3 Dimensional Hg Jet Simulation

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Boundary Conditions

X axis is in the long (3.9 unit) direction
Y axis is in the short (2 unit) direction = bend plane
Z axis is in the very long (50 unit direction = direction of jet
No gravity in the model.

Units on this slide are in jet diameters
Axial Velocity Contour At The Jet Inlet

\[ u = U + \sqrt{2k/3}, \text{ where } k = \frac{1}{2}(u'^2 + v'^2 + w'^2) \]

Outlet at straight pipe with nozzle but no weld

Units on this slide are meters
Initial Condition At X=0

At t = 0, v = 20 m/s for all z > 0 and r < 0.5 cm, but the velocity at z = 0 is taken from slide 3.

At t > 0 fluid enters the left boundary (= inlet), always with the parameters of slide 3, \(\Rightarrow\) no time dependence to inlet flow, \(\Rightarrow\) inlet flow is effectively laminar.
Initial Condition At Y=0

Units on this slide are meters
Results at $t = 14\text{ms}$

At plane $X=0$

At plane $Y=0$

Units on this slide are meters
## Five Inlet Conditions For 3D Jet Simulation

<table>
<thead>
<tr>
<th>Case #</th>
<th>Half Bend Angle (deg)</th>
<th>Nozzle</th>
<th>Weld</th>
<th>Complete?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>90</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
<td>Yes</td>
<td>Whole weld</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
<td>Yes</td>
<td>Partial weld out of the bend plane</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
<td>Yes</td>
<td>Partial weld in the bend plane</td>
<td>No (about two weeks)</td>
</tr>
</tbody>
</table>
Mesh For New Case Of Partial Weld