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SECOND TARGET STATION (STS) PROJECT

Interface Sheet for the Target Vacuum Systems and Conventional Facilities

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OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE US DEPARTMENT OF ENERGY

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1. PURPOSE

This document defines the interface between Target Vacuum Systems and Conventional Facilities. The interface described in this document will provide inputs to the design of Target Vacuum Systems and Conventional Facilities.

2. SCOPE

The scope of this document is the complete interface definition for the interface between Target Vacuum Systems and Conventional Facilities as identified in the parent Interface Control Document [1] between Target Systems (TS) and Conventional Facilities (CF).

2.1 INTERFACING PARTS OR COMPONENTS

No.	Components (Target Vacuum Systems)		Components (Conventional Facilities)	
	Name	Functional reference Number	Name	Functional reference Number
1	PBW Inflatable Seals Vacuum Pumps	VACP-23500 VACP-23501	Vacuum equipment space, compressed air piping, HOG piping, pump power	N/A
2	PBW Inflatable Seals Vacuum Tubing	N/A	TDR wall/floor penetration and bunker wall penetration	N/A
3	PBW Shielding Inflatable Seals Vacuum Pumps	VACP-23504 VACP-23505	Vacuum equipment space, compressed air piping, HOG piping, pump power	N/A
4	PBW Shielding Inflatable Seals Vacuum Tubing	N/A	TDR wall/floor penetration and bunker wall penetration	N/A
5	Core Vessel Vacuum Pumps	VACP-23508 VACP-23511	Vacuum equipment space, compressed air piping, HOG piping, pump power	N/A
6	Core Vessel Vacuum Tubing	N/A	TDR wall/floor penetration and bunker wall penetration	N/A
7	CMS Hydrogen Coldbox Vacuum Skid	TBD	Vacuum equipment space, compressed air piping, skid power	N/A
8	CMS Hydrogen Transfer Line Vacuum Skid	TBD	Vacuum equipment space, compressed air piping, skid power	N/A
9	ACH Drying Vacuum Pump	VACP-24046	Vacuum equipment space, compressed air piping, HOG piping, pump power	N/A
10	ACH Drying Vacuum Tubing	N/A	HPV / Service Cell wall penetration	N/A
11	Core Vessel Vent Line Tubing	N/A	Target high bay floor trench and roof penetration	N/A

3. ACRONYMS AND DEFINITIONS

ACH Activated Component Handling
CF Conventional Facilities
CMS Cryogenic Moderator Systems
CV Core Vessel
HOG Hot Off Gas
HPV Hot Process Vault
HUR Hydrogen Utility Room
ICD Interface Control Document
PBW Proton Beam Window
SSC Structure, System or Component
TDR Target Drive Room
TS Target Systems

4. REFERENCES

4.1 DOCUMENTS APPLICABLE TO THE INTERFACING SSCS

Ref	Document Titles	Document Control System Location
[1]	Second Target Station (STS) Project Interface Control Document for Target Systems and Conventional Facilities	S01020500-IC0006
[2]	Target Process Systems Piping and Instrumentation Diagram Legend Sheet 1	S03090200-J8U-8800-A10000
[3]	Target Process Systems Piping and Instrumentation Diagram Legend Sheet 2	S03090200-J8U-8800-A10001
[4]	MRA and Core Vessel Cooling Loop 2 Proton Beam Window Piping and Instrumentation Diagram	S03090200-J8U-8800-A10007
[5]	MRA and Core Vessel Cooling Loop 2 Core Vessel Cooling Piping and Instrumentation Diagram	S03090200-J8U-8800-A10008
[6]	MRA & Core Vessel Cooling Loop 2 Core Vessel Atmosphere Management Piping and Instrumentation Diagram	S03090200-J8U-8800-A10009
[7]	Activated Cooling Loops Activated Components Drying Piping and Instrumentation Diagram	S03090200-J8U-8800-A10017
[8]	Target & Instrument Building Level 01 – Enlarged Plan – Sector T1	8800-AR1114
[9]	Target & Instrument Building Level 02.5 – Enlarged Plan – Sector T1	8800-AR1127
[10]	Target & Instrument Building Level 03 – Enlarged Plan – Sector T1	8800-AR1134
[11]	Target & Instrument Building Level 1 - Loading Diagram - Overall	8800-ST0010

[12]	Target & Instrument Building Level 2 - Loading Diagram - Overall	8800-ST0020
[13]	Target & Instrument Building Level 3 - Loading Diagram - Overall	8800-ST0030
[14]	Target & Instrument Building Enlarged Structural Plan – Level 1 – Sector T1	8800-ST4000
[15]	Target & Instrument Building Enlarged Structural Plan Level 2.5 – Sector T1	8800-ST4201
[16]	Target & Instrument Building – Level 3 – Structural Plan – Sector T1	8800-ST1134
[17]	Target & Instrument Building Level 1 Sector T1 Mechanical Floor Plan	8800-MH1114
[18]	Target & Instrument Building Level 2 Sector T1 Mechanical Floor Plan	8800-MH1124
[19]	Target & Instrument Building Level 1 Sector T1 Mechanical Piping Floor Plan	8800-MP1114
[20]	Target & Instrument Building Level 2 Sector T1 Mechanical Piping Floor Plan	8800-MP1124
[21]	Target & Instrument Building Level 3 Sector T1 Mechanical Piping Floor Plan	8800-MP1134
[22]	Target & Instrument Building Level 1 Sector T1 Plan - Equipment Connections	8800-EP1134
[23]	Target & Instrument Building Level 1 Sector T1 - Process Equipment Electrical Connections Schedule	8800-EP1314P
[24]	Target & Instrument Building Level 2.5 Sector T1 Plan - Equipment Connections	8800-EP1328
[25]	Target & Instrument Building Level 3 Sector T1 Plan - Equipment Connections	8800-EP1334
[26]	Target & Instrument Building Level 3 Sector T1 - Process Equipment Electrical Connections Schedule	8800-EP1334P
[27]	Target & Instrument Building penetration details	TBD
[28]	Target & Instrument Building penetration schedule	TBD
[29]	Interface Sheet for the Process Systems Helium Distribution System and Conventional Facilities	S01020500-IST10075
[30]	Interface Sheet for the Process Systems and Conventional Facilities	S01020500-IST10070
[31]	Target Cryogenic Moderator Systems Piping and Instrumentation Diagrams	TBD

5. INTERFACE DEFINITION

5.1 TECHNICAL DESCRIPTION OF THE INTERFACE

There are a total of nine (9) vacuum pumps serving Target Systems as follows:

Description	Quantity	Location
PBW Inflatable Seals Vacuum Pumps	2	Monolith Vacuum Systems (STS204)
PBW Shielding Inflatable Seals Vacuum Pumps	2	Monolith Vacuum Systems (STS204)
Core Vessel Vacuum Pumps	2	Monolith Vacuum Systems (STS204)
CMS Hydrogen Coldbox Vacuum Cart	1	Hydrogen Utility (STS302)
CMS Hydrogen Transfer Line Vacuum Cart	1	Hydrogen Utility (STS302)
ACH Drying Vacuum Pump	1	Hot Process Vault (STS105)

Vacuum pumps will be used to keep target system components at negative pressure to prevent release of activated air.

Target Systems is responsible for:

- The design, procurement, and installation of the vacuum pumps, pump supports, vacuum tubing, pipe supports, and other vacuum systems equipment [2-7].
- Final electrical power connections from disconnect switches to vacuum pumps and other vacuum systems equipment.
- Final HOG connections to the vacuum system, method of connection to be determined.
- Routing vacuum tubing or other vacuum connection from the vacuum pumps to the end uses in the Target Drive Room, Hydrogen Utility Room, Hot Process Vault and Service Cell.
- Routing helium piping from the gas panels in Mechanical Room STS128 to final helium utility connections to the vacuum system. There are no TS Vacuum Systems to CF helium interfaces anticipated, refer to [29] for Target Process to CF helium system interfaces.

Conventional Facilities provides:

- A room or space house the vacuum pumps near the end use.
- Adequate structure to support and anchor the vacuum pump stands and pipe supports wherever vacuum service is needed.
- Electrical power to disconnect switches near each vacuum pump or other powered vacuum equipment location with accommodation for backup power on redundant pumps (CV and Inflatable Seal systems only).
- Compressed air connections at locations near vacuum valves.
- HOG piping connections to locations near each vacuum pump (excluding CMS systems).
- Wall penetrations to route vacuum tubing from vacuum pumps in the Monolith Vacuum Systems space to the Target Drive Room, and from the vacuum pump in the HPV to the Service Cell.
- A trench and penetrations as required to route the Core Vessel vent line to the roof.

5.2 INTERFACE DATA

5.2.1 Interface No. 1 - PBW Inflatable Seals Vacuum Pumps

- The PBW Inflatable Seal vacuum pumps will be specified, procured and installed by Target Vacuum Systems in the will be in Monolith Vacuum Systems Room (STS204) adjacent the Target Drive Room as shown in Figure 1.
- Vacuum pump equipment information is provided in Table 1 of Section 5.2.12. Additional system details are provided in [4].
- Structural and architectural details for the Monolith Vacuum Systems Room (STS204) can be found in [9, 15].
- Floor loading capacity information is provided in [13].
- CF will provide HOG and compressed air connections within STS204 and pipe routing information is provided in [18, 21].
- CF will provide electrical power to a disconnect in STS204 for each of the pumps [24].

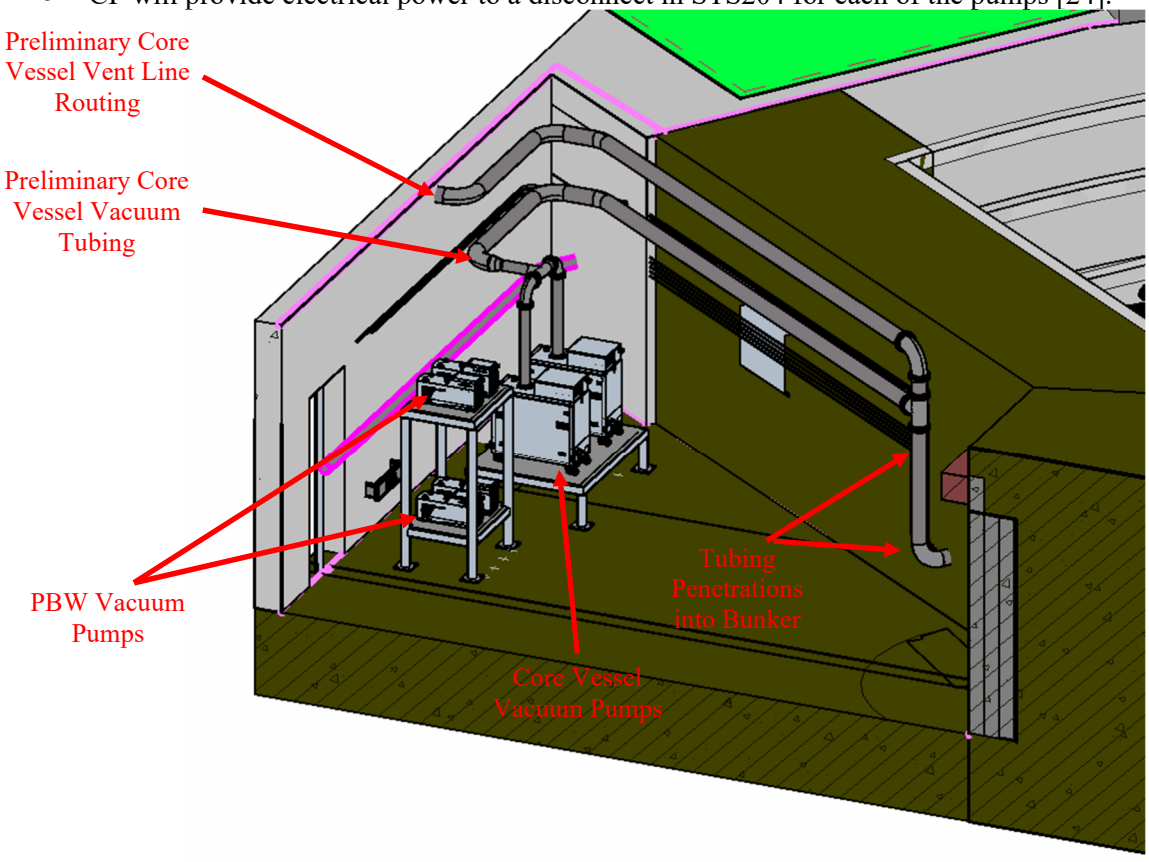

Figure 1. Monolith Vacuum Systems Room Layout

5.2.2 Interface No. 2 – PBW Inflatable Seals Vacuum Tubing

- PBW Inflatable Seals vacuum tubing and system information is provided in [4].
- Target Systems is responsible for sizing, routing, procuring, and installing this vacuum tubing and all associated instrumentation and components.

- CF will provide penetrations in the Bunker and Monolith/TDR walls to enable routing of the 1" line form the point of use to the vacuum pumps. Penetration details are TBD [27, 28].

5.2.3 Interface No. 3 – PBW Shielding Inflatable Seals Vacuum Pumps

- The PBW Shielding Inflatable Seal vacuum pumps will be specified, procured and installed by Target Vacuum Systems in the will be in Monolith Vacuum Systems Room (STS204) adjacent the Target Drive Room as shown in Figure 1.
- Vacuum pump equipment information is provided in Table 1 of Section 5.2.12. Additional system details are provided in [4].
- Structural and architectural details for the Monolith Vacuum Systems Room (STS204) can be found in [9, 15].
- Floor loading capacity information is provided in [13].
- CF will provide HOG and compressed air connections within STS204 and pipe routing information is provided in [18, 21].
- CF will provide electrical power to a disconnect in STS204 for each of the pumps [24].

5.2.4 Interface No. 4 – PBW Shielding Inflatable Seals Vacuum Tubing

- PBW Shielding Inflatable Seals vacuum tubing and system information is provided in [4].
- Target Systems is responsible for sizing, routing, procuring, and installing this vacuum tubing and all associated instrumentation and components.
- CF will provide penetrations in the Bunker and Monolith/TDR walls to enable routing of the 1" line form the point of use to the vacuum pumps. Penetration details are TBD [27, 28].

5.2.5 Interface No. 5 – Core Vessel Vacuum Pumps

- The Core Vessel vacuum pumps and Residual Gas Analyzer will be specified, procured and installed by Target Vacuum Systems in the will be in Monolith Vacuum Systems Room (STS204) adjacent the Target Drive Room as shown in Figure 1.
- Vacuum pump equipment information is provided in Table 1 of Section 5.2.12. Additional system details are provided in [5, 6].
- Structural and architectural details for the Monolith Vacuum Systems Room (STS204) can be found in [9, 15].
- Floor loading capacity information is provided in [13].
- CF will provide HOG and compressed air connections within STS204 and pipe routing information is provided in [18, 21].
- CF will provide electrical power to a disconnect in STS204 for each of the pieces of equipment [24].

5.2.6 Interface No. 6 – Core Vessel Vacuum Tubing

- Core Vessel vacuum tubing and system information is provided in [5, 6].
- Target Systems is responsible for sizing, routing, procuring, and installing this vacuum tubing and all associated instrumentation and components.
- CF will provide penetrations in the Bunker and Monolith/TDR walls to enable routing of the 6" line form the point of use to the vacuum pumps. Penetration details are TBD [27, 28].

5.2.7 Interface No. 7 – CMS Hydrogen Cold Box Vacuum Pump Skid

- The Hydrogen Cold Box vacuum pump skid will be specified, procured and installed by Target Vacuum Systems in the Hydrogen Utility Room (STS302).
- Vacuum pump equipment information is provided in Table 1 of Section 5.2.12, and additional details are anticipated to be provided by TS in [31].
- Structural and architectural details for the HUR can be found in [10, 16].
- Floor loading capacity information is provided in [13].
- CF will provide compressed air supply and connections for vacuum valves if necessary within the HUR and pipe routing information is provided in [21].
- CF is not providing HOG for CMS vacuum vent connections. Venting will be within the scope of TS and is planned to utilize the hydrogen vent to be routed up through the roof, which is in TS scope.
- CF will provide electrical power to a disconnect in the HUR for the pump skid [25, 26].

5.2.8 Interface No. 8 – CMS Hydrogen Transfer Line Vacuum Pump Skid

- The Hydrogen Transfer Line vacuum pump skid will be specified, procured and installed by Target Vacuum Systems in the HUR.
- Vacuum pump equipment information is provided in Table 1 of Section 5.2.12, and additional details are anticipated to be provided by TS in [31].
- Structural and architectural details for the HUR can be found in [10, 16].
- Floor loading capacity information is provided in [13].
- CF will provide compressed air supply and connections for vacuum valves if necessary within the HUR and pipe routing information is provided in [21].
- CF is not providing HOG for CMS vacuum vent connections. Venting will be within the scope of TS and is planned to utilize the hydrogen vent to be routed up through the roof, which is in TS scope.
- CF will provide electrical power to a disconnect in the HUR for the pump [25, 26].

5.2.9 Interface No. 9 ACH Drying Vacuum Pump

- The ACH Drying vacuum pump will be specified, procured and installed by Target Vacuum Systems in the Hot Process Vault (STS105).
- Vacuum pump equipment information is provided in Table 1 of Section 5.2.12. Additional system details are provided in [7].
- Structural and architectural details for the HPV can be found in [8, 14].
- Floor loading capacity information is provided in Reference [11].
- CF will provide HOG and compressed air connections within the HPV and pipe routing information is provided in [17, 19].
- CF will provide electrical power to a disconnect in the HPV for the pump [22, 23].
- This pump is anticipated to require chilled water cooling. The interface for that is captured in [30].

5.2.10 Interface No. 10 ACH Drying Vacuum Tubing

- ACH Drying vacuum tubing and system information is provided in [7].
- Target Systems is responsible for sizing, routing, procuring, and installing this vacuum tubing and all associated instrumentation and components.

- CF will provide a penetration in the Service Cell / HPV wall to enable routing of the 2" line form the point of use to the ACH drying vacuum pump. Penetration details are TBD [27, 28].

5.2.11 Interface No. 11 Core Vessel Vent Line Tubing

- Core Vessel Vent Line information is provided in [4, 5].
- Target Systems is responsible for sizing, routing, procuring, and installing this vent line.
- The 6" vent line is currently planned to be routed from the Monolith Vacuum Systems room across the high bay floor, and up the plan east wall of the high bay to the roof. CF will provide a trench in the high bay floor and trench cover for this [16]. Roof penetration details are TBD.

5.2.12 Reference Vacuum Pump Data

Current equipment selections for Target Vacuum Systems anticipated vacuum pump configurations with power and utility requirements is presented in Table 1 below.

Vacuum System	Desc.	Component	Qty	Mfr	Mfr P/N	Location	Acceptable Input Voltage *(V AC)*	Acceptable Operating Temperature *(°F/°C)*	Water Consumption *(L/min)*	Expected Supplied Voltage *(V AC)*
Core Vessel Vacuum System	Roughing Pump	Pfeiffer ACP 90, Dry Multi-stage Roots	2	Pfeiffer	V9GABSBZRF01	Monolith Vacuum	3∅, 200-240 V	53.6-104 / 12-40	N/A	3-P, 240
Inflatable Seal, *PBW or Core Vessel Side Vacuum System*	Roughing Pump	Pfieffer ACP 28, Dry Multi-stage Roots	2	Pfeiffer	V6SATSGZMF	Monolith Vacuum Systems Area	1∅, 100-230 V	53.6-104 / 12-40	N/A	1-P, 120
Inflatable Seal, *PBW Shielding or Accelerator Side Vacuum System*	Roughing Pump	Pfieffer ACP 28, Dry Multi-stage Roots	2	Pfeiffer	V6SATSGZMF	Monolith Vacuum Systems Area	1∅, 100-230 V	53.6-104 / 12-40	N/A	1-P, 120
CMS H2 Transfer Line Vacuum System	Roughing Pump	Pfieffer ACP 28, Dry Multi-stage Roots	1	Pfeiffer	V6SATSGZMF	Hydrogen Utility Room	1∅, 100-230 V	53.6-104 / 12-40	N/A	1-P, 120
CMS H2 Transfer Line Vacuum System	Turbo Pump	Pfeiffer Hipace 700, for TCP 350, DN 160 CF	1	Pfeiffer	PM P04 081	Hydrogen Utility Room	N/A	Air Cooling Fan, ±30 °F	N/A	N/A
CMS H2 Transfer Line Vacuum System	Turbo Pump Controller	Pfeiffer TCP 350	1	Pfeiffer	PM C01 740	Hydrogen Utility Room	1∅, 115 to 230	41-104 / 5-40	N/A	1-P, 120
CMS H2 Cold Box Vacuum System	Roughing Pump	Pfieffer ACP 28, Dry Multi-stage Roots	1	Pfeiffer	V6SATSGZMF	Hydrogen Utility Room	1∅, 100-230 V	53.6-104 / 12-40	N/A	1-P, 120
CMS H2 Cold Box Vacuum System	Turbo Pump	Pfeiffer Hipace 700, for TCP 350, DN 160 CF	1	Pfeiffer	PM P04 081	Hydrogen Utility Room	N/A	Air Cooling Fan, ±30 °F	N/A	N/A
CMS H2 Cold Box Vacuum System	Turbo Pump Controller	Pfeiffer TCP 350	1	Pfeiffer	PM C01 740	Hydrogen Utility Room	1∅, 115 to 230	41-104 / 5-40	N/A	1-P, 120
Component Drying Vacuum System	*Roughing Pump*	*MD-Kenny SDV Dry Screw, 200*	*1*	*MD-Kinney*	*SDV-200*	*Hot Process Vault*	*3 ∅, 230-460*	*Water Cooled*	*4*	*TBD*

Table 1. Target Vacuum Systems Pump Equipment