Fire Safety Engineering Group
Maritime Greenwich Campus,
Cooper Building,
University of Greenwich,
King William Walk,
London SE10 9JH, UK.

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PART 1 – CONTROLLED TEST SETUP

Test case : **Fire in a completely open compartment with lid case – 2000/2/3**

Document Version 1.1

PART 1 – CONTROLLED TEST SETUP

Case: **Simple volumetric fire under a lid case – 2000/2/3**

User details	
Run by: Date: Phone no: email:	Address:

Fire modelling Software

SMARTFIRE	CFX	PHOENICS			

Version/build number____________
Date of release__________________

Operating System

Windows 95/98/2000	Windows NT	Unix	Dos	

Version/build number______________________

Machine

PC	Unix Workstation	

CPU:
Memory:

Case description

This Fire case utilises a volumetric heat source. The compartment is completely open apart from a solid ceiling. The fire is located on the floor at the centre of the building. The prescribed fire volume is 1m x 1m x 1m. The fire power is defined as H = $0.188t^2$(kW) (i.e. t squared fire and t is measured in seconds). The compartment is 5m(wide) × 5m(long) × 3m(high). It should be noted that this is a hypothetical case for which there is no experimental data. The walls are adiabatic. The ambient temperature is 303.75K.

Required Results

The results should be supplied as graphs and as Excel97 worksheets

This case is used for comparison between the codes.

All the results are instantaneous results for the 110^{th} second.
Temperature profile across the cabin 0.1m below the ceiling.

Temperature profile across the cabin 0.3m below the ceiling.

CFD set up

1D	2D	3D

Transient	Steady State

110*1s timesteps (110s total)

Differencing Schemes

Temporal:

Fully Implicit	Crank-Nicolson	Explicit	Exponential	

Spatial:

Hybrid	Central Difference	Upwind		

Notes:

Physical Models

Radiation Model *(if not listed please specify in the space provided)*

None	Six flux	Discrete Transfer	Monte Carlo	Radiosity	

Notes:

(1) If the fire modelling software does not possess the six-flux model, a discrete transfer model may be used in place of the six-flux model. If the discrete transfer model must be used instead of a six flux model then the discrete model must be made to emulate the behaviour of the six-flux model. This can be achieved by using 6 rays in the co-ordinate directions. If a radiation mesh needs to be specified, this should be identical to the flow mesh. If this is not possible, then at least the same number of cells in each direction must be specified. The details of the mesh must also be provided with your results.

Parameters

The absorption coefficient (a) is equal to 0.7

It is assumed there is no scattering so s = 0.0.

Turbulence model *(if not listed please specify in the space provided)*

Laminar	k- ε	buoyancy modified k-ε	RNG	

Notes:

Turbulence Parameters*:

C_{μ}	σ_k	σ_{ε}	$C_{1\varepsilon}$	$C_{2\varepsilon}$	C_3
0.09	1.0	1.3	1.44	1.92	1.0

*If different parameters are being used please specify in the table above.

Combustion Model *(if not listed please specify in the space provided)*

none	Volumetric heat source	Mixed is burnt	Eddy break up
Magnussen soot model			

Combustion Parameters:

Compressibility

Incompressible	Boussinesq	Weakly compressible	Fully compressible

Compressibility Parameters:

External Pressure 1.01325e+05

Buoyancy

Yes	No

Gravity	-9.81m/s in the v-velocity direction.

Material Properties

Material Name	Air
Density	Determined by compressibility (Ideal Gas Law) Molecular Weight of air is 29.35
Viscosity	1.6e-005 + Value determined from turbulence model
Conductivity	0.02622
Specific heat capacity	1045.78

Initial Values

U-VELOCITY	0.0
V-VELOCITY	0.0
W-VELOCITY	0.0
PRESSURE	0.0
TEMPERATURE	303.75
KINETIC ENERGY	0.01
DISSIPATION RATE	0.01

Boundary conditions

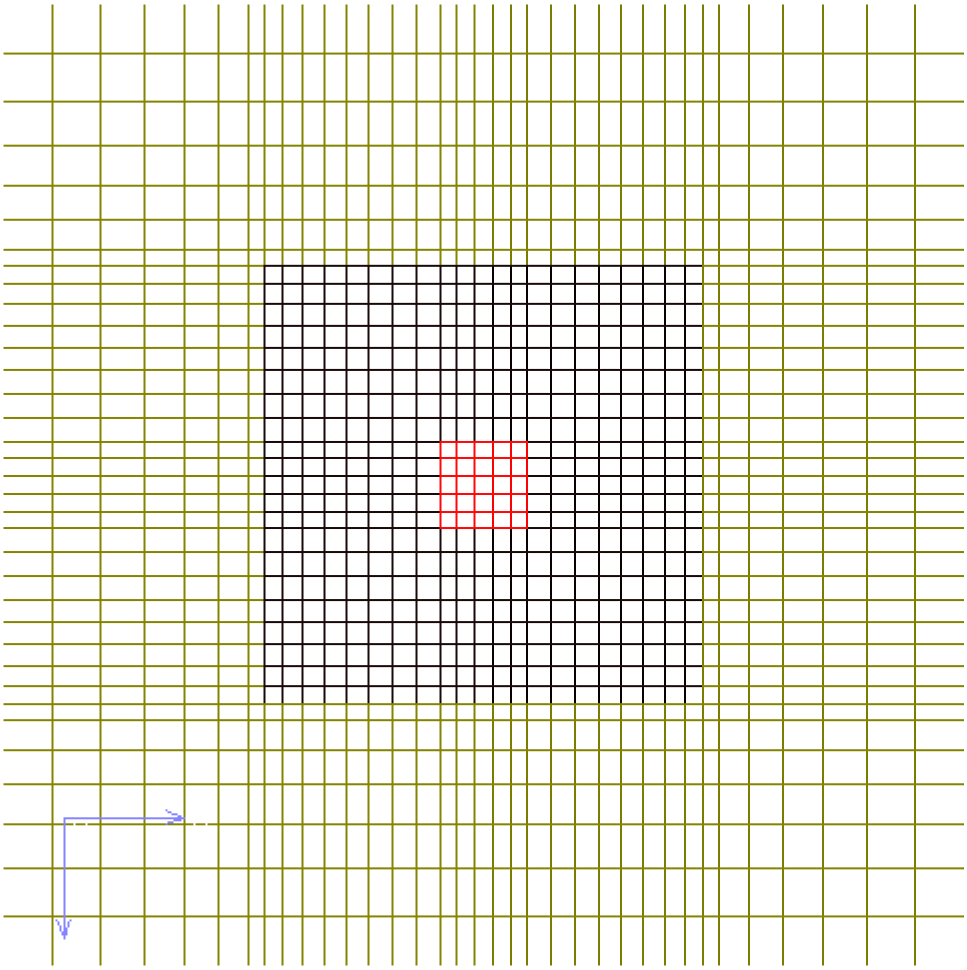
All walls are assumed to be adiabatic for the first phase of the validation process. In the first phase of validation the walls are perfect reflectors of radiation, i.e. the emissivity of the walls is 0. The default log-law turbulent wall functions should be used.

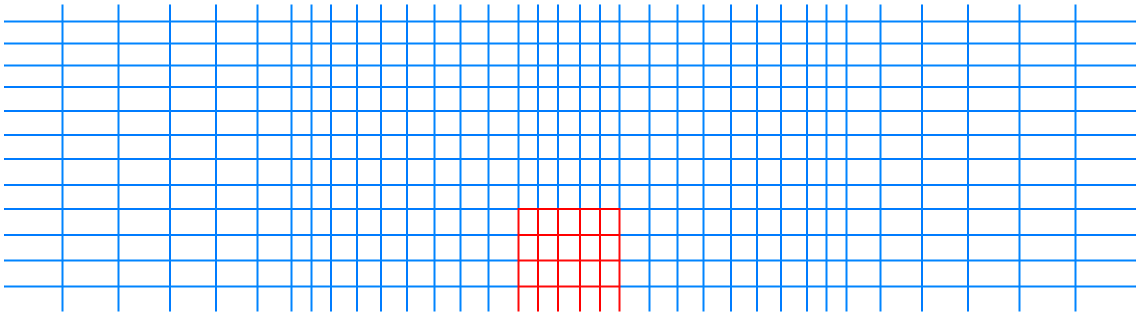
An adiabatic floor covering the whole of the bottom of the domain
An adiabatic ceiling centrally located 3m above the floor measuring 5m x 5m.

The centrally located fire volume is 1m x 1m x 1m. The fire power is defined by the standard method, i.e., $H = 0.188t^2$(kW) (i.e. t squared fire)

Extended regions are required all around the compartment and outlet boundary conditions are applied to these patches with pressure set to equal 0.0Pa.

Mesh





35 13 35

X & Z 0.0 0.582337 1.126982 1.629535 2.083877 2.480691 2.803219 3.0 3.203063 3.435275 3.67993 3.933033 4.192609 4.457462 4.726788 5.0 5.2 5.4 5.6 5.8 6.0 6.273212 6.542538 6.807391 7.066967 7.32007 7.564725 7.796937 8.0 8.196781 8.519309 8.916123 9.370465 9.873018 10.417663 11.0

Y 0.0 0.25 0.5 0.75 1.0 1.243039 1.483051 1.719647 1.952316 2.180348 2.402694 2.617619 2.821613 3.0

Model Definition files

Convergence

Please specify your convergence criteria including type of error estimator and tolerance value for each variable

Runtime

Results files/Archiving:

Document cross-reference:

User Guides, etc

Comments