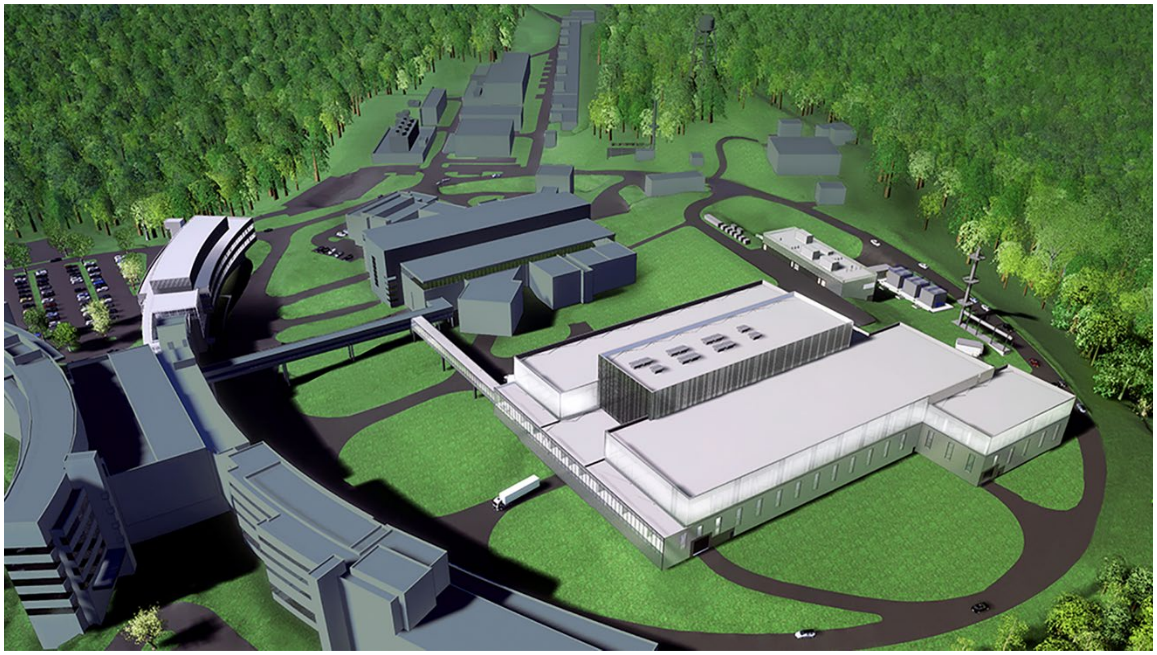
S03060000-MFP10000

Second Target Station Project: Vessel Systems – Acquisition Strategy



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April 2025

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Second Target Station Project

VESSEL SYSTEMS – ACQUISITION STRATEGY

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April 2025

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LIST OF FIGURES

LIST OF ABBREVIATIONS

COTS	Commercial Off The Shelf
CV	Core Vessel
STS	Second Target Station

1. SCOPE

This document describes the acquisition strategy for the Vessel Systems (VS) scope within the Target Systems (TS) group of the Second Target Station (STS) project.

2. REFERENCES

Ref	Document Title	Document Number
[1]	Vessel Systems Manufacturing and Fabrication Strategy	S03060000-MFP10001
[2]	Vessel Systems Cost Estimation	S03060000-MFP10002

3. ACQUISITION STRATEGY

The Vessel Systems scope will be acquired in a series of build to print manufacturing subcontracts with an estimated value of $15.7M, as seen in the Vessel Systems Cost Estimation document [2]. Due to the wide variety of component sizes and complexities, it is anticipated that several different vendors will be contracted to build various components of the Vessel Systems scope. Due to the long lead time of some Vessel Systems components and its early installation within the monolith, the first Vessel Systems procurements will start immediately once STS Subproject 2 is approved to begin procurements.

3.1 CORE VESSEL ASSEMBLY ACQUISITION STRATEGY

The Core Vessel (CV) Assembly will be procured as a single large manufacturing project. This procurement will include the main upper and lower CV weldments as well as the CV lid and access hatches. A number of temporary hatches and covers will also be included in the procurement that will allow for pressure and vacuum leak testing of the CV assembly at the vendor. These covers will also be used to keep the interior of the CV as clean as possible during transportation to the STS build site. All CV components will be constructed from 316/316L stainless steel. The CV beltline is the most complicated section of the vessel to build due to its internal water cooled passages that require deep hole drilling. Due to the large size and precision tolerances required by the CV assembly, only a small number of domestic manufacturers will be capable of fabricating the CV. An ASME certified shop will also be required. Figure 1 below shows the collection of components that will be procured as part of this acquisition package. The Vessel Systems manufacturing and fabrication strategy details all steps necessary to fabricate the CV Assembly [1].

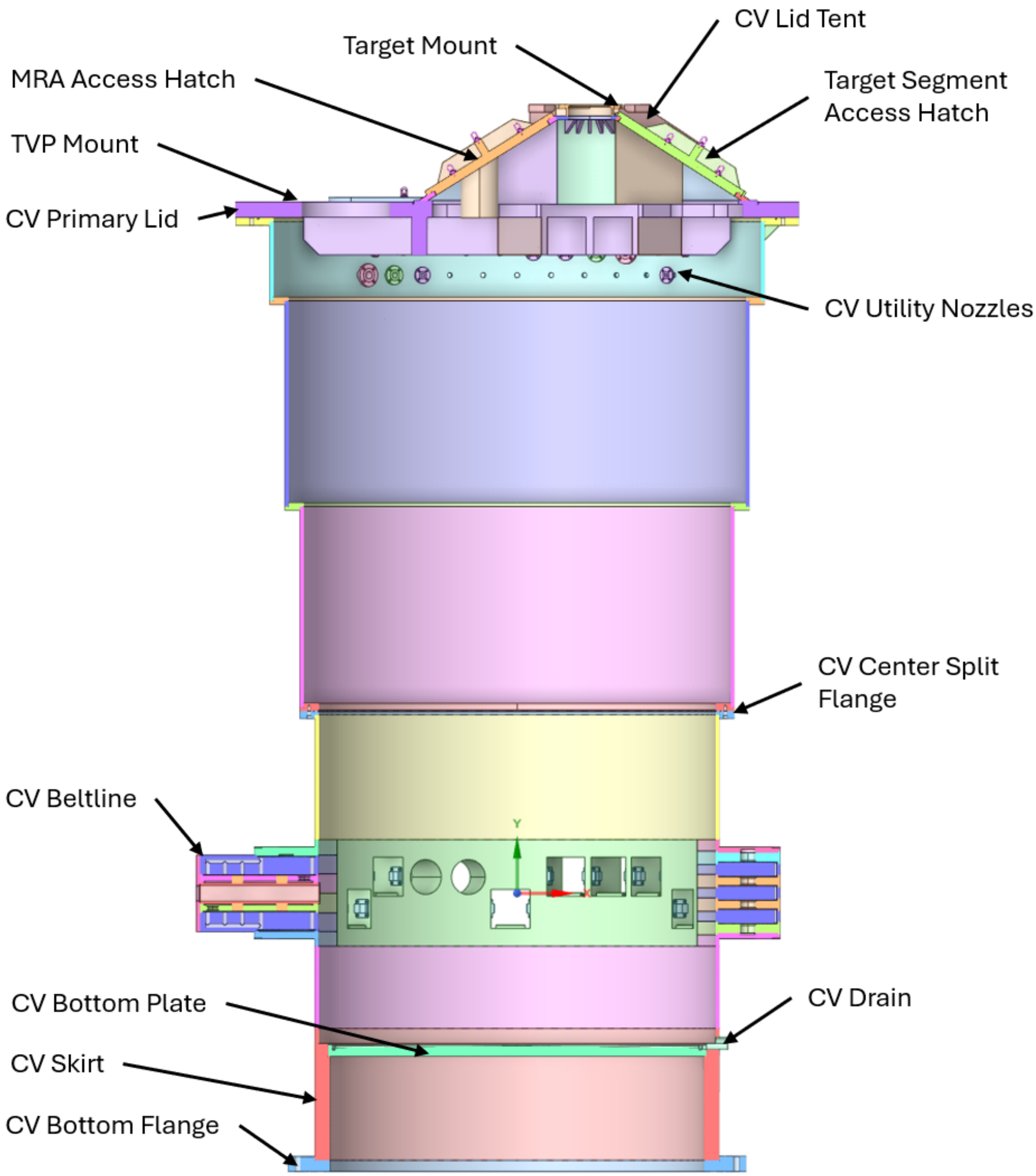

Figure 1: Cross section view showing the general layout of the Core Vessel

3.2 NOZZLE EXTENSION ACQUSITION STRATEGY

There are a total of 18 nozzle extension, including 15 standard nozzle extension, 2 dual channel nozzle extensions and 1 QIKR nozzle extensions. The Nozzle Extension assemblies mount to the outside facets of the CV beltline and extend through both the monolith carbon steel shielding and the monolith concrete as can be seen in Figure 2 below. It is anticipated that all 18 nozzle extensions as well as their associated mounting hardware will be procured from a single vendor. However, the nozzle extension contract may be split into multiple contracts with different vendors if lead times for building all nozzle extensions at a single vendor are unacceptably long.

Standard nozzle extensions are weldments constructed from 316/316L stainless steel plate and square tubing. Dual channel and QIKR nozzle weldments are constructed from 316/316L SS plates and are expected to be more challenging to fabricate. Each nozzle extension is roughly 5 meters in length and is required to remain very straight after welding is completed to function as designed. This poses significant manufacturing challenges, limiting the vendor pool capable of successfully fabricating the nozzle extensions. Each nozzle extension will require pressure and helium leak testing. An ASME certified fabrication shop will be required to produce these components. The Vessel Systems manufacturing and fabrication strategy details all steps necessary to fabricate the Nozzle Extensions [1].

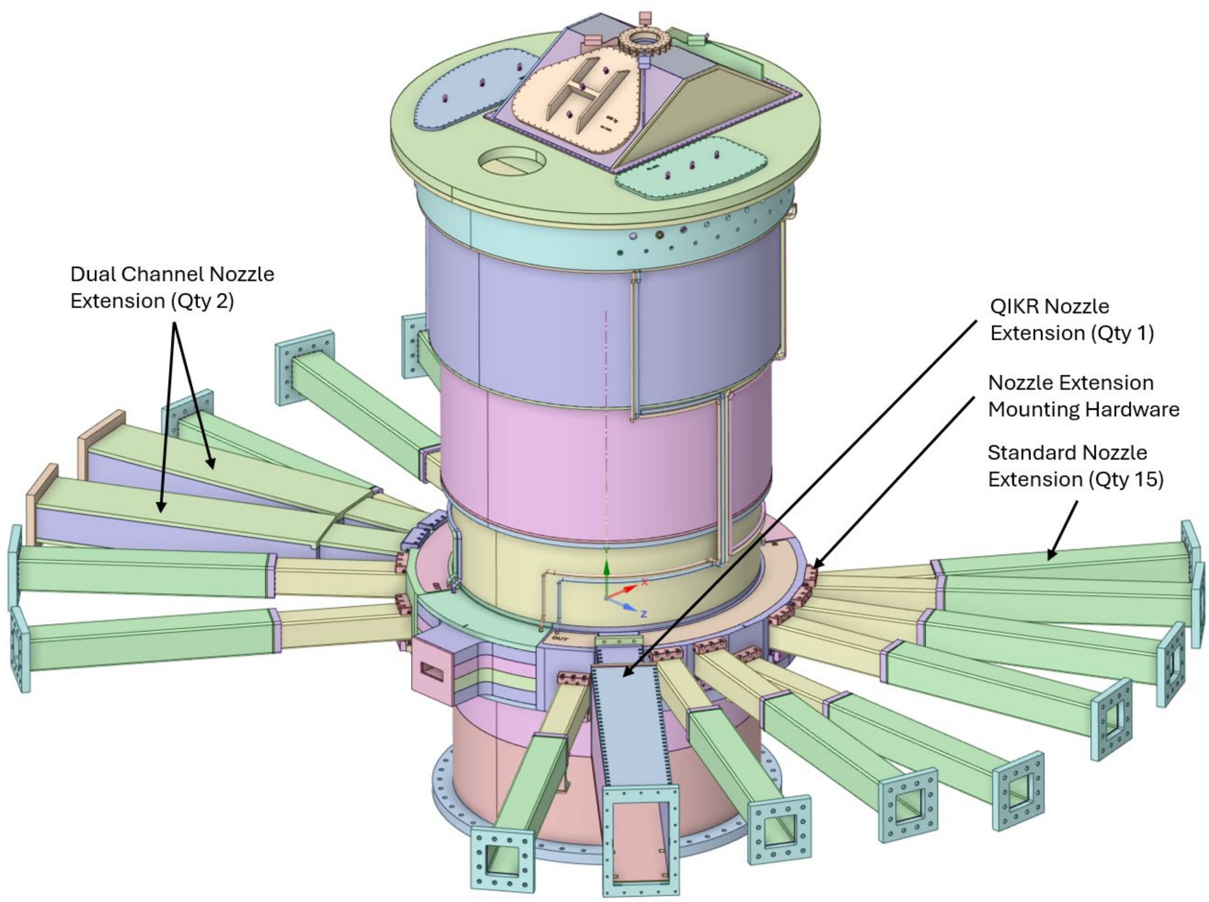

Figure 2: CAD image showing the CV with nozzle extensions attached

3.3 CORE VESSEL COOLED SHIELDING ACQUISITION STRATEGY

A total of 5 water cooled shield blocks reside within the CV. Each shield block will begin as a solid 316/316L forging. High aspect ratio cooling holes will be produced via gun drilling to create the water cooling passages in each shield block. Water plenums will be machined in the top and bottom of each shield block to route cooling water, as can be seen in Figure 3 below. The large size, weight and machining complexity is expected to limit the number of vendors capable of fabricating the cooled shield blocks. Ideally all five shield blocks will be produced by a single vendor, however the order may be split if lead times become an issue. The Vessel Systems manufacturing and fabrication strategy details all steps necessary to fabricate the CV Cooled Shielding [1].

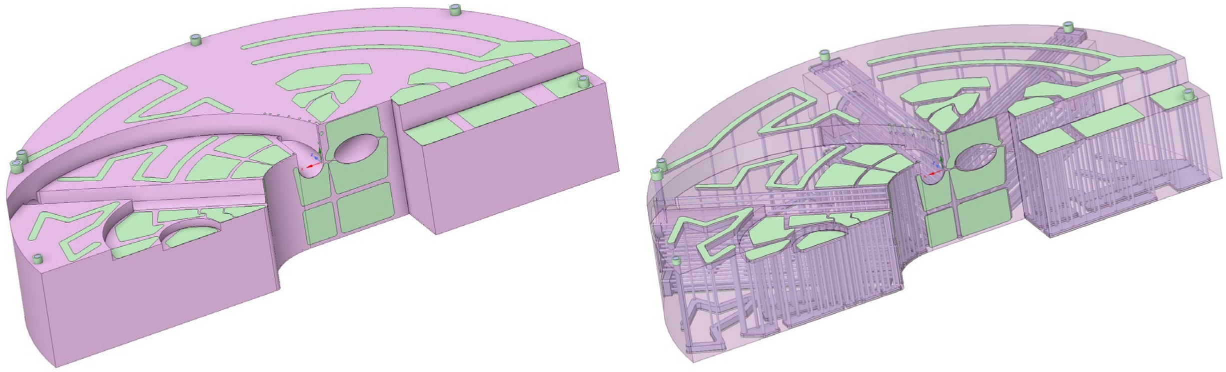

Figure 3: CAD model views of Shield Block #3 in solid form (left) and transparent form (right) showing the water circuit.

3.4 CORE VESSEL UNCOOLED SHIELDING ACQUSITION STRATEGY

A total of 6 uncooled shield blocks reside within the CV and will be manufactured by an outside vendor. Cobble or secondary plate steel similar to what was used on the FTS bulk shielding will be utilized to fabricate the uncooled shield blocks. This type of steel offers a very low cost per pound price while still providing excellent radiation shielding performance. The method of construction of each shield block will be determined in collaboration with the shielding vendor. Stacked and welded plates is the most likely construction method to be employed. Each shield block will require final machining to produce drilled thru holes, blind tapped holes and outside profile features. Efforts will be made to minimize the tolerance requirements of these shield blocks to keep costs down as much as possible. Each shield block will be nickel plated after final machining to provide corrosion resistance. The uncooled shield blocks are considerably less complicated than other scope within Vessel Systems, which should increase the potential vendor pool. However, only a handful of low cost domestic steel vendors exist to supply the starting material, and the large size and weight of the shield blocks will require vendors to have large mills capable of performing the machining work. The Vessel Systems manufacturing and fabrication strategy details all steps necessary to fabricate the CV uncooled shielding[1].

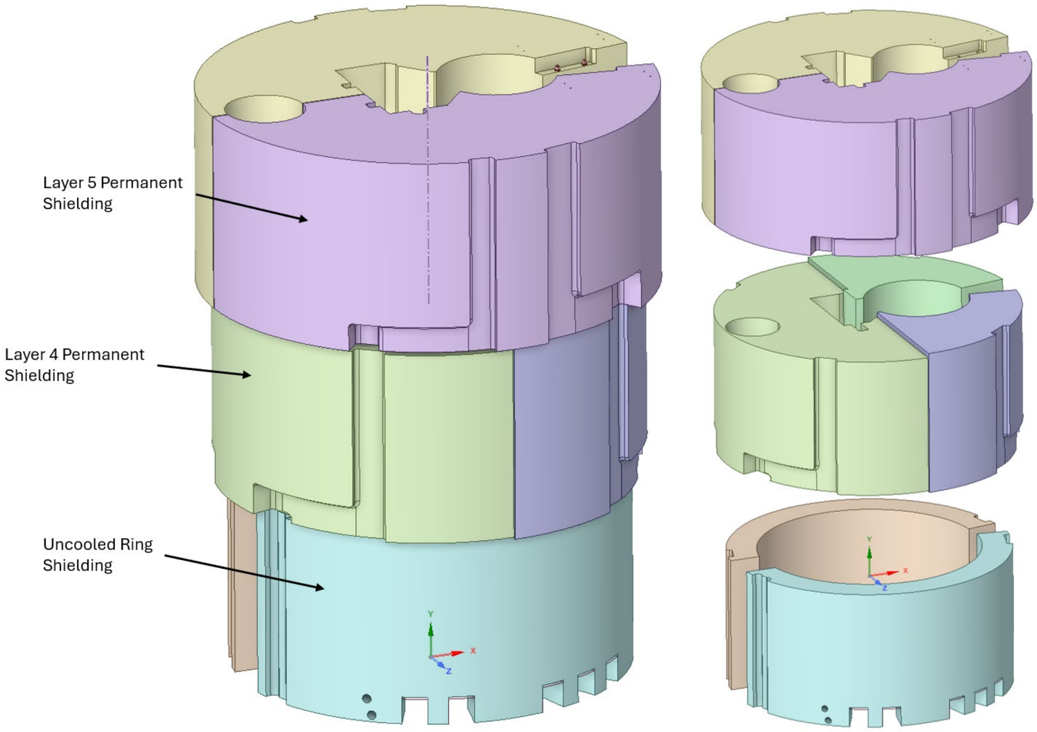

Figure 4: CAD renderings of the uncooled permanent shielding

3.5 GAMMA GATE ACQUSITION STRATEGY

The Gamma Gate assembly is a collection of custom fabricated and commercial off the shelf parts that will be procured from an outside vendor capable of individual component fabrication as well as integration and testing of the fully build assembly. The gamma gate assembly layout is shown in Figure 5 below. The vessel of the Gamma Gate will be constructed from 316/316L stainless steel due to its excellent corrosion resistance and proven performance in high radiation environments. The vessel will be filled with lead to serve as the primary blocker of gamma radiation streaming. A vendor capable of pouring molten lead will be required to fabricate the gamma gate block. The remaining components of the gamma gate assembly are a collection of relatively simple machine to print components and COTS components. The fully assembled gamma gate actuation system will be benchtop tested at the vendor prior to shipment to STS. The Vessel Systems manufacturing and fabrication strategy details all steps necessary to fabricate the Gamma Gate Assembly [1].

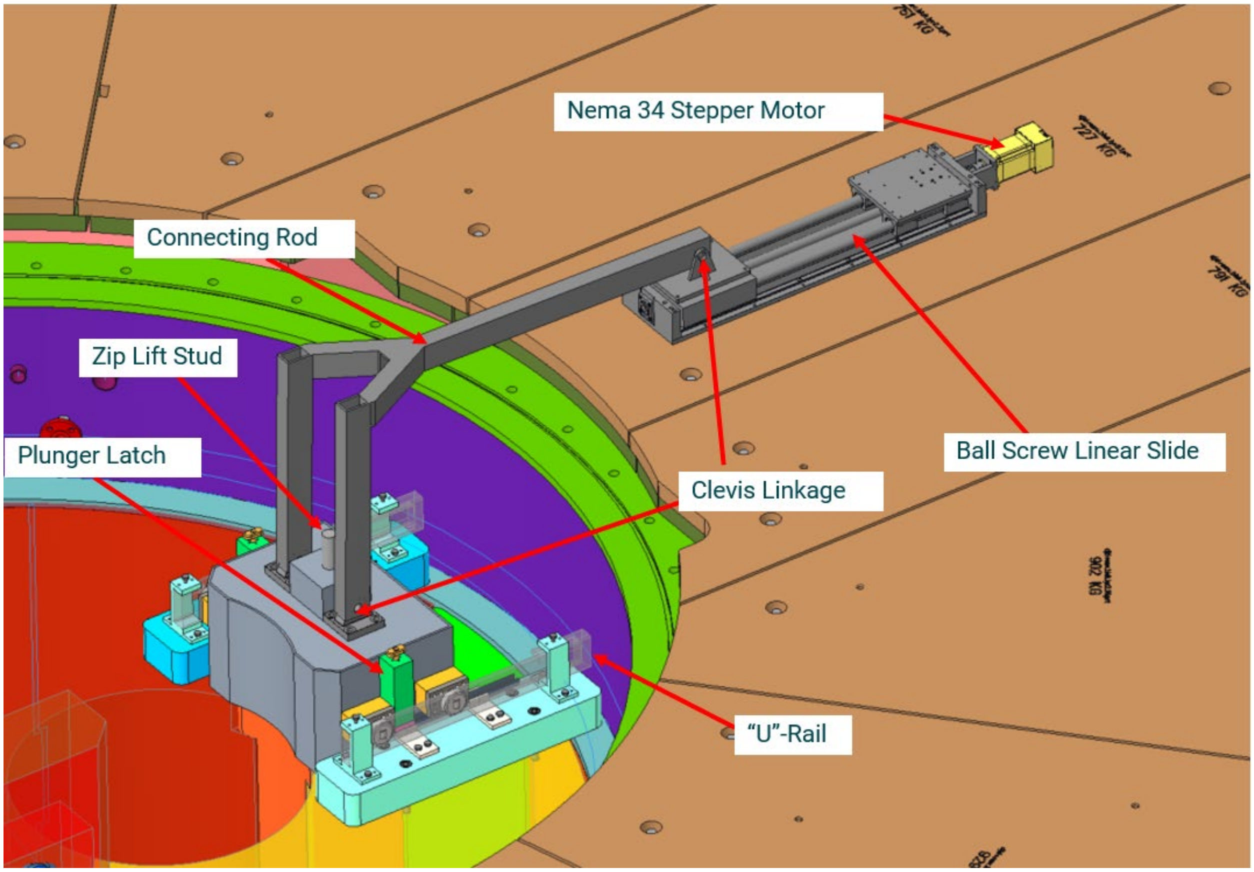

Figure 5: Gamma Gate Component Definition