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ANNUAL CONFERENCE ON FIRE RESEARCH
Book of Abstracts
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Kellie Ann Beall, Editor

Building and Fire Research Laboratory
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U.S. Department of Commerce
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Comparison of Measured Data with CFAST Predictions for the HDR T51 Wood Crib Test Series

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The HDR test facility in Karlstein, Germany, was a decommissioned, research reactor whose containment building was preserved for use as a large scale test facility for a wide variety of nuclear safety studies. One of the test series performed measured the effects of large fires on the containment building using a number of fuel types in different locations inside the building. A subset of the first fire test series, T51, consisted of three wood crib fires located in the bottom third of the HDR facility. While large quantities of cellulose materials are not typically found in reactor containment buildings, the wood crib tests were performed for the benefit of the fire research community which uses wood cribs as a standard fire type.

The wood cribs were burned in a specially prepared compartment inside the containment building. This compartment was lined with firebrick and fireproof insulation to prevent damaging the structural integrity of the HDR facility which, under German law, was still required to meet nuclear safety standards. In addition to the fire compartment, a flow path from it to a vertical shaft rising the length of the building to the upper dome was also constructed using firebrick. A second vertical shaft was present on the opposite side of the building and allowed flow from the dome back down to the level of the fire. The primary purpose of this flowpath was again to protect the facility, in this case the containment building's steel shell pressure boundary. Measured data from the tests consisted of temperatures, flow velocities, gas concentrations, pressure, and extinction coefficients. Data collection took place for ten minutes before ignition of the wood cribs and for at least thirty minutes after the end of significant combustion.

This paper will discuss the efforts required to model the T51 wood crib fires and will compare measured data from two of the three wood crib tests with predictions made by CFAST v3.1.1. The wood crib tests selected include one well ventilated fire and one underventilated fire. The first test modeled, T51.16, combusted five wood cribs and had a maximum power of 1000 kW. This test was well ventilated and little CO or smoke was produced. The second test modeled, T51.18, combusted eleven wood cribs, had a maximum power of 2300 kW, and was underventilated producing significant quantities of CO and smoke.

References

1. Floyd, J. and Wolf, L. *Evaluation of the HDR Fire Test Data and Accompanying Computational Activities with Conclusions from Present Code Capabilities, Volume 3: Test Description and CFAST Validation for T51 Wood Crib Fire Test Series*. Dept. Materials and Nuclear Engineering, University of Maryland. College Park, Maryland. Report NUMAFIRE:03-98. 1998.
2. Portier, R., Reneke, P., Jones, W., and Peacock, R. *User's Guide for CFAST Version 1.6*. Building and Fire Research Laboratory, NIST. Gaithersburg, MD. NISTIR 4985. Dec. 1992.
3. Peacock, R., et al. *CFAST, the Consolidated Model of Fire Growth and Smoke Transport*. Building and Fire Research Laboratory, NIST. Gaithersburg, Maryland. NIST Technical Note 1299. Feb. 1993.