

Min Project on ANSYS ICEMCFD

Multiblock Mesh Generation

Blocking Strategy



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Working out the blocking strategy is the most critical step for creating structured mesh. It takes time for one to acquire required skills to generate blocking structure for complex geometry. It's always a good idea to start with simple geometry topology and move towards complex topology. In this project, number of geometrical configurations are given in increasing complexity order. It starts with simple cylindrical geometry and the goes to more complex multi zone meshing. The end goal of the project is not to generate mesh for any specific flow rates, but to create a blocking structure such that it could be used for any flow conditions later. The focus is on creating a blocking structure and zones rather than create a mesh.

This mini project tests your understanding of various multiblock mesh generation options in ANSYS ICEMCFD. After completing this mini project you will be comfortable in creating multiblock structured meshing for simple geometries.

1 Prerequisites

The main pre-requisite for project is basic understanding of multiblock hexahedral meshing using ANSYS ICEMCFD. Before taking this project, please make sure that you have gone through lessons on "Structured Hexahedral meshing".

2 Problem Definition

Project contains set of geometries. The focus of this project is to create a blocking structure suitable for all given geometries. Once the blocking structure is created, that could be adapted to any flow rate conditions later. It is also expected that you create required O-Grid blocking so that boundary layer mesh could be generated. It is advised that you should work on these geometries in the sequence they are given below.

For all geometries, two inputs are given, one the required dimensions to create the geometry and other the zone labels and type. It is expected that you create the geometry and make sure that your exported mesh (for any solver), would have the required zone labels and zone type.

For the geometries containing multiple zones, you have to create a mesh which is conformal at the zone boundaries. This requires connected blocking structure. The best way to create such blocking structure is to use "Top-to-Bottom" blocking approach. This requires one big block to be created first and then split and delete unwanted blocks to get required blocking structure.

2.1 Single Cylinder

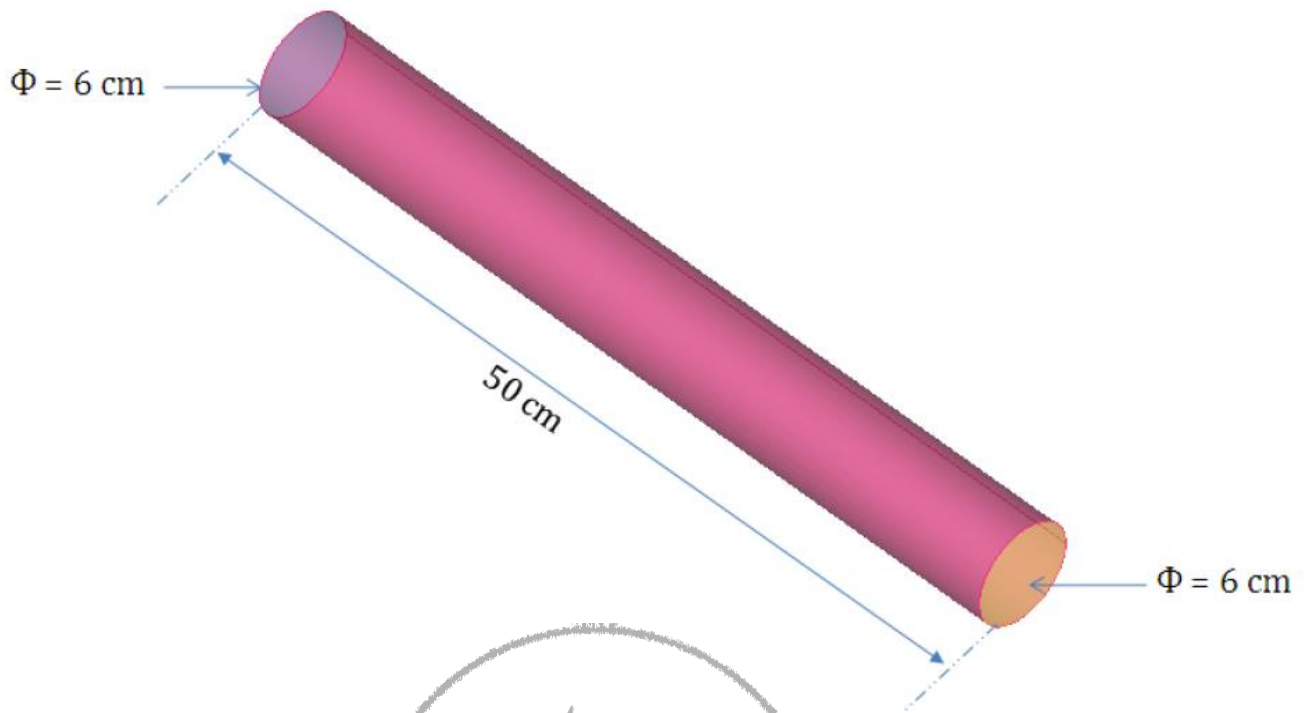


Figure 1: Dimensions

Zone Label : Inlet
Zone Type : Velocity Inlet

Zone Label : Wall
Zone Type : Wall

Zone Label : Water
Zone Type : Fluid

Zone Label : Outlet
Zone Type : Pressure Outlet

Figure 2: Zone assignment

2.2 Two Cylinders

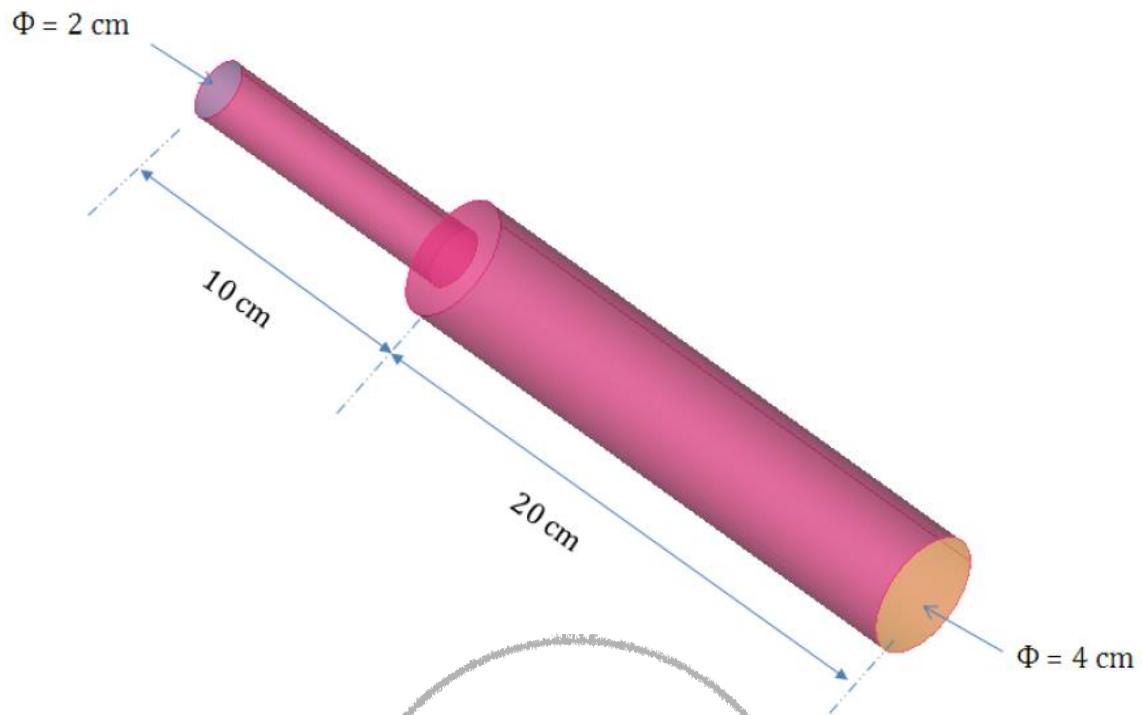


Figure 3: Dimensions

Zone Label : Inlet
Zone Type : Velocity Inlet

Remaining Surfaces
Zone Label : Wall
Zone Type : Wall

All Volume Mesh
Zone Label : Water
Zone Type : Fluid

Zone Label : Outlet
Zone Type : Pressure Outlet

Figure 4: Zone assignment

2.3 Three Cylinders

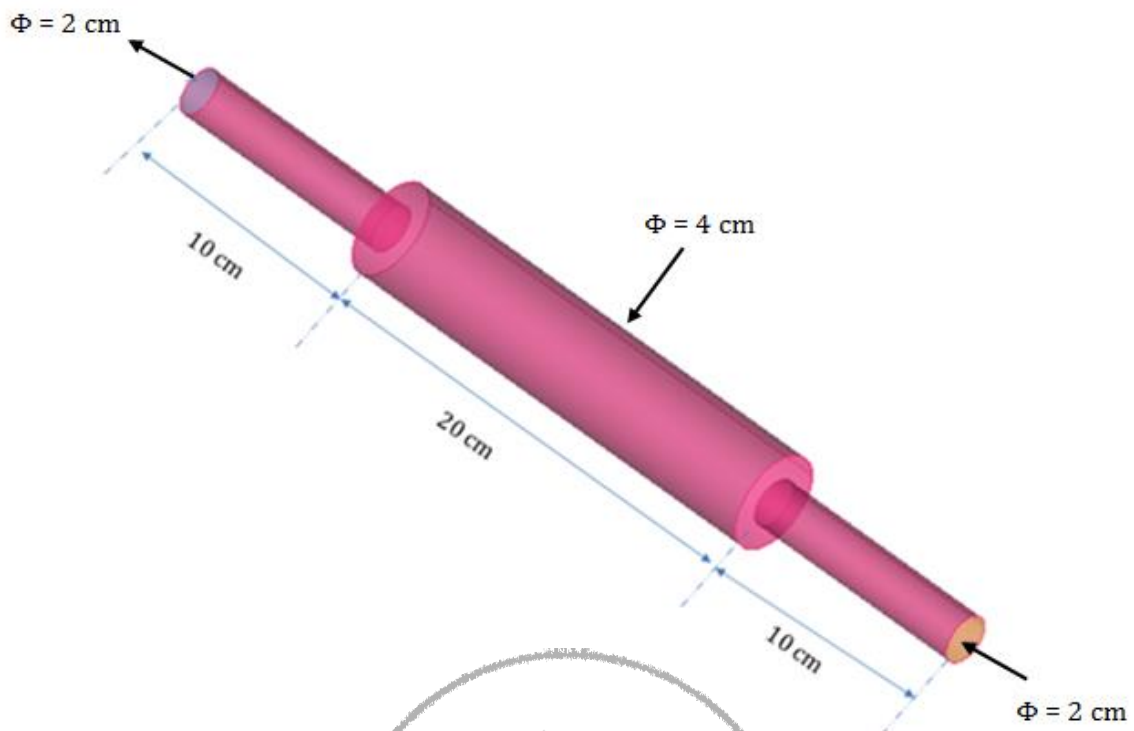


Figure 5: Dimensions

Zone Label : Inlet
Zone Type : Velocity Inlet



Figure 6: Zone assignment

2.4 Pipe with Thickness

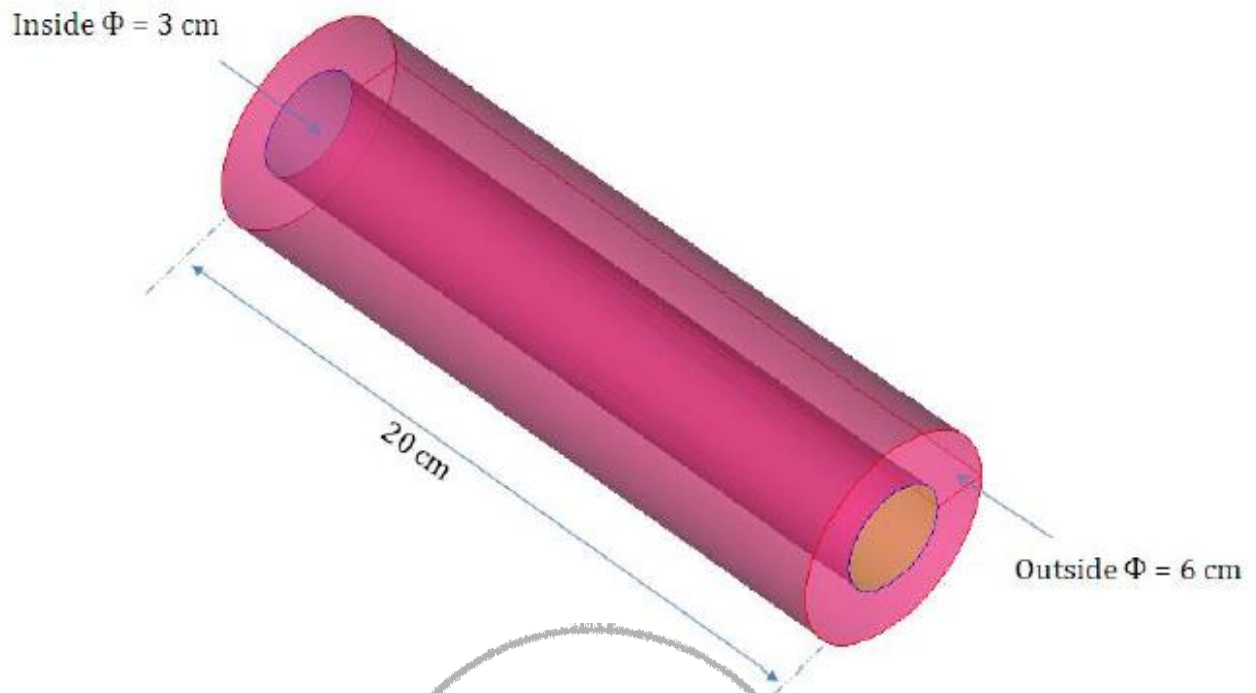


Figure 7: Dimensions

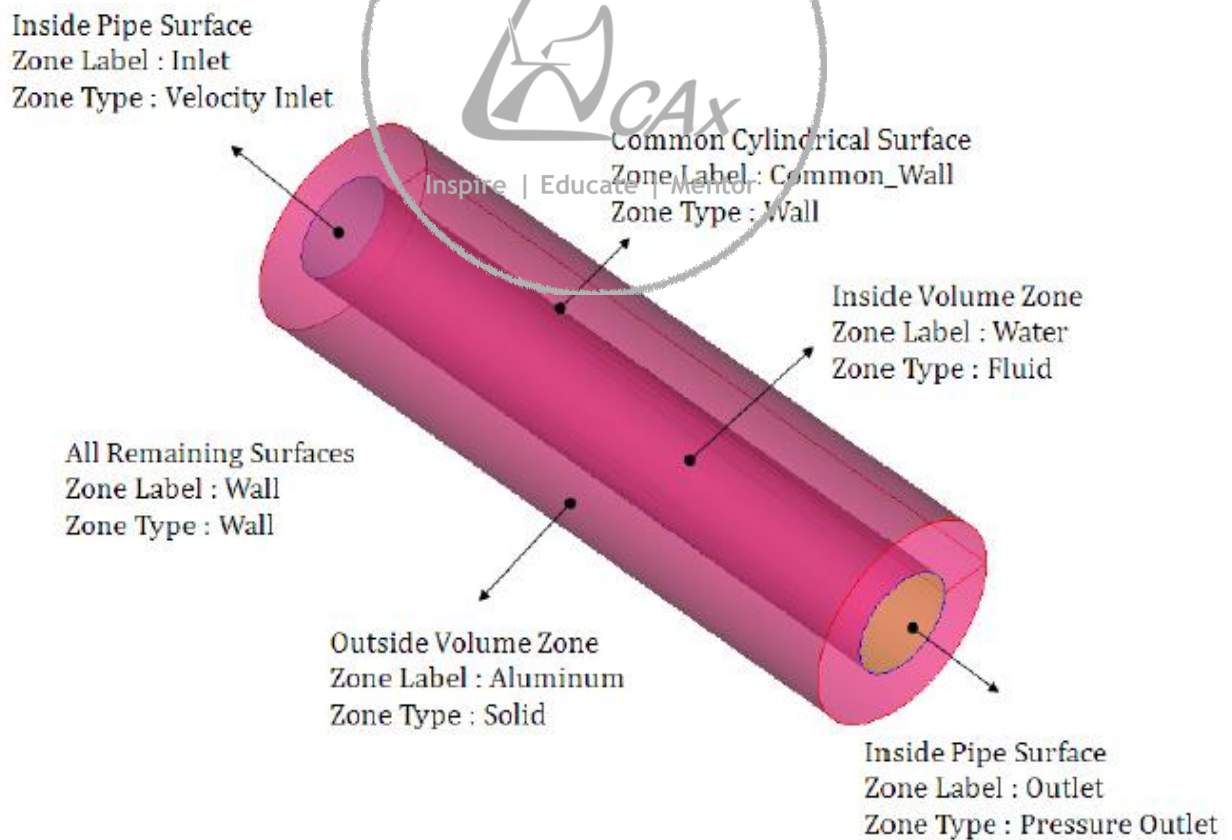


Figure 8: Zone assignment

2.5 Simple Shell-and-Tube

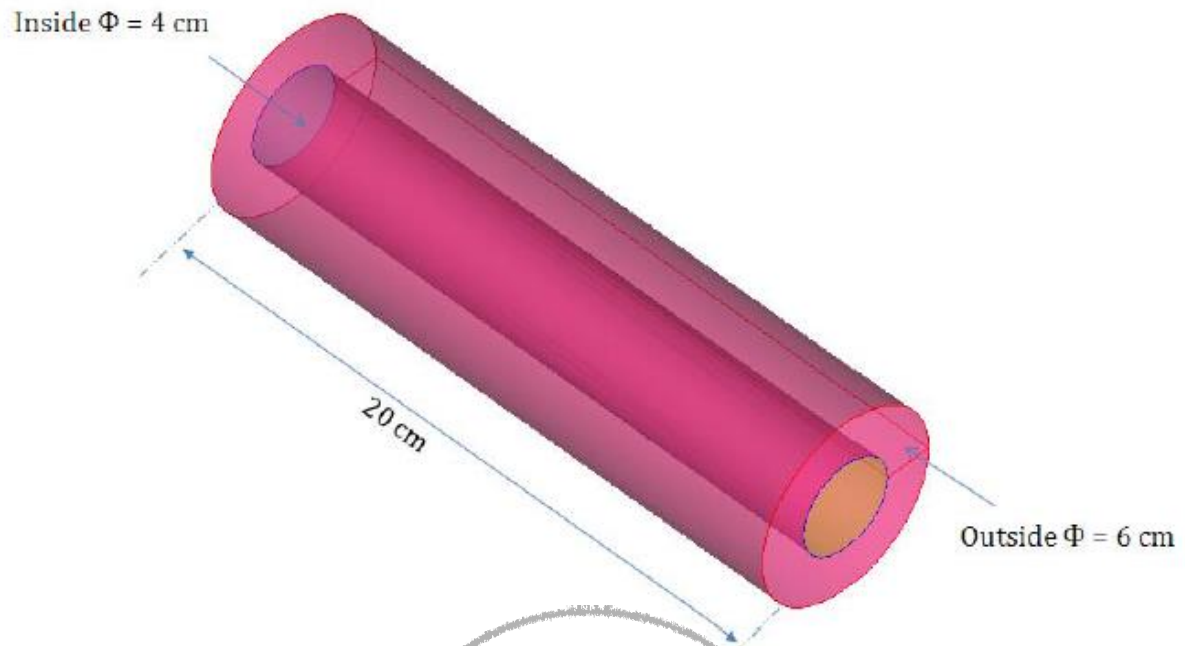


Figure 9: Dimension

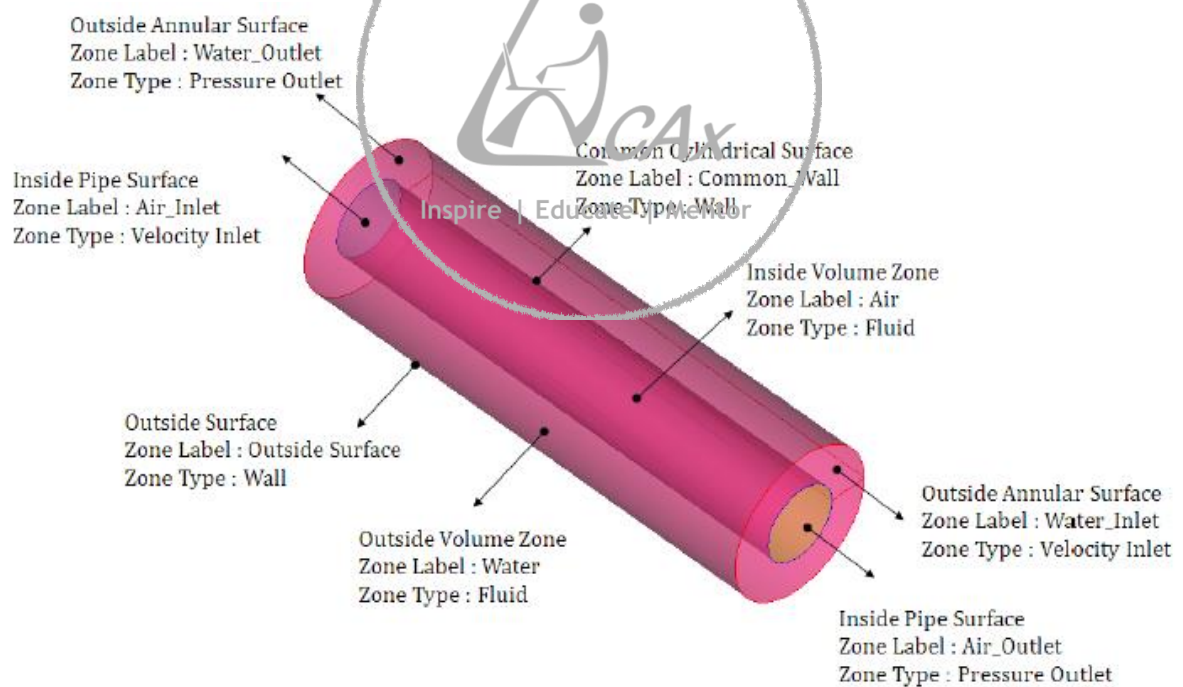


Figure 10: Zone assignment

2.6 Shell and Tube with Thickness

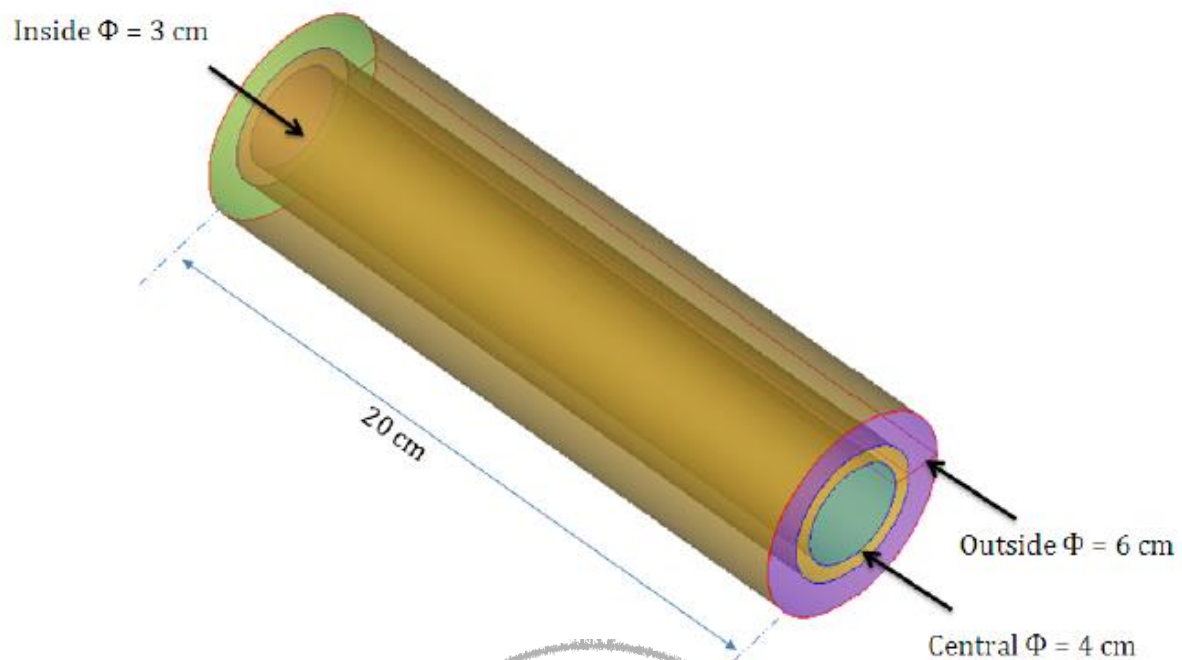


Figure 11: Dimensions

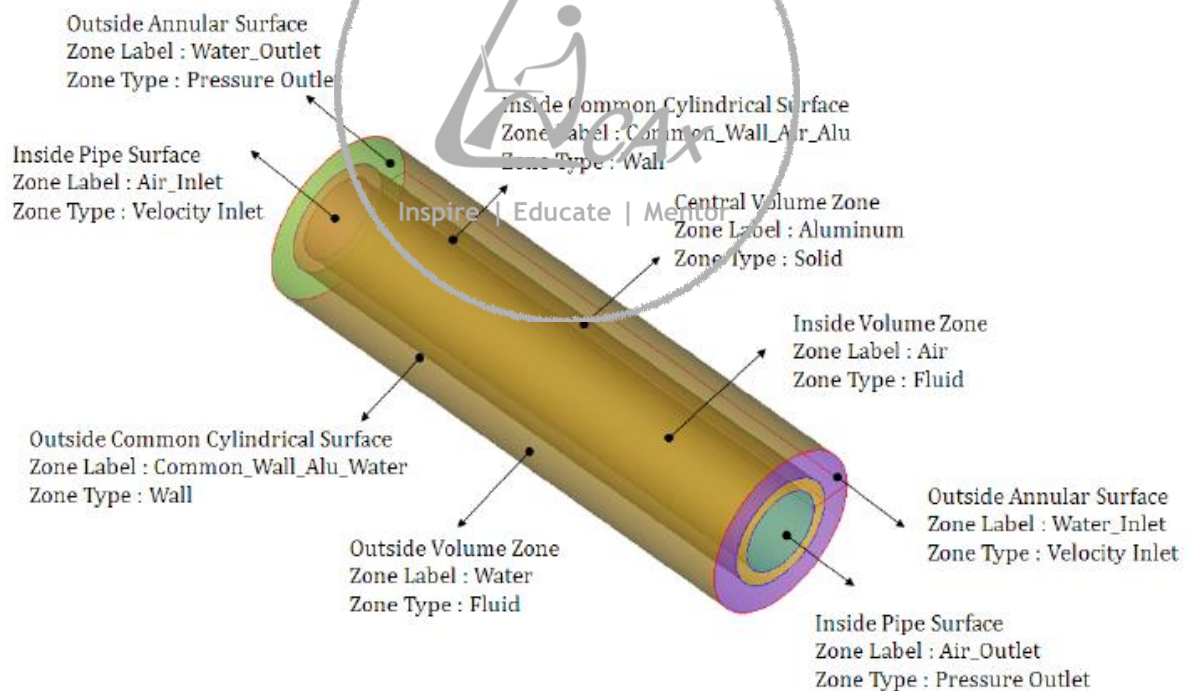


Figure 12: Zone assignment

2.7 Pump a Like (2D)

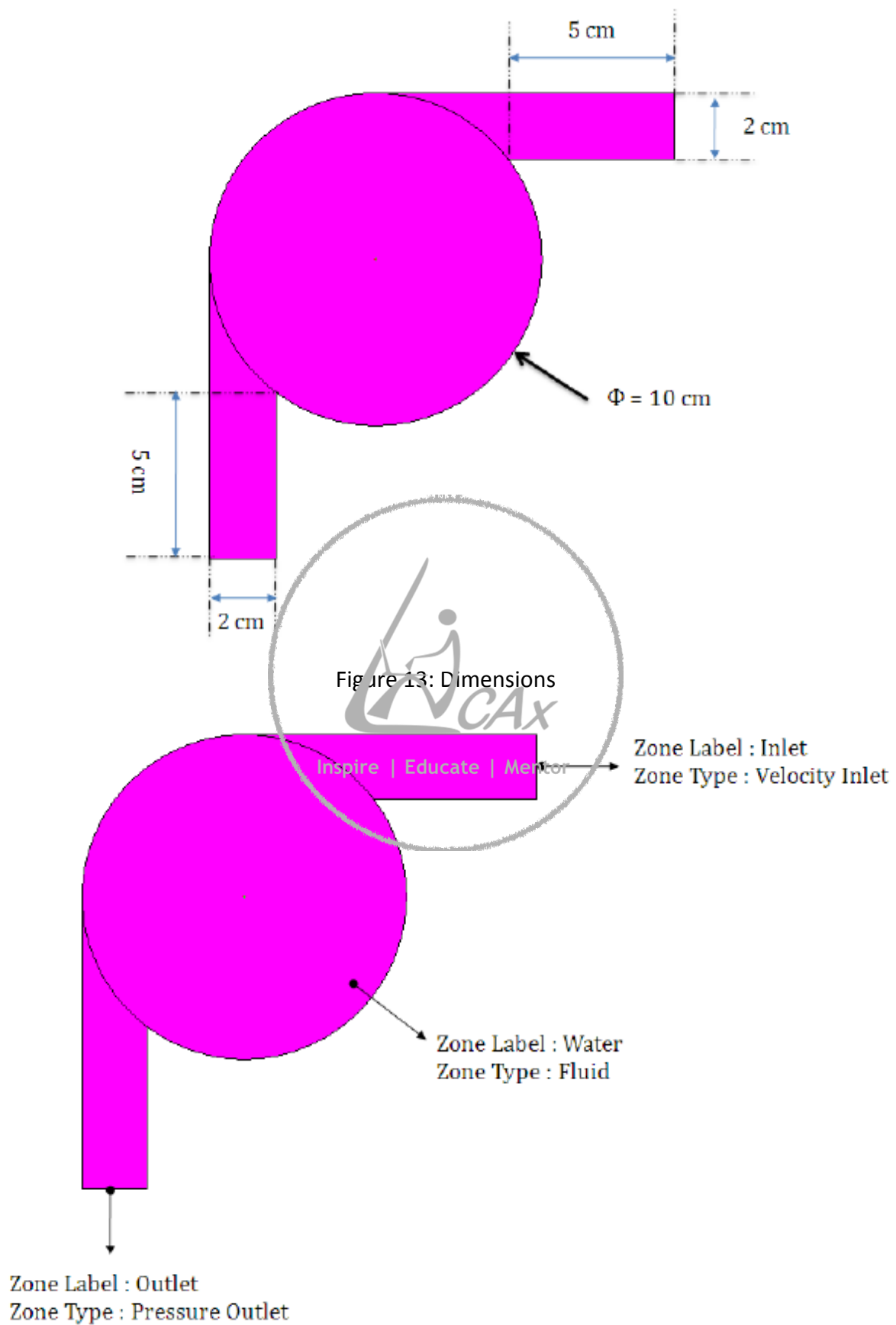


Figure 14: Zone assignment

2.8 Sector with Rotational Periodicity

Following different activities are expected for this geometry:

1. Only sector mesh: Create a sector blocking and mesh with periodic boundary conditions.
Complete mesh (approach 1): Create a sector blocking and rotate blocking along with geometry. Create mesh for complete geometry.
2. Complete mesh (approach 2): Create sector blocking and sector mesh. Load the sector mesh and rotate (with merging nodes) to get complete mesh.

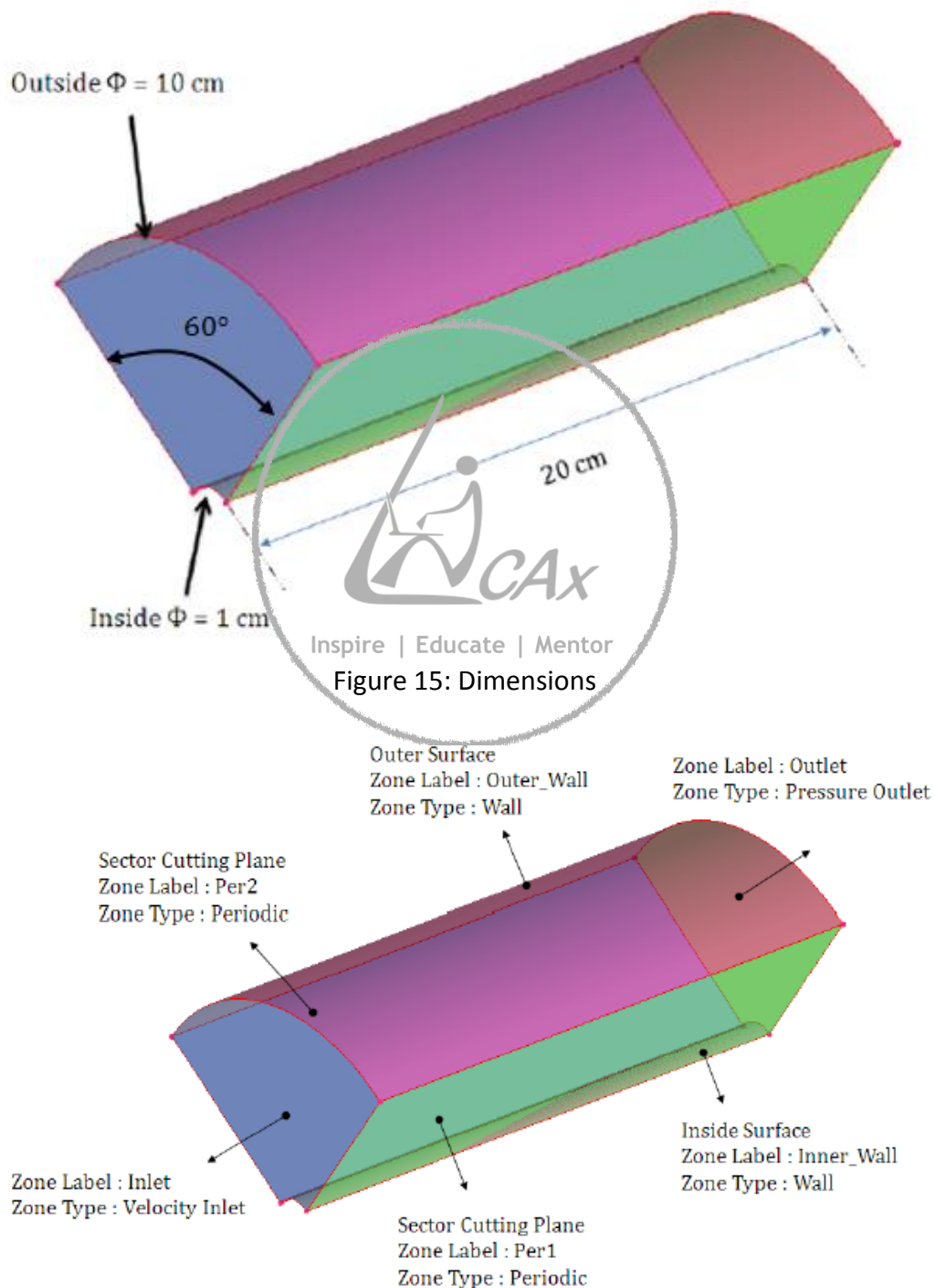


Figure 16: Zones

3 Download Input Files

This mini project does not require any input files. Use geometry dimensions given above to create the geometry. You can download the PDF copy with details of this mini project from below link. Its compressed zip files, so download and unzip the file to get PDF copy.

1. PDF instructions for this mini project

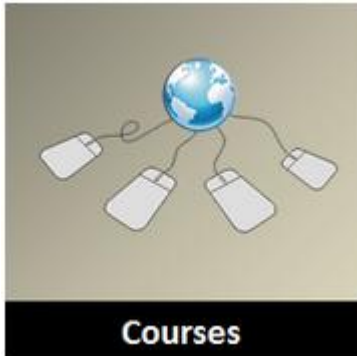
You can also download PDF instruction file from “Shared Files” section on lesson page.

4 Results and Discussion

If you have any specific query about the mini project or want to share the results of this project, please post them on [course discussion forum](#).



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