Environment and Compartments

Key word: VERSN
Inputs: Version Number, Title

```
VERSN    1 Example Case for CFAST 1.6 User's Guide
```

Key word: TIMES
Inputs: Simulation time, Print Interval, History Interval, Display Interval, Copy Count

```
TIMES    200    10    10     0     0
```

Key word: DUMPR
Input: History File

```
DUMPR PRM.HI
```

Key words: EAMB and TAMB (External and Internal)
Inputs: Ambient Temperature, Ambient Pressure, Station Elevation

```
TAMB   300.  101300.      0.
EAMB   300.  101300.      0.
```

Key word: WIND
Inputs: Wind Speed, Reference Height, Lapse Rate Coefficient

```
WIND   5.14   22.5    0.16
```

Key word: WIDTH, DEPTH, HEIGH, HI/F
Input: Compartment Width

```
WIDTH    4.00   4.00
DEPTH    4.00   4.00
HEIGH    2.30   2.30
HI/F     0.00   2.30
```

Two additional commands, ROOMA and ROOMH, may be used for defining compartment properties. The ROOMA and ROOMH commands allows for non-rectangular rooms by specifying cross-sectional area as a function of height.

Key word: ROOMA, ROOMH
Input: First Compartment, Number of Area Data Points, Area Data Point(s)

```
ROOMA 1    3     10.0  5.0  3.0
ROOMH 1    3     0.0   1.0  2.0
```

The above example specifies that compartment 1 has a cross-sectional area of 10, 5 and 3 m^2 at elevations 0.0, 1.0 and 2.0 m respectively.

Key word: CEILI, WALLS, FLOOR
Inputs: Material names

```
CEILI GYPSUM    GYPSUM
WALLS PINEWOOD  PINEWOOD
FLOOR CONCRETE  CONCRETE
```

Key word: HVENT
Inputs: First Compartment, Second Compartment, Vent Number, Width, Soffit, Sill, Wind

```
HVENT   2  3  1   1.07   2.00   1.00   0.00
```

Key word: CVENT
Inputs: First Compartment, Second Compartment, Vent Number, Width for each time

```
CVENT   1  3  1   1.00   1.00
```

Key word: VVENT
Inputs: First Compartment, Second Compartment, Area, Shape

```
VVENT   2   1  1.00   1
```

Key word: DETECT
Inputs: Detector Type, Compartment, Activation Temperature, Depth Position, Breadth Position, Height Position, RTI, Sprinkler, Spray Density

Fire Specification

Fire specifications allow the user to describe the fire source in the simulation. By default, the fire is placed in the center of the compartment on the floor. To place the fire in a different location, the FPOS key word may be included in the input file.

With the three parameters, the heat of combustion (HOC) from CHEMI, FMASS and FQDOT, the pyrolysis and heat release rate are over specified. The model uses the last two of the three to obtain the third parameter. That is, if the three were specified in the order HOC, FMASS and FQDOT, then FQDOT would be divided by FMASS to obtain the HOC for each time interval.

Species production rates are specified in a manner similar to the fire, entering the rates as a series of points with respect to time:

- Nitrogen
- Oxygen
- Carbon Dioxide
- Carbon Monoxide
- Hydrogen Cyanide
- Hydrogen Chloride
- Total Unburned Hydrocarbons
- Water
- Soot (Smoke Density)
- Concentration-Time Product

For a type one (LFBT=1) fire, only the concentration-time product of pyrolysate (CT) can be specified; for LFBT=2, all species are tracked.

An example for two time points, 0 and 400 Seconds

Key word: FTIME
Inputs: Time Points

```
FTIME  400. <<<=== There is an implicit point at time=0
```

Key word: CHEMI
Inputs: Molar Weight, Relative Humidity, Lower Oxygen Limit, Heat of Combustion, Initial Fuel Temperature, Gaseous Ignition Temperature, Radiative Fraction

```
CHEMI  16.    0.  10.0    18100000.  300. 400.   0.
```

Key word: FAREA
Inputs: Fuel Area

```
FAREA  0.00   0.00
```

Key word: FHIGH
Inputs: Fuel Height

```
FHIGH  0.00   0.01
```

Key word: FMASS
Inputs: Mass Loss Rate

```
FMASS  0.0014 0.0014
```

Key word: FPOS
Inputs: Depth, Breadth, Height (relative to the left rear corner of the compartment

```
FPOS   2.00   2.00   0.00 (The default is -1 -1 0 which is the bottom center)
```

Key word: FQDOT
Inputs: Heat Release Rate (Watts)

```
FQDOT  2.53E+04 2.53E+04
```

Key word: LFBO
Input: Compartment of Fire Origin

LFBO 1 (compartment 1; an entry of 0 turns off the main fire)

Key word: LFBT
Input: Fire Type (1 or 2)

Always us 2!!! A type 1 (unconstrained has limitations)

Key words: HCN, HCL, CT, HCR, or O2
Inputs: Composition of the Pyrolyzed Fuel (kg/kg)

Key words: OD and CO
Inputs: Yield with respect to CO_2 (kg/kg)

```
HCR    0.333 0.333
CO     0.010 0.010
```

Forced Ventilation

CAUTION: Nodes specified by each MVDCT entry must connect with other nodes, fans, or compartments. Do not specify ducts which are isolated from the rest of the system. The heights for interior nodes are absolute heights above the reference datum specified by TAMB.

Key word: INELV
Inputs: Node Number, Height

```
INELV   1   2.10   2   4.40   3   4.40
```

Key word: MVDCT
Inputs: First Node Number, Second Node Number, Length, Diameter, Absolute Roughness, First Flow Coefficient, First Area, Second Flow Coefficient, Second Area

```
MVDCT   1   2   2.30   0.10 .00200   0.00 1.0000   0.00 1.0000
```

Key word: MVOPN
Inputs: Compartment Number, Duct Work Node Number, Orientation, Height, Area

```
MVOPN   1   1 V   2.10   0.12
```

Key word: MVFAN
Inputs: First Node, Second Node, Minimum Pressure, Maximum Pressure, Coefficients

A fan is defined using the MVFAN line to indicate node numbers and to specify the fan curve with power law coefficients. There must be at least one and a maximum of five coefficients specified for each MVFAN entry. The fan coefficients are simply the coefficients of an interpolating polynomial for the flow speed as a function of the pressure across the fan housing. In this example, the coefficients:

```
  B( 1) =    0.140E+00      b(1)
  B( 2) =   -0.433E-03      b(2) x p
```

were calculated from entries made in FAST:

```
            PRESSURE         FLOW

Minimum         0.00       0.1400
Maximum       300.00       0.0101

Which gives us MVFAN 2 3 0.0 300.0 0.140E+00 -0.433E-03
```

Other commands and attributes

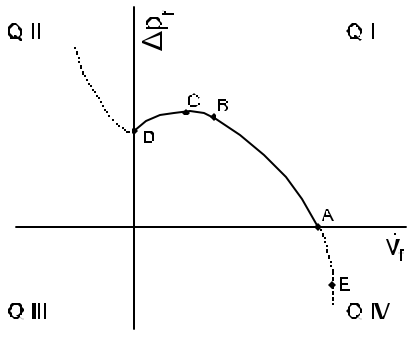
Ceiling Jet

Key word: CJET Input: OFF, CEILING, WALL, or ALL

```
CJET CEILING
```

The OBJECT key word allows the specification of additional objects to be burned in the fire scenario. The object name and object compartment are required if the OBJECT key word is used. All other input items have default values if they are not specified. These defaults are:
start time 0.0, first element 1, depth (x position) one half the depth of the compartment, breadth (y position) one half the width of the compartment, and height (z position) 0.0. To specify any input item, all preceding items on the OBJECT line must also be specified. For example, the first element can not be set if start time is not set. Positioning of the object within a compartment is specified in the same manner as for the main fire. See figure below.

Key word: OBJECT Inputs: Object Name, Object Compartment, Ignition Criterion Value, Ignition Criterion Type, Depth Position, Breadth Position, Height Position, Normal Vector (Depth), Normal Vector (Breadth), Normal Vector (Height), Horizontal Flame Spread Ignition Position, Vertical Flame Spread Ignition Position



Typical fan performance at constant speed.

```
OBJECT SOFA       1     10   1   4.00   2.00
 0.00
OBJECT WARDROBE   1     30   3   0.00   2.00
 0.00
```

Heat transfer between the ceiling and floor of specified compartments is included with the CFCON keyword. Ceiling to floor heat transfer occurs between interior compartments of the structure or between an interior compartment and the outdoors.

Key word: CFCON
Input: First Compartment, Second Compartment

```
CFCON     1     2
```

Horizontal conduction between specified compartments is included with the HHEAT keyword. Ceiling to floor heat transfer occurs between interior compartments of the structure or between an interior compartment and the outdoors.

Key word: HHEAT
Input: First Compartment, Number of Partrs, Second Compartment, Fraction

```
HHEAT 2    3    1 0.5    3 0.25    4 0.25
```

The TARGET keyword is used to specify arbitrary targets placed anywhere in a compartment.

Key word: TARGET
Input: Compartment, Depth Position, Breadth Position, Height Position, Normal Vector (Depth), Normal Vector (Breadth), Normal Vector (Height), Material, Method, Equation Type

```
TARGET  1  7.62000  1.52400  4.26720 0.000000  1.00000 0.000000
```

The TARG keyword is used to specify targets on the interior bounding surface of a compartment.

Key word: TARG
Input: Compartment, Surface, Depth Position, Breadth Position, Method, Equation Type

```
TARG  1 DOWN  4.57000  7.62000
```

For stairwells, elevator shafts, and similar compartments, the use of a single, well-mixed zone better approximates conditions within the compartment. To specify use of a one zone model for individual compartments rather than the typical two zone model, the SHAFT keyword is used.

Key word: SHAFT
Input: Compartment

```
SHAFT 1
```

For long hallways or corridors, there can be a significant delay time for the initial hot gas layer to travel along the ceiling to the far end of the compartment.

Key word: HALL
Input: Compartment, Velocity, Depth, Decay Distance

```
HALL 1
```