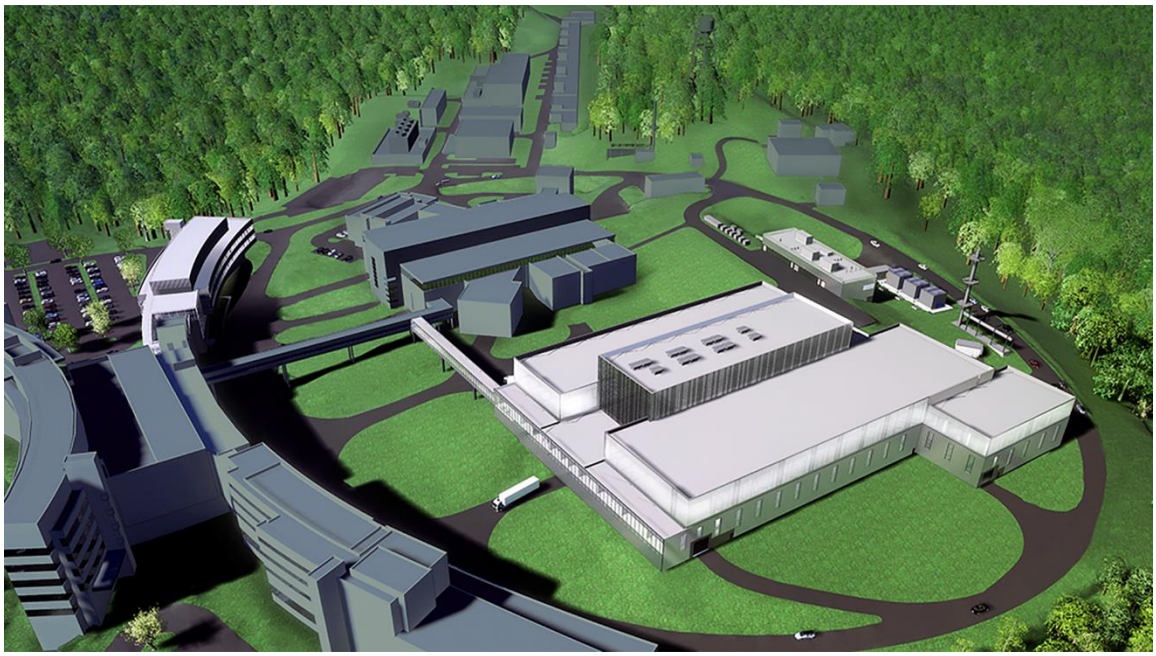
Second Target Station Project: IS - Target Assembly - Core Vessel



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IS - TARGET ASSEMBLY - CORE VESSEL

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CONTENTS

IS - TARGET ASSEMBLY - CORE VESSEL

1. BOUNDARY LOADS

The target will impose the following maximum (bounding) loads to the core vessel. Note: Directions are per the STS global Coordinate system. Forces and moments are applied at the centroid of the lid interface as defined in Drawing TBD.

Table 1. Target Assembly Loads (TBR)

		kN			kN-m				
Load		Fx	Fy	Fz	Mx	My	Mz	Configuration	Comment
Gravity	D	0	-132	0	0	0	0	Operation	
Imbalance	L_{ω}	0.25	0	0.25	0.5	0	0.5	Operation	4.5Hz (amplitude shown)
Vacuum Pressure	P_{vac}	Per surface area of penetration						Operation	Vacuum
Partial Pressure	P_{He}	Per Surface area of penetration							Helium
Start/Stop	L_{start}	0	0	0	0	0.5	0	Operation	
Segment Replacement	L_{maint}				1.2		1.2	Maintenance	Moment is applied exclusively in either direction but not concurrently (rotated shaft with half the segments missing)
Seismic	E	±60	±21.6	±60	265	0	265	Operation	Horizontal components applied in worst case combination; not concurrently

For nominal gaps between Target Assembly and Core Vessel shielding, as well as tolerances, refer to drawing *S03000000-M8U-8800-A10001*.

The lower interface between the Core Vessel and the Target Assembly consists of the limit ring. The purpose of the ring is to prevent the shaft from swinging into the MRA during a seismic event. The ring is part of the Target Assembly scope and mounts to the Core Vessel lower shield block. Refer to drawing S03020000-M8U-8800-A10000 for dimensions. The lower shield block should mount the limit ring such that it can withstand a 40 kN seismic load.

2. TARGET ACCESS

The shielding near the target segment access area shall provide an easily removable shield component in accordance with S03020000-M8U-8800-A10000. The removable shielding plug shall be removable within a duration of 8 hours. *Note: This includes disconnecting water, attaching to remote handling fixtures, and lifting into cask* (Figure 1).

- The Core Vessel shall maintain access around the top of the removable shielding plug for personnel and tooling for segment removal.

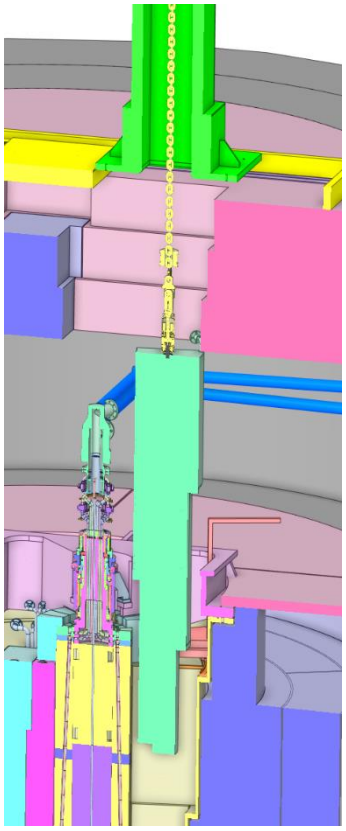

Figure 1: Removable Shield Plug Removal In-Process

Geometry shall be present to guide a target segment out of the core vessel and back in. *NOTE: The desire is to guide a target segment heel pin into the alignment hole at the bottom of the shaft each time, and ensure that as long as the top vertical alignment is correct, that the lower portion is in the correct position (Figure 2).*

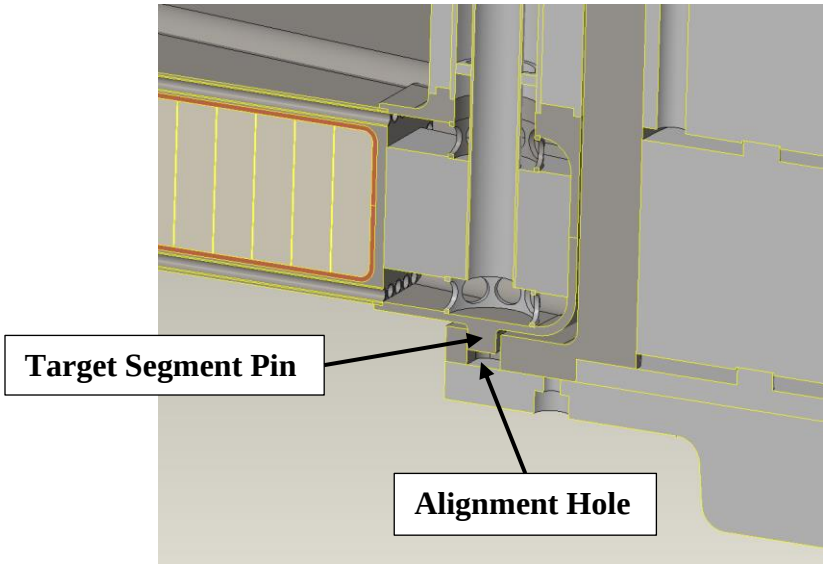

Figure 2: Target Segment Alignment Pin in Alignment Hole

2.1 GAMA GATE

The gama gate is within the Core Vessel WBS scope.

The gama gate consists of two steel-encase plates that reside over the area of the removable shielding plug. The purpose is to permit the removal of the removable shielding plug while still blocking the streaming gap while individuals are working near the top of the segment. The two plates allow the gate to slide to both sides of the opening to allow the removal and insertion of a target segment, as well as the removable shield plug.

- *NOTE: With the shield in place, the dose rate is within the allowable range of [TBD].*

3. TARGET ASSEMBLY MOUNTING INTERFACE

The core vessel shall provide a mounting interface with the geometry specified in *S03020000-M8U-8800-A10000* whose deflection and tolerances meet those laid out in *S03000000-M8U-8800-A10001*, for all load combinations specified in Table 1.

4. MOUNTING AND SUPPORT

The shielding below the target shaft shall be capable of supporting the shaft (16,000kg), during maintenance operations, without damage or permanent deformation. Additionally, the gap between the bottom of the shaft and the lower shield blocks should be such that target segments do not contact the MRA when the shaft is set on the lower shield block.

5. SEAL INTERFACE BETWEEN CORE VESSEL AND TARGET ASSEMBLY:

The interface between the Core Vessel and Target Assembly shall be a vacuum sealed interface that will allow 5mm of vertical compliance and 5mm of radial compliance. The seal shall be around the "SEAL ELEVATION" as shown in *S03020000-G8U-8800-A10000*.

Note: Preferably, the seal around the drive is split to permit segment removal without disconnecting the Process Water.

6. CORE VESSEL FEED THROUGHS

Two instances of feedthroughs in the Core Vessel lid structure are needed for the Target Assembly bearing assembly: bearing lubrication and seal purge gas.

- **Bearing Lubrication:** 2x Swagelok ¼" (TBR) fittings
- **Seal Purge Gas:** 1x Swagelok ¼" (TBR) fitting

As shown in Figure 3 below, the Core Vessel scope is to provide a female threaded pass-through for fittings provided by the Target Assembly scope.

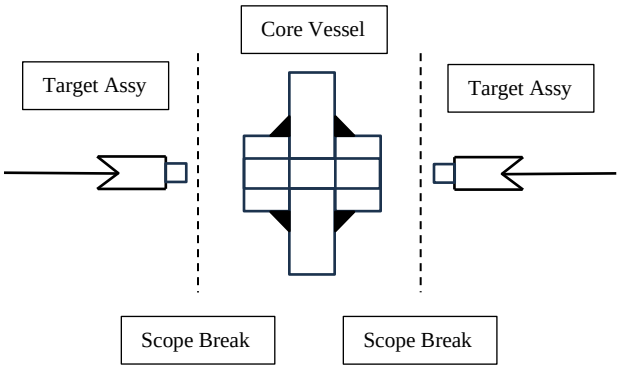

Figure 3: Target Assembly and Core Vessel Feed-Through Scope Division

7. CORE VESSEL ENVIRONMENT RELATIVE TO TARGET ASSEMBLY

7.1 VACUUM OPERATION

Temperature:	20-40°C
Pressure:	≤1x10^{-1} Torr
Relative Humidity:	TBD
Target Assembly Leak Rate:	<1x10-1 Torr-L/s

7.2 HELIUM OPERATION

Temperature:	20-40°C
Pressure:	<95,000 Pa
Gas Purity	TBR 99.0%
Relative Humidity:	TBD
Target Assembly Leak Rate:	<1x10-1 Torr-L/s

8. RADIATION SAFETY

Note: Radiation safety in the Target Assembly and Core Vessel are not captured in detail in this document. Target assembly and Core Vessel manage this interface by ensuring consistency between the MCNP & CAD model with respect to materials, locations, etc.