

Vessel Systems System Verification Plan

Project: Second Target Station
 Part/Assembly: Vessel Systems
 WBS: S.03.06
 Lead Engineer: Chris Anton

Requirement	Item ID	Description	PDR	FDR	FAT	Installation Test	Integrated System Test
Accept Proton Beam	6121	The Vessel and internal Shielding shall allow greater than 99.9% of the proton beam profile delivered by the Accelerator Systems to reach the Target Assembly unobstructed. "NOTE 1: Beam profile and other characteristics relevant to hardware will depend on beam area and beam position as defined in S01020500-ISXXXX."					
Radiation Shielding	6130	The Core Vessel and internal shielding shall be capable of limiting radiation exposure in areas accessible to personnel during beam-on and beam-off operations in accordance with the STS Radiation Safety Policy and Plan.					
Core Vessel Pressure Relief	7047	The Core Vessel shall maintain an internal pressure of less than +7.35 PSIG Note: A pressure relief system with burst disc shall be designed to ensure that +7.35 PSIG is not exceeded Note: Pressure limit determined by Proton Beam Window per Interface Sheet S01020500-IST10217 "PHAR References:" " AIC3~-3~, ""AIC3~-5~, ""AIC3~-9~, ""AIC3~-10~, ""AIC7~-1~, ""BG7~-8~, ""BG7~-9a~, ""BG7~-9b~, ""CMS1~-1~, ""CMS2~-1~, ""CMS2~-2a~, ""CMS2~-2b~, ""CMS4~-1~, ""CMS4~-2~, ""CMS4~-4~, ""CW3~-1d~, ""CW3~-3a~, ""CW3~-3b~, ""CW3~-10~, ""TS3~-2~, ""TS3~-3~, ""TS3~-4~, ""TS3~-5~, ""TS3~-6~, ""TS3~-7~, ""TS3~-8~, ""TS3~-10~, ""TS3~-12~, ""VS1~-1~, ""VS2~-1a~, ""VS3~-2~, "	7196	7196			
Core Vessel Leak Collection	7048	The Core Vessel shall collect water leaks inside the vessel and route to a drain port near the bottom of the vessel that connects to Process Systems drain line of the same diameter. Note: Sizing of the drain line is the responsibility of Process Systems. "PHAR References:" "AIC3~-3~, AIC3~-4~, AIC3~-5~, AIC3~-7~, AIC3~-9~, AIC3~-10~, AIC7~-1~, BG7~-8~, BG7~-9a~, BG7~-9b~, BG7~-12~, CMS1~-1~, CMS2~-1~, CMS2~-2a~, CMS2~-2b~, CMS3~-4~, CMS3~-5~, CMS4~-1~, CMS4~-2~, CMS4~-4~, CMS7~-1~, CMS7~-3~, CMS7~-5~, CMS7~-6~, CMS7~-7~, CW3~-1a~, CW3~-1b~, CW3~-1d~, %(color:rgb(209, 72, 65);)CW3~-2a (Credited)%!~, CW3~-2b~, CW3~-3a~, CW3~-3b~, CW3~-7a~, CW3~-7b~, CW3~-10~, GW2~-3~, HB2~-2~, HPV3~-9~, LCS1~-1~, LCS2~-1~, LCS3~-1~, LCS3~-2~, LCS3~-3~, LCS4~-1~, RH3~-5~, %(color:rgb(209, 72, 65);)TS3~-2 (Credited)%!~, %(color:rgb(209, 72, 65);)TS3~-3 (Credited)%!~, TS3~-4~, TS3~-5~, %(color:rgb(209, 72, 65);)TS3~-7 (Credited)%!~, TS3~-8~, TS3~-10~, %(color:rgb(209, 72, 65);)TS3~-12 (Credited)%!~, VS2~-2~, VS3~-1"					
Vacuum Port	7049	The Core Vessel shall have a vacuum port that connects to a vacuum system "Note: Vacuum nozzle size may be determined in collaboration with other systems to accommodate maintenance ventilation and connection to a Hydrogen-safe release stack." "PHAR References:" "AIC3~-3~, AIC3~-4~, AIC3~-5~, AIC3~-9~, AIC3~-10~, AS3~-2~, BG3~-2~, BG7~-8~, BG7~-9a~, BG7~-9b~, BG7~-11~, BG7~-12~, CMS1~-1~, CMS2~-1~, CMS2~-2a~, %(color:rgb(209, 72, 65);)CMS2~-2b (Credited)%!~, CMS2~-2C~, CMS3~-4~, CMS3~-5~, CMS3~-6~, MCS3~-7~, CMS4~-1~, CMS4~-2~, CMS4~-4~, CMS7~-1~, CMS7~-3~, CMS7~-5~, CMS7~-6~, CMS7~-7~, CW3~-1a~, CW3~-1b~, CW3~-1d~, CW3~-2a~, CW3~-2b~, CW3~-3a~, CW3~-3b~, CW3~-7a~, CW3~-7b~, CW3~-10~, GW3~-12~, HB2~-2~, ISB3~-1~, RH3~-11~, TS3~-2~, TS3~-3~, TS3~-4~, TS3~-5~, TS3~-6~, TS3~-7~, TS3~-8~, TS3~-9~, TS3~-10~, TS3~-12~, %(color:rgb(209, 72, 65);)VS1~-1 (Credited)%!~, VS1~-2~, %(color:rgb(209, 72, 65);)VS2~-1a (Credited)%!~, VS2~-1b~, VS2~-2~, VS3~-1~, VS3~-2"	7414	7414			
			7416	7416			

Core Vessel Pressure Range	7052	Core Vessel shall be designed to operate in a range of full vacuum to +15 PSIG per the STS Design and Fabrication of Pressure and Vacuum Systems (S01020000-PC0007). "PHAR References:" "AIC3~-3~, AIC3~-4~, AIC3~-5~, AIC3~-9~, AIC3~-10~, AS3~-2~, BG3~-2~, BG7~-8~, BG7~-9a~, BG7~-9b~, BG7~-11~, BG7~-12~, CMS1~-1~, CMS2~-1~, CMS2~-2a~, %% (color:rgb(209, 72, 65));CMS2~-2b (Credited)%!~, CMS2~-2C~, CMS3~-4~, CMS3~-6~, MCS3~-7~, CMS4~-1~, CMS4~-2~, CMS4~-4~, CMS7~-6~, CW3~-1a~, CW3~-1b~, CW3~-1d~, CW3~-2a~, CW3~-2b~, CW3~-3a~, CW3~-3b~, CW3~-7a~, CW3~-7b~, CW3~-10~, HB2~-2~, TS3~-2~, TS3~-3~, TS3~-4~, TS3~-5~, TS3~-6~, TS3~-7~, TS3~-8~, TS3~-9~, TS3~-12~, %% (color:rgb(209, 72, 65));VS1~-1 (Credited)%!~, %% (color:rgb(209, 72, 65));VS2~-1a (Credited)%!~, VS2~-2~, VS3~-1~, VS3~-2"	7417	7417
Non-flammable Materials	7053	Core Vessel and Core Vessel shielding components shall be made of non-flammable materials where practical Note: Small volumes (< 0.01%) of elastomers will be used for vacuum and water seals within Vessel Systems scope. "PHAR References:" "BG1~-1~, %% (color:rgb(209, 72, 65));BG6~-9 (Credited)%!~, BG7~-1a~, BG7~-11~, CMS2~-2C~, CMS7~-3~, CW3~-2a~, CW3~-2b~, VS1~-1~, VS1~-2~, VS2~-1a~, VS2~-1b"	7418	7418
Target Temperature Limit during Facility Fire	7054	Core Vessel shielding shall keep target temperature below 800C under reasonable fire conditions "PHAR References:" "BG1~-1~, %% (color:rgb(209, 72, 65));BG6~-9 (Credited)%!~, BG7~-1a~, BG7~-11~, CMS7~-3~, CMS7~-5~, %% (color:rgb(209, 72, 65));CMS7~-7 (Credited)%!~, CW3~-2a~, CW3~-2b"	7419	
Impact Damage Protection	7055	The Monolith steel shielding shall protect the Target feet and Moderator Reflector Assembly from physical impact damage when the Target System is installed and in operational configuration. Note: Monolith steel shielding does not protect Moderator Reflector Assembly or target feet that have been removed from their home positions within the monolith. Note: Monolith steel shielding provides less protection when removable shielding is not in place during maintenance activities. "PHAR References:" BG6~-6~, BG6~-7~, %% (color:rgb(209, 72, 65));BG6~-9 (Credited)%!~, BG6~-10~, BG7~-4~, CMS2~-5~, HB2~-2~, HB2~-3~, RH3~-1~, RH3~-2~, RH3~-5~,	7420	
Protect Cryogenic Transfer Lines	7056	Vessel Systems shall not permit the Core Vessel or shielding within the Core Vessel to cause the Moderator Reflector Assembly or cryogenic transfer lines to release Hydrogen under SDC2 seismic conditions "PHAR References:" "%% (color:rgb(209, 72, 65));BG7~-1a (Credited)%!~, BG7~-2~, %% (color:rgb(209, 72, 65));BG7~-11 (Credited)%!~, BG7~-12~, CMS4~-2~, CMS7~-1~, %% (color:rgb(209, 72, 65));CMS7~-5 (Credited)%!~, %% (color:rgb(209, 72, 65));CMS7~-7 (Credited)%! "	7510	7510
Core Vessel Anchoring	7057	The Core Vessel shall be anchored in such a way to limit motion of the Core Vessel base flange relative to the floor to < 0.1 mm under SDC Level 2 seismic loads. "PHAR References:" "BG7~-2~, BG7~-12~, CMS7~-1~, CMS7~-3~, CMS7~-5"	7512	7512

Core Vessel Environment	7058	Core Vessel shall maintain an inert environment (<1 torr vacuum or < 700 torr helium) under normal operating conditions "Note: The Core Vessel environment will extend to the Nozzle Extensions accommodating the Instrument Systems Monolith Inserts. Vacuum pumping and instrumentation is in the scope of Target Vacuum Systems, but Vessel Systems and interfacing components that make up the vacuum boundary must be capable of maintaining the required pressure, i.e. to hold leak rates low enough to maintain the required pressure." "PHAR References:" "AIC3~-3~, AIC3~-4~, AIC3~-5~, AIC3~-9~, AIC3~-10~, AS3~-2~, BG3~-2~, BG7~-8~, BG7~-9A~, BG7~-9B~, BG7~-11~, BG7~-12~, CMS1~-1~, CMS2~-1~, CMS2~-2A~, %(color:rgb(209, 72, 65);)CMS2~-2b (Credited)%!~, CMS2~-2C~, CMS3~-4~, CMS3~-6~, CMS3~-7~, CMS4~-1~, CMS4~-2~, CMS4~-4~, CMS7~-1~, CMS7~-3~, CMS7~-5~, CMS7~-6~, CMS7~-7~, CW3~-1A~, CW3~-1B~, CW3~-1D~, CW3~-2A~, CW3~-2B~, CW3~-3A~, CW3~-3B~, CW3~-7A~, CW3~-7B~, CW3~-10~, GW3~-12~, HB2~-2~, ISB3~1~, RH3~-11~, TS3~-2~, TS3~-3~, TS3~-4~, TS3~-5~, TS3~-6~, TS3~-7~, TS3~-8~, TS3~-9~, TS3~-10~, TS3~-12~, %(color:rgb(209, 72, 65);)VS1~-1 (Credited)%!~, VS1~-2~, %(color:rgb(209, 72, 65);)VS2~-1A (Credited)%!~, VS2~-1B~, VS2~-2~, VS3~-1~, VS3~-2 "		
Core Vessel Negative Pressure With Hatches Removed	7059	Core Vessel shall have an exhaust port that provides negative pressure when Core Vessel lid hatches are removed. "PHAR References:" "%(color:rgb(209, 72, 65);)CMS2~-2C (Credited)%!~, RH3~-1~, RH3~-2~, RH3~-4~, RH3~-5~, RH3~-6~, RH3~-7~, RH3~-8~, RH3~-9~, RH3~-10~, RH3~-11~, RH3~-21~, RH3~-22~, RH3~-24~, RH3~-25~, RH3~-26~, RH3~-27~, VS3~-3"	7197	
Radiation Shielding Performance	7060	Vessel Systems design, along with the other Target Systems components in the Monolith and Target Drive Room, shall not prevent necessary operations in the high bay due to radiation dose. "PHAR References:" "%(color:rgb(209, 72, 65);)RH4~-7 (Credited)%!~, %(color:rgb(209, 72, 65);)RH4~-8 (Credited)%!~, RH4~-9~, %(color:rgb(209, 72, 65);)RH4~-10 (Credited)%!~, %(color:rgb(209, 72, 65);)VS4~-1 (Credited)%!"	7513	7513
Non-LOF Water-Cooled Component Connections	7063	All water-cooled components that are not considered permanent shall have flanged connections that are broken for component removal. "PHAR References:" "RH3~-17~, RH3~-18~, RH3~-20"		
Target Protection during LOCA	7064	Core Vessel shielding shall assist in maintaining target temperatures below 800 C in a loss of cooling event "Note: The shielding acts as a thermal sink that helps maintain target temperatures of < 800 C during a loss of cooling event" "Note: LOCA to be performed by the Target Assembly group with input from Vessel Systems on shielding configuration. " "PHAR References:" RG7~-8~, BG7~-9A~, %(color:rgb(0, 0, 0);)BG7~-9B~,%l BG7~-12~, CMS7~-1~, CMS7~-3~, %(color:rgb(209, 72, 65);)CMS7~-5 (Credited)%!~, CMS7~-6~, %(color:rgb(209, 72, 65);)CMS7~-7 (Credited)%!~, TS3~-2~, TS3~-3~, TS3~-5~, TS3~-6~, TS3~-7	7515	7515
Temperature Monitoring	7065	All vessel systems water cooled components should have thermocouples that monitor component temperature "PHAR References:" CMS2~-2C~, CW3~-1D~, VS1~-1~, VS1~-2~, VS1~-1A~, VS1~-1B~, VS3~-1	7516	7516
Mechanical Load Support	7118	Vessel Systems shall support the gravitational, imbalance, seismic and segment replacement loads imparted by the target assembly per Interface Sheet S01020500-IST10209 within the deflection limits specified in drawing S03000000-M8U-8800-A10001 at the physical locations specified in drawing S03020000-M8U-8800-A10000	7517	7517
Limiting Ring Integration	7119	Vessel Systems shall provide an interface including a mating face and tapped hole pattern to secure Target Assembly's limiting ring to the Layer 1 Core Vessel shielding. The interfacing dimensions are shown in drawing S03020000-M8U-8800-A10000. Note: Currently missing from Interface Sheet S01020500-IST10209, will be added during next revision	7606	7606
Limiting Ring Mechanical Support	7120	Vessel Systems shall not allow horizontal motion of the portion of the target shaft that contacts the limiting ring in excess of xxxx under a 40 kN seismic side load imparted on the limiting ring by the target shaft. Note: Currently missing from Interface Sheet S01020500-IST10209, will be added during next revision.	7607	7607
			7608	7608

Target Segment Access	7121	Vessel Systems shall allow access to a single target segment within 8 hours per Interface Sheet S01020500-IST10209.	7609	7609	7610
		"NOTE 1: The clock starts when the Core Vessel is vented and stops when the Target Segment is exposed for removal."			
		"NOTE 2: Driven by Target Segment requirement dictating time allotted for Segment replacement."			
Target Segment Personnel Access	7123	Vessel Systems components shall allow space for personnel and tooling access to the target segment mounting hardware for removal, repair and reinstallation of target segments per Interface Sheet S01020500-IST10209	7611	7611	7612
Target Segment Installation Guidance	7124	The Core Vessel Shielding shall provide mechanical boundaries that ensure proper engagement of the target segment to the target shaft when a target segment is installed per Interface Sheet S01020500-IST10209.	7613	7613	
Shielding for Target Segment Removal and Installation	7125	Vessel Systems shall allow for hands-on maintenance at the top of the target segment with the target removable shield block removed.			
		Note: A gamma gate assembly is moved into place after removable shield block removal to provide radiation protection during hands-on target maintenance	7616	7616	
Target Shaft Bottom Support	7127	Vessel Systems shall allow for the full 16,000 kg mass of the target assembly to rest on the bottom Core Vessel shield block without contacting the Moderator Reflector Assembly per Interface Sheet S01020500-IST10209.	7735	7735	
Target Assembly Seal	7128	Vessel Systems shall provide a seal interface for the Target Assembly per Interface Sheet S01020500-IST10209 and drawing S03020000_G8U-8800-A10000.	7736	7736	
Hydrogen Transfer Line Nozzle	7136	Vessel Systems shall provide a nozzle in the side wall of the CV for the hydrogen transfer line per interface sheet S03000000-IST10010.	7737	7737	
MRA Cooling Water Connections	7137	Vessel Systems shall provide water supply and return lines that connect the Moderator Reflector Assembly water inlet and outlet flanges to the appropriate nozzles in the Core Vessel side wall per Interface Sheet S03000000-IST10009	7738	7738	
MRA Cooling Water Line Tie-Downs	7138	Vessel Systems will provide mounting features to accommodate Moderator Reflector Assembly water line tie-downs per Interface Sheet S03000000-IST10009	7739	7739	
MRA Access	7139	Vessel Systems shall allow access to the Moderator Reflector Assembly within 8 hours per Interface Sheet S03000000-IST10009.			
		Note: The clock starts when the removal of the Moderator Reflector Assembly access hatch in the Core Vessel lid begins and stops when the Moderator Reflector Assembly is exposed for removal.	7741	7741	7740
Proton Beam Window Shielding Sealing Interface	7141	Vessel Systems shall provide a sealing surface for the proton beam window shielding that is capable of achieving a <10 ⁻⁴ Torr l/s leak rate	7748	7748	7749
Target Viewing Periscope Alignment Holes	7144	Vessel Systems shall provide mounting holes in the Core Vessel Shielding for mounting of the Target Viewing Periscope canoe sphere alignment system in the locations described in Interface Sheet S01020500-IST10217	7750	7750	
Target Viewing Periscope Support	7145	Vessel Systems shall support the loads imparted by the Target Viewing Periscope assembly while maintaining the alignment tolerances specified in Interface Sheet S01020500-IST10217	7751	7751	
Target Viewing Periscope Vacuum Flange	7146	Vessel Systems will provide a flange seal mounting interface in the Core Vessel Lid as specified in Interface Sheet S01020500-IST10217	7752	7752	
Target Viewing Periscope Keep-Out Zones	7147	Vessel Systems shall provide openings in the Core Vessel Shielding per Interface Sheet S01020500-IST10217			
		"NOTE: Decomposes from TVP requirement [5445 ISSUE:5445]" to ensure that the Target Viewing Periscope can view the Target Segment without obstruction."	7753	7753	
Target Viewing Periscope Doghouse Mounting	7149	Vessel Systems shall provide features in the Core Vessel lid for mounting of the Target Viewing Periscope doghouse per Interface Sheet S01020500-IST10217.	7754	7754	
Target Viewing Periscope 3rd Mirror Mounting	7151	Vessel Systems shall provide features in the Core Vessel lid for mounting of the Target Viewing Periscope 3rd mirror assembly per Interface Sheet S01020500-IST10217	7755	7755	
Utility Nozzle Connections	7155	Vessel Systems shall provide utility nozzles in the sidewall of the Core Vessel that allow cooling water and helium gas provided by Process Systems to enter the Core Vessel. Vessel Systems shall provide the interfacing locations of all Core Vessel beltline utility waterlines. The sizes and locations of all utility nozzles and water connections are specified in Interface Sheet S03000000-IST10004.	7758	7758	
Cooling Water Requirements	7156	Vessel Systems will provide the required cooling water specifications for all water cooled components within Vessel Systems scope to Process Systems per Interface Sheet S03000000-IST10004.	7759	7759	
Target Water Line Support	7159	Vessel Systems will support target water line support assemblies on top of the Core Vessel lid per Interface Sheet S03000000-IST10004.	7760	7760	
Removable Component Lifting Interfaces	7162	Vessel Systems shall provide lifting interfaces for all removable Vessel Systems components per Interface Sheet S03000000-IST10006.	7763	7763	
Gamma Gate Control	7163	Vessel Systems shall provide power and control requirements for the gamma gate linear actuator to Remote Handling per Interface Sheet S03000000-IST10006.	7764	7764	
Monolith Insert Clearance	7165	Vessel Systems shall provide gaps between the monolith inserts and the Core Vessel technical components (nozzle extensions, Core Vessel beltline and Core Vessel internal shielding) per Interface Sheet S01020500-IST10025	7820	7820	
Monolith Insert Interfacing Component Tolerances	7166	Vessel Systems shall maintain dimensional tolerances of monolith insert interfacing components (nozzle extensions, Core Vessel beltline and Core Vessel internal shielding) per Interface Sheet S01020500-IST10025	7821	7821	7855
Monolith Insert Sealing	7167	Vessel Systems shall provide a flanged sealing interface at the rear of each nozzle extension that corresponds to the Monolith Insert geometry per Interface Sheet S01020500-IST10025	7822	7822	
Monolith Insert Support	7168	Vessel Systems shall mechanically support the monolith inserts while maintaining the tolerances described in Interface Sheet S01020500-IST10025	7823	7823	

Monolith Insert Installation Support	7169	Vessel Systems shall support the Monolith Inserts during the installation process without plastic deformation per Interface Sheet S01020500-IST10025	7824	7824	
Neutron Flight Path to Monolith Inserts	7170	Vessel Systems shall provide clearance within the Core Vessel Shielding to ensure an unobstructed path between the monolith insert windows and the moderator per Interface Sheet S01020500-IST10025	7825	7825	
Monolith Insert Seal Leak Rate	7171	Vessel Systems shall accommodate the monolith insert rear seal leak rates specified in Interface Sheet S01020500-IST10025		7826	
Monolith Insert Over Pressurization Protection	7172	Vessel Systems shall ensure that the monolith inserts are not subjected to a positive pressure greater than XXXX per Interface Sheet S01020500-IST10025			
		Note: This is not currently captured in the interface sheet, but I suggested to Pete that he add it.	7827	7827	
Vessel Systems Temperature Monitoring	7178	Vessel Systems should include devices for monitoring the temperature of all cooled shield blocks as well as the cooled Core Vessel beltline per Interface Sheet S01020500-IST10128	7828	7828	7829
Thermocouple Wiring	7179	Vessel Systems shall provide pin-out IDs for all temperature monitoring device connections to the hermetic feedthroughs per Interface Sheet S01020500-IST10128	7830	7830	
Hermetic Electrical Feedthroughs	7180	Vessel Systems shall provide and install hermetic feedthroughs allowing thermocouple signal transfer out of the Core Vessel per Interface Sheet S01020500-IST10128	7831	7831	
Stainless Steel Temperature Limit	7181	Vessel Systems stainless steel structures should have a maximum operating temperature of 200 C	7231	7231	
Carbon Steel Temperature Limit	7182	Vessel Systems nickel plated carbon steel structures should have a maximum operating temperature of 200 C		7231	
Lifetime	7183	All vessel systems components shall be life of the facility components having a lifetime greater than or equal to 40 years with the following exceptions: 1. Gamma Gate assembly 2. Thermocouples and associated wiring 3. Vacuum and water replaceable seals			
		Note: Exceptions will be governed by the maintenance and lifetime criteria for perishable components (Requirement 1.9)			
				7353	
Water Leak Rates	7184	All Vessel Systems water boundaries shall be designed to mitigate water leaks			
		Note: Leak testing with water is not practical, leak rates to be verified via helium leak testing with an anticipated acceptance criteria of of 1x10 ⁻⁶ mbar-l/s or less		7352	7352 7352
Pressure Bearing Component Design Criteria	7185	All Vessel Systems water cooled shielding, CV beltline and CV shall be designed per the STS Design and Fabrication of Pressure and Vacuum Systems (S01020000-PC0007).	7354		
Piping Design Criteria	7186	All Vessel Systems water piping shall be designed and fabricated to ASME B31.3	7355		7733
Pressure Drop	7187	Vessel Systems water cooled components should have pressure drops less than 103.4 kPa (15 PSI) at 30.3 L/min (8 gpm) per cooling line.	7761	7761	
Water Boundary Pressure	7188	Vessel Systems water cooled components shall have a MAWP of 500 kPa.			
		Note: Pressure relief devices will be specified to ensure that the MAWP is not exceeded at the shield block locations.	7762	7762	
MRA Alignment Features	7404	Vessel Systems shall provide mounting features in the Core Vessel shielding for mounting of the Moderator Reflector Assembly canoe sphere alignment system as described in Interface Sheet S03000000-IST10009	7742	7742	
MRA Support	7405	Vessel Systems shall support the loads imparted by the Moderator Reflector Assembly while maintaining the alignment tolerances specified in Interface Sheet S03000000-IST10009	7743	7743	
Position and gaps	7407	Vessel Systems shall ensure that all hardware adjacent to the Target and Moderator Reflector Assembly conforms to the positions and gaps outlined in Interface Sheet S01020500-IST10205	7744	7744	7745
Positional deviations	7408	Vessel Systems shall ensure that all hardware adjacent to the Target and Moderator Reflector Assembly does not deviate beyond the Vessel Systems tolerance allotment per Interface Sheet S01020500-IST10205			
		Note: Anticipated deviations include manufacturing, alignment, seismic, thermal and pressure induced.	7842		
Vacuum Pumping Performance	7615	The Core Vessel shall be capable of maintaining an operating pressure of <1 torr	7765	7765	7766
Operability with Water Leaks	7617	Vacuum Systems shall be able to operate with a small internal water leak per Interface Sheet S03000000-IST10008	7812	7812	
Maintenance and Lifetime Criteria - Perishable Components	7674	All Components shall meet one (or more) of the following criteria: Non-replaceable components shall be designed and constructed with a negligible chance of failure beyond the life of the facility. Components that are designed for the life of the facility but have a chance of failure shall be designed and constructed to permit replacement. Components with expected minimum lifetime of 5000 hours shall be replaceable in 1400 hours or less. Components with expected minimum lifetime of 2500 hours shall be replaceable in 250 hours or less. Components with expected minimum lifetime of 500 hours shall be replaceable in 72 hours or less. Components with expected minimum lifetime of 192 hours shall be replaceable in 16 hours or less.			
		"Note: The criteria above give a high confidence level in meeting the availability requirement"		7725	
Target Viewing Periscope Position and Gaps	7685	Vessel Systems shall ensure that all hardware adjacent to the Target Viewing Periscope conforms to the positions and gaps outlined in Interface Sheet S01020500-IST10217			
		Note: Currently missing from Interface Sheet S01020500-IST10217, will be added during next revision.	7756	7756	7757

Positional Deviations	7686	Vessel Systems shall ensure that all hardware adjacent to the Target Viewing Periscope does not deviate beyond the Vessel Systems tolerance allotment per Interface Sheet S01020500-IST10217		
		Note: Anticipated deviations include manufacturing, alignment, seismic, thermal and pressure induced.		
		Note: Currently missing from Interface Sheet S01020500-IST10217, will be added during next revision.	7841	7841
Hydrogen Transfer Line Clearance	8048	Vessel Systems shall provide > 25mm of clearance between Vessel Systems hardware and the transfer line per interface sheet S03000000-IST10010.	8062	8062
Hydrogen Transfer Line Support	8049	Vessel Systems shall provide features in the top of the core vessel shielding stack to accommodate hydrogen transfer line supports designed and provided by CMS per Interface Sheet S03000000-IST10010.	8063	8063
Hydrogen Transfer Line Welding Access	8050	Vessel Systems shall provide appropriate welding access to the hydrogen transfer lines during MRA installation via removable hatches in the CV lid and removable shielding above the transfer lines per Interface Sheet S0300000-IST10010.	8064	8064
				8133

Test Cases and Test Steps					
Item ID	Name	Test Steps,Action	Test Ste Verifies	Type	Phase
8133	Demonstration - Hydrogen Transfer Line Welding Access	Demonstrate using the mockup test stand welding operations on the hydrogen transfer lines during MRA installation.	[S.03.06-8050] - Hydrogen Transfer Line Welding Access	Demonstration	Integrated System Test
		Is appropriate welding access provided?	Yes		
8064	Demonstration - Hydrogen Transfer Line Welding Access	Demonstrate using the CAD models of the core vessel that vessel systems provides appropriate welding access the hydrogen transfer lines during MRA installation.	[S.03.06-8050] - Hydrogen Transfer Line Welding Access	Demonstration	PDR\FDR
		Is appropriate welding access provided?	Yes		
8063	Inspection - Hydrogen Transfer Line Support	Review drawings of vessel systems	[S.03.06-8049] - Hydrogen Transfer Line Support	Inspection	PDR\FDR
		Does vessel systems provide features on the top of the core vessel shielding stack to accommodate hydrogen transfer line supports designed and provided by CMS per Interface Sheet S03000000~-IST10010?	Yes		
8062	Inspection - Hydrogen Transfer Line Clearance	Review drawings of vessel systems hardware and the transfer line	[S.03.06-8048] - Hydrogen Transfer Line Clearance	Inspection	PDR\FDR
		Does vessel systems provide ≥ 25mm of clearance between Vessel Systems hardware and the transfer line per interface sheet S03000000~-IST10010?	Yes		
7855	Inspection - Monolith Insert Interfacing Component Tolerances	Inspect the dimensional tolerances of monolith insert interfacing components (nozzle extensions~, CV beltline and CV internal shielding) per Interface Sheet S01020500~-IST10025.	[S.03.06-7166] - Monolith Insert Interfacing Component Tolerances	Inspection	Installation Test
		Does vessel systems maintain dimensional tolerances of monolith insert interfacing components (nozzle extensions~, CV beltline and CV internal shielding) per Interface Sheet S01020500~-IST10025?	Yes		
7842	Analysis - Positional Deviations MRA	%%(white-space:normal;)Perform a tolerance stack up on vessel systems hardware adjacent to the MRA. Combine effects from manufacturing alignment~, seismic~, thermal~, and pressure.%I	[S.03.06-7408] - Positional deviations	Analysis	FDR
		Does the vessel systems hardware adjacent to the MRA not deviate beyond the Vessel Systems tolerance allotment per Interface Sheet S01020500~-IST10205?	Yes		
7841	Analysis - Positional Deviations TVP	Perform a tolerance stack up on vessel systems hardware adjacent to the TVP. Combine effects from manufacturing alignment~, seismic~, thermal~, and pressure.	[S.03.06-7686] - Positional Deviations	Analysis	PDR\FDR
		Does the vessel systems hardware adjacent to the TVP not deviate beyond the Vessel Systems tolerance allotment per Interface Sheet S01020500~-IST10217?	Yes		
7831	Inspection - Hermetic Electrical Feedthroughs	Review drawings of hermetic feedthroughs on the core vessel.	[S.03.06-7180] - Hermetic Electrical Feedthroughs	Inspection	PDR\FDR
		Does vessel systems provide and install hermetic feedthroughs allowing thermocouple signal transfer out of the core vessel?	Yes		
7830	Demonstration - Thermocouple Wiring	Review drawings of hermetic feedthroughs on the core vessel	[S.03.06-7179] - Thermocouple Wiring	Demonstration	PDR\FDR
		Are pin~-out ID~s provided for all temperature monitoring device connections to the hermetic feedthroughs?	Yes		
7829	Test - Vessel Systems Temperature Monitoring	Test and calibrate all devices monitoring the temperature of all cooled shield blocks and cooled CV beltline.	[S.03.06-7178] - Vessel Systems Temperature Monitoring	Demonstration	Installation Test
		Does vessel systems include devices for monitoring the temperature of all cooled shield blocks and cooled CV beltline per Interface Sheet S01020500~-IST10128?	Yes		
7828	Inspection - Vessel Systems Temperature Monitoring	Review drawings of all cooled shield blocks and cooled CV beltline.	[S.03.06-7178] - Vessel Systems Temperature Monitoring	Inspection	PDR\FDR
		Do all cooled shield blocks and cooled CV beltline include devices for monitoring the temperature per Interface Sheet S01020500~-IST10128?	Yes		

7827	Demonstration - Monolith Insert Over Pressurization Protection	Review drawings of vessel systems	[S.03.06-7172] - Monolith Insert Over Pressurization Protection	Inspection	PDR\,FDR
		Have design considerations been made to ensure that the monolith inserts are not subjected to a positive pressure greater than XXXXX per Interface Sheet S01020500~-IST10025?	Yes		
7826	Analysis - Monolith Insert Seal Leak Rate	Perform a leak rate calculation on the core vessel combined with the leak rate from the monolith insert rear seal from Interface Sheet S01020500~-IST10025.	[S.03.06-7171] - Monolith Insert Seal Leak Rate	Analysis	FDR
		Can vessel systems accommodate the leak rate from the monolith insert rear seal?	Yes		
7825	Inspection - Neutron Flight Path to Monolith Inserts	Review drawings of the core vessel shielding~, monolith insert windows~, and the moderator	[S.03.06-7170] - Neutron Flight Path to Monolith Inserts	Inspection	PDR\,FDR
		Does vessel systems provide clearance within the core vessel shielding to ensure an unobstructed path between the monolith insert windows and the moderator per Interface Sheet S01020500~-IST10025?	Yes		
7824	Analysis - Monolith Insert Installation Support	Perform a structural analysis of the core vessel simulating loads present during monolith insert installation.	[S.03.06-7169] - Monolith Insert Installation Support	Analysis	PDR\,FDR
		Does the core vessel support the monolith inserts during the installation process without plastic deformation?	Yes		
7823	Analysis - Monolith Insert Support	Perform a structural analysis of the core vessel interactions with the monolith inserts.	[S.03.06-7168] - Monolith Insert Support	Analysis	PDR\,FDR
		Does the core vessel mechanical support the monolith inserts while maintaining the tolerances described in Interface Sheet S01020500~-IST10025?	Yes		
7822	Inspection - Monolith Insert Sealing	Review drawings of the interface between vessel systems and instrument systems.	[S.03.06-7167] - Monolith Insert Sealing	Inspection	PDR\,FDR
		Does vessel systems provide a flanged sealing interface at the rear of each nozzle extension that corresponds to the Monolith Insert geometry per Interface Sheet S01020500~-IST10025?	Yes		
7821	Inspection - Monolith Insert Interfacing Component Tolerances	Review drawings of vessel systems components that interface with the monolith inserts.	[S.03.06-7166] - Monolith Insert Interfacing Component Tolerances	Inspection	PDR\,FDR
		Does vessel systems maintain the dimensional tolerances of monolith insert interfacing components (nozzle extensions~, CV beltline and CV internal shielding) per Interface Sheet S01020500~-IST10025?	Yes		
7820	Inspection - Monolith Insert Clearance	Review drawings of the interface between core vessel technical components and the monolith inserts.	[S.03.06-7165] - Monolith Insert Clearance	Inspection	PDR\,FDR
		Does vessel systems provide gaps between the monolith inserts and the core vessel technical components (nozzle extensions~, CV beltline and CV internal shielding) per Interface Sheet S01020500~-IST10025?	Yes		
7812	Analysis - Operability with Water Leaks	Perform a vacuum calculation for the core vessel with the assumption there is a small internal water leak.	[S.03.06-7617] - Operability with Water Leaks	Analysis	PDR\,FDR
		Can the vacuum system maintain an operating pressure of <1 torr with the presence of a small internal water leak?	Yes		
7766	Test - Vacuum Pumping Performance	Perform a pump down test during integrated system testing.	[S.03.06-7615] - Vacuum Pumping Performance	Test	Integrated System Test
		Does the core vessel reach an operating pressure of <1 torr in less than 1 hour?	Yes		
7765	Analysis - Vacuum Pumping Performance	Perform a vacuum calculation to determine how long it takes the core vessel to reach an operating pressure of <1 torr	[S.03.06-7615] - Vacuum Pumping Performance	Analysis	PDR\,FDR
		Does the core vessel reach an operating pressure of <1 torr in less than 1 hour?	Yes		
7764	Inspection - Gamma Gate Control	Review Interface Sheet S03060000~-IST10001.	[S.03.06-7163] - Gamma Gate Control	Inspection	PDR\,FDR
		Does vessel systems provide power and control requirements for the gamma gate linear actuator to Remote Handling?	Yes		
7763	Inspection - Removable Component Lifting Interfaces	Review drawings of all removable vessel systems components.	[S.03.06-7162] - Removable Component Lifting Interfaces	Inspection	PDR\,FDR
		Does vessel systems provide lifting interfaces for all removable vessel systems components per Interface Sheet S03060000~-IST10001?	Yes		
7762	Analysis - Water Boundary Pressure	Perform a structural analysis of all vessel systems water cooled components.	[S.03.06-7188] - Water Boundary Pressure	Analysis	PDR\,FDR
		Can all vessel systems water cooled components operate at a maximum allowable working pressure of 500 kPa?	Yes		
7761	Analysis - Pressure Drop	Perform CFD analysis of all vessel systems water cooled components.	[S.03.06-7187] - Pressure Drop	Analysis	PDR\,FDR

		Do all vessel systems water cooled components have pressure drops less than 103.4 kPa (15 PSI) at 30.3 L/min (8 gpm)?	Yes			
7760	Inspection - Target Water Line Support	Review drawings of the interface between vessel systems and target water lines supports	[S.03.06-7159] - Target Water Line Support	Inspection	PDR\FDR	
		Does vessel systems support the target water line support assemblies on top of the core vessel lid per Interface Sheet S03060000~IST10000~R00?	Yes			
7759	Inspection - Cooling Water Requirements	Review design documentation for the vessel systems cooling water specifications for all water~cooled components within Vessel Systems scope.	[S.03.06-7156] - Cooling Water Requirements	Inspection	PDR\FDR	
		Does vessel systems provide the required cooling water specifications for all water~cooled components within Vessel Systems scope to Process Systems per Interface Sheet S03060000~IST10000~R00?	Yes			
7758	Inspection - Utility Nozzle Connections	Review drawings of the interface between vessel systems and process systems.	[S.03.06-7155] - Utility Nozzle Connections	Inspection	PDR\FDR	
		Does vessel systems provide utility nozzles on the sidewall of the core vessel that allow cooling water and helium gas provided by Process Systems to enter the core vessel?	Yes			
7757	Inspection - Target Viewing Periscope Nominal Position and Gaps	Inspect all vessel systems hardware adjacent to the TVP during installation.	[S.03.06-7685] - Target Viewing Periscope Position and Gaps	Inspection	Installation Test	
		Does all vessel systems hardware adjacent to the TVP conform to the nominal positions and gaps outlined in Interface Sheet S01020500~IST10217?	Yes			
7756	Inspection - Target Viewing Periscope Nominal Position and Gaps	Review drawings of the interface between vessel systems and the TVP.	[S.03.06-7685] - Target Viewing Periscope Position and Gaps	Inspection	PDR\FDR	
		Does vessel systems hardware adjacent to the TVP conform to the nominal positions and gaps outlined in Interface Sheet S01020500~IST10217?	Yes			
7755	Inspection - Target Viewing Periscope 3rd Mirror Mounting	Review drawings of interface between vessel systems and the TVP.	[S.03.06-7151] - Target Viewing Periscope 3rd Mirror Mounting	Inspection	PDR\FDR	
		Does the vessel systems provide features in the core vessel lid for mounting the TVP 3rd mirror assembly per Interface Sheet S01020500~IST10217?	Yes			
7754	Inspection - Target Viewing Periscope Doghouse Mounting	Review drawings of the interface between vessel systems and the TVP.	[S.03.06-7149] - Target Viewing Periscope Doghouse Mounting	Inspection	PDR\FDR	
		Does the core vessel lid provide features for mounting of the TVP doghouse per Interface Sheet S01020500~IST10217?	Yes			
7753	Inspection - Target Viewing Periscope Keep-Out Zones	Review drawings of the interface between vessel systems and the TVP.	[S.03.06-7147] - Target Viewing Periscope Keep-Out Zones	Inspection	PDR\FDR	
		Does vessel systems provide openings in the core vessel shielding per Interface Sheet S01020500~IST10217?	Yes			
7752	Inspection - Target Viewing Periscope Vacuum Flange	Review drawings of the interface between vessel systems and the TVP	[S.03.06-7146] - Target Viewing Periscope Vacuum Flange	Inspection	PDR\FDR	
		Does vessel systems provide a flange seal mounting interface in the core vessel lid as specified in Interface Sheet S01020500~IST10217?	Yes			
7751	Analysis - Target Viewing Periscope Support	Perform a structural analysis of the core vessel with the loads imparted by the TVP assembly.	[S.03.06-7145] - Target Viewing Periscope Support	Analysis	PDR\FDR	
		Does the core vessel support the loads imparted by the TVP assembly while maintaining the alignment tolerances specified in Interface Sheet S01020500~IST10217?	Yes			
7750	Inspection - Target Viewing Periscope Alignment Holes	Review drawings of the interface between vessel systems and mounting for the TVP canoe sphere alignment system.	[S.03.06-7144] - Target Viewing Periscope Alignment Holes	Inspection	PDR\FDR	
		Does vessel systems provide mounting holes in the core vessel shielding for mounting of the TVP canoe sphere alignment system in the locations described in Interface Sheet S01020500~IST10217?	Yes			
7749	Test - Proton Beam Window Shielding Sealing Interface	Perform a leak rate test of the seal between the proton beam window shielding and vessel systems during integrated system testing.	[S.03.06-7141] - Proton Beam Window Shielding Sealing Interface	Test	Integrated System Test	
		Is the leak rate <10~^~4 Torr I/s?	Yes			
7748	Analysis - Proton Beam Window Shielding Sealing Interface	Perform an engineering analysis to estimate the leak rate of the sealing interface between vessel systems and the proton beam window shielding.	[S.03.06-7141] - Proton Beam Window Shielding Sealing Interface	Analysis	PDR\FDR	
		Is the calculated leak rate <10~^~4 Torr I/s?	Yes			

7747	Inspection - Proton Beam Window Shielding Sealing Interface	Review drawings of the interface between vessel systems and the proton beam window shielding. Does vessel systems provide a sealing surface for the proton beam window shielding?	Yes	[S.03.06-7141] - Proton Beam Window Shielding Sealing Interface	Inspection	PDR\,FDR
7745	Inspection - Nominal position and gaps	Inspect the nominal positions and gaps of all vessel systems hardware adjacent to the Target and MRA during installation.		[S.03.06-7407] - Position and gaps	Inspection	Installation Test
		Does all vessel systems hardware adjacent to the Target and MRA conform to the nominal positions and gaps outlined in Interface Sheet S01020500~-IST10205?	Yes			
7744	Inspection - Nominal position and gaps	Review drawings of the interface between vessel systems~, the target~, and the MRA.		[S.03.06-7407] - Position and gaps	Inspection	PDR\,FDR
		Does vessel systems hardware adjacent to the Target and MRA conform to the nominal positions and gaps outlines in Interface Sheet S01020500~-IST10205?	Yes			
7743	Analysis - MRA Support	Perform a structural analysis of the core vessel with the loads imparted by the MRA applied.		[S.03.06-7405] - MRA Support	Analysis	PDR\,FDR
		Are the alignment tolerances specified in Interface Sheet S03000000~-IST10009 maintained?	Yes			
7742	Inspection - MRA Alignment Features	Review drawings of the interface between vessel systems and the MRA canoe sphere alignment system.		[S.03.06-7404] - MRA Alignment Features	Inspection	PDR\,FDR
		Does vessel systems provide mounting features in the CV shielding for mounting of the MRA canoe sphere alignment system as described in Interface Sheet S03000000~-IST10009?	Yes			
7741	Analysis - MRA Access	Perform a labor analysis of the operations required to access the MRA.		[S.03.06-7139] - MRA Access	Analysis	PDR\,FDR
		Does the design of vessel systems allow access to the MRA within 8 hours per Interface Sheet S03000000~-IST10009?	Yes			
7740	Test - MRA Access	Perform the operations necessary to access the MRA using the mockup test stand.		[S.03.06-7139] - MRA Access	Test	Installation Test
		Does the vessel systems design allow access to the MRA within 8 hours of operations?	Yes			
7739	Inspection - MRA Cooling Water Line Tie-Downs	Review drawings of the interface between vessel systems and the MRA water line.		[S.03.06-7138] - MRA Cooling Water Line Tie-Downs	Inspection	PDR\,FDR
		Does vessel systems provide mounting features to accommodate MRA water line tie~-downs per Interface Sheet S03000000~-IST10009?	Yes			
7738	Inspection - MRA Cooling Water Connections	Review drawings of vessel systems interface with the MRA.		[S.03.06-7137] - MRA Cooling Water Connections	Inspection	PDR\,FDR
		Does vessel systems provide water supply and return lines that connect the MRA water inlet and outlet flanges to appropriate nozzles in the core vessel side wall?	Yes			
7737	Inspection - Hydrogen Transfer Line Nozzle	Review drawings of vessel systems.		[S.03.06-7136] - Hydrogen Transfer Line Nozzle	Inspection	PDR\,FDR
		Does vessel systems provide a nozzle in the side wall of the core vessel for the hydrogen transfer line per Interface Sheet XXXXXX?	Yes			
7736	Inspection - Target Assembly Seal	Review drawings of interface between vessel systems and the Target Assembly.		[S.03.06-7128] - Target Assembly Seal	Inspection	PDR\,FDR
		Does vessel systems provide a seal interface for the Target Assembly per Interface Sheet S01020500~-IST10209 and drawing S03020000~.G8U~-8800~-A10000?	Yes			
7735	Analysis - Target Shaft Bottom Support	Perform a structural analysis of the core vessel with the target assembly resting on the bottom core vessel shield block.		[S.03.06-7127] - Target Shaft Bottom Support	Analysis	PDR\,FDR
		Does the core vessel support the 16~,000 kg load of the target assembly without contacting the MRA?	Yes			
7733	Inspection - Piping Design Criteria Test Case	Inspect all vessel systems water piping as part of integrated system testing.		[S.03.06-7186] - Piping Design Criteria	Inspection	Integrated System Test
		Was all vessel systems water piping fabricated to ASME B31.3?	Yes			
7725	Analysis - Maintenance and Lifetime Criteria - Perishable Components	Review maintenance criteria for all vessel systems components.		[S.03.06-7674] - Maintenance and Lifetime Criteria - Perishable Components	Analysis	FDR
		Do all vessel systems components meet one or more of the criteria listed in the requirement?	Yes			
7616	Analysis - Shielding for Target Segment Removal and Installation Test Case	Perform a neutronics evaluation of the radiation level at the top of the target segment with the target removable shield block removed.		[S.03.06-7125] - Shielding for Target Segment Removal and Installation	Analysis	PDR\,FDR
		Do the vessel system components allow for radiation level appropriate for hands~-on maintenance at the top of the target segment with the target removable shield block removed?	Yes			

7613	Demonstration - Target Segment Installation Guidance Test Case	Review the mechanical boundaries of the core vessel shielding with the target segment installation path.	[S.03.06-7124] - Target Segment Installation Guidance	Demonstration	PDR\FDR
		Does the core vessel shielding provide a mechanical boundary that ensures proper engagement of the target segment to the target shaft when a target segment is installed?	Yes		
7612	Demonstration - Target Segment Personnel Access	Perform a demonstration of accessing the target segment using the mockup test stand with personnel and tooling	[S.03.06-7123] - Target Segment Personnel Access	Demonstration	Integrated System Test
		Do the vessel systems components allow space for personnel and tooling access for removal~, repair~, and reinstallation of target segments?	Yes		
7611	Demonstration - Target Segment Personnel Access	Perform a human factors evaluation of the target segment access area using the model of the core vessel	[S.03.06-7123] - Target Segment Personnel Access	Demonstration	PDR\FDR
		Do the vessel systems components allow space for personnel and tooling access for removal~, repair~, and reinstallation of target segments?	Yes		
7610	Demonstration - Target Segment Access	Using the mock up test stand~, a test shall be performed to determine how long it takes to gain access to a single target segment.	[S.03.06-7121] - Target Segment Access	Demonstration	Installation Test
		Does the design of the core vessel allow for access to a single target segment within 8 hours?	Yes		
7609	Analysis - Target Segment Access	Perform estimate of labor time required to gain access to a single target segment after the core vessel has been vented.	[S.03.06-7121] - Target Segment Access	Analysis	PDR\FDR
		Does the design of vessel systems allow for access to a single target segment after the core vessel has been vented?	Yes		
7608	Analysis - Limiting Ring Mechanical Support	Perform a shear analysis of the limiting ring bolted interface to Layer 1 CV shielding with a 40 kN seismic side load imparted on the limiting ring by the target shaft.	[S.03.06-7120] - Limiting Ring Mechanical Support	Analysis	PDR\FDR
		Does the limiting ring prevent horizontal motion of the target shaft in excess of xxxx under the prescribed loads?	Yes		
7607	Inspection - Limiting Ring Integration	Review target assembly and vessel systems interface	[S.03.06-7119] - Limiting Ring Integration	Inspection	PDR\FDR
		Does vessel systems provide an interface including a mating face and tapped hole pattern to secure the target assembly limiting ring to Layer 1 CV shielding per drawing S0302000~-M8U~-8800~-A10000?	Yes		
7606	Analysis - Mechanical Load Support	Create a structural model of the core vessel with gravitational~, imbalance~, seismic~, and segment replacement loads imparted by the target assembly per Interface Sheet S01020500~-IST10209 A.32.	[S.03.06-7118] - Mechanical Load Support	Analysis	PDR\FDR
		Does the core vessel deflect within the limits specified in drawing S03020000~-M8U~-8800~-A10001 at the physical locations specified in drawing S03020000~-M8U~-8800~-A10000?	Yes		
7519	Inspection - Installation Tolerances	Inspect the positions of CV shield block positions during installation		Inspection	Installation Test
		Are the CV shield blocks installed within +/- 0.5 mm with respect to the global coordinate system.			
7517	Inspection - Temperature Monitoring	Review model of all vessel systems water cooled components.	[S.03.06-7065] - Temperature Monitoring	Inspection	PDR\FDR
		Do all vessel systems water cooled components have thermocouples that monitor component temperature?	Yes		
7516	Analysis - Target Protection during loss of cooling event	Perform thermal analysis of core vessel~, internal shielding~, and target assembly for loss of cooling event	[S.03.06-7064] - Target Protection during LOCA	Analysis	PDR\FDR
		Does the core vessel shielding maintain a temperature below 60 degrees Celsius while absorbing 8 kW of thermal energy for 24 hours in a loss of cooling event.	Yes		
7515	Inspection - Non-LOF Water-Cooled Component Connections	Review interface of vessel systems and process systems	[S.03.06-7063] - Non-LOF Water-Cooled Component Connections	Inspection	PDR\FDR
		Do all non~-life of facility water~-cooled component connects have flanged connections that can be disconnected for component removal?	Yes		
7513	Analysis - Core Vessel Negative Pressure with Hatches Removed - Test Case	Review design of the exhaust port on the core vessel	[S.03.06-7059] - Core Vessel Negative Pressure With Hatches Removed	Analysis	PDR\FDR
		Does the exhaust port provide sufficient negative pressure to provide an air flow rate of XX ft/min with the hatches removed?	Yes		
7512	Analysis - Core Vessel Anchoring - Test Case	Perform seismic analysis of the core vessel and internal shielding under SDC2 seismic conditions.	[S.03.06-7057] - Core Vessel Anchoring	Analysis	PDR\FDR
		Is the core vessel sufficiently anchored to prevent motion relative to the floor under SDC2 Level 2 seismic conditions?	Yes		

7510	Analysis - Protect Cryogenic Transfer Lines - Test Case	Perform a seismic analysis of the core vessel and internal shielding under SDC2 seismic conditions.	[S.03.06-7056] - Protect Cryogenic Transfer Lines	Analysis	PDR\FDR
		Does the shielding not cause damage to the MRA or cryogenic transfer lines under SDC2 seismic conditions?	Yes		
7420	Inspection - Impact Damage Protection Test Case	Review the CAD models of the core vessel and internal shielding.	[S.03.06-7055] - Impact Damage Protection	Inspection	FDR
		Does the steel shielding of the monolith protect the target feet and MRA from physical impact damage?			
7419	Analysis - Target Temperature Limit Test Case	Perform an analysis of reasonable fire conditions in the STS building	[S.03.06-7054] - Target Temperature Limit during Facility Fire	Analysis	FDR
		Does the target maintain a temperature of below 800 degrees Celsius?	Yes		
7418	Inspection - Non-flammable Materials Test Case	Create a report of all materials present as components of the CV and CV shielding.	[S.03.06-7053] - Non-flammable Materials	Inspection	PDR\FDR
		Are all materials present as components of the CV and CV shielding non-flammable?	Yes		
7417	Inspection - Core Vessel Pressure Range Test Case	Review ASME BPVC for all vessel systems water cooled shielding~, CV beltline and CV.	[S.03.06-7052] - Core Vessel Pressure Range	Inspection	PDR\FDR
		Is the CV designed to operate in a range of ~-15 psig to +15 psig per ASME BPVC Section VIII Div. 2?	Yes		
7416	Inspection - Vacuum Port Test Case	Review Core Vessel to Vacuum systems interface.	[S.03.06-7049] - Vacuum Port	Inspection	PDR\FDR
		Does the Core Vessel have a vacuum port that connects to a vacuum systems pipe of the same size?	Yes		
7414	Inspection - Core Vessel Drain Test Case	Review Core Vessel to Process systems interface	[S.03.06-7048] - Core Vessel Leak Collection	Inspection	PDR\FDR
		Does the Core Vessel have a drain port near bottom of the vessel that connects to process systems drain line of the same diameter?	Yes		
7413	Inspection - Core Vessel Pressure Relief Test Case	Locate CAD model in which the component is located	[S.03.06-7047] - Core Vessel Pressure Relief	Inspection	FDR
		Does the core vessel design have a burst disc with a rating of less than +7.35 PSIG?	Yes		
		Are burst disc and piping sized appropriately for hydrogen production rate?	Yes		
7355	Inspection - Piping Design Criteria Test Case	Review vessel systems water piping design and fabrication	[S.03.06-7186] - Piping Design Criteria	Inspection	FDR
		Does the water piping design comply with ASME B31.3?	Yes		
7354	Inspection - Pressure Bearing Component Design Criteria Test Case	Review drawings associated with all vessel systems water cooled shielding~, CV beltline and CV for compliance to ASME BPVC.	[S.03.06-7185] - Pressure Bearing Component Design Criteria	Inspection	FDR
		Do components comply with ASME BPVC?	Yes		
7353	Analysis - Lifetime Test Case	Create a report of lifetime DPA of core vessel and internal shielding.	[S.03.06-7183] - Lifetime	Analysis	FDR
		Confirm core vessel and internal shielding stay below maximum allowable DPA for non-beam intercepting components per the STS Materials Handbook.	Yes		
7352	Test - Leak Rates Test Case	Review supplier provided factory acceptance test	[S.03.06-7184] - Water Leak Rates	Test	FAT\Installation Test\Integrated System Test
		Does the vessel have a leak rate of less than 1x10^-6 mbar~l/s during factory acceptance test?	Yes		
		Perform pre-installation leak rate test on the vessel			
		Does the vessel have a leak rate of less than 1x10^-6 mbar~l/s during pre-installation test?	Yes		
		Perform installation test on the vessel.			
		Does the vessel have a leak rate of less than 1x10^-6 mbar~l/s during installation test	Yes		
7231	Analysis - Stainless Steel and Carbon Steel Temperature Limit Test Case	Create a thermal model of the core vessel and internal shielding.	[S.03.06-7181] - Stainless Steel Temperature Limit,[S.03.06-7182] - Carbon Steel Temperature Limit	Analysis	PDR\FDR
		Is the stainless-steel maximum temperature less than 200 C?	Yes		
		Is the carbon steel maximum temperature less than 200 C?	Yes		
7197	Analysis - Maintain Target Systems Environment	Perform a vacuum calculation of all sealing surfaces of the core vessel.	[S.03.06-7058] - Core Vessel Environment	Analysis	FDR
		Does the calculated leak rate allow for a sealed environment of either <1 Torr or sub atmospheric Helium of 700 to 7XX Torr?	Yes		

7196	Analysis - Radiation Shielding	Create a neutronics model of the internal shielding and core vessel and combine with shielding provided by CF~, Target Station Shielding~, and all other technical components.	[S.03.06-6130] - Radiation Shielding.[S.03.06-7060] - Radiation Shielding Performance	Analysis	PDR\FDR
		Does the internal shielding and core vessel combined with shielding provided by CF~, Target Station Shielding~, and all other technical components permit radiation exposure in area accessible to personnel during beam~-on and beam~-off operation that is acceptable on accordance with the STS Radiation Safety Policy and Plan?			Yes
7177	Inspection - Vessel and internal shielding configuration and alignment test case	Review proton beam path profile	[S.03.06-6121] - Accept Proton Beam	Inspection	FDR
		Does the vessel and internal shielding allow greater than 99.9~% of the proton beam profile delivered by the accelerator systems to reach the target assembly unobstructed?			Yes
		Is vessel and internal shielding configured per S03000000~-M8U~-8800~-A10001?			Yes