Computer Models
For
Fire and Smoke

Model Name:	SAWTEF – Structural Analysis of Wood Trusses Exposed to Fire
Version:	1.1
Classification:	Structural Fire Endurance Model
Very Short Description:	A structural fire endurance model to predict the deflections of a metal-plate connected wood truss exposed to known high temperatures.
Modeler(s), Organization(s):	Steven M. Cramer, University of Wisconsin-Madison, former graduate student Deepak Shrestha, Robert White, USDA Forest Products Laboratory.
User's Guide:	User's Manual SAWTEF – Ver. 1.1
Technical References:	White, R. H., Cramer, S. M. and Shrestha, D. K., "Fire Endurance Model for a Metal-Plate-Connected Wood Truss," Res. Pap. FPL-RP-522, USDA Forest Service, Forest Products Lab., July 1993, 12 pgs. Shrestha, D., Cramer, S. M., and White, R., "Time-Temperature Profile Across a Lumber Section Exposed to Pyrolytic Temperatures," *Fire and Materials*, Wiley, Vol. 18, 1994, pp. 211-220. Shrestha, D., Cramer, S. and White, R. "Simplified Models for the Properties of Dimension Lumber and Metal-Plate Connections at Elevated Temperatures," *Forest Products Journal*, 45(7/8), 1995, pp. 35-42.
Validation References:	Cramer, S., "Fire Endurance Modeling of Wood Floor/Ceiling Assemblies," Proceedings of the Fourth International Fire and Materials Conference, InterScience Communications Limited, London, England, 1995, pp. 105-114.

Availability:	Being released only in special circumstances. The program is neither generally available nor maintained because of dependence on DOS operating system. Windows versions are in development.
Price:	Not applicable
Necessary Hardware:	Intel architecture running DOS 3.1 or later. Operates with some difficulties under the DOS Window in Windows 95, 98.
Computer Language:	Fortran
Size:	Approximately 1 MB of disk space and 1 MB of RAM required.
Contact Information:	Steven Cramer, 608-262-7711, cramer@engr.wisc.edu

Detailed Description:

The SAWTEF model computes the deflection and internal forces in a single metal-plate connected wood truss exposed to temperatures expected in a gypsum drywall protected plenum. The model requires the following input data:

- Truss geometry including span, slope, individual member size and length and metal plate size and orientation. Pitched or parallel chord trusses may be considered.
- Wood member stiffness and strength values at room temperature including tension, bending and compression strength.
- Stiffness values for the connections at room temperature in tension.
- Gravity load magnitudes.
- Air/gas temperatures surrounding the truss members with an upper limit of approximately 350°C.

Loss of stiffness and strength of the wood members and connections because of thermal degradation of the wood are computed. The model considers the nonlinearities introduced by the connection behavior, fire-induced degradation, and large displacements using established methods of structural finite element analysis.

This model was developed with support from the American Forest and Paper Association and cooperation with the USDA Forest Service Forest Products Laboratory (FPL). Dr. Robert White of the FPL participated in the development.