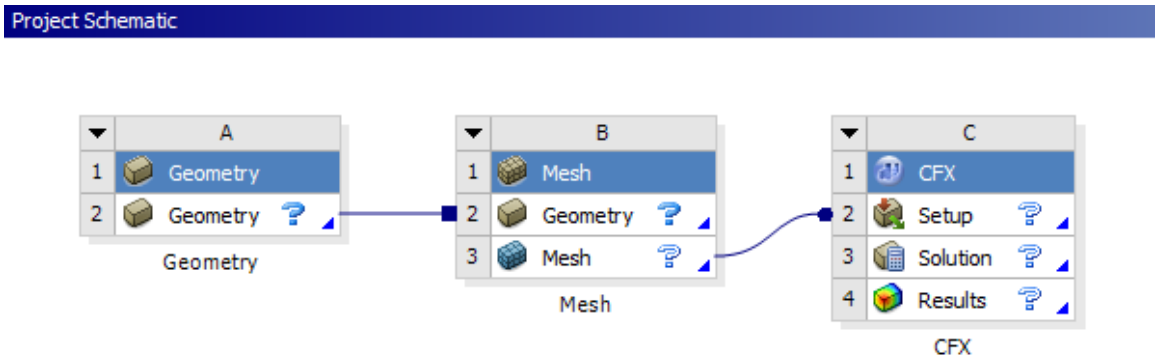
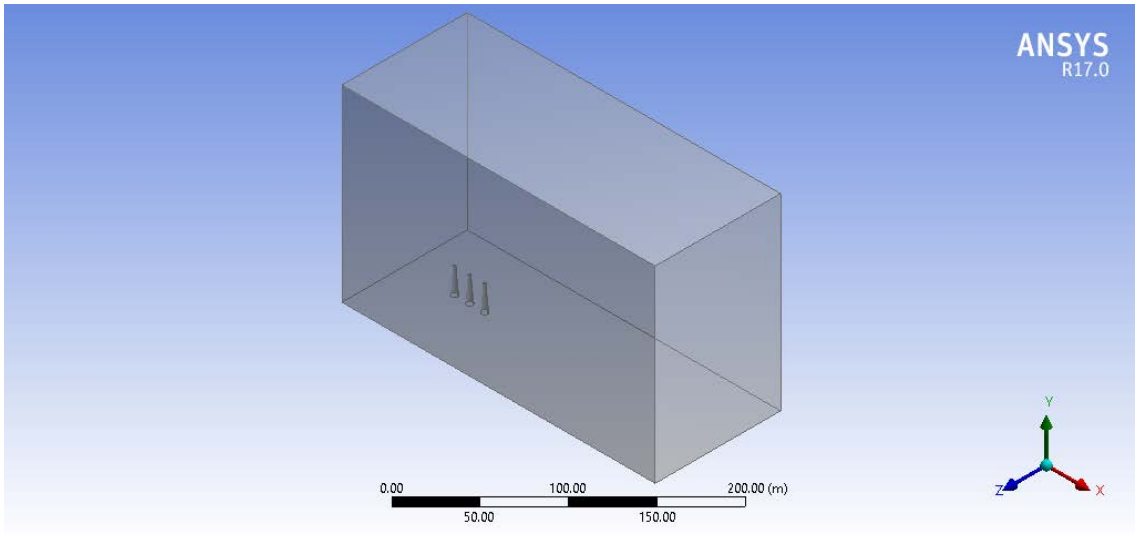
LAMPIRAN

***Project Schematic ANSYS WORKBENCH* :**



***Geometry* :**

X = 250 m ; Y = 150 m ; Z = 100 m

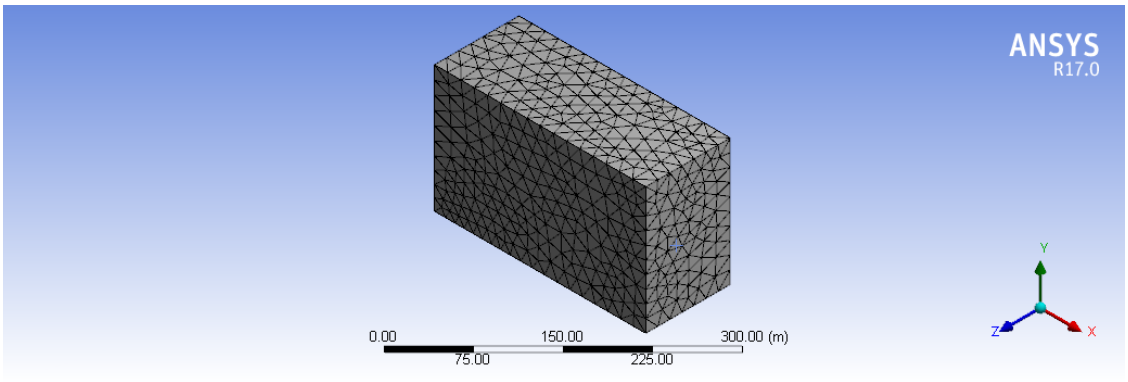


***Mesh* :**

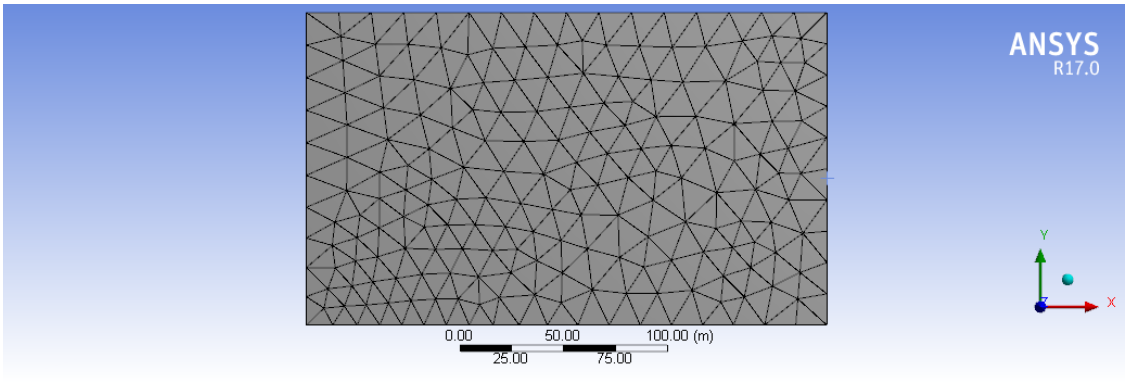
Details of "Mesh"

Display	
Display Style	Body Color
Defaults	
Physics Preference	CFD
Solver Preference	CFX
Relevance	0
Shape Checking	CFD
Element Midside Nodes	Dropped
Sizing	
Inflation	
Advanced	
Statistics	

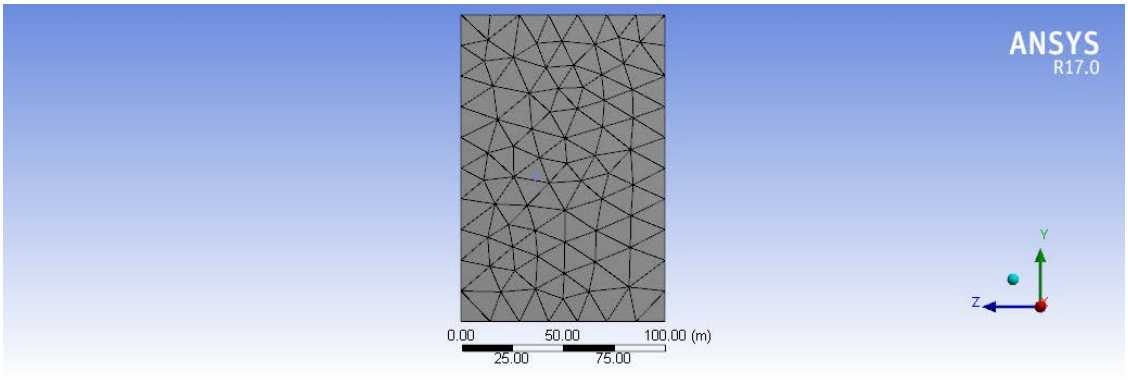
Tampak *Isometri*



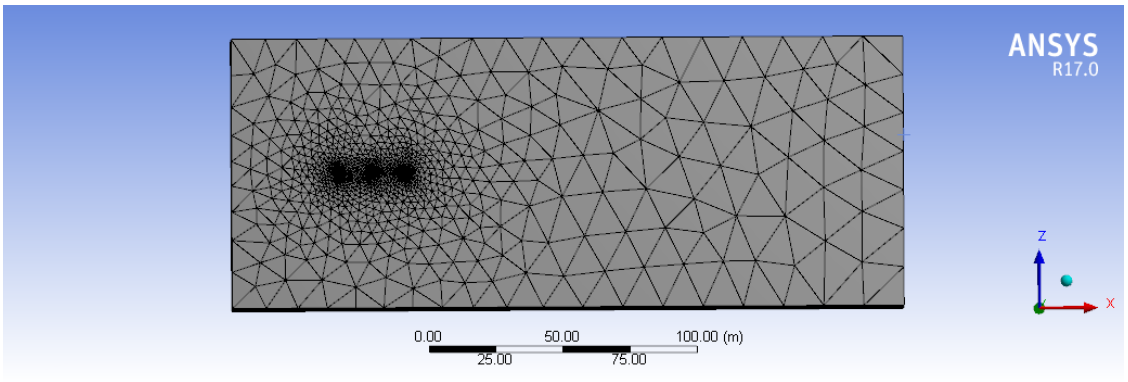
Tampak Samping (Z)



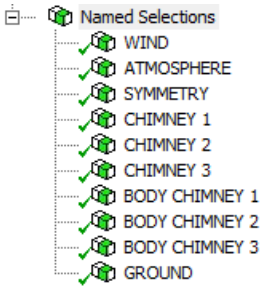
Tampak Depan (X)

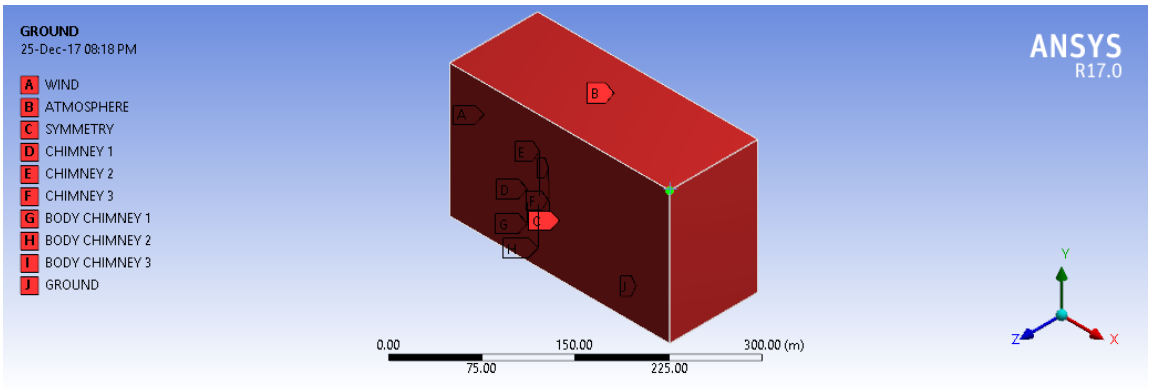


Tampak Atas (Y)

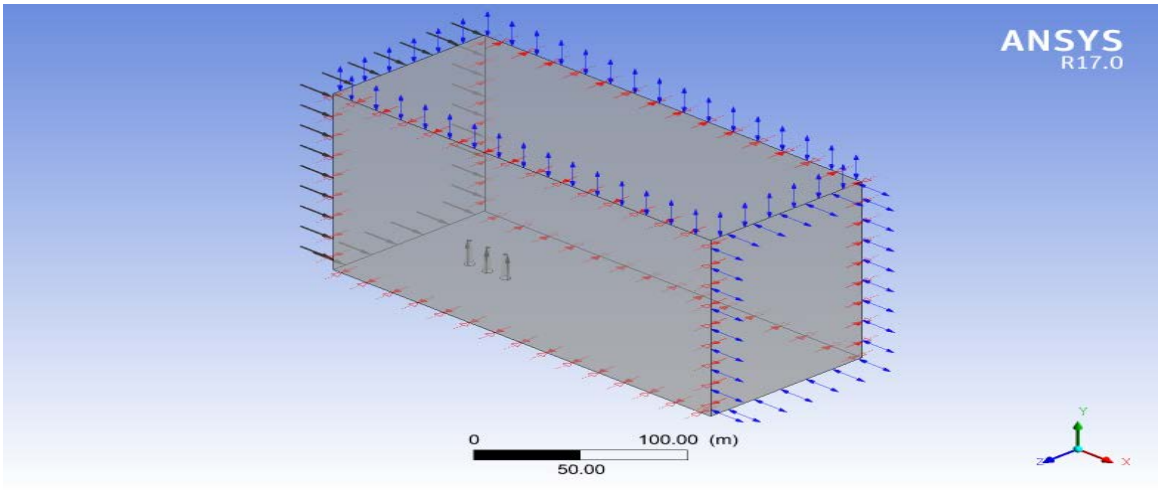


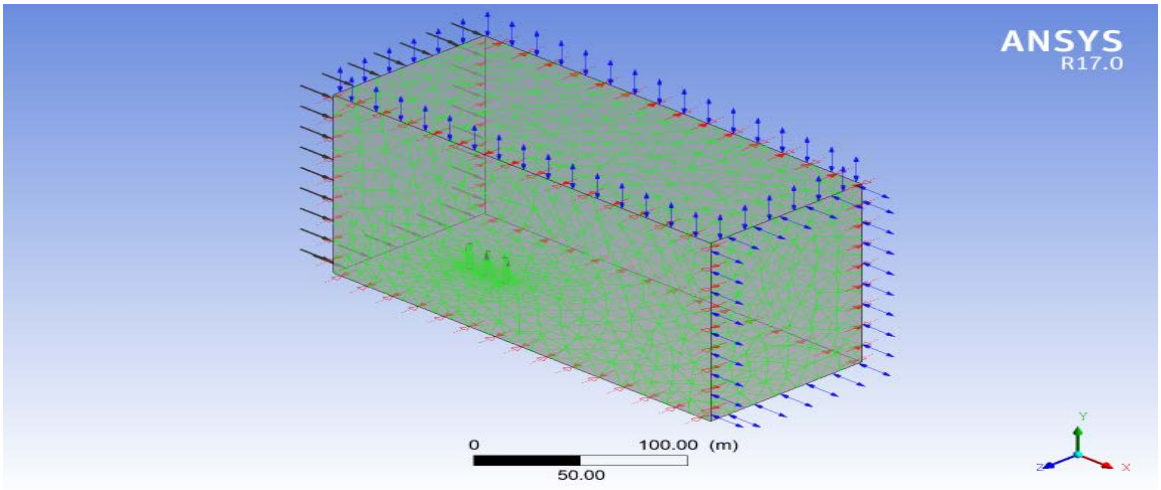
***Name Selections* :**



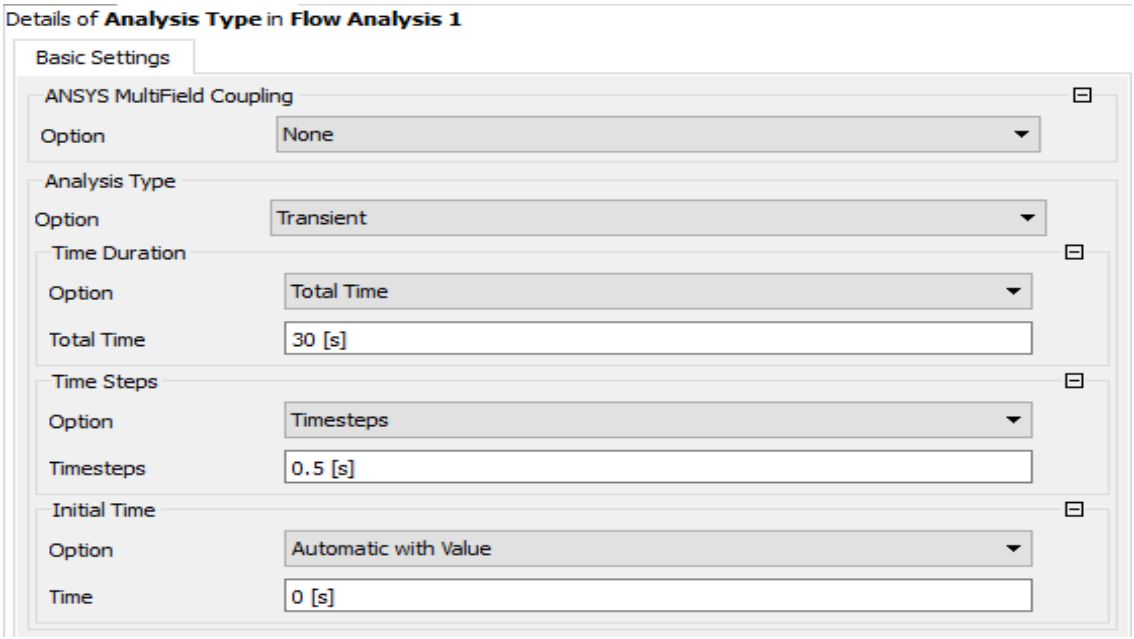


***Setup* :**

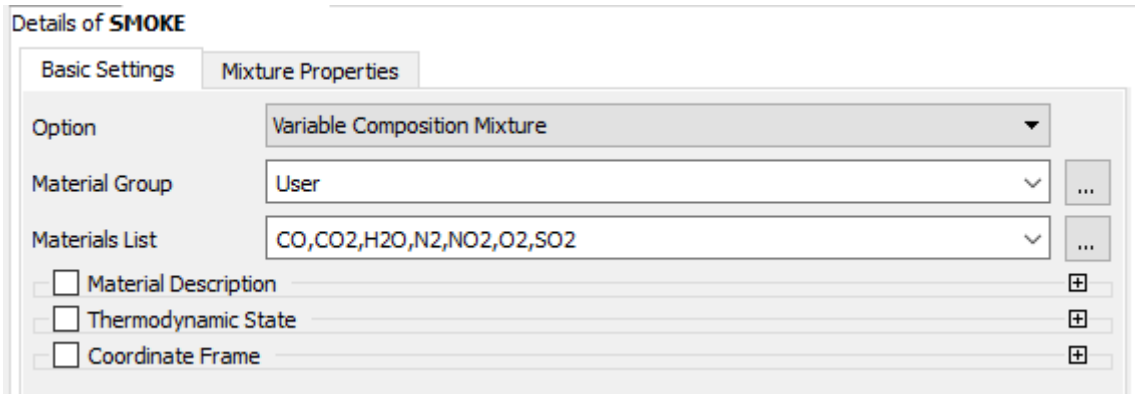




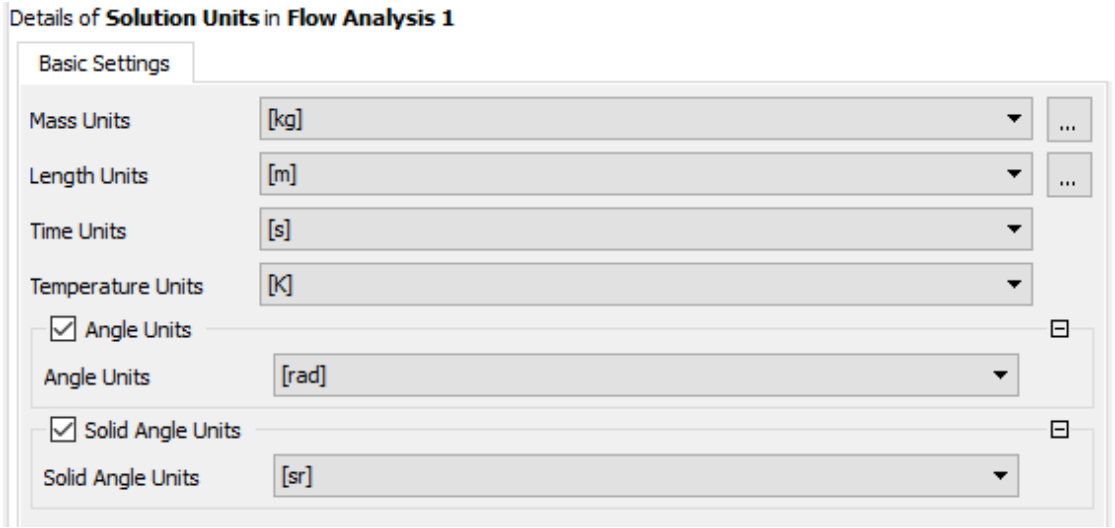
***Analysis Tyipe* :**



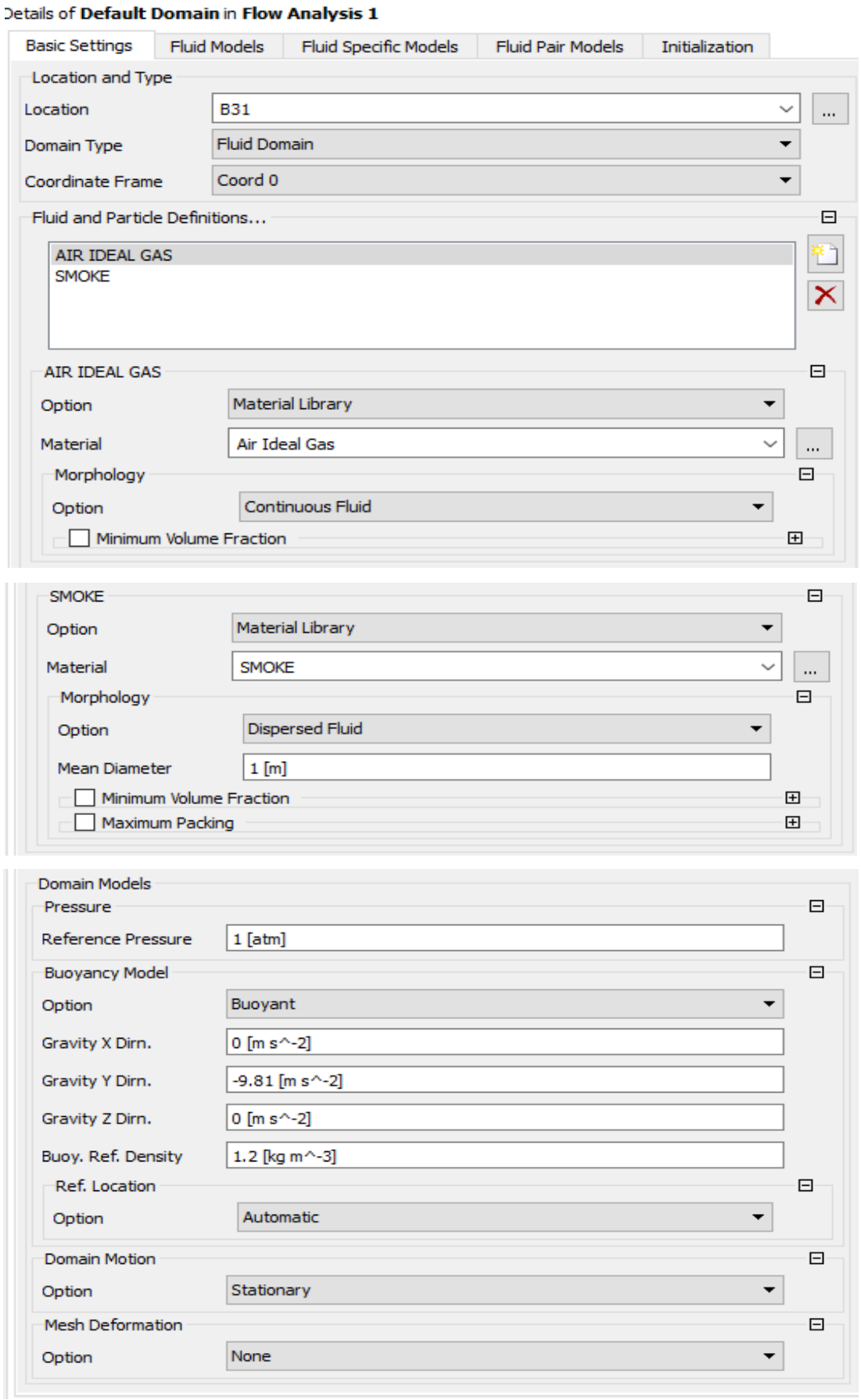
***Material* :**



Solution Unit :

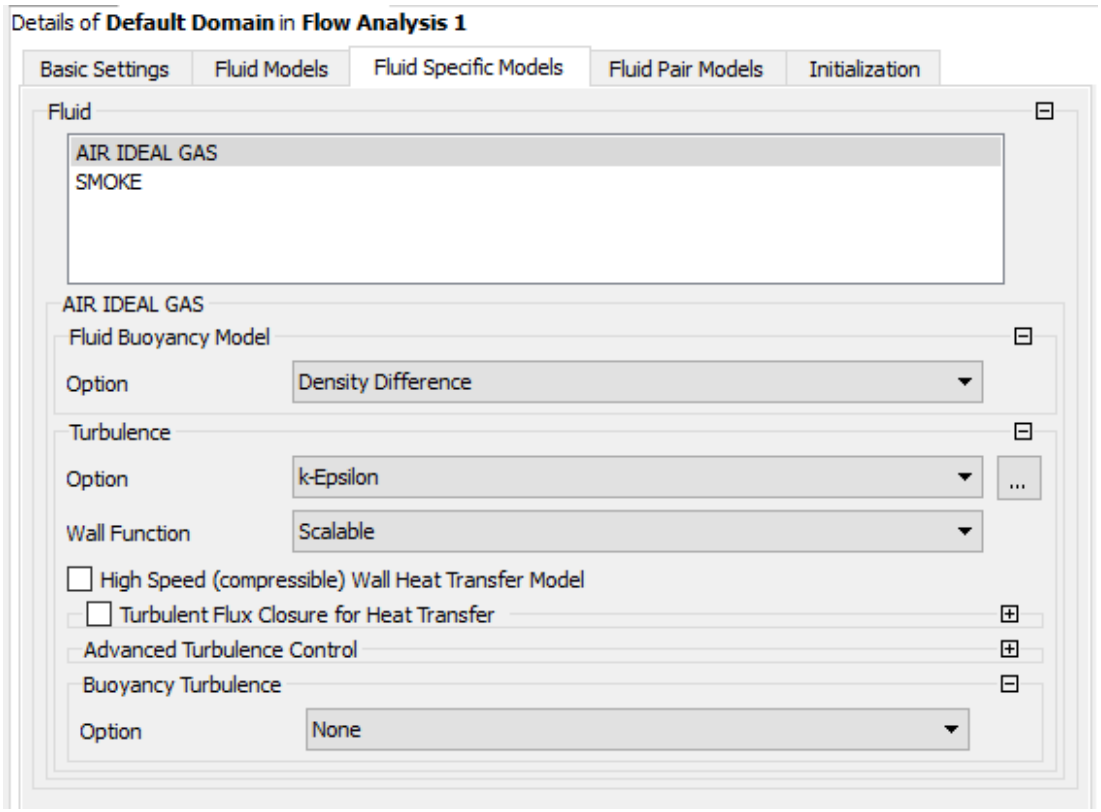


***Default Domain – Basic Settings* :**

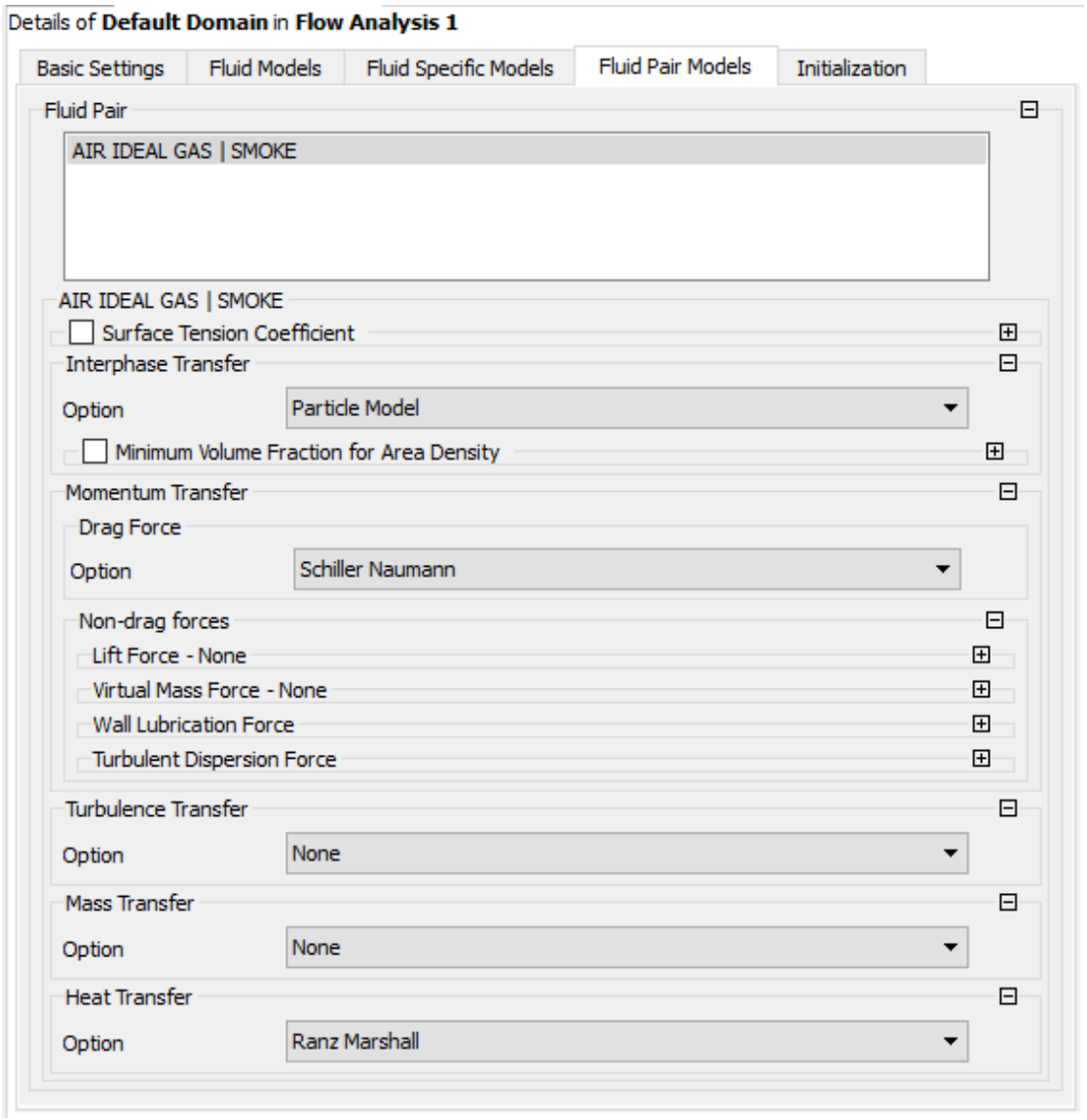


***Default Domain – Fluid Models* :**

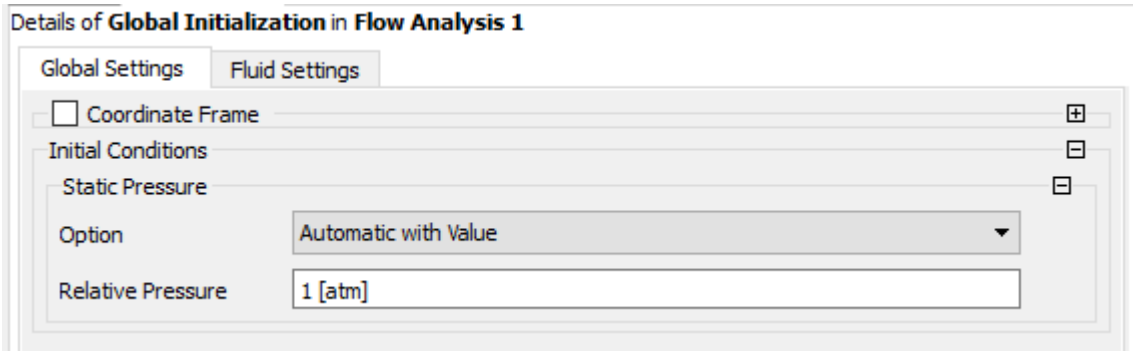
***Default Domain – Fluid Spesific Models* :**



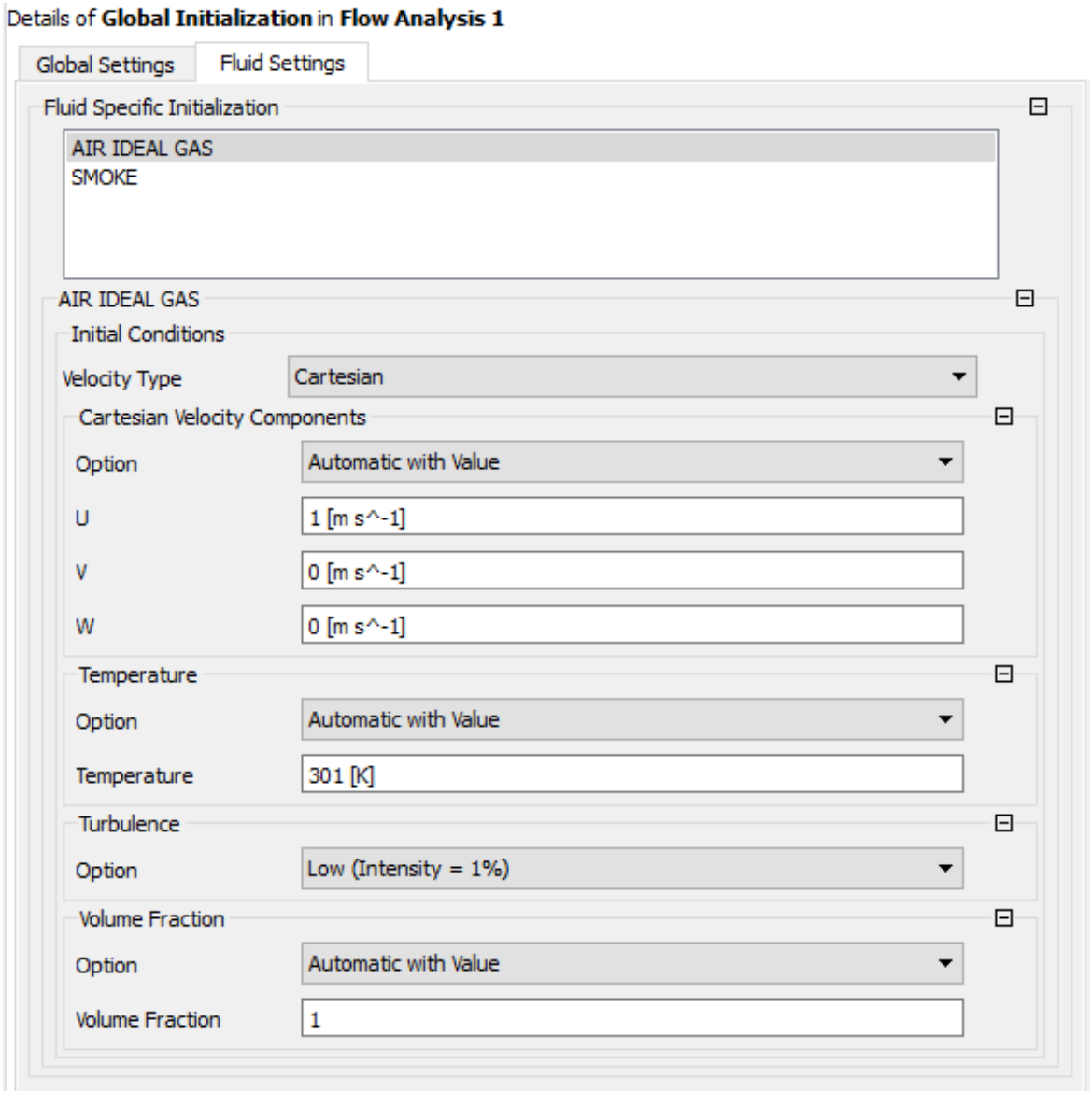
***Default Domain – Fluid Pair Models* :**



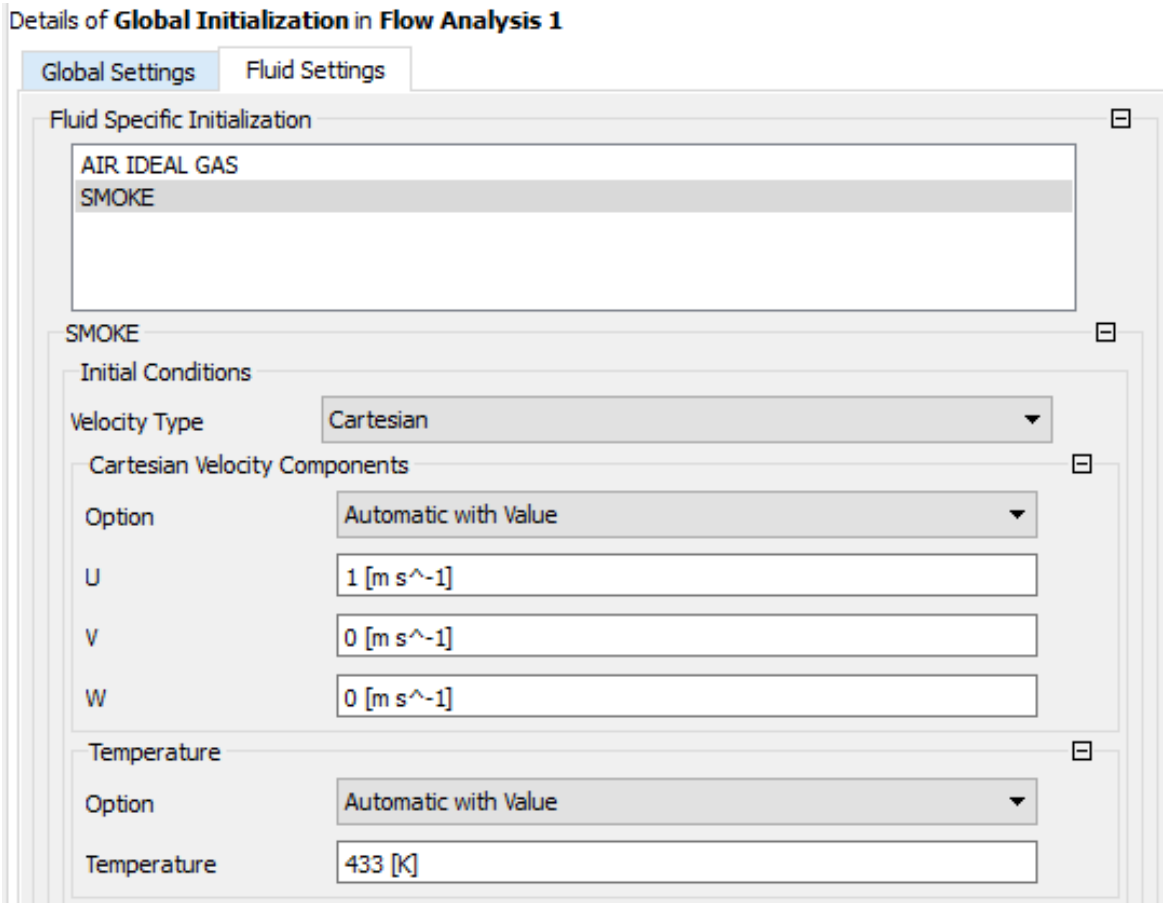
***Initialization – Global Setting* :**



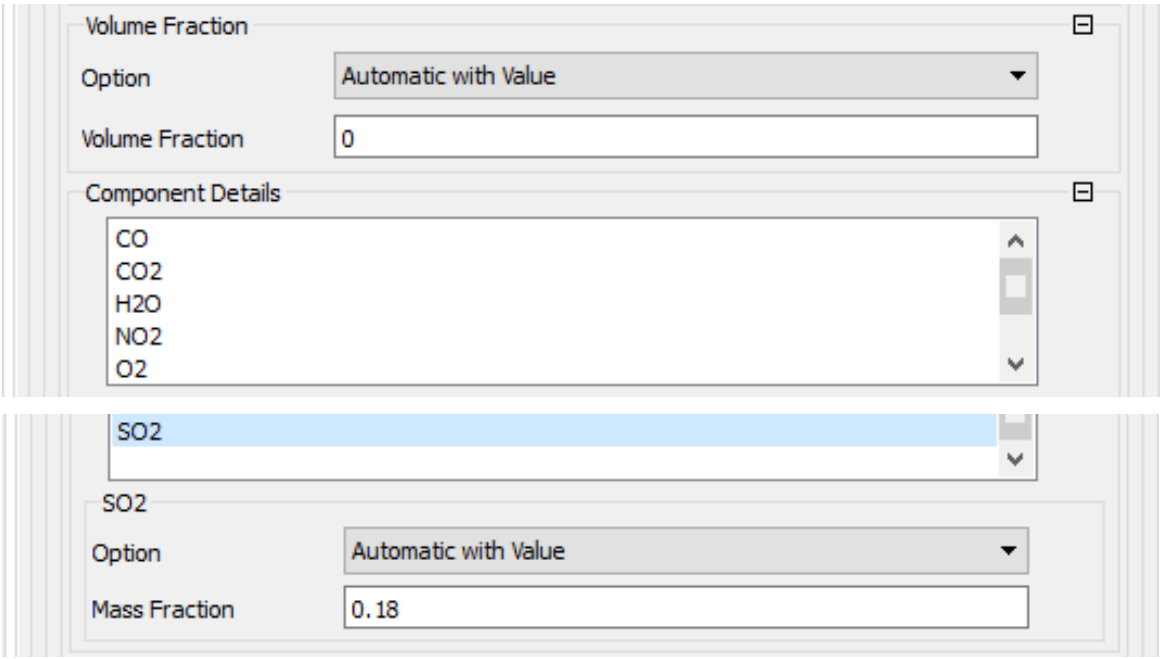
***Initialization – Fluid Setting (Air Ideal Gas)* :**



***Initialization – Fluid Setting (Smoke)* :**

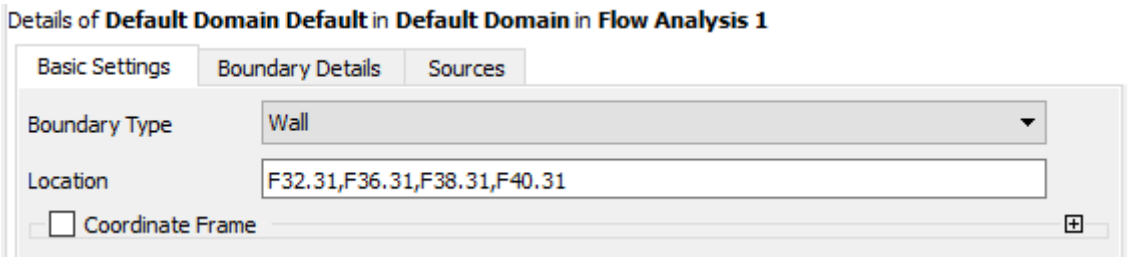


***Value Mass Fraction* :** CO = 0 ; CO_2 = 0 ; H_2O = 0 ; NO_2 = 0.32 ; O_2 = 0.22 ; NO_2 = 0.18

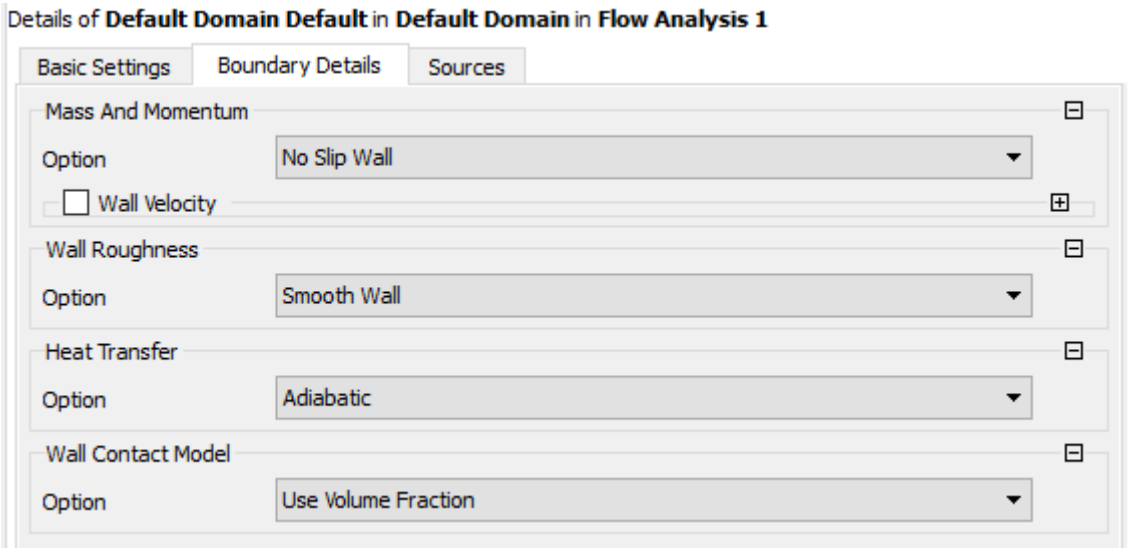


Boundary – Default Domain Default

***Basic Settings* :**

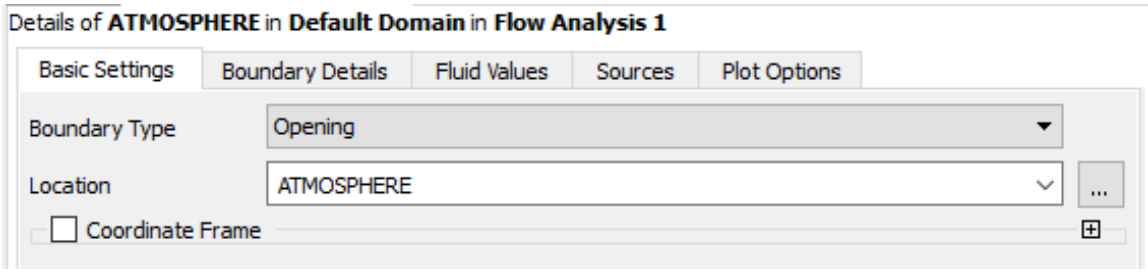


***Boundary Details* :**

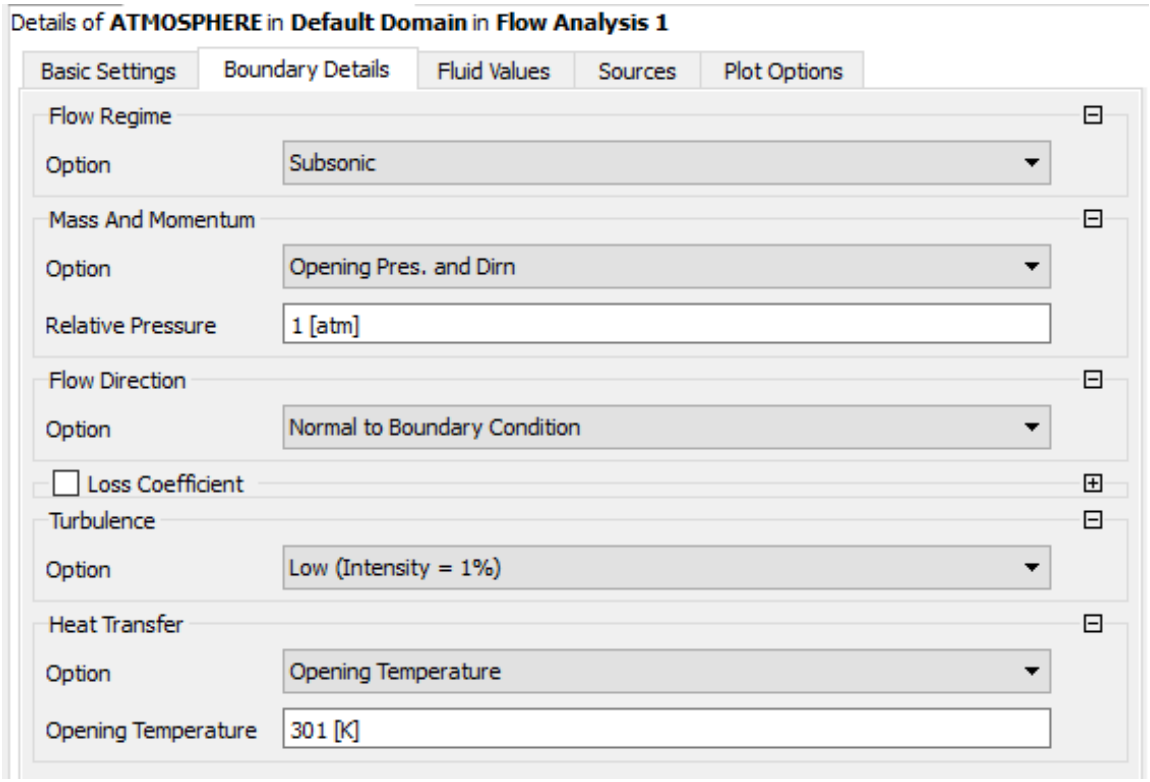


Boundary – Atmosphere

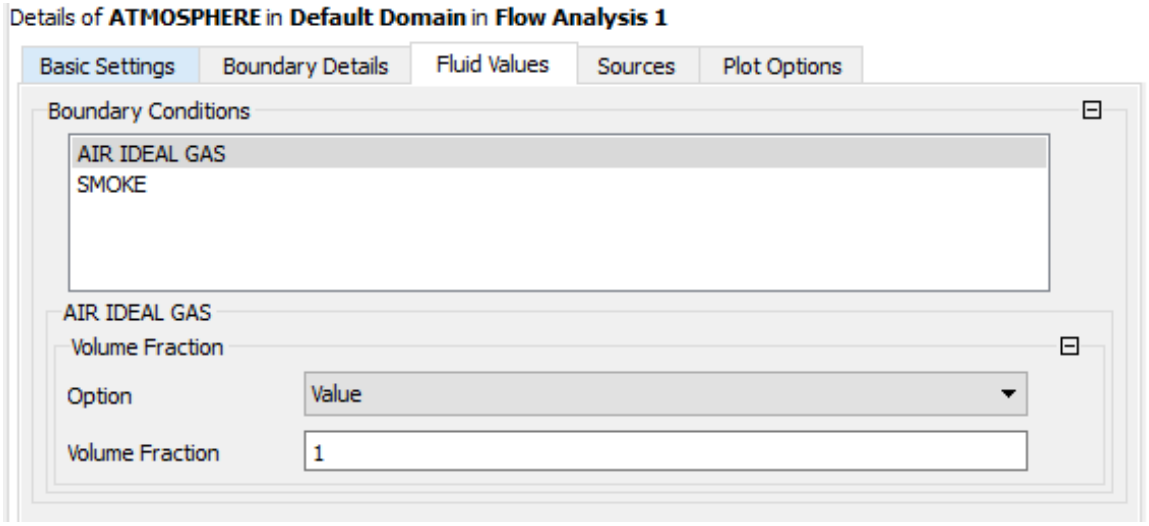
***Basic Settings* :**

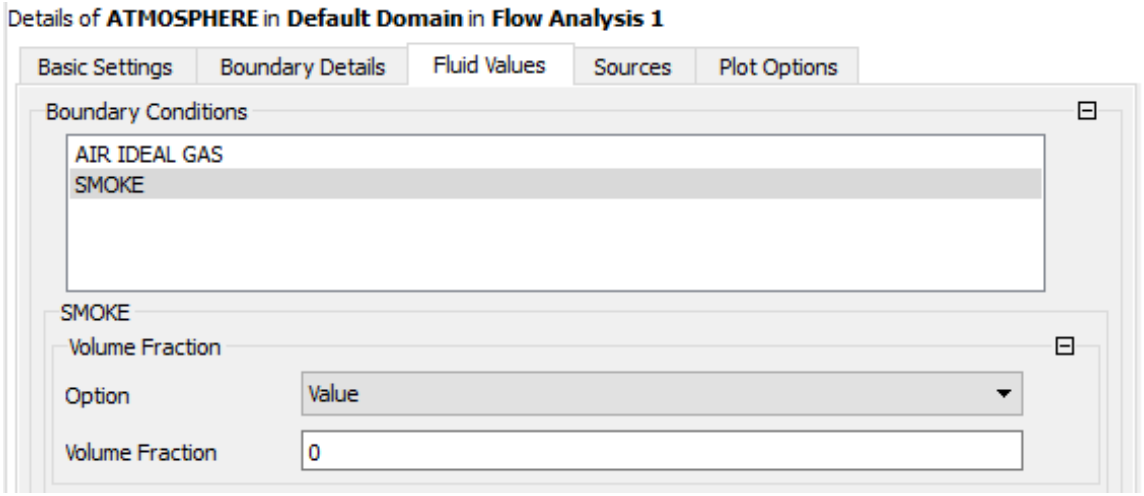


***Boundary Details* :**



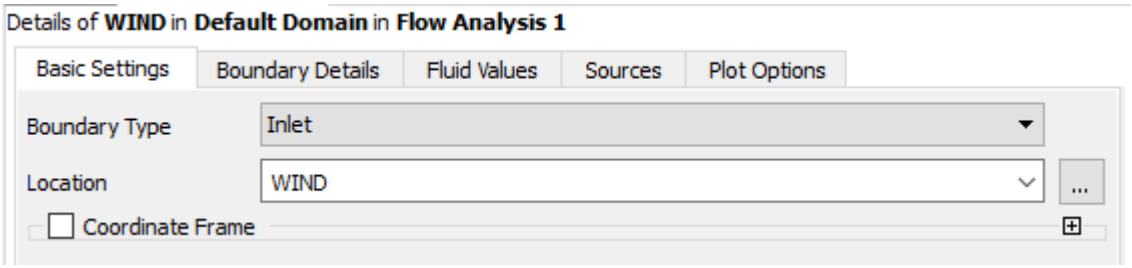
***Fluid Details* :**



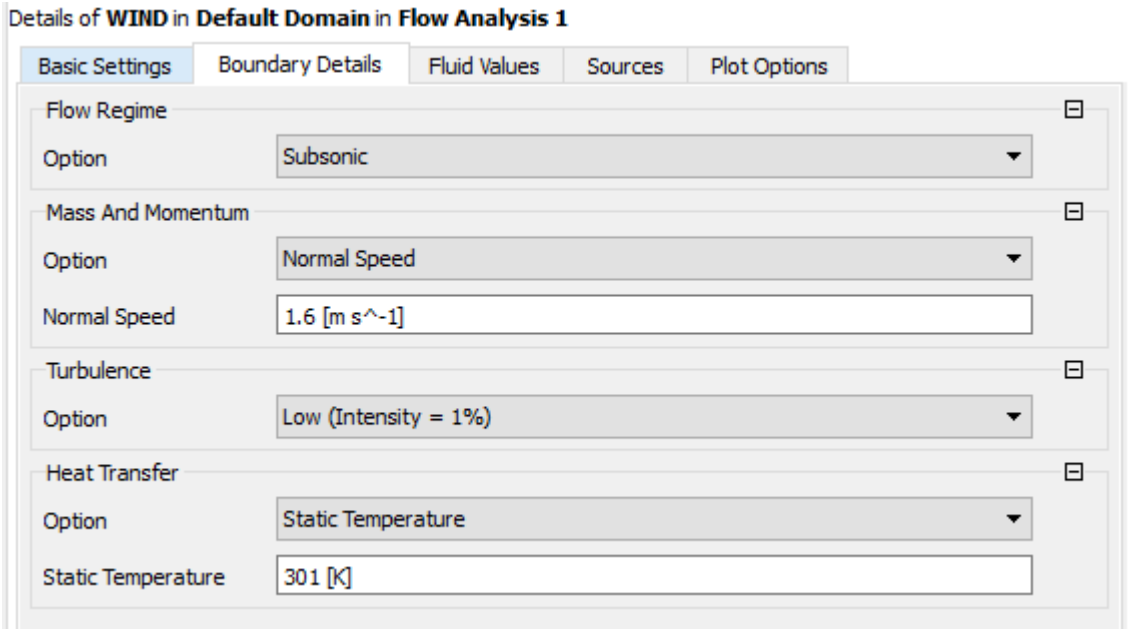


Boundary – Wind

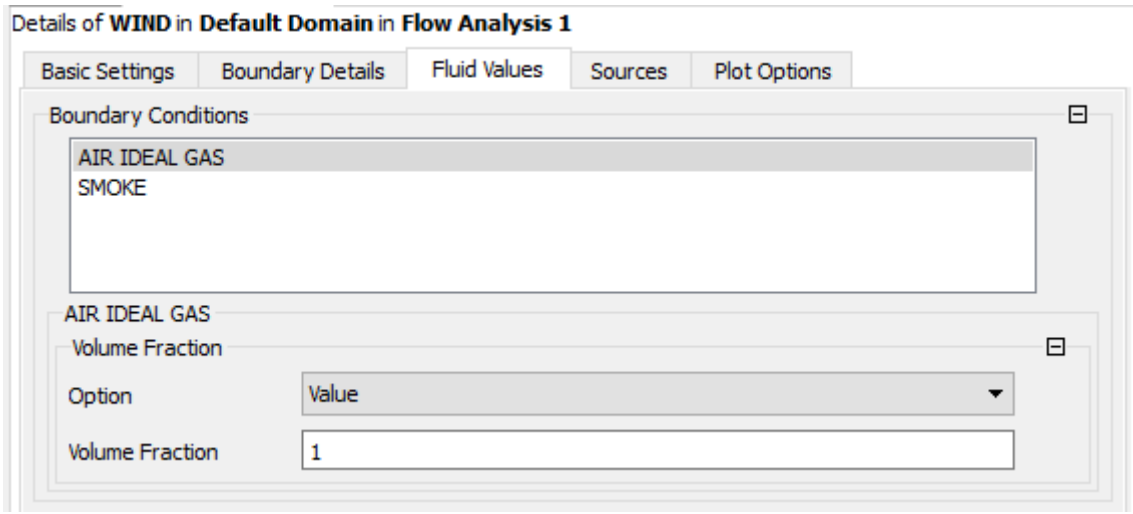
***Basic Settings* :**

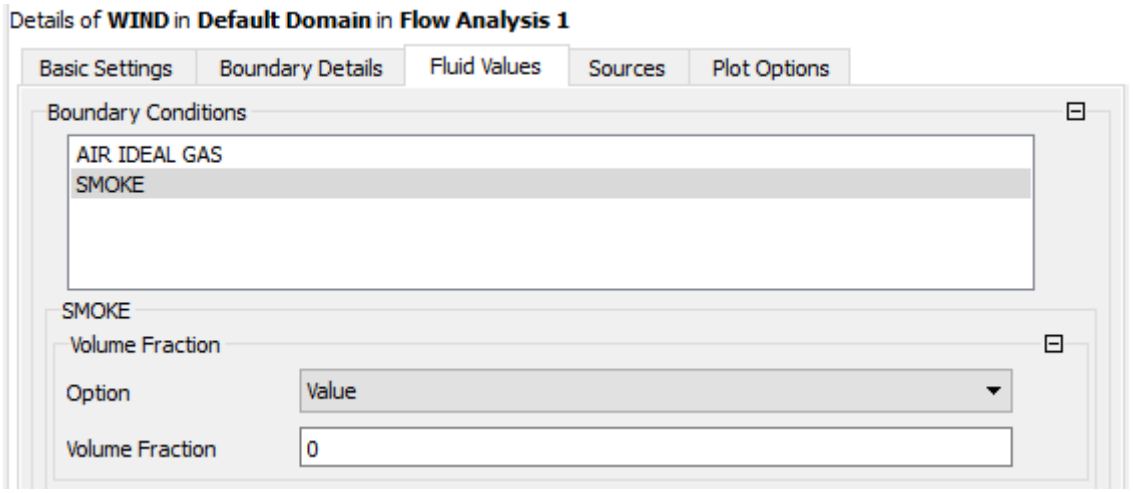


***Boundary Details* :**



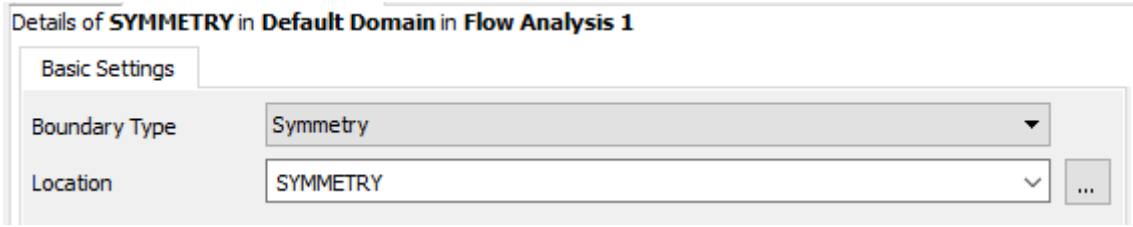
Fluid Details **:**





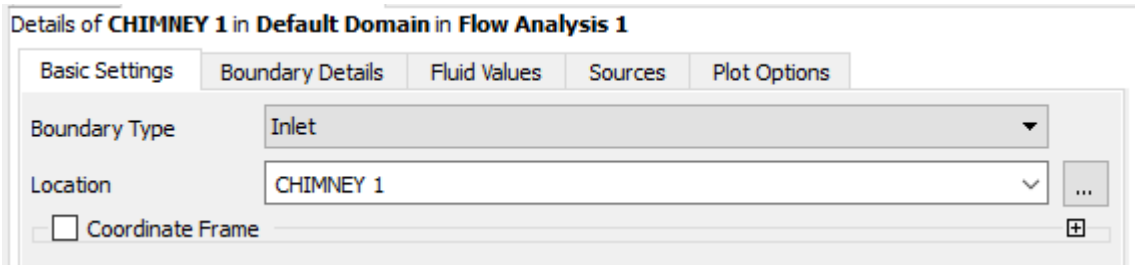
Boundary - Symmetry **:**

Basic Settings **:**

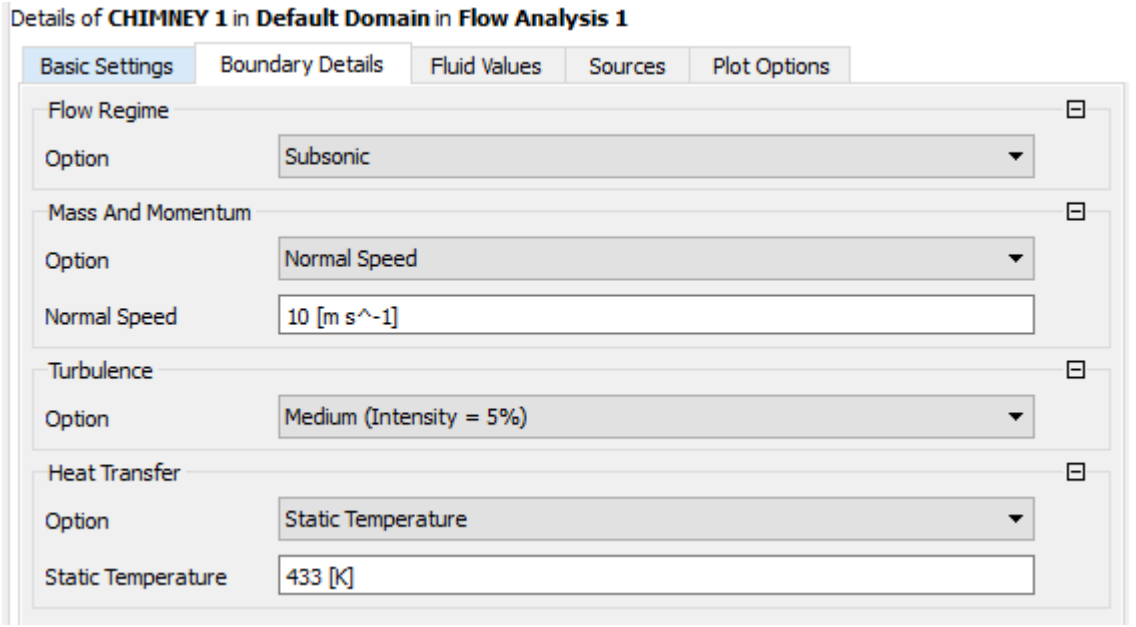


Boundary – Chimney 1

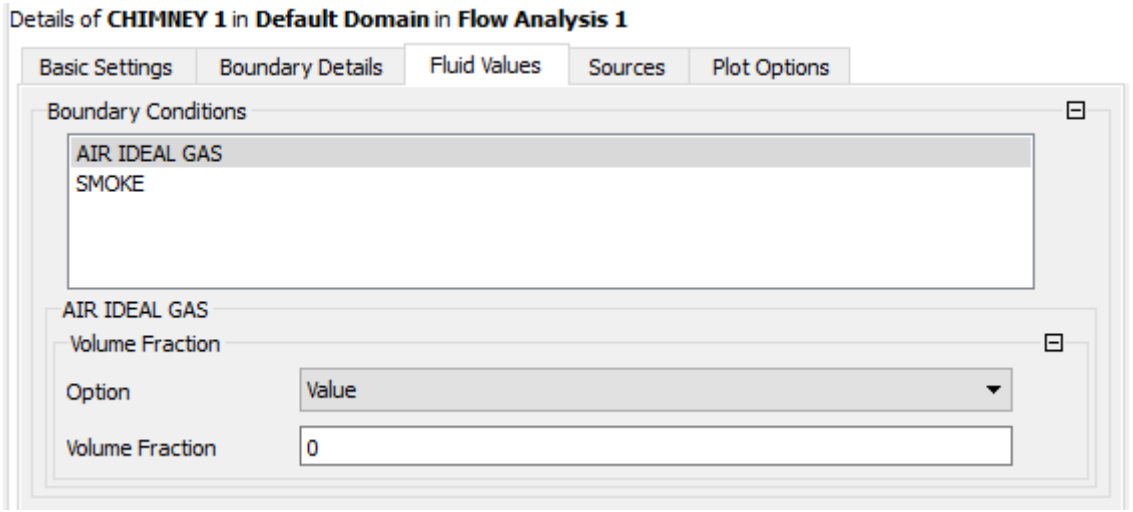
***Basic Settings* :**

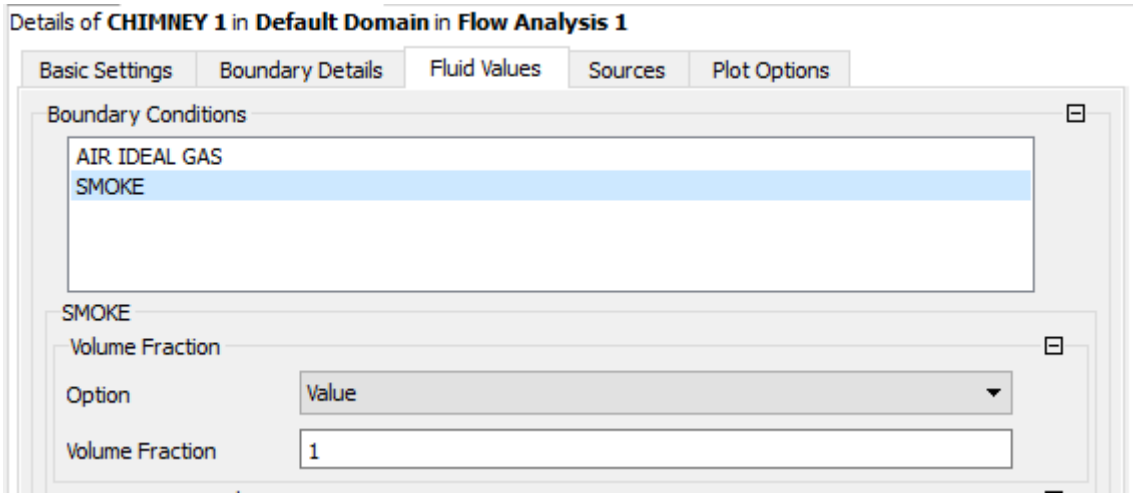


***Boundary Details* :**



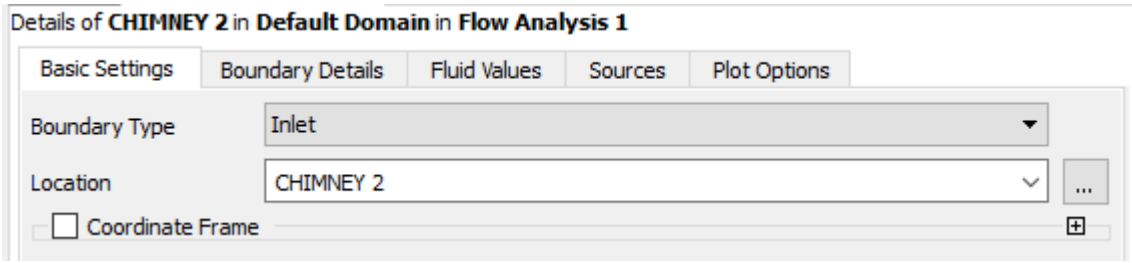
***Fluid Details* :**



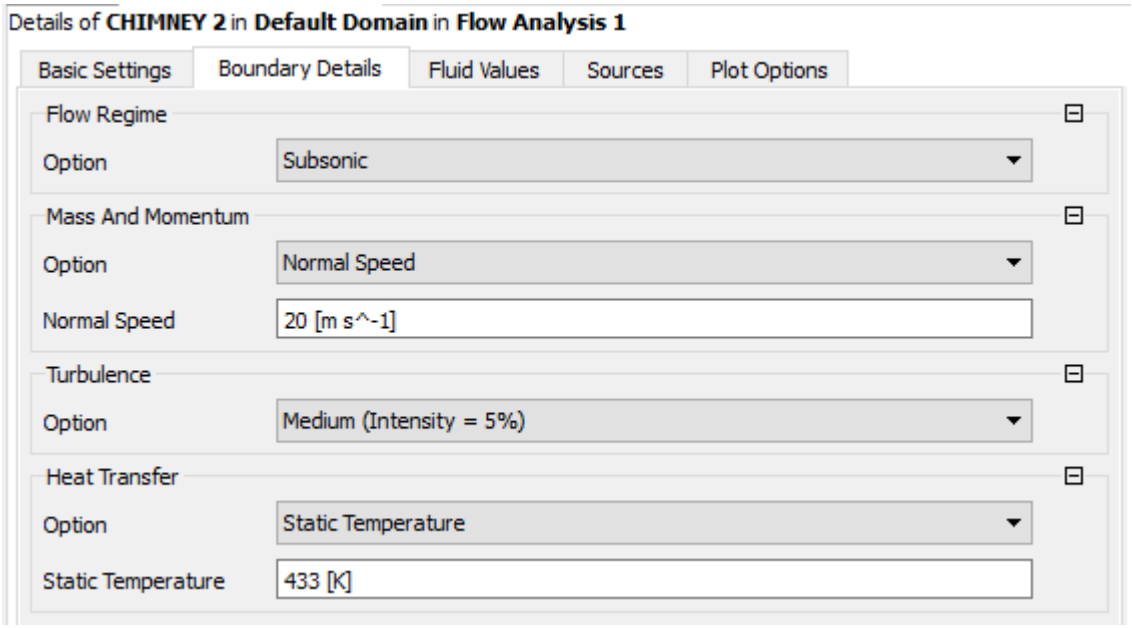


***Boundary – Chimney* 2**

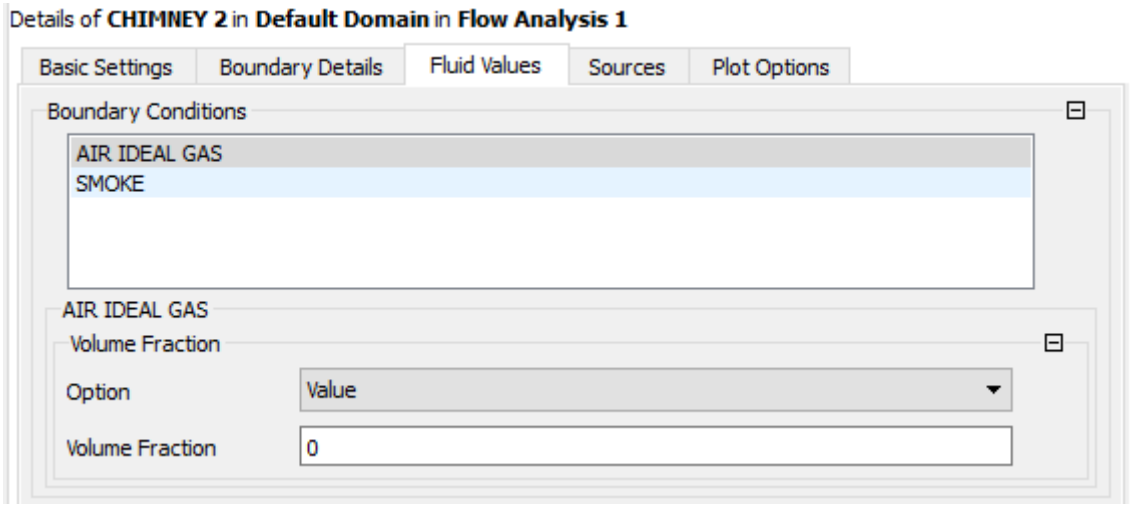
***Basic Settings* :**

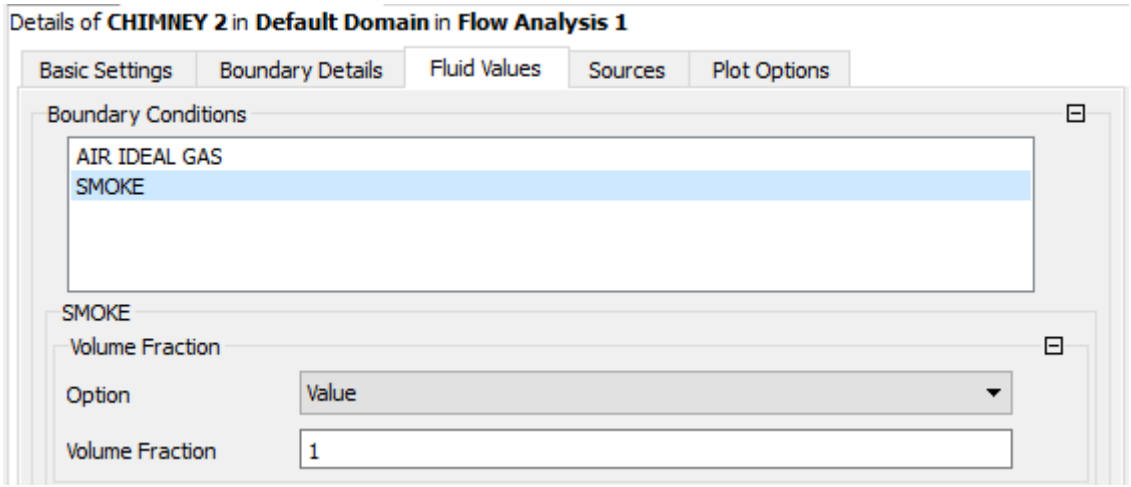


***Boundary Details* :**



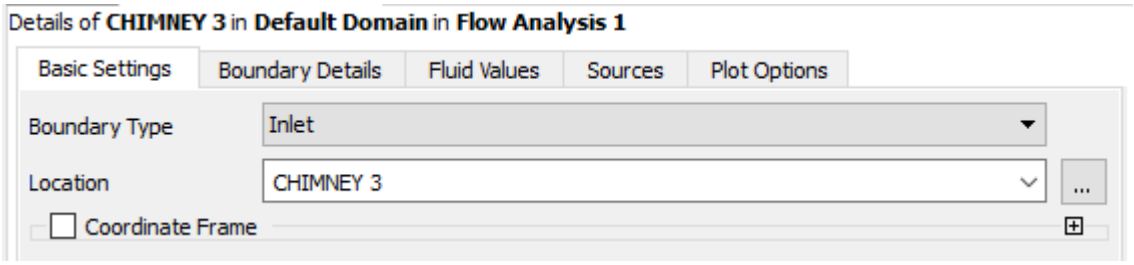
***Fluid Details* :**



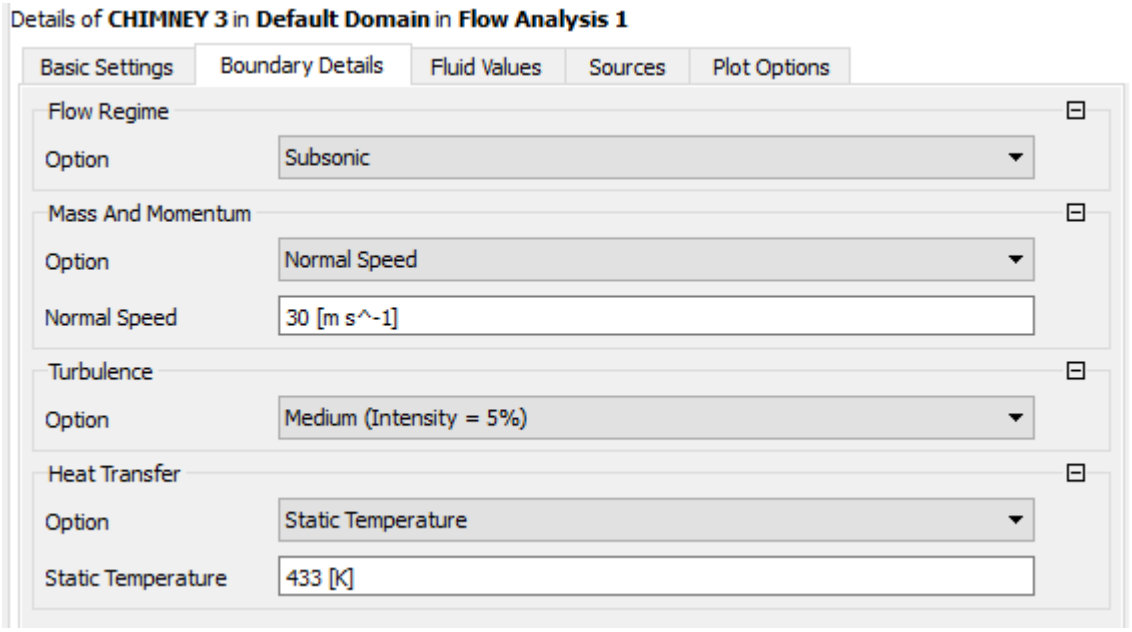


Boundary – Chimney 3

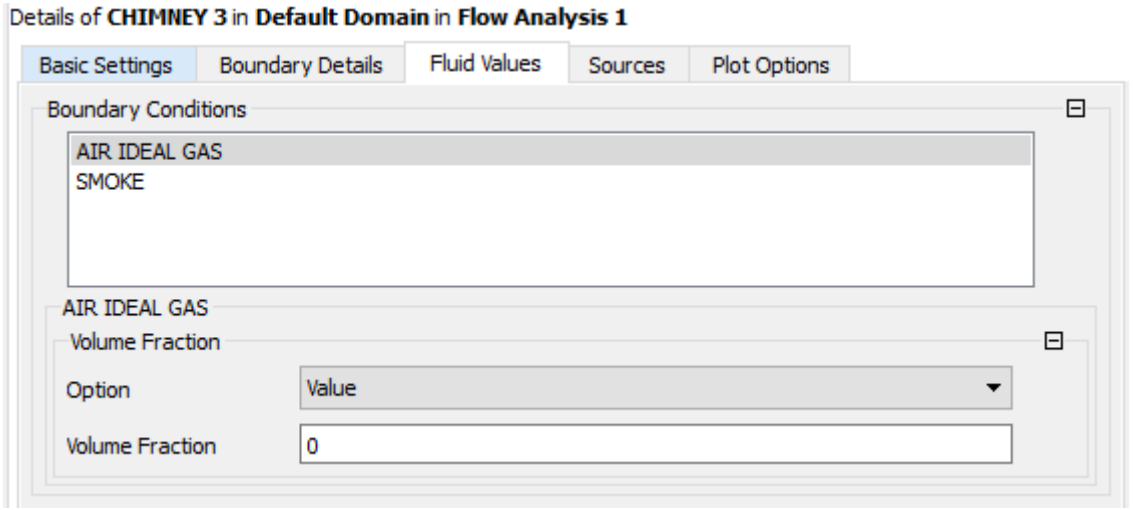
***Basic Settings* :**

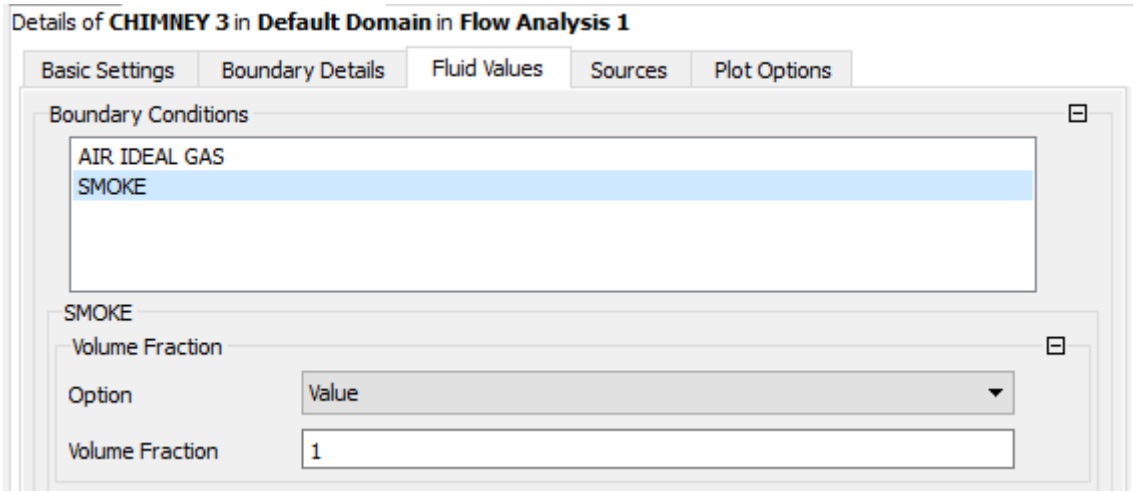


***Boundary Details* :**

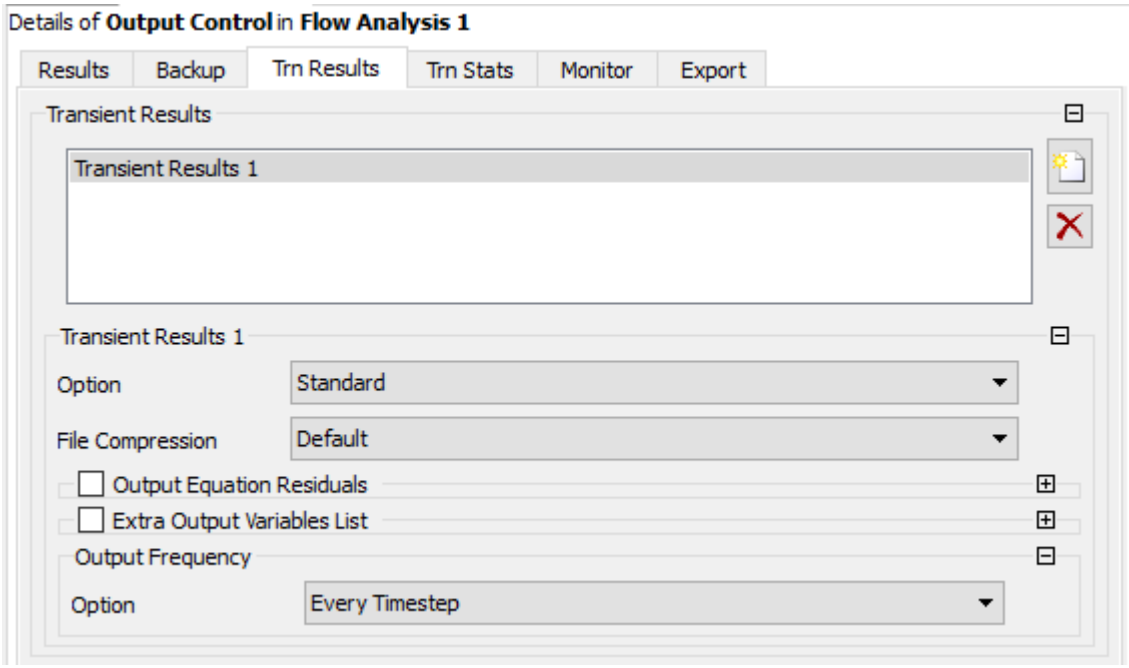


***Fluid Details* :**

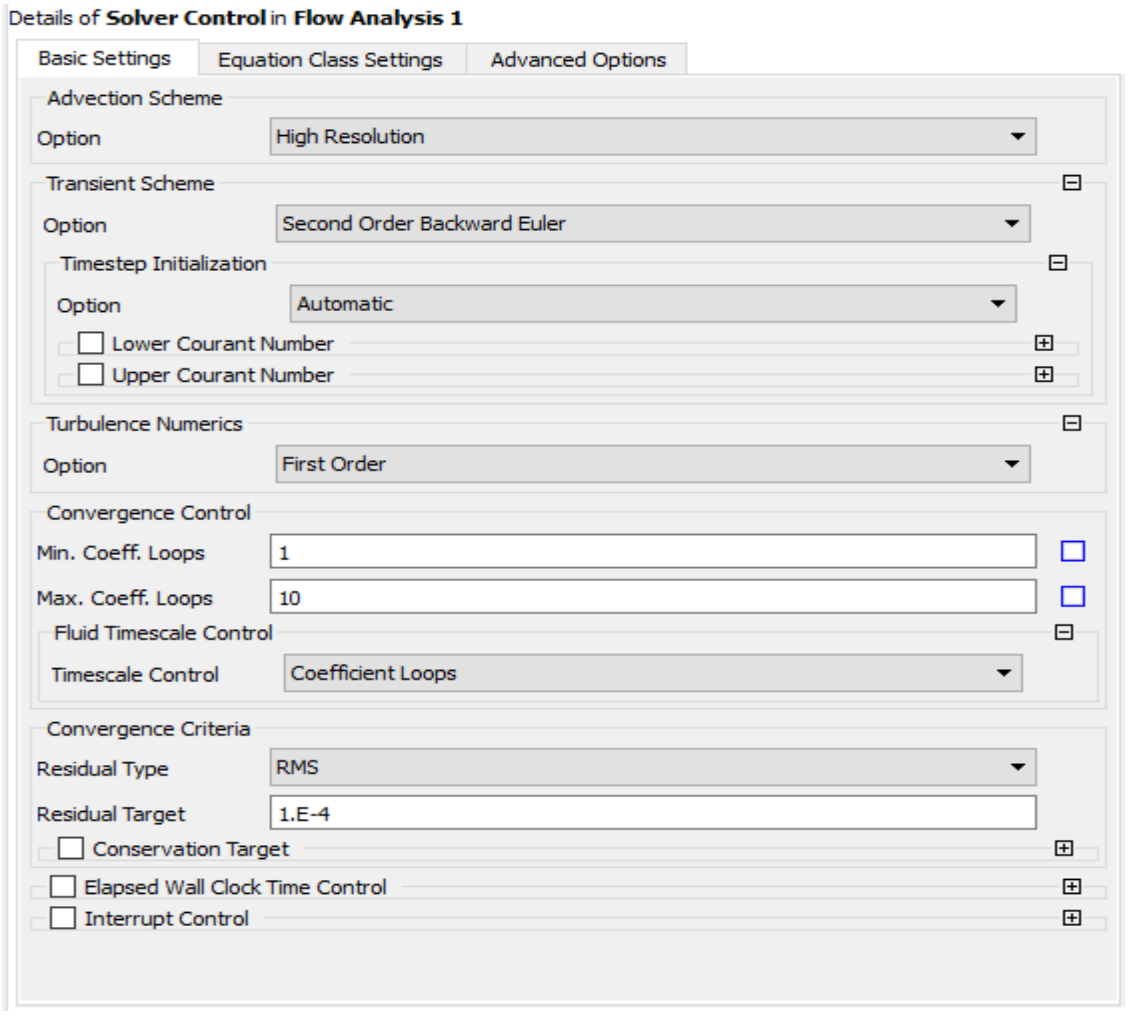




***Output Control* :**



***Solver Control* :**



CONVERSION FACTORS*

Length:

$$\begin{aligned}\mathbf{1\ ft} &= 0.3048\ \text{m} = 12\ \text{in.} = \text{mile}/5280 = \text{nautical mile}/6076 \\ &= \text{km}/3281 \\ \mathbf{1\ m} &= 3.281\ \text{ft} = 39.37\ \text{in.} = \text{km}/1000 = 100\ \text{cm} = 1000\ \text{mm} \\ &= 10^6\ \text{microns} = 10^6\ \mu\text{m} = 10^9\ \text{nm} = 10^{10}\ \text{Å}\end{aligned}$$

Mass:

$$\begin{aligned}\mathbf{1\ lbm} &= 0.45359\ \text{kg} = \text{short ton}/2000 = \text{long ton}/2240 = 16\ \text{oz (av.)} \\ &= 14.58\ \text{oz (troy)} = \text{metric ton (tonne)}/2204.63 = 7000\ \text{grains} \\ &= \text{slug}/32.2 \\ \mathbf{1\ kg} &= 2.2046\ \text{lbm} = 1000\ \text{g} = (\text{metric ton or tonne or Mg})/1000\end{aligned}$$

Force:

$$\begin{aligned}\mathbf{1\ lbf} &= 4.4482\ \text{N} = 32.2\ \text{lbm} \cdot \text{ft/s}^2 = 32.2\ \text{poundal} = 0.4536\ \text{kgf} \\ \mathbf{1\ N} &= \text{kg} \cdot \text{m/s}^2 = 10^5\ \text{dyne} = \text{kgf}/9.81 = 0.2248\ \text{lbf}\end{aligned}$$

Volume:

$$\begin{aligned}\mathbf{1\ ft^3} &= 0.02831\ \text{m}^3 = 28.31\ \text{liters} = 7.48\ \text{U.S. gallons} \\ &= 6.23\ \text{Imperial gallons} = \text{acre-ft}/43\,560 \\ \mathbf{1\ U.S.\ gallon} &= 231\ \text{in.}^3 = \text{barrel (petroleum)}/42 = 4\ \text{U.S. quarts} \\ &= 8\ \text{U.S. pints} = 3.785\ \text{liters} = 0.003785\ \text{m}^3 \\ \mathbf{1\ m^3} &= 1000\ \text{liters} = 35.29\ \text{ft}^3\end{aligned}$$

Energy:

$$\begin{aligned}\mathbf{1\ Btu} &= 1055\ \text{J} = 1.055\ \text{kw} \cdot \text{s} = 2.93 \times 10^{-4}\ \text{kwh} = 252\ \text{cal} \\ &= 777.97\ \text{ft} \cdot \text{lbf} = 3.93 \times 10^{-4}\ \text{hp} \cdot \text{h} \\ \mathbf{1\ J} &= \text{N} \cdot \text{m} = \text{W} \cdot \text{s} = \text{volt} \cdot \text{coulomb} = 9.48 \times 10^{-4}\ \text{Btu} \\ &= 0.239\ \text{cal} = 10^7\ \text{erg} = 6.24 \times 10^{18}\ \text{electron volts}\end{aligned}$$

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*These values are mostly rounded. There are several definitions for some of these quantities, e.g., the Btu and the calorie; these definitions differ from each other by up to 0.2 percent. For the most accurate values see the *ASTM Metric Practice Guide*, ASTM Pub. E 380-93, Philadelphia, 1993.

Power:

$$\mathbf{1\ hp} = 550\ \text{ft} \cdot \text{lbf/s} = 33\,000\ \text{ft} \cdot \text{lbf/min} = 2545\ \text{Btu/h} = 0.746\ \text{kW}$$

$$\mathbf{1\ W} = \text{J/s} = \text{N} \cdot \text{m/s} = \text{volt} \cdot \text{ampere} = 1.34 \times 10^{-3}\ \text{hp} = 0.239\ \text{cal/s}$$
$$= 9.49 \times 10^{-4}\ \text{Btu/s}$$

Pressure:

$$\mathbf{1\ atm} = 101.3\ \text{kPa} = 1.013\ \text{bar} = 14.696\ \text{lbf/in.}^2 = 33.89\ \text{ft of water}$$
$$= 29.92\ \text{inches of mercury} = 1.033\ \text{kgf/cm}^2 = 10.33\ \text{m of water}$$
$$= 760\ \text{mm of mercury} = 760\ \text{torr}$$

$$\mathbf{1\ psi} = \text{atm}/14.696 = 6.89\ \text{kPa} = 0.0689\ \text{bar} = 27.7\ \text{in. } H_2O = 51.7\ \text{torr}$$

$$\mathbf{1\ Pa} = \text{N/m}^2 = \text{kg/m} \cdot \text{s}^2 = 10^{-5}\ \text{bar} = 1.450 \times 10^{-4}\ \text{lbf/in.}^2$$
$$= 0.0075\ \text{torr} = 0.0040\ \text{in. } H_2O$$

$$\mathbf{1\ bar} = 10^5\ \text{Pa} = 0.987\ \text{atm} = 14.5\ \text{psia}$$

Psia, psig:

Psia means pounds per square inch, absolute. Psig means pounds per square inch, gauge, i.e., above or below the local atmospheric pressure.

Viscosity:

$$\mathbf{1\ cp} = 0.01\ \text{poise} = 0.001\ \text{g/cm} \cdot \text{s} = 0.001\ \text{kg/m} \cdot \text{s} = 0.001\ \text{Pa} \cdot \text{s}$$
$$= 6.72 \times 10^{-4}\ \text{lbm/ft} \cdot \text{s} = 2.42\ \text{lbm/ft} \cdot \text{h} = 2.09 \times 10^{-5}\ \text{lbf} \cdot \text{s/ft}^2$$
$$= 0.01\ \text{dyne} \cdot \text{s/cm}^2$$

Kinematic viscosity:

$$\mathbf{1\ cs} = 0.01\ \text{stoke} = 0.01\ \text{cm}^2/\text{s} = 10^{-6}\ \text{m}^2/\text{s} = 1\ \text{cp}/(\text{g/cm}^3)$$
$$= 1.08 \times 10^{-5}\ \text{ft}^2/\text{s} = \text{cp}/(62.4\ \text{lbm/ft}^3)$$

Temperature:

$$\mathbf{K} = {}^\circ\text{C} + 273.15 = {}^\circ\text{R}/1.8 \approx {}^\circ\text{C} + 273 \qquad {}^\circ\mathbf{C} = ({}^\circ\text{F} - 32)/1.8$$

$${}^\circ\mathbf{R} = {}^\circ\text{F} + 459.67 = 1.8\ \text{K} \approx {}^\circ\text{F} + 460 \qquad {}^\circ\mathbf{F} = 1.8{}^\circ\text{C} + 32$$

Concentration (ppm):

In the air pollution literature and in this book, ppm applied to a gas always means parts per million by volume or by mol. These are identical for an ideal gas, and practically identical for most gases of air pollution interest at 1 atm pressure. Ppm applied to a liquid or solid means parts per million by mass.

For perfect gases at 1 atm and 25°C, 1 ppm = (40.87 · molecular weight) $\mu\text{g/m}^3$