Computer Models
For
Fire and Smoke

Model Name:	SAFIR
Version:	SAFIR98a
Classification:	Structural model
Very Short Description:	* Transient analysis of the temperature distribution in the structure; 2D or 3D, Steel, concrete, gypsum and insulating material models; Eurocode models; water evaporation; radiation in internal cavities (2D) * Mechanical analysis of the structure during the fire; 2D and 3D, beam, truss and shell F.E., large displacements, any cross section type for the beams, concrete and steel eurocode models, *Postporcessing; home made Windows based software; shows the stucture, the isotherms, the displaced structure, the bending moment diagrams, the load, etc. Plot the evolution of several results.
Modeler(s), Organization(s):	Jean-Marc Franssen, Univ. of Liege, Belgium
User's Guide:	D. Nwosu, V. Kodur, J.-M. Franssen and J. Hum, User Manual for SAFIR A Computer Program for Analysis of Structures at Elevated Temperature Conditions, NRC-CNRC, Int. Report 782, Oct. 1999.
Technical References:	-----
Validation References:	A comparison between five structural fire codes applied to steel elements, J.-M. Franssen, J.-B. Schleich, L.-G. Cajot, D. Talamona, B. Zhao, L. Twilt and K. Both, Fourth International Symposium on Fire Safety Science, Ottawa, (1994), 1125-1136.

	Evaluation of the thermal part of the code SAFIR by comparison with the code TASEF, D. Pintea & J.-M. Franssen, Proc. 8th Int. Conf. on Steel Structures, Vol. 2, M. Ivan ed., MIRTON, Timisoara, (1997), 636-643. Appui à la normalisation - Volet II. Partie 2: Validation de Programmes Numériques Modélisant lers Structures en cas d'incendie, J.-M. Franssen & J. Unanua, Research Report, Univ. of Liege, 2000.
Availability:	J.-M. Franssen, 1, Chemin des Chevreuils, 4000 Liege 1, Belgium, JM.FRANSSEN@ULG.AC.BE
Price:	Basic price : 10 000 EUROS + eventual training sessions Educational price : - 40% Reduced prices for reduced versions (thermal only and/or 2D only)
Necessary Hardware:	A reasonable P.C. Calculations have made made on Vax VMS and on Unix machines
Computer Language:	The postprocessing is in VisualBasic. The resolution is in FORTRAN
Size:	1.4 Mb for the resolution, 1.2 Mb for the postprocessing
Contact Information:	J.-M. Franssen, 1, Chemin des Chevreuils, 4000 Liege 1, Belgium, JM.FRANSSEN@ULG.AC.BE tel. +32-4-366,92,65 fax +32-4-366,95,34

Detailed Description:

Transient analysis of the temperature distribution in the structure;
2D (3 or 4 nodes) or 3D (6 or 8 nodes) linear finite elements. Shape of the F.E. not necessarily regular.
Non linear steel, concrete, gypsum and insulating material models; Eurocode models; water evaporation (but no water migration);
Radiation in internal cavities (2D), any shape is possible ibncluding non concave cavities, objects included in the cavity, or 2 objects not
touching each other (false ceiling under a concrete slab).

* Mechanical analysis of the structure during the fire;
2D (3 nodes, 3-1-3 D.o.F.)and 3D (3 nodes, 7-1-7 D.o.F.) beam F.E.
2D or 3D truss F.E. (1 material, 1 temperature, 1 point of integration, only compression or tension transmitted)

Shell F.E. (included in next release, temperature variation on the thickness, Quadrilateral element, plane stress steel model)
Large displacements (corrotational description),
Any cross section type for the beams (uses same discretisation as the one used in the thermal analysis)
Concrete and steel eurocode non linear models (creep implicitely taken into account).