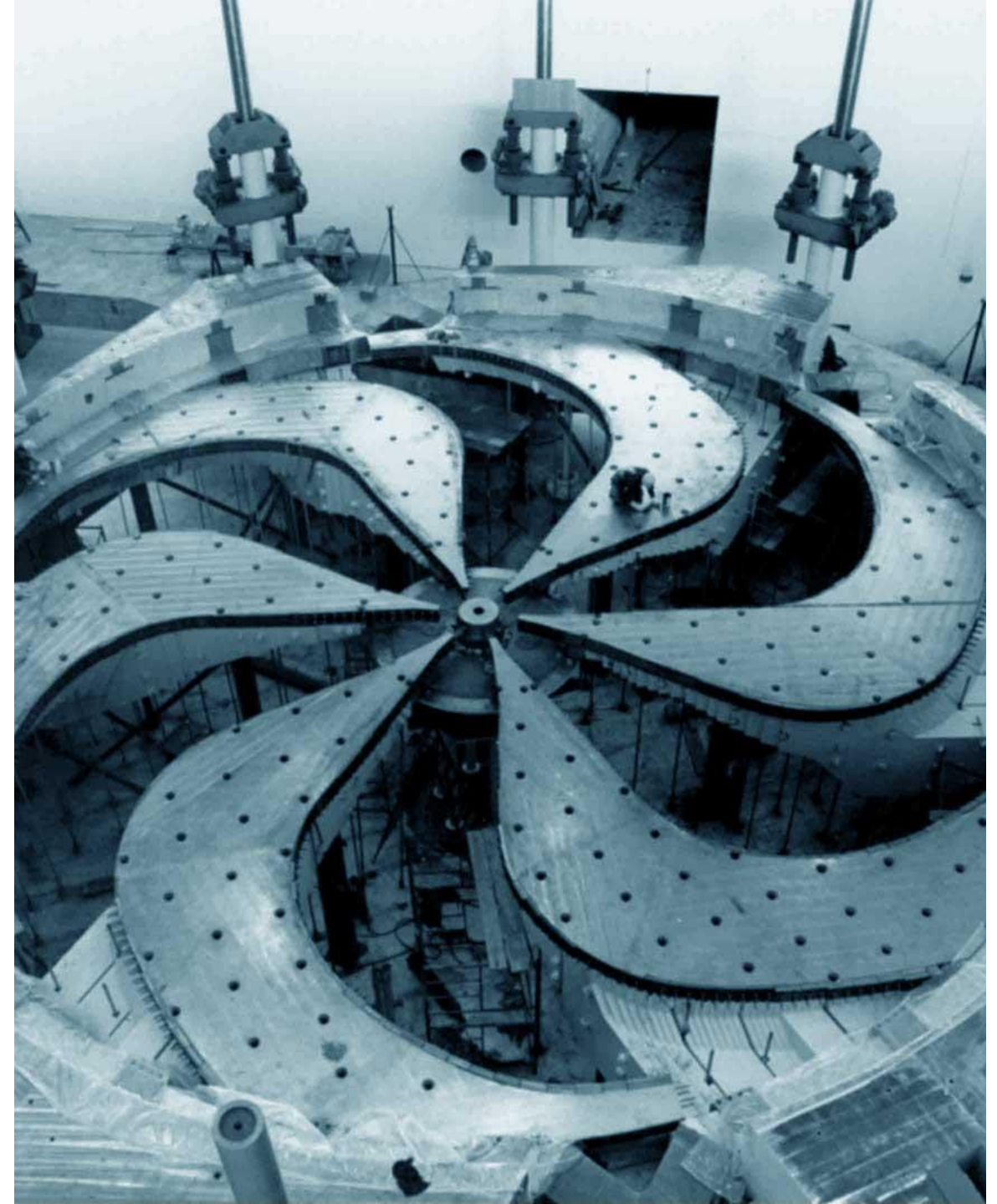


RFD-CM Drawing Status and Strategy

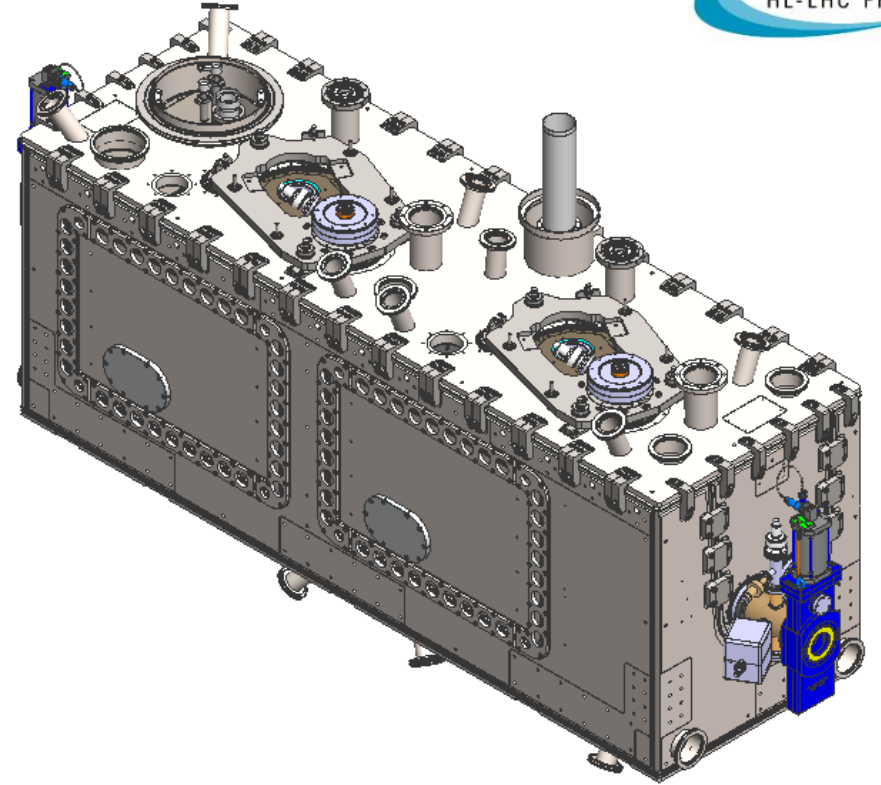
Ben Matheson
SRF

2023-09-27



TRIUMF's General CAD Strategy

- TRIUMF uses SOLIDWORKS/PDM for 3D models, drawings, and CAD workflow.
- We have created a new "XHL" number set exclusively for HL-LHC files.
- For the cryomodule, we will create TRIUMF top level assemblies but use CERN's models and drawings for sub-assemblies and parts.
- Tooling will use a mixture of TRIUMF and UK/CERN models and drawings.



*TRIUMF Top level model,
XHL0100*

CERN Sub-Assembly Status



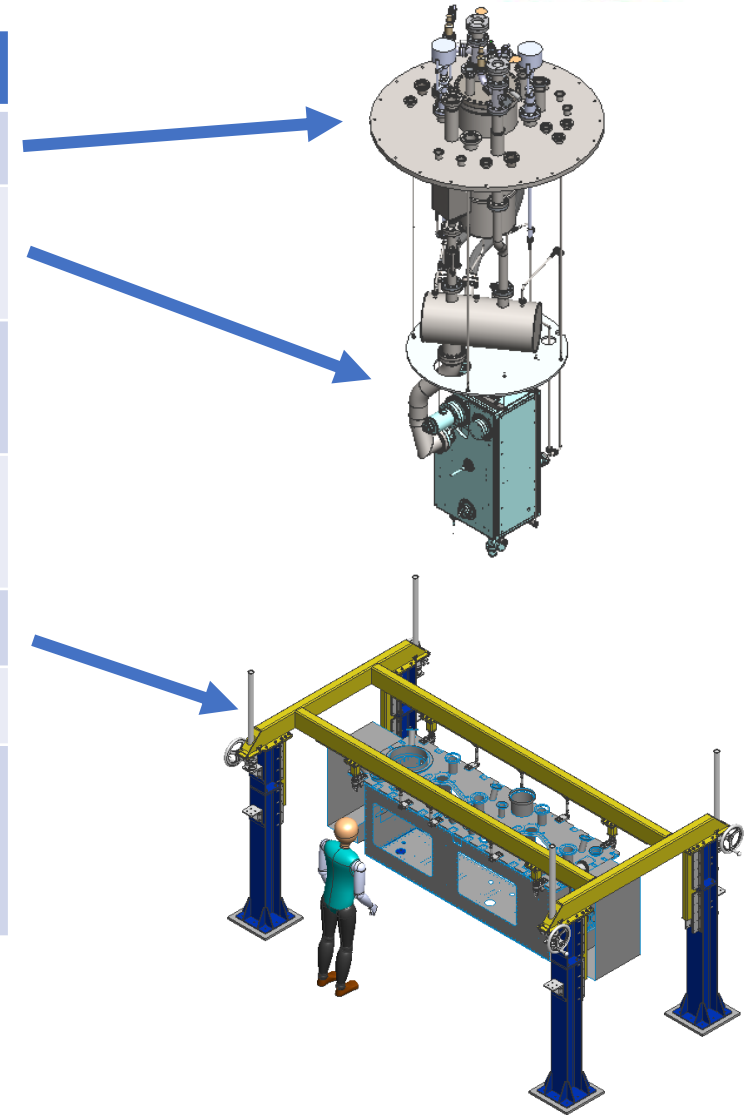
The following table is a list of critical sub-assemblies required by TRIUMF.

Assembly	CERN Part Numbers	Status
Warm magnetic shield	ST1667814	Unreleased. awaiting revision
Cryo lines and support	ST1633544 ST1720007 ST1720023 ST1762369	Unreleased
Tuner System (tank side)	ST1063566 ST1441042	Released, but revision change expected.
MLI 2K/50K	ST1555934* ST1759753* ST1731450	50K not released. 2K status is unknown
Thermal shield	ST1661462	Unreleased

**There are currently two 2K MLI models in assembly step 8*

Tooling Status

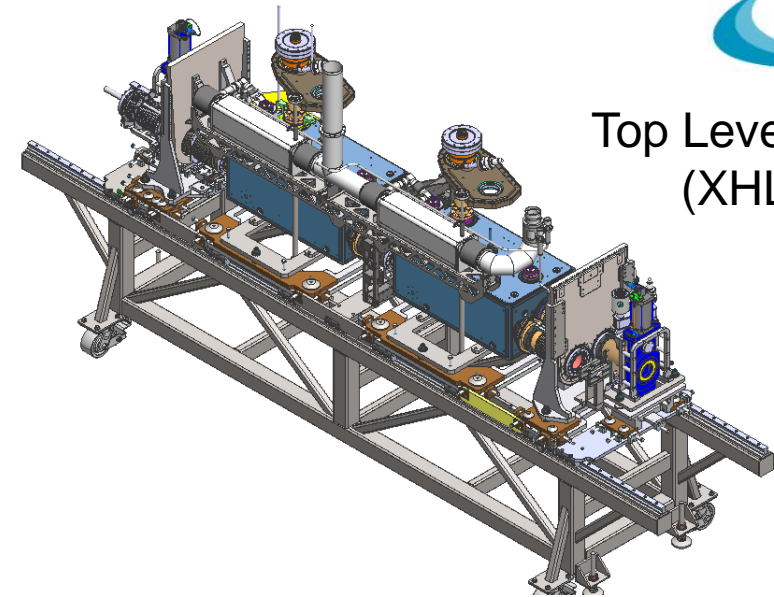
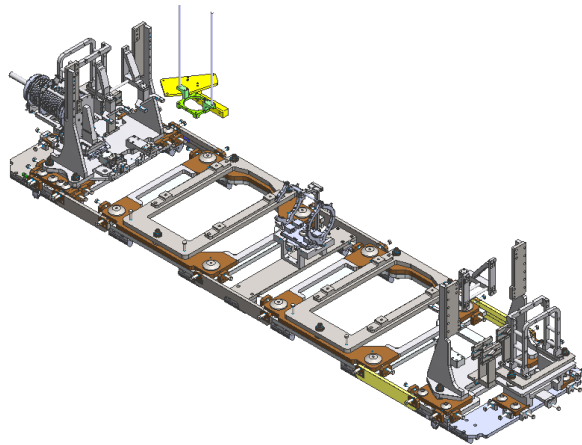
Name	Number	Status
Cryostat insert	IRF5110	Released. Assembly complete
Cavity Cold Test	IRF5087	Released. Parts complete, ready for assembly
Dummy Cavity	IRF5673	Drawings released, ready for manufacturing
String Assembly Cart	XHL0200	TRIUMF drawings in final review. UK drawings ready for manufacture
Lid assembly frame	XHL0150	Detailed design ongoing
Tank cart	N/A	Conceptual design ongoing
Cavity Handling Frame	N/A	Purchased Lifting cart received. Cavity attachment in conceptual design.



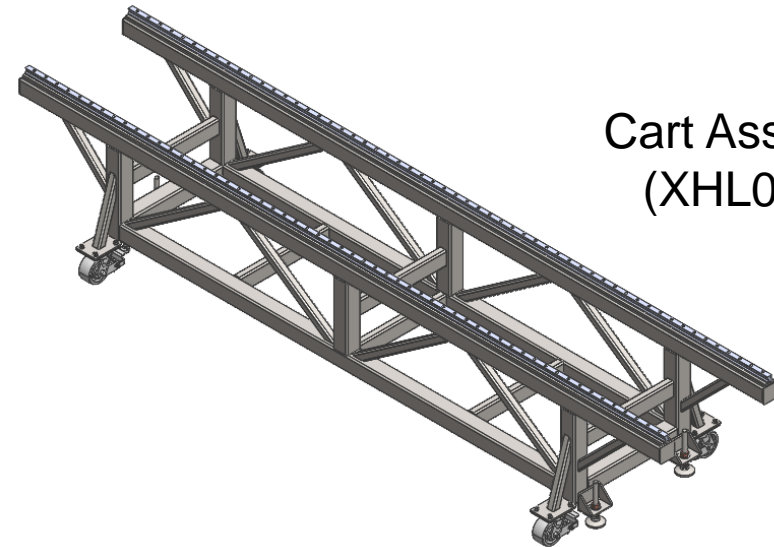
Tooling Status

String Assembly Cart example

- Top level assembly complete but not released
- Cart assembly is in final drawing review.
- Upper fixtures have been provided by the UK and are ready for manufacturing.
(Big thanks to the Daresbury team!!)



Top Level Assembly₅
(XHL0200).

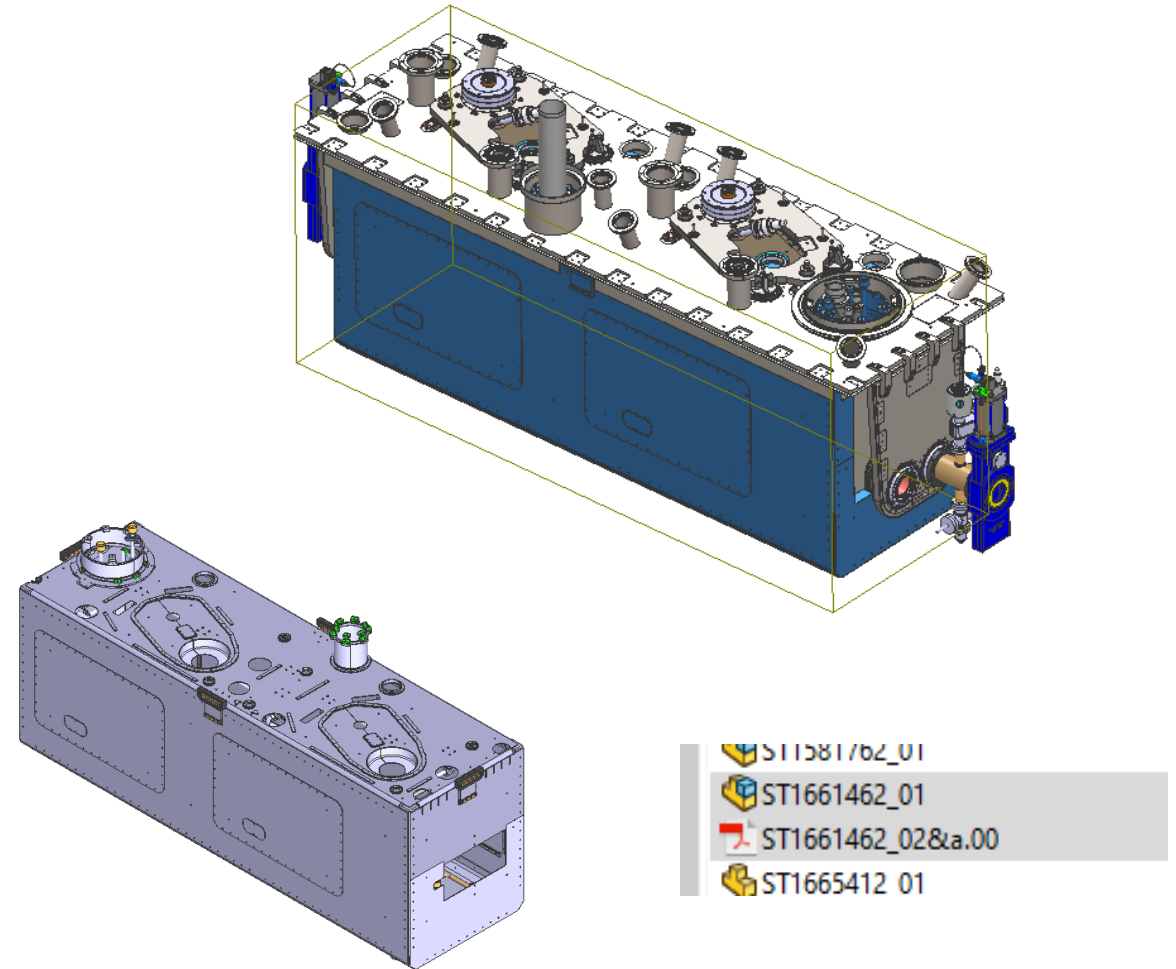


Cart Assembly
(XHL0201)

Importing CAD from CERN

- 3d models will be downloaded from CERN as step files and saved into SolidWork/PDM using the CERN ST numbers.
- Models will be integrated into TRIUMF assemblies in such a way that they are easily replaceable.
- Drawings will be downloaded as 2d PDFs from the Smarteam/PLM database.
- Drawings will use the ST name and be saved in the same PDM location as the corresponding part file.

Example Part: ST1661462
Thermal screen



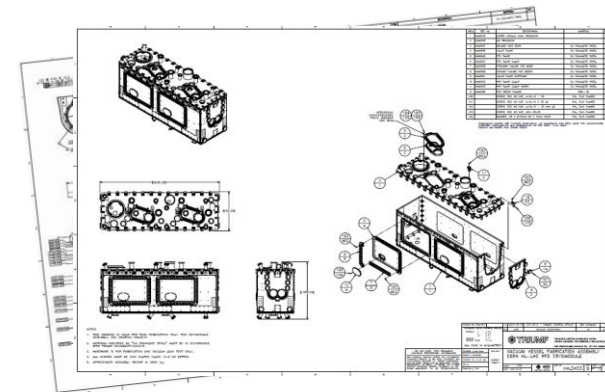
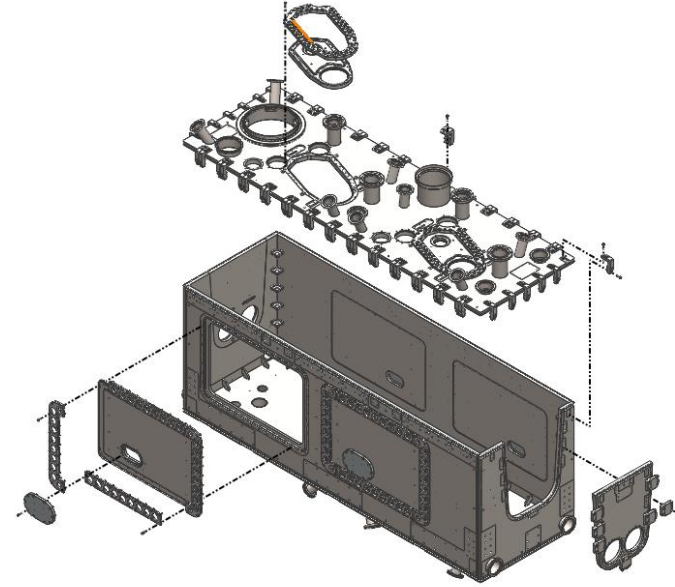
OVC Drawings

- TRIUMF OVC drawings have been released and sent out for tender. A vendor has been selected and manufacturing will begin once material arrives.
- Early on we decided that to have more control over the vendor we would create TRIUMF drawings for the OVC.
- We found it very cumbersome converting CERN ISO drawings directly into TRIUMF ASME standard.
- In hindsight, converting to ASME standards is unnecessary. If we did this again, we would use CERNs drawings directly.

XHL5655 - VACUUM VESSEL FABRICATION ASSEMBLY



7



Challenges

CERN Design Workflow

- The primary challenge TRIUMF faces is working with unreleased design workflows.
- Ideally TRIUMF would not start manufacturing until we have a completely released cryomodule package.
- We understand this is not feasible, but due to budget and timeline constraints, TRIUMF needs to begin manufacturing.
- At the very least we need things to be released at the major sub-assembly level, with the understanding that any changes are a significant challenge for TRIUMF.
- Critically we need all CERN part numbers fixed.

Currently we do not have confidence in what is released and what is not released.

Example: Warm Magnetic Shield. We were under the impression that this was released. We are in the final stages of procurement, and need released drawings ASAP

ST1667814_01 a.00 This revision is not the latest available for this document. Go to: b.00
 LHC-RFD WARM MAGNETIC SHIELD
 Responsible: Irene Alonso Romero Team: CAD-EN-MME

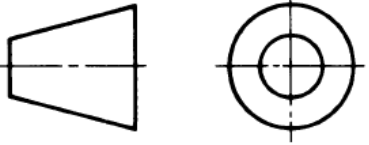
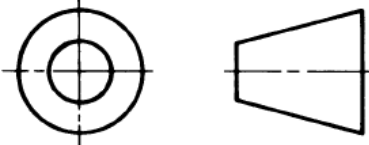
EDMS SPECIFICATIONS					
No	TITLE	EDMS REFERENCE			
1	Engineering Specification: Warm Magnetic Shield for crab cryomodules	210126 v.1.0			
	WHERE USED	Not Applicable (Last checked: 2023-09-19 08:51)			
DESIGNATION		DESIGNED	V. ALONSO ROMERO		FORMAT
LHC-RFD WARM MAGNETIC SHIELD		CHECKED			A2
		RELEASED			SCALE
		APPROVED			1:10
EQUIPMENT CODE LHCACFWM0058 - deflected (2019) - Warm Magnetic Shield		DESIGNED	2023-09-19		
	REFERENCES	Doc No: ST1667814_02	INDEX	LABEL	QAC
		LHCACFWM0058	AA	NOT VALID FOR EXECUTION	SHEET
					1/1

There are some minor components with SPS descriptions. Will these numbers change?

07	162	Bezel Disc M6 CRAB CAVITY RFD - SPS	L
08	162	CSK Hex Head Vented Screw M6x16 Vis Tête CHC Fraisée Percée M6x16	Jeveka
09	32	Bezel Disc M5 CRAB CAVITY RFD - SPS	L

Challenges

1st angle vs 3rd angle projection

Projection	Symbol
First angle	
Third angle	

- CERN uses 1st angle projection, TRIUMF uses 3rd angle projection.
- This affects the fundamental interpretation of drawings and could lead to critical errors.
- Both systems are correct. Care must be taken interpreting drawings.

ASME vs ISO drawing standards

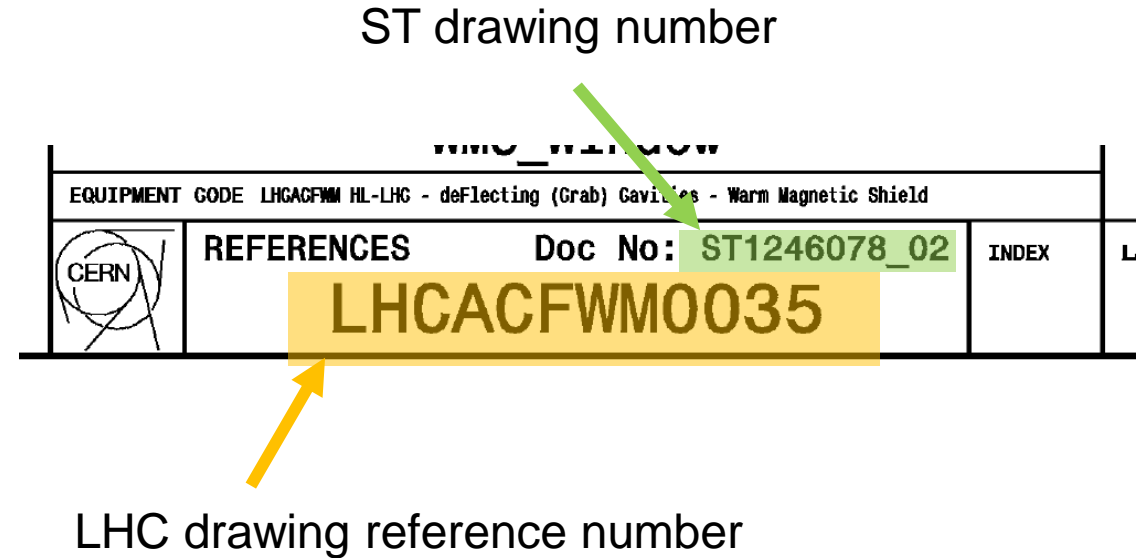


- CERN's drawings are made to ISO standard, TRIUMF drawings are based on ASME standards.
- There are some differences, but both systems are intuitive and similar in symbology.
- Again, care must be taken interpreting drawings.

Challenges

CERN LHC vs ST file naming

- CERN uses a “ST” part number format for models and drawings, but drawings get an additional “LHC” (CDD) drawing reference number.
- The LHC number is the primary reference in other documentation.
- Downloaded step files use the ST naming format.
- ST drawing numbers are not searchable in EDMS.
- Both ST and LHC numbers are searchable in PLM/SmarTeam database and appear in drawing title blocks and BOMs.



*To be correctly referenced in TRIUMF’s system, models and drawings **must** have the same file name.*

We will use the ST file name for all models and drawings.

Challenges

Other minor challenges:

- Different PDF quality between Smarteam/PLM and EDMS downloads
 - *EDMS PDFs are raster based, ST/PLM are vector based*
 - *For most instances, vector format is preferred.*
 - *See appendix slides 2 and 3*

- Only some files are available in PLM
 - All files are available in SmarTeam database

- PDFs download from SmarTeam database have unusable file names.

- Cannot search ST numbers in EDMS

Summary

- OVC drawings have been released. A vendor has been selected and manufacturing will commence soon.
- Warm Magnetic Shield vendor has been selected. We need released drawings ASAP.
- TRIUMF is waiting for released drawings of other major sub assemblies.
- Our tooling designs are advancing. More focus on fabrication in the upcoming months.
- There are challenges working with different ISO/ASME standards.
- There are challenges working with CERN's naming conventions and document management systems.

Thank you
Merci

www.triumf.ca

Follow us @TRIUMFLab



Appendix Slide 1

Workflow Challenge Example:

- Example: Warm magnetic shield, ST1667814 (LHCACFWM0058)
- Listed as released in excel file EDMS 2825848
- EDMS and SmarTeam show “In Work” status (b.00 in ST)
- Drawings shows “Change in the shape of one lateral plate”
- 2023-09-18

This drawing may




A	2023-09-18	I. Alonso Romero		Change in the shape of one lateral plate
IND.	DATE	NAME	ZONE	MODIFICATION

- We were not aware of any changes to the lateral plate.
- We do not know what this change is.
- Note: TRIUMF has already gone out for tender with unreleased drawings with the understanding that any change will be minor.



Appendix Slide 2

PDF Downloads

File names as downloaded from SmarTeam. Note stings does contain correct ST number and revision

 Conversions_StepOperational_2022-42_ST1631733_01&a.00_18128c2a55a5525f21449a8fc848fc52caa12e25f8ecb86c2b8f5137ae895594_20221215105552.hoops
 Conversions_DxfOperational_2022-42_ST1631733_02&a.00_147306a3a75e6fd9db003f4b61bcac35adb945efa743914a0ce3903911aae792_20221018171331.dxf
 Conversions_PdfOperational_2022-42_ST1631733_02&a.00_ee459f5a9023aa2d1a7827b8edb508919194a1566b911cc8553fdfa752e07516_20221018171211.catia

Files downloaded from EDMS require manual renaming to ST number

 lhcacfwm0058-v0_plt_cpdf
 lhcacfwm0021-vAA_plt_cpdf

Appendix Slide 3

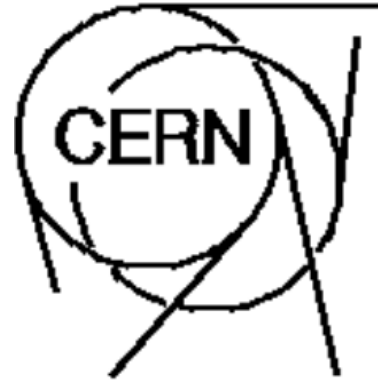
Raster vs Vector PDF Downloads

- Cannot select text in raster based PDFs
- In most cases vector format is preferred.
- For large detailed drawings, neither raster or vector are ideal. For these drawings DXF can be used.

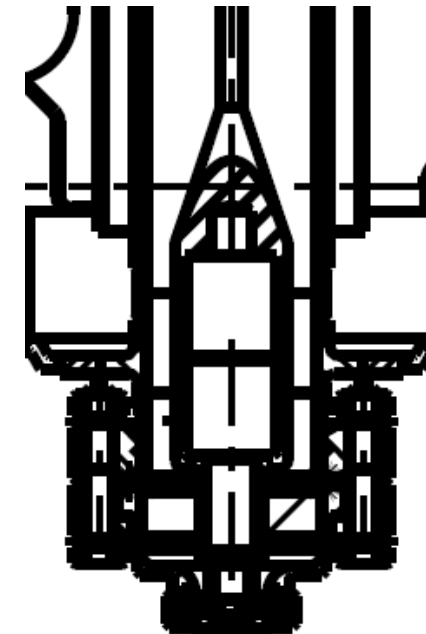
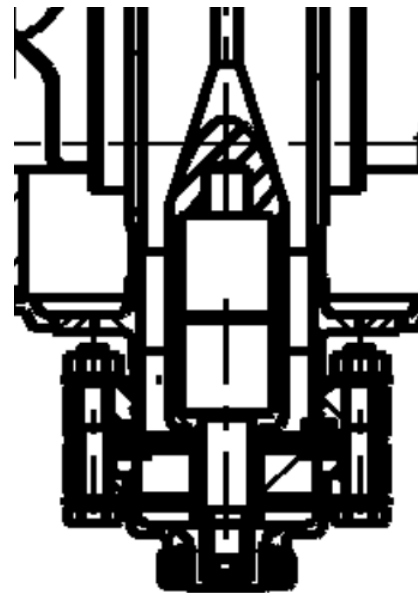
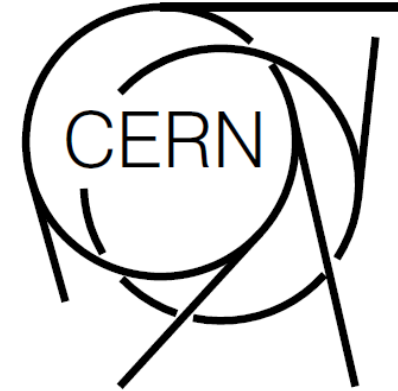
Text is clear and selectable in vector format

BILL OF MATERIALS	
	REFERENCE
TRUM	LHCACFHT0355
	ST1337040
ETMAI	LHCACFHC0324

Raster based PDF (EDMS)



Vector based PDF (ST/PLM)



DXF (ST)

