

# FDStoSAFIR

## User's manual

A specific version of FDS has been compiled that allows creating a transfer file to be used in subsequent SAFIR thermal analyses. It will be called here FDStoSAFIR<sup>1</sup>.

This document describes the specific command line that has to be inserted in the input file of this version of FDS to generate the transfer file.

- 1) The compartment and the fire source are first described in the input file as for any other FDS calculation. Three command lines are of particular interest for the transfer file.

The command "MESH"? It has 2 arguments:

- "IJK" gives the number of divisions of the FDS domain in the X, Y and Z directions;
- "XB" gives the limits of the FDS domain as  $X_{min}$ ,  $X_{max}$ ,  $Y_{min}$ ,  $Y_{max}$ ,  $Z_{min}$ ,  $Z_{max}$ .

For example, with the command line underneath, the FDS domain extends from 0 to 7 m in the X and Y direction and from 0 to 3.5 m vertically. The size of the cells is 0.10 in each direction.

```
&MESH IJK = 70, 70, 35 XB = 0.0, 7.0, 0.0, 7.0, 0.0, 3.5 /
```

The command "TIME" gives the final time of the FDS simulation.

For example, with the command line underneath, the FDS simulation will run for an hour.

```
&TIME T_END = 3600. /
```

The command "RADI" dictates, according to the table underneath, the number of directions in which the radiation intensities will be computed and written in the transfer file. Note that the number that is indicated in this command is not the number of directions.

NUMBER_RADIATION_ANGLES	RESULTING NUMBER OF INTENSITIES
12	16
24	24
30	32
36	40
48	48
52	56
56	64
64	72
80	80
86	88
90	96
100	104

For example, with the following command, the radiation intensities will be written in 104 directions

```
&RADI NUMBER_RADIATION_ANGLES = 100 /
```

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<sup>1</sup> In April 2018, this version is in the file called « FDS6-SAFIR.EXE »

- 2) A specific command line is introduced for the creation of the transfer file. This is the command "FDStoSAFIR". This command has several arguments:
- "STATUS": the command will be considered if STATUS=.TRUE. whereas the command will be disregarded and no transfer file will be created if STATUS=.FALSE.
  - "T\_BEGIN" gives the first time for which information will be written in the transfer file. It is good practice to write T\_BEGIN = 0 in order to have initial conditions written in the transfer file.
  - "T\_END" gives the last time for which information will be written in the transfer file. The value given for "T\_END" in the command "FDStoSAFIR" may not be greater than the value given for "T\_END" in the command "TIME"
  - "DT" gives the time step after which information will be written in the transfer file. It is good practice that the result of ( "T\_END" – "T\_BEGIN" ) / "DT" be an integer.
  - "XB" gives the limits of the transfer domain as  $X_{min}$ ,  $X_{max}$ ,  $Y_{min}$ ,  $Y_{max}$ ,  $Z_{min}$ ,  $Z_{max}$ . The transfer domain may not extend outside the FDS domain described by "XB" in the "MESH" command. It is good practice to have the boundaries of the transfer domain aligned with the cells of the CFD domain.
  - dXSAFIR gives the maximum value of the intervals in space for which information will be written in the transfer file. The 3 values are dX, dY and dZ. The exact value of the interval will be calculated as follows (explanations given for the direction X).
    - the position of the centre of the first cell is:  
 $X_{min}$  of the transfer domain + 0.5 x size of a cell.
    - The position of the centre of the last cell is:  
 $X_{max}$  of the transfer domain - 0.5 x size of a cell.
    - The difference between these two positions is the length  $L$  of the transfer domain.
    - The number of intervals  $n$  is the result of  $L / dX$ , rounded up to the nearest higher or equal integer.
    - The interval is the result of  $L / n$ .

For example, with the following command, the transfer file will be written every 60 s from time  $t = 0$  to 1800 s in a box that extends from 2.3 m to 6.6 m in the X direction, from 1.3 m to 5.3 m in the Y direction and from 0 to 3.6 m in the Z direction.

In the X direction, the centre of the first cell is at  $X = 2.35$  m, the centre of the last cell is at  $X = 6.55$  m, the length of the transfer domain  $L$  is 4 m, the number of intervals is 14, the interval is 0.286 m and the transfer file will be written at  $X = 2.350, 2.636, \dots, 6.264, 6.550$ .

In the Y directions, values are 1.35, 5.25, 3.90, 13, and 0.30 with values written at  $Y = 1.35, 1.65, \dots, 4.95, 5.25$

```
&FDStoSAFIR STATUS = .TRUE., T_BEGIN = 0., T_END = 1800., DT = 60., DxSAFIR = 0.3, 0.3, 0.25,
XB = 2.3, 6.6, 1.3, 5.3, 0, 3.6 /
```