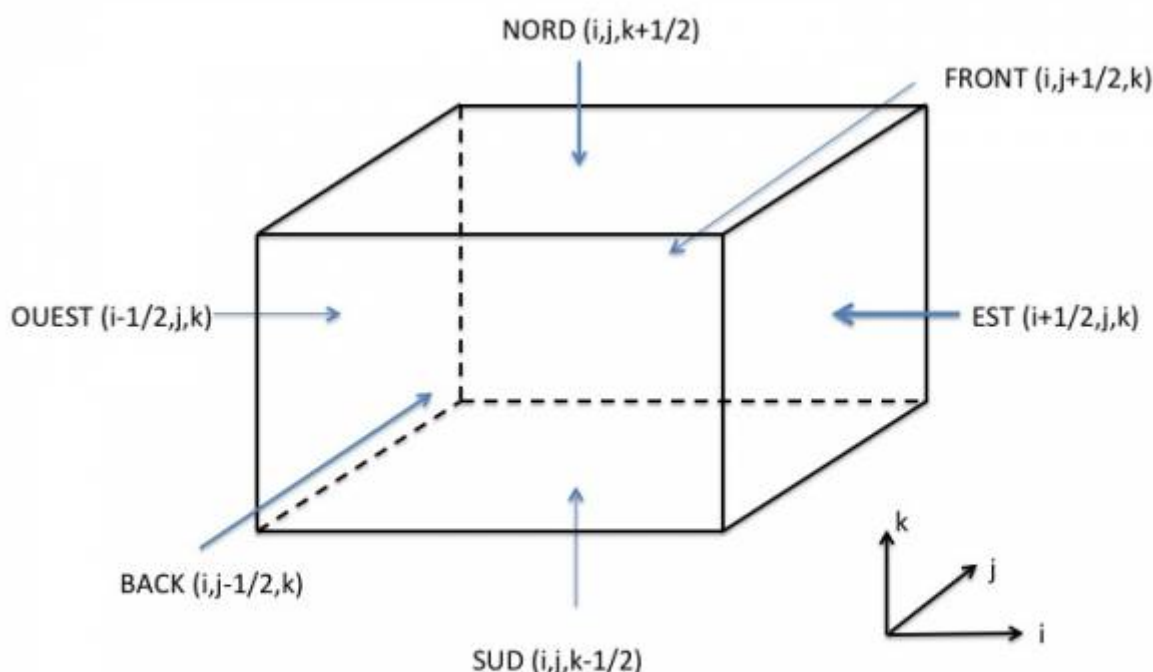


## Namelist "Heat\_Wall\_Boundary\_Condition\_Setup"

This data set allows the user to handle the heat boundary conditions applied to walls. Walls are identified according to the orientation of their normal direction from the adjacent fluid-cell. They are named as :

- WEST : if the wall is located at the  $i-1/2$  face-cell (**in regard to a fluid-cell**)
- EAST : if the wall is located at the  $i+1/2$  face-cell.
- BACK : if the wall is located at the  $j-1/2$  face-cell.
- FRONT : if the wall is located at the  $j+1/2$  face-cell.
- SOUTH : if the wall is located at the  $k-1/2$  face-cell.
- NORTH : if the wall is located at the  $k+1/2$  face-cell.

A data set can be attributed to the walls of several solid bodies. [Some examples are given here](#) .



## Full data set of the namelist

```
&Heat_Wall_Boundary_Condition_Setup
Wall_BC_DataSetName      ="Set1",
West_Heat_BC_Option      = 0      , East_Heat_BC_Option      = 0 ,
Back_Heat_BC_Option      = 0      , Front_Heat_BC_Option   = 0 ,
South_Heat_BC_Option     = 0      , North_Heat_BC_Option  = 0 ,
West_Heat_Function_Type   = 0      , East_Heat_Function_Type = 0 ,
Back_Heat_Function_Type   = 0      , Front_Heat_Function_Type= 0 ,
```

```
South_Heat_Function_Type= 0      , North_Heat_Function_Type= 0 ,
West_Wall_BC_Value      = 293.  , East_Wall_BC_Value      = 293.0  ,
Back_Wall_BC_Value      = 293.  , Front_Wall_BC_Value   = 293.  ,
South_Wall_BC_Value     = 293.  , North_Wall_BC_Value  = 293.  ,
Material_Thermal_Conductivity= 1.00 ,
Material_Mass_Heat_Capacity = 1.00 ,
Material_Density         = 1.00 ,
Time_Fct_Name           = "Sinus" ,
Time_Fct_Threshold      = 0.0  ,
Time_Fct_Time_Scale     = 1.0  ,
Time_Fct_Magnitude      = 0.0  /
```



- Some specific data like thermal conductivity, heat capacity or density, are not directly linked to thermal boundary conditions, they are used only when a solid body is stated like a thermally conductive material and the heat transfer through it is explicitly solved. A solid body is built from the namelists [Polyhedral\\_Immersed\\_Bodies](#) and [Cylindrical\\_Immersed\\_Bodies](#)
- When **all the walls of the domain are adiabatic**, this namelist could be omitted in the data file. The code uses this boundary condition by default.
- Data related to time evolution can be omitted when the boundary conditions are constant.
- This namelist can be pooled with other ones of same type (for the velocity components or species mass fraction) to form a full wall boundary condition setup.

Find [here](#) how to construct the wall boundary conditions and some examples.

## Definition of the data set

### Wall\_BC\_DataSetName

- Type : character string
- Name of the data set associated to the wall boundary conditions for the heat. This name is used as an identifier in order distinguish the different sets of the wall boundary condition defined in the data file. The naming convention adopted is "Set" adjoined with a number : for example "Set1" for the first set, "Set2" for the second one, and so on ...
- By default "Set1" is always linked with the walls of domain ends (when they exist). Of course, it can be also linked with any other solid body.
- The same name must be used in the namelists [Velocity\\_Wall\\_Boundary\\_Condition\\_Setup](#) (for velocity boundary conditions) and [Species\\_Wall\\_Boundary\\_Condition\\_Setup](#) (for species boundary conditions), for building a full wall data set . The user finds [here](#) some examples about

wall boundary conditions).

- Default value= none

## WEST\_Heat\_BC\_Option

- Type : integer value
- Select the type of the heat boundary condition linked to the WEST wall. The available options are :
  - 0 : Fixed temperature
  - 1 : Fixed heat flux
  - 2 : Heat transfer in the solid body is explicitly calculated. The solid body is thus stated like a thermically conductive material and the heat transfer through it is explicitly solved.
  - 3 : Time-variable heat flux. Time functions defined further are required in the data set.
  - 4 : Time-variable temperature. Time functions defined further are required in the data set.
- Default value= 1

## WEST\_Heat\_Function\_Type

- Type : integer value
- Definition of the distribution law over the wall face. The available options are :
  - 0 : Uniform distribution over the wall
  - greater than 0 : require an user's defined function in the module module\_user\_define\_wall\_bc.f90)

Default value= 0

## WEST\_Wall\_BC\_Value

- Type : real value
- Reference value of the temperature or the heat flux on the wall. This depends on the type of boundary condition chosen (see WEST\_Heat\_BC\_Option)
- Default value= 0.0



**NOTE : The equivalent data exist for the other walls. Please, replace the characters "WEST" by "EAST", "FRONT", "BACK", "NORTH or "SOUTH" to define the boundary conditions on the walls oriented to the appropriate direction.**



The following data are useful for the thermically conductive materials (materialized by walls) in which the heat transfer is explicitly solved, otherwise they can be omitted.

## Material\_Thermal\_Conductivity

- Type : real value
- Thermal conductivity of the solid body
- Default value= Thermal conductivity of the fluid

## Material\_Mass\_Heat\_Capacity

- Type : real value
- Mass heat capacity of the solid body
- Default Value= Heat capacity of the fluid.

## Material\_Density

- Type : real value
- Density of the solid body
- Default value = Density of the fluid



The following data are useful when the heat boundary conditions are time variable. Otherwise they can be omitted.

## Time\_Fct\_Name

- Type : character string linked to the user's time function defined in the module "module\_user\_define\_temporal\_function.f90". The time functions already available are :
  - "Sinus" : sinus function
  - "Linear\_Ramp" : Linear ramp function

## Time\_Fct\_Threshold

- Type : real value
- Time from which the time function is enabled

## Time\_Fct\_Time\_Scale

- Type : real value
- Time scale of the function (i.e the period for a sinusoidal function)

## Time\_Fct\_Magnitude

- Type : real value
- Magnitude of the time function

## End\_of\_Data\_Block

- Type : boolean value
- Specify the end of the namelist or a group of this type of namelist used to define different types of heat boundary conditions.

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