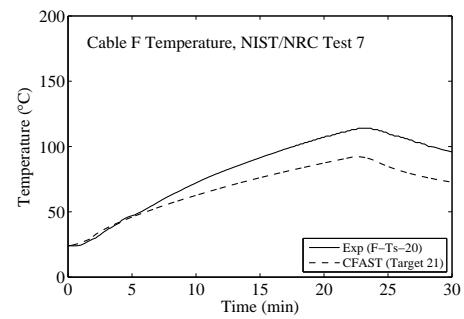
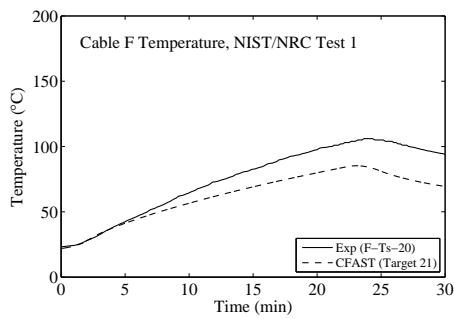


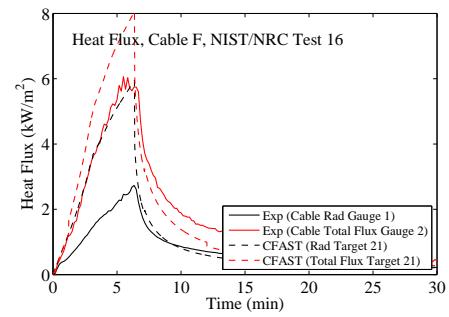
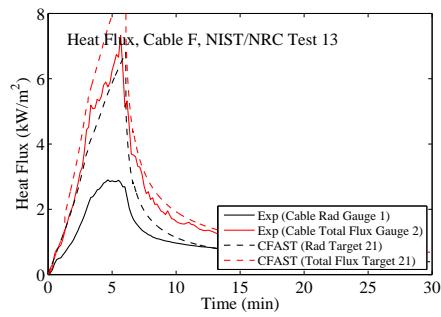
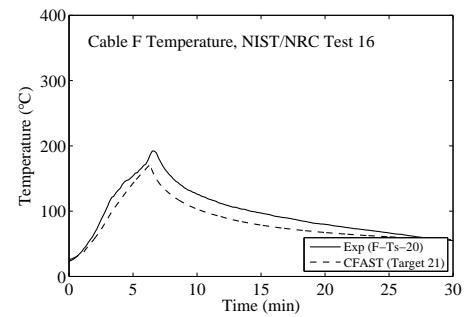
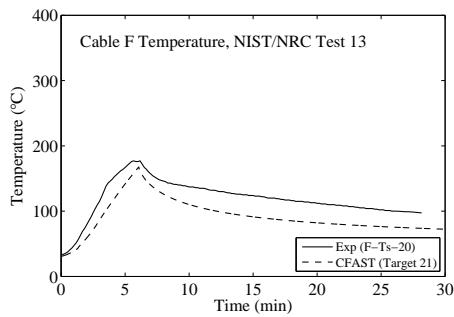
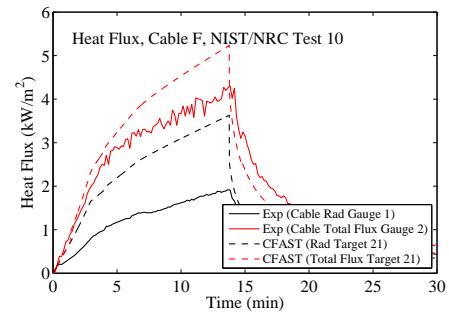
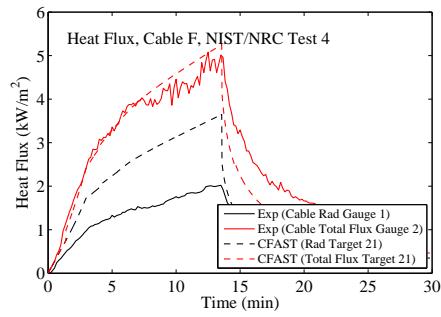
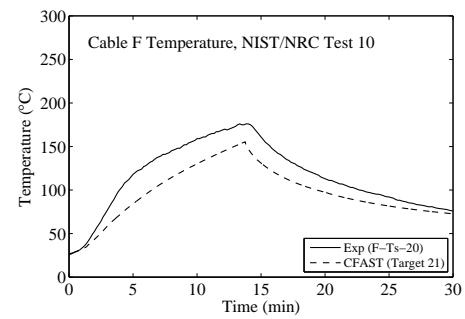
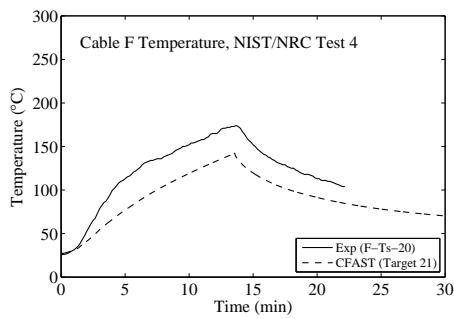


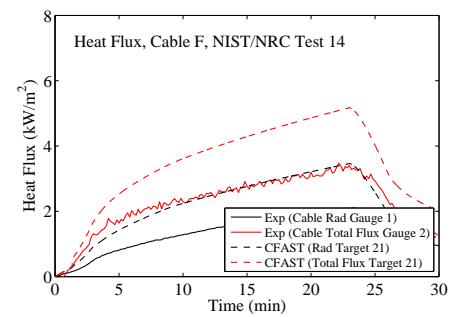
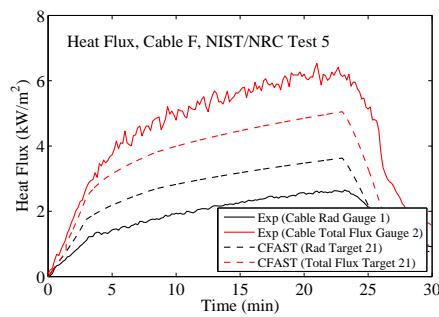
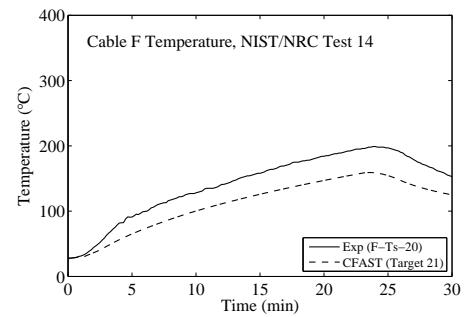
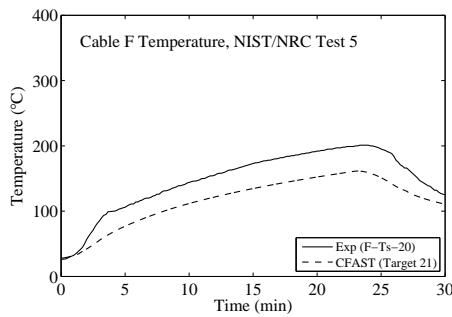
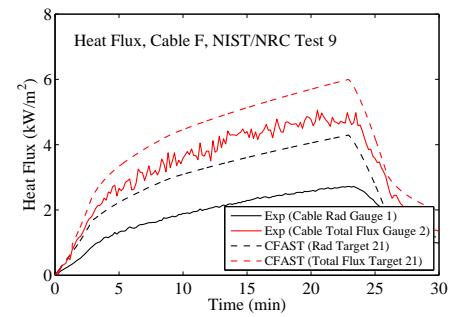
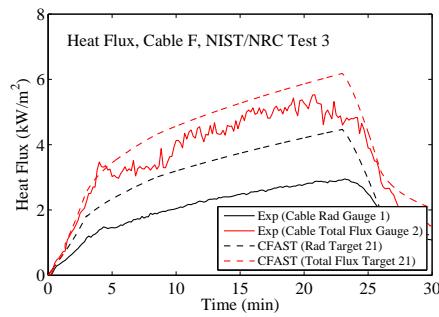
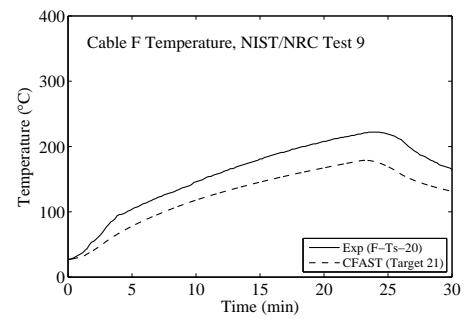
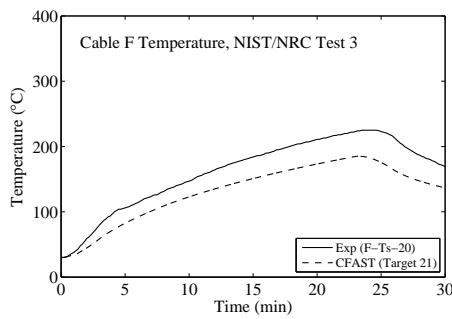


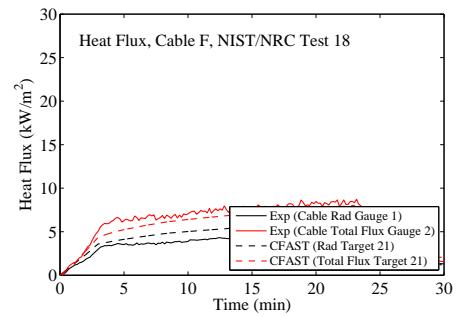
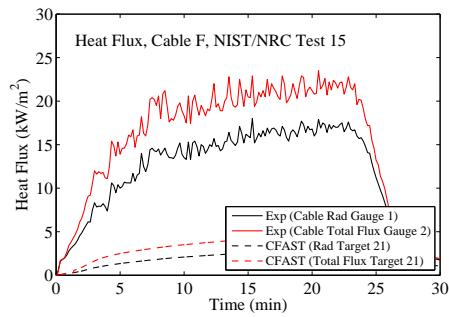
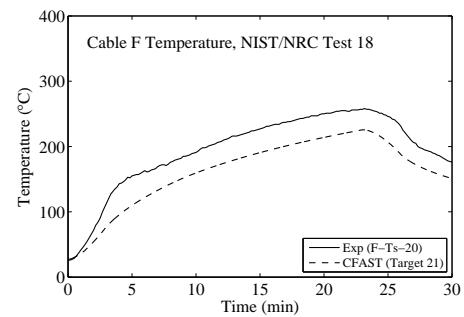
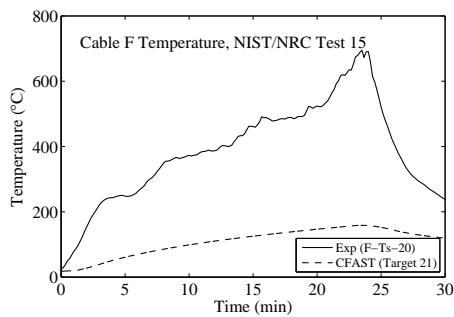


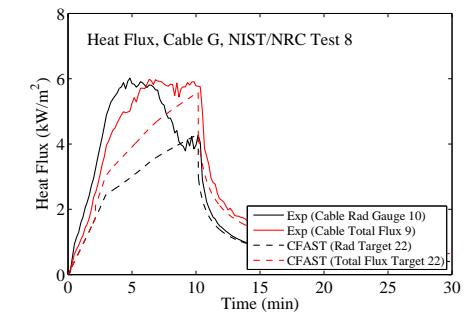
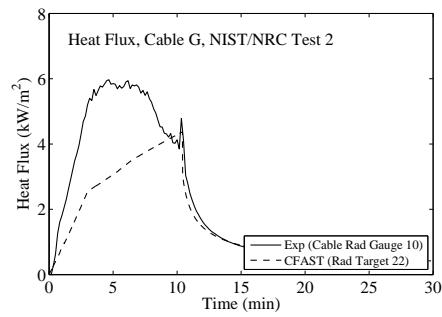
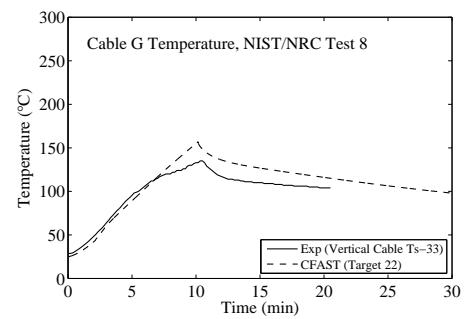
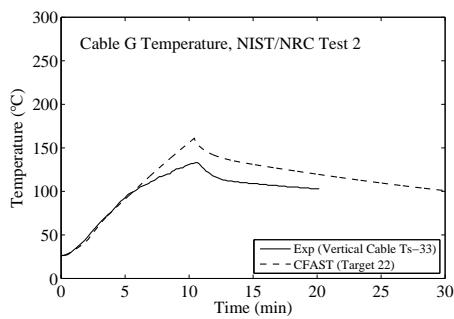
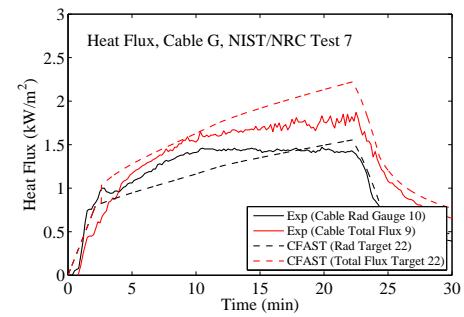
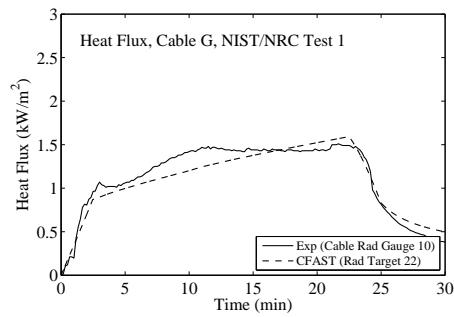
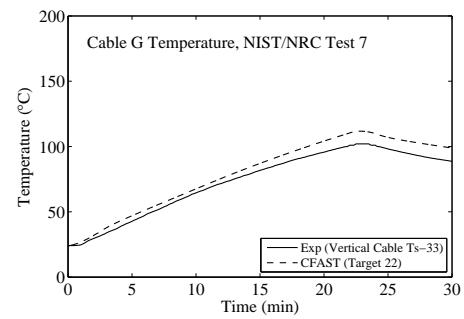
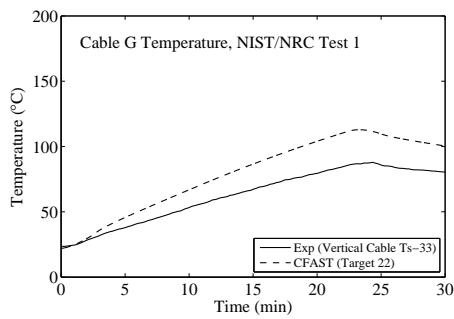


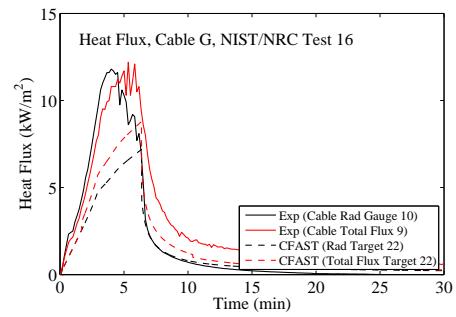
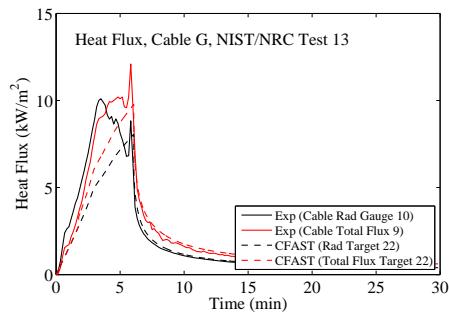
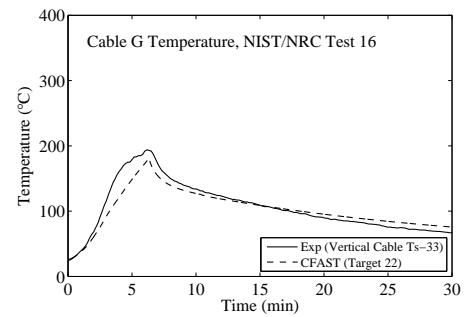
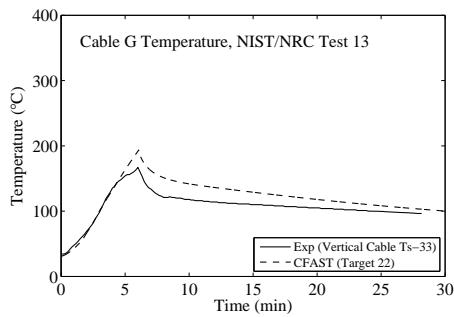
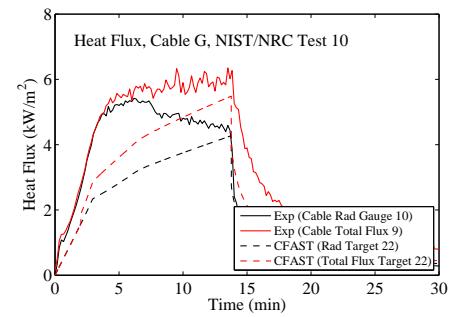
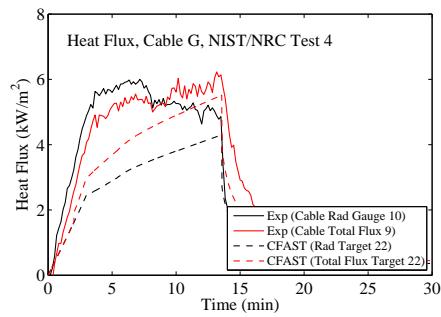
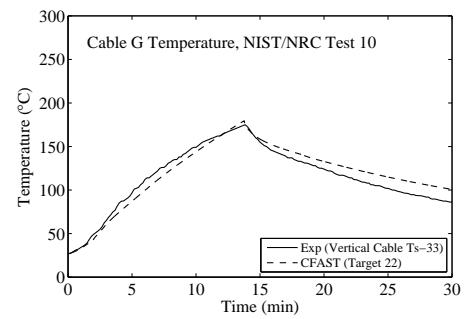
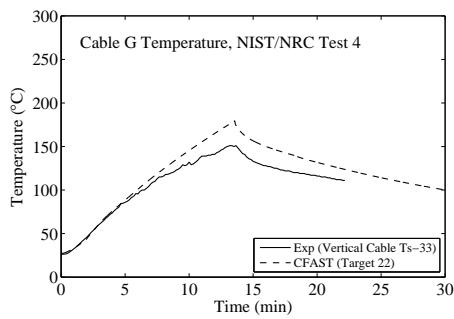


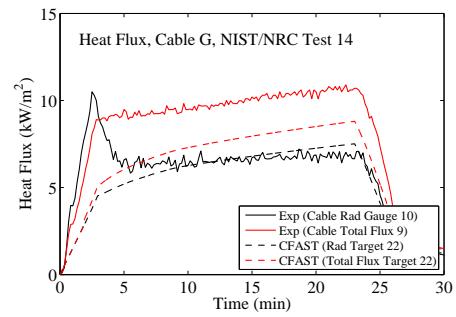
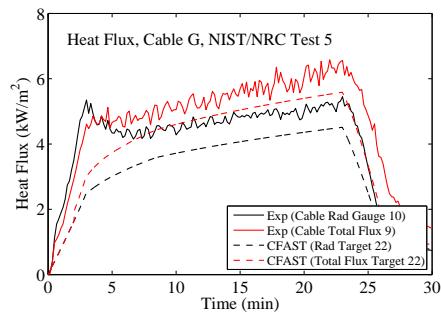
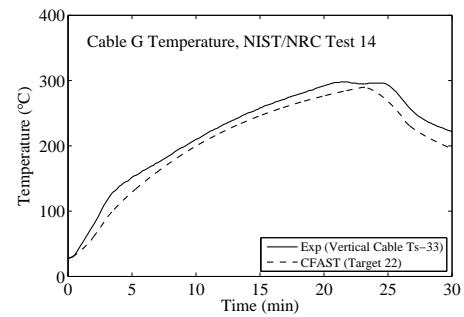
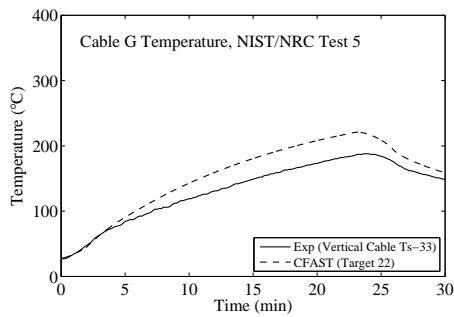
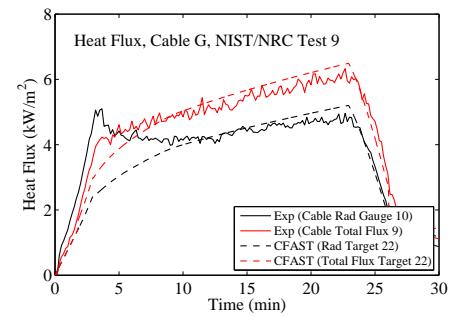
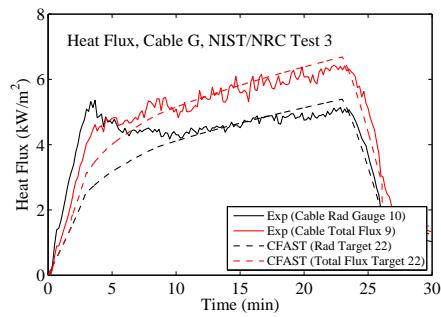
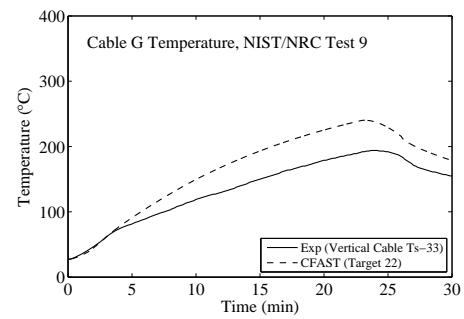
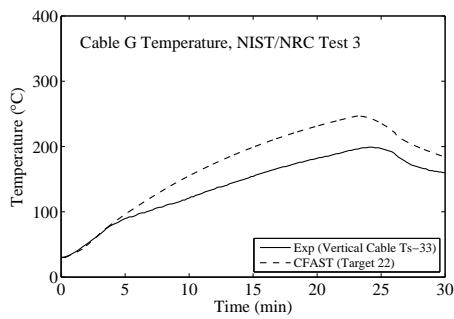


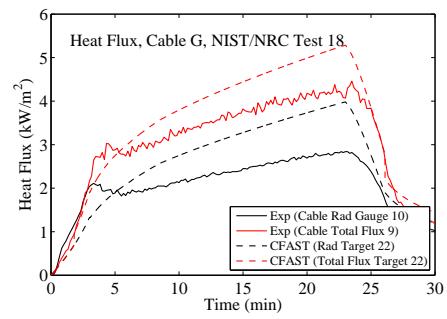
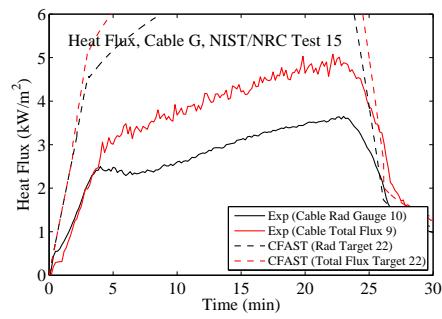
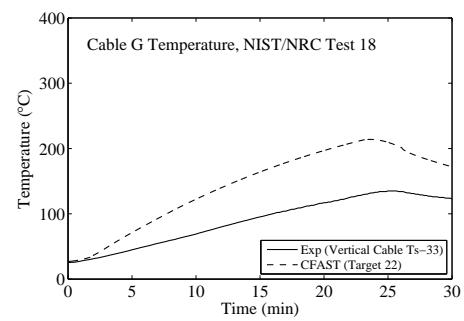
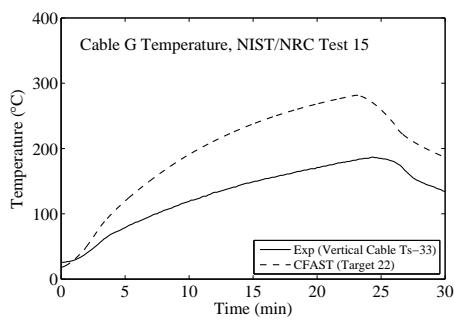




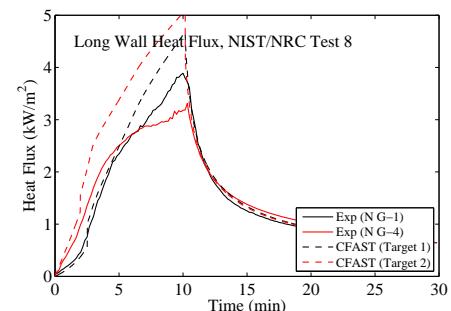
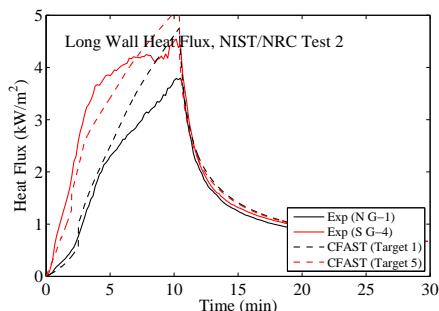
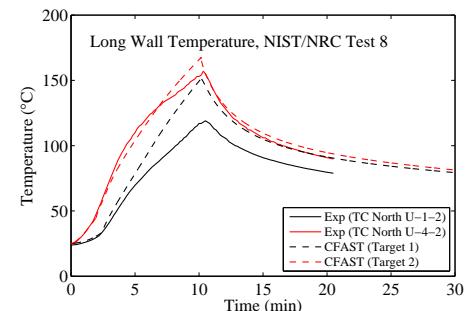
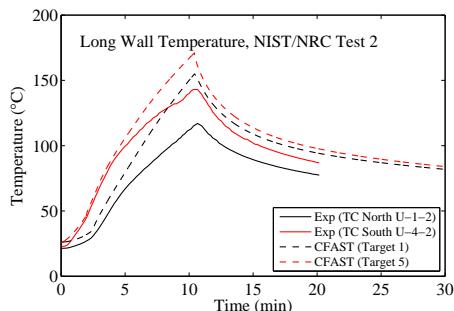
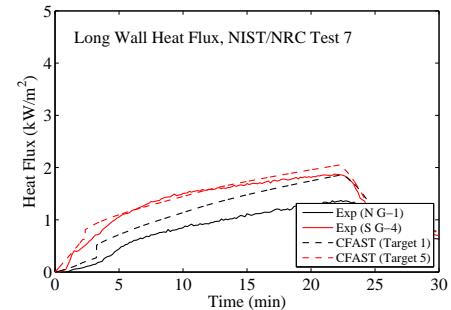
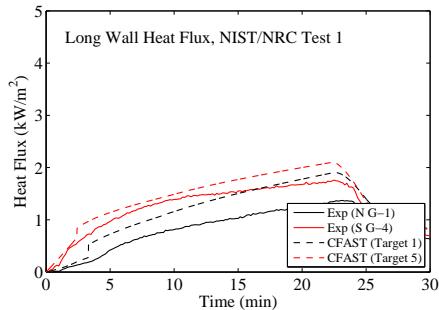
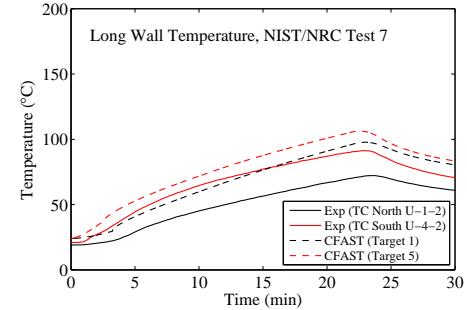
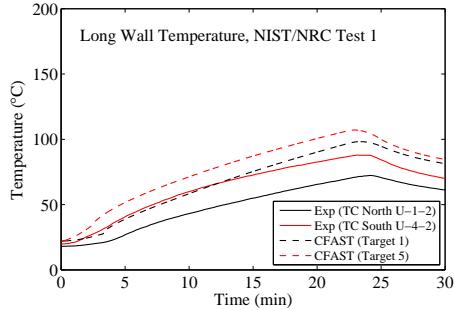


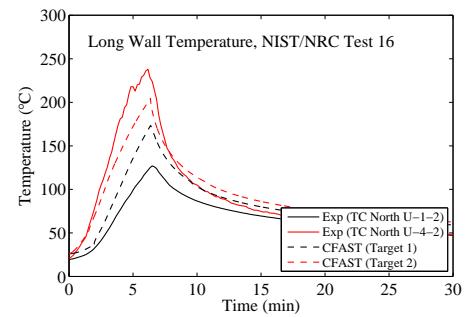
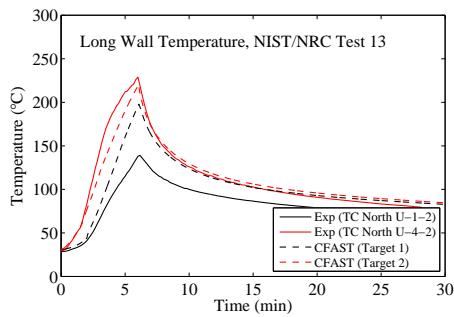
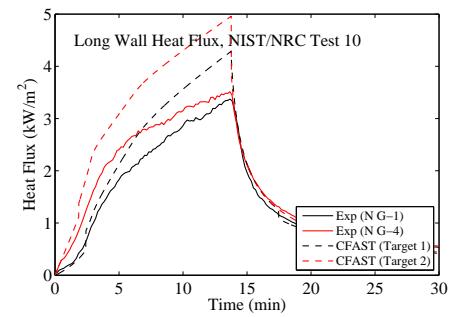
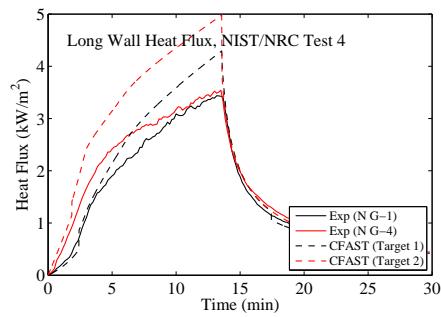
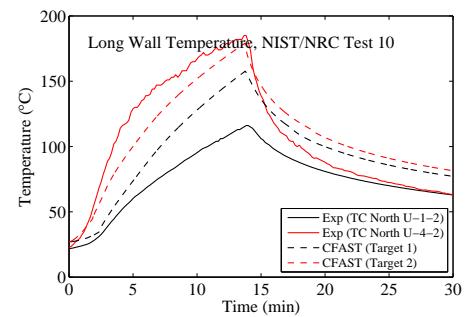
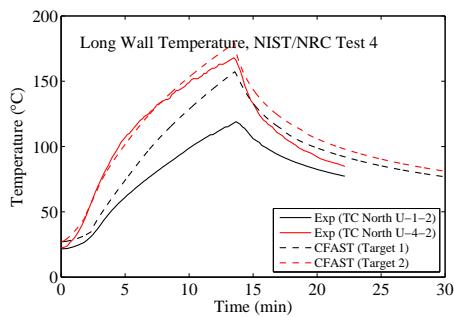




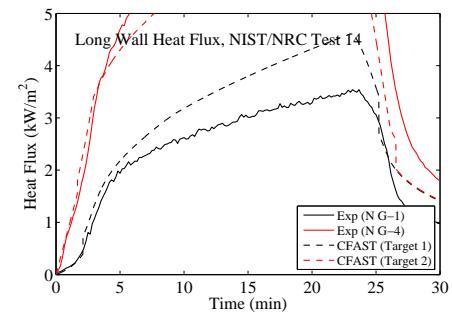
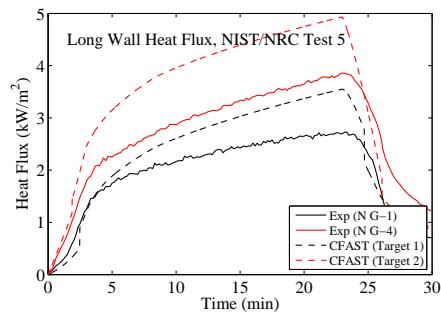
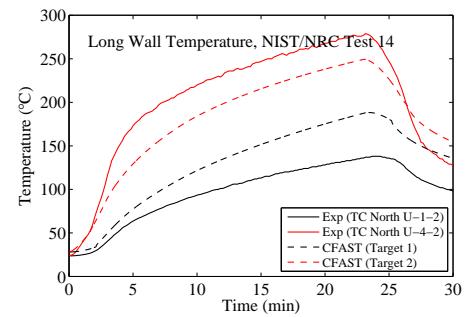
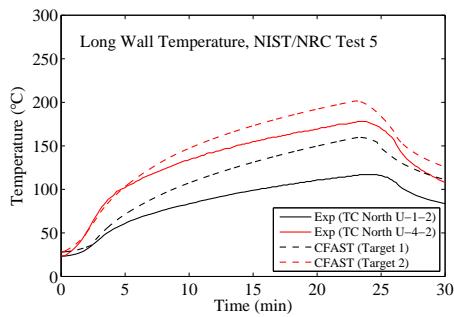
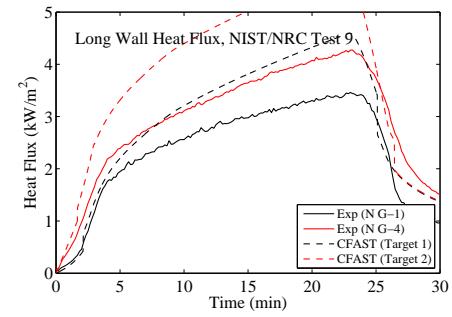
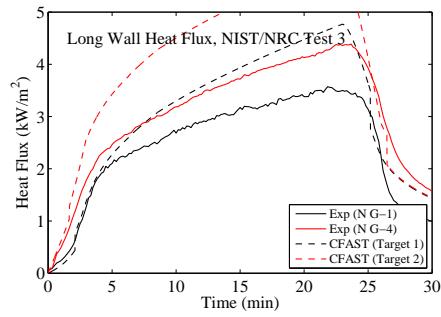
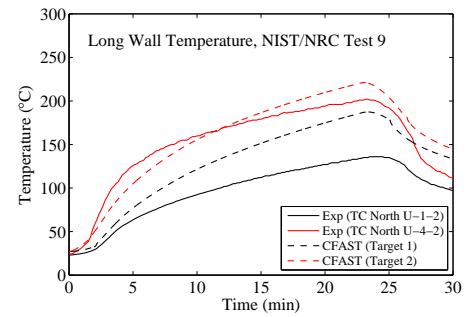
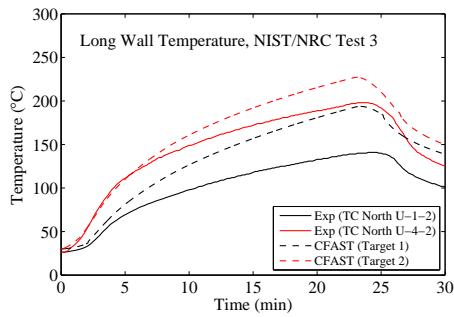


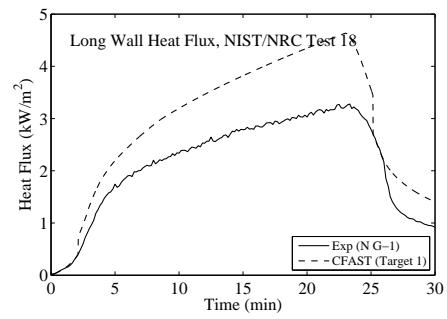
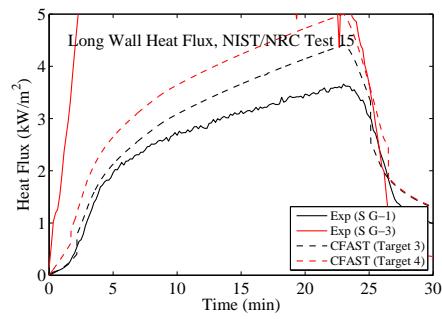
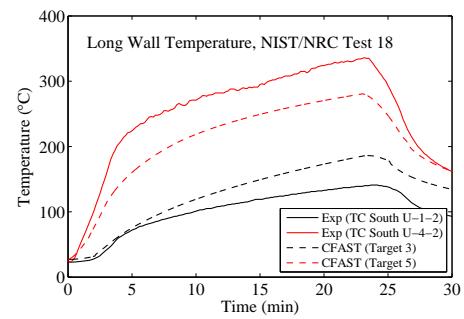
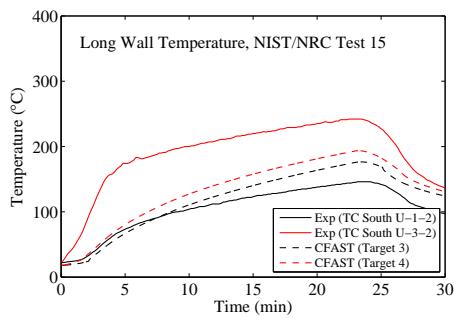
B.5.7 Surface Temperature and Heat Flux

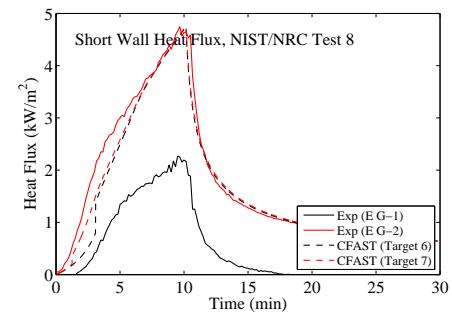
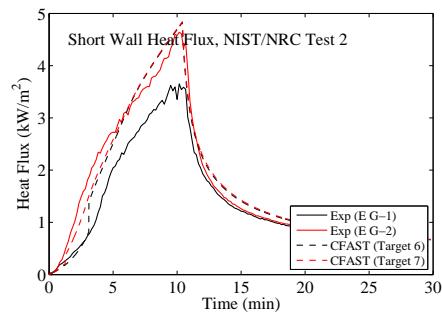
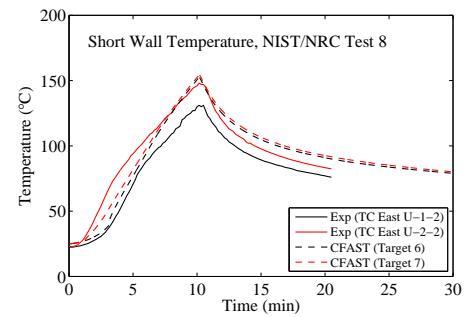
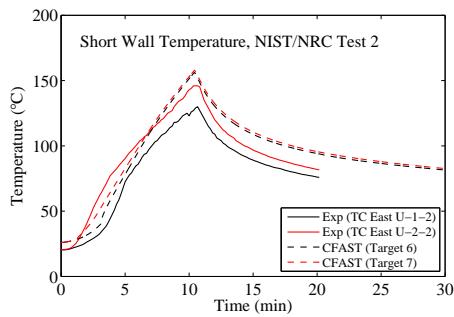
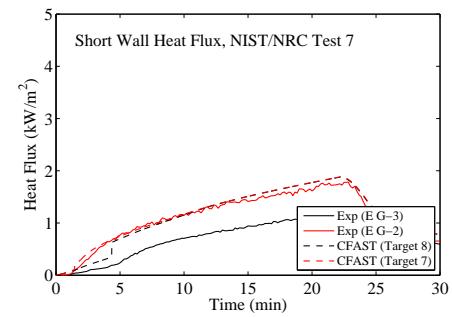
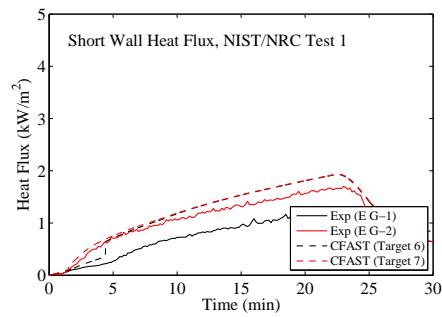
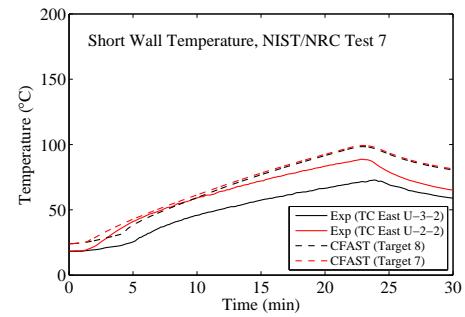
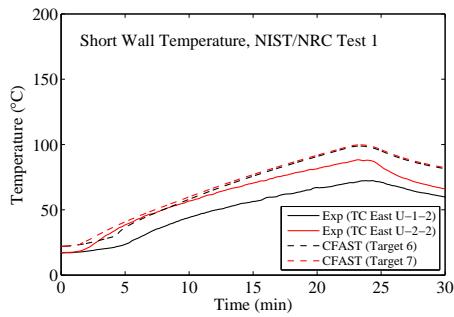


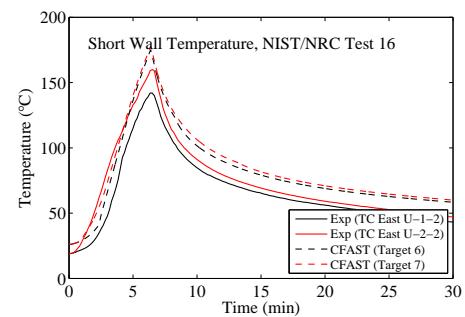
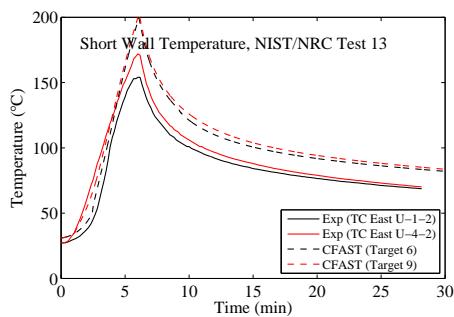
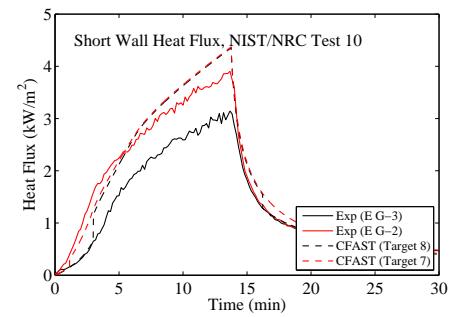
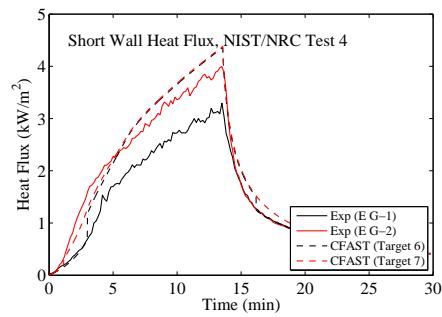
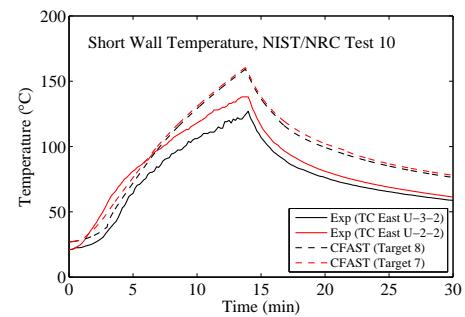
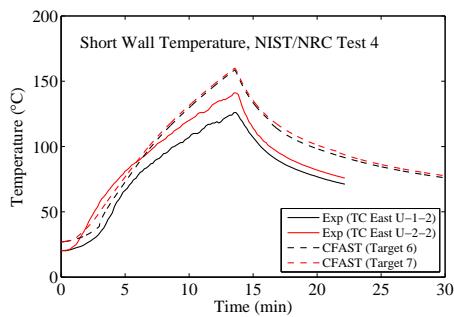


Experimental Heat Flux Data Not Available Experimental Heat Flux Data Not Available

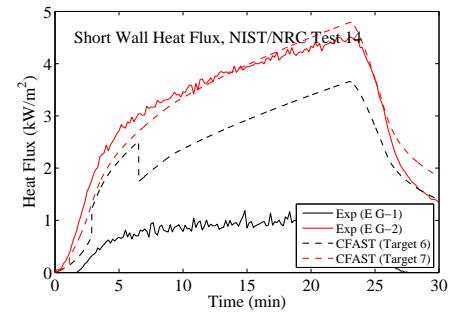
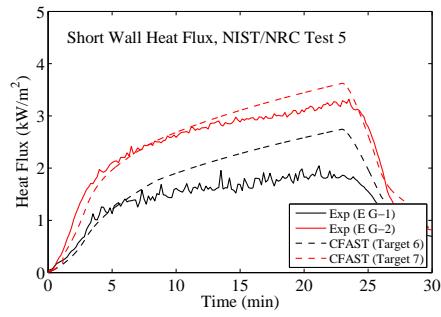
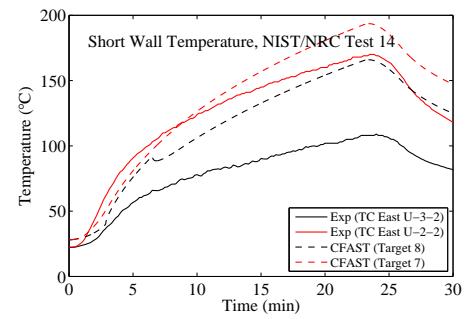
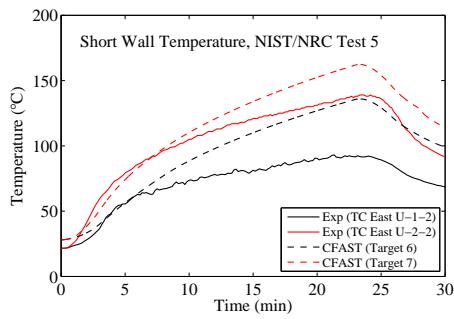
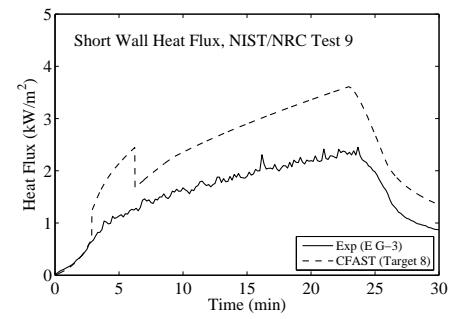
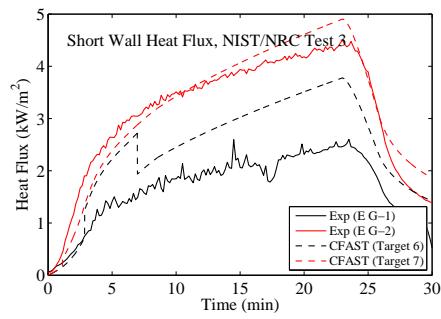
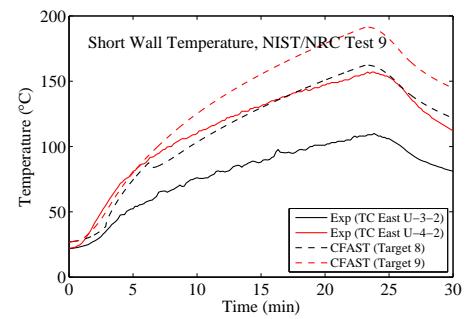
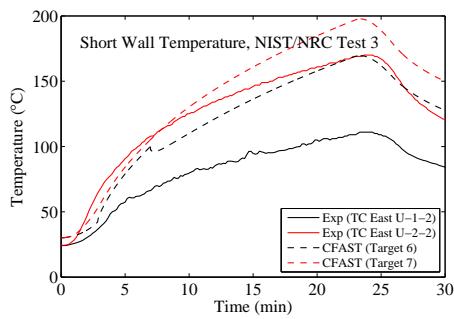


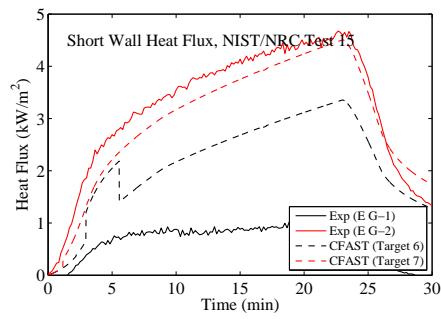
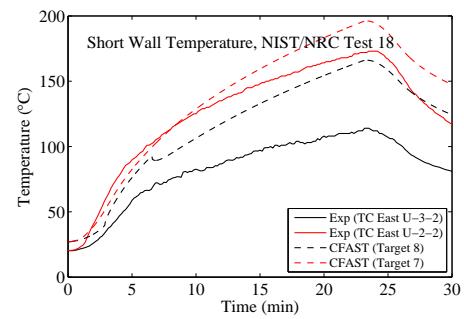
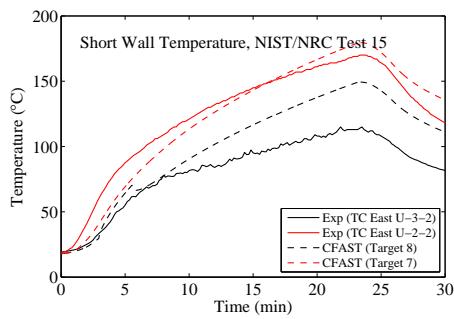




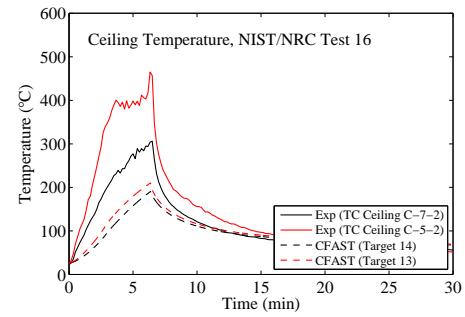
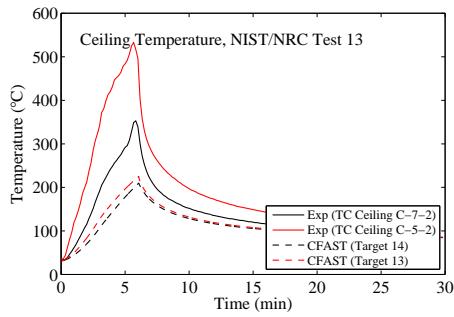
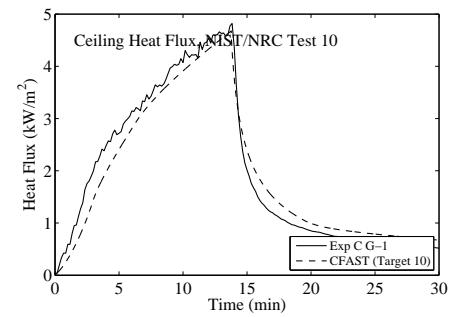
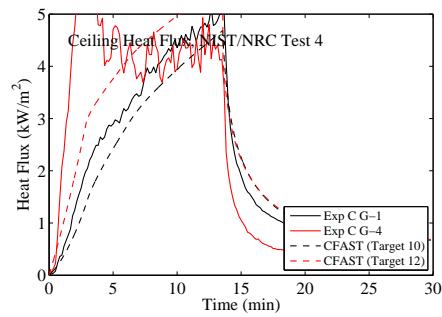
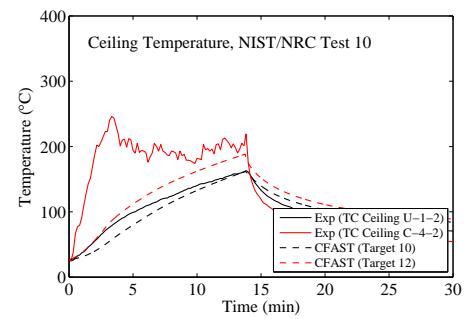
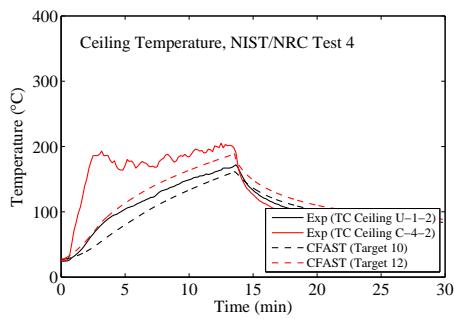


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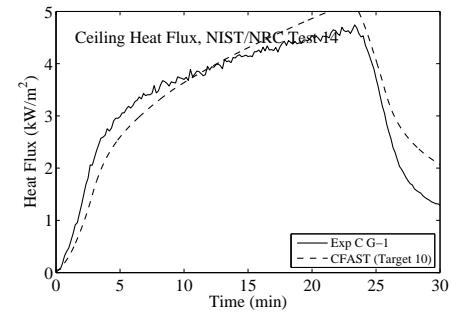
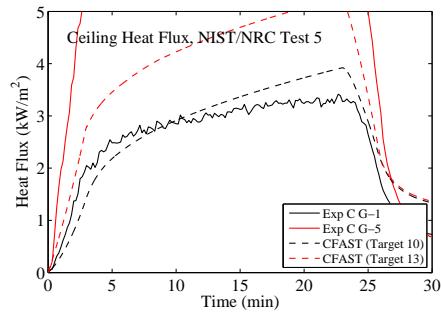
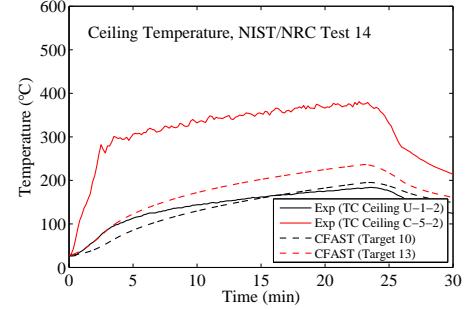
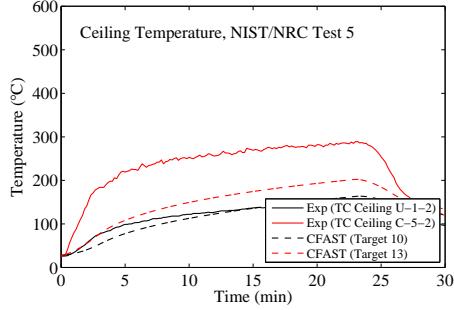
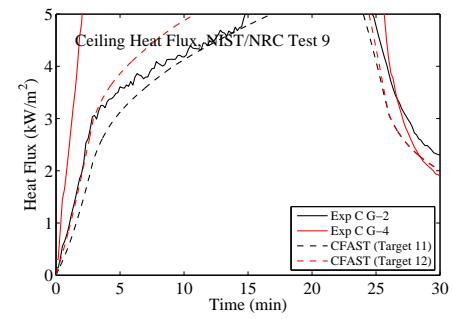
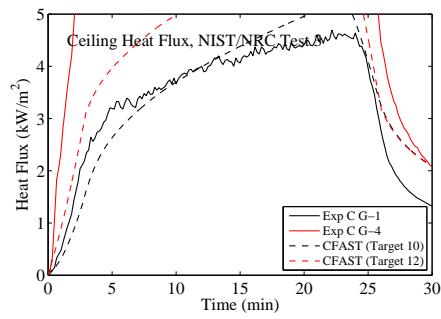
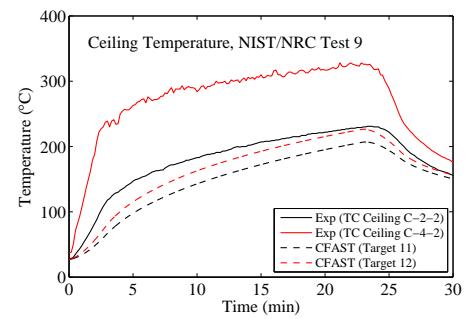
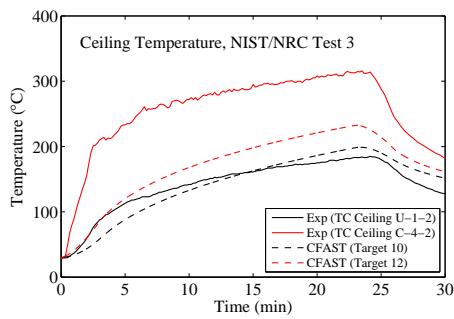


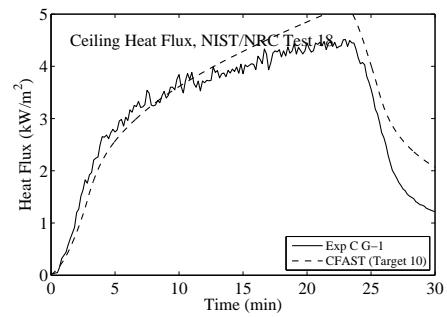
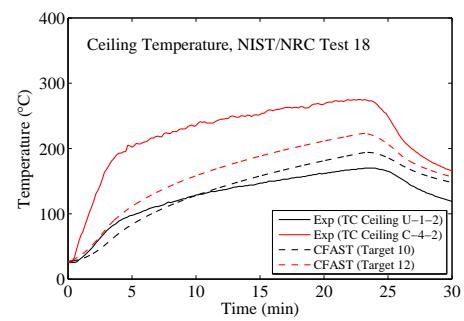
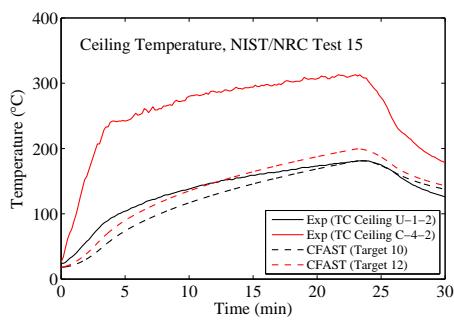


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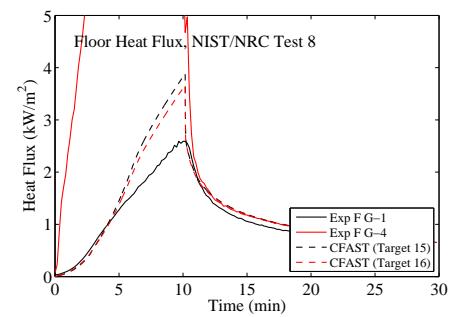
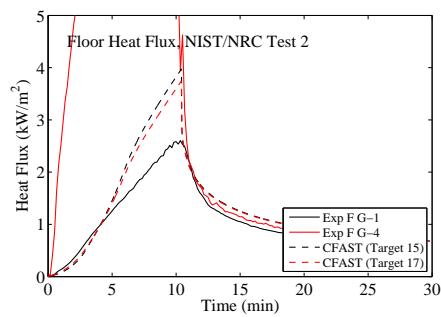
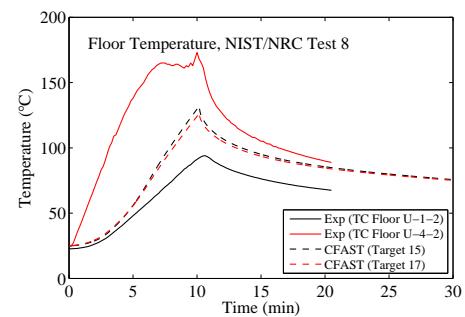
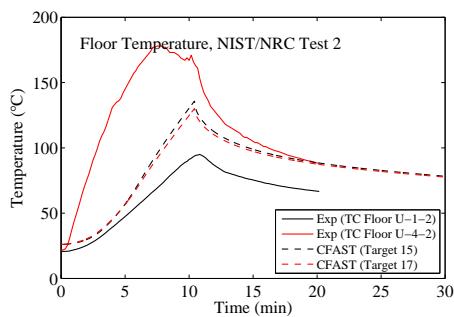
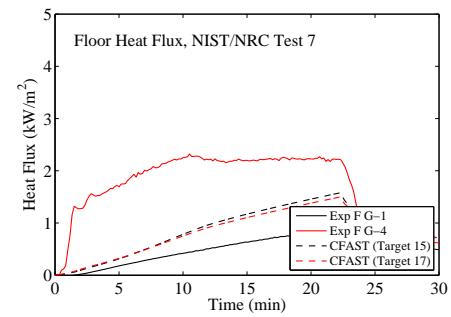
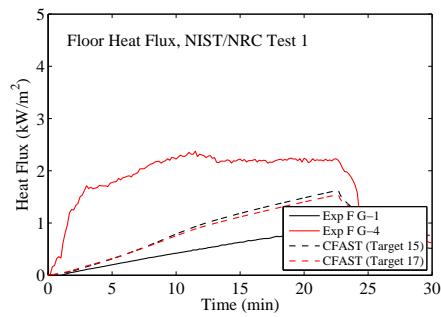
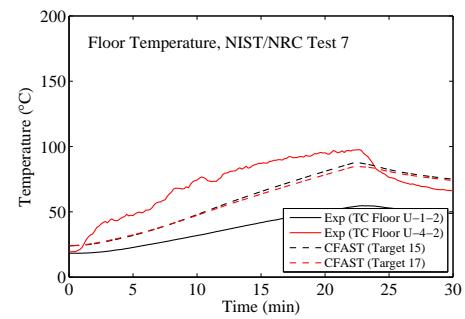
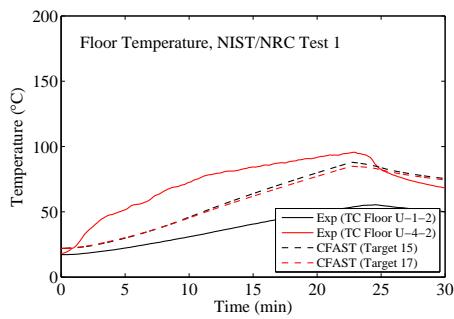


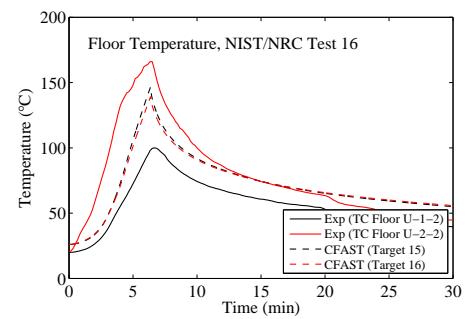
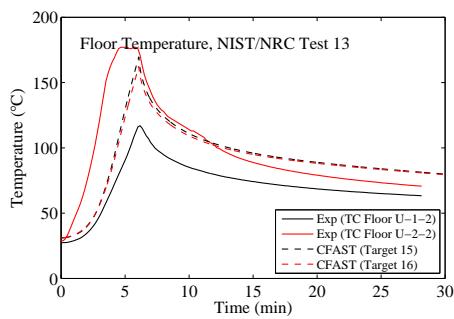
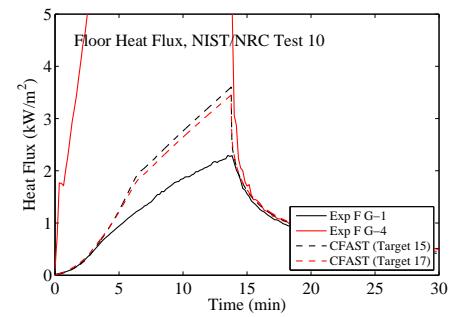
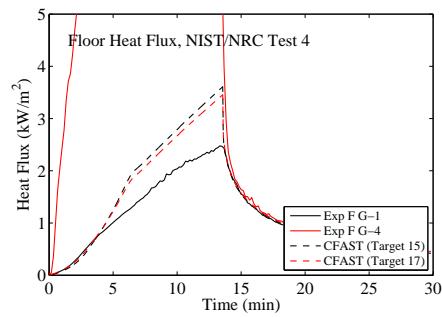
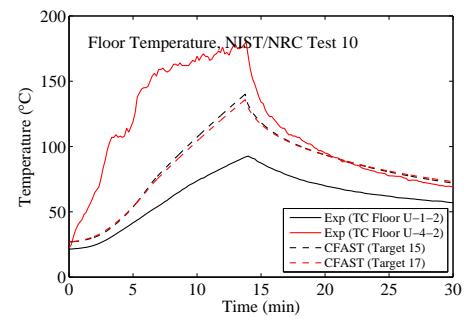
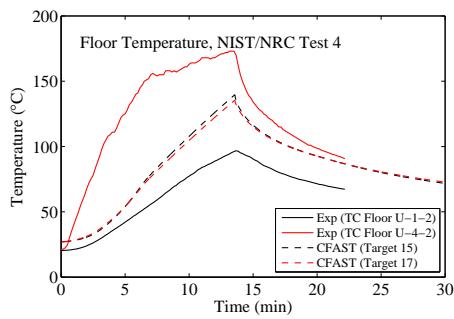
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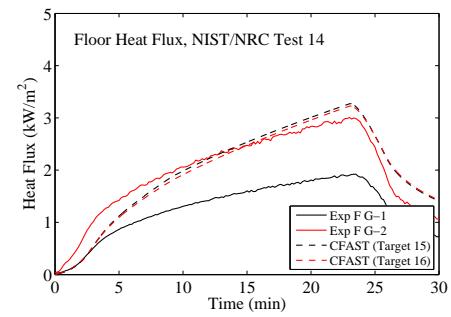
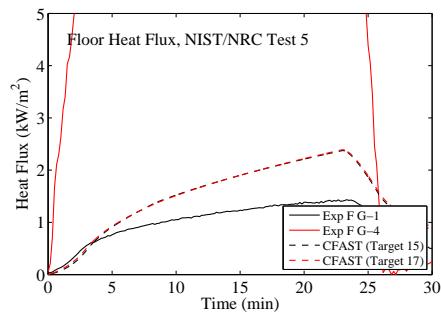
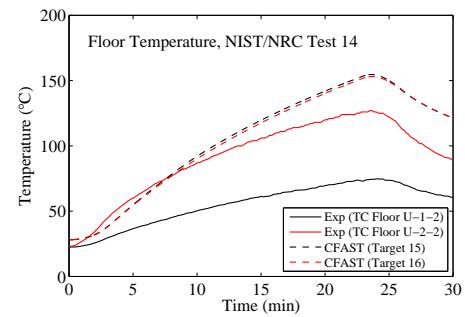
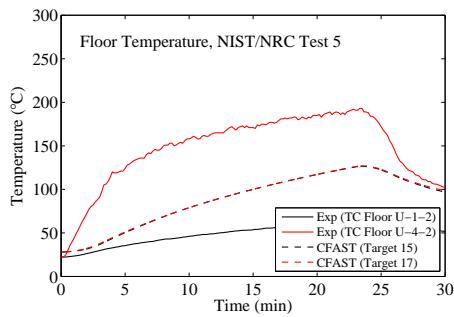
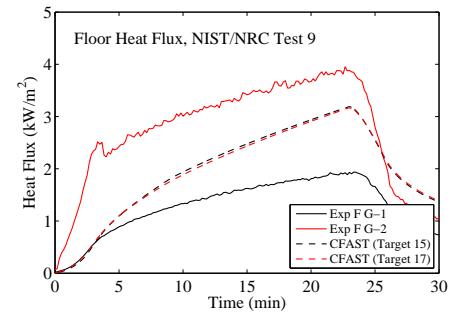
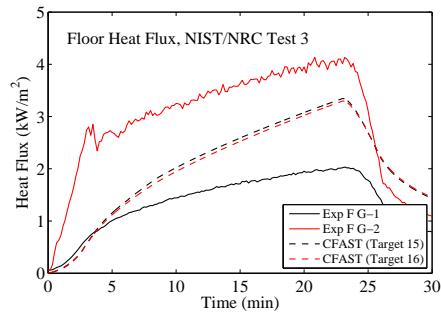
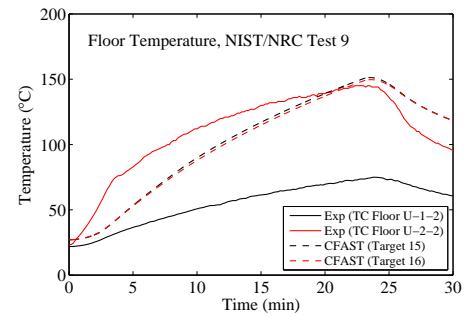
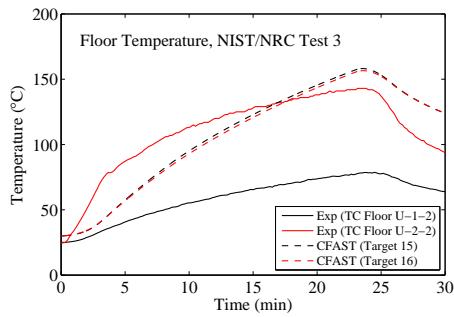


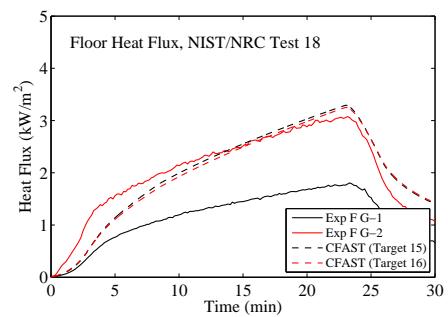
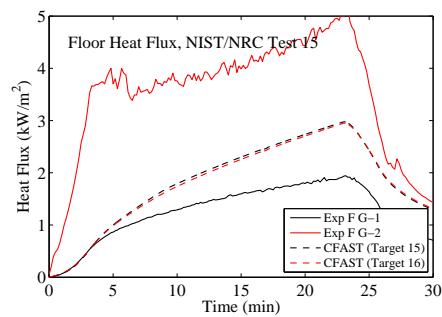
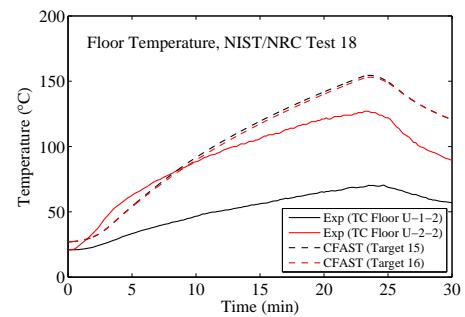
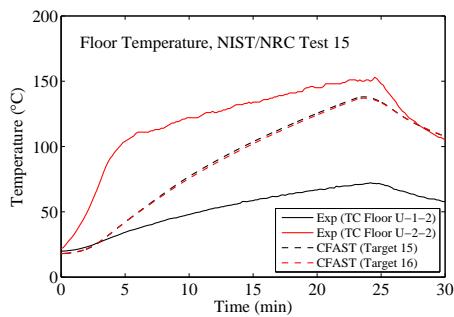
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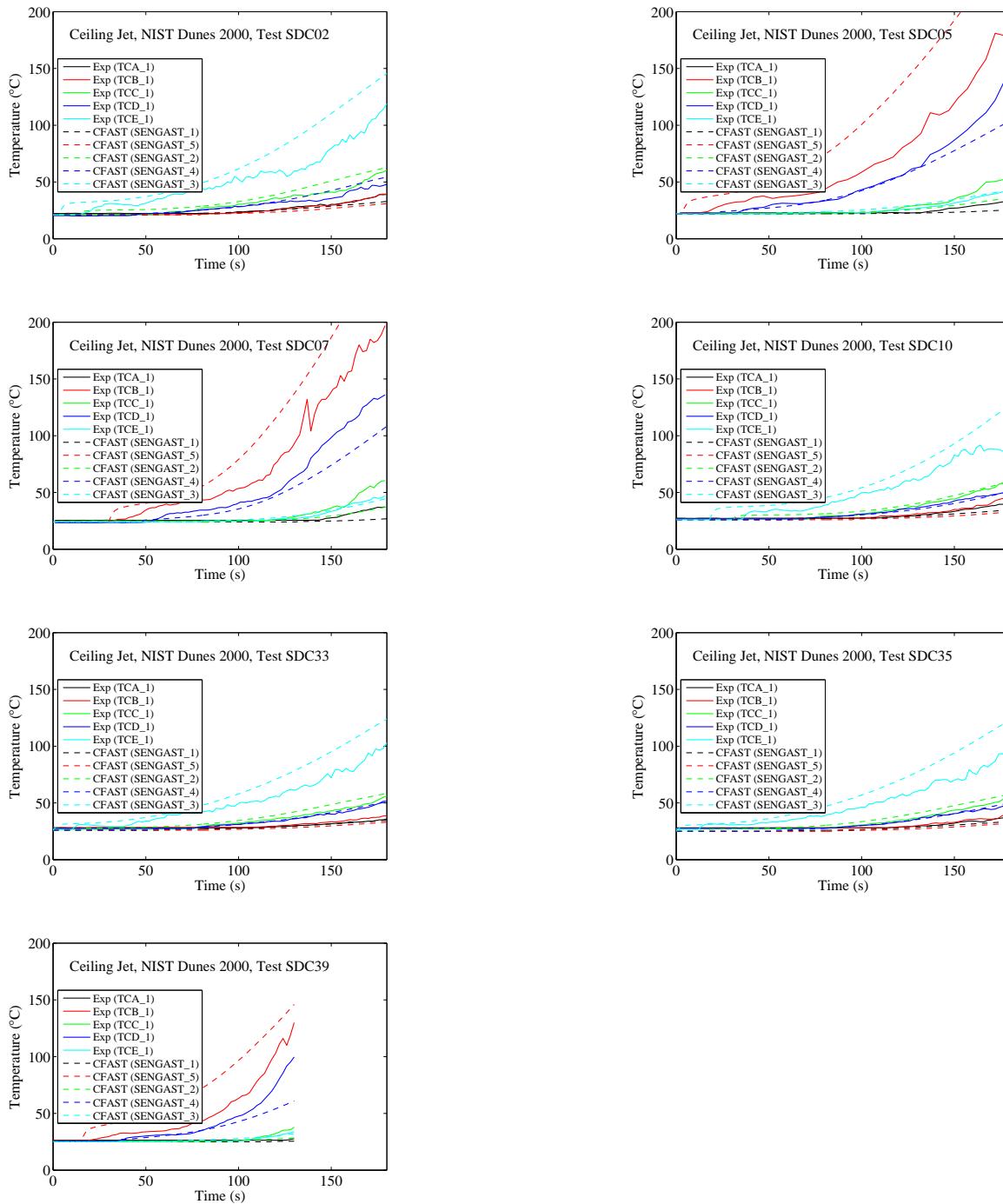
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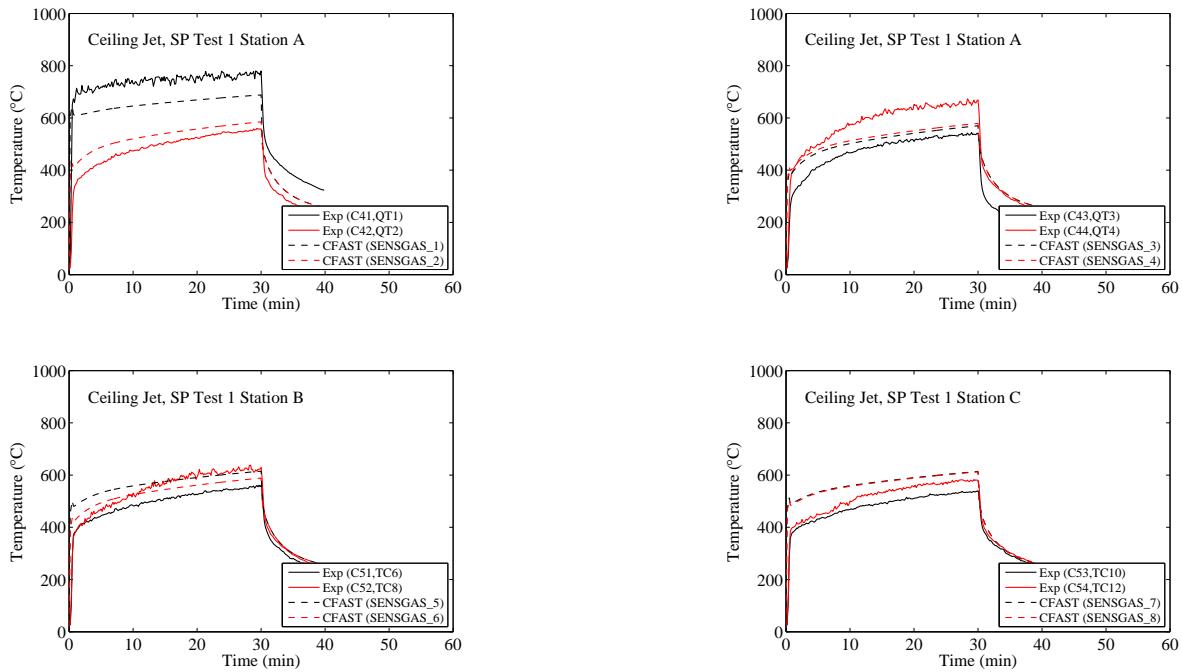
B.6 NIST Smoke Alarm Experiments

B.6.1 Ceiling Jet Temperature

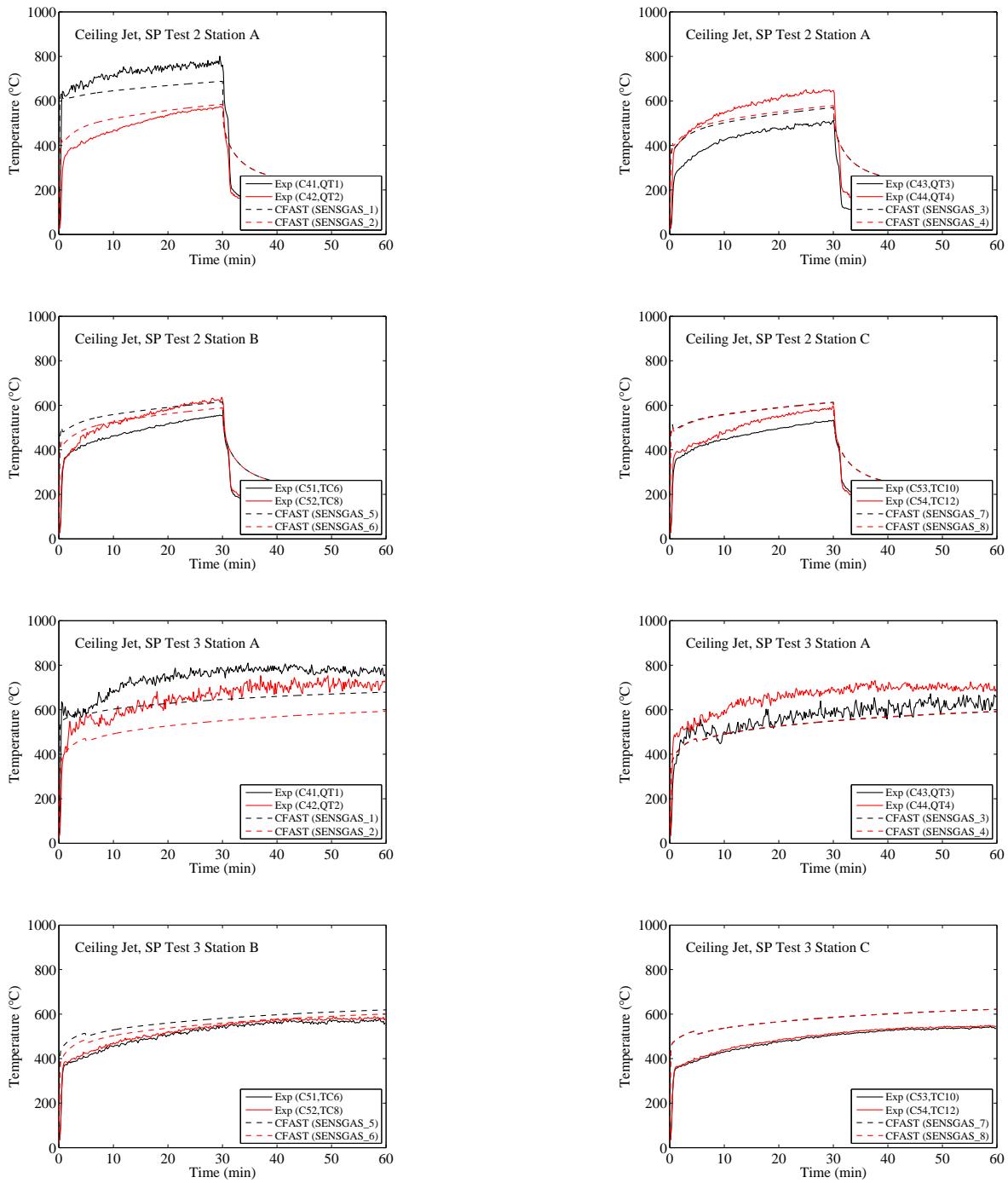


B.7 SP Adiabatic Surface Temperature Experiments

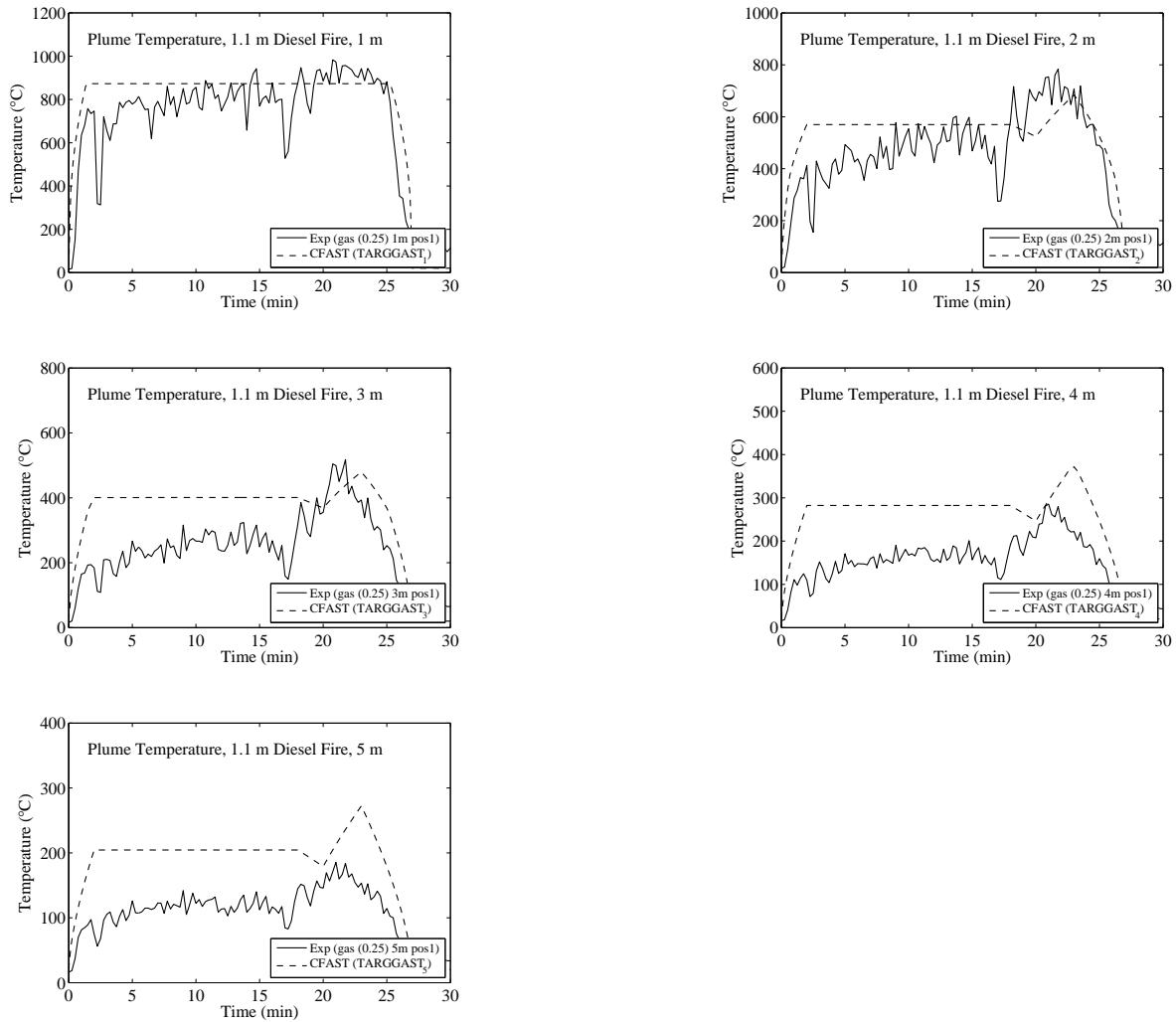
B.7.1 Ceiling Jet Temperature



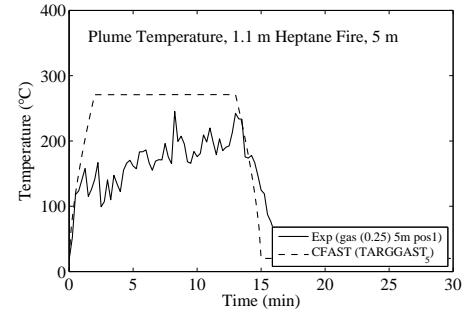
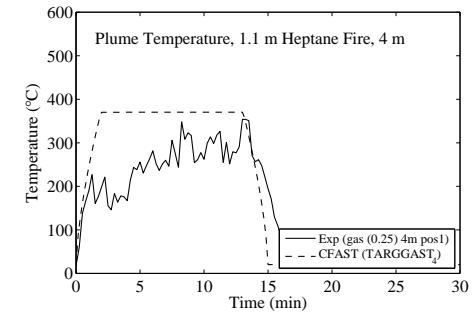
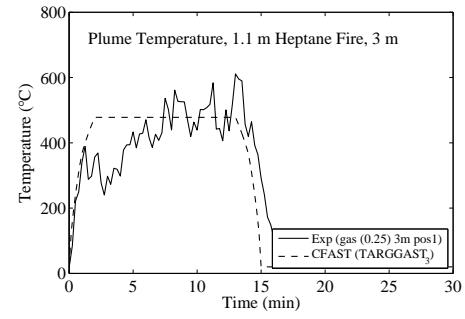
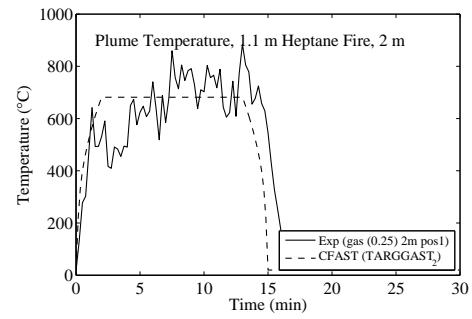
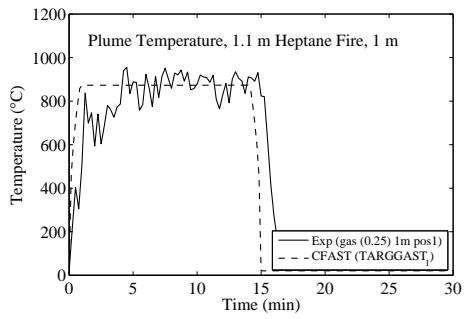
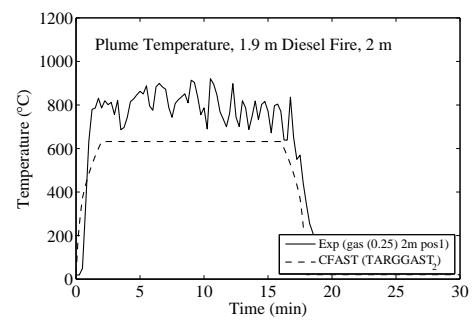
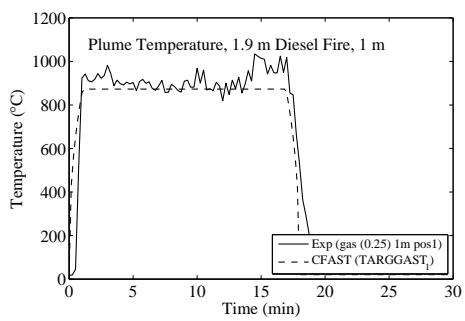
SP ADIABATIC SURFACE TEMPERATURE EXPERIMENTS



SP ADIABATIC SURFACE TEMPERATURE EXPERIMENTS

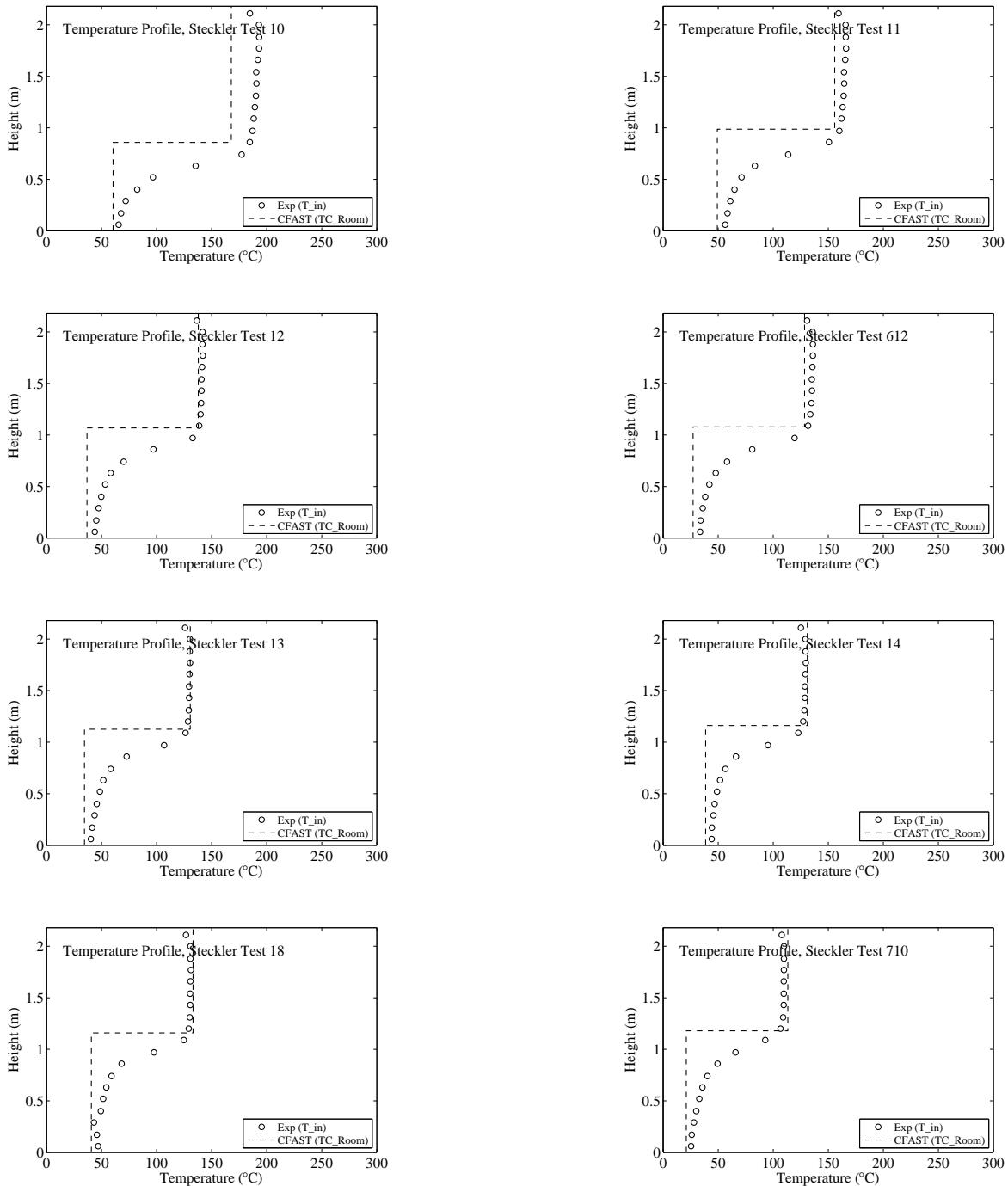


SP ADIABATIC SURFACE TEMPERATURE EXPERIMENTS

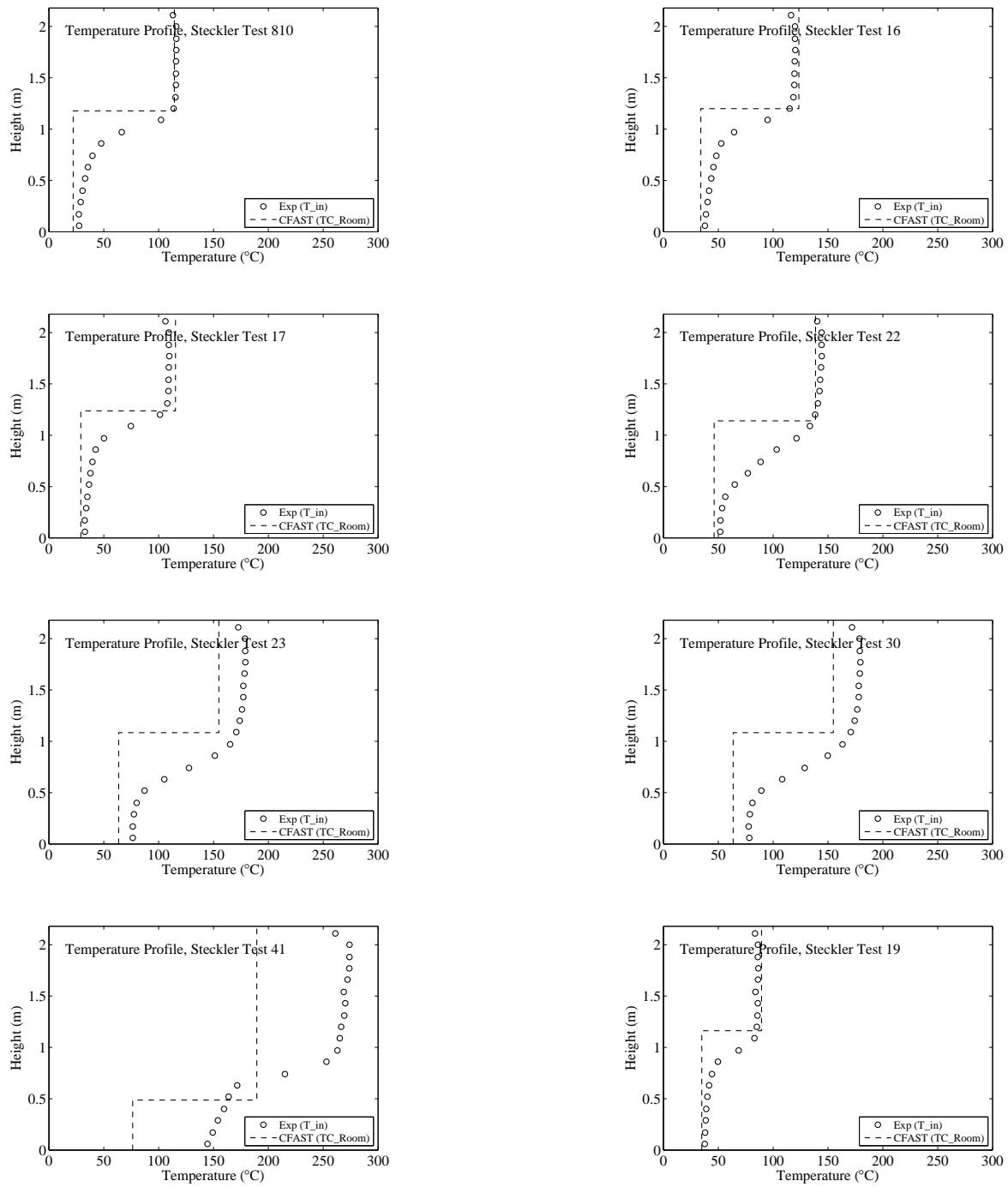


B.8 Steckler Compartment Experiments

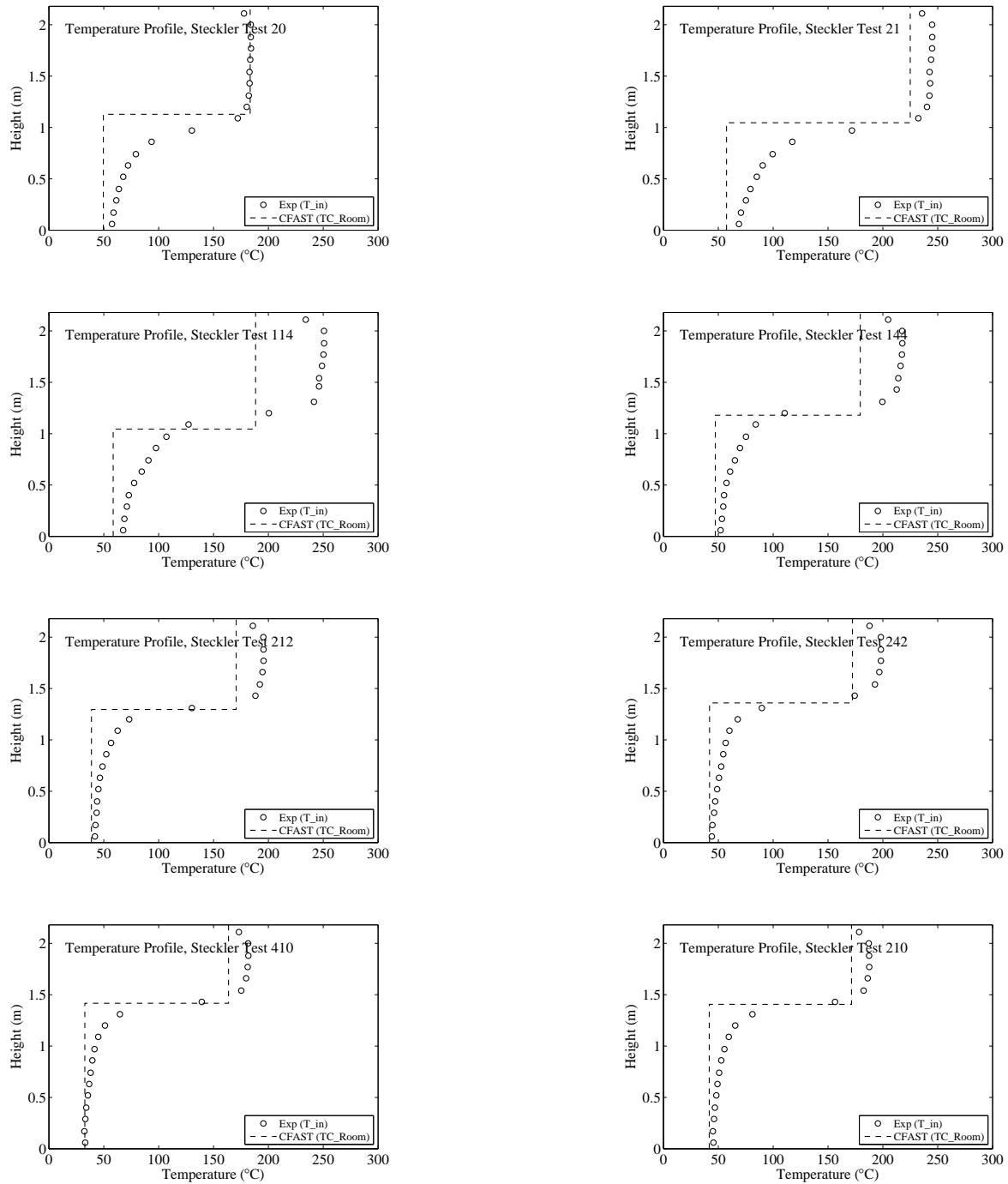
B.8.1 HGL Temperature and Depth



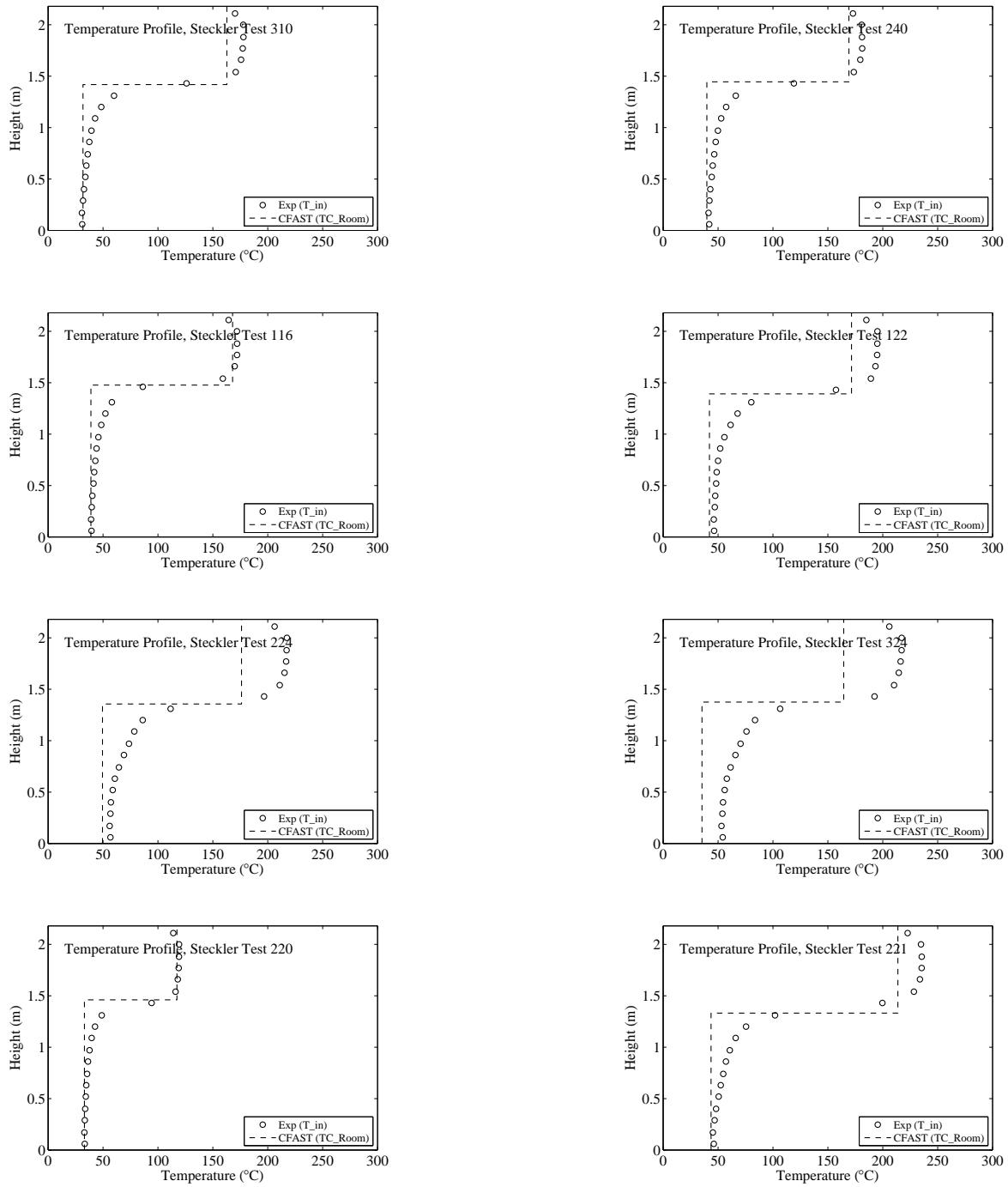
STECKLER COMPARTMENT EXPERIMENTS



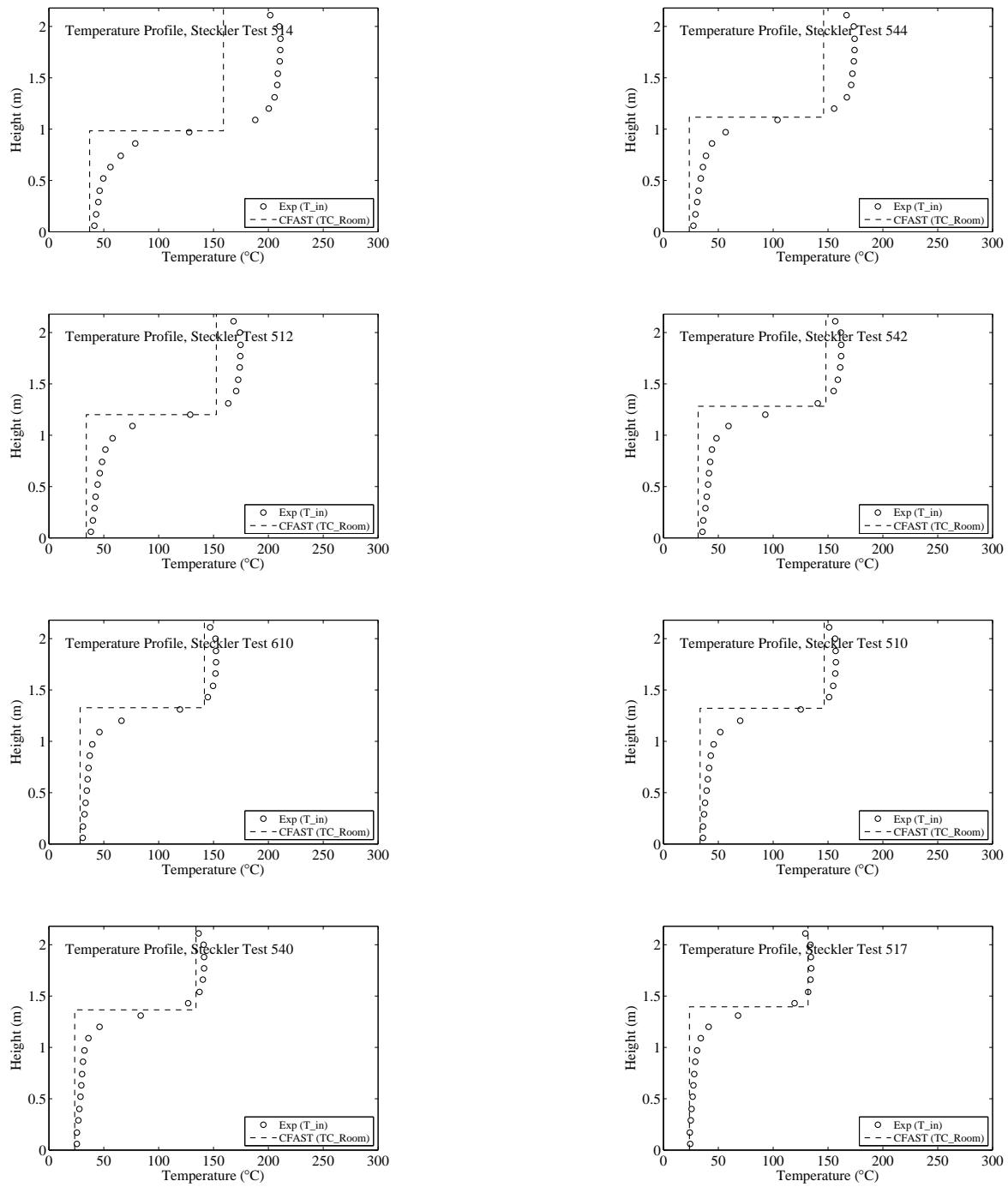
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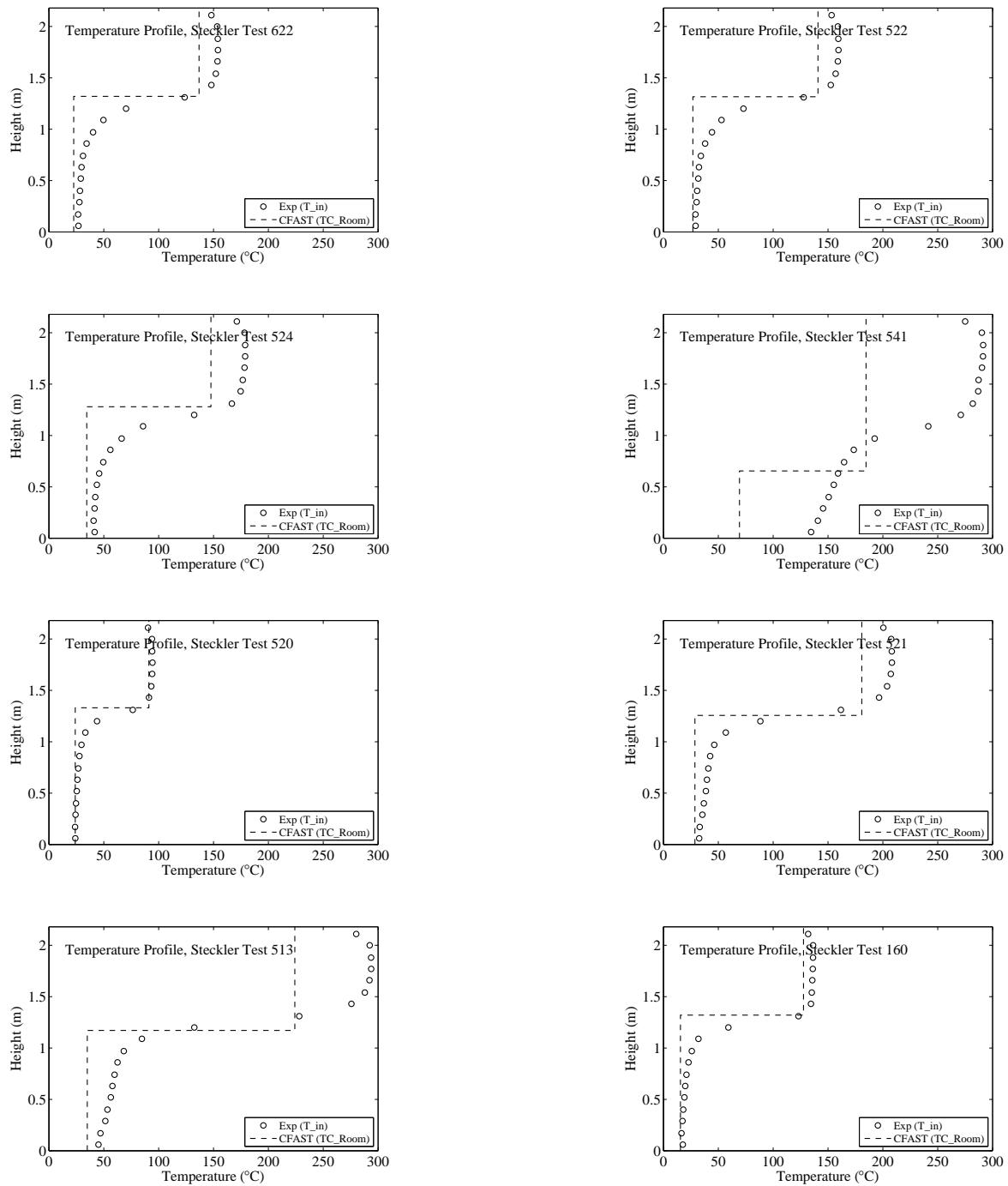
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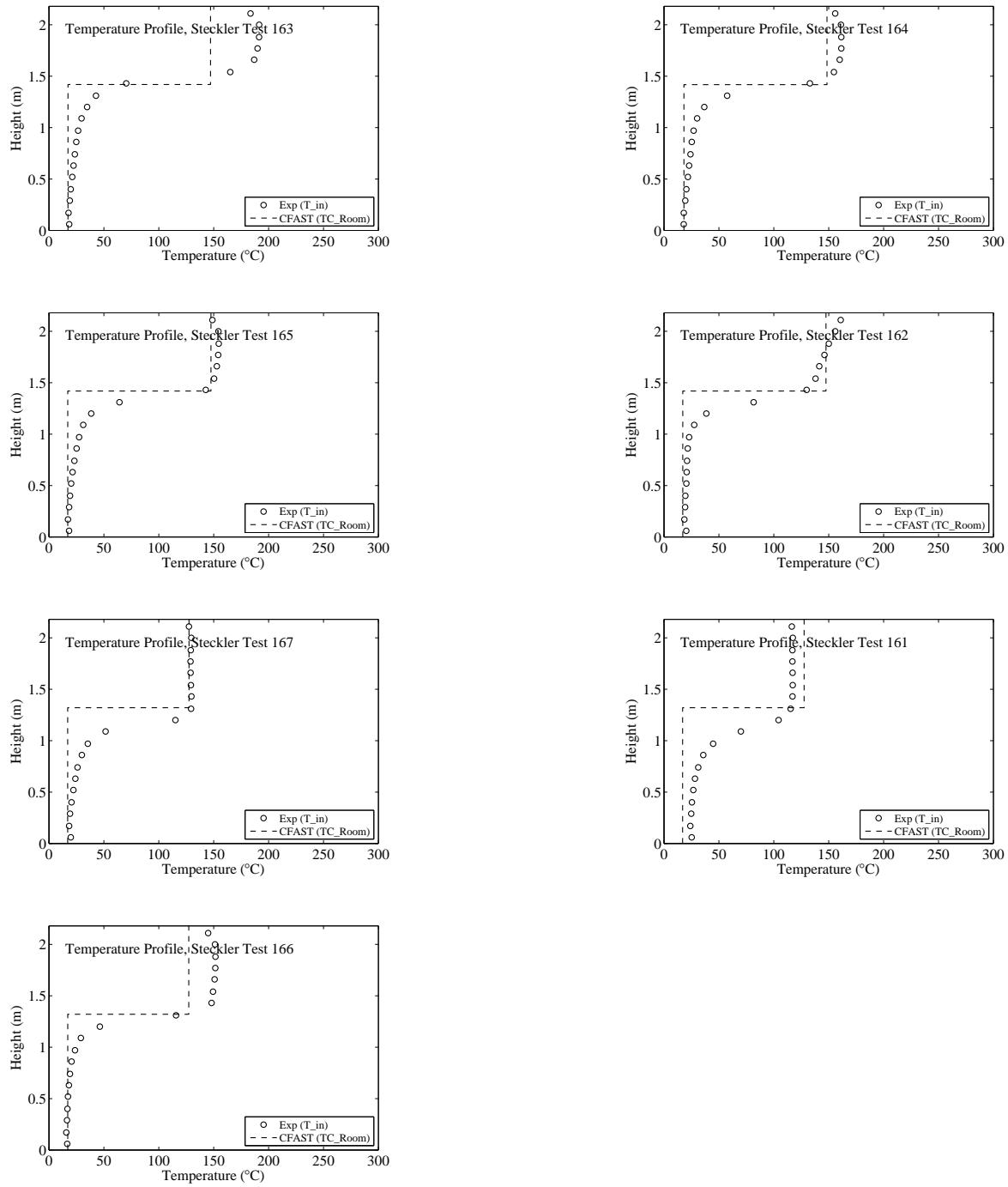
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STECKLER COMPARTMENT EXPERIMENTS

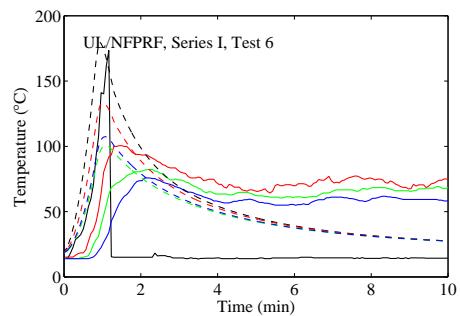
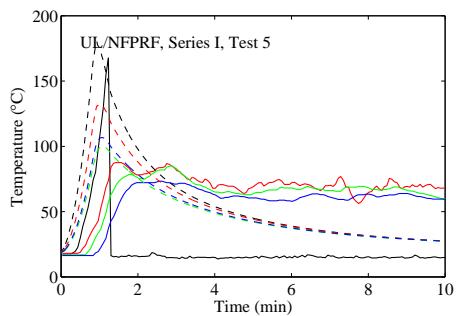
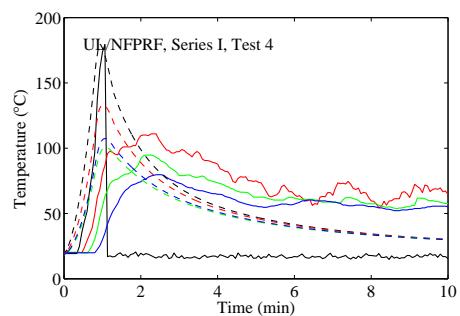
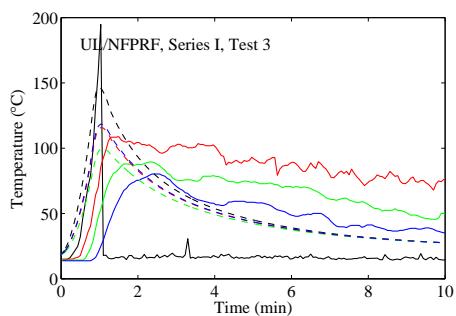
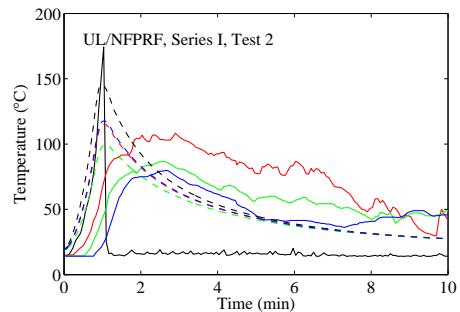
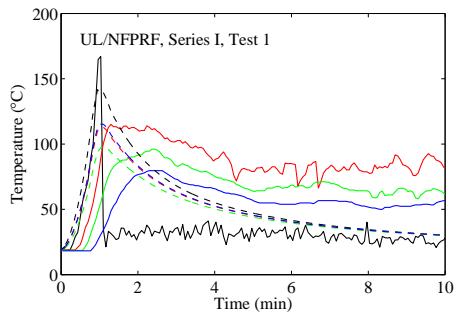


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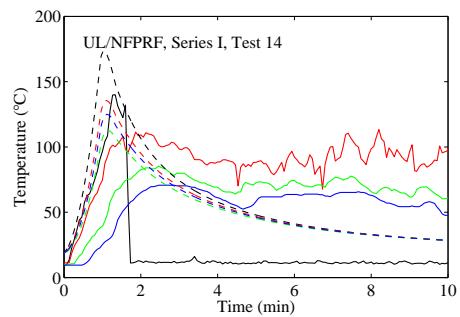
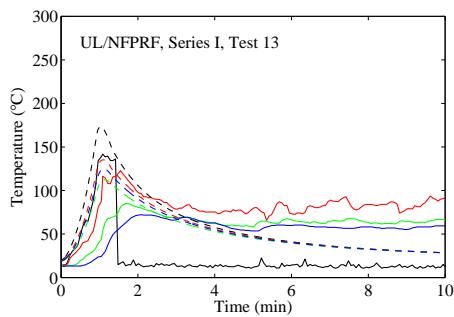
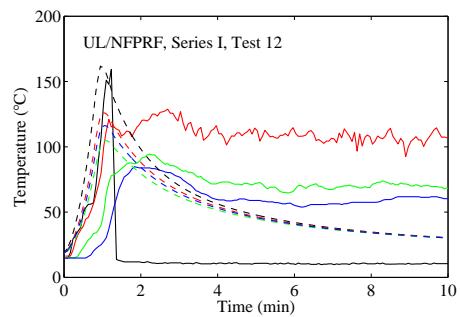
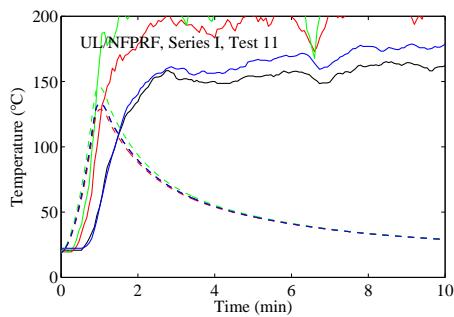
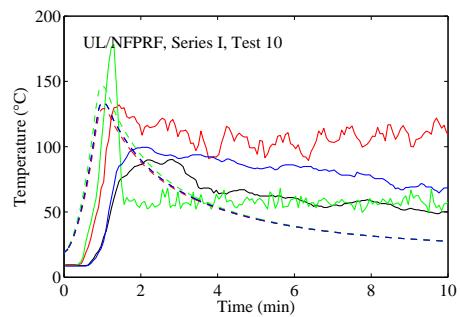
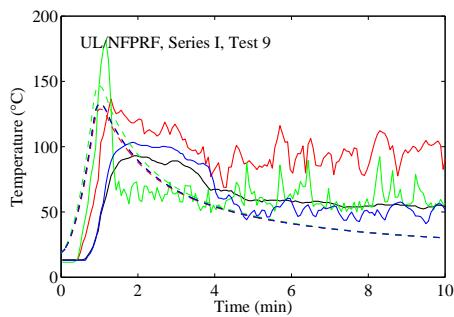
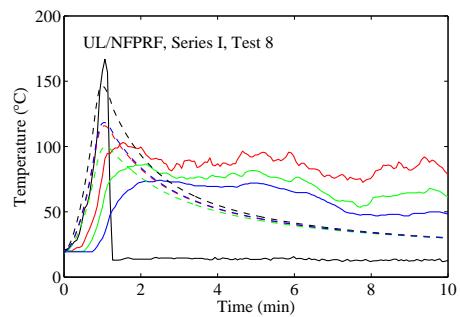
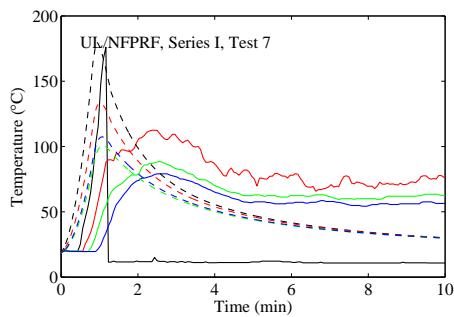


B.9 UL/NFPRF Series I Experiments

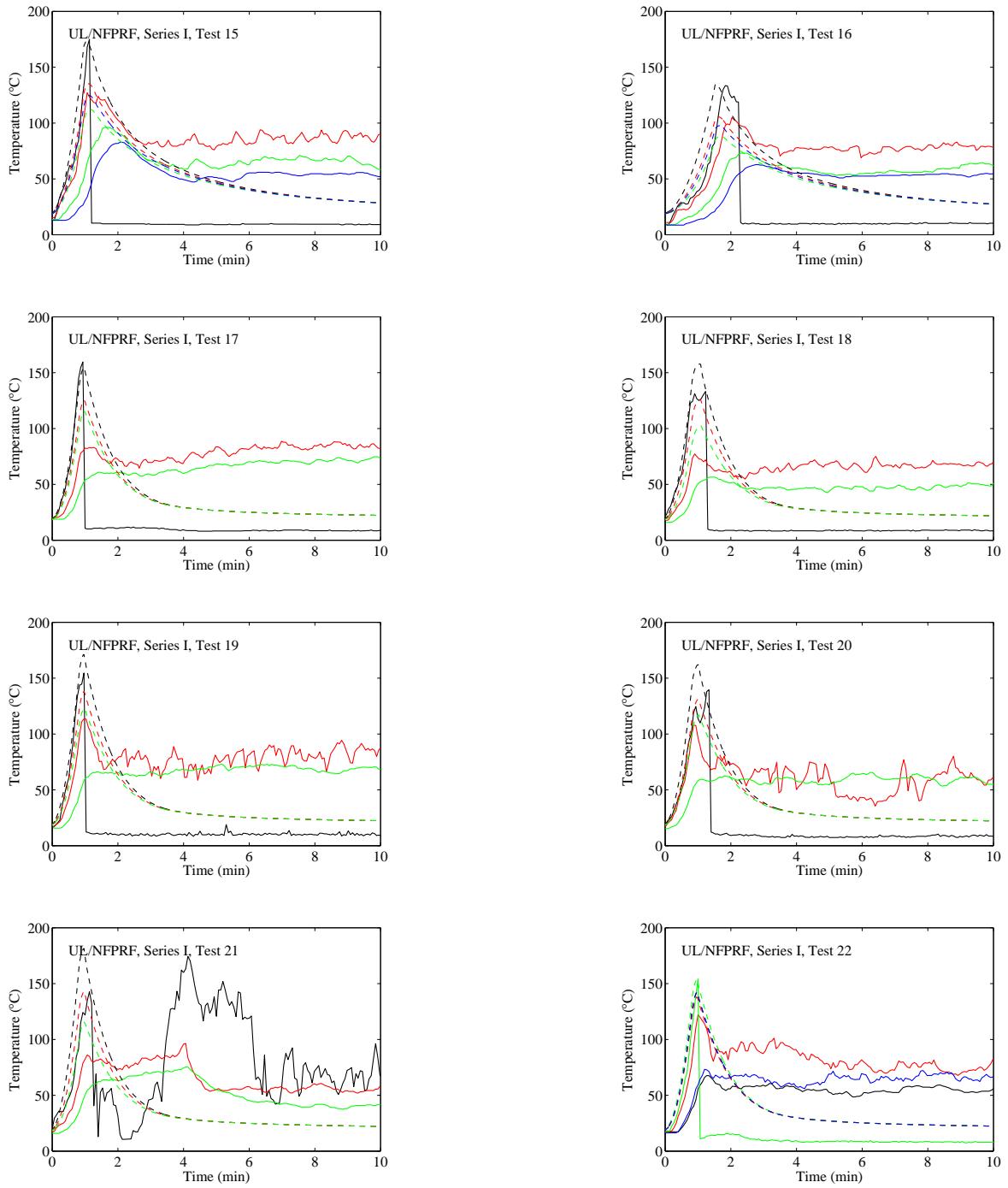
B.9.1 Ceiling Jet temperature



UL/NFPRF SERIES I EXPERIMENTS

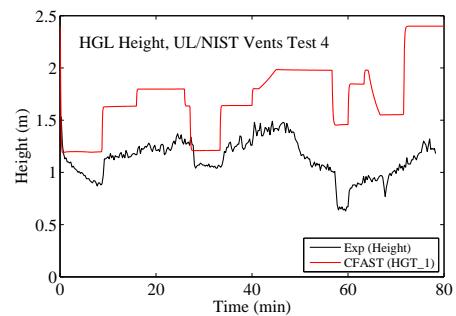
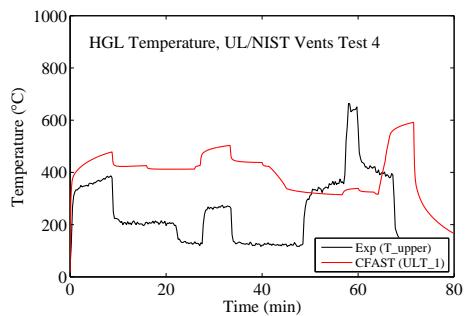
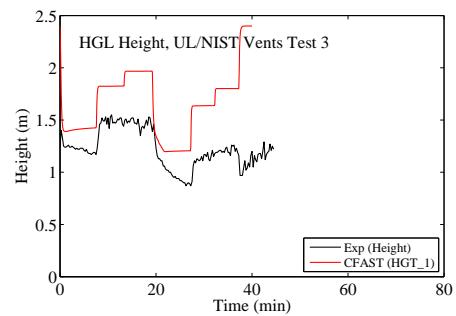
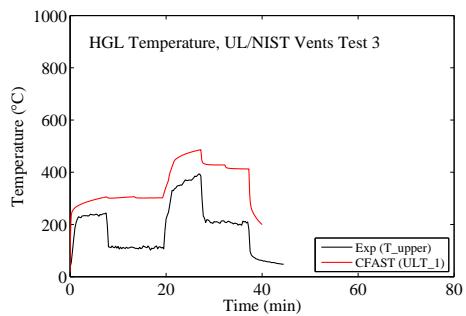
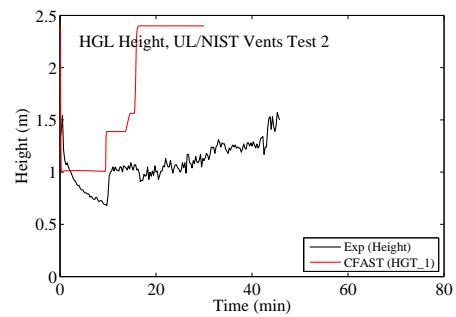
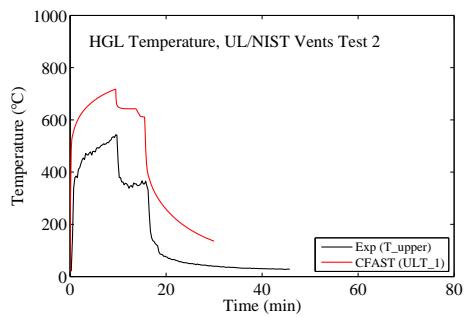
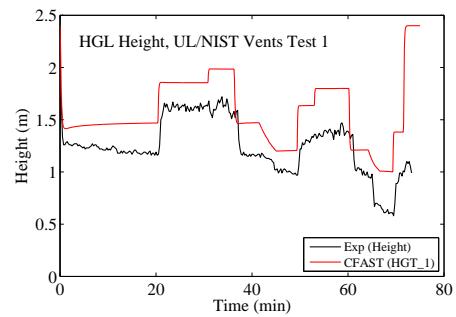
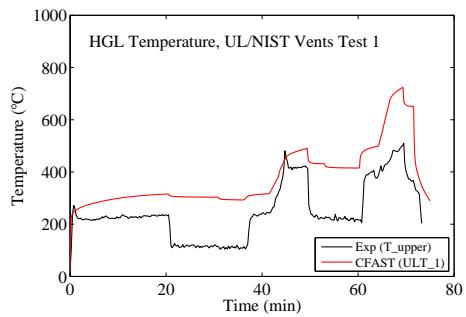


UL/NFPRF SERIES I EXPERIMENTS

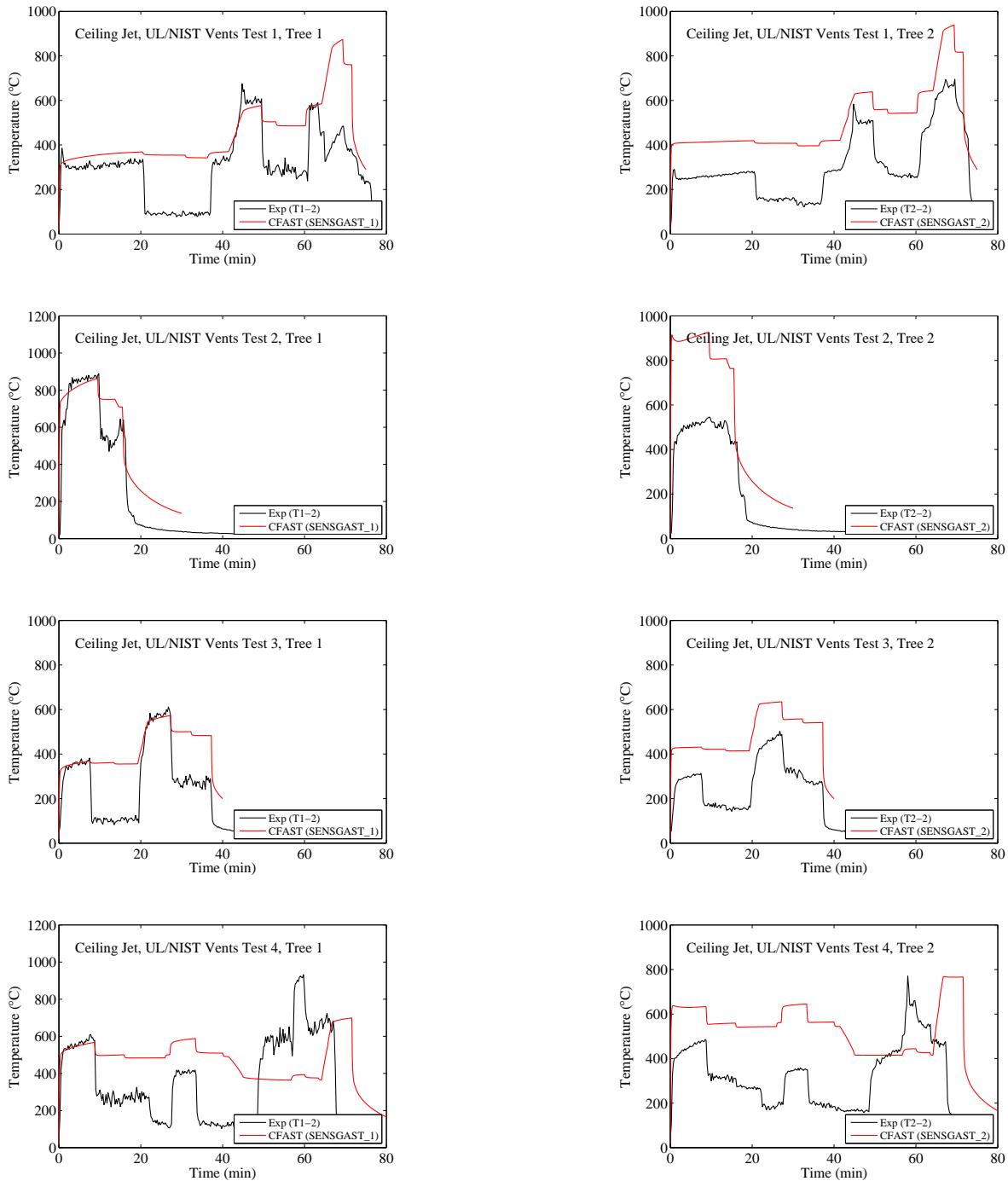


B.10 UL/NIST Vent Experiments

B.10.1 HGL Temperature and Depth

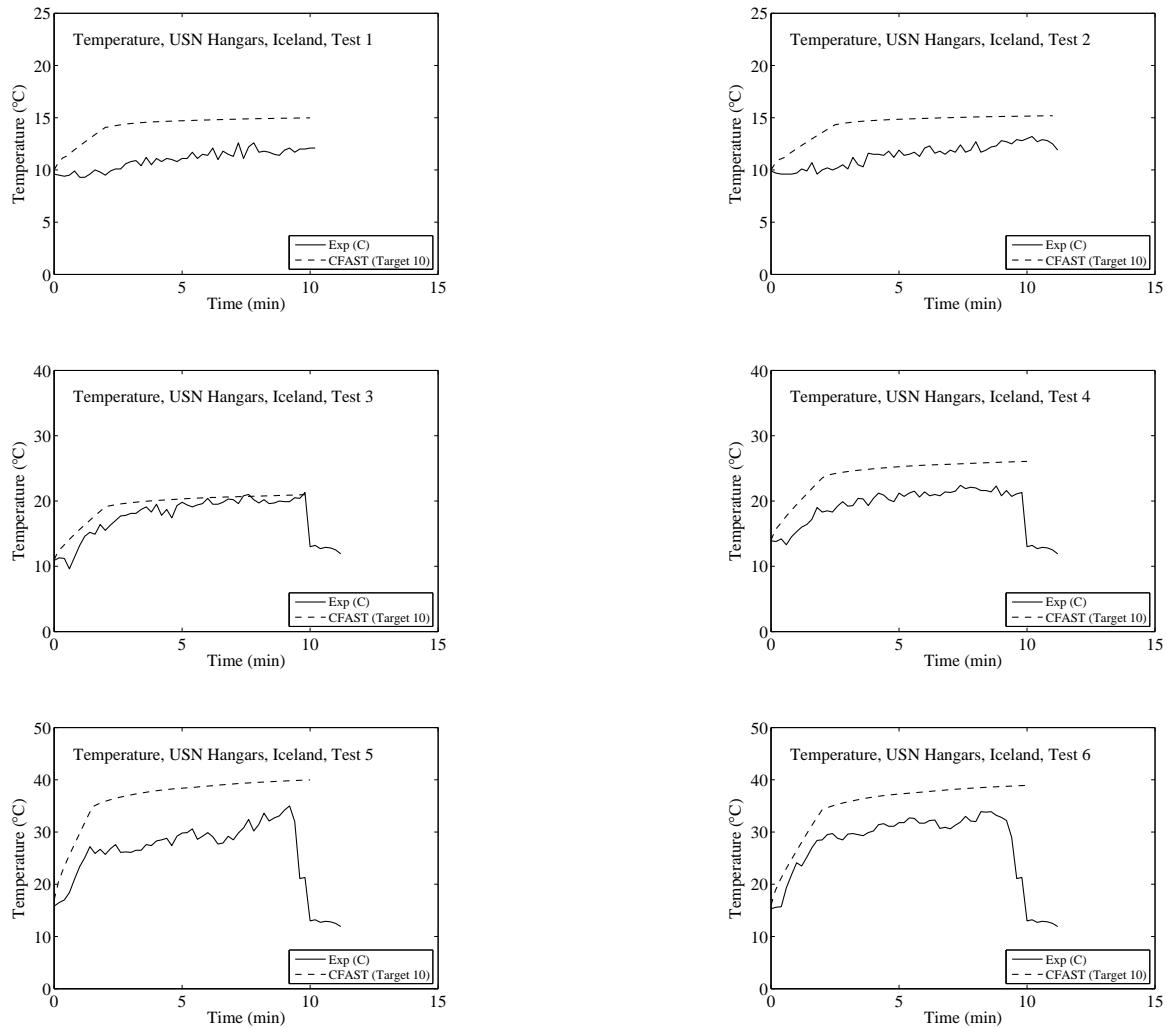


UL/NIST VENT EXPERIMENTS

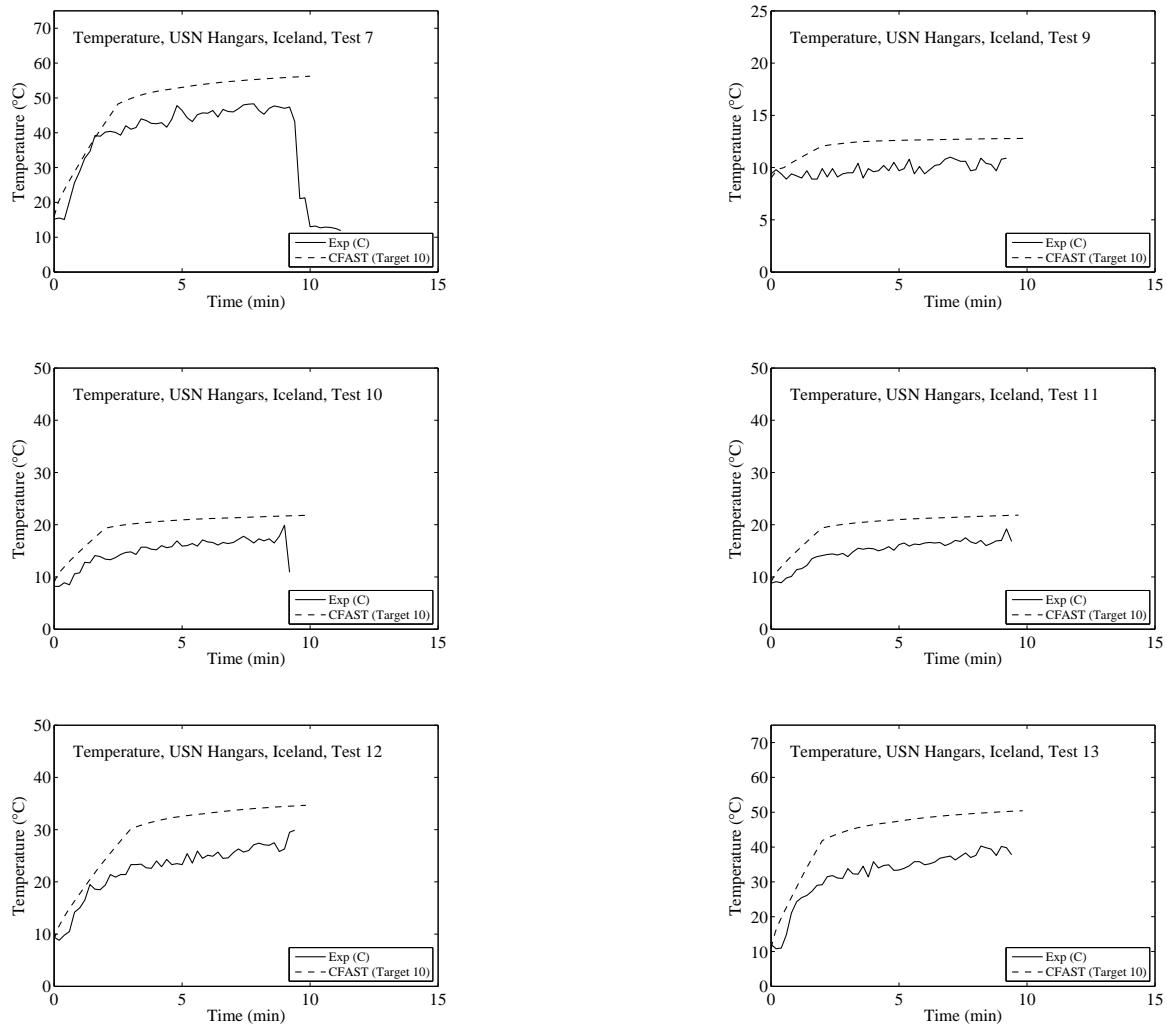


B.11 USN High Bay Hangar Experiments

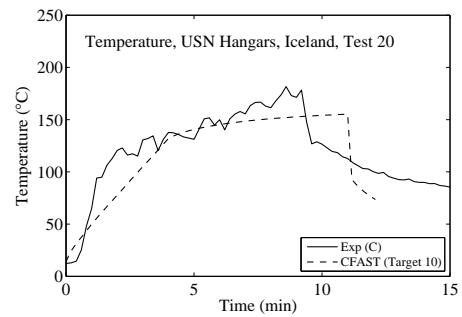
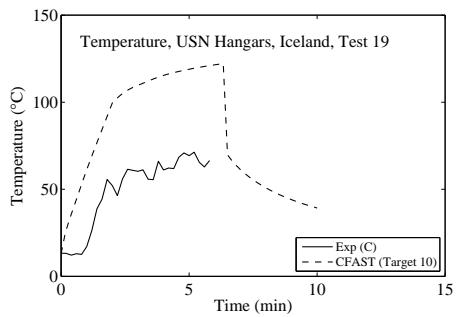
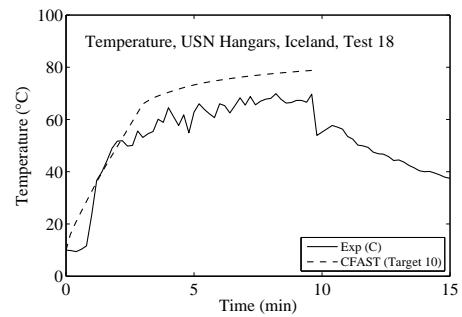
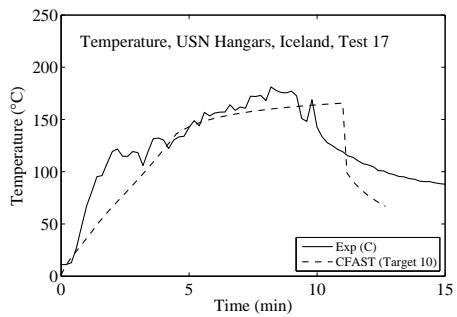
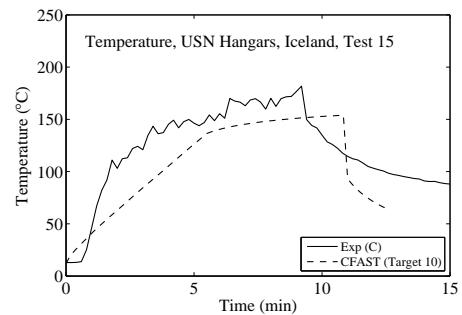
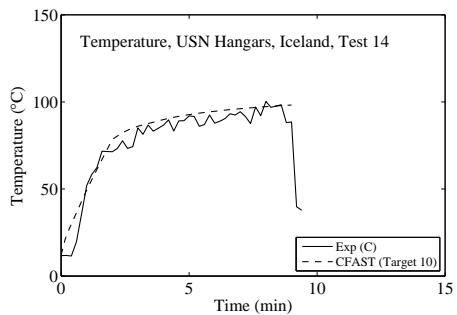
B.11.1 Plume Temperature



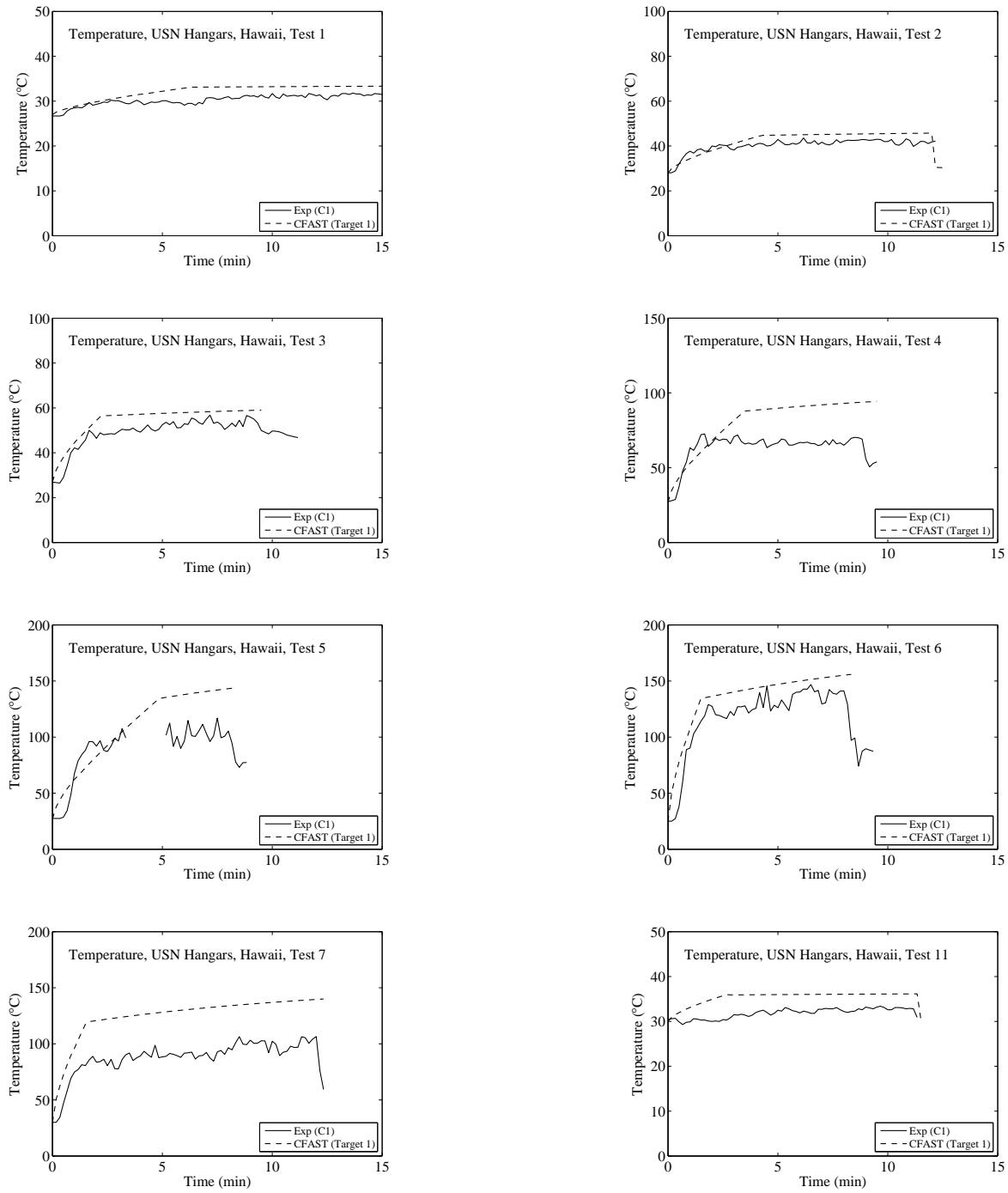
USN HIGH BAY HANGAR EXPERIMENTS



USN HIGH BAY HANGAR EXPERIMENTS

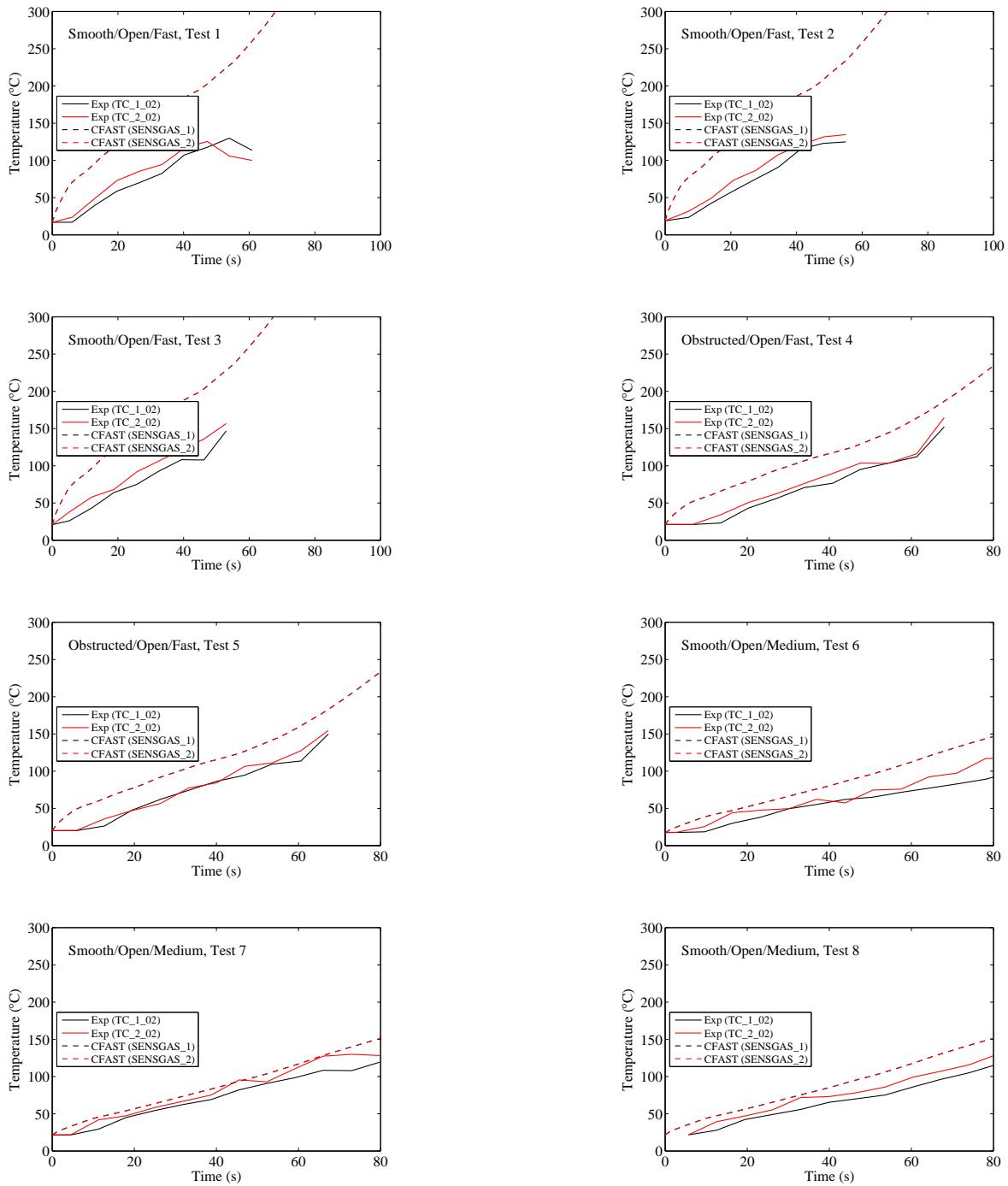


USN HIGH BAY HANGAR EXPERIMENTS

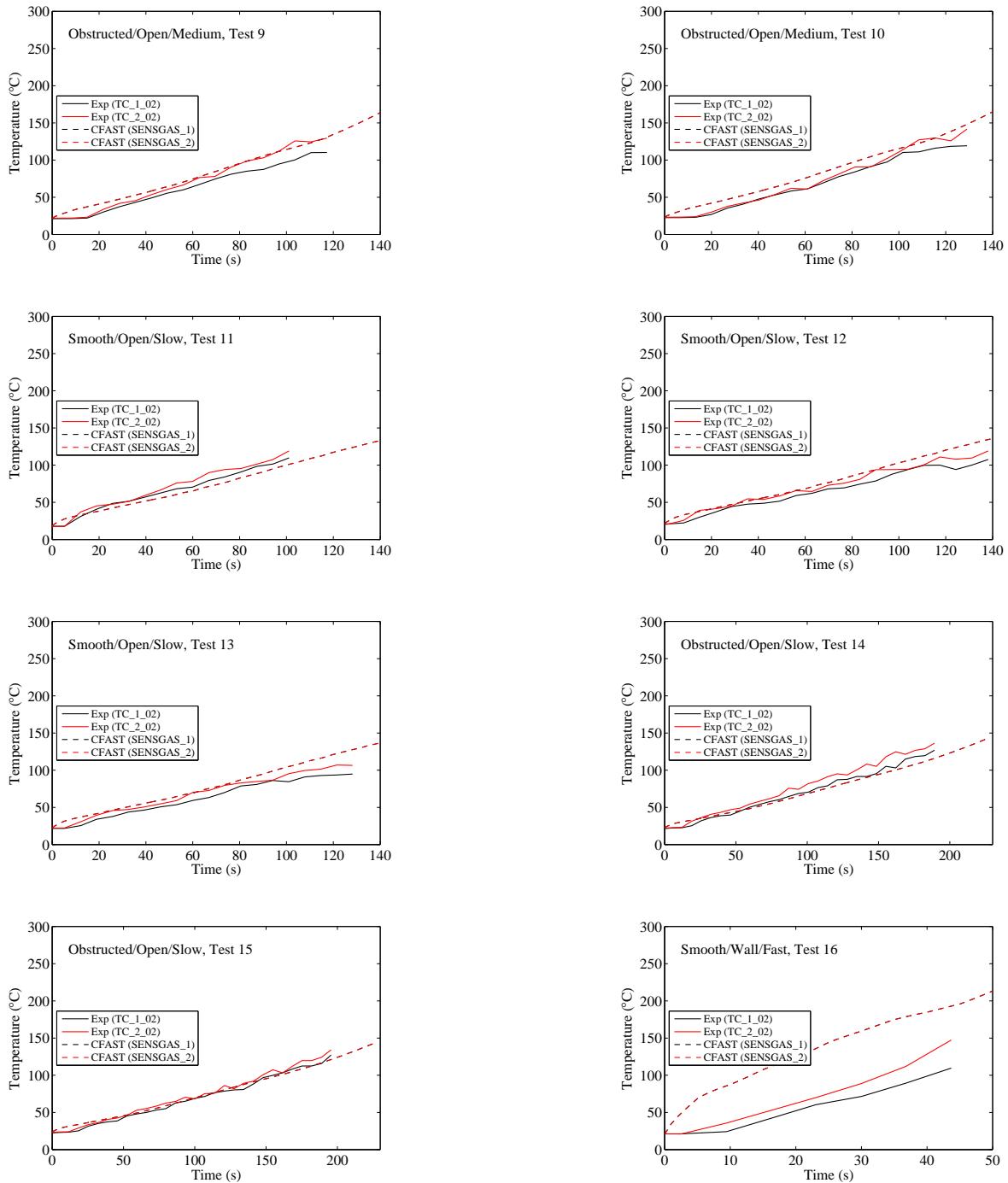


B.12 Vettori Flat Ceiling Experiments

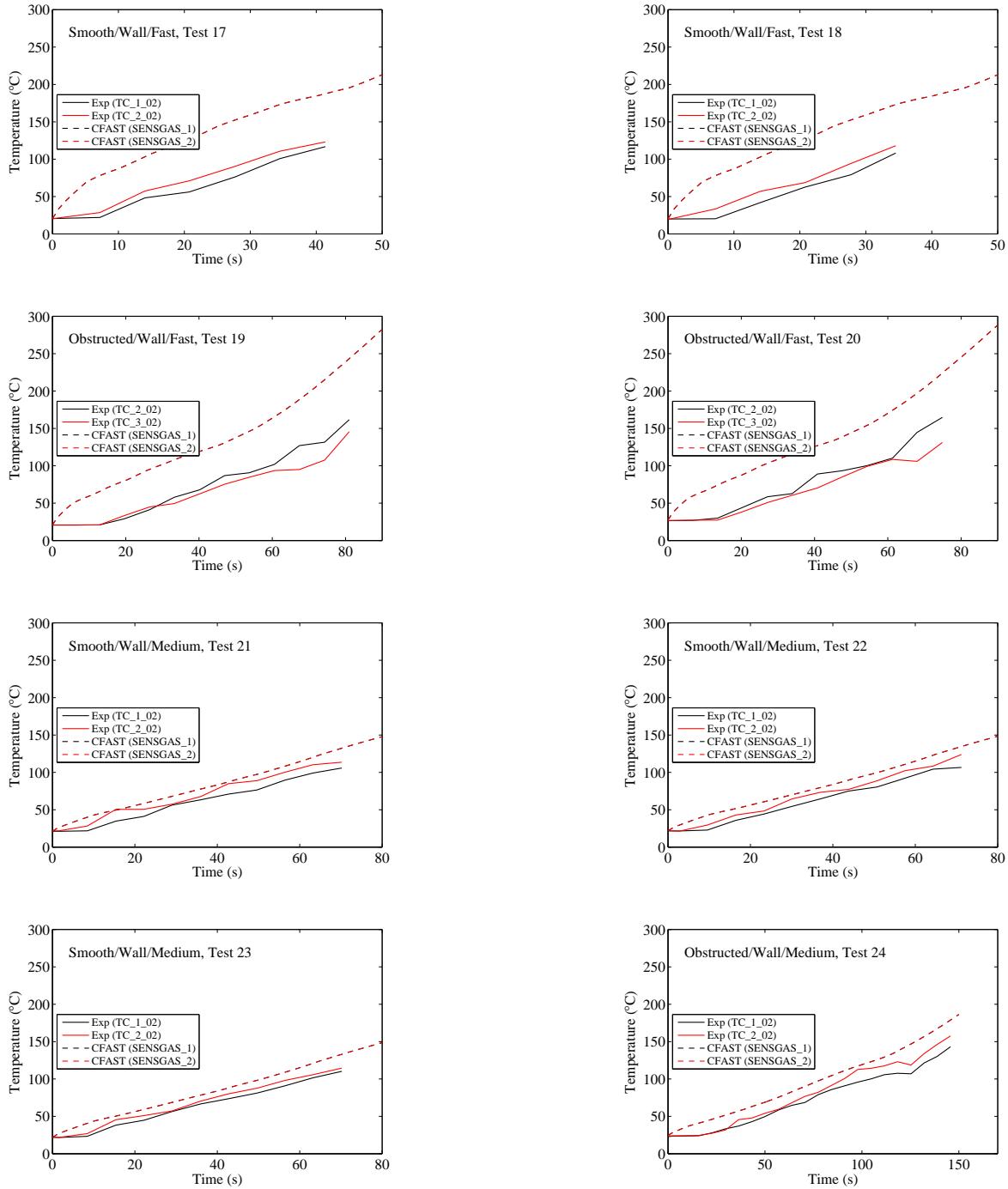
B.12.1 Ceiling Jet Temperature



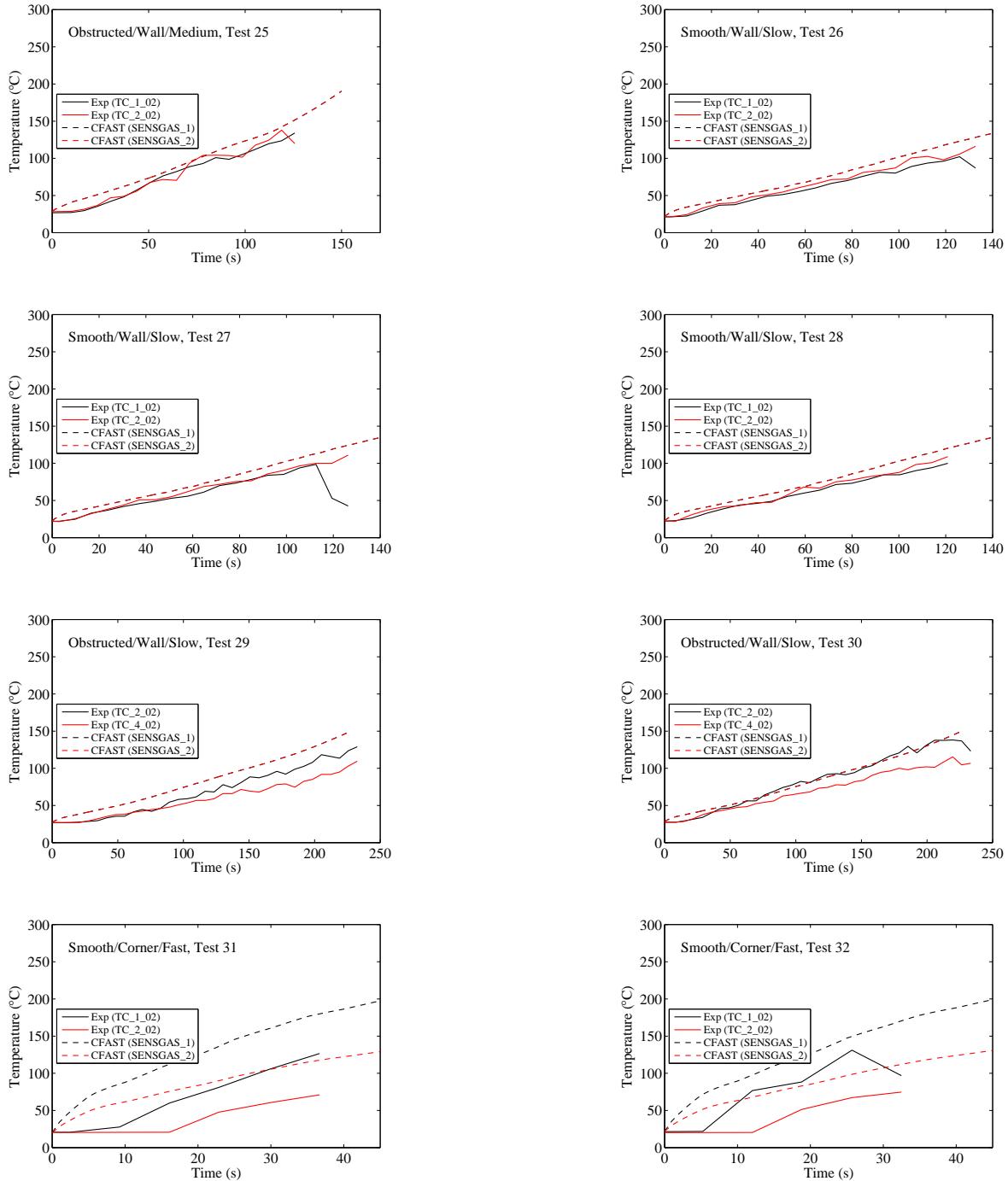
VETTORI FLAT CEILING EXPERIMENTS



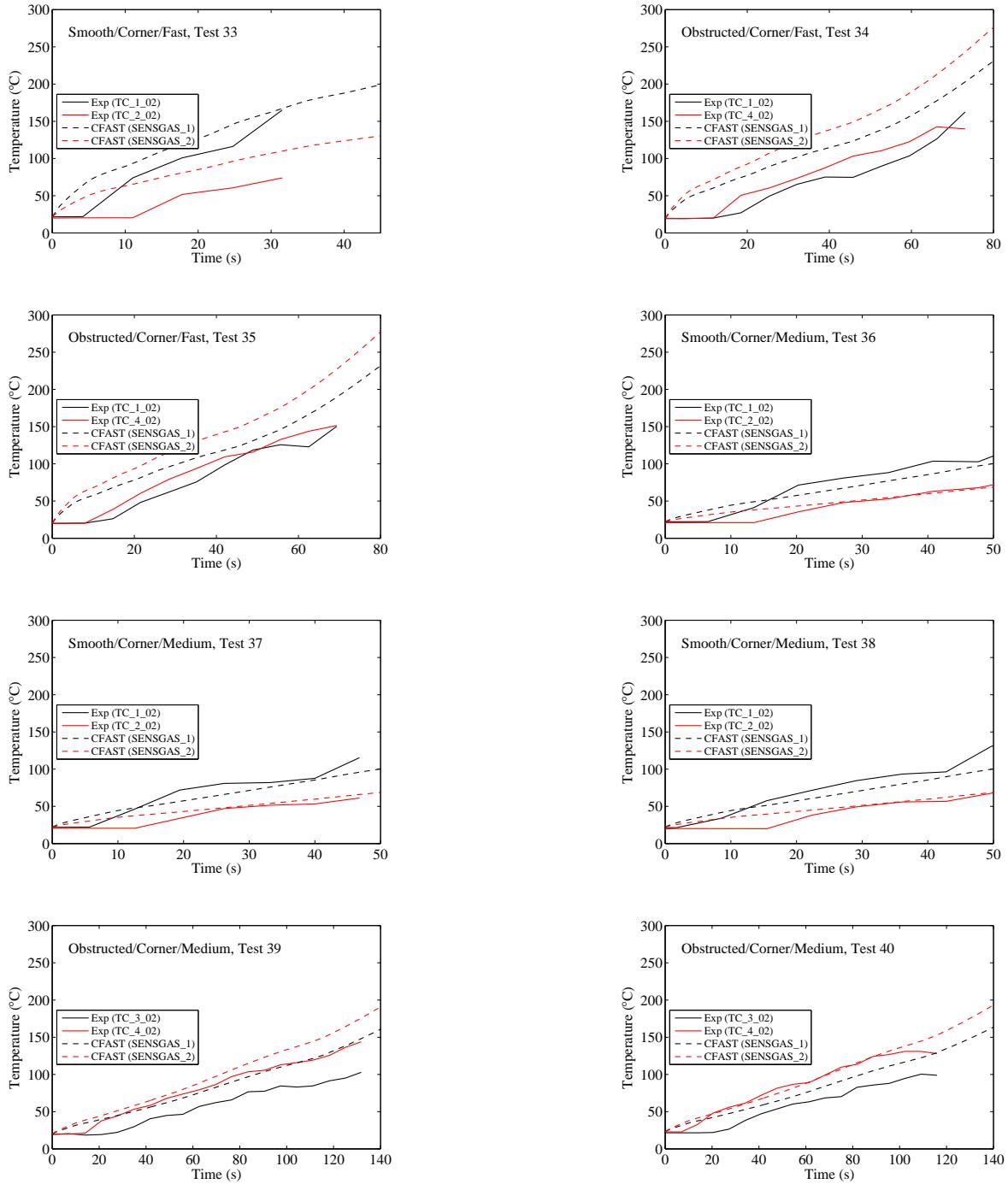
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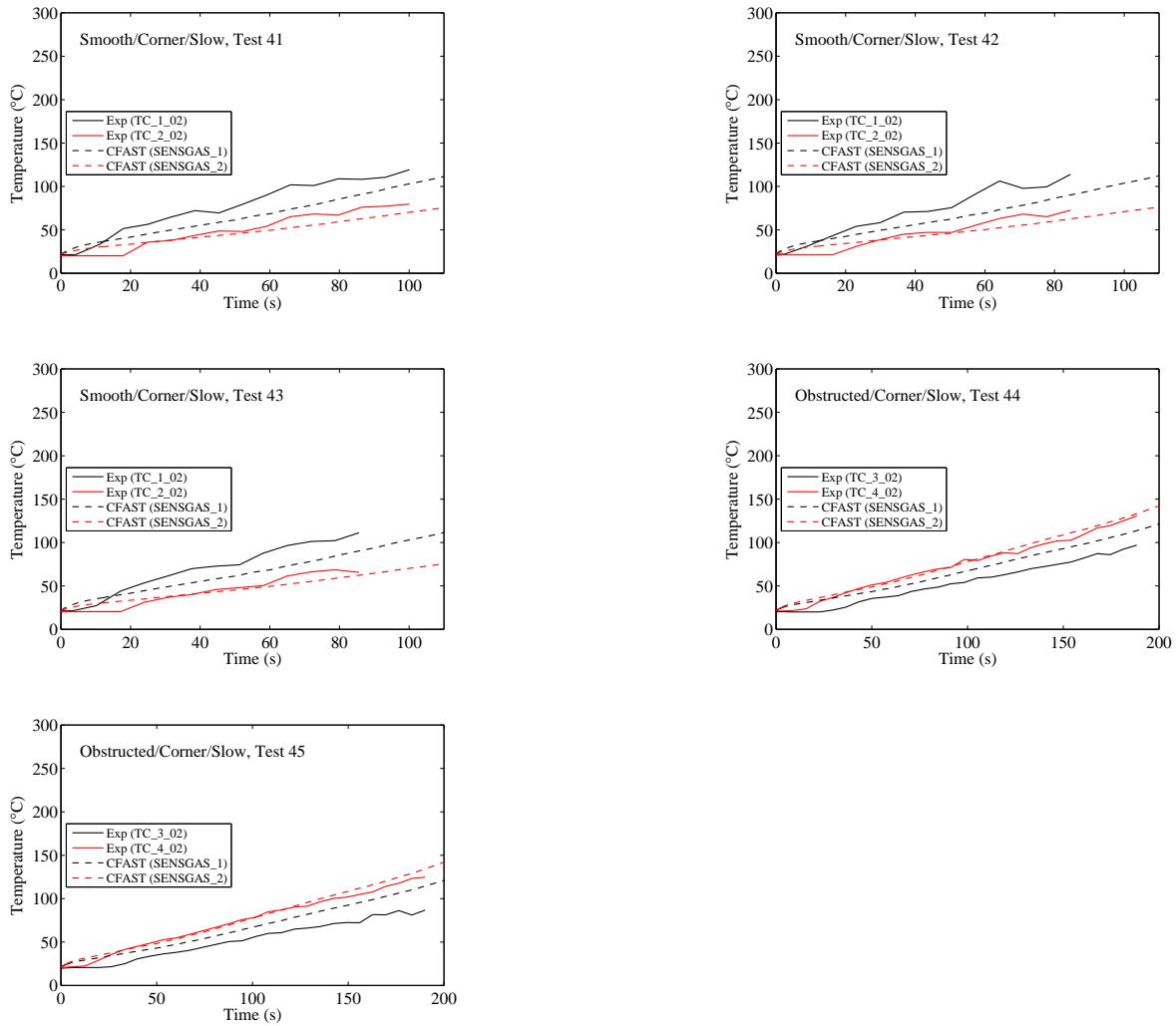
VETTORI FLAT CEILING EXPERIMENTS



VETTORI FLAT CEILING EXPERIMENTS

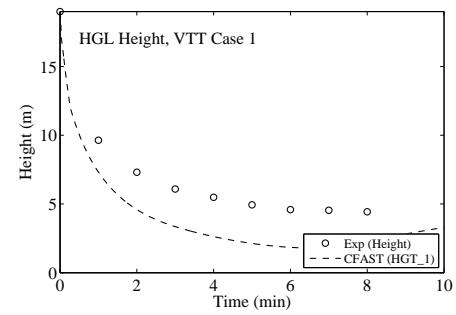
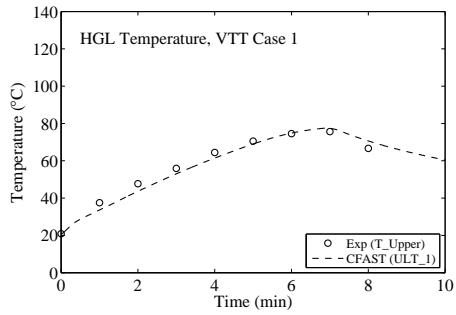
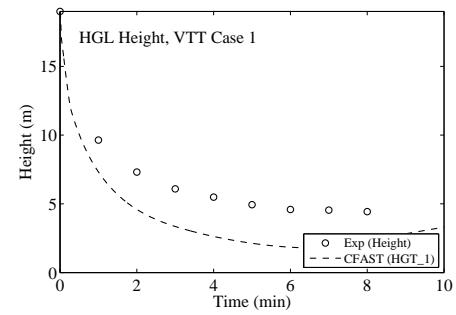
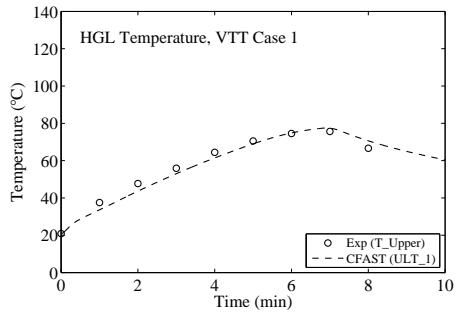
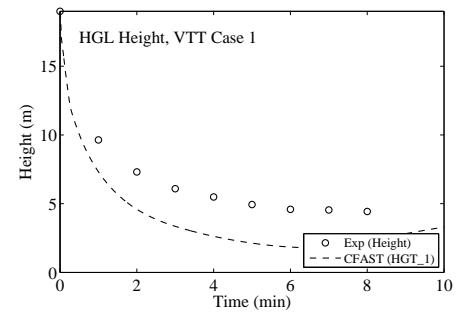
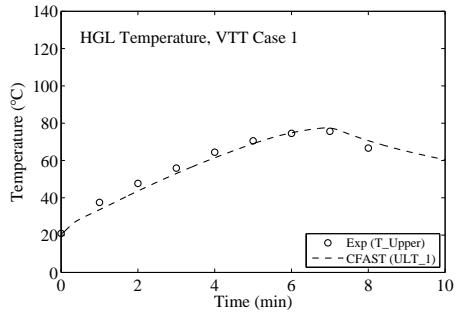


VETTORI FLAT CEILING EXPERIMENTS

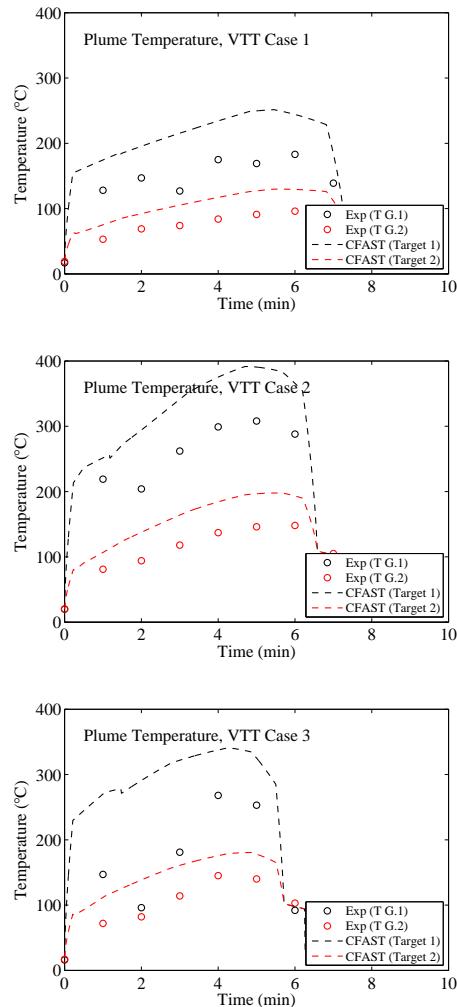


B.13 VTT Large Hall Tests

B.13.1 HGL Temperature and Depth

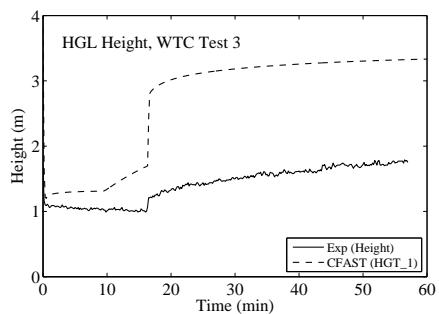
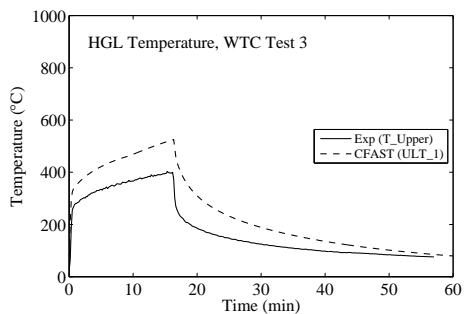
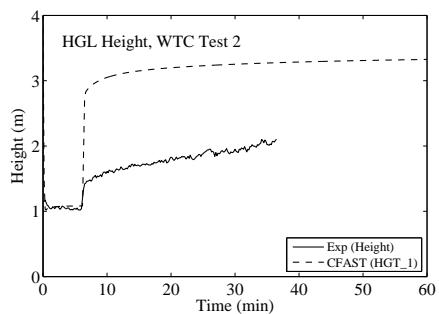
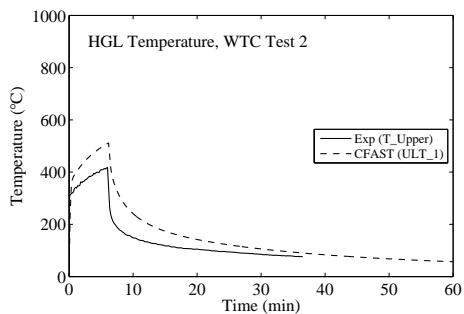
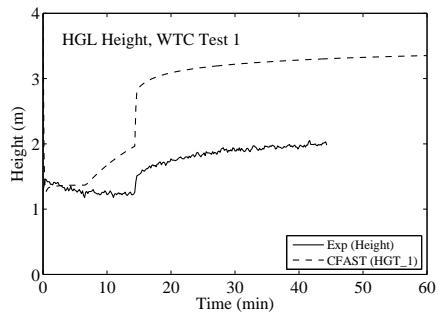
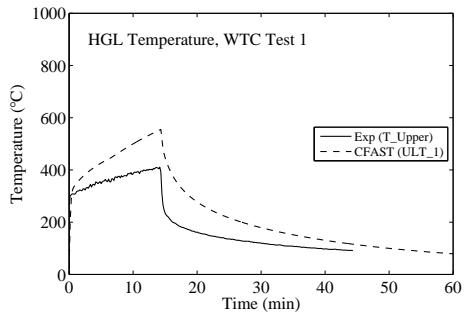


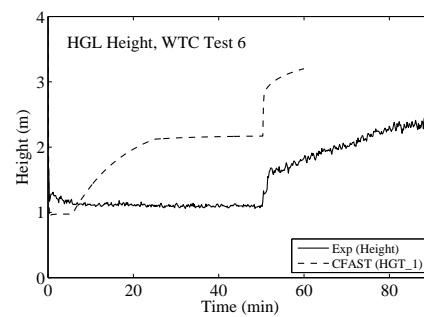
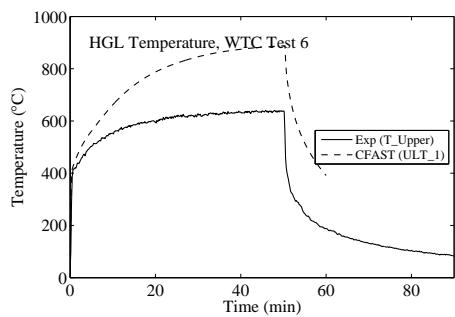
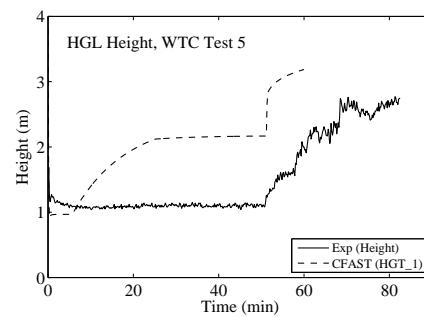
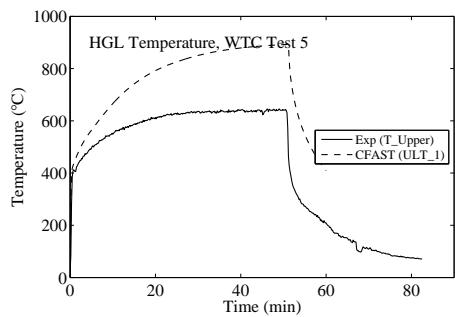
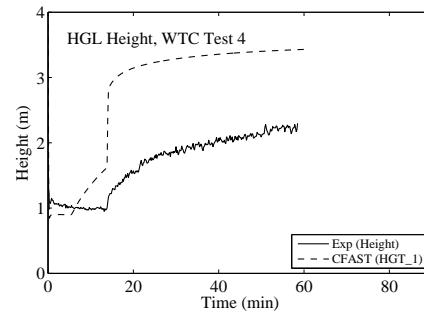
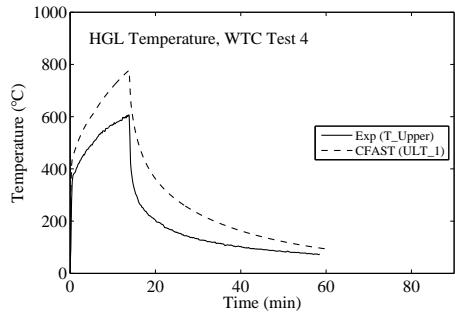
B.13.2 Plume Temperature

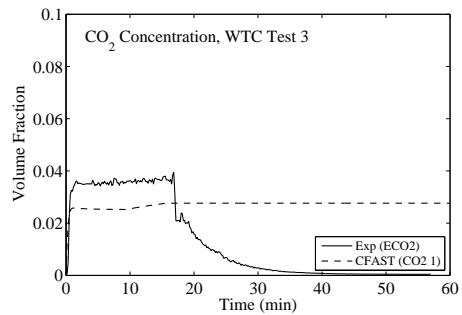
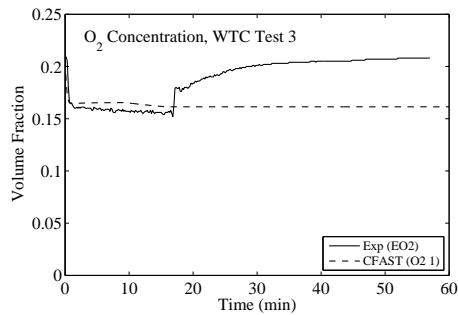
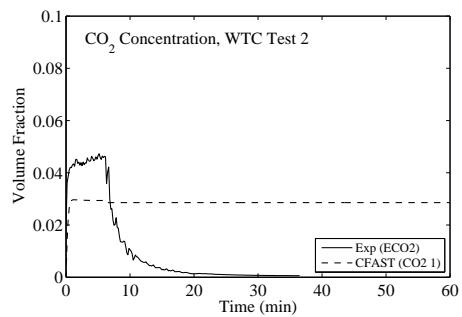
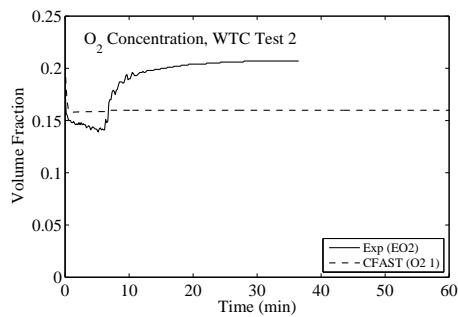
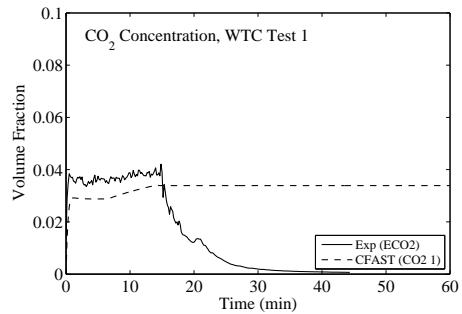
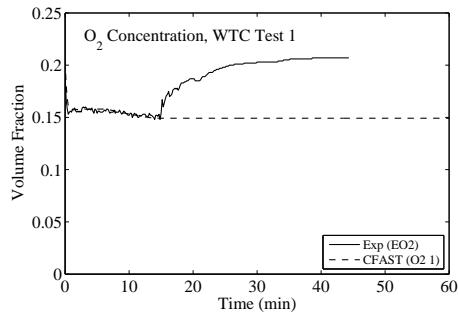


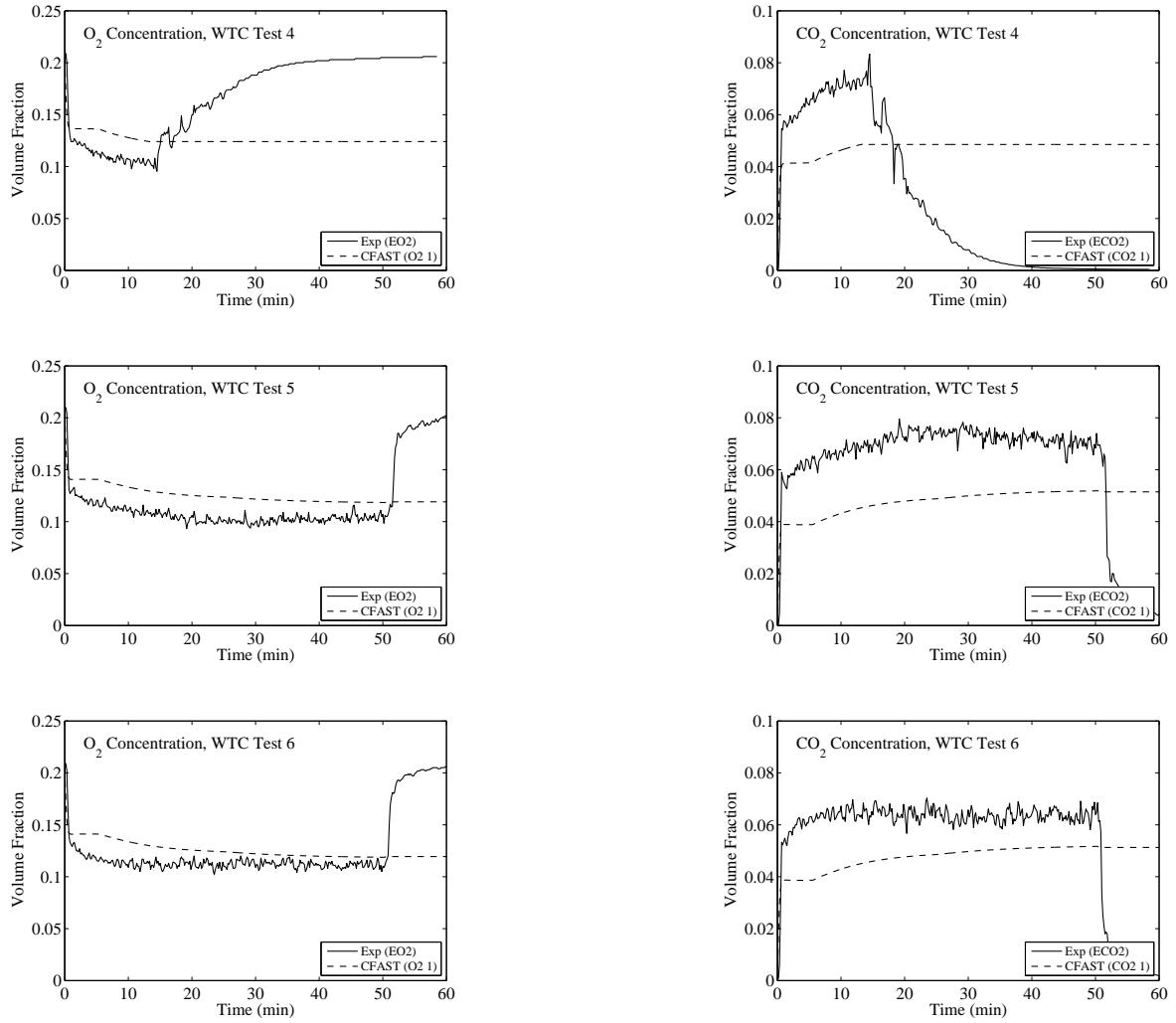
B.14 WTC Test Series

B.14.1 HGL Temperature and Depth

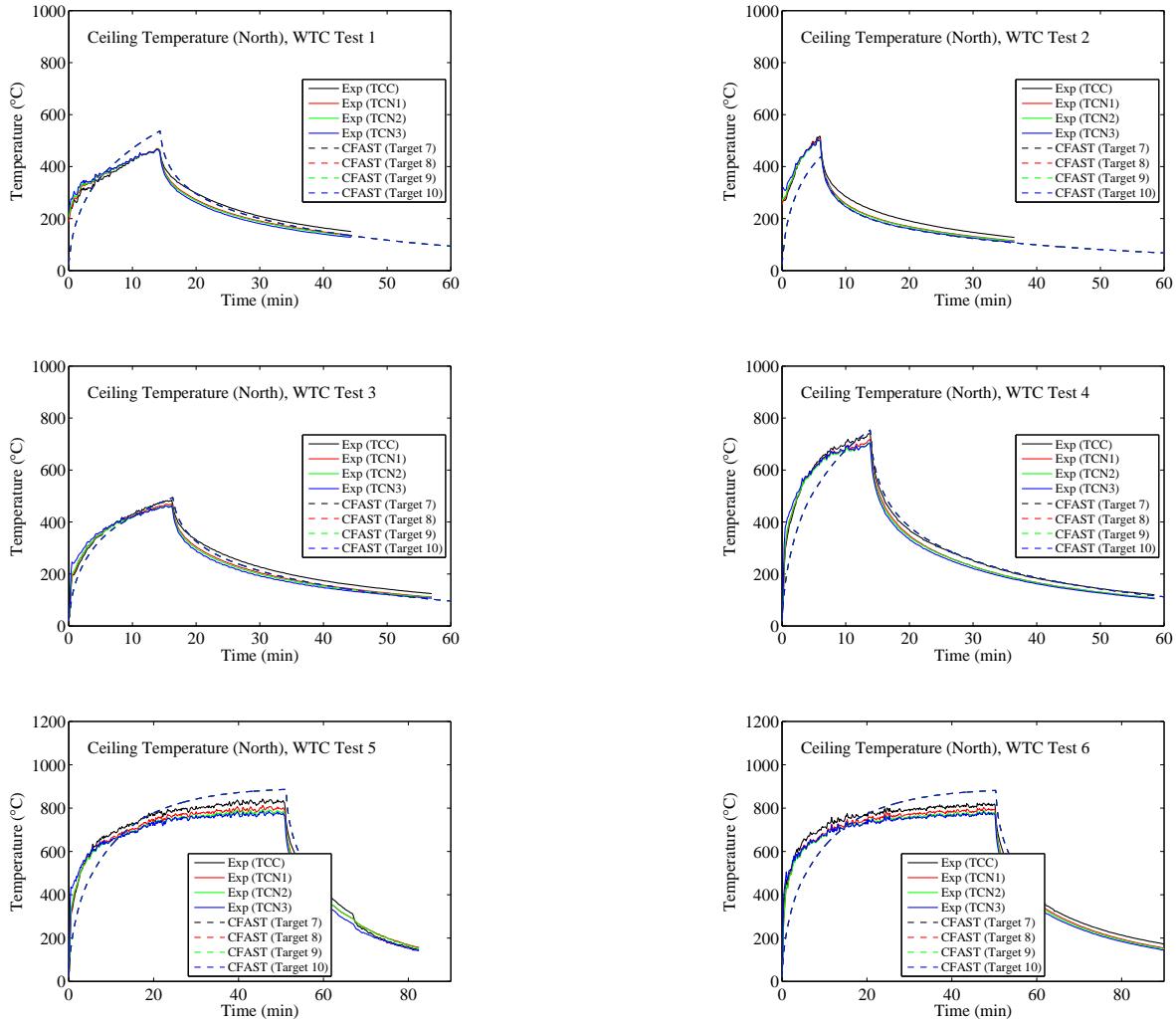


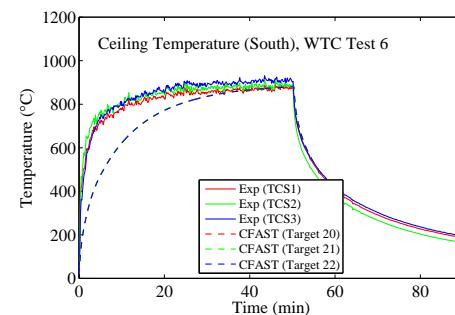
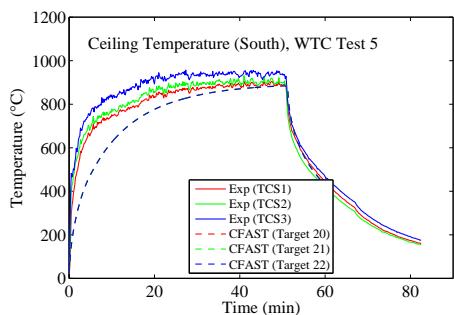
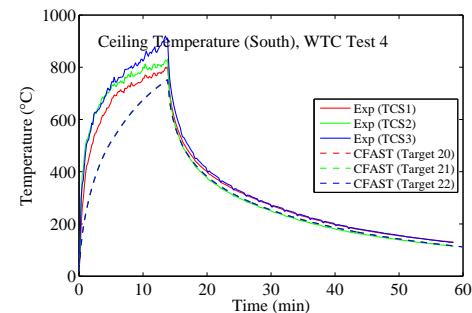
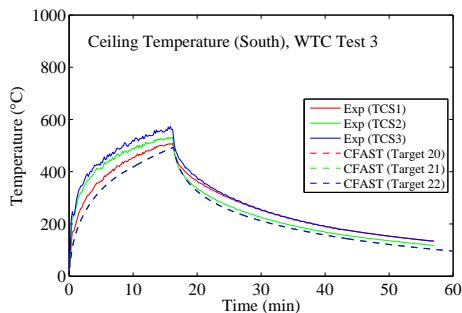
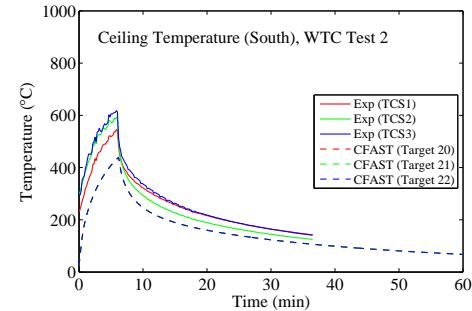
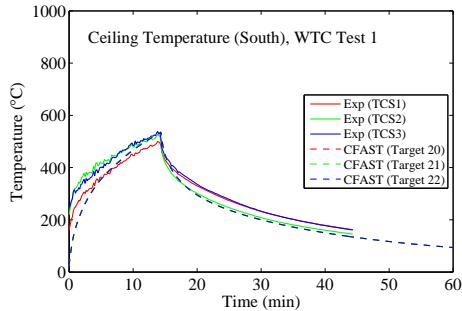


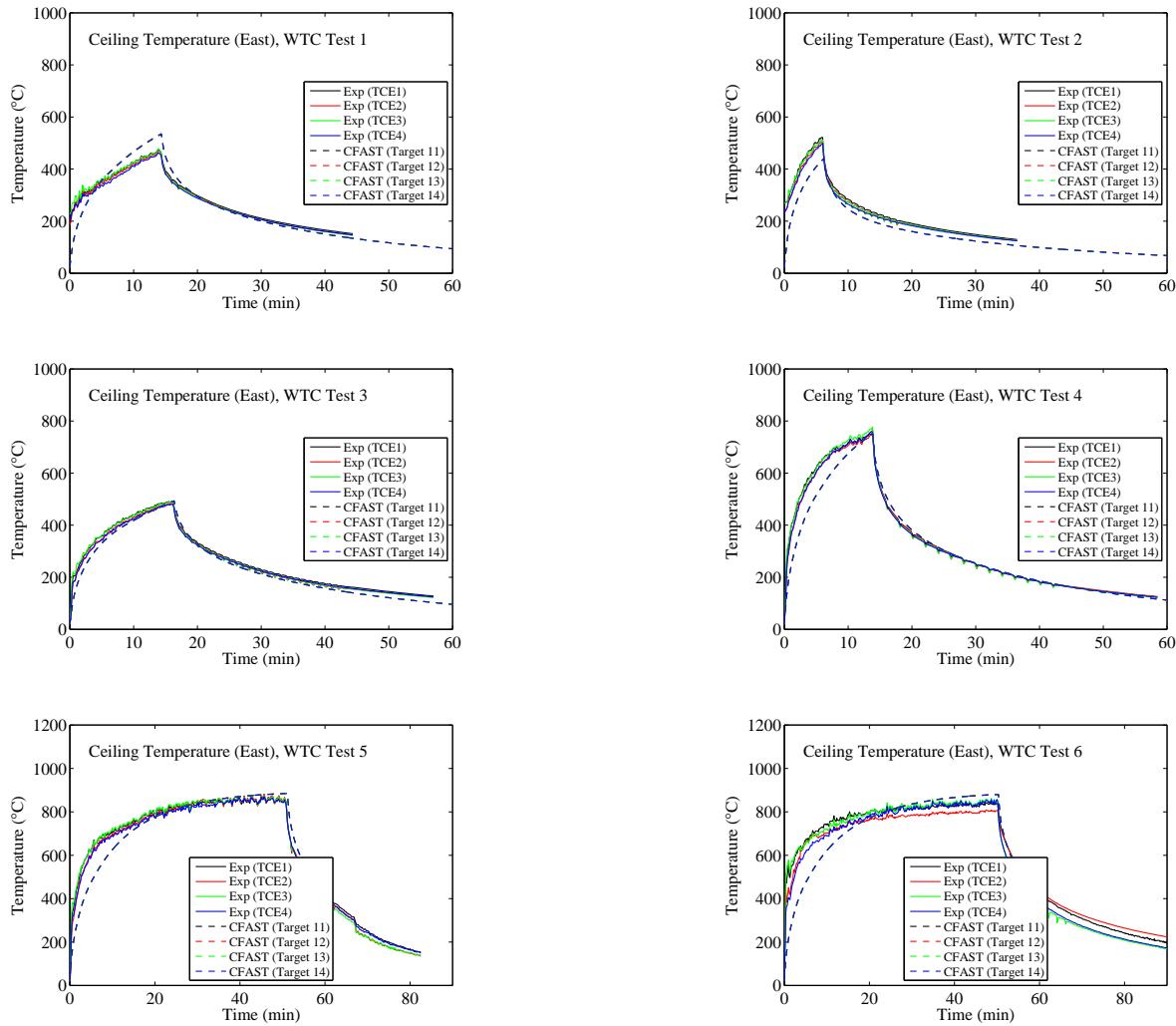
B.14.2 Oxygen and Carbon Dioxide Concentration

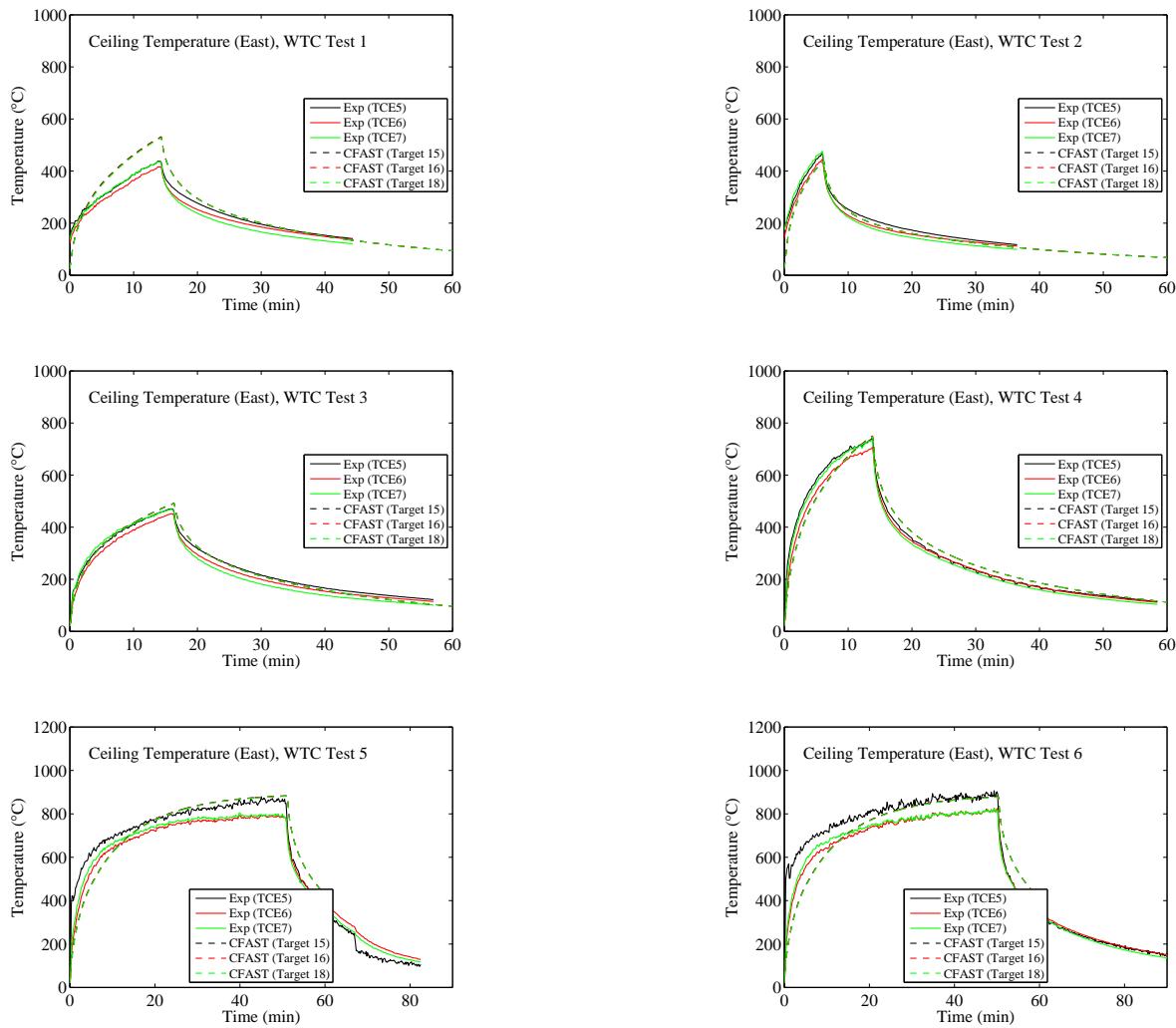


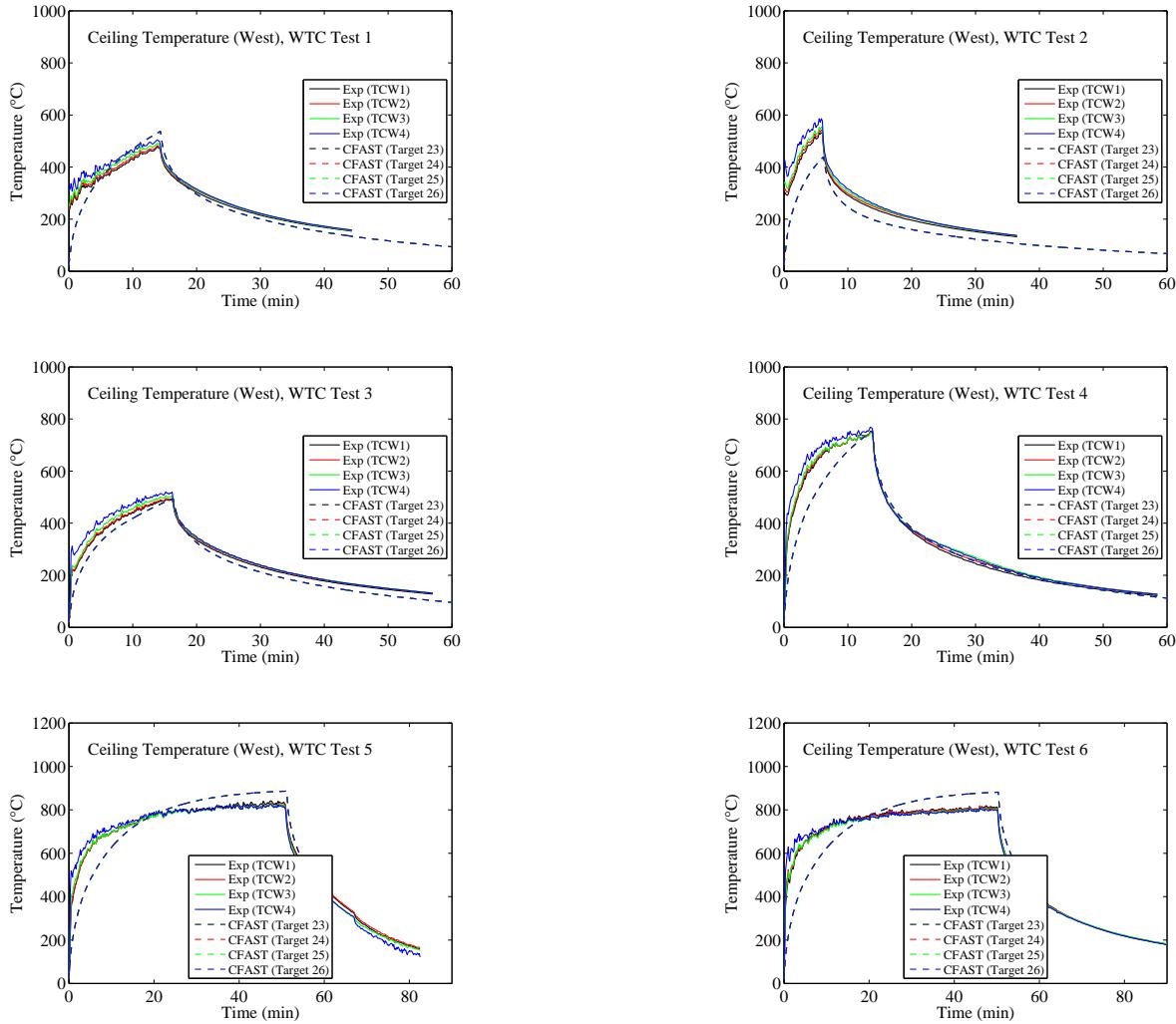
B.14.3 Surface Temperature

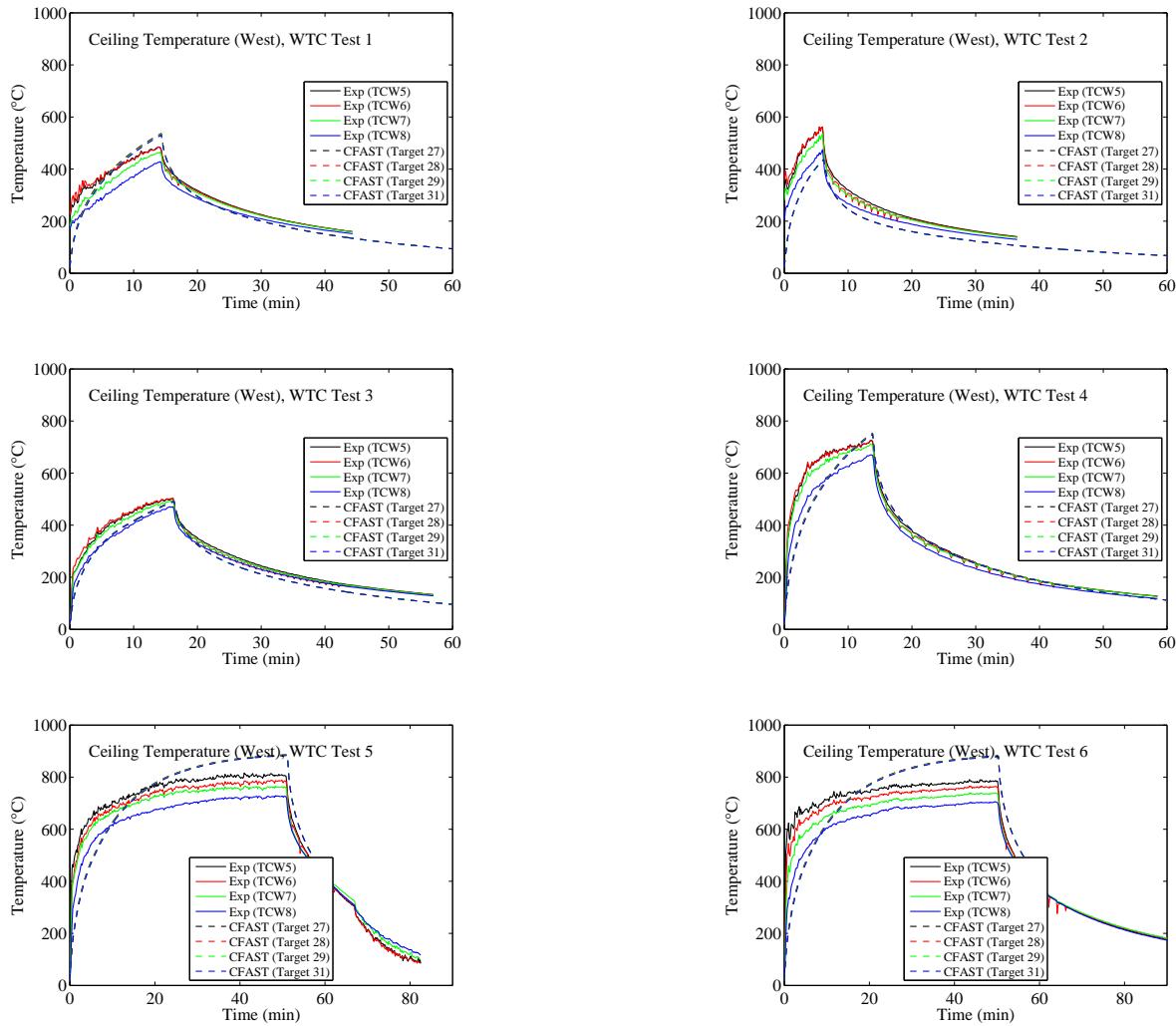


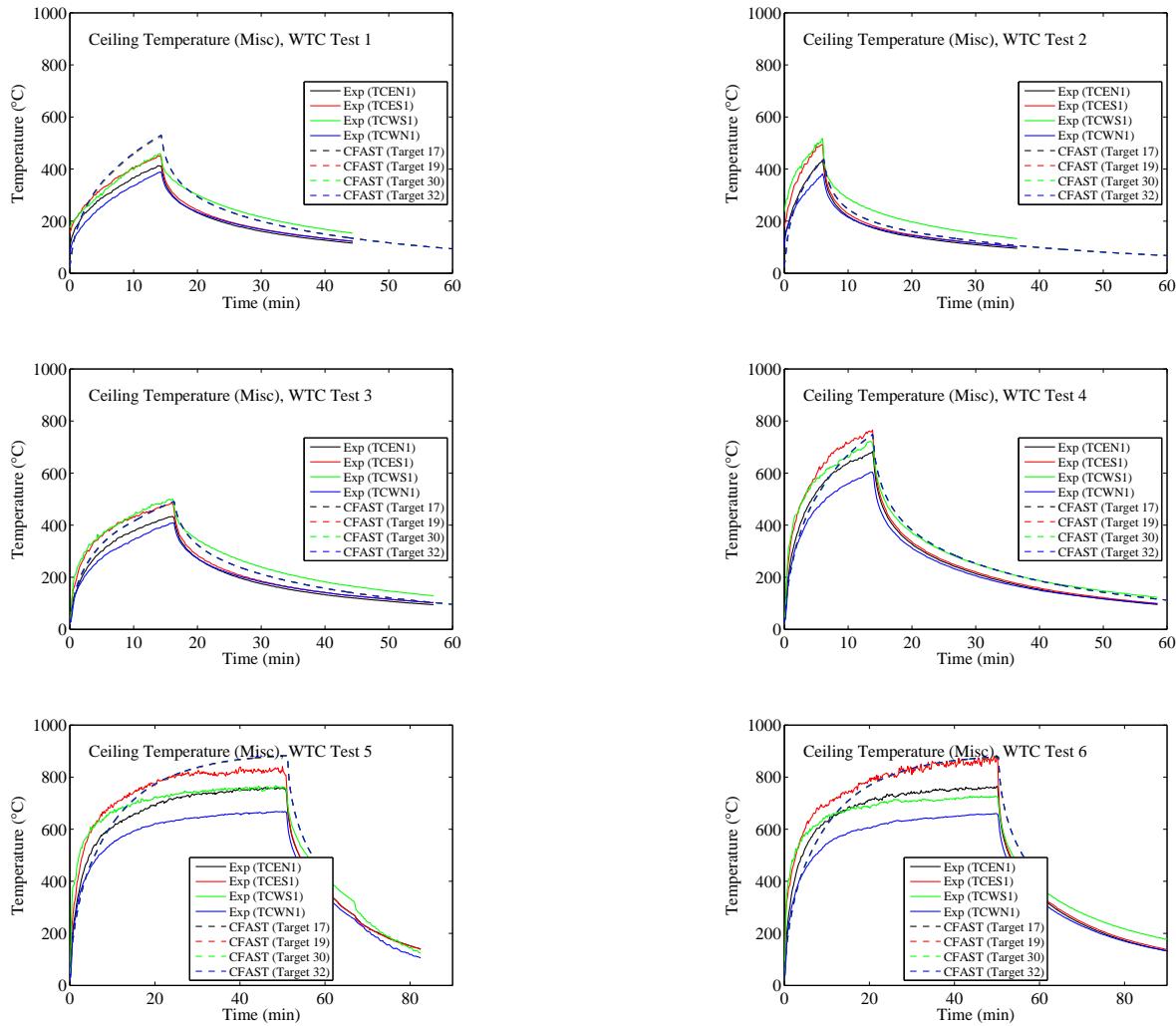


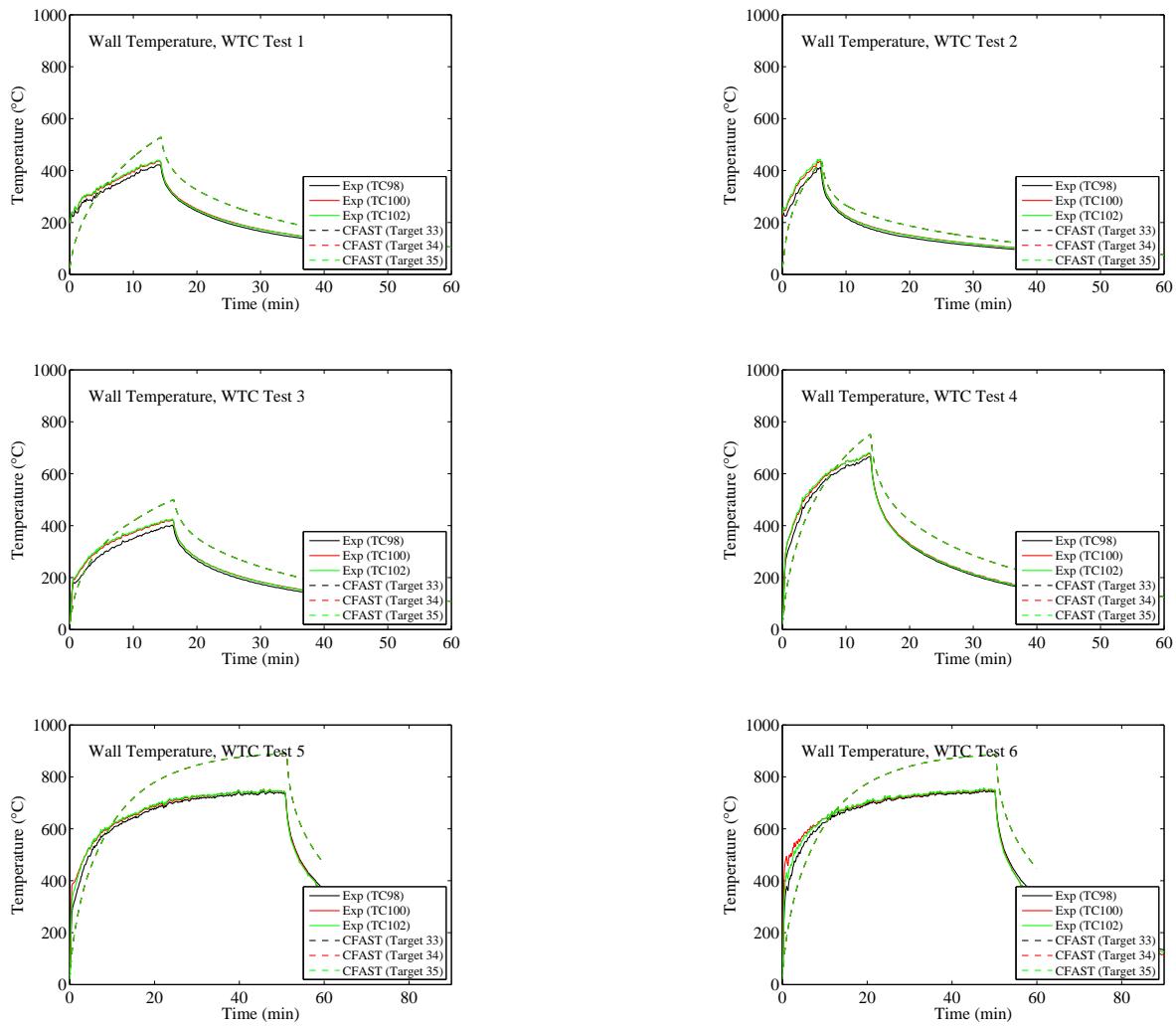


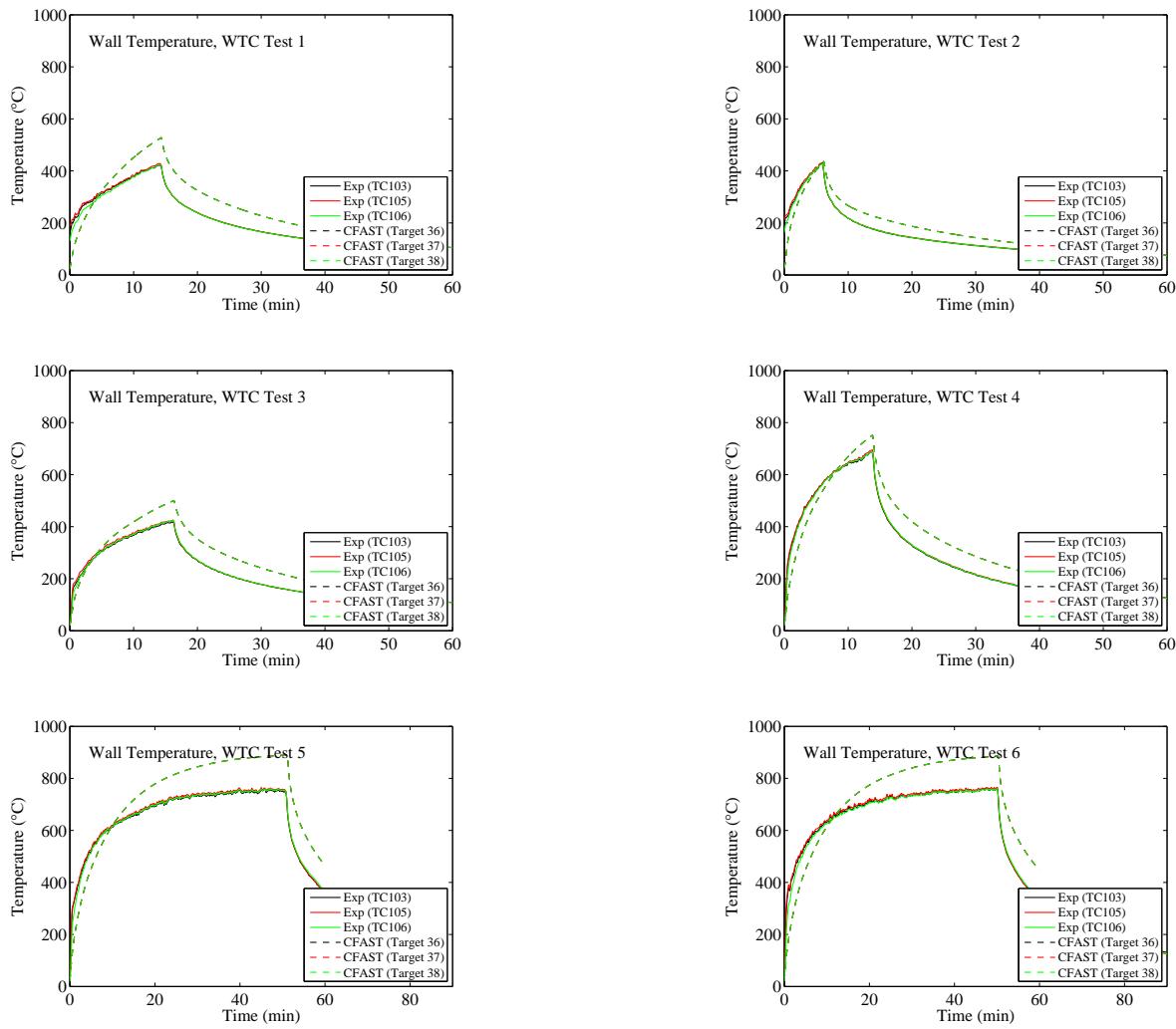


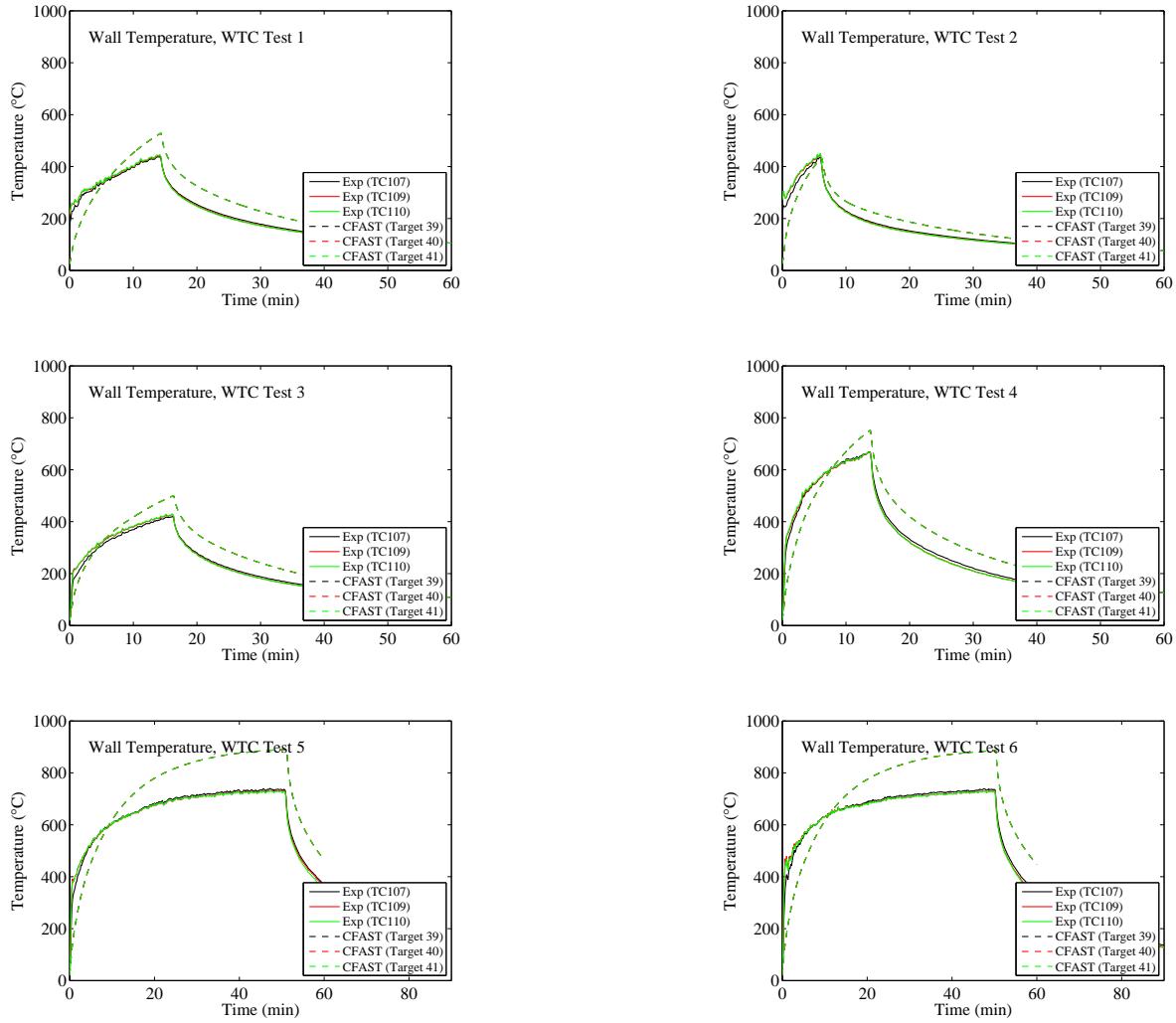












B.14.4 Surface Heat Flux

