

Second Target Station Project: Moderator Reflector Assembly Installation Plan



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MODERATOR REFLECTOR ASSEMBLY INSTALLATION PLAN

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1. PURPOSE

The purpose of this document is to describe the installation plan of the Second Target Station (STS) Moderator Reflector Assembly (MRA). The required status of the Target Systems installation prior to MRA installation is described as well as the steps required for the installation of the MRA. At this stage, this document is not intended to comprehensively describe every detail, but to instead identify installation issues which would require changes to the MRA design. The final details of the installation sequence will be developed within the Installation of Monolith Systems WBS.

2. INSTALLATION PLAN

2.1 MODERATOR REFLECTOR ASSEMBLY ALIGNMENT PHILOSOPHY

The relative alignment between the Moderator Reflector Assembly and the Instrument Systems neutron guide entrances is critical to the neutron performance of the STS facility. Alignment between the Target Assembly and the MRA is also critical to prevent interactions between the structures. The STS global coordinate system will be set based on the installed location of the core vessel beltline, specifically the locations used for supporting the Instrument Systems Monolith Inserts. This basis facilitates alignment of the Monolith Inserts to the global coordinate system. The Moderator Reflector Assembly and Target Assembly will also be aligned to the global coordinate system. Note that the Vessel Systems structures which support and align the MRA and Target Assembly will be installed without the precision required to meet these critical tolerances, likely requiring adjustments/shimming of the MRA and Target Assembly alignment features to meet required installation tolerances relative to the global coordinate system.

2.2 TARGET SYSTEMS INSTALLATION

At this time, an STS target systems installation outline has been created, but development of a detailed installation plan will occur later within the Installation of Monolith Systems WBS. For the purpose of this document, we will simply describe the state of the target station installation that must be achieved prior to MRA installation.

The Vessel Systems Core Vessel, Core Vessel Nozzles, Core Vessel permanent shielding, and monolith shielding should all be fully installed. At this point, the majority of the mass of the target station monolith is in place, so elastic settling of the monolith should be nearly complete. The MRA installation must occur after the installation of the Target Assembly Shaft and either before or after the Target Viewing Periscope, as this component is relatively light compared to the overall Target System. The Core Vessel Lid Tent will be installed with the Target Shaft [1], allowing verification of installation clearances through the MRA hatch opening for future MRA installations, although the MRA hatch lid must not yet be installed, as seen in Figure 2.1.

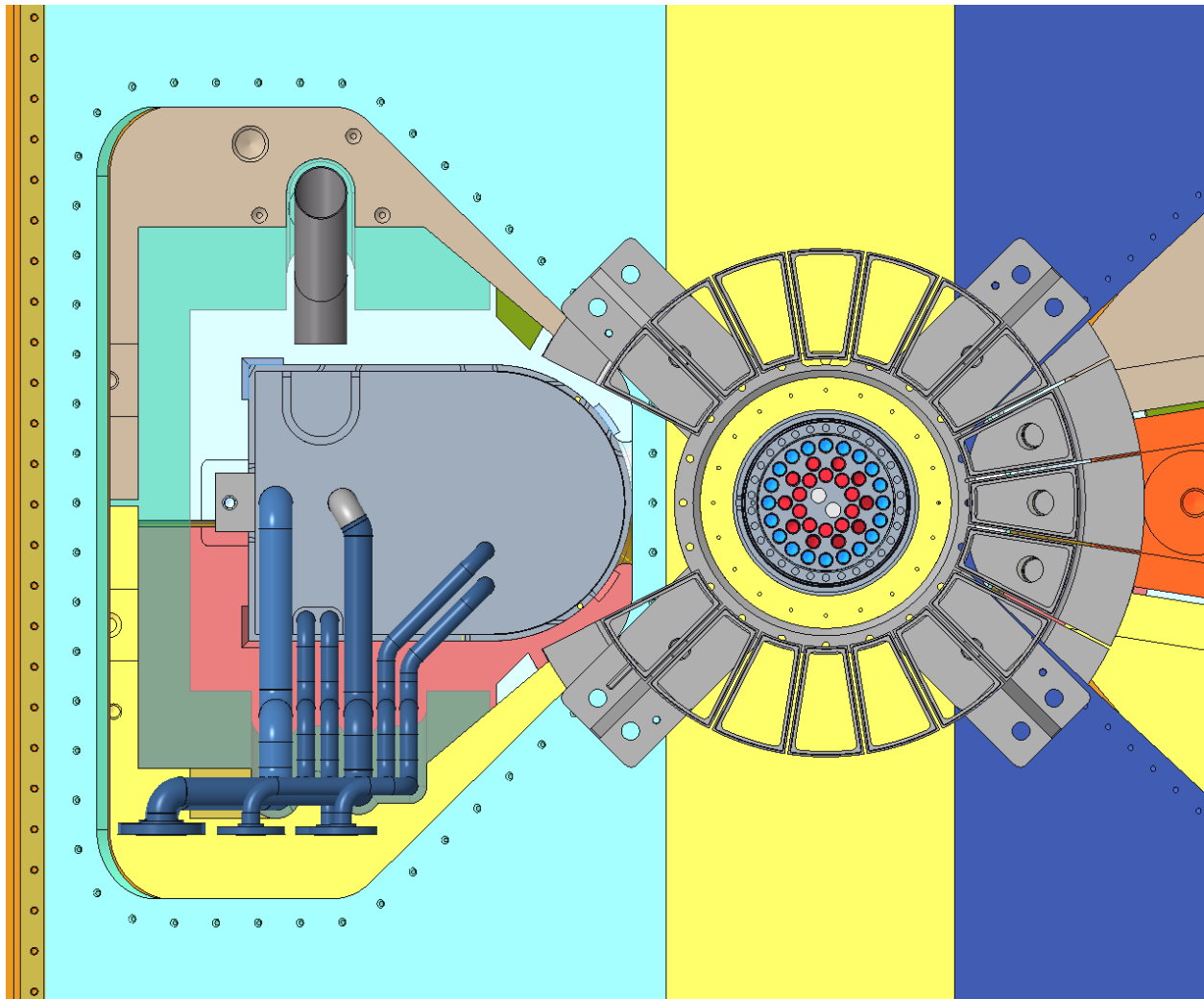


Figure 2.1 MRA Clearances to Core Vessel Lid Tent Structure during MRA Installation

At this point, the permanent Core Vessel MRA Alignment Pins and MRA Seismic Pin must be surveyed to define their “as installed” locations within the STS global coordinate system. This step is critical, as these mounting features are life of the facility components and their surroundings will become activated during early operations making later surveys extremely difficult or impossible. At the same time, the MRA cavity, along with the MRA utility chases formed by the Core Vessel Shielding should be surveyed in order to record as installed conditions.

2.3 MODERATOR REFLECTOR ASSEMBLY INSTALLATION

Due to the small moderator sizes, alignment of the MRA relative to the STS global coordinate system is critical to maximize neutron beam performance. Therefore, the alignment blocks and seismic block on the MRA must be adjusted relative to the “as installed” location of the Core Vessel MRA Alignment Pins and Seismic Pin to position the moderators as close as possible to their nominal locations and ensure the Seismic Block doesn’t impact normal operating alignment. Because this adjustment must happen on a nearly complete MRA, the alignment blocks and seismic block themselves will be custom machined, as described in the final assembly in the MRA manufacturing plan [2], in order to reduce schedule impact of the adjustment. Once the adjusted alignment blocks are installed, the MRA will be surveyed to record its final “as built” condition. Note that subsequent MRAs will have this same adjustment applied during manufacturing instead of as an adjustment just prior to installation.

The installation of the MRA itself is quite straightforward. If any Target Assembly Segments have been installed, a void of at least 3 segments must be rotated into the MRA installation location. The MRA will be lifted for installation by the threaded lifting stud, as the stud on the top of the MRA is designed for the MRA to hang level from this point for a pure vertical installation. The MRA should be lowered slowly into the MRA cavity of the Core Vessel Shielding, monitoring clearances between the MRA and piping to the Core Vessel Shielding and Lid. The piping has been designed so that the base of the MRA will engage into the MRA cavity in the shielding before the piping reaches the tight confines of the pipe chases, as seen in Figure 2.2. The MRA and Core Vessel shielding also include ramped features to help guide the MRA into the MRA cavity, as noted in [3]. Once within the MRA cavity, the MRA alignment blocks are designed to self align to the Core Vessel Alignment Pins. Once the MRA is landed on the alignment blocks, another survey should be conducted to confirm desired as installed moderator locations, check gaps to the Core Vessel Shielding for the MRA backbone shield block and utility lines, and to check clearance from the MRA Seismic Pin to the Seismic Block. Once these locations and gaps have been confirmed, the removable Core Vessel MRA Shield block which resides above the MRA should be installed.

Finally, the MRA utilities must be connected. The water lines should be mated up with the Core Vessel Jumpers to complete the connection to Process Systems. These flanges should be leak checked to the requirements of Process Systems connections within the Core Vessel. Next the connection to the Cryogenic Moderator System Hydrogen Transfer Line must be completed. The two hydrogen lines must be welded, cold shocked, pressure tested, and leak checked. Then, the vacuum line must be welded closed and subsequently cold shocked, pressure tested, and leak checked. At this point, any required transfer line supports within the Core Vessel Can be installed, completing the installation of the MRA.

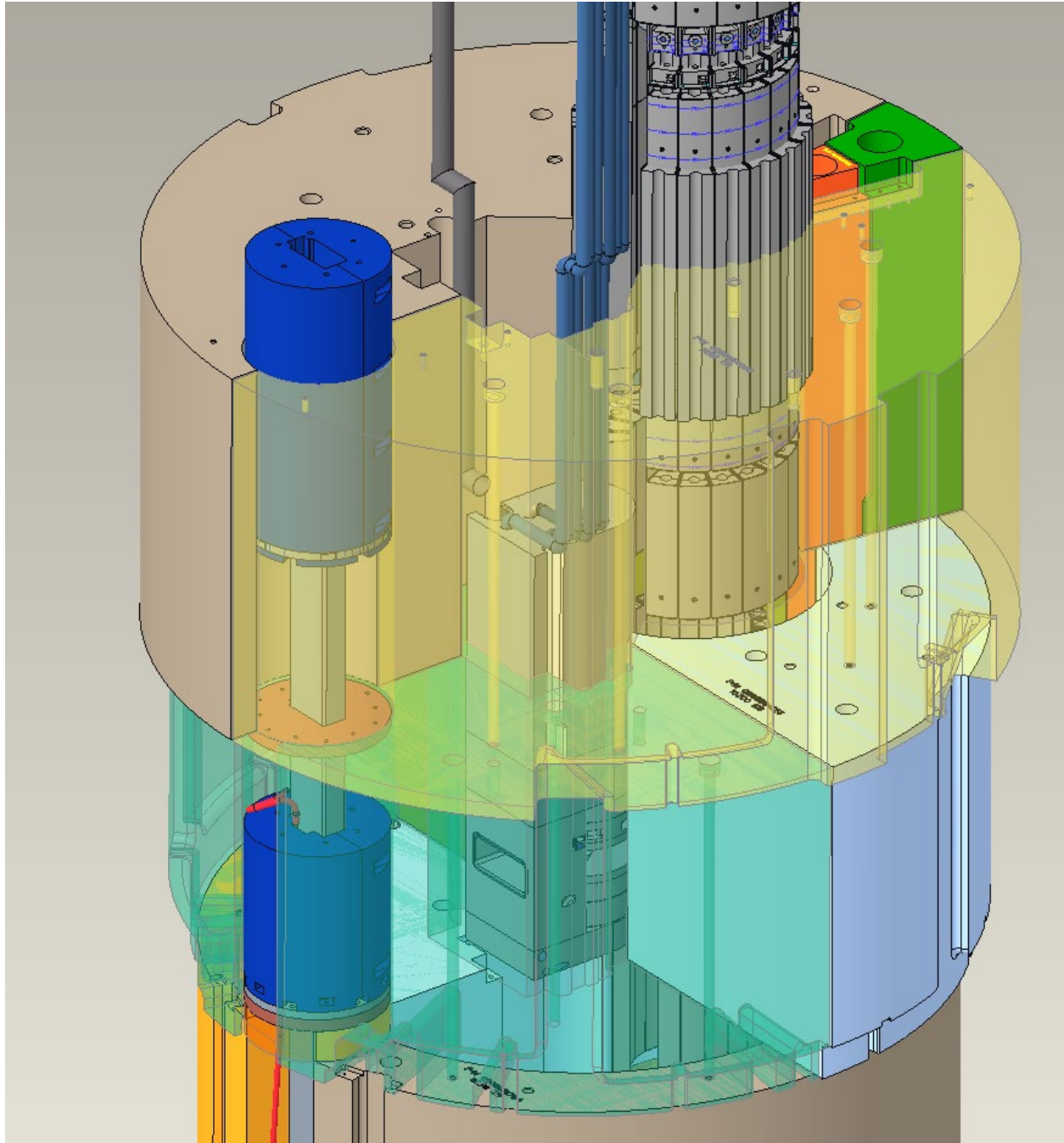


Figure 2.2 MRA just entering MRA cavity in Core Vessel Shielding with Piping Still Yet to Enter Chases

3. REFERENCES

- [1] "Target Assembly Installation Plan," S03020000-TDO10000.
 - [2] "Fabrication Strategy for the Moderator Reflector Assembly," S03040000-MFP10000.
 - [3] "Interface Sheet for Vessel Systems and Moderator Reflector Assembly," S03000000-IST10009.
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