

MicroBooNE Cryostat, Cryogenics & Purification

WBS turning into a Project Form

Unique ID	ID	WBS	Task Name	Duration	Start
1	1		MicroBooNE Project	598 days	Mon 10/8/08
2	2	1.1	Project Milestones & Mgmt	418 days	Mon 10/8/08
15	17	1.2	Cryostat, Cryogenics & Purification	589 days	Mon 10/8/08
42	18	1.2.1	Cryostat, Cryogenics & Purification Milestones	599 days	Mon 10/8/08
43	19	1.2.1.1	Vessel Design Complete - Ready for Bid	0 days	Thu 9/17/09
44	20	1.2.1.2	L-Ar Recirculation Design Review	0 days	Mon 10/8/08
45	21	1.2.1.3	Vessel Delivered to Site	0 days	Thu 1/27/11
16	22	1.2.2	Cryostat Design	239 days	Mon 10/8/08
17	23	1.2.2.1	Cryostat Vessel Design	239 days	Mon 10/8/08
180	24	1.2.2.1.1	Finalize Size Specifications	40 days	Mon 2/2/09
336	25	1.2.2.1.2	Heat Load Modeling	10 days	Mon 5/11/09
229	26	1.2.2.1.3	Specify End Cap	40 days	Tue 5/26/09
230	27	1.2.2.1.4	Penetrations for LAr System	40 days	Mon 3/2/09
232	28	1.2.2.1.5	Penetrations for Gas Systems	40 days	Mon 3/2/09
233	29	1.2.2.1.6	Penetrations for Vacuum System	10 days	Mon 3/2/09
234	30	1.2.2.1.7	Penetrations for Cryogenics Monitoring Systems	20 days	Mon 3/2/09
235	31	1.2.2.1.8	Design Penetrations for Detector Systems	5 days	Mon 3/2/09
236	32	1.2.2.1.8.1	TPC Signal FT Penetration Size	5 days	Mon 3/2/09
237	33	1.2.2.1.8.2	TPC HV FT Penetration Size	5 days	Mon 3/2/09
238	34	1.2.2.1.8.3	TPC Bias Voltage FT Penetration Size	5 days	Mon 3/2/09
239	35	1.2.2.1.8.4	PM Signal FT Penetration Size	5 days	Mon 3/2/09
240	36	1.2.2.1.8.5	PM HV FT Penetration Size	5 days	Mon 3/2/09
241	37	1.2.2.1.8.6	Purity Monitor FT Penetration Size	5 days	Mon 3/2/09
242	38	1.2.2.1.9	Design Internal Support Structures	10 days	Mon 3/30/09
243	39	1.2.2.1.9.1	TPC System Supports	10 days	Mon 3/30/09
244	40	1.2.2.1.9.2	PM System Supports	10 days	Mon 3/30/09
245	41	1.2.2.1.9.3	Cryogenics & Purity Instrumentation Supports	10 days	Mon 3/30/09
338	42	1.2.2.1.10	Vessel Design Drawings & Specs	40 days	Wed 7/22/09
338	43	1.2.2.1.11	Review and Sign-off of Detector Support Fixtures on Vessel	1 day	Thu 9/17/09
399	44	1.2.2.1.12	Review and Sign-off of Detector Feed-through Flanges on Vessel	1 day	Mon 10/8/08
360	45	1.2.2.1.13	Review and Sign-off of Cryo, Monitoring, Gas & Vacuum Flanges	1 day	Mon 10/8/08
23	46	1.2.2.2	Vessel Foam Insulation Design	98 days	Mon 10/8/08
178	47	1.2.2.2.1	Specification - heat loads	20 days	Mon 2/2/09
255	48	1.2.2.2.2	Specification - how to deal with shrinkage gaps	1 day	Mon 10/8/08
61	49	1.2.2.3	Vessel Heat Shield Design	1 day	Mon 10/8/08
174	50	1.2.2.3.1	Specification - layout of piping for LN	1 day	Mon 10/8/08
29	51	1.2.2.4	Vessel Mechanical Support Design	158 days	Mon 10/8/08

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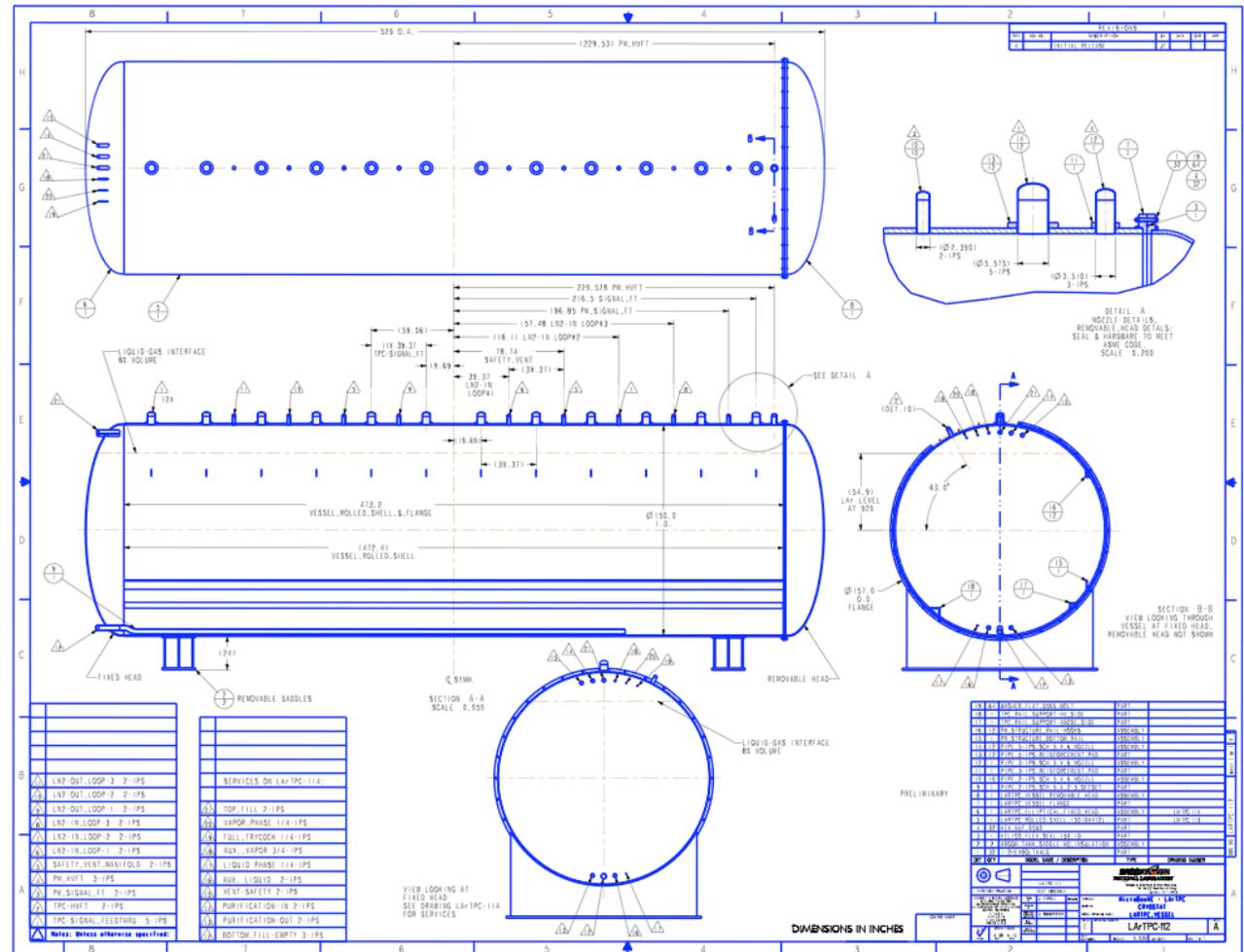
Cryostat:

General Design Understood

Single wall vessel, vacuum capable, with penetrations and internals

Enough for Cost Estimate for CD-1

(EfCEfCD1)

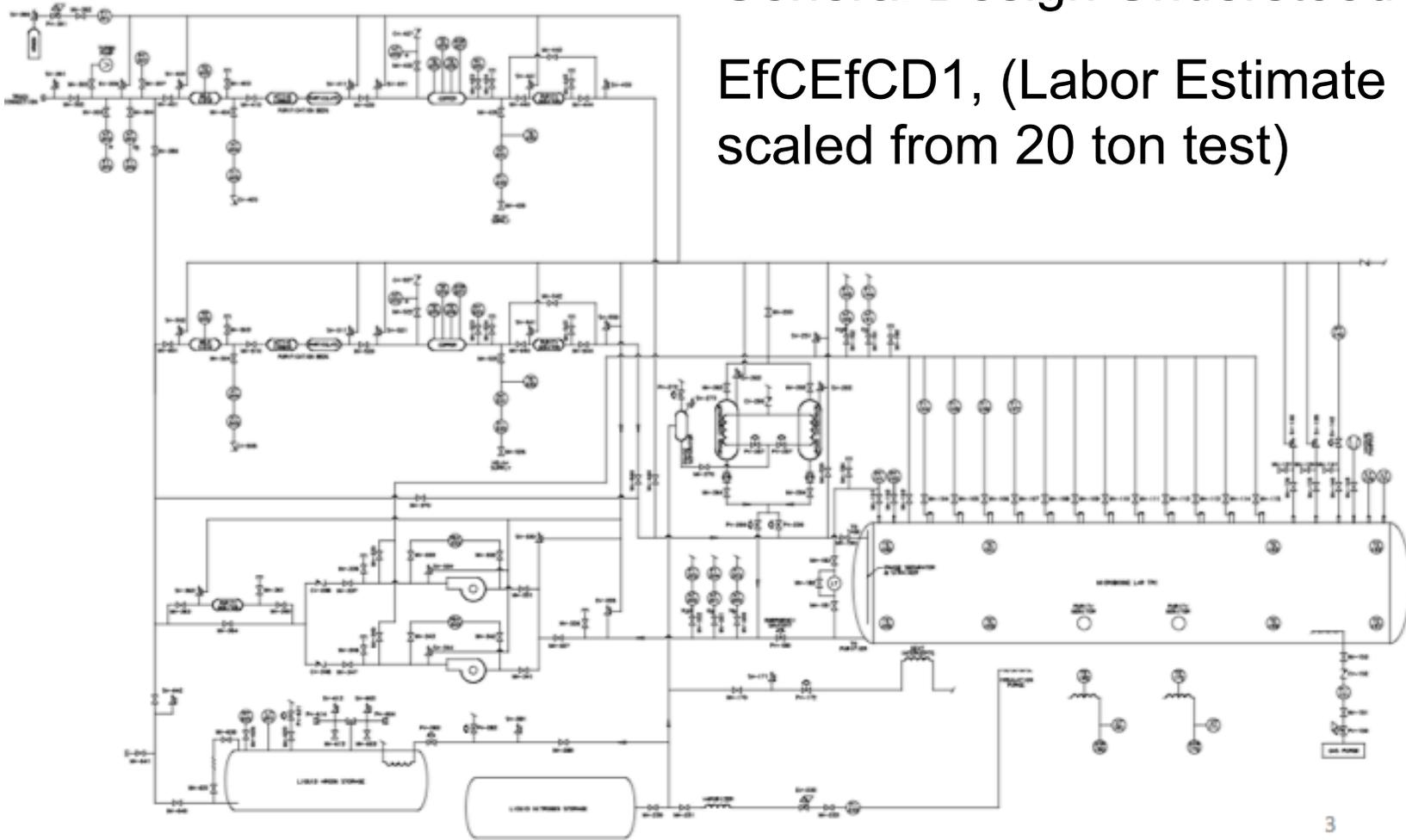


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Purification and Cryogenics:

General Design Understood

EfCEfCD1, (Labor Estimate scaled from 20 ton test)



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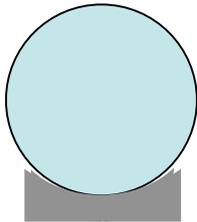
Cryostat:

issues of detail

- interfaces with interior detectors,
flanges for feedthroughs,
welded or flanged head

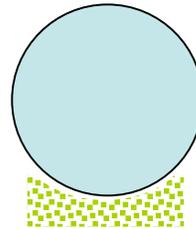
Cryostat:
issue of design
Support

steel cradle



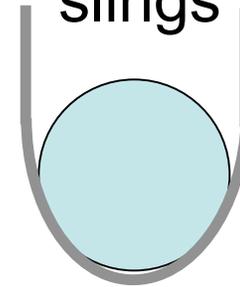
welded to Vessel

High Density
Poly-Urethane

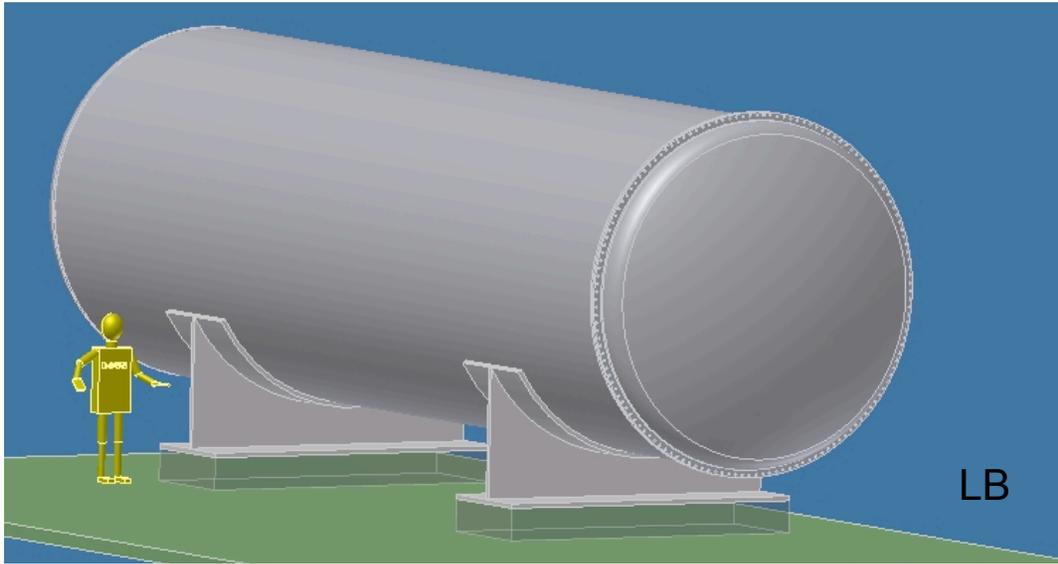


part of insulation

slings

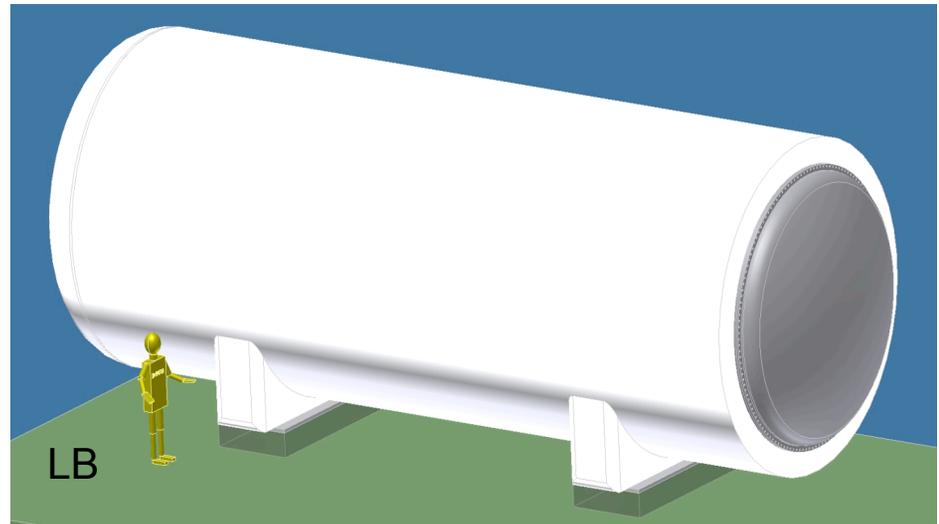


around Vessel

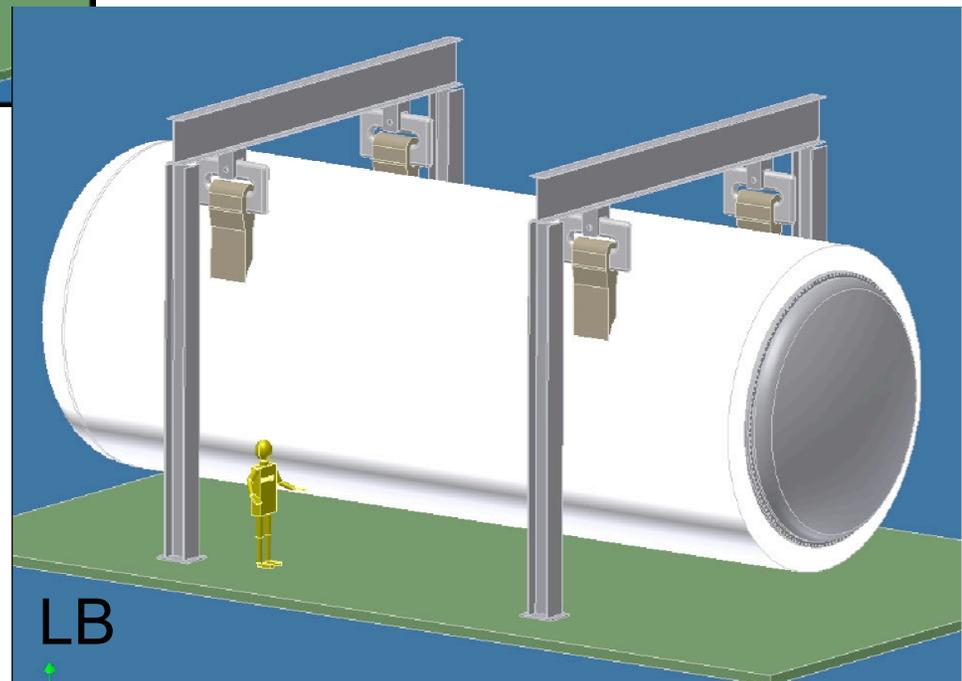
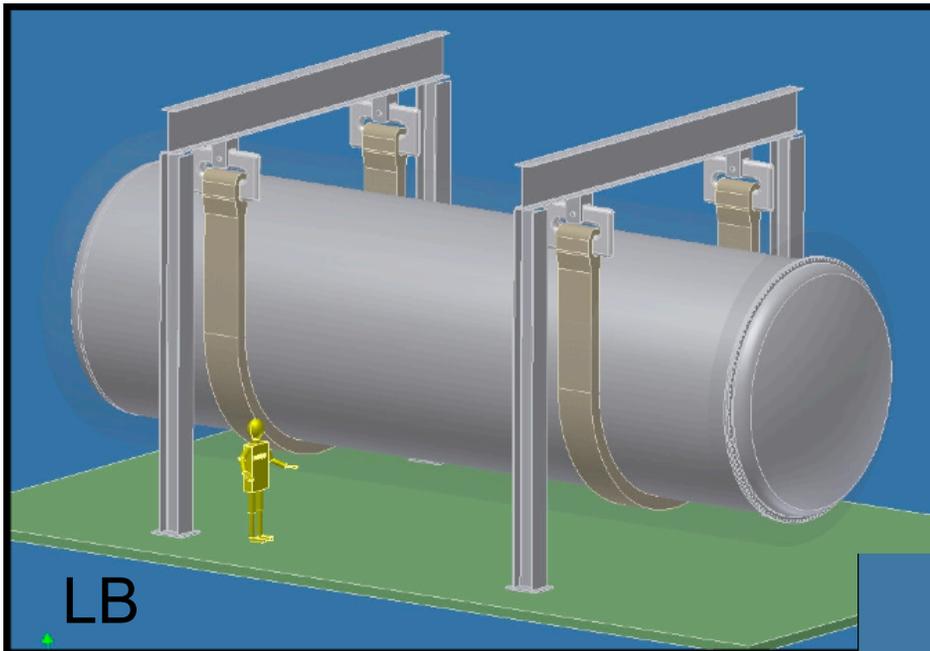


Sketches of Saddle model
bare and with insulation

Total weight of full vessel
(incl. insulation) is ~ 250 tons



Sketches of Sling Option Bare, and with insulation



Pursuing all 3 support options - pros & cons on each:

Saddle - simple, needs to deal with contraction

Slings - thermal good, structure needs engineering, contraction may be easier

HDFU - need to validate material properties

expect cost estimate needed for (just) one for CD-1

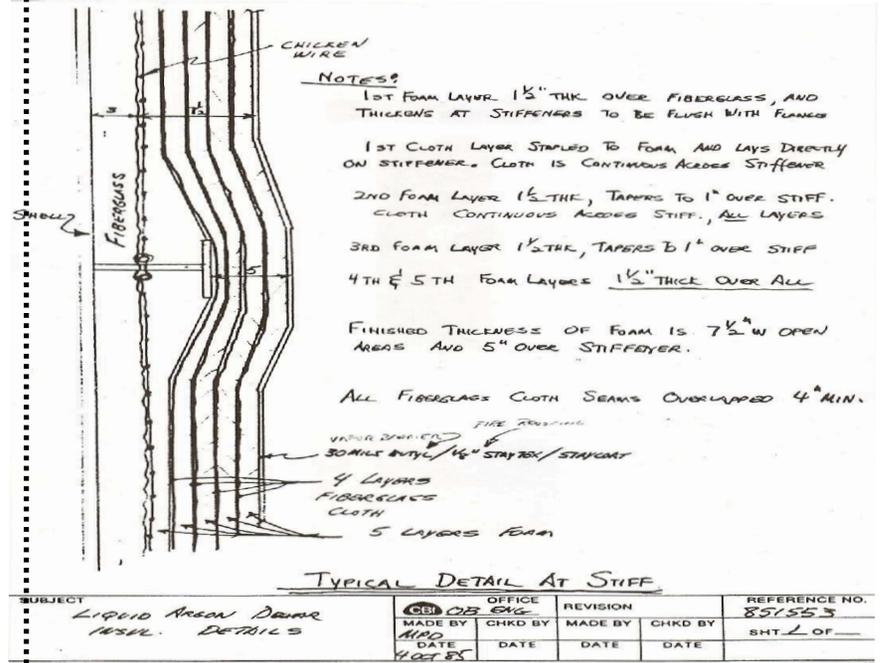
Issues of Design:

Insulation (blankets vs sprayed-on foam)



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E-706 LAr Calorimeter



Recipe for installing foam in many layers (existence proof)

Not yet addressed in CC&P WG:

Design item

ODH mitigation

Infrastructure items including:

power

service buildings

truck access

location and installation of storage dewars

receiving station

who?

Will need Facilities Engineering Services for cost estimates