



71-9294

**Global Nuclear Fuel**

A Joint Venture of GE, Toshiba, &amp; Hitachi

August 23, 2001

Mr. E. William Brach, Director  
Spent Fuel Project Office, M/S O-13D13  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Dear Mr. Brach:

Subject: Response to Request for Additional Information (RAI) Regarding the New Powder Container (NPC)

References: (1) Docket 71-9294, USA/9294/AF-85, TAC No. L23355  
(2) Letter, C. Vaughan – GNF-A to E. William Brach – NRC, Dated 8/1/01  
(3) Letter, N. Osgood – NRC to C. Vaughan – GNF-A, Dated 8/15/01

This letter is in response to the NRC's request for additional information (Reference 3) in relation to GNF-A's amendment to COC 9294 (Reference 2).

In our request of 8/1/01, we indicated that we needed approval of the amendment by 9/7/01 to meet shipping arrangements and commitments to Japan. We have learned, as I discussed by phone earlier, that the transportation plan for these shipments has changed. Currently, the trucks must leave Wilmington on 10/15/01. Therefore, we need approval for this amendment no later than close of business 10/11/01.

In response to the RAI, GNF-A has provided, as Attachment 1, a discussion that we believe answers the question posed regarding the change in specification. In the process of researching this answer, we found two pages in the SAR that needed to be changed. Additionally, during the receiving inspection of the first packages, we identified the transposition of a hole diameter on one of the drawings, and we have corrected that drawing. These are included in Attachment 2 as follows:

<u>Location of Changes in the Current SAR</u>	<u>Description of Change</u>
Chapter 1.0, Drawing 0019D0007, Revision 3, Zone F3	0.65 was transposed. Should read 0.56
Chapter 2.0, Page 2-20, Figures 2.10.1-1 and 2.10.1-2	Correction to the graphic presentation of the CTU foam curves
Chapter 2.0, Page 2-21, Figures 2.10.1-3 and 2.10.1-4	Same as above

These two pages are identified as Revision 2, 8/2001 in the top right hand corner. A vertical line has been placed in the right hand column to indicate changes to the page.

NMS501 public

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Attachment 4 is a letter from General Plastics Manufacturing Company providing the revised compressive strength specification values and describing the reasons for the proposed changes to the foam specification.

Please contact me on (910) 675-5656 if you have any questions or would like to discuss this matter further.

Sincerely,

Global Nuclear Fuel – Americas, LLC

A handwritten signature in cursive script, reading "Charles M. Vaughan".

Charles M. Vaughan, Manager  
Facility Licensing

/zb  
Attachment

cc: CMV-01-035

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**Attachment 1**

**Answer to Request for Additional Information**

## **Answer to Request for Additional Information**

### ***Structural***

*Revise the application to provide justification that the proposed adjustment of compressive strength of the foam will not adversely affect the package performance under hypothetical accident conditions. As an alternative, modify the acceptance criteria in Chapter 8 of the Safety Analysis Report (SAR) to specify that the average minimum compressive strength for foam components shall not be lower than -10% of the nominal compressive strength of the foam.*

### **Response:**

This request for additional information deals with a subject related to evaluations during the original licensing review of the package. In particular, the NRC Request for Additional Information dated 8/28/00; item 2-5 and GNF-A's response dated 11/10/00 directly relate to this current RAI. Those discussions dealt with the relative importance of the foam in the overall structural performance of the package and the justification of the specifications included in Chapter 8 of the SAR which were to be used as the acceptance criteria for the package.

During the preparation of graphics in support of this current response, which compare the certified CTU foam compressive strength values with the proposed specifications, we noted some unexpected inconsistencies when compared to the curves currently in SAR Figures 2.10.1-1 through 2.10.1-4. Upon investigation we found two minor clerical errors and an incorrect adjustment factor were used in the plotting of the CTU values. While the impact of these errors is small, it is noticeable when comparing the curves to the specified acceptance curves. We have therefore provided corrected curves for Figures 2.10.1-1 through 2.10.1-4 (Attachment 2) as replacement pages (pages 2-20 and 2-21) to the SAR. To ensure their accuracy, all plotted data now presented was traced back to the data packages corresponding to the four CTUs. It is most important to note, that the corrected figures do not change any conclusions that were derived from the original graphs; i.e., as shown by the attached curves, CTU foam strengths were indeed at the low end of the range of strength values specified for production units as desired and as previously claimed.

Figures 2.10.1-1 through 2.10.1-4 were presented in the SAR to show the foam characteristics of the four test objects relative to the proposed specification in Chapter 8. These figures were not intended to demonstrate or justify the acceptability of the foam specifications. The fact that the compressibility of the foam used in the four test objects is generally on the lower side of the nominal specified value is helpful in the discussion. Regardless of which nominal value is considered for acceptance (the one from the 10-year old specification or the nominal from the currently proposed specification), the

compressive strength of the foam in the four test units was generally on the low side of nominal. To demonstrate this is true for the newly proposed specification, a set of graphs, comparable to Figures 2.10.1-1 through 2.10.1-4, are included in Attachment 3. These graphs compare the CTUs with the proposed new foam specification and should aid in the comparison of the old and new specification values and allow for a determination of the acceptability of the new specification values.

It is also important to note in the discussion that the foam in the four test packages and the foam in the production units are all the same foam from a chemistry, process and measurements stand point. The information used in the design of the package and in the application was based on a General Plastics Specification, which they indicate was based on work of approximately 10 years ago. There have been some changes in the chemicals used and in the measurements. With the experience of the four test units and the first eight production units, General Plastics felt that the data indicated a slight shift in the nominal values based on these changes and that the specification should be shifted slightly (General Plastics letter of 7/10/01 Attachment 4).

A comparison of the nominal values from the original specification and the new proposed nominal values along with the percentage of change are as follows:

	11# Parallel				11# Perpendicular		
Strain	Original	New	% Difference		Original	New	% Difference
10%	397	405	+2		361	398	+10
40%	467	458	-2		450	449	0
70%	1350	1284	-5		1427	1311	-8
	15# Parallel				15# Perpendicular		
10%	691	695	+1		673	721	+7
40%	864	817	-5		857	841	-2
70%	2731	2587	-5		2787	2619	-6

The changes are both up and down and are small. It is important to note that in all cases the compressive strength at the lower strain value increases and this has a positive effect on the foam's ability to absorb energy in an impact because it means more energy will be absorbed at lower strain values. It is also important to note that it is not the change in any one single point that is important but rather the energy absorption integral for the foam. Given the improved crush characteristics of the foam at the low strain values coupled with the relatively small changes at the other strain values, it is appropriate to conclude that the foam represented by the newly proposed specification would not perform significantly differently in the NPC when compared to the older specification.

With regard to the importance of the foam in the impact performance of the NPC, this was studied and reported in Section 2.10.2 **Structural Dynamic Sensitivity Analysis** in the current revision of the SAR. In this analysis, the two most damaging orientations

were studied with LS-DYNA and the results are reported in the SAR. This information was used to justify the acceptability of the tolerances around the nominal specification value for the crush characteristics of the foam.

In both cases, the analysis concluded that the impact performance of the package was not sensitive to 30% shifts in the compressive strength of the foam. In the CG-Over-OCA Lid orientation, the total foam contribution to kinetic energy adsorption was nominally 11% with the 11# foam accounting for 3% and the 15# accounting for 3.4% (Tables 2.10.2-1 and 2.10.2-2 of the SAR). In the OCA Side Edge case, the foam accounted for nominally 31.2% of the kinetic energy absorption with the 11# contributing 13.7% and the 15# accounting for 2.1% (Tables 2.10.2-3 and 2.10.2.4 of the SAR).

While the foam is important to the overall performance of the package, the results of the sensitivity analysis and the observations of performance during the testing of the four test units, which all contained foam with compressive strength characteristics on the low side of nominal, clearly indicate that small shifts in the foam characteristics as proposed in this shift in the nominal specification do not lead to a situation where the performance of the package is compromised.

In summary, GNf-A's believes the changes in the specification for the foam are warranted based on the following key points:

- The foam used in the certification test objects is the same foam that is being used in the production units.
- The foam used in the test objects for certification was generally on the lower side of nominal and performance was satisfactory.
- There are reasons that the 10-year-old specification used in earlier work does not best characterize the current foam.
- The kinetic energy sensitivity analysis demonstrates that the package performance is not dependent on the crush strength of the foam to a degree that would be impacted by this proposed change.

**Attachment 2**

**Chapter 1.0, Revised Drawing 0019D0007 as Revision 3**

**and**

**Revised Figures 2.10.1-1 through 2.10.1-4  
Pages 2-20 and 2-21 of the SAR**

**These pages have been marked in the upper right corner as Revision 2,  
Dated 8/2001.**

**A vertical line has been placed in the right hand margin indicating  
changes to these pages.**

**FIGURE WITHHELD UNDER 10 CFR 2.390**

4	CN09835				A. LINGENFELTER	6/23/01			
2	FIRST ISSUE				H. KNIGHT	1/28/01			
REV	DESCRIPTION	BY	DCR#	APPROVAL	DATE				

REVISIONS						
SIGNATURES	DAY	MO	YR			
R VAN LE	1	20	00	<b>GNF</b>		
OTHER				Global Nuclear Fuel		
OTHER				GLOBAL NUCLEAR FUEL		
OTHER				GNF NEW POWDER CONTAINER (NPC)		
				PACKAGING		

SCALE 1/4      **AS SHOWN** ✓

UNLESS OTHERWISE SPECIFIED

TOLERANCES ON :

2 PLACE DECIMALS ±      FRACTIONS ±

3 PLACE DECIMALS ±      ANGLES ±

DATE MADE	QCN NO.	QCN
	0019D0007	4
FOR INL	FILE	QCN
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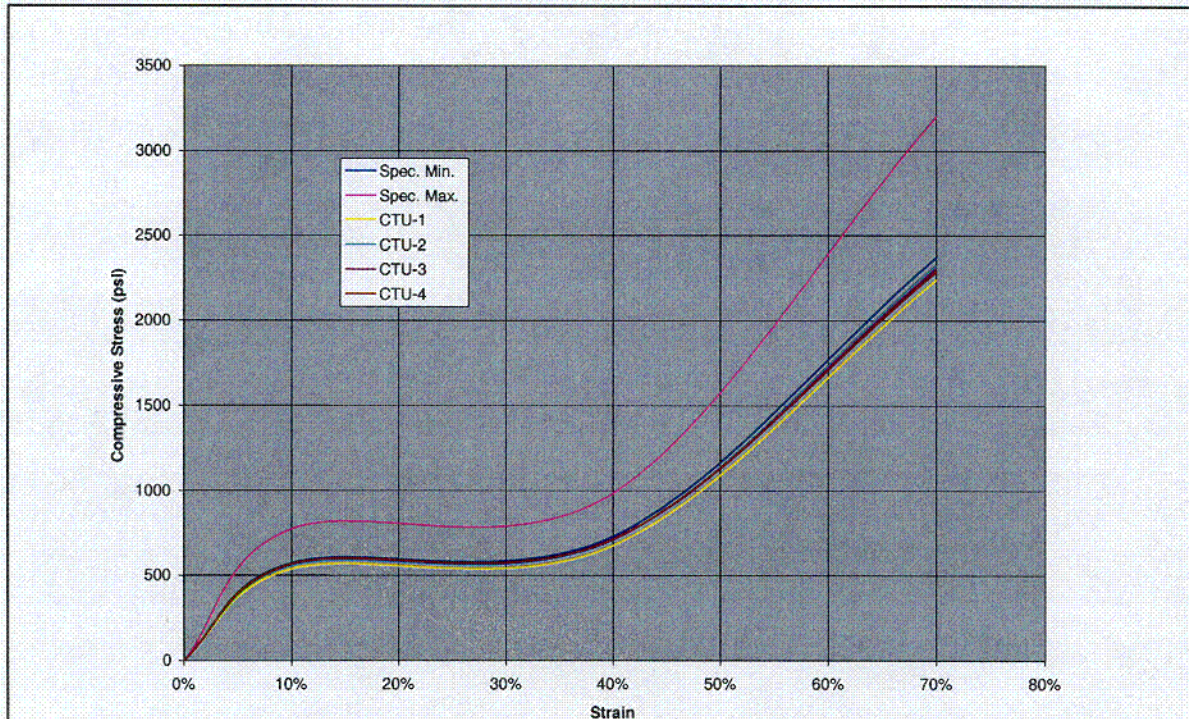


Figure 2.10.1-1 - OCA Lid Perpendicular-to-Foam Rise (15 Lbs./Ft<sup>3</sup>)

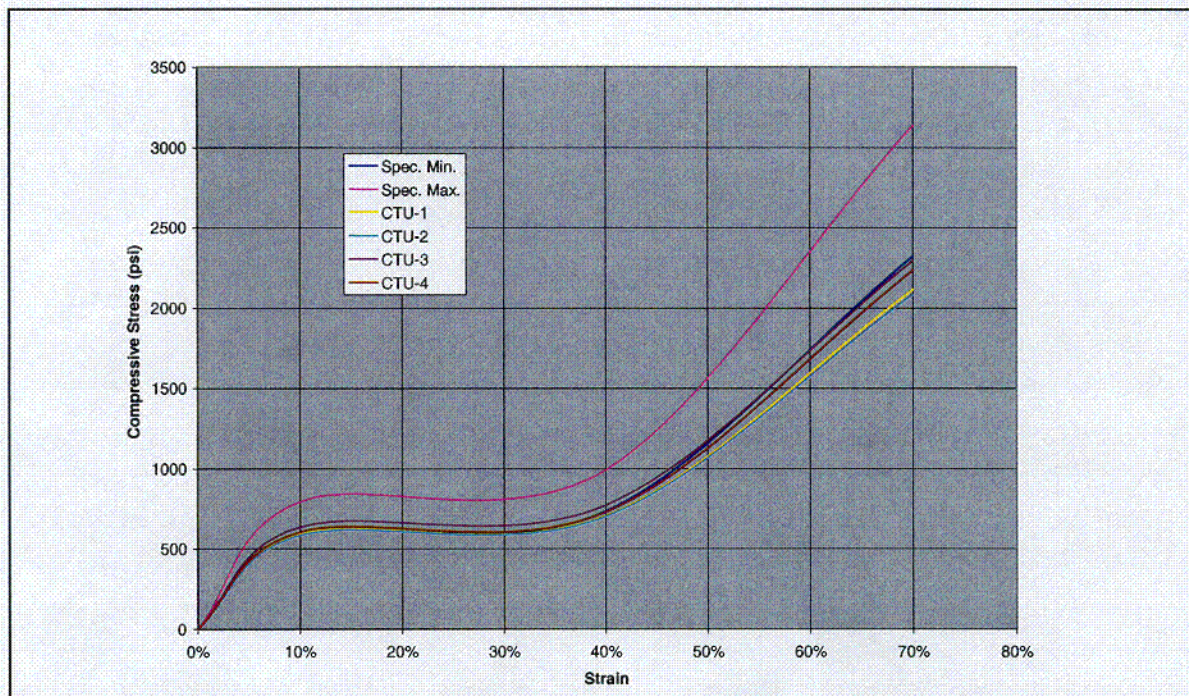


Figure 2.10.1-2 - OCA Lid Parallel-to-Foam Rise (15 Lbs./Ft<sup>3</sup>)



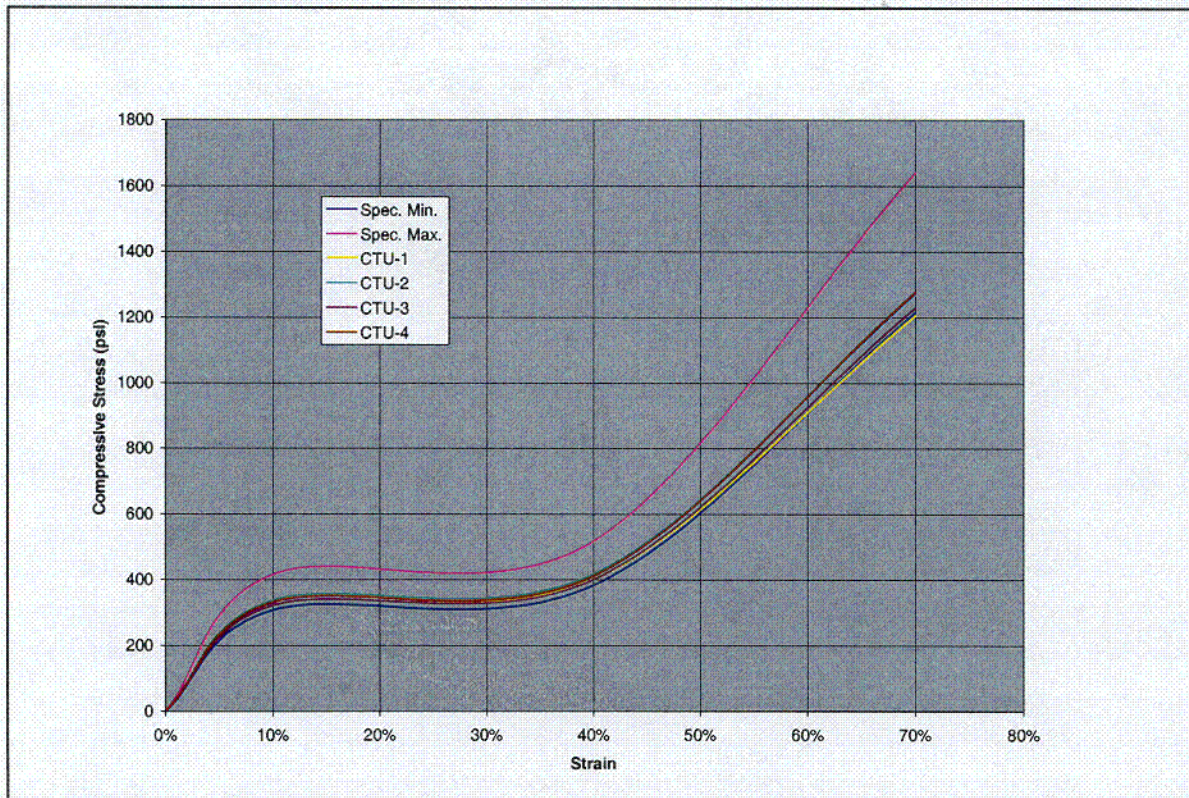


Figure 2.10.1-3 - OCA Body Perpendicular-to-Foam Rise (11 Lbs./Ft<sup>3</sup>)

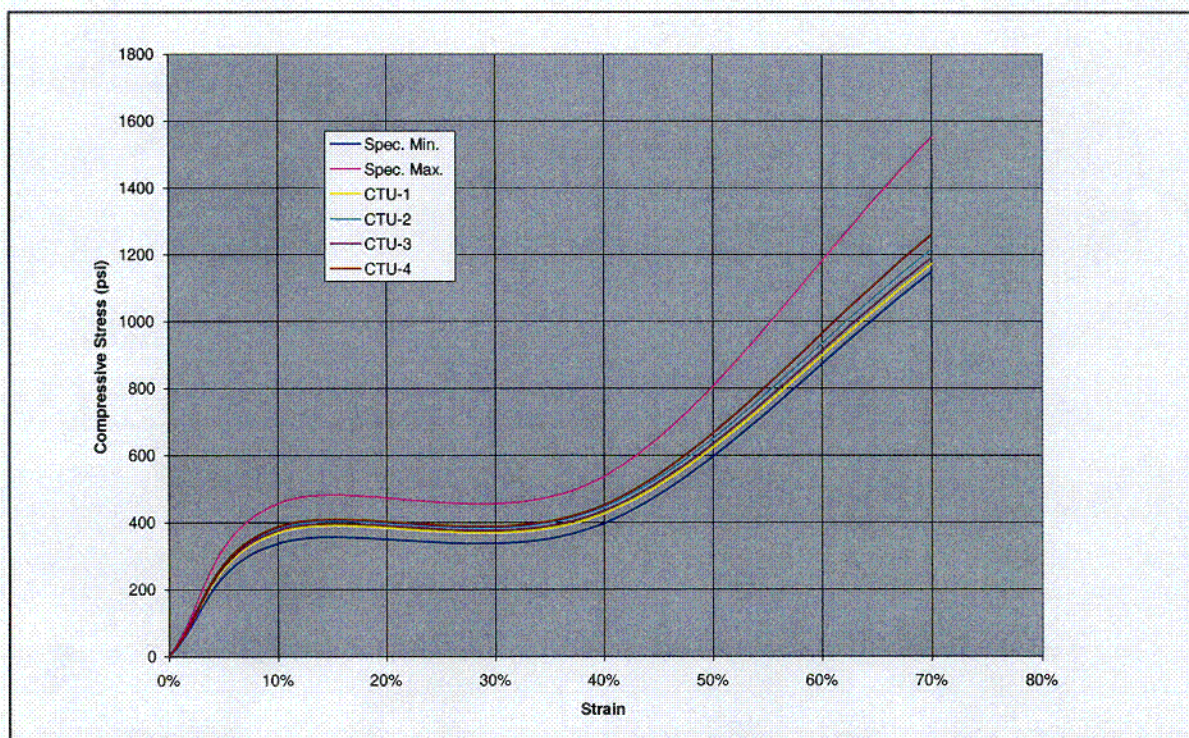


Figure 2.10.1-4 - OCA Body Parallel-to-Foam Rise (11 Lbs./Ft<sup>3</sup>)



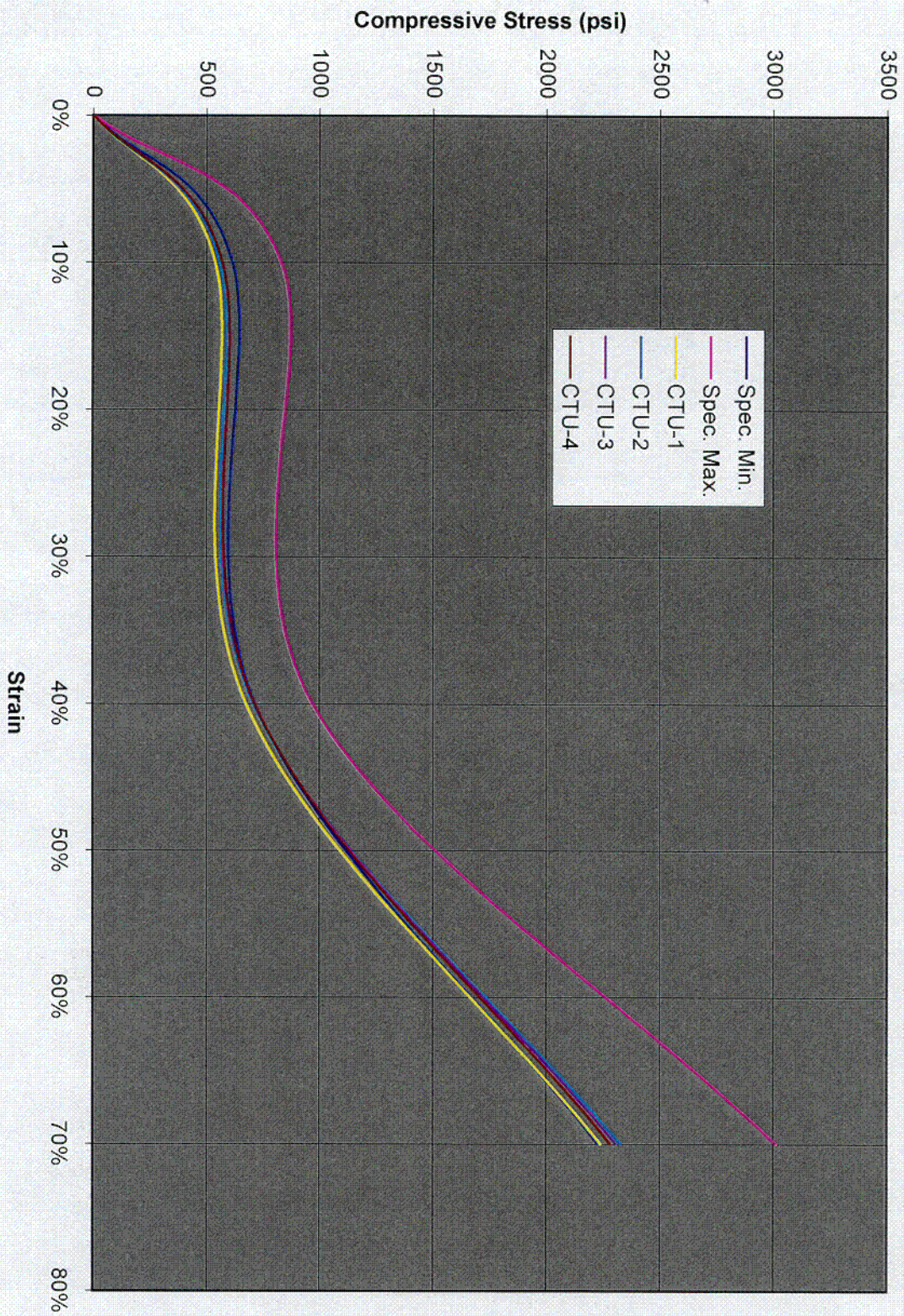
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**Attachment 3**

**A Set of Four (4) Graphs that Compare the CTUs with the Proposed New  
Foam Specification**



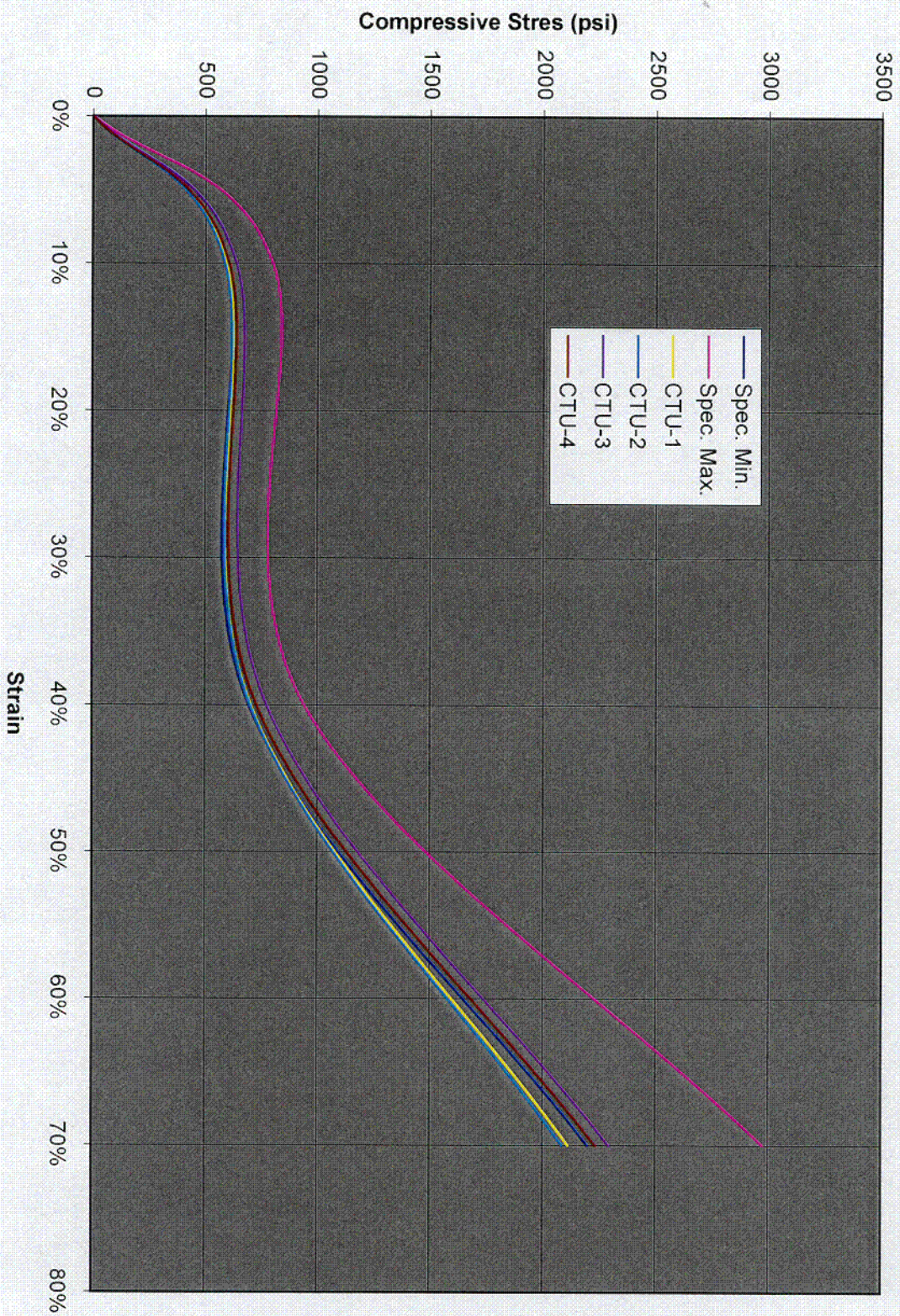
CTUs Compared to New Specifications (cf Figure 2.10.1-1)  
NPC OCA Lid - Perpendicular-to-Rise Stress (15 pcf)



C-03



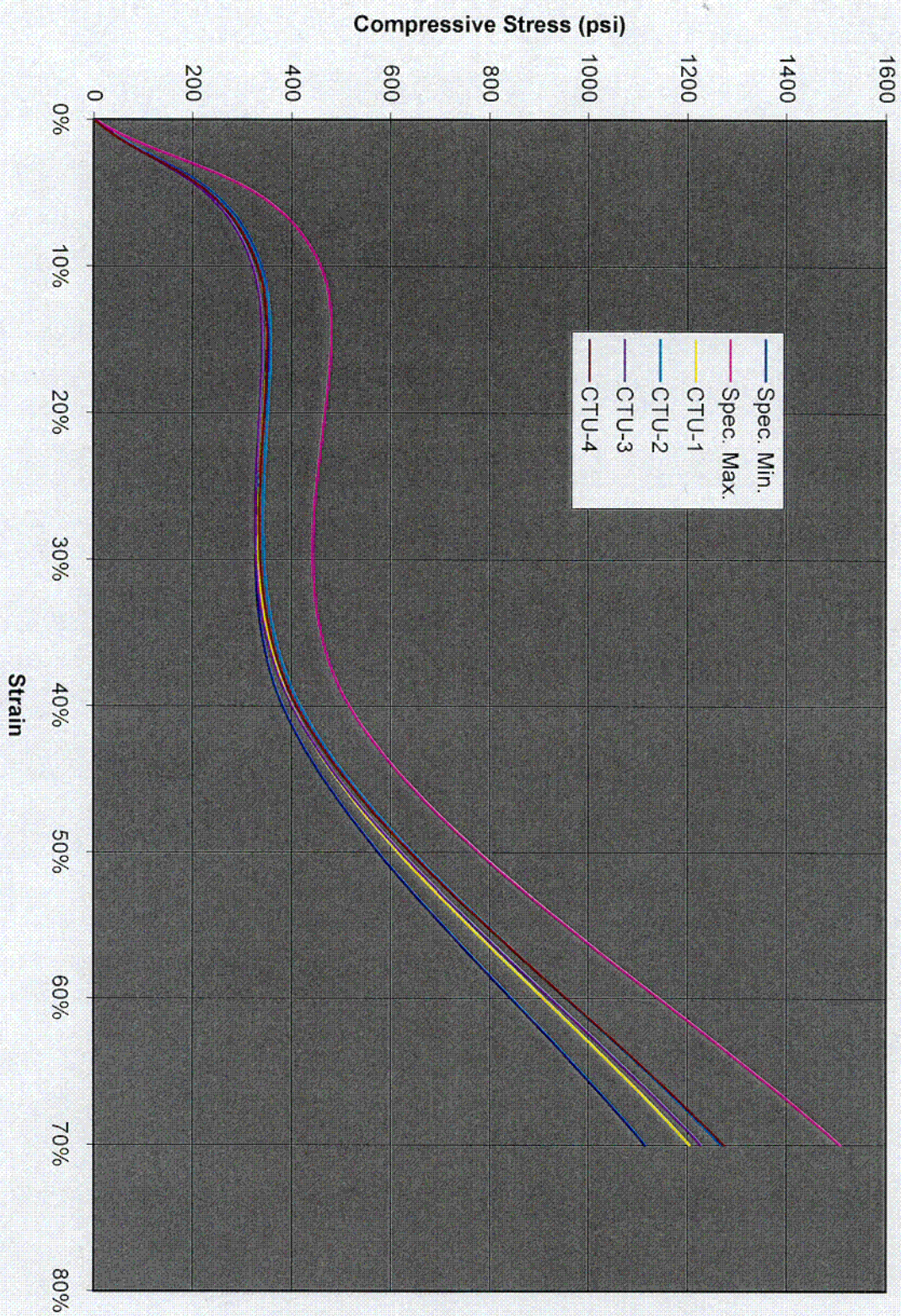
CTUs Compared to New Specification (cf Figure 2.10.1-2)  
NPC OCA Lid - Parallel-to Rise (15 pcf)



C-04



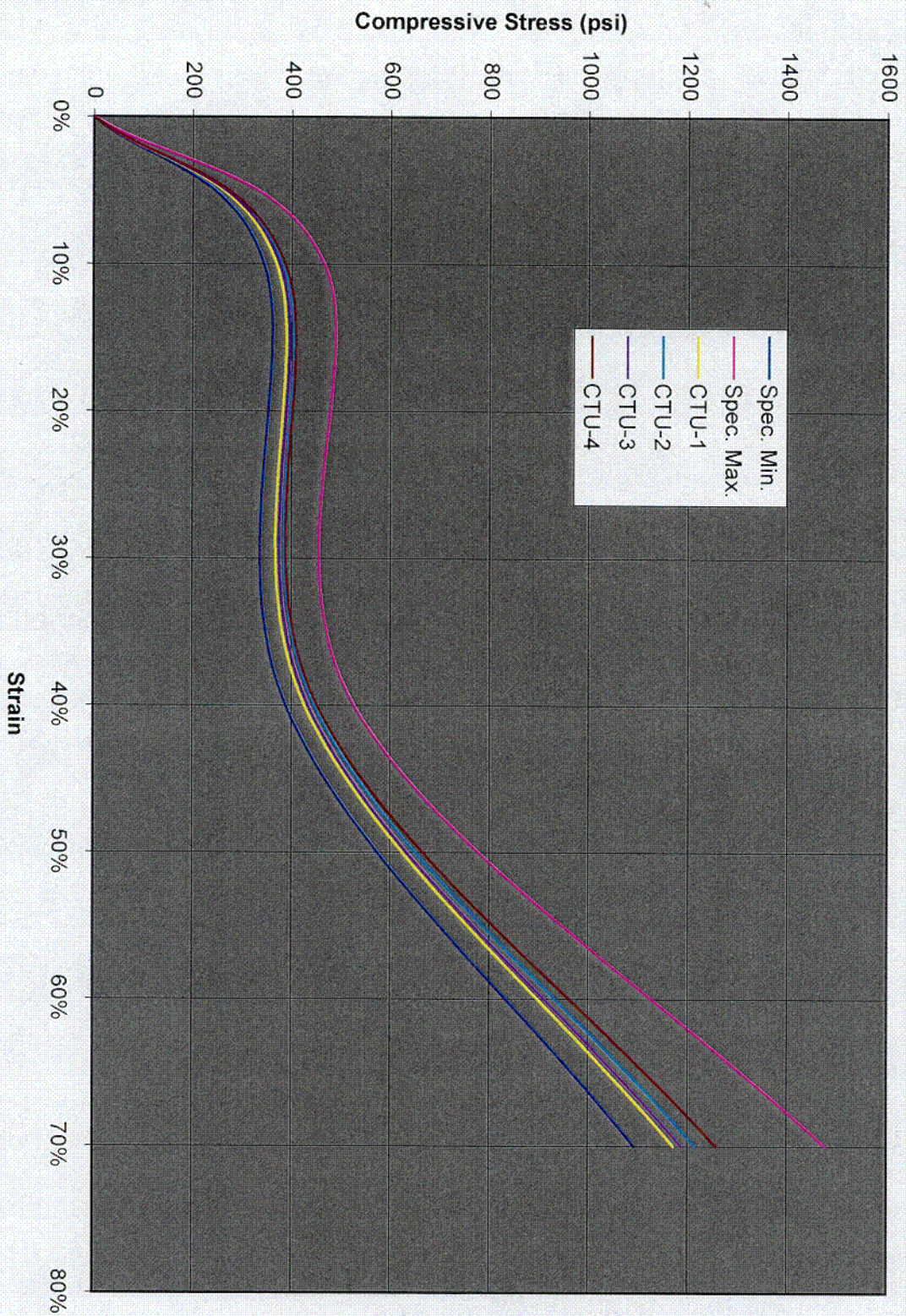
CTUs Compared to New Specification (cf Figure 2.10.1-3)  
NPC OCA Body - Perpendicular-to-Rise (11 pcf)



0-05



CTUs Compared to New Specification (cf Figure 2.10.1-4)  
NPC OCA Body - Parallel-to-Rise (11 pcf)



C-06



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**Attachment 4**

**General Plastics Letter Dated 7/10/01**





GENERAL PLASTICS MANUFACTURING COMPANY  
 4910 BURLINGTON WAY, TACOMA, WA 98409  
 (206) 473-5000 FAX (206) 473-5104

To: Mr. Robert Johnson, President  
 Packaging Technology, Inc.  
 1102 Broadway Plaza, Suite 300  
 Tacoma, WA 98402

July 10, 2001

Robert:

In the table below we propose compressive (crush) strength specification values for the LAST-A-FOAM FR-3711 and FR-3715 used in the GNF New Powder Container. We have found that current production values for these characteristics are minimally different from those that were used to establish the original specification 10 years ago. The revised requirements below are based on the foam test values used in the prototype test packages for GNF and for the first 8 units foamed in June of this year. Harmonization of the specification requirements with the crush performance of the current and prototype foam is necessary to allow for a reasonable tolerance in the crush strength of foam in production.

FR-3711	PARALLEL			PERPENDICULAR		
	10%	40%	70%	10%	40%	70%
NOM. -25%	304	344	963	299	337	983
NOM. -20%	324	366	1027	318	359	1049
NOM. -15%	344	389	1091	338	382	1114
NOMINAL	405	458	1284	398	449	1311
NOM. +15%	466	527	1477	458	516	1508
NOM. +20%	486	550	1541	478	539	1573
NOM. +25%	506	573	1605	498	561	1639

FR-3715	PARALLEL			PERPENDICULAR		
	10%	40%	70%	10%	40%	70%
NOM. -25%	522	613	1940	541	631	1964
NOM. -20%	556	654	2070	577	673	2095
NOM. -15%	591	694	2199	613	715	2226
NOMINAL	695	817	2587	721	841	2619

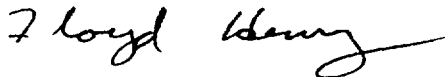
NOM. +15%	800	940	2975	829	967	3012
NOM. +20%	834	980	3104	865	1009	3143
NOM. +25%	869	1021	3234	901	1051	3274

*It should be noted that the foam in the first 8 units meets both the requirements of FP-024 rev. 2 and those of the new proposed limits above, and that both old and new requirements are conservative with respect to the tested prototypes.*

In summary, we believe that these proposed changes to the foam specification better reflect foam crush properties than the data originally published around ten years ago. Over that time there have been slight changes in the production process and raw materials. For example, Freon 11 is no longer used as an expanding agent. Another change was the upgrading and automating of the testing equipment resulting in more accurate analysis.

Sincerely,

General Plastics Manufacturing Company



Floyd P. Henry

Vice President, Engineering and Production