MUCOOL Collaboration Meeting 11/09/00

DESIGN AND CONSTRUCTION PLANS

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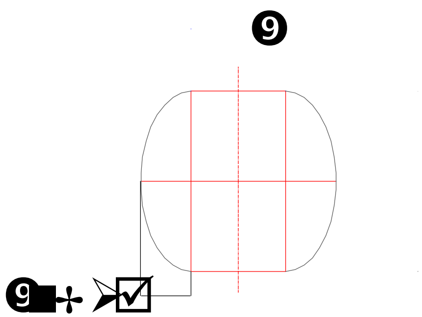
ABSORBER BASE GEOMETRY

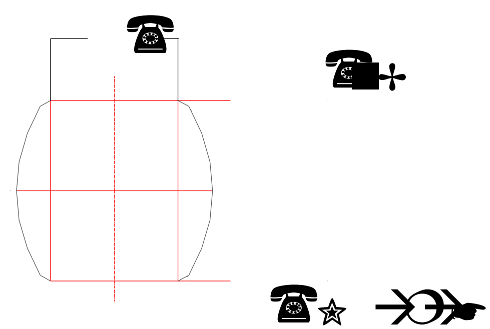
- From the “INITIAL PARAMETERS FOR STUDY 2, DESIGN A, DRAFT 4”, the geometry for the absorbers in each of the lattices are studied using the ASME design guide for pressure vessels.
- The study compares the minimum required window thickness within the maximum allowable stress value corresponding to aluminum alloys material for the absorber windows geometry.
- It is impractical to fabricate the manifold assembly portion of the absorber, on a longitudinal dimension less than of 0.03m [1.18”] for any window diameter; consequently, by this condition the hemispheric configuration is eliminated leaving the ellipsoidal and the torispherical to be considered (see tables attached).
- Manufacturers technology for forming windows to the specified parameters, particularly thickness, requires an R&D program which will explore methods that include machine tapering and perhaps chemical etching to the finish parameter.

GEOMETRY

ELLIPSOIDAL



TORISPHERICAL



ABSORBER GEOMETRY DIMENSIONS

FROM PARAMETERS FOR STUDY 2				ELLIPSOIDAL			TORISPHERICAL			FINAL
LATTICE	dl (LH_2)	D	t REQ.	rE	LE	t CALC	T	LT	t CALC	dl+2t
2.75m	m	m	m	m	m	m	m	m	m	m
1.1	0.175	0.36	200 ?	0.09	–0.01	302	0.36	0.05	535	0.17607
1.2	0.175	0.30	250	0.08	0.03	252	0.30	0.07	446	0.17589
1.3	0.175	0.26	130	0.07	0.05	218	0.26	0.09	387	0.17577
1.65m	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.1	0.105	0.22	110	0.06	–0.01	185	0.22	0.03	327	0.10565
2.2	0.105	0.20	100	0.05	0.00	168	0.20	0.04	297	0.10559
2.3a	0.105	0.18	90	0.05	0.02	151	0.18	0.04	268	0.10554
2.3b	0.105	0.16	80	0.04	0.03	134	0.16	0.05	238	0.10548
1) Dimensions less than 0,03m nullify construction										
2) Dimensions and thickness calculation are based on the ASME Standards										
3) Thickness is calculated at 1.2 atmospheres pressure										
4) Material selected is 6061 –T6 aluminum alloy										

OTHER MATERIALS

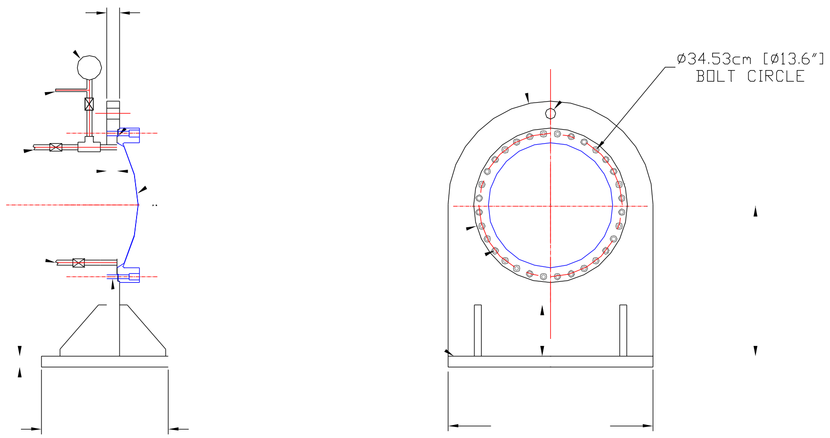
Material: Aluminum–Beryllium Alloy Spec. No. AM162 AlBeMet

FROM PARAMETERS FOR STUDY 2				**TORISPHERICAL**			FINAL	
LATTICE	dl	D	t REQ.	T	LT	t CALC	dl+2t	
2.75m	m	m	m	m	m	m	m	
1.1	0.175	0.36	200	0.36	0.05	**194**	0.17539	
1.2	0.175	0.30	250	0.30	0.07	**162**	0.17532	
1.3	0.175	0.26	130	0.26	0.09	**140**	0.17528	
1.65m	-----	-----	-----	-----	-----	**-----**	-----	
2.1	0.105	0.22	110	0.22	0.03	**119**	0.10524	
2.1	0.105	0.20	100	0.20	0.04	**108**	0.10522	
2.3a	0.105	0.18	90	0.18	0.04	**97**	0.10519	
2.3b	0.105	0.16	80	0.16	0.05	**86**	0.10517	
1) Dimensions and thickness calculation are based on the ASME Standards								
2) Thickness is calculated at 1.2 atmospheres pressure								

NEAR FUTURE PLANS

- Fabrication of windows will include sheet metal stamping and welding, although this method is les desirable because of the reduction on the pressure resistance capability of the windows for as much as 60% do to the addition of welding material and heat induced stresses in addition to the stresses produced by the forming operation.
- To facilitate the production type fabrication of the selected window(s) design the manufacturing program includes the development of a reliable quality assurance and quality control intimately related to the engineering design from the onset of the prototype fabrication that includes destructive tests at room temperature.
- Data from destructive testing of windows, whit as–built accurate measurements will be used on Finite Element Analysis (FEA) computer models to studied and develop a method of analytical–quality–controlled production.
- Current advanced instrumentation technology which includes visual aid already existing within the Mucool collaboration community shall help optimize the design meeting the channel cooling requirements.

TEST SETUP



TEST HARDWARE

- The hardware consist of:
- A strong back plate mounted on a pedestal, where the window to be tested is bolted.
- On the back of the plate pipe connections are strategically located so that water will be permitted to flood the volume between the plate and the inside the window.
- One pipe connection introduces pressurized water to the volume, the other is connected to pressure sensing and indicating devises.
- The outside surface of the window, not shown on the drawing, will be painted with a high electrical resistance paint strips that will function as a strain gauges positioned at strategic locations.
- A high speed movie camera will film the pressure burst event, time coordinated with the data from all the other instruments.

Current progress

- The UMISS Physics Mucool collaboration group from The University of

  Mississippi–Oxford Campus has a machine shop with a large numerically controlled lathe and two numerically controlled milling machines. They are committed to machine the initial windows for destructive testing as well as some of the ancillaries for the test. They have already purchased sufficient 6061–T6 aluminum alloy material to machine 3 windows, the backing plate and support pedestal.

  There are some photographs showing the progress of the work.

  We can expect the first hardware to arrive at Fermilab about the middle of January.