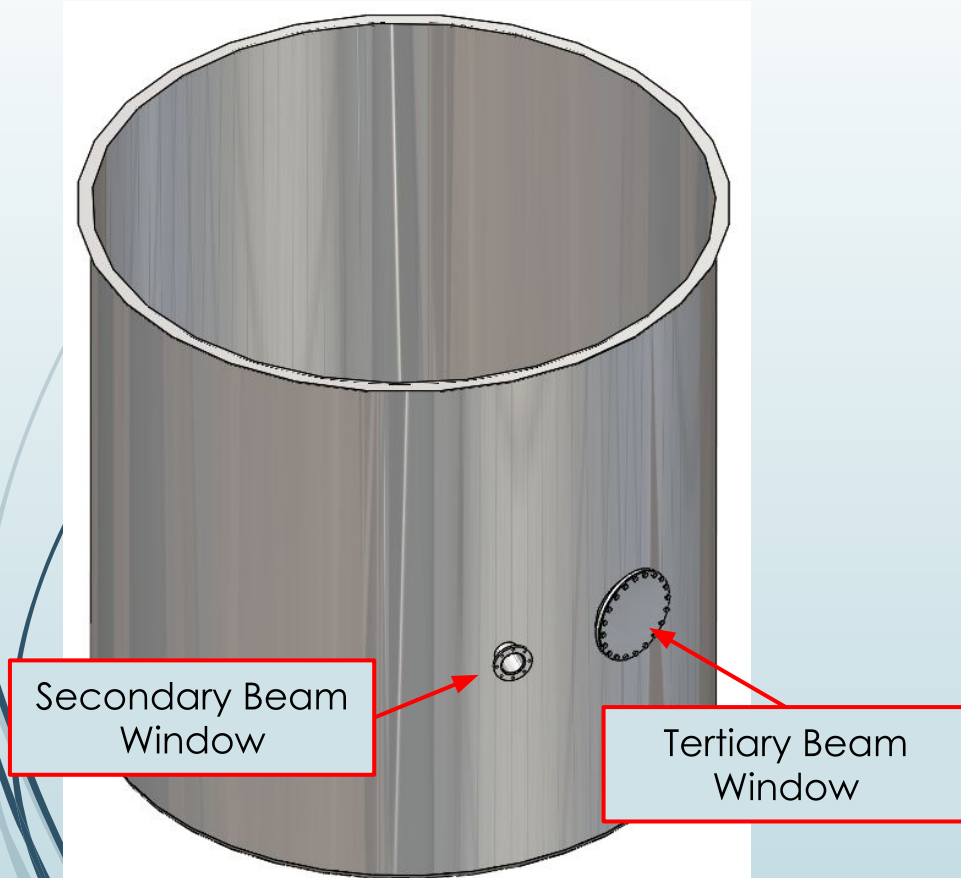


# Beam Window

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# Beam Windows



There are Two Beam windows :

1. Secondary Beam window
2. Tertiary Beam Window

## **Secondary Beam Window:**

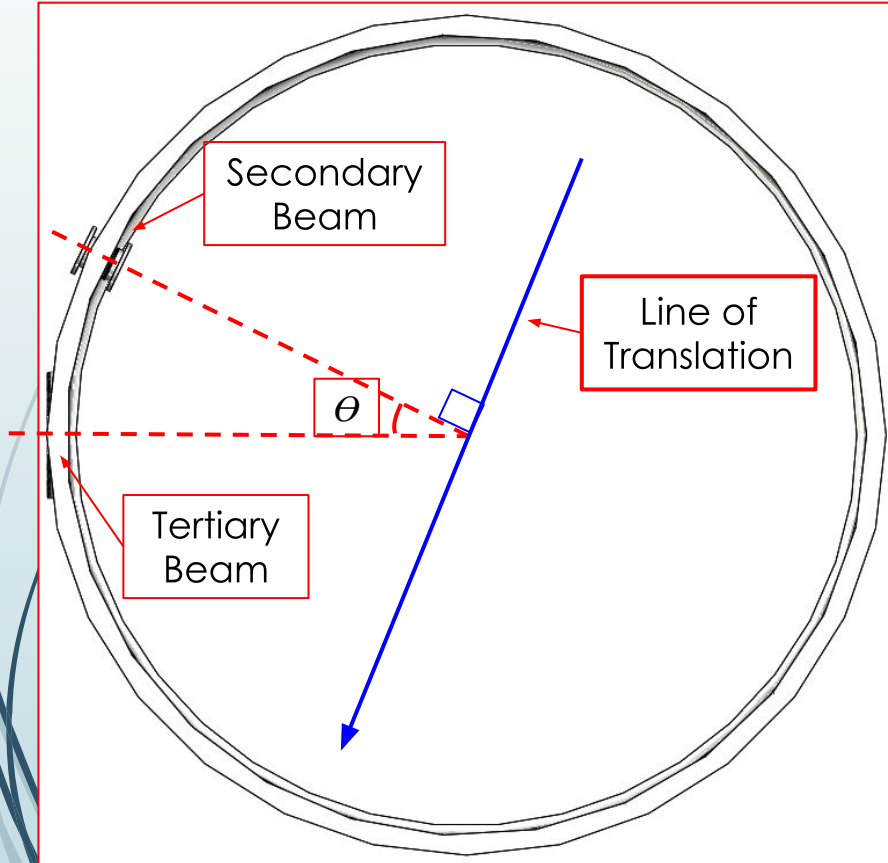
The position of the Beam window can be change radially inside the Tank

1. Flexible component
2. Removable pipes

## **Tertiary beam window:**

Stationary on the wall of Tank.

## Beam Location

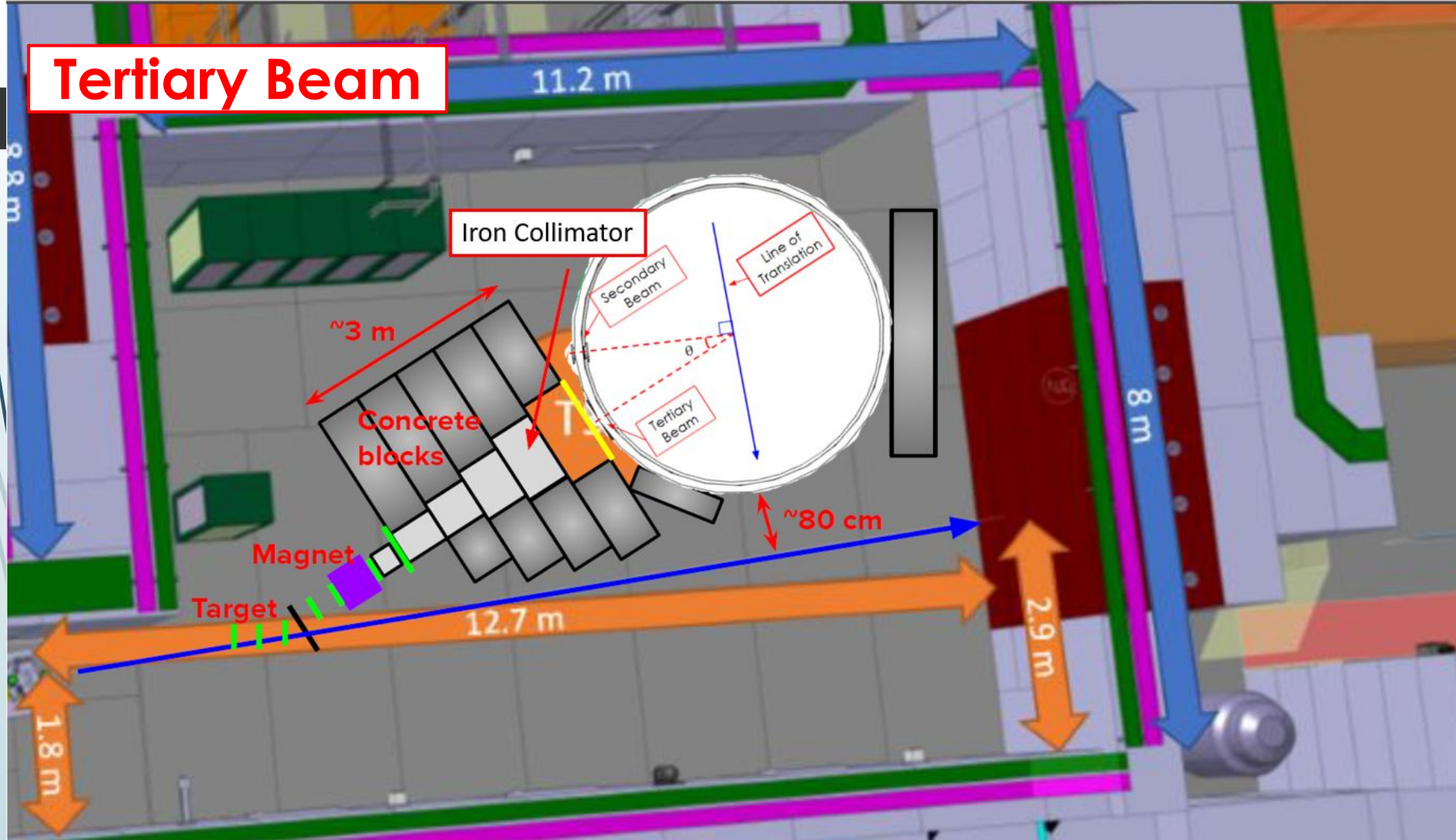


The angle between the tertiary beam and Secondary Beam is **450 mrad**.

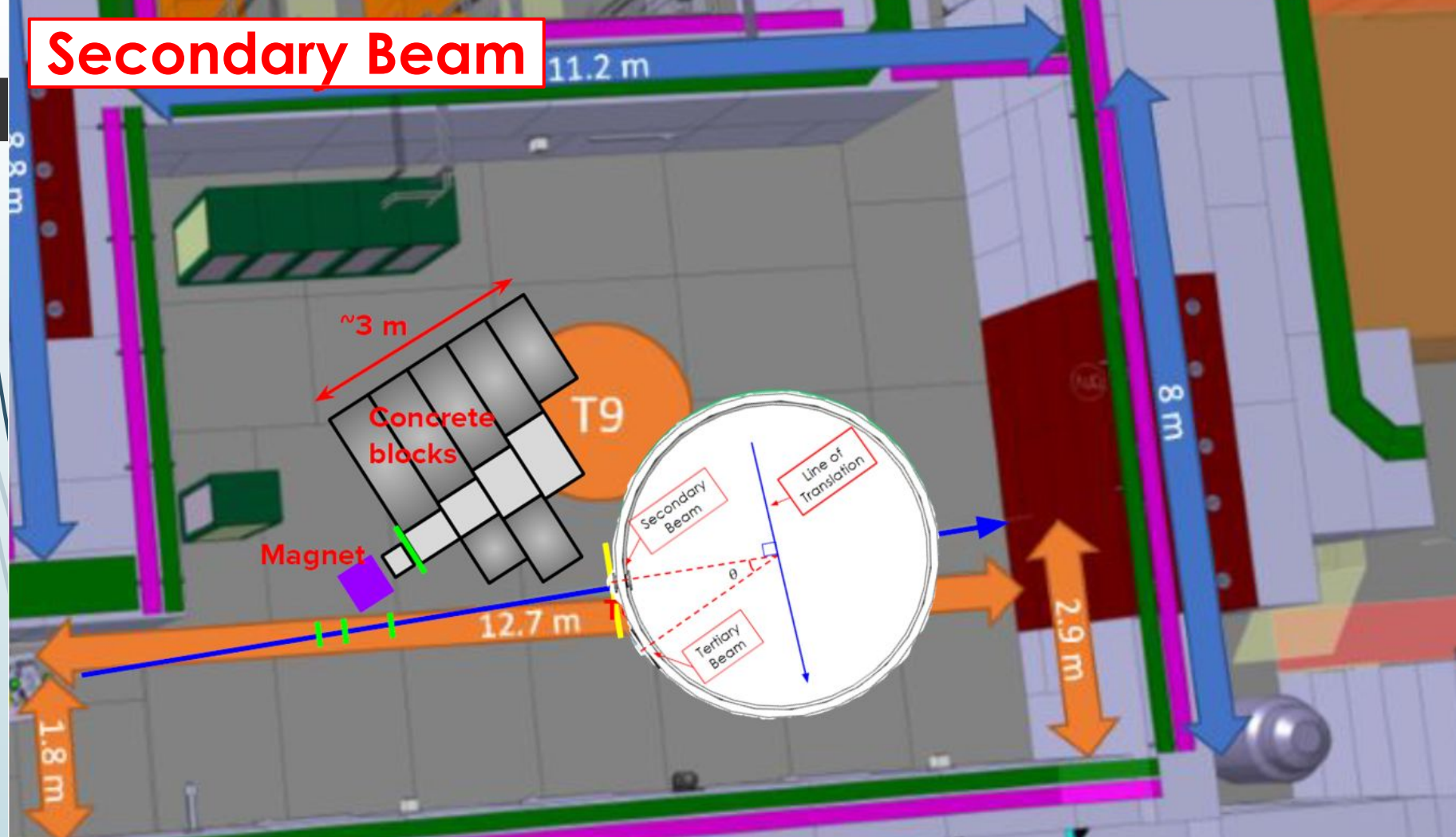
The Angle between two windows is **450 mrad**.

Translation of the tank is **perpendicular to Secondary window axis** for aligning beam window without need of rotation of tank.

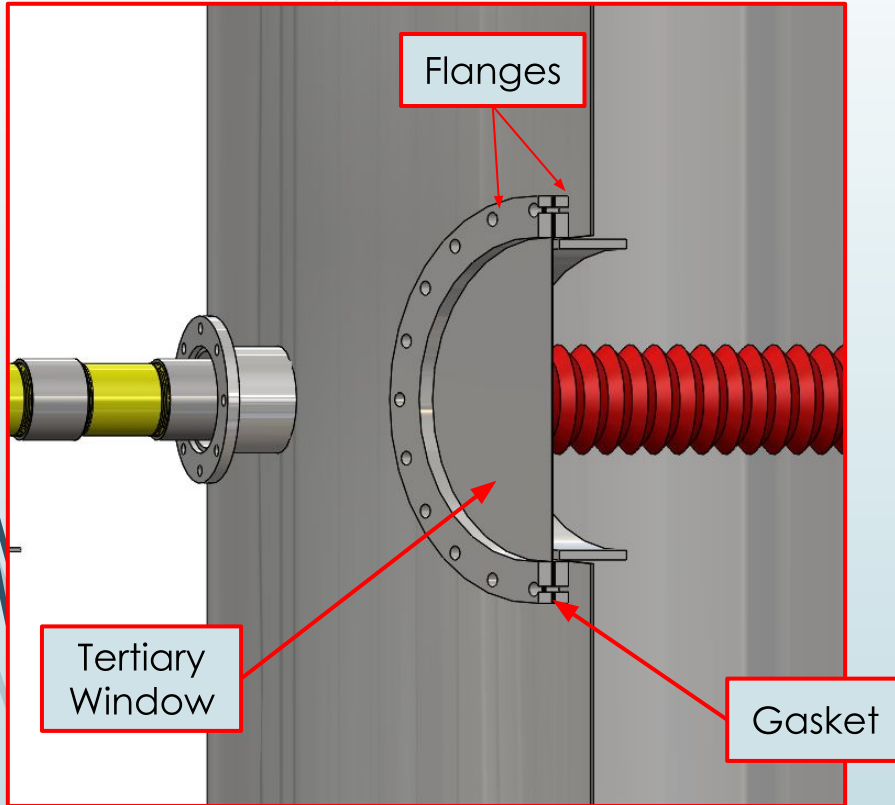
# Tertiary Beam



# Secondary Beam



# Tertiary Beam Window



Tertiary beam window consist of two components:

1. Beam window
2. Sealing Gasket

Both components are mounted on the Flange on tank.

## Dimensions:

**Beam window** = 500 mm dia.

**Flange** = PN6\_DN500 (Slip on)

**Pressure:** ~0.02 MPa

**Possible Material:** Stainless Steel / Aluminium / Composite material



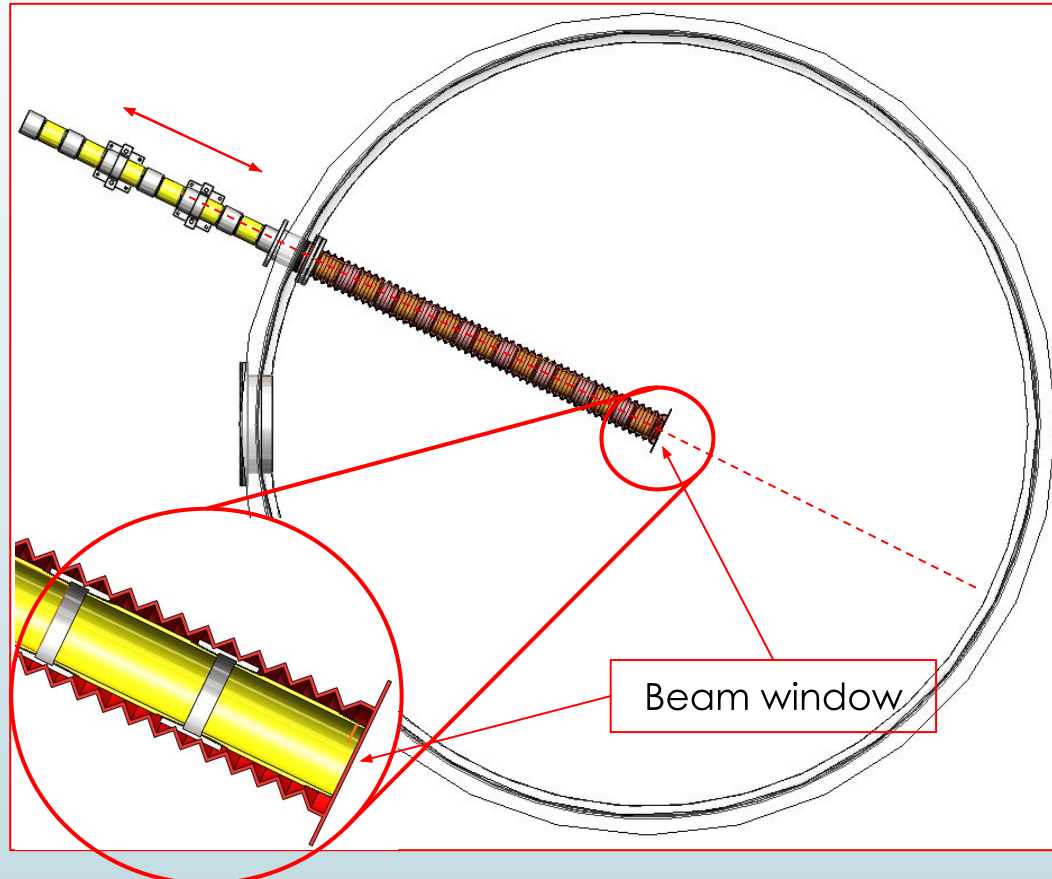
## Secondary beam window

### Working:

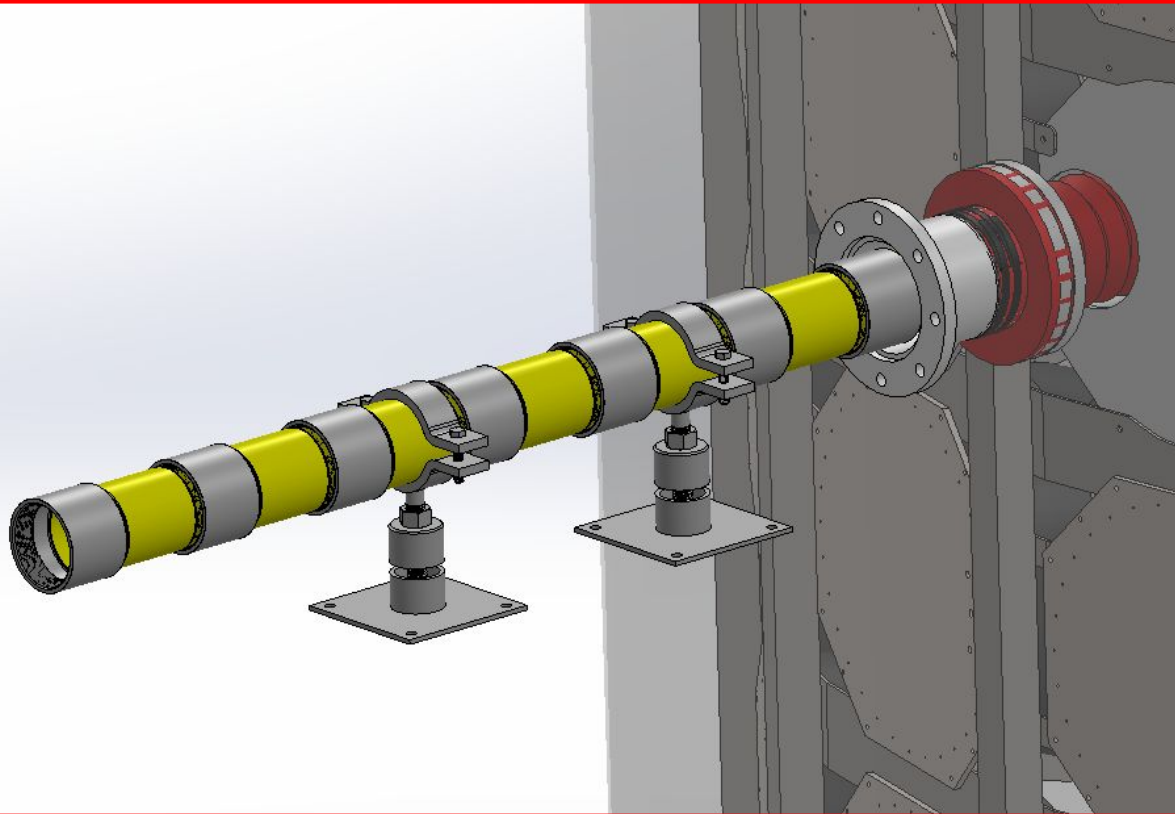
The beam window has flexible hose for water proofing (Red) and pipe for adding rigidity to the system.

Adding and removing of the pieces of the pipe can change the location of the Beam window which is at the end of the pipe and hose.

\*Resolution of location is depends upon the length of removable pipe



## Secondary Beam pipe



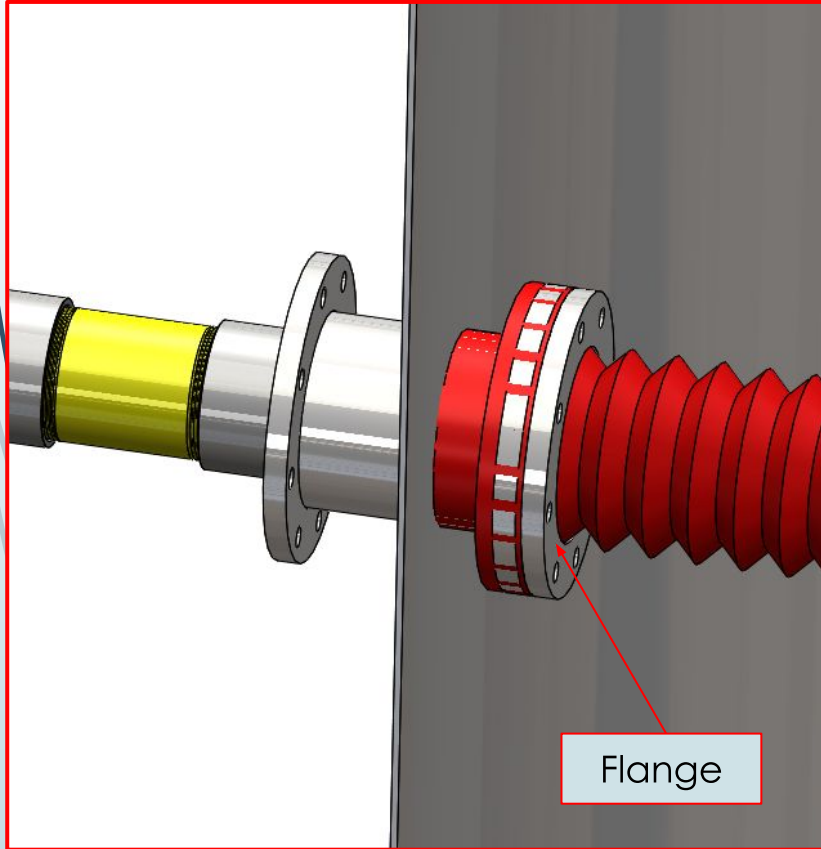
Standard **4 inch** dia Pipes and connectors can be used.

For example : **8 inch** long pipes are used.

The supporting post is off the shelf part.



# Sealing of Secondary Pipe



## Sealing from Inside

The seal need to be watertight for operation of the secondary pipe.

**Extra flange** can be used to ensure sealing.

In contact with company for some custom modification.



**Steel Flange**

# Sealing of Secondary Pipe

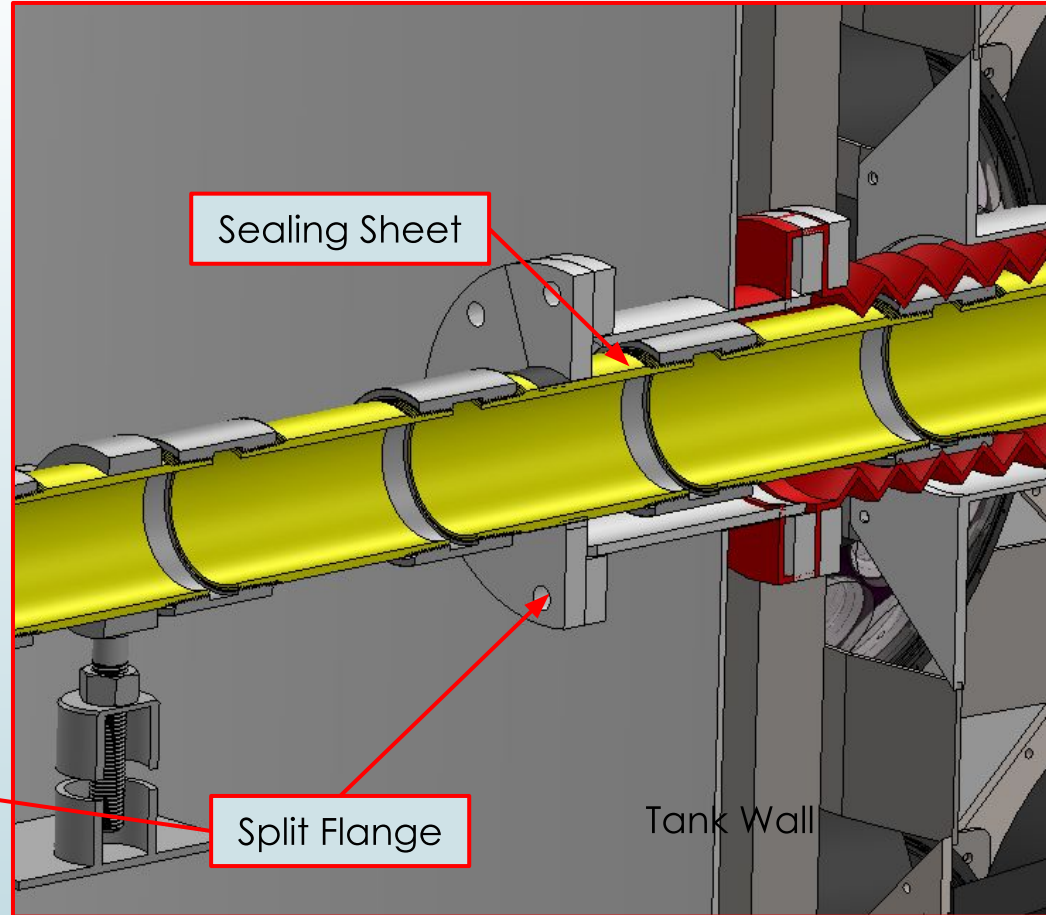
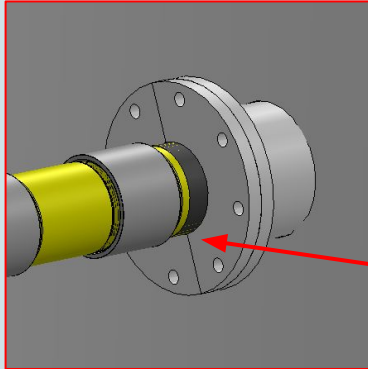
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## Sealing from Outside

The sealing system is in case the leak is happen form flexible piece.

The split flange can be used.

Gasket and a rubber sheet wrap around the removable pipe can be used to make it watertight.



# Summary

There are Two Beam Ports to Tank at an angle of 450 mrad to each other

1) Secondary Beam Port :

- a) **Dimensions - 100 mm** in Diameter
- b) **Features -**
  - i) Can change position radially inside the tank.
  - ii) Consist of two components one for waterproofing and another for rigidity.

2) Tertiary Beam Port:

- a) **Dimensions - 500 mm in** Diameter
- b) **Features -**
  - i) Stationary on the Tank wall.
  - ii) The Beam window can be made from material which can sustain the water pressure of **0.02 MPa** (2m water head).

Thank You!

# Radiation Length Chart

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## Atomic and nuclear properties of aluminum (Al)

Quantity	Value	Units	Value	Units
Atomic number	13			
Atomic mass	26.9815385(7)	g mole <sup>-1</sup>		
Specific gravity	2.699	g cm <sup>-3</sup>		
Mean excitation energy	166.0	eV		
Minimum ionization	1.615	MeV g <sup>-1</sup> cm <sup>2</sup>	4.358	MeV cm <sup>-1</sup>
Nuclear collision length	69.7	g cm <sup>-2</sup>	25.82	cm
Nuclear interaction length	107.2	g cm <sup>-2</sup>	39.70	cm
Pion collision length	95.6	g cm <sup>-2</sup>	35.41	cm
Pion interaction length	136.7	g cm <sup>-2</sup>	50.64	cm
Radiation length	24.01	g cm <sup>-2</sup>	8.897	cm
<a href="#">Critical energy</a>	42.70	MeV (for e <sup>-</sup> )	41.48	MeV (for e <sup>+</sup> )
Molière radius	11.93	g cm <sup>-2</sup>	4.419	cm
Plasma energy $\hbar\omega_p$	32.86	eV		
Muon critical energy	612.	GeV		
Melting point	933.5	K	660.3	C
Boiling point @ 1 atm	2792.	K	2519.	C

## Atomic and nuclear properties of materials:

Iron (Fe)

Quantity	Value	Units	Value	Units
Atomic number	26			
Atomic mass	55.845(2)	g mole <sup>-1</sup>		
Density	7.87	g cm <sup>-3</sup>		
Mean excitation energy	286.0	eV		
Minimum ionization	1.451	MeV g <sup>-1</sup> cm <sup>2</sup>	11.43	MeV cm <sup>-1</sup>
Nuclear collision length	81.7	g cm <sup>-2</sup>	10.37	cm
Nuclear interaction length	132.1	g cm <sup>-2</sup>	16.77	cm
Pion collision length	107.0	g cm <sup>-2</sup>	13.59	cm
Pion interaction length	160.8	g cm <sup>-2</sup>	20.42	cm
Radiation length	13.84	g cm <sup>-2</sup>	1.757	cm
<a href="#">Critical energy</a>	21.68	MeV (for e <sup>-</sup> )	21.00	MeV (for e <sup>+</sup> )
Molière radius	13.53	g cm <sup>-2</sup>	1.719	cm
Plasma energy $\hbar\omega_p$	55.17	eV		
Muon critical energy	347.	GeV		
Melting point	1811.	K	1538.	C
Boiling point @ 1 atm	3134.	K	2861.	C

## Atomic and nuclear properties of polycarbonate (PC)

Quantity	Value	Units	Value	Units
$\langle Z/A \rangle$	0.52697			
Specific gravity	1.200	g cm <sup>-3</sup>		
Mean excitation energy	73.1	eV		
Minimum ionization	1.886	MeV g <sup>-1</sup> cm <sup>2</sup>	2.263	MeV cm <sup>-1</sup>
Nuclear collision length	58.3	g cm <sup>-2</sup>	48.62	cm
Nuclear interaction length	83.6	g cm <sup>-2</sup>	69.63	cm
Pion collision length	85.7	g cm <sup>-2</sup>	71.46	cm
Pion interaction length	115.5	g cm <sup>-2</sup>	96.27	cm
Radiation length	41.50	g cm <sup>-2</sup>	34.59	cm
<a href="#">Critical energy</a>	85.85	MeV (for e <sup>-</sup> )	83.57	MeV (for e <sup>+</sup> )
Molière radius	10.25	g cm <sup>-2</sup>	8.543	cm
Plasma energy $\hbar\omega_p$	22.91	eV		
Muon critical energy	1104.	GeV		