



Cryo-Assembly Shipping

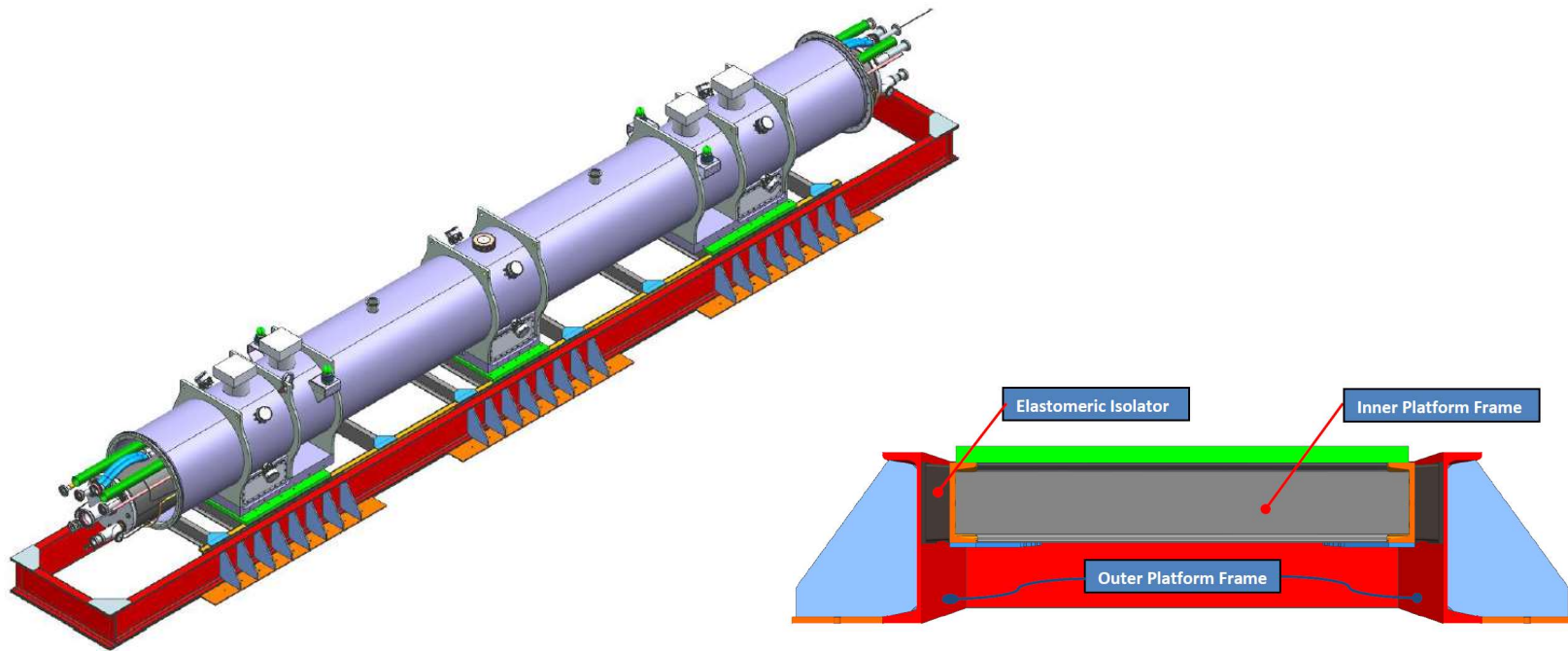
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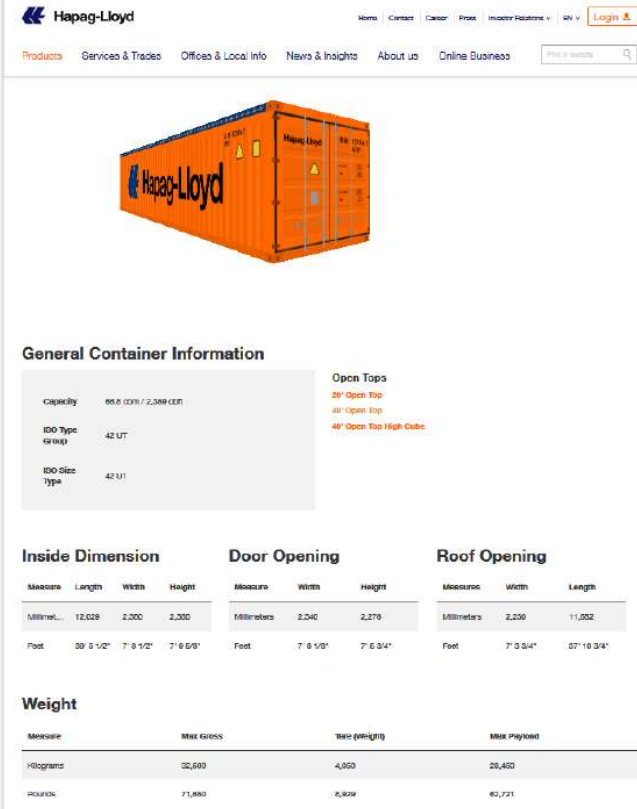
Preliminary design of the shipping frame has been completed.



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Other aspects of the shipping system are just underway.



The screenshot shows the Hapag-Lloyd website interface. At the top, there is a navigation bar with links for Home, Contact, Career, Press, Investor Relations, and My Account, along with a Login button. Below this is a secondary navigation bar with links for Products, Services & Trades, Offices & Local Info, News & Insights, About us, and Online Business, accompanied by a search bar. The main content area features a 3D rendering of an orange Hapag-Lloyd container. Below the rendering is a section titled "General Container Information" which includes a table of specifications and a list of "Open Tops" options. Further down, there are three tables: "Inside Dimension", "Door Opening", and "Roof Opening", each providing measurements in millimeters and feet. At the bottom, a "Weight" table lists maximum gross weight, tare weight, and maximum payload in kilograms and pounds.

General Container Information

Capacity	65.0 CBM / 2,300 CBM
ISO Type Group	42 UT
ISO Size Type	42 U1

Open Tops

- 20' Open Top
- 30' Open Top
- 40' Open Top
- 40' Open Top High Cube

Inside Dimension

Measure	Length	Width	Height
Millimeters	12,028	2,200	2,200
Feet	39' 5 1/2"	7' 3 1/2"	7' 3 1/2"

Door Opening

Measure	Width	Height
Millimeters	2,240	2,270
Feet	7' 4 1/8"	7' 5 3/4"

Roof Opening

Measure	Width	Length
Millimeters	2,230	11,552
Feet	7' 3 3/4"	37' 10 3/4"

Weight

Measure	Max Gross	Tare (empty)	Max Payload
Kilograms	32,500	4,050	28,450
Pounds	71,890	8,929	62,721

Future tasks have been scheduled out to the April 2020 prototype shipment.

	CY 2018		CY 2019												CY 2020			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
SHIPPING FRAME DESIGN/ANALYSIS - FERMILAB																		
Write shipping frame Engineering Design Specification (EDS)	█																	
Shipping frame mechanical/structural analysis		█																
Shipping frame vibration/resonance analysis		█																
Cryo-Assembly vibration/resonance analysis			█	█														
Detailed design of shipping frame																		
SHIPPING FRAME DESIGN/ANALYSIS - VENDOR																		
Place contract for vendor design & analysis of shipping frame based on FRS	█																	
Shipping frame design		█	█															
Shipping frame mechanical/structural analysis			█															
Shipping frame vibration/resonance analysis			█															

Future tasks have been scheduled out to the April 2020 prototype shipment.

- Shipping Frame mechanical/structural analysis when loaded with Cryo-Assembly
 - Stress analysis of individual members based on shear and bending moments
 - Stress analysis of lifting lugs and welds
- Shipping Frame + Cryo-Assembly vibration/resonance analysis
 - Determine damping ratio
 - Determine resonant frequencies, compare to typical transport resonant frequencies
 - Finalize quantity of isolators
- Cryo-Assembly vibration/resonance analysis
 - Determine resonant frequencies, compare to typical transport resonant frequencies and resonant frequencies of Shipping Frame + Cryo-Assembly

Future tasks have been scheduled out to the April 2020 prototype shipment.

	CY 2018		CY 2019												CY 2020			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
SHIPPING FRAME PROCUREMENT; SHIPPING SYSTEM EVALUATION																		
Design reviews of Fermilab and vendor shipping frames																		
Selection of shipping frame design																		
Place contracts for shipping system evaluation																		
Obtain vendor quotes for shipping frames (qty 2)																		
Shipping system evaluation by transport companies																		
Procure shipping frames (qty 2)																		
Shipping frame fabrication oversight																		
Receive shipping frames																		

Future tasks have been scheduled out to the April 2020 prototype shipment.

	CY 2018		CY 2019												CY 2020			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
SHIPPING FRAME TEST - FERMILAB																		
Write shipping frame Fermilab Test Plan	█	█																
Planning and execution of on-site testing of shipping frame															█	█		
SHIPPING FRAME TEST - VENDOR																		
Vendor identification for DOT testing of shipping frame	█	█																
Write shipping frame vendor Test Plan	█	█																
Procurement of shipping frame vendor test													█	█				
Vendor testing of shipping frame															█	█		

Future tasks have been scheduled out to the April 2020 prototype shipment.

- Vendor identification for DOT testing of shipping frame
 - A market survey conducted by Fermilab Procurement to identify vendors who can test large shipping fixtures
 - Profit from past experience, such as the g-2 magnet shipping fixture

Future tasks have been scheduled out to the April 2020 prototype shipment.

	CY 2018		CY 2019												CY 2020			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
SHIPPING CONTAINER																		
Obtain vendor quotes for shipping container																		
Procure shipping container																		
SHIPMENT																		
Write Cryo-Assembly Crating and Shipping Specification																		
Specification of shipping diagnostics/instrumentation																		
Develop detailed shipping procedure and checklist																		
Install shipping posts and cold mass restraints, securing cold mass to vacuum vessel																		
Secure shipping frame to shipping container																		
Secure cryo-assembly to shipping frame																		
Shipment of prototype																		