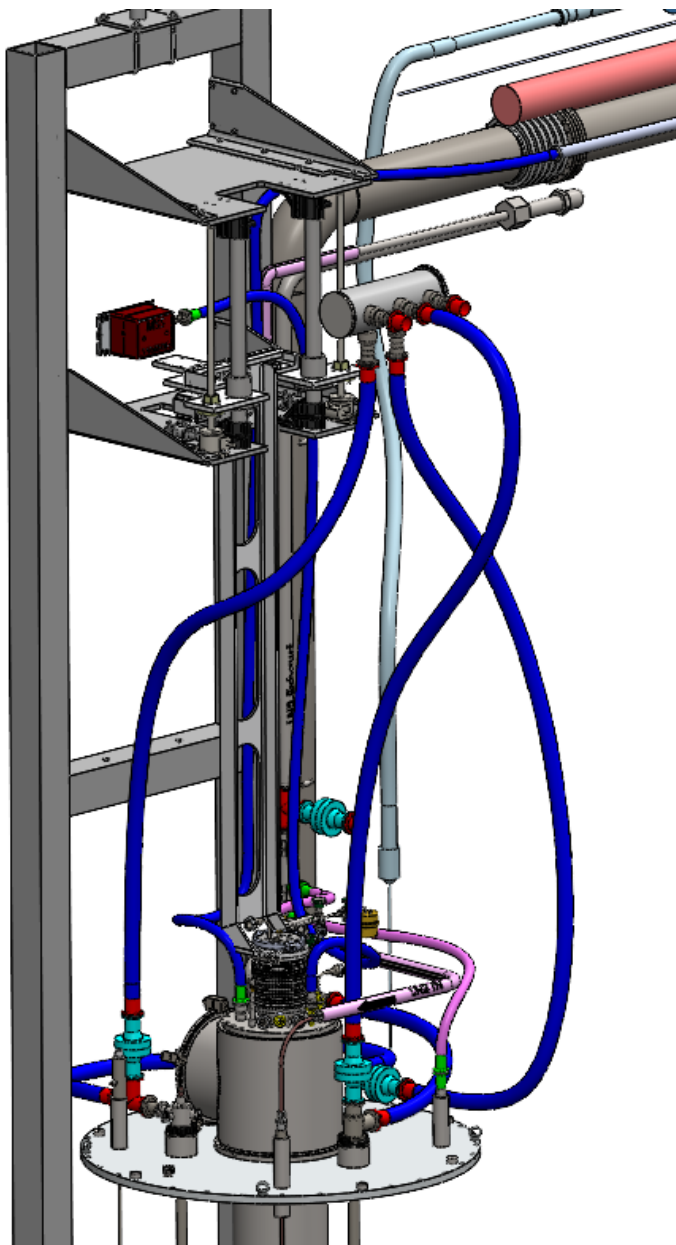
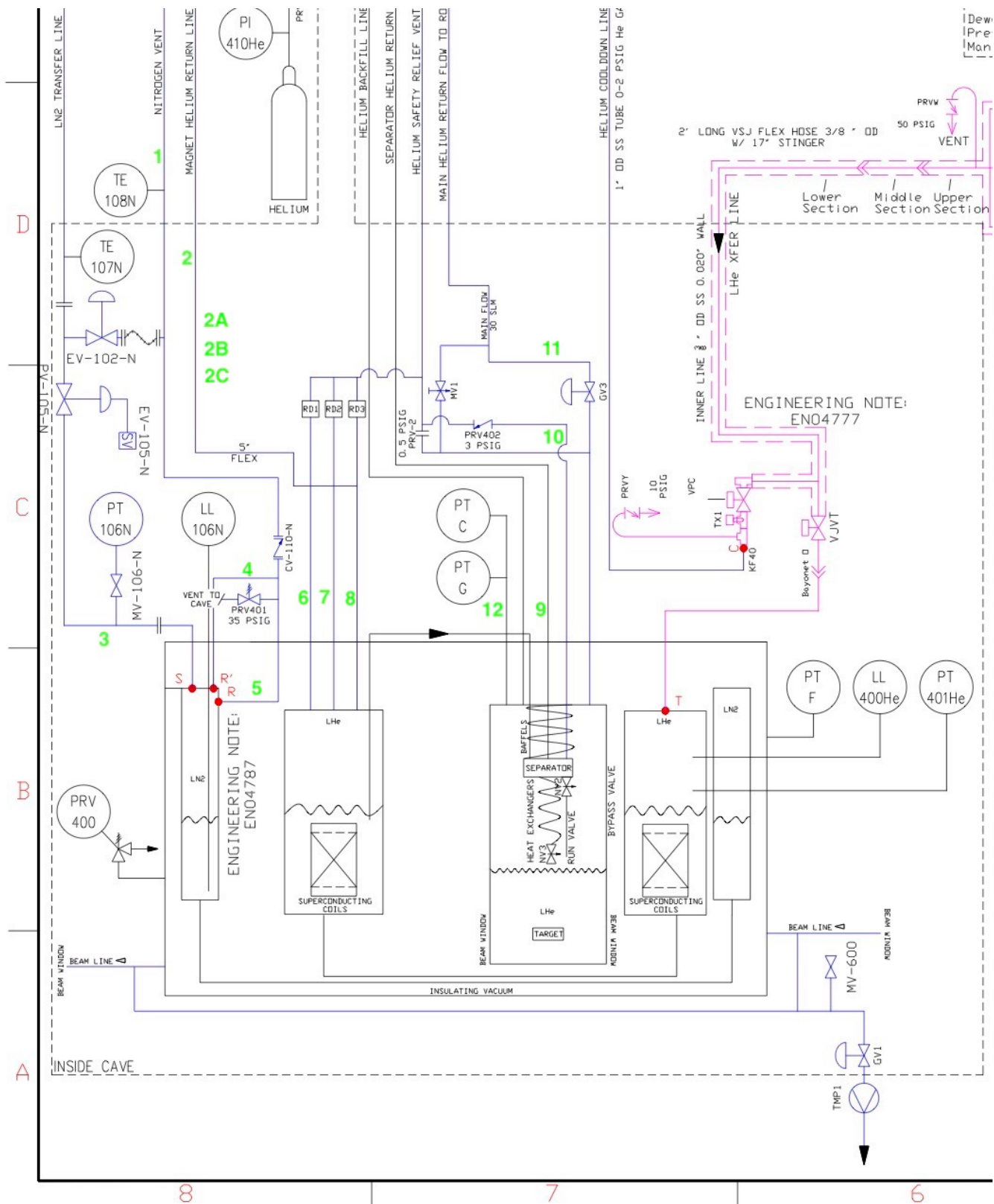


P&ID Information in the Cave NM4

Annotated section from the diagram from docdb (original file: <https://seaquest-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=5834>)



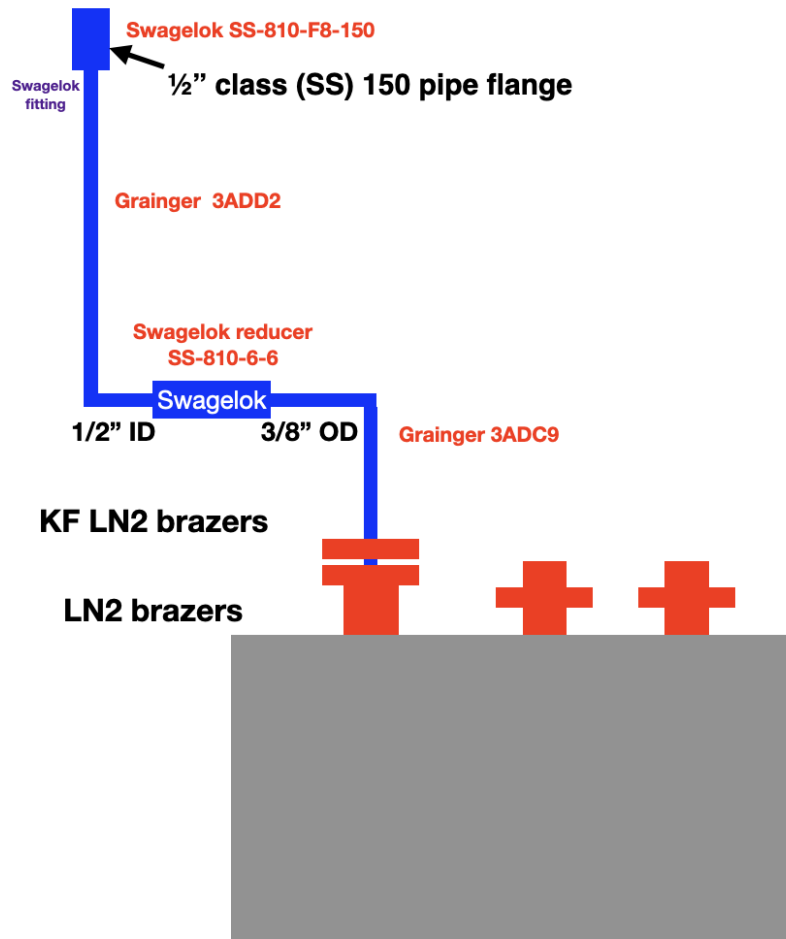


Piping-specs for purchasing

Item #	P&ID code /name	Section	Description	Length (inches)	He /N2 /Type	/Vendor Product	Part Number	Eng. Note Availability
1								
	RD1, RD2, RD3	C8	Rupture/Burst disks	N/A	He	OsecoElfab https://www.osecoelfab.com/product/union-holder or https://www.contdisc.com/products/union-holder-assembly/	2" Union Disk holder	
2A	Magnet He return line	D8	KF-40 Flex hose (1.5" NPT Braided)	36		Mc-Master Carr	5793K17	
2B	Magnet He return line	D8	KF-40 Flex hose (1.5" NPT Braided)	36		Mc-Master Carr	5793K17	
2C	Magnet He return line	D8	KF-40 Flex hose (1.5" NPT Braided)	24		Mc-Master Carr	5793K17	
3	Copper Tubing / MV-106-N	C8	LN2 supply using Copper tube [OD < 1mm] (brazing to KF)	180	LN2	Mc-Master Carr	8955K261	
4	Connecting to CV-110-N https://www.checkall.com/PDFfiles/Catalog.pdf	C8	KF 25 flex hose	24	N2	Mc-Master Carr	5793K15	
5	Connecting to CV-110-N	C8	KF 25 flex hose	36	N2	Mc-Master Carr	5793K15	
6,7,8	RD1/2/3 to He Safety Relief Vent	C7	3 x KF40 flex hoses (1.5" NPT Braided)	100	He	Mc-Master Carr https://www.mcmaster.com/5793K17/	5793K17	
9	Separator	C7	KF 25 flex hose (connecting separator outlet to separator pump) (1" NPT Braided He)	100	He	Mc-Master Carr	5793K15	
10								
11								
12	PTC, PTG	C7	KF 16 flex hose (connecting the baratron brick)	135	He	Mc-Master Carr	5793K64	
			Other items					
13	KF-40 O'ring (Qty:20)			N/A		Kurt J. Lesker	QF40-150-SRV	
14	KF-25 O'ring (Qty:8)			N/A		Kurt J. Lesker	QF25-100-SRV	
15	KF-16 O'ring (Qty:4)			N/A		Kurt J. Lesker	QF16-075-SRV	
16	KF-40 Over Pressure ring (Qty:20)			N/A		Kurt J. Lesker	QF40-150-OPR	
17	KF-25 Over Pressure ring (Qty:8)			N/A		Kurt J. Lesker	QF25-100-OPR	
18	KF-16 Over Pressure ring (Qty:4)			N/A		Kurt J. Lesker	QF16-075-OPR	
19	KF-40 EVAC (Qty:20)			N/A		Kurt J. Lesker	QF40-150-CCL	
20	KF-25 EVAC (Qty:8)			N/A		Kurt J. Lesker	QF25-100-CCL	
21	KF-16 EVAC (Qty:4)			N/A		Kurt J. Lesker	QF16-075-CCL	
22	KF-40 to 1.5" FPT (Qty:12)			N/A		LoCo Science	LS-KF40-FNPT-1500-S	
23	KF-40 to 1.5 MPT (Qty:7)			N/A		LoCo Science	LS-40-MNPT-2000-S	
24	KF-25 to 1" FPT (Qty:6)			N/A		LoCo Science	LS-KF25-FNPT-1000-S	

25	KF-16 to 3/4" FNPT (Qty:2)			N/A		LoCo Science	LS-KF16-FNPT-0750-S	
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LN2 Fill Line



1. 3/8" OD tube: <https://www.grainger.com/product/GRAINGER-APPROVED-50-ft-Welded-304-Stainless-3ADC9>
2. 3/8" to 1/2" converter: <https://products.swagelok.com/en/c/straights/p/SS-810-6-6>
3. 1/2" ID tube: <https://www.grainger.com/product/GRAINGER-APPROVED-50-ft-Welded-304-Stainless-3ADD2>
4. 1/2" Class-150 SS pipe flange: <https://products.swagelok.com/en/c/straights/p/SS-810-F8-150>

Documentation from Swagelok

Flange Fitting Literature.pdf

<https://www.swagelok.com/downloads/webcatalogs/en/ms-02-200.pdf>

<https://www.swagelok.com/downloads/webcatalogs/en/ms-01-140.pdf>

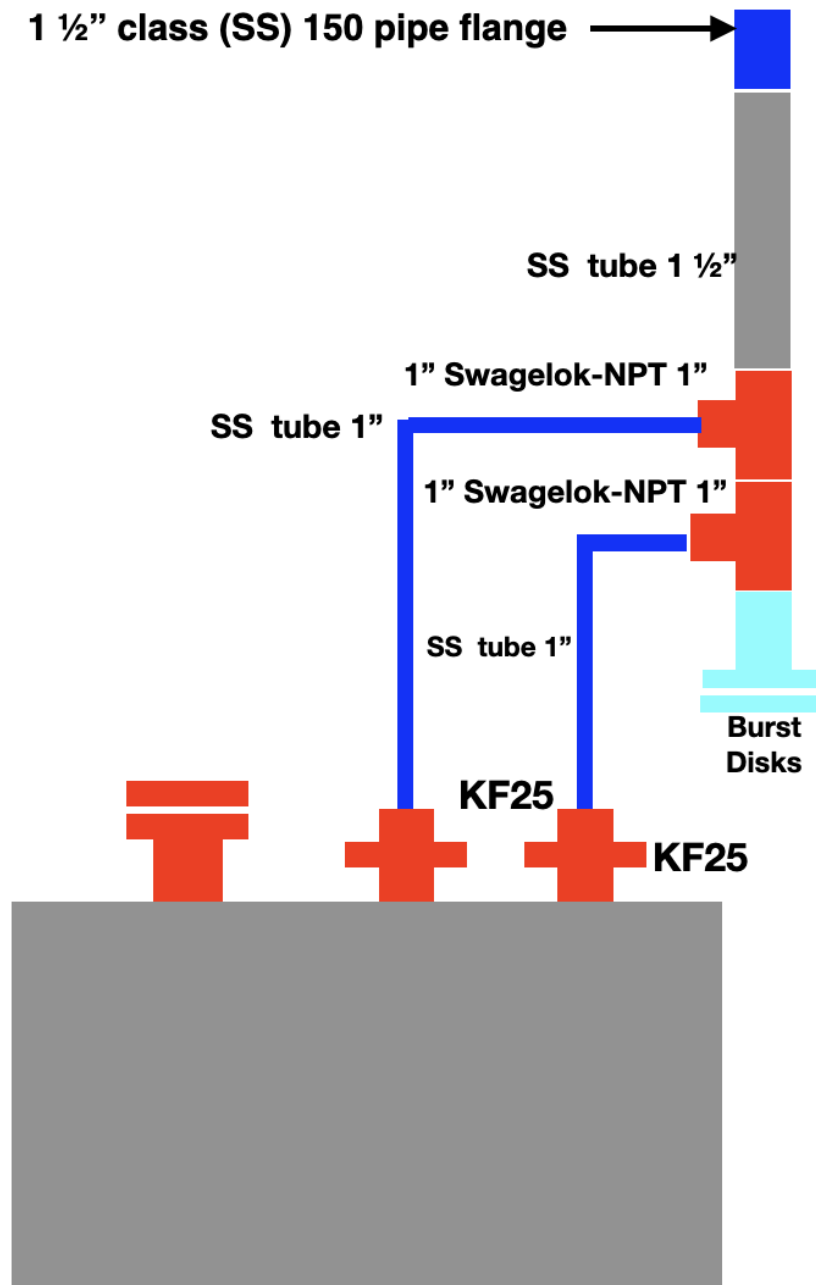
Documentation from Grainger are included in those products links.

Documentation from McMaster

89495K345 Material Cert.pdf

89495K345 Certificate of Compliance.pdf

LN2 Relief Line



LN2 Manifold parts List

1	KF40 Tee	https://www.idealvac.com/Tee-KF-40-Vacuum-Fittings/pp/P101211
1	KF40/25 Reduser Tee	https://www.idealvac.com/Tee-Reducer-KF-40-to-KF-25-Vacuum-Fittings/pp/P101633
1	KF40/25 Reduser Elbow	https://www.idealvac.com/Elbow-90-Reducer-KF-40-to-KF-25-Vacuum-Fittings/pp/P109597
4	EVAC clamp KF 40	https://www.idealvac.com/EVAC-Chain-Clamp-for-Converting-Elastomer-Seal-NW40-KF40-to-UHV-Metal-Seal/pp/P103398

4	KF 40 Knife edge oring	https://www.idealvac.com/EVAC-Aluminum-Metal-Knife-Edge-OUTER-Seal-NW40-KF40-for-UHV-Seal-PN-NW-40-MS-A/pp/P103402
2	EVAC clamp KF 25	https://www.idealvac.com/EVAC-Chain-Clamp-for-Converting-Elastomer-Seal-NW25-KF25-to-UHV-Metal-Seal/pp/P103397
2	KF 40 Knife edge oring	https://www.idealvac.com/EVAC-Aluminum-Metal-Knife-Edge-OUTER-Seal-NW25-KF25-for-UHV-Seal-PN-NW-25-MS-A/pp/P103401
1	2" NPT to KF 40	https://www.idealvac.com/Adapter-KF-40-to-2in-NPT-Male/pp/P106111

Information from Swagelok

Hose Literature:

[FJ Hose Literature.pdf](#)

[FJ Hose Literature - Updated 1.7.22.pdf](#)

Swagelok web catalog specifications: <https://www.swagelok.com/downloads/WebCatalogs/en/MS-01-180.PDF>

Sample certifications from Swagelok (Material specs & Compliance)



Flanges

1. SS-810-F8-150 <https://products.swagelok.com/en/c/straights/p/SS-810-F8-150>
2. SS-810-6-6 <https://products.swagelok.com/en/c/straights/p/SS-810-6-6>

Documentation for Flanges: [Flange Fitting Literature.pdf](#)

Tubes

1. [Tube Fittings Catalog.pdf](#)

Quotes:

[Sales Quotation_20071495_20220107_95715AM.pdf](#) (without flanges)

[Sales Quotation_20071495_20220113_24630PM.pdf](#) (with flanges)

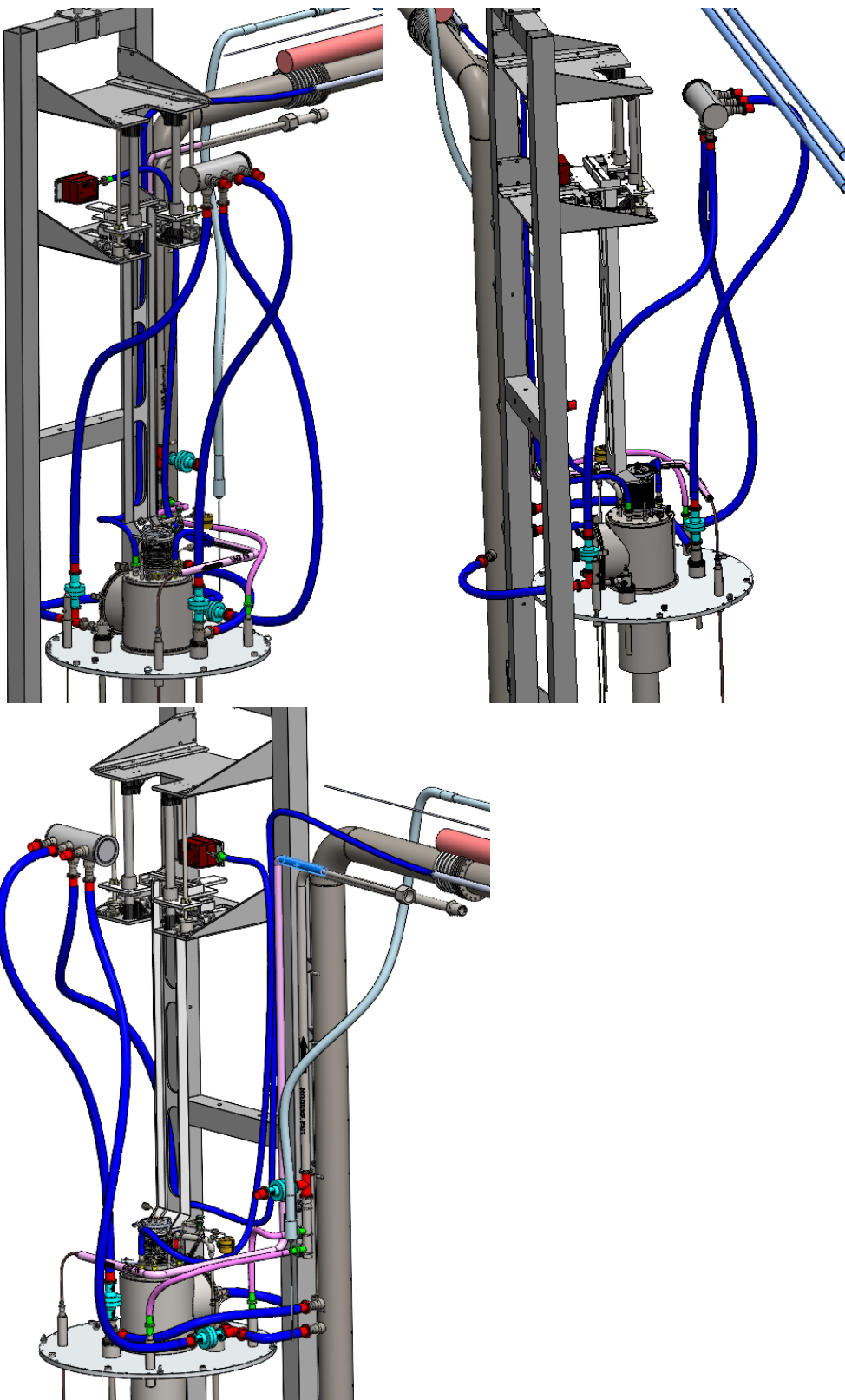
[Sales Quotation_20071980_20220114_83635AM.pdf](#) (All parts from Swagelok identified 01/14/2022 : two hoses, 3/8"-1/2" reducer, pipe-flange)

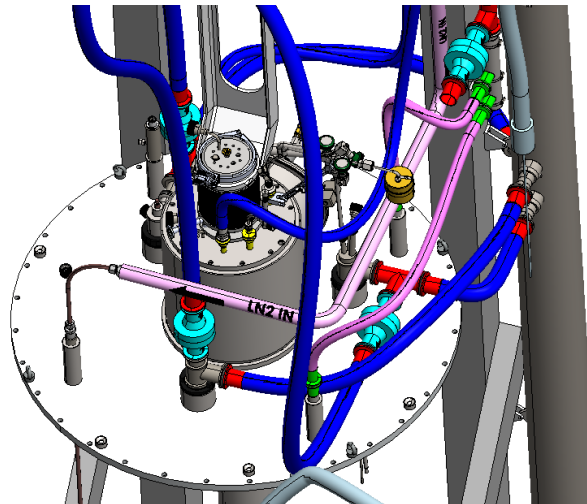
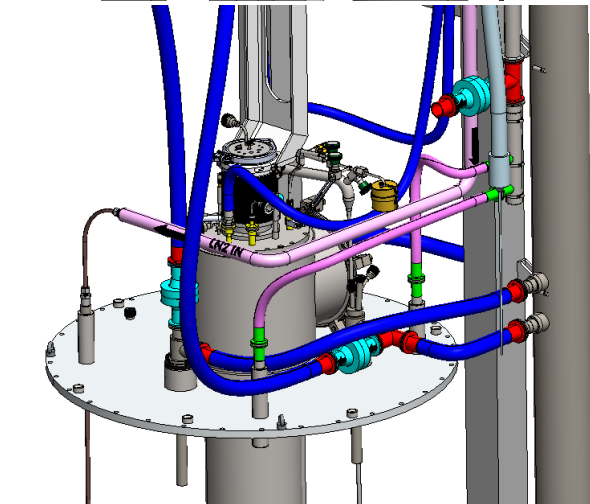
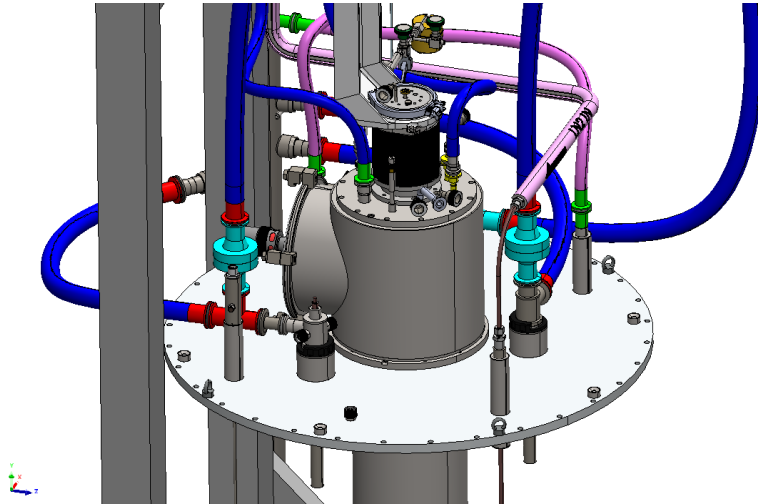
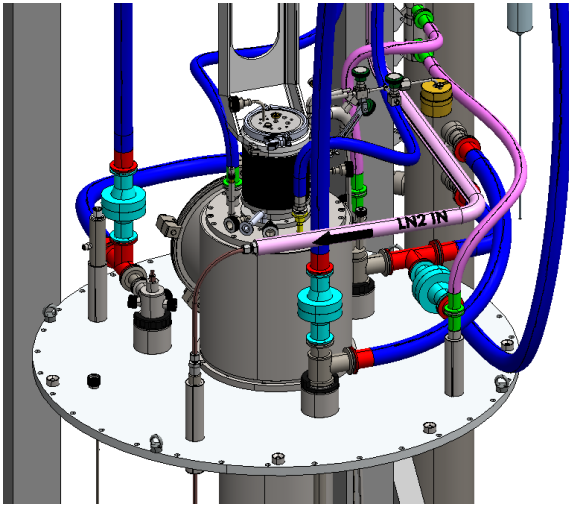
Color Code :

Blue: Helium

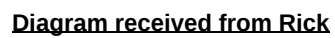
Pink: Nitrogen

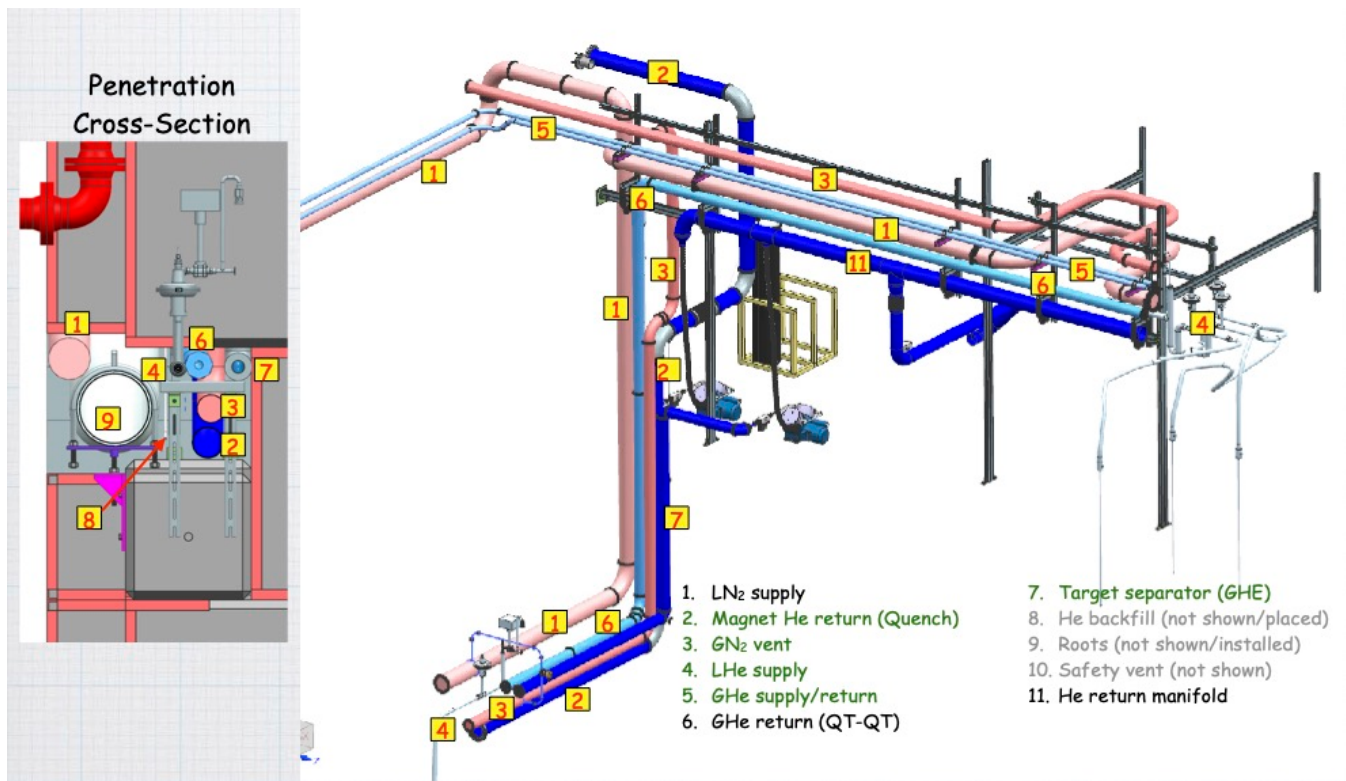
Screenshots from the 3D Model (Solidworks)





Another annotated diagram





Useful information from communications with vendors

24 Jan 2022

"Meyer and they can probably handle a few more little jobs from us if needed. Right now, we are waiting for a quote from them on the LHe riser. We were also going to ask them for a quote on one of the pipes. They are also working on putting the fridge back together. The N₂ relief might be a good option for them to make so let me know if we want to get quote from them."