ASD

VACUUM STANDARDIZATION

Michael Hechler

August 15 - 16, 2000

VACUUM STANDARDIZATION

MEETING AGENDA

Tuesday, August 15

8:00 - 8:15	Welcome/Meeting Itinerary	M. Hechler/D. Gurd
8:15 - 9:45	Vacuum Standardization - Proposals	Forum/M. Hechler
	Round Table Discussion	
9:45 - 10:00	Break	
10:00 - 12:00	Vacuum Standardization - Proposals cont.	Forum/M. Hechler
	Round Table Discussion	
12:00 - 1:00	Lunch	
1:00 - 2:00	Vacuum Handbook - Comment Discussion	M. Hechler
2:00 - 2:15	Controls Introduction	D. Gurd
2:15 - 2:30	Review on Proposed SNS Vacuum Control	J. Tang
	System Architecture Standard	
2:30 - 3:00	Warm Linac Vacuum Controls	K. Kishiyama
3:00 - 3:15	Break	
3:15 - 3:45	SCL Vacuum Controls	T. Powers

MEETING AGENDA

Wednesday, August 16

8:00 - 8:30	Status/Day's Itinerary Update	M. Hechler/D. Gurd
8:30 - 9:45	Controls Standardization - Proposals Round Table Discussion	Forum/L. Dalesio
9:45 – 10:00	Break	
10:00 – 12:00	Controls Standardization - Proposals cont. Round Table Discussion	Forum/L. Dalesio
12:00 - 1:00	Lunch	
1:00 - 2:30	Vacuum Components' Standardization Strategy Plan and Assignments	M. Hechler
2:30 – 2:45	Break	
2:45 - 4:00	Controls' Standardization Strategy Plan and Assignments	D. Gurd

VACUUM STANDARDIZATION

GOALS

- Reduce the number of unique types of components
- Reduce the number of spare unique types which must be maintained
- Reduce the degree of training associated with servicing multiple unique types
- Reduce the number of unique specific locations and required interfaces
- Reduce variances in performance and calibration
- Reduce costs by economy of scale and a centralize procurements

VACUUM STANDARDIZATION

OBJECTIVES

- Standardize on as many components as possible
- Standardize on practices where possible
- Derive a plan for procurement & delivery of components that integrates with the subsystems' design/assembly plans
- Assign the preparation of specifications
- Assign the preparation of procedures
- Buy hardware FY 2001

VACUUM STANDARDIZATION

STANDARD ELEMENTS

- Components
- Processes
- Controls
- Quality Assurance
- The resultant standard elements shall be reflected in the "Accelerator Systems Division - Vacuum Standards Handbook" Doc. No. SNS 102020000-ST0001-R00.

VACUUM STANDARDIZATION

STANDARD COMPONENTS

- Pumps
- Valves
- Gauges
- Hardware

VACUUM STANDARDIZATION

STANDARD COMPONENTS

- Pumps
  - Roughing
    - **Cart Roughing** — **11 - 100 L/S*, 14 - 250 L/S, 2 - 550 L/S**
    - **Station Roughing** — **4 - 1 L/S, 1 - 5 L/S, 5 - 100 L/S***
  - Turbomolecular
    - **Large > 100 L/S** — **4 - 1000 L/S**
    - **Small < 100 L/S** — **14 - 70 L/S**
  - Sputter-Ion
    - **Large > 100 L/S** — **66 - 300 L/S, 69 - 200 L/S**
    - **Small < 100 L/S** — **72 - 40 L/S, 8 - 50 L/S**
  - Cryogenic
    - **Large > 2000 L/S** — **6 - 2200 L/S**
  - Gettering
    - **Large > 1000 L/S** — **14 - 1000 L/S**
    - **Small < 1000 L/S** — **7 - 430 L/S**

***TBD**

VACUUM STANDARDIZATION

PUMPS

SYSTEM	VAC LEVEL	VACUUM PUMPS				CONTROLLER	MISCELLANEOUS
	(Torr)	TYPE	SIZE	QTY	MAKE/MODEL	MAKE/MODEL	
FRONT END							
SOURCE/LEBT	1.0×10^{-4}						
		TURBO PUMP	1000 L/S	3	Pfieffer - Model TMH 1000	Pfieffer - TBD	
		ROUGHING PUMP	1 L/S	3	Varian MD 60	TBD	Dry Diaphram Pump
RFQ	1.0×10^{-6}						
		CRYO PUMP	2200 L/S	6	CTI - Cryo Torr 8	CTI	
		ROUGHING PUMP	5 L/S	1	Varian Triscroll PTS 600	TBD	Dry Scroll Pump
MEBT	1.8×10^{-7}						
		ION PUMP	50 L/S	8	Varian VacIon Plus 55 StarCell	TBD	
		ROUGHING PUMP CART	550 L/S	2	VARIAN - MSPA8419N	N/A	Dry Scroll Pump
TEST STAND	1.0×10^{-4}						
		TURBO PUMP	1000 L/S	1	Pfieffer - Model TMH 1000	Pfieffer - TBD	
		ROUGHING PUMP	1 L/S	1	Varian MD 60	TBD	Dry Diaphram Pump
LINAC							
DTL	1.8×10^{-7}						
6 Vessels x 3 per		MAIN ION PUMP	300 L/S	18	Varian VacIon Plus 300 StarCe	VARIAN - 9295000	Dual Controller
6 Vessels x 1 per		WAVEGUIDE TURBO PUM	70 L/S	6	VARIAN - Turbo-V70	VARIAN - 9699505	Single Controller
		WAVEGUIDE NEG PUMP	1000 L/S	6	SAES Capacitorr -ST185	TBD	
		ROUGHING SYSTEM	250 L/S	6	VARIAN - Turbo-V300HT	VARIAN - 9699524	Single Controller
					VARIAN - Triscroll-PTS300		Single Controller
CCL	9.65×10^{-8}						
8 Modules x 6 per		MAIN ION PUMP	300 L/S	48	Varian VacIon Plus 300 StarCe	VARIAN - 9295000	Dual Controller
8 Modules x 1 per		WAVEGUIDE TURBO PUM	70 L/S	8	VARIAN - Turbo-V70	VARIAN - 9699505	Single Controller
		WAVEGUIDE NEG PUMP	1000 L/S	8	SAES Capacitorr -ST185	TBD	TBD
		ROUGHING SYSTEM	250 L/S	8	VARIAN - Turbo-V300HT	VARIAN - 9699524	Single Controller
					VARIAN - Triscroll-PTS300		Single Controller
SRF	1.0×10^{-9}						
LE Diff Pump Stand		MAIN ION PUMP	40 L/S	3	Physical Electronics	Custom	5kV-70mA
		NEG PUMP	430 L/S	3	SAES Capacitorr -ST707	TBD	
HE Diff Pump Stand		MAIN ION PUMP	40 L/S	4	Physical Electronics	Custom	5kV-70mA
		NEG PUMP	430 L/S	4	SAES Capacitorr -ST707	TBD	
Warm Sections (32)		MAIN ION PUMP	40 L/S	65	Physical Electronics	Custom	5kV-70mA
RF Coupler (117)		COUPLER ION PUMP	TBD L/S	116	TBD	TBD	TBD
		ROUGHING PUMP CART	TBD L/S	0	TBD	TBD	TBD
RING							
HEBT	5.0×10^{-8}						
		ION PUMP	200 L/S	17	TBD		
		TURBO / ROUGHING	100 L/S	5	TBD		
RING	1.0×10^{-8}						
		ION PUMP	200 L/S	36	TBD		
		TURBO / ROUGHING	100 L/S	5	TBD		
RTBT	1.0×10^{-7}						
		ION PUMP	200 L/S	16	TBD		
		TURBO / ROUGHING	100 L/S	5	TBD		

VACUUM STANDARDIZATION

STANDARD COMPONENTS

- Valves
  - Beamline
    - **Normal Closing** — **10 - 1 1/2”, 9 - 2 1/2”, 64 - 3”, 6 -6”, 8 - 8”, 3 - 10”, 6 - TBD**
    - **Fast Closing** — **8 - 3”, 1 - 6”**
  - Component
    - **Pump Isolation** — **10 - 6 in,**
    - **Roughing Isolation** — **27 - 1 1/2”, 2 - 2 1/2”, 29 - 6”**
    - **Misc. Isolation** — **117 - 3” (CM Construction)**
    - **Venting** — **26 - 1/2 in**
  - Actuation
    - **Manual** — **venting, misc. isolation,**
    - **Remote** — **all beamline & pump & roughing isolation**
  - **Position Indication** — **yes**

VACUUM STANDARDIZATION

VALVES

SYSTEM	VACUUM VALVES				CONTROLLER	MISC INFO
	TYPE	SIZE	QTY	MAKE/MODEL	MAKE/MODEL	
FRONT END						
SOURCE/LEBT						
	Source Pump Isolation	8 in	3	MDC/ 307007	N/A	Manual
	Roughing/Backing Pump	1 1/2 in	3	MDC/ TBD	TBD	TBD
	Source Vent Valve	TBD	1	MDC/ TBD		TBD
	LEBT/RFQ Beam Line	1 1/2	1	MDC/ 321054	TBD	Pneumatic
RFQ						
	RFQ Pump Isolation	8 in	6	MDC/ TBD	N/A	Manual
	Roughing/Backing Pump	1 1/2 in	7	MDC/ TBD	TBD	TBD
MEBT						
	RFQ/MEBT Beam Line	1 1/2	1	MDC/ TBD	TBD	Pneumatic
	MEBT Pump Cart Isolation	2 1/2 in	2	MDC/ TBD	TBD	TBD
TEST STAND						
	Source Pump Isolation	8 in	1	MDC/ 321054	N/A	Manual
	Roughing/Backing Pump	1 1/2 in	1	MDC/ 307007	TBD	TBD
	LEBT Vent Valve	TBD	1	MDC/ TBD	N/A	Manual
LINAC						
DTL						
	Beam Line	1 1/2	7	MDC - GV-2500M-P	TBD	Pneumatic
	Roughing Isolation	6 in	6	MDC - GV-6000M	N/A	Manual
CCL						
	Beam Line	2 1/2	9	MDC - GV-2500M-P	TBD	Pneumatic
	Roughing Isolation	6 in	8	MDC - GV-6000M	N/A	Manual
	Roughing/Backing/Isolation	1 1/2	16	MDC - MAV-150-V	N/A	Manual
	Isolation	1/2	24	MDC - AV-050M	N/A	Manual
SRF						
LE Diff Pump Stand	Beam Line	1 1/2	1	VAT	VAT/MDC	Pneumatic
HE Diff Pump Stand	Beam Line	3	1	VAT	VAT/MDC	Pneumatic
Warm Sections (32)	Beam Line CM Isolation	3	64	VAT/MDC	VAT/MDC	TBD
	CM Assembly	4	117	TBD	N/A	Manual
RING						
HEBT						
	Beam Line	6	6	TBD	TBD	Pneumatic
	HEBT Fast Closing Beam Line	6	1	TBD	TBD	Pneumatic
	Roughing Isolation	6	5	TBD	TBD	Manual
RING						
	Sector Isolation Beam Line	8	8	VAT	VAT	Pneumatic
	Injection/Foil Beam Line	10	3	VAT	VAT	Pneumatic
	Inject Fast Closing Beam Line	TBD	1	TBD	TBD	Pneumatic
	Roughing Isolation	TBD	5	TBD	TBD	Manual
RTBT						
	Beam Line	TBD	5	TBD	TBD	Pneumatic
	RTBT Fast Closing Beam Line	TBD	1	TBD	TBD	Pneumatic
	Roughing Isolation	TBD	5	TBD	TBD	Manual

VACUUM STANDARDIZATION

STANDARD COMPONENTS

- Gauges
  - Low Level Vacuum 100 units
  - High Level Vacuum 68 units
  - Partial Pressure 35 units
  - Machine Safety System TBD

VACUUM STANDARDIZATION

GAUGES

SYSTEM	VACUUM GAUGES				CONTROLLER	MISC INFO
	TYPE	RANGE TORR	QTY	MAKE/MODEL	MAKE/MODEL	
FRONT END						
SOURCE/LEBT						
	Low Level Gauge	0 -1x10^{-4}	2	Granville-Phillips -275913-EU	TBD	TBD
	Ion gauge	5x10^{-4} - 2x10^{-10}	1	Granville-Phillips -354002-YK-T	On-Board	TBD
	Capacitive Manometer		1	MKS-1479 A 12CR1BV	MKS-246B	
RFQ						
	Low Level Gauge	0 - 1x10^{-4}	7	Granville-Phillips -275908-EU	On-Board	275 Mini-Convectron
	Ion gauge	5x10^{-4} - 2x10^{-10}	4	Granville-Phillips -354002-YF-T	On-Board	354 Micro-Ion Module
	RGA gauge	1x10^{-14}	1	TBD	TBD	TBD
MEBT						
	Low Level Gauge	0 - 1x10^{-4}	1	Granville-Phillips -275913-EU	TBD	TBD
	Ion gauge	5x10^{-4} - 2x10^{-10}	7	Granville-Phillips -354002-YF-T	On-Board	354 Micro-Ion Module
	Ion gauge	5x10^{-4} - 2x10^{-10}	1	Varian Eyesys Mini-IMG R14003	On-Board	inverted magnetron, fast response
	RGA gauge	1x10^{-14}	1	TBD	TBD	TBD
TEST STAND						
	Low Level Gauge	0 -1x10^{-4}	2	Granville-Phillips -275913-EU	TBD	TBD
	Ion gauge	5x10^{-4} - 2x10^{-10}	1	Granville-Phillips -354002-YK-T	TBD	TBD
	RGA gauge	0 - 1x10^{-4}	1	MKS-1479 A 12CR1BV	TBD	TBD
LINAC						
DTL						
	Low Level Gauge	0 - 1x10^{-4}	6	Granville-Phillips -275238	Granville-Phillips -360106	CONVECTRON
	Ion gauge	5x10^{-4} - 2x10^{-10}	6	Granville-Phillips -360120	Granville-Phillips -360101	STABIL-ION
	RGA gauge	1x10^{-14}	6	SRS - RGA100	SRS - TBD	RGA
CCL						
	Low Level Gauge	0 - 1x10^{-4}	16	Granville-Phillips -275238	Granville-Phillips -360107	CONVECTRON
	Ion gauge	5x10^{-4} - 2x10^{-10}	16	Granville-Phillips -360120	Granville-Phillips -360101	STABIL-ION
	RGA gauge	1x10^{-14}	8	SRS - RGA100	SRS - TBD	RGA
SRF						
LE Diff Pump Stand	Low Level Gauge	0 - 1x10^{-4}	1	Granville-Phillips -XXXXXX	Granville-Phillips - XXXXXX	CONVECTRON
LE Diff Pump Stand	Low Level Gauge	0 - 1x10^{-4}	1	Granville-Phillips -XXXXXX	Granville-Phillips - XXXXXX	CONVECTRON
Warm Sections (32)	Low Level Gauge	0 - 1x10^{-4}	32	Granville-Phillips -XXXXXX	Granville-Phillips -XXXXXX	CONVECTRON
RING						
HEBT						
	Low Level Gauge	0 - 1x10^{-3}	10	TBD	TBD	convectron type Pirani
	Ion gauge	1x10^{-3} - 1x10^{-10}	10	TBD	TBD	inverted-magnetron CCG
	RGA gauge	1x10^{-14}	5	TBD	TBD	RGA
RING						
	Low Level Gauge	0 - 1x10^{-3}	12	TBD	TBD	convectron type Pirani
	Ion gauge	1x10^{-3} - 1x10^{-10}	12	TBD	TBD	inverted-magnetron CCG
	RGA gauge	1x10^{-14}	8	TBD	TBD	RGA
RTBT						
	Low Level Gauge	0 - 1x10^{-3}	10	TBD	TBD	convectron type Pirani
	Ion gauge	1x10^{-3} - 1x10^{-10}	10	TBD	TBD	inverted-magnetron CCG
	RGA gauge	1x10^{-14}	5	TBD	TBD	RGA

VACUUM STANDARDIZATION

STANDARD COMPONENTS

- Hardware
  - Flanges
    - **Pump Mounting**
    - **Beamline**
      - **Bolted**
      - **Quick Disconnect**
    - **Gauge**
    - **Diagnostics**
  - Seals
    - **Beamline**
    - **Off-axis**
  - Bellows
    - **Beamline**
    - **Off-axis**

VACUUM STANDARDIZATION

STANDARD PRACTICES

- Design
- Materials
- Manufacturing
- Cleaning
- Inspection
- Testing

VACUUM STANDARDIZATION

STANDARD CONTROLS

- Architecture
- Elements
- Naming Conventions

  "Systems Requirements Document for Equipment, Device and Signal Naming", # SNS 102000000-SR0001-R00, Draft Aug. 9, 2000.

VACUUM STANDARDIZATION

STANDARD QUALITY ASSURANCE

- SNS Quality Assurance Plan, #SNS 102040000QA0001
- SNS Work Smart Standards
- ASTM
- AVS
- LBNL, LANL, TJNAF, LLNL, BNL, ORNL

VACUUM STANDARDIZATION

FUTURE ACTIVITIES

- Component Specifications
  - Ion Pumps - 1 spec covering large & small & controllers
  - Turbo Pumps - 1 spec covering small & controllers
  - Roughing Systems - 1 spec covering cart & stations & controllers
  - Getter Pumps - 1 specs -large & controllers
  - Gauges - 1 spec covering TC & Ion gauges & controllers
    1 spec covering RGAs & controllers
  - Test Carts - 1 spec covering leak test cart & controllers
- Practices
  - Cleaning Procedures - 1 for each type utilized by institution
  - Welding/Brazing Procedures - 1 for each type utilized by institution
  - Bake-out Procedures - 1 for each type utilized by institution
- Provide Copy or prepare Material Data Sheets / referenced processes

VACUUM STANDARDIZATION

FUTURE ACTIVITIES

- Define component quantity, location and delivery requirements
- Define SNS assembly / installation requirements

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VACUUM STANDARDIZATION

ROUGHING PUMP CART

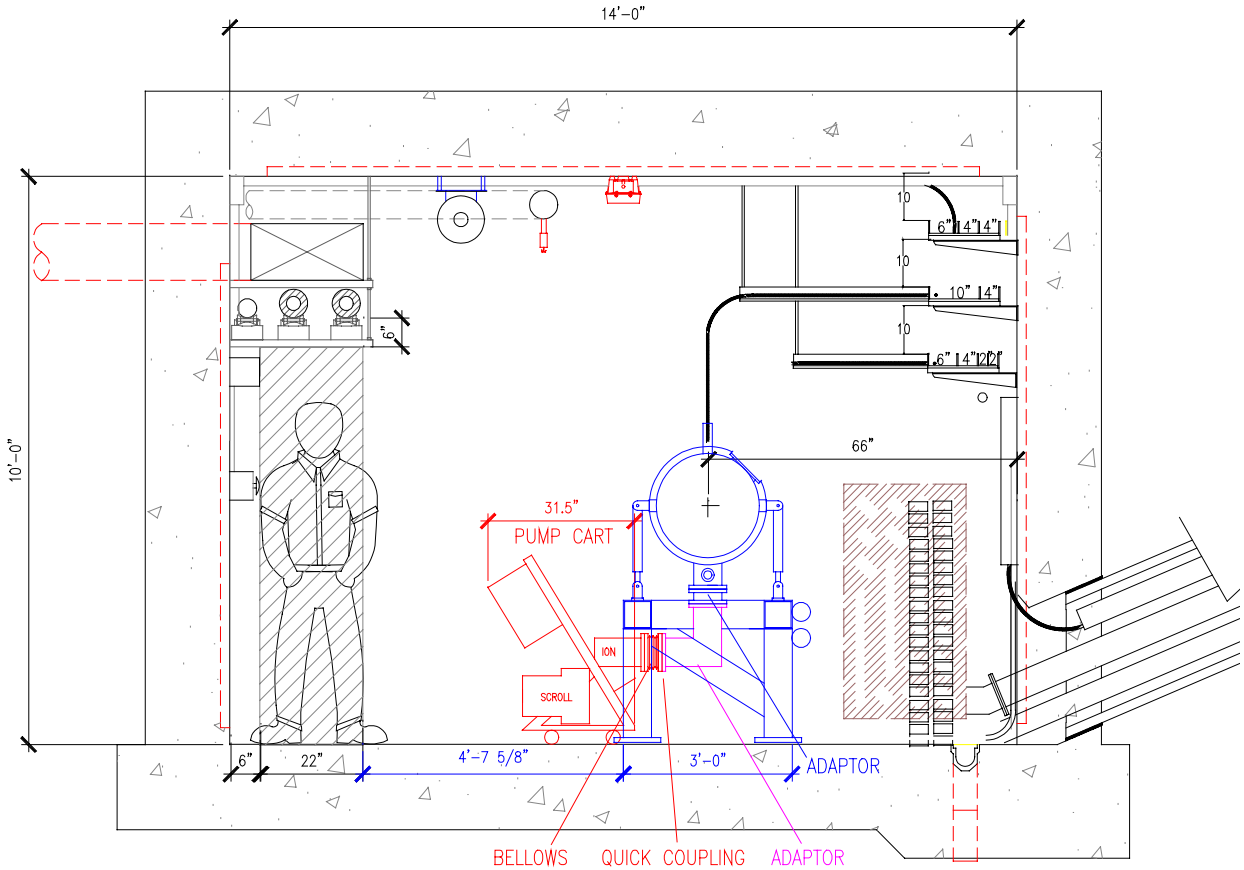
LAYOUT PROPOSAL

Michael Hechler

August 15 - 16, 2000

VACUUM STANDARDIZATION

DTL CART



DTL TUNNEL CROSS-SECTION - BASELINE

VACUUM STANDARDIZATION

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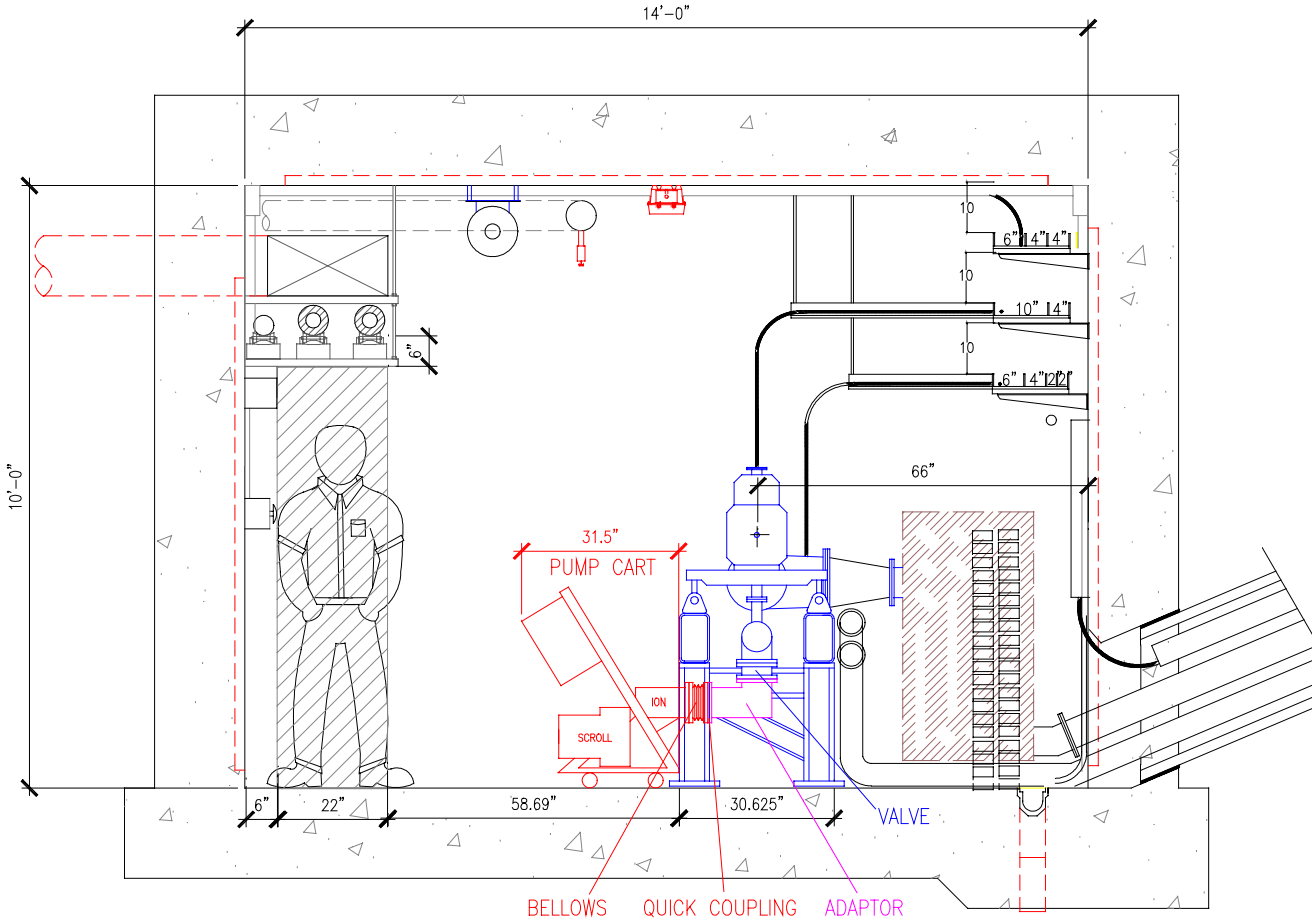

CCL TUNNEL CROSS-SECTION - BASELINE

VACUUM STANDARDIZATION

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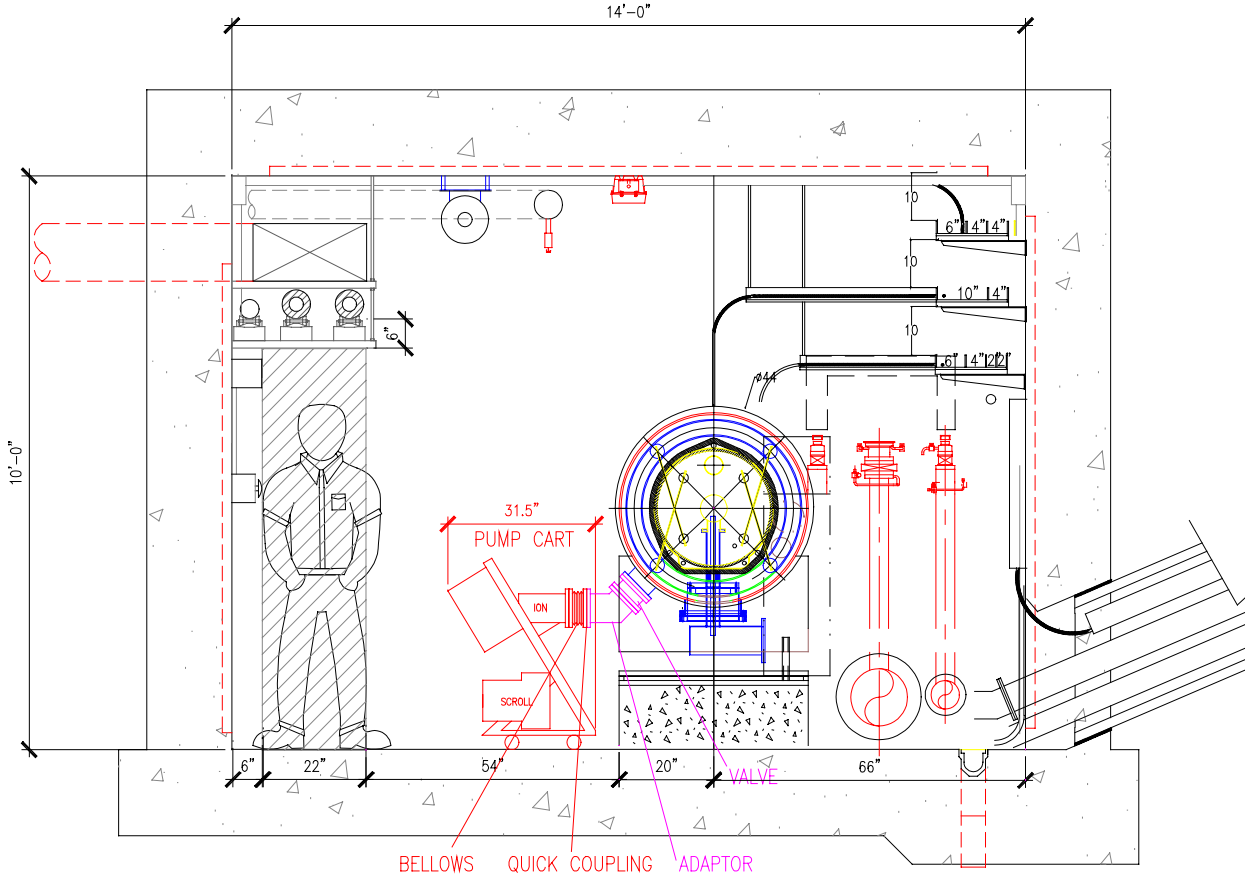
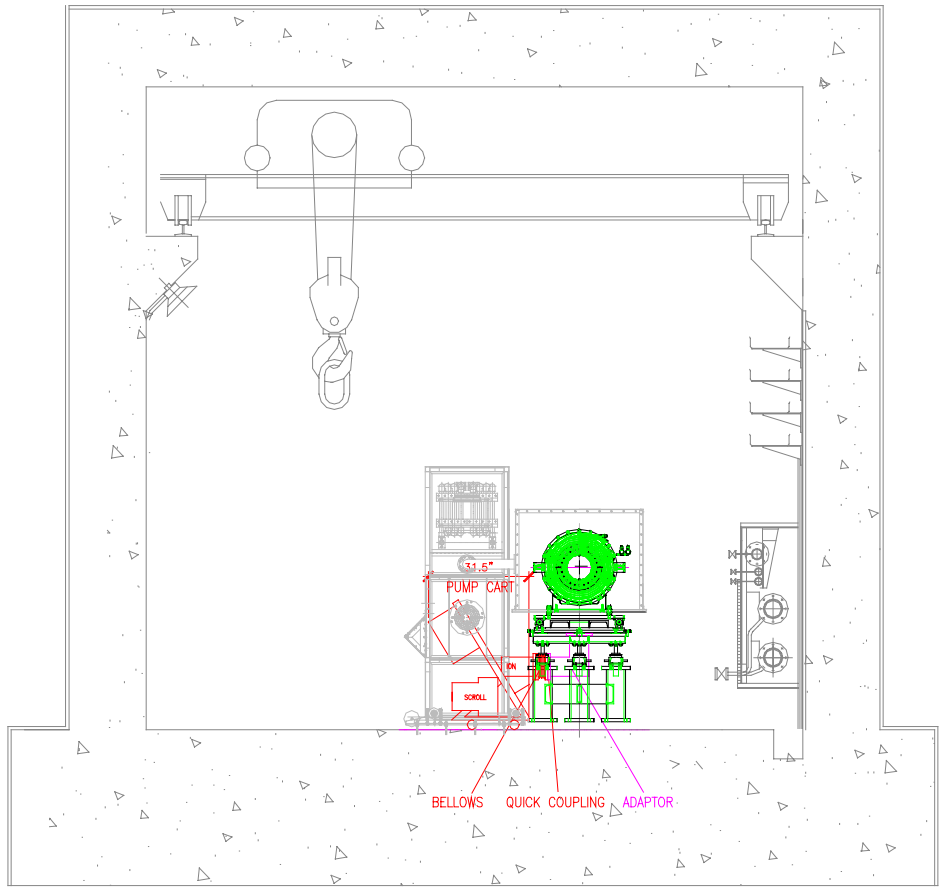


SCL TUNNEL CROSS-SECTION - BASELINE

VACUUM STANDARDIZATION

RING TUNNEL CLEARANCES

RING CAR



RING TUNNEL – 17' WIDE