Computer Models
For
Fire and Smoke

Model Name:	STA
Version:	-----
Classification:	Model for transient conduction in heated solid objects
Very Short Description:	The model uses the finite element method to solve the transient conduction within a solid (or hollow) body subjected to surface heating. The model generates its own finite element mesh and produces temperature plots and contours. The model is designed primarily for the determination of the fire resistance of building components.
Modeler(s), Organization(s):	Dr Raymond Connolly, Fire & Risk Solutions Ltd., Kinetic House, Theobald Street, BorehamWood, Herts, UK WD6 4PJ and Dr James A Kirby, Department of Mathematics, Brunel University, Uxbridge, London.
User's Guide:	in-built help and user facilities. The main asset of the model is its user-friendliness and the absence of any pre or post processing requirements or indeed the need to undertand finite element technology.
Technical References:	Whitaker S. Fundamental Principles of Heat Transfer. Robert E. Krieger Publishing Company, Inc., Malabar, Florida, 1983. Wickstrom U. A Numerical Procedure for Calculating Temperature in Hollow Structures Exposed to Fire. Lund Institute of Technology, Sweden.
Validation References:	validated against fire resistance test data from various UK references. Recently used in UK Department of Environment Partners in Technology Project with British Steel (Corus), Building Research Establishment and University of Edinburgh to predict thermal response of

	unprotected steelwork exposed to natural fires at Cardington laboratory.
Availability:	available from author
Price:	free of charge to research/academic bodies. Commercial users contact author at connollyrj@eircom.net.
Necessary Hardware:	PC with 486 process or better
Computer Language:	Visual C++
Size:	<1MB
Contact Information:	Dr Raymond J Connolly, Fire & Risk Solutions Ltd. Kinetic House, Theobald Street, BorehamWood, Herts UK WD6 4PJ Connollyrj@eircom.net

Detailed Description:

STA is a user friendly equivalent of the better known TASEF and TEMPCALC codes.

The model is an improvement of the original THELMA model developed by the authors whilst working at Building Research Establishment UK. The new features include:

i) operational in MS windows environment
ii) graphically driven input of problem with on screen CAD of object
iii) assignment of materials from in-built databases including thermal properties from standard references
iv) automatic generation of finite element mesh
v) automatic mesh regeneration to minimise numerical errors and runtime
vi) colour contour output of temperatures
vii) graphs of local time temperature development
viii) capable of considering hollows and voids within solid body
ix) runtimes in the order of 0-5 minutes for reasonably elaborate meshes
x) choice of numerical solution modes available.

STA has improved well established techniques and fire safety technology and incorporated them within a modern user-friendly program for quick and easy use by practitioners.

The programme has been used in Department of the Environment Partners in Technology Projects, Building Research Establishment projects and commercially for structural fire safety design in the UK.