Cryogenic Test Report

Performed for

Integrity Products & Supplies, Inc.

www.integrity-products.com

CryoPlug

Project Number: 222298
Test Date: January 19, 2023

Performed by

YARMOUTH RESEARCH AND TECHNOLOGY, LLC

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Yarmouth Research and Technology, LLC

Customer: Integrity Products & Supplies, Inc. **Date:** 19-Jan-23

Project Number: 222298

Part Description: CryoPlug

General Setup Conditions

See sent Instruction

Procedure

Test Date:	1/19/2023	
Assemble parts as described above:	Yes	(Y/N)
Float assembly on pool of liquid nitrogen:	Yes	(Y/N)
Start 1 minute data recorder:	11:28	EST
Maintain liquid level for 2 hours minimum:	Yes	(Y/N)
End of 2 hour soak:	13:52	EST
Open blue cap:	Yes	(Y/N)
Video record measuring foam gap at top:	Yes	(Y/N)
Foam diametric gap:	0.023	inches
Top of foam temperature:	38	F
End temperature recorder:	Yes	(Y/N)
Pull foam insert out of assembly while video recording:	Yes	(Y/N)
Foam diameter at bottom:	2.427	inches

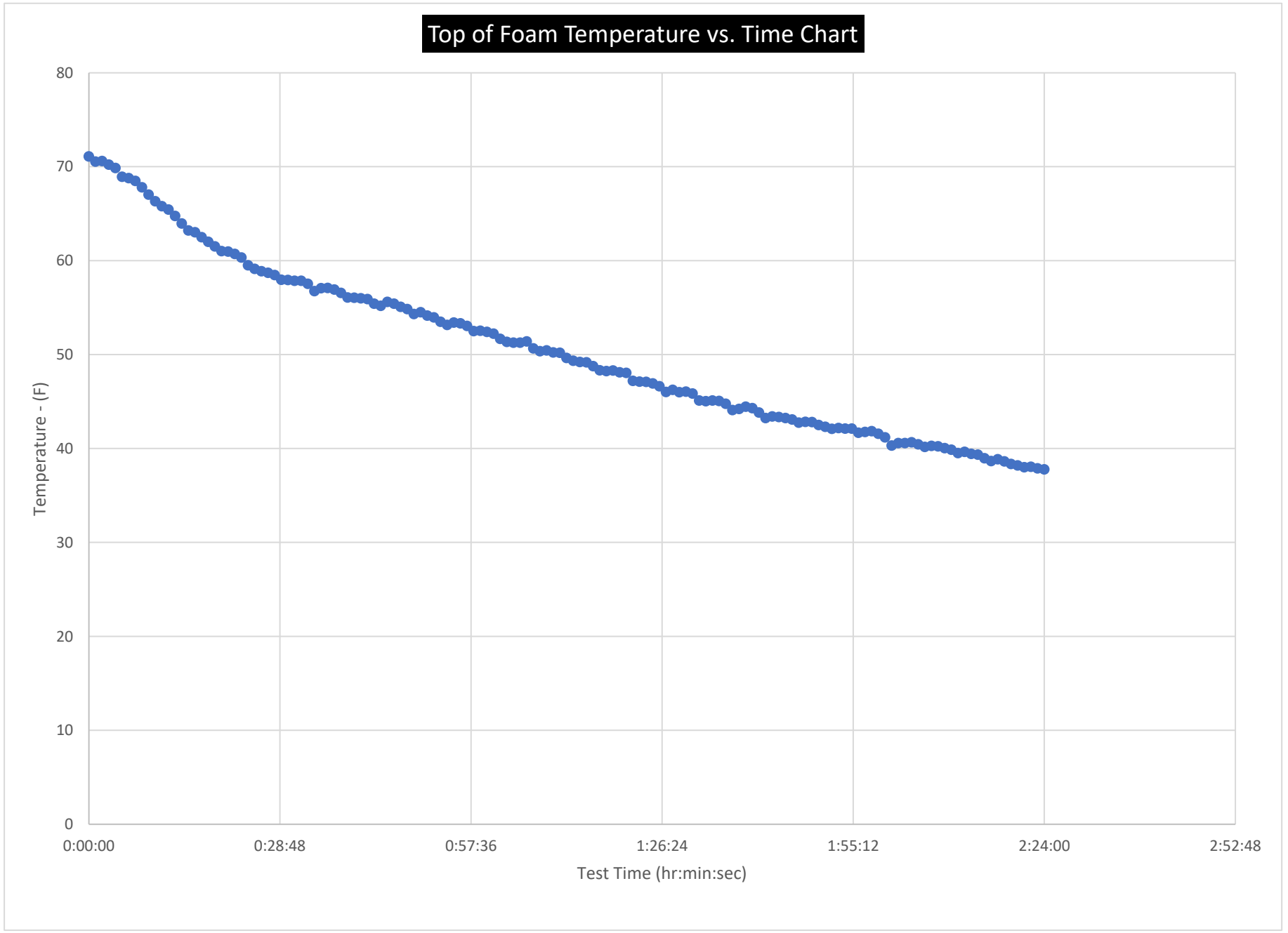
Notes

Foam slightly narrower further from end - See photos

Remove assembly from liquid nitrogen:	Yes	(Y/N)
Immediately measure ID of Teflon liner:	2.529	inches

Certified By

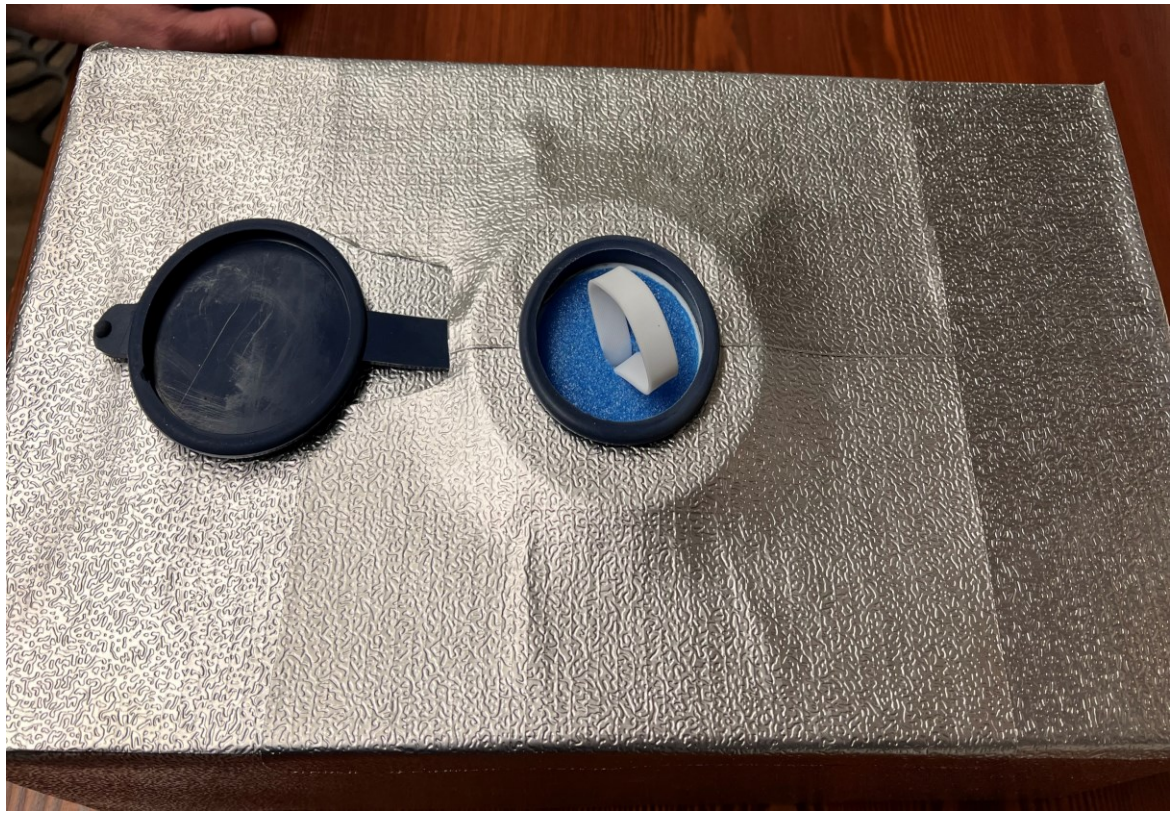
Matthew Wasielewski, PE
President and Manager
Yarmouth Research and Technology, LLC


Top of Foam Temperature vs. Time Chart
Temperature - (F)
80
70
60
50
40
30
20
10
0
0:00:00
0:28:48
0:57:36
1:26:24
1:55:12
2:24:00
2:52:48
Test Time (hr:min:sec)

Assembly installed in cryogenic chamber

Foam removed from liner
Measurement on report at end of piece.

CRYOPLUG ASSEMBLY



TOP VIEW – WITH OPEN CAP

SIDE VIEW – WITH OPEN CAP

Note: Please refer step by step instructions on page 3 of this document. Don’t remove anything even cap

CRYOPLUG ASSEMBLY

BOTTOM SIDE – TO FACE LIQUID NITROGEN IN A FLOATING MANNER

Note: Please refer step by step instructions on page 3 of this document. Don’t remove anything even cap

INSTRUCTIONS – STEP BY STEP

- Integrity has marked the portion on the blue cap that can be drilled by the lab for the incorporation of thermocouple that will extend only to/ touch the top flush portion of insert foam (drilling and thermocouple install should be done prior to the start of the test) – **Please ensure to give a video call to Integrity Products & Supplies Inc. prior to making this hole**
- The assembly will be floating in the cryogenic bath during the duration of the test
- The temperature readings will be taken via the thermocouple after every 10 minutes for a period of 2 hours (i.e., 12 readings)
- Open the blue cap only after 2 hours immediately upon completion of the test and prior to removing the assembly from the bath
- Record the circumferential gap at the top flush portion (between foam and Teflon liner) before removing the assembly from the bath
- All readings (i.e., 12 temperature readings, 01 gap reading) will be noted as well as recorded using the phone camera
- No need to take temperature and gap readings at the midway and bottom of the foam, Teflon liner (only at the top flush portion)
- 10. Right after completion of the test and recording all readings, remove the foam (via pulling out) and observe shrinkage of the bottom flush portion (which was facing the cryogenic bath). This should be done before removing the assembly from the bath