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H1259 Container Foams: Performance Data on Aged Materials

L. A. Domeier, P. N. Keifer, K. L. Lee

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185 and Livermore, California 94550

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Linda Domeier
Pat Keifer
Materials Chemistry Department

Ken Lee
Materials Mechanics Department

Sandia National Laboratories
Livermore, CA 94550

ABSTRACT

Samples of the three cushioning foams used in the H1259 weapon storage container were obtained in 1997, 1998, 2000 and 2001 and tested for density, compression set and compressive strength using the same procedures specified for acceptance testing. Foams from six containers, all about 30 years old and located at Pantex, were evaluated. The bottom cushioning foam is a General Plastics polyurethane foam and the two side pads are rebonded polyurethane foams. All the tests were carried out at room temperature.

When compared to the original acceptance requirements the foams were generally in-spec for density and compressive strength at 10% strain and were generally out-of-spec for compression set and compressive strength at 50% strain. Significant variability was noted in the performance of each foam sample and even more in the container-to-container foam performance. The container-to-container variability remains the major unknown in predicting the long-term suitability of these containers for continued use.

The performance of the critical bottom cushion foams was generally more uniform and closer to the specified performance than that of the rebonded foams. It was judged that all the foams were adequate for continued use as storage container foams (not shipping) under controlled conditions to mitigate temperature extremes or high impact.

This archived information is important in evaluations of the continued suitability for weapon storage use of the H1259 containers and other containers using the same foam cushions.

Contents

Page

INTRODUCTION ---------- 5

PROCEDURES ---------- 5

RESULTS and DISCUSSION ---------- 6

SUMMARY ---------- 8

APPENDIX ---------- 20

Introduction and Procedures

Surplus H1259 storage containers at Pantex are currently planned for refurbishment into H1639 storage containers. Those containers are expected to see continued storage use for additional weapon systems being removed from stockpile. Many of the H1259 containers are already 30 years old. As part of this effort, therefore, the condition of the foams in the containers and any apparent aging trends were evaluated.

Six of the oldest H1259 containers were selected in 1997 for testing and samples of each of the three container foams were removed in 1997, 1998, 2000 and 2001. The identity of the containers is shown in Figure 1 along with a schematic of the three foams and their locations within the containers. Part numbers for the three foams are 272009, 272011 and 320664. The most critical cushion is the bottom cushion, part 272011 (per specification 2170372,) and this was fabricated from virgin polyurethane foam made by General Plastics. The mid (part 320664) and lower (part 272009) side pads (per specification 2170619 in 2170617 thru 2170620) were made from less expensive rebonded polyurethane foams, which generally have poorer and less uniform performance.

The material specs call out the use of test specification 9952033 (Type I) for acceptance testing. These same density, compression set and compressive strength (deflection) tests were used to evaluate the aged foams from Pantex. The results from the four series of tests have been compiled and graphed and are archived in this report. The results from the tests in 1997 and 1998 were also documented in memos from Larry Brown to DOE. All of these results were presented to a December 2001 review of the H1639 storage container program.

Procedures (per 9952033)

After the large foam pieces were received at Sandia, CA they were sent out to Bob's Foam Factory in Fremont, CA to be cut into test specimens. Three to four specimens measuring 2x2x1 inch and three to four specimens measuring 4x4x1 inch were cut from each piece of foam.

The 2x2x1 inch specimens were used both to measure density and then compression set. The 4x4x1 inch specimens were used to measure compressive strength at 10% and 50% strain. The dimensions of the test specimens were not highly uniform or precise and that variability was one factor contributing to the observed performance variability. In most tests only three specimens were used. All tests were carried out under ambient conditions.

In the density test the dimensions and weight of each specimen were measured and used to calculate a density. Dimensions were measured with either a ruler or micrometer with little difference noted. These individual density values were averaged to give a density for each foam piece in each container. The specified density for the bottom cushion (272011) is 6.5-8.5 pcf (pounds per cubic foot). The specified density for the mid (320664) and bottom (272009) pad rebond foams is 6.75-8.25 pcf.

In the compression set test the height of the specimens was measured with a laser micrometer (Techmet LaserMike Model 183) using the lowest value obtained in four measurements with the sample rotated to a different face before each measurement. The specimens were then placed between steel compression plates and compressed to 0.5 inches using spacers. The compression set plates with the specimens were placed in an oven at 158°F (70°C) for 22 hours. After removing the foam specimens from the plate fixtures they were allowed to cool for about 30 minutes and the height was again measured with the laser micrometer. The compression set percentage is calculated as the difference between the initial and final measured thickness divided by the initial thickness minus the compressed thickness. If the sample does not rebound at all from the compressed thickness the compression set would be 100%. If it completely rebounds the CS% would be 0%. All specimens were compressed to 0.5 inches regardless of their actual height, which varied slightly from the nominal one inch specified. This variability in the actual percent compression, along with the material variability, would contribute to the observed variability in the compression set values. The specified maximum compression set for the bottom cushion (272011) is 8%. The specified maximum compression set for the mid (320664) and bottom (272009) pad rebond foams is 20%.

In the compressive strength test the specimens were compressed at 2 inches/minute to 60% strain and decompressed three times and then allowed to relax for 5 minutes. The specimens were then compressed a fourth time and the stress measured at 10% and 50% strain. The specified compressive strength for the bottom cushion (272011) is 1.5-3.5 psi at 10% strain and 4.5-7.5 psi at 50% strain. The specified compressive strength for the mid (320664) and bottom (272009) pad rebond foams is 0.7-1.3 psi at 10% strain and 5.0-9.0 psi at 50% strain. The rebonded foams have less strength than the virgin foam at low strains and higher strength at high strains.

It should be noted that any permanent change in the foam dimensions over the 30 years they have been fielded was not captured by the compression set test above. No unusual distortion was noted in the foams, however, and no foam densities above the specified limits were observed. Any significant compression set in the field would be reflected by an increase in the apparent foam density.

Results and Discussion

The average test data for all four test series is presented in Table 1 and in Figures 2 through 4. These averages combine the data for each foam in all six containers to provide an overview of the foam performance and any aging trends over the five-year span of the tests. Those table values, which are out-of-spec, are highlighted by shading. As is apparent from the summary table, the two tests with the highest levels of out-of-spec performance are the compression set and the compressive strength at 50% strain.

Table 1 also contains standard deviations, which reflect the container-to-container variability (denoted as SD-C) and the test and material variability (denoted as SD-F). SD-C was calculated from the six test values, one per container, for each foam in a given year where those values (shown in Table 1) were averages of the 3 to 4 specimens tested. SD-F was calculated by averaging the standard deviations found for the 3 to 4 test specimens for that foam type in each

container. Individual test values and standard deviation data for each test are provided in the more detailed test data in the appendix.

Additional figures (5 through 40) depict the average performance of each foam type over the four test series (three plots per page) and also the performance of the foams in each container (six plots per page) over the four test series. These plots enable a more detailed look at the performance of each container and the variability in the container and foam performance.

The performance variability observed is high over the six containers examined and probably reflects variability in the entire population. The container-to-container variability was higher than the test/material variability in all tests except the compressive strength at 10% where they were roughly the same. Because the six containers chosen for this testing were among the oldest, it is presumed that the newer containers may have better performance.

The average foam density has been within specification for all four test series with a few exceptions. The densities have shown little change over the period examined and, as noted above, no exceptionally high densities were noted which might indicate excessive compression set in the field.

The average foam compression set values were slightly over specification for all four test series, but have changed little over the period examined. The highest compression sets, close to 30%, were found in the lower pad rebond foam in container 4, and the lower pad foam generally showed more container-to-container variability than the other foams. The bottom cushion foam, the most important foam, had compression set values above the specified 8% maximum but were generally uniform in performance and ranged from about 8 to 16%. The rebonded foams used in mid and lower pads, are lower performance materials and have a specified compression set maximum of 20%. With the exception of container 4, these compression set values ranged from about 15 to 25%.

A key concern has been the compressive strength at 10% and 50% strain. Changes in the operator, the test hardware and the test software have introduced slight differences in the test methodology from year to year and such changes appear to account for the lower values observed in the 2001 test series. When all these changes are considered there appears to be no significant change in these properties over the period examined. Overall, the compressive strength values at 10% strain are generally within spec with some data above and below the target ranges. The compressive strength values at 50% strain show higher levels of below-spec performance in the two rebond foams (lower and mid pad). The bottom cushion foam shows better performance with most test values within spec.

The foams remain compliant to the touch with no evidence of brittleness and do not look "bad." The test data discussed above also showed no deterioration trends over the five-year span of these tests, which would suggest that the foams would no longer be usable in the near future.

Summary

The H1259 container foams show reasonably good performance in spite of their age. This performance does vary widely from container to container, however, and worse case scenarios need to be considered in evaluating their suitability for continued use. All the current test data is only suitable for judging the uniformity of the foams and their performance relative to the initial requirements. This data does not measure the foam performance under high strain rates or at different temperatures.

These containers are already certified for storage only, not for transportation use. While technically out-of-spec in many cases, the foams appear to be suitable for such continued benign use, particularly if care is taken to minimize exposure to extreme temperatures and to mitigate conditions that might result in high impacts.

Figure 1. H1259 Container Foams from Pantex

	Unit Identification	+Desiccant?	Original Storage Site
Unit 1	JAW-2770-F71	yes	Bull Barn (under awning)
Unit 2	MBZ-R/A-B78	no	Bull Barn
Unit 3	JAW-1133-00, MBZ-R/A-C71	yes	Bull Barn (was outside)
Unit 4	JAW-2627	no	Bull Barn
Unit 5	JAW-1334-F0, MBZ-R/A-C71	yes	inside
Unit 6	JAW-1521-H0, MCA-R/A-B71	no	inside

Six older containers were selected at Pantex, two from inside storage and four from the Bull Barn area, and marked as "Engineering Evaluation Unit." During each test cycle, a single large sample was cut from the three foams in each container, bagged and marked with the foam part and container serial numbers. The remaining foams were returned to each container for storage. Desiccant was added to one drum stored inside and two stored in the bull barn. At SNL/CA each sample was cut into 3 to 4 pieces measuring 2x2x1 inches and 3 to 4 pieces measuring 4x4x1 inches for testing. All units had foams with apparent water stains except Unit 1. Unit 3 was an unbolted "Training Only" unit moved to the Bull Barn from outside storage.

272011: Bottom Cushion General Plastics (GP) virgin foam

272009: Lower Pad re-bonded foam

320664: Mid Pad re-bonded foam

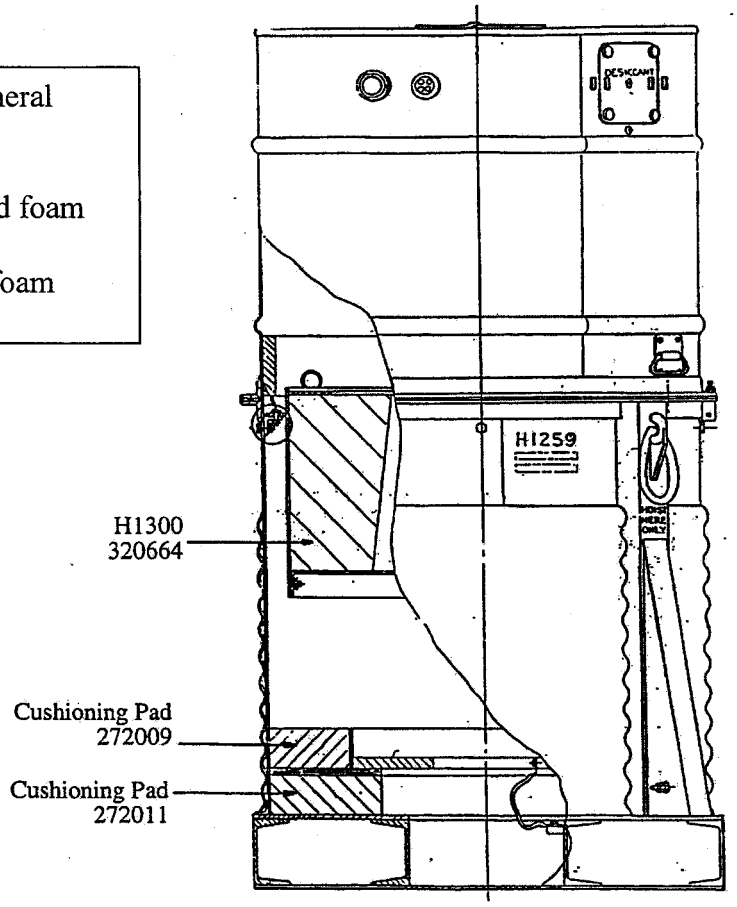


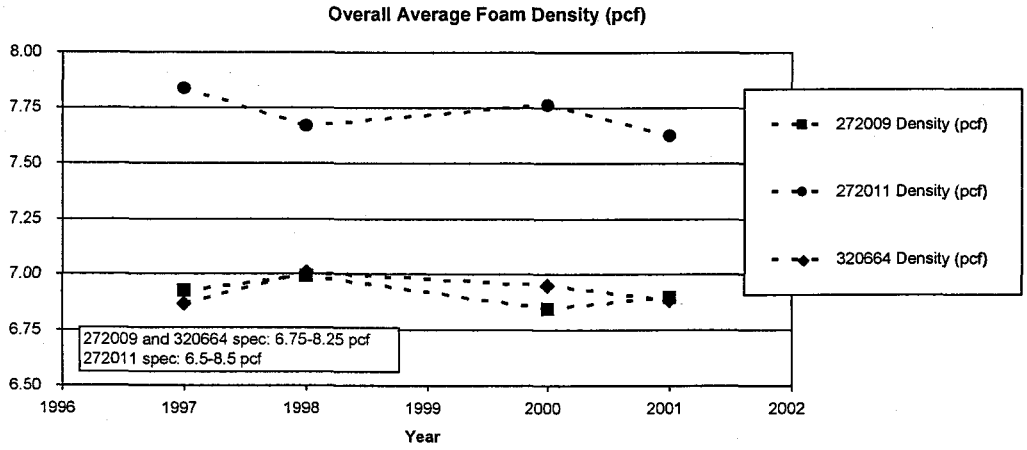
Table 1. Summary Table of H1259 Container Foam Properties

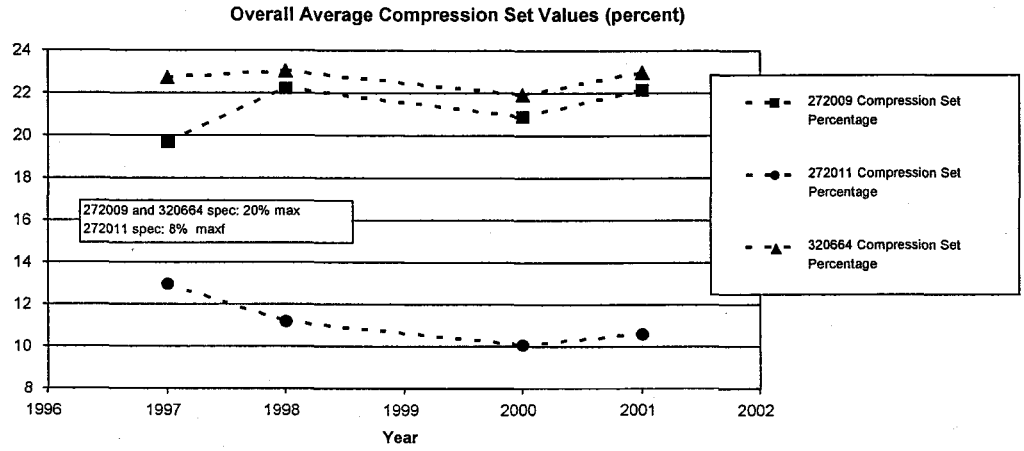
Summary of H1259 Storage Container Foam Properties (Individual values are the average of measurements on 3-4 foam samples.)
Test procedures as per 9952033. denotes "out-of-spec" results

Unit	Foam	Density (lbs/cubic foot)				Compression Set Percentage				Strength at 10% Compression (psi)				Strength at 50% Compression (psi)			
No.	Number	1997	1998	2000	2001	1997	1998	2000	2001	1997	1998	2000	2001	1997	1998	2000	2001
1	272009	7.64	7.43	7.35	7.30	19.2	20.1	20.2	19.9	0.72	0.84	1.14	0.81	4.94	4.93	6.25	4.86
1	272011	8.02	7.80	8.00	7.89	9.2	9.4	7.7	7.9	1.09	2.10	2.30	2.04	3.81	4.77	4.95	4.36
1	320664	6.67	6.80	6.55	6.87	23.0	25.6	26.0	25.1	0.74	1.19	1.08	1.15	4.54	5.03	5.29	4.38
2	272009	6.50	6.99	7.12	7.34	12.8	14.5	15.0	15.4	0.57	0.79	1.04	0.83	3.39	4.37	4.91	4.66
2	272011	7.66	7.43	7.84	7.79	12.7	12.4	12.3	14.6	1.73	2.55	3.23	2.46	5.84	6.62	7.97	6.52
2	320664	6.93	6.80	6.94	6.54	20.8	22.3	23.7	25.2	0.52	1.22	1.08	0.61	4.03	5.21	5.55	3.70
3	272009	7.98	7.43	7.31	7.21	15.4	20.5	19.5	19.8	0.96	0.91	1.28	0.86	6.07	5.42	6.44	5.32
3	272011	8.18	8.18	8.02	7.84	13.6	14.4	10.4	11.5	1.41	2.79	3.14	2.36	5.84	6.83	7.62	5.84
3	320664	6.52	6.43	6.41	6.57	23.1	23.8	21.2	26.2	0.79	0.86	1.04	0.74	4.89	4.70	5.02	4.53
4	272009	5.36	6.62	5.30	5.62	30.6	31.1	27.5	33.0	0.51	0.52	0.78	0.55	3.68	3.28	4.27	3.58
4	272011	7.00	6.56	6.84	6.78	16.4	12.0	10.4	12.1	1.60	2.14	2.25	2.13	4.15	4.45	4.87	4.40
4	320664	7.57	7.49	7.61	7.43	24.2	23.7	21.8	24.3	0.58	1.17	1.12	0.55	4.50	4.84	6.14	4.40
5	272009	7.36	6.87	7.09	7.19	19.6	21.3	21.1	20.3	0.78	0.90	1.20	0.82	5.25	5.32	6.38	5.02
5	272011	8.21	7.80	7.92	7.75	15.9	8.5	9.3	8.3	1.57	2.81	2.98	2.43	4.93	5.83	6.09	5.02
5	320664	7.43	7.37	7.79	7.52	19.0	21.2	19.2	16.2	0.59	0.73	0.87	1.07	3.55	4.42	4.42	4.76
6	272009	6.72	6.62	6.93	6.72	20.7	25.8	22.2	24.4	0.77	1.13	1.70	1.12	5.37	6.53	8.12	6.27
6	272011	7.96	8.24	7.97	7.70	10.1	10.1	10.4	9.1	1.76	2.32	2.48	2.11	4.56	4.99	5.50	4.48
6	320664	6.12	7.18	6.39	6.36	26.2	21.7	19.8	20.9	0.39	0.47	0.66	0.31	2.53	2.72	3.16	2.24
Avg.	**272009**	**6.93**	**6.99**	**6.85**	**6.90**	**19.7**	**22.2**	**20.9**	**22.13**	**0.72**	**0.85**	**1.19**	**0.83**	**4.78**	**4.98**	**6.06**	**4.95**
Avg.	**272011**	**7.84**	**7.67**	**7.77**	**7.63**	**13.0**	**11.1**	**10.1**	**10.58**	**1.53**	**2.45**	**2.73**	**2.26**	**4.86**	**5.58**	**6.17**	**5.10**
Avg.	**320664**	**6.87**	**7.01**	**6.95**	**6.88**	**22.7**	**23.0**	**22.0**	**22.98**	**0.60**	**0.94**	**0.98**	**0.74**	**4.01**	**4.49**	**4.93**	**4.00**
Range	272009	2.62	0.81	2.01	1.72	17.8	11.0	12.5	17.6	0.45	0.61	0.92	0.57	2.68	3.25	3.85	2.69
Range	272011	1.21	1.68	1.18	1.11	7.2	5.9	4.6	6.7	0.67	0.71	0.98	0.42	2.03	2.38	3.10	2.16
Range	320664	1.45	1.06	1.40	1.16	7.2	4.4	6.8	10.0	0.40	0.75	0.46	0.84	2.36	2.49	2.98	2.52
Range = the spread (high to low value) of the average values measured for each container. This is the container-to-container range.																	
SD-C	272009	0.95	0.37	0.77	0.66	6.11	5.63	4.06	6.04	0.16	0.20	0.30	0.18	1.04	1.09	1.35	0.88
SD-C	272011	0.45	0.62	0.46	0.42	2.94	2.19	1.52	2.60	0.25	0.31	0.44	0.18	0.85	1.00	1.34	0.89
SD-C	320664	0.55	0.40	0.62	0.49	2.53	1.62	2.54	3.79	0.15	0.31	0.18	0.32	0.86	0.91	1.04	0.93
SD-C = the standard deviation of the average of the test values from each container. This is an indication of the **container-to-container variability**																	
SD-F	272009	NA	NA	0.10	0.14	0.39	1.23	0.72	1.36	0.14	0.06	0.13	0.05	0.41	0.26	0.35	0.18
SD-F	272011	NA	NA	0.09	0.12	1.72	1.76	0.68	0.82	0.51	0.28	0.15	0.21	0.45	0.49	0.29	0.23
SD-F	320664	NA	NA	0.17	0.18	1.97	1.17	0.71	1.05	0.11	0.10	0.08	0.05	0.28	0.32	0.28	0.14
SD-F = the average of the six standard deviations for that foam type. Three to four test specimans were cut from each container foam sample. This is an indication of the **material and test variability**																	

			Density spec.	CS spec.	10% Comp. spec.	50% Comp. spec.
Unit 1: JAW-2770	Unit 4: JAW-2627	272009 = Rebond Foam, Lower Pad	6.75-8.25 pcf	20%	0.7-1.3 psi	5.0-9.0 psi
Unit 2: MBZ-R/A-B78	Unit 5: JAW-1334	272011 = GP Foam, Bottom Cushion	6.50-8.50 pcf	8%	1.5-3.5 psi	4.5-7.5 psi
Unit 3: JAW-1133	Unit 6: JAW-1521	320664 = Rebond Foam, Mid Pad	6.75-8.25 pcf	20%	0.7-1.3 psi	5.0-9.0 psi

Figure. 2 - 4. Overall Average H1259 Container Foam Properties vs. Sample Year





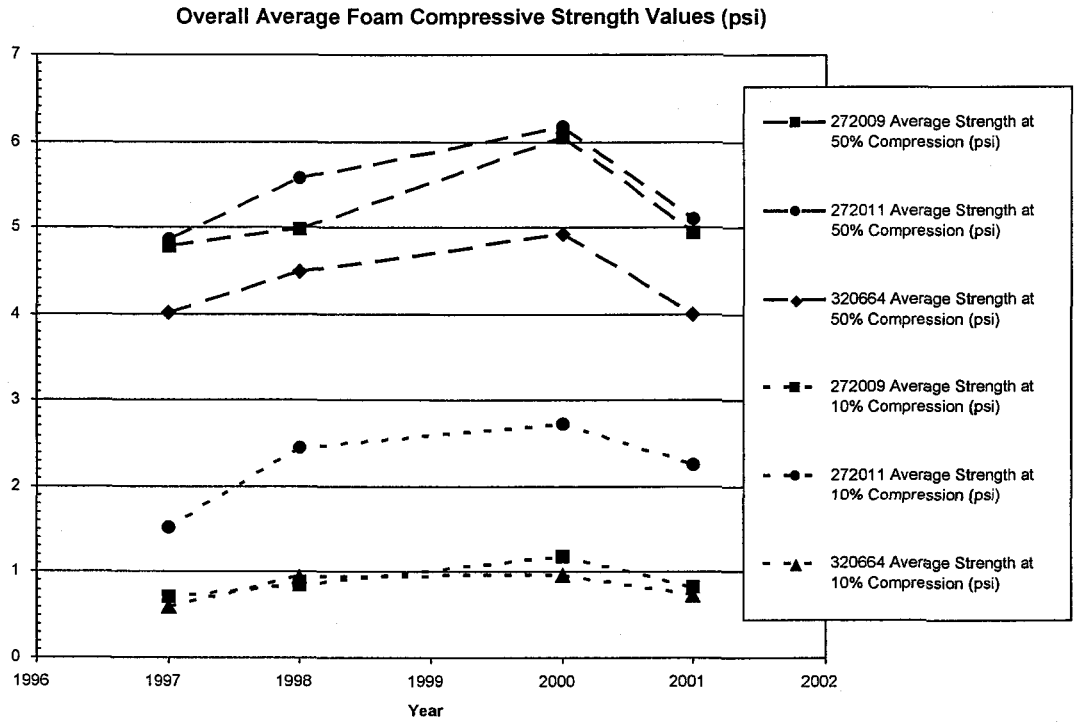
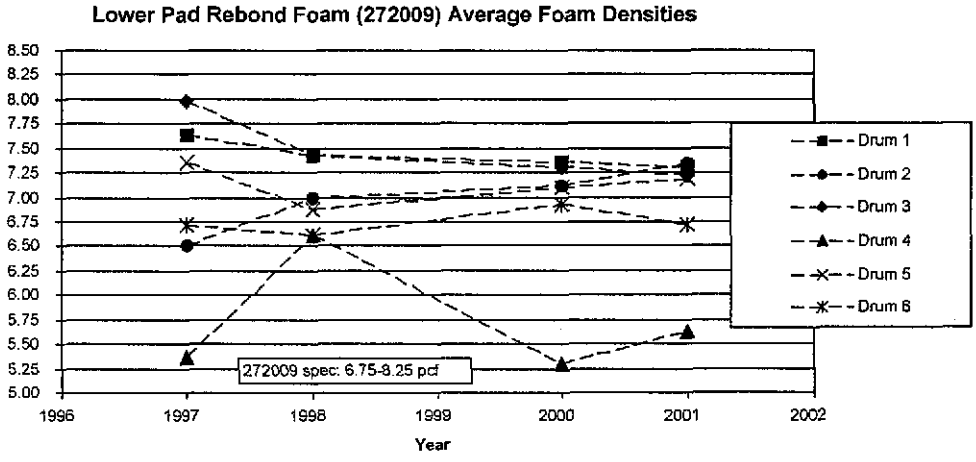
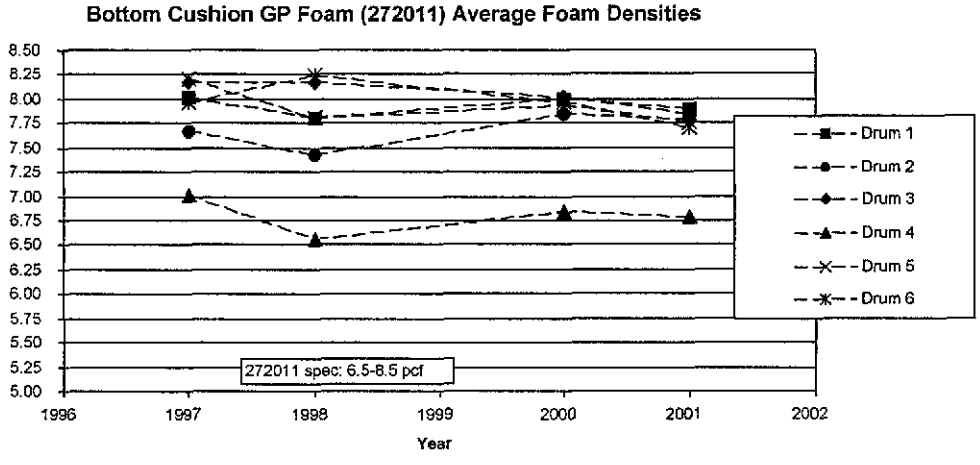


Figure. 5 - 7. Average Foam Densities





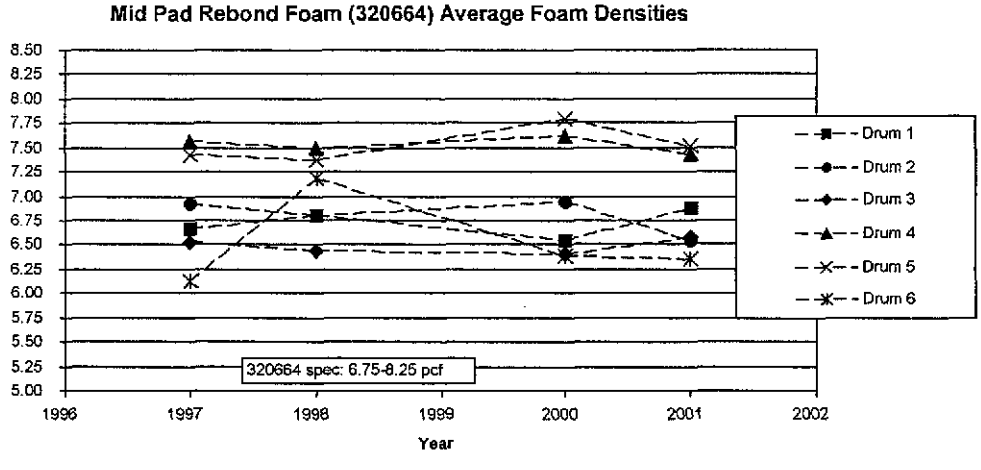
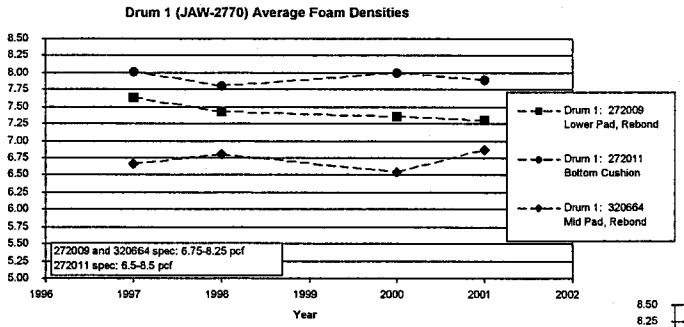
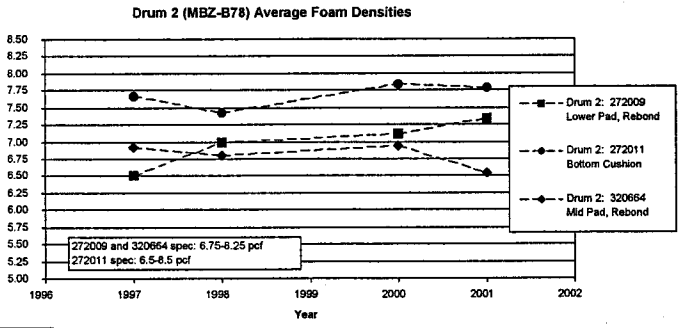
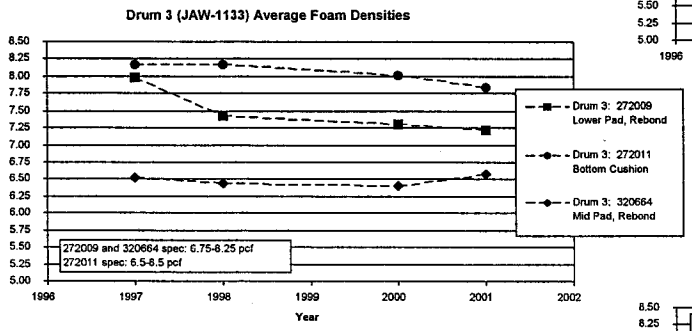
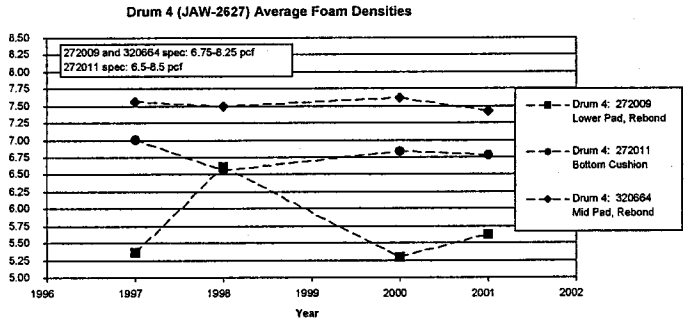


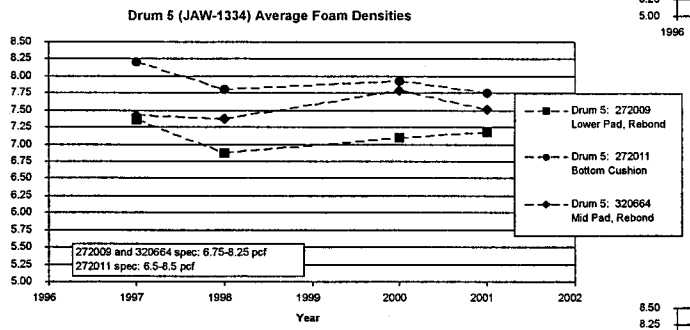
Figure. 8 - 13. Individual Container Foam Densities











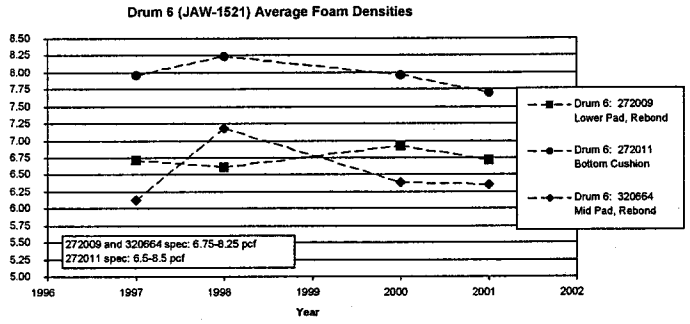
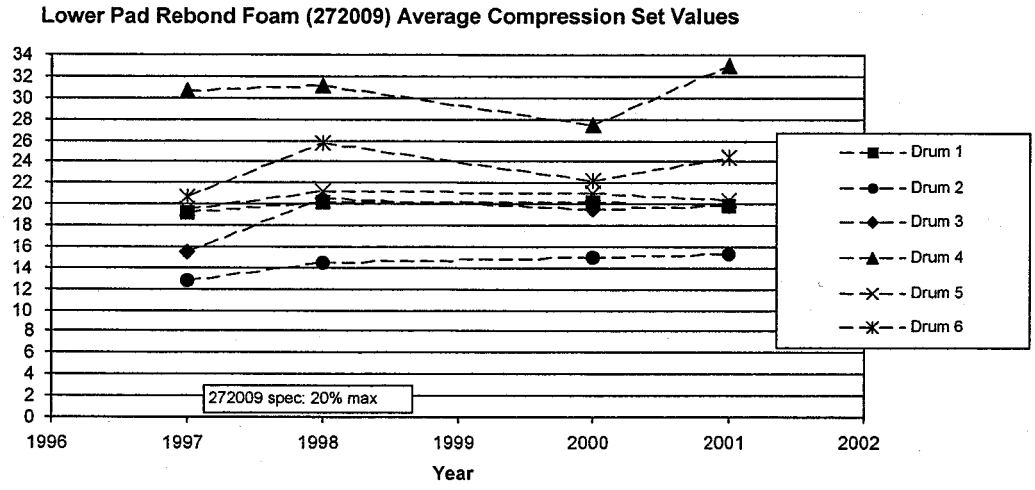
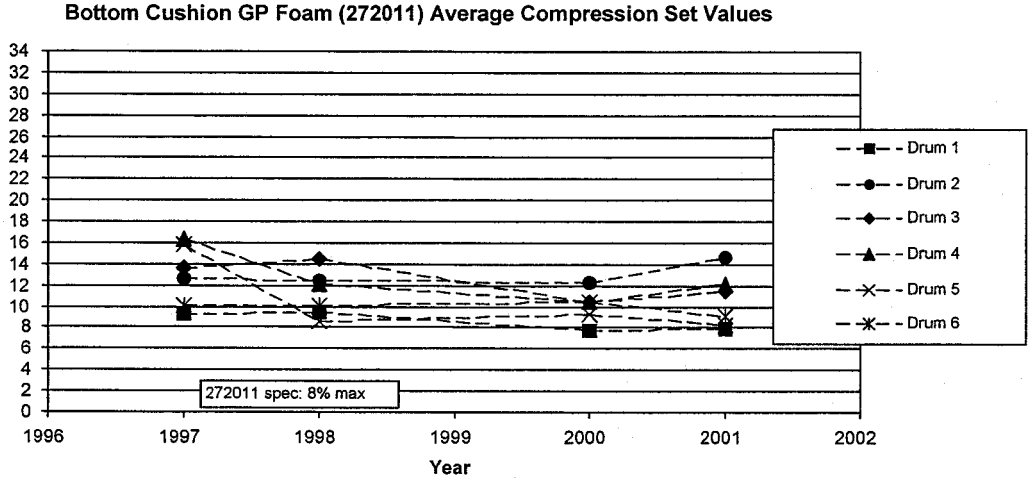


Figure. 14 - 16. Average Foam Compression Set Values





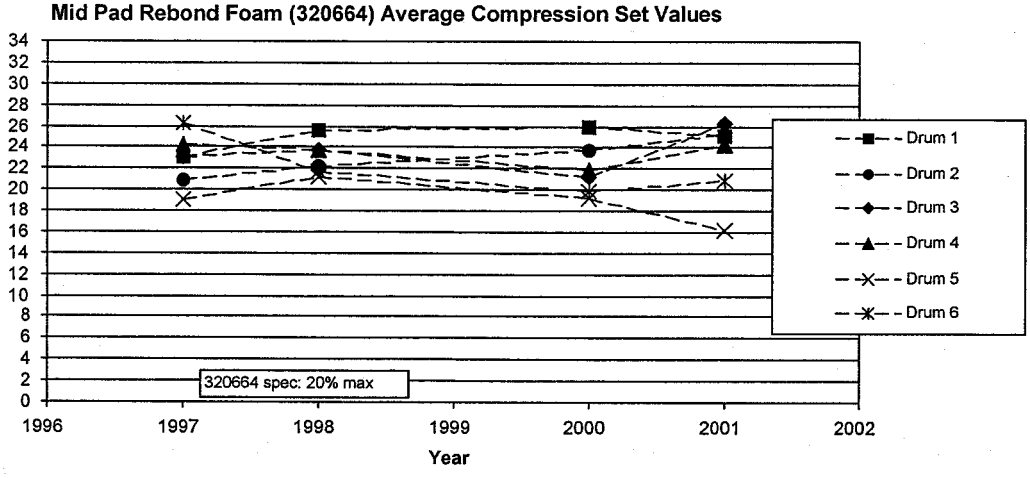
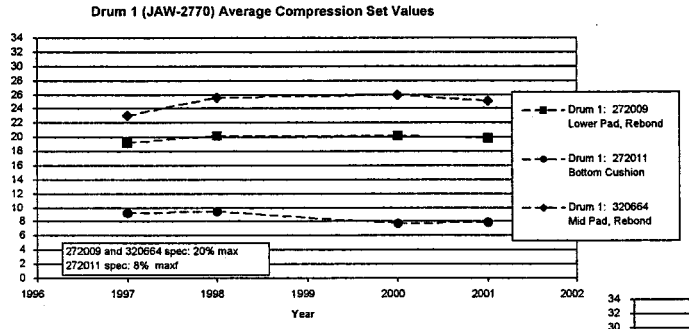
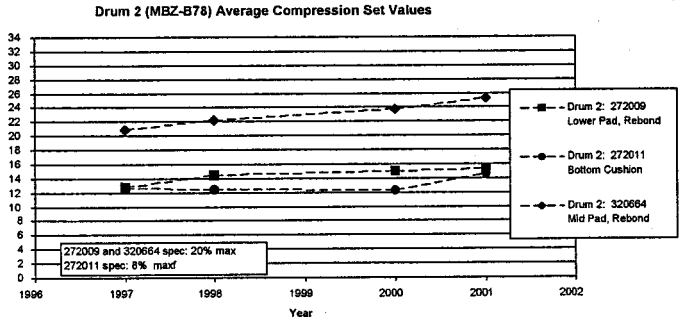
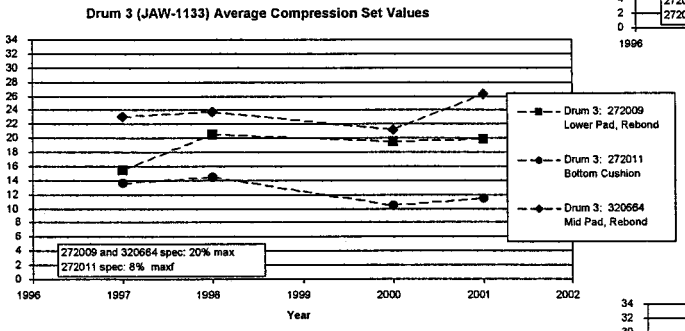
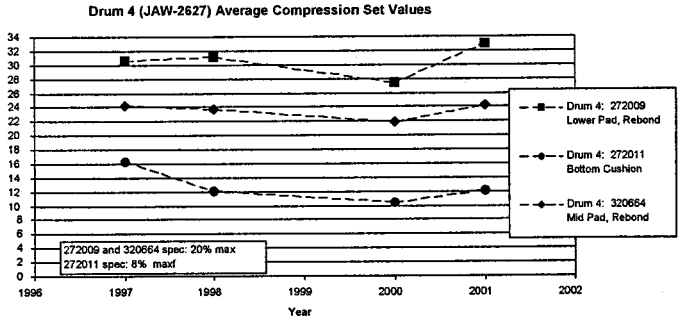


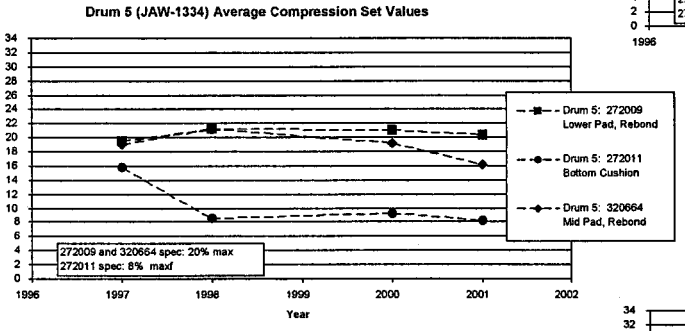
Figure. 17 - 22. Individual Container Compression Set Averages











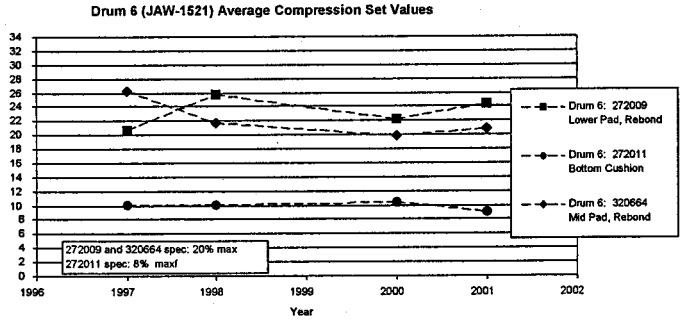
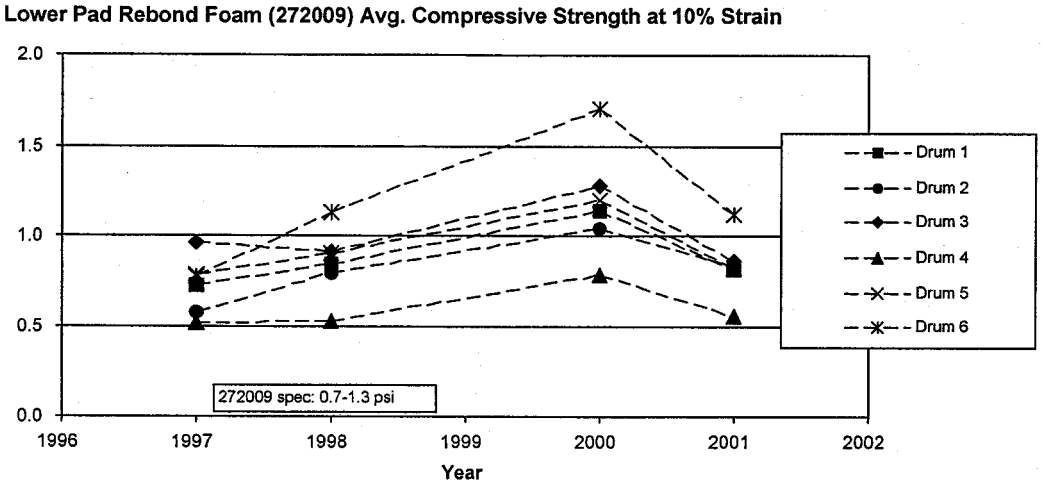
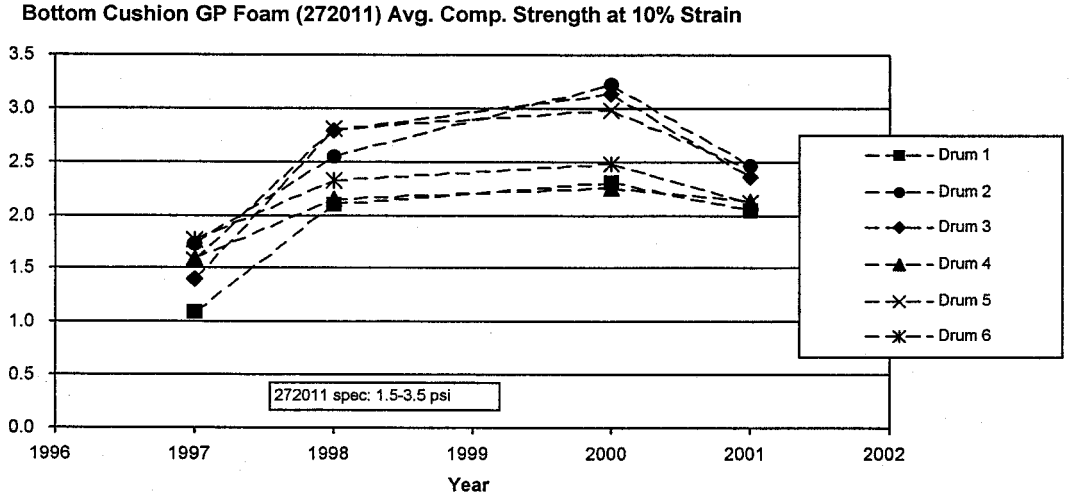


Figure. 23 - 25. Average Foam Compressive Strength Values at 10% Strain





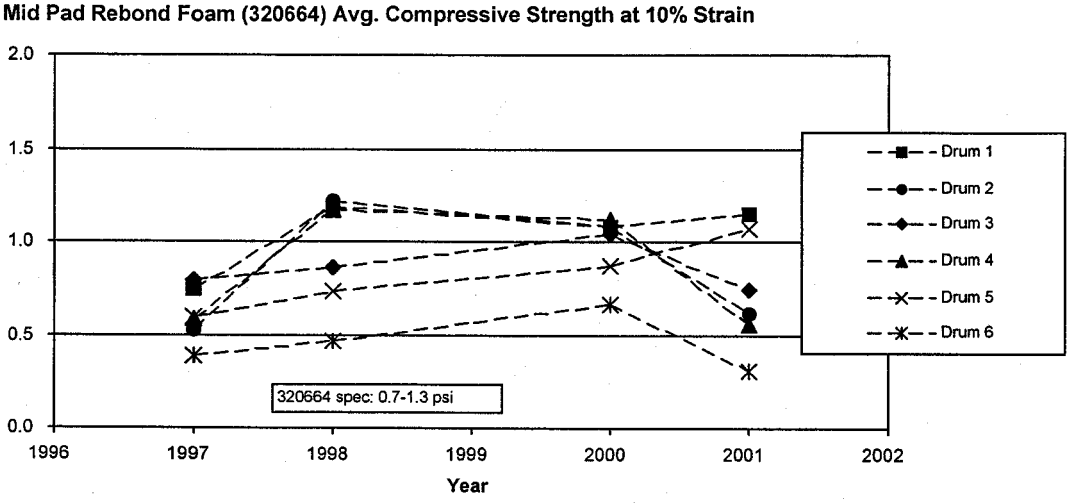
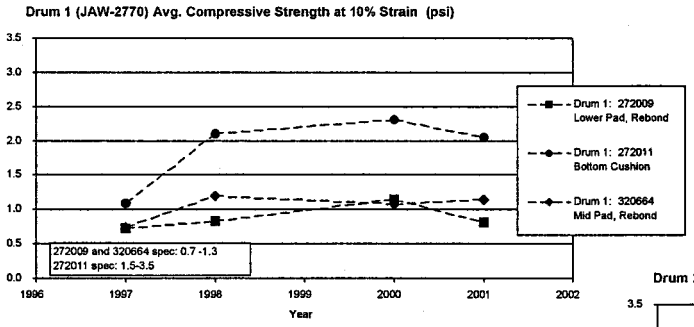
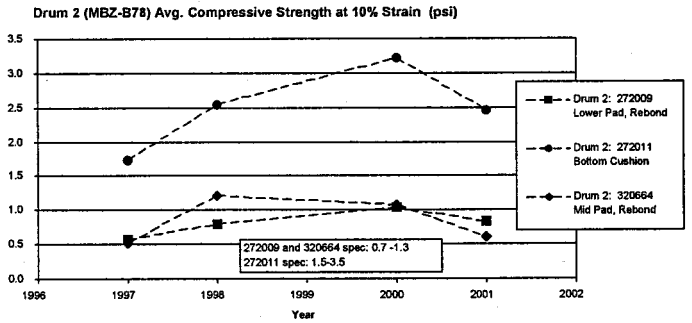
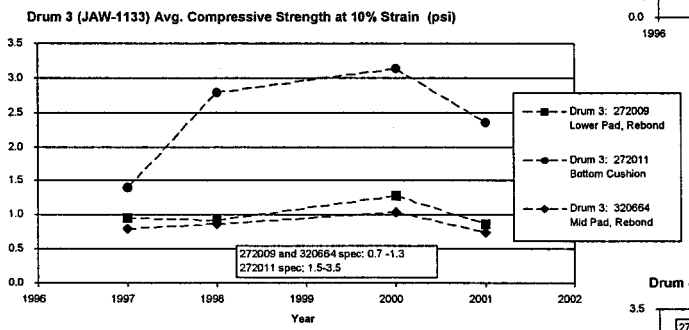
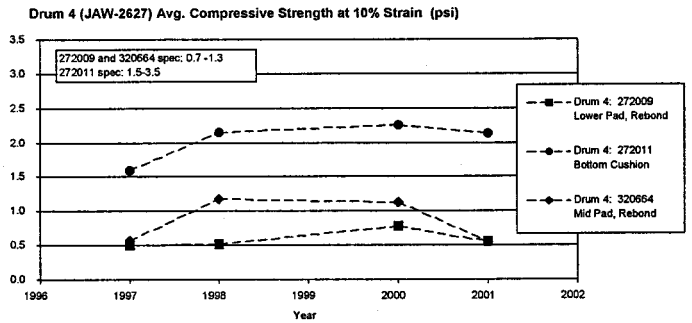


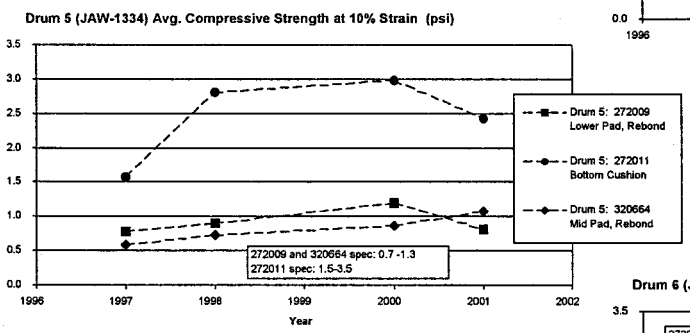
Figure. 26 - 31. Individual Container Compressive Strength Values at 10% Strain











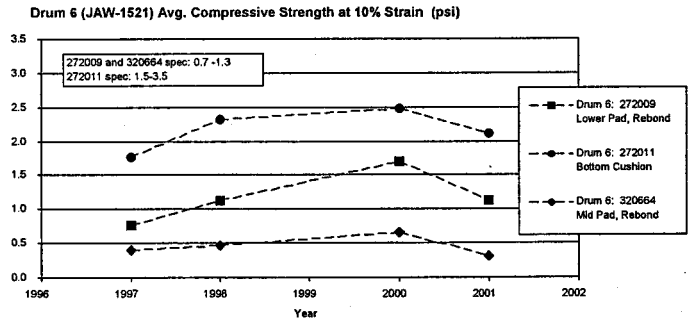
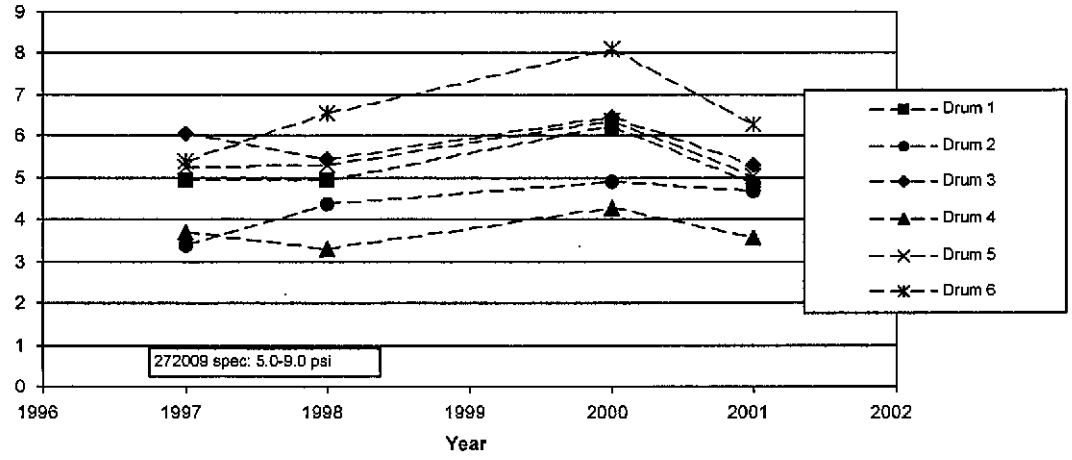
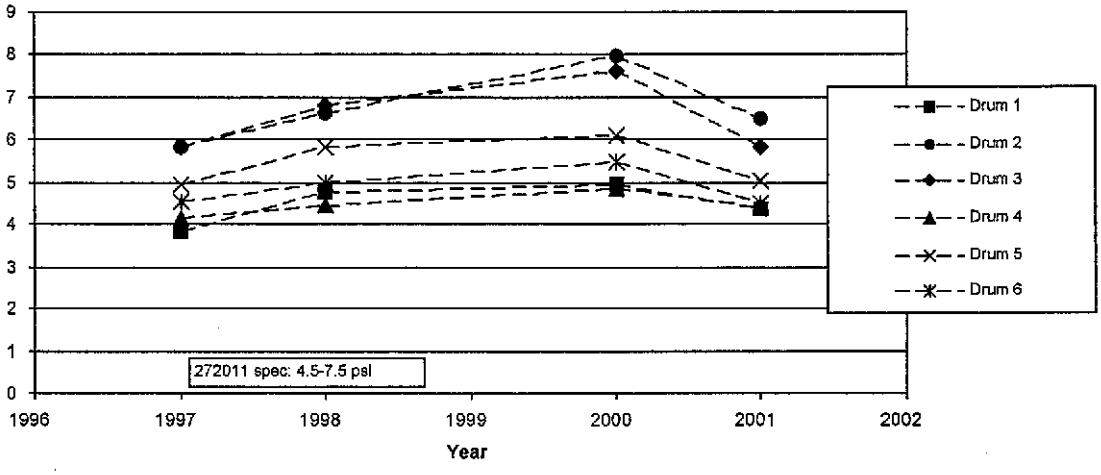


Figure. 32 - 34. Average Foam Compressive Strength Values at 50% Strain

Lower Pad Rebond Foam (272009) Avg. Compressive Strength at 50% Strain



Bottom Cushion GP Foam (272011) Avg. Comp. Strength at 50% Strain



Mid Pad Rebond Foam (320664) Avg. Compressive Strength at 50% Strain

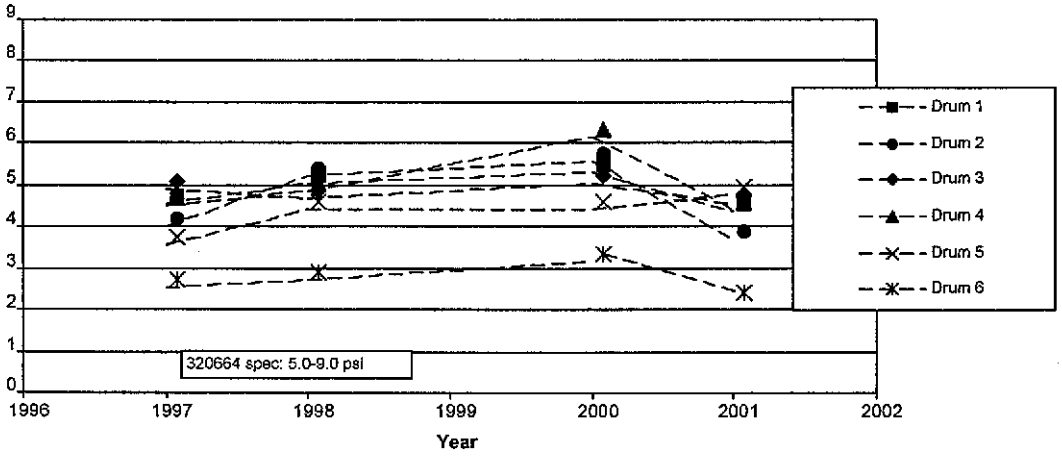
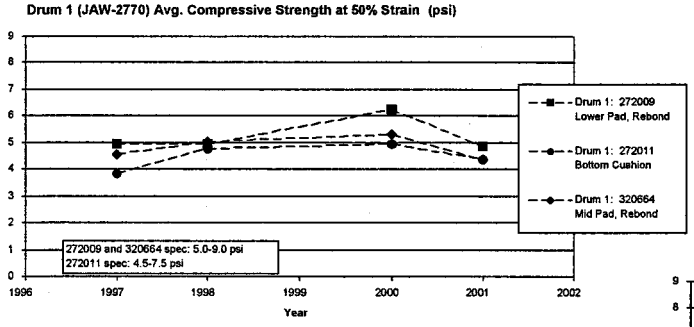
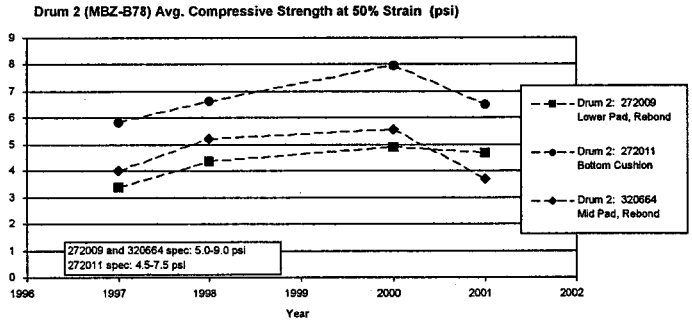
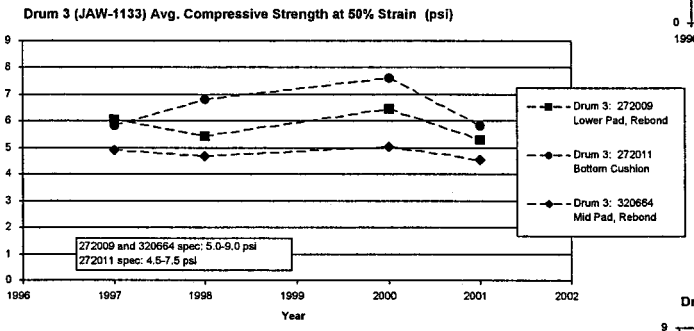
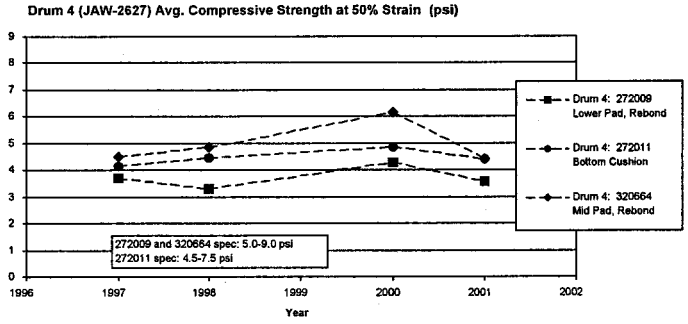


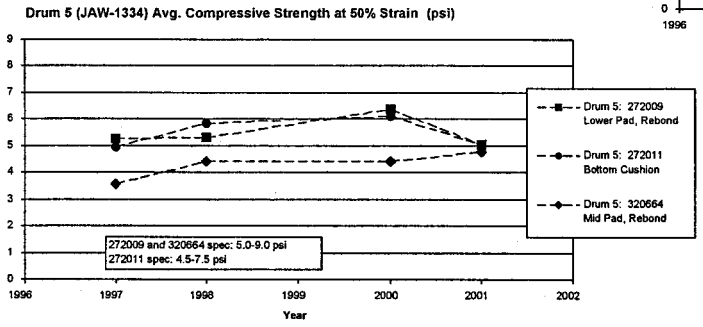
Figure. 35 - 40. Individual Container Compressive Strength Values at 50% Strain

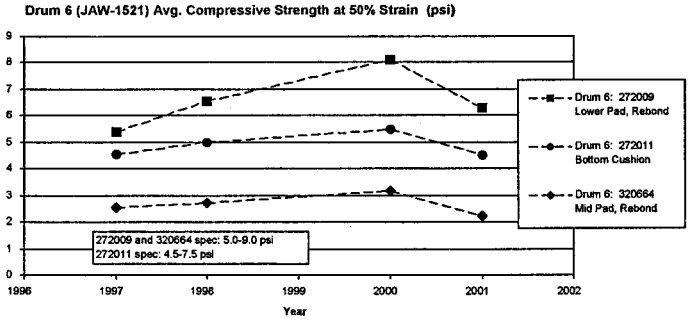












Appendix

The following tables provide detailed test information, which has been summarized in the Table and Figures in the report body. The original data from the 1997 and 1998 density tests could not be located.

Container Foam Densities: 2000 Data

2000 Polyurethane Foam Densities (using 2 x 2 x 1 inch compression set samples)

Unit	Foam No.	Wt - 1	Wt - 2	Wt - 3	Size - 1			Size - 2			Size - 3			Vol - 1	Vol - 2	Vol - 3	Den - 1	Den - 2	Den - 3	**Avg.**	Std. Dev.	Avg.	Std. Dev.	Coef.
		grams	grams	grams	in x in x in			in x in x in			in x in x in			in3	in3	in3	lbs/ft3	lbs/ft3	lbs/ft3	**lbs/ft3**	lbs/ft3	g/cc	g/cc	Var.
1	272009	8.56	8.39	8.03	1.04	2.03	2.07	1.03	2.09	2.03	1.01	2.04	2.04	4.37	4.37	4.20	7.46	7.32	7.28	**7.35**	0.10	0.118	0.002	1.33
1	272011	9.27	9.33	9.37	1.03	2.09	2.07	1.04	2.06	2.07	1.05	2.07	2.04	4.46	4.43	4.43	7.93	8.02	8.05	**8.00**	0.06	0.128	0.001	0.81
1	320664	7.48	7.57	7.13	1.00	2.04	2.05	1.06	2.05	2.04	1.02	2.03	2.07	4.18	4.43	4.29	6.82	6.51	6.34	**6.55**	0.24	0.105	0.004	3.69
2	272009	7.89	7.96	7.98	0.99	2.07	2.03	1.03	2.03	2.07	1.02	2.05	2.04	4.16	4.33	4.27	7.23	7.01	7.13	**7.12**	0.11	0.114	0.002	1.54
2	272011	8.86	8.94	9.44	1.02	2.06	2.06	1.05	2.06	2.02	1.07	2.08	2.04	4.33	4.37	4.54	7.80	7.80	7.92	**7.84**	0.07	0.125	0.001	0.92
2	320664	8.28	8.22	8.34	1.04	2.09	2.08	1.07	2.09	2.06	1.04	2.08	2.09	4.52	4.61	4.52	6.98	6.80	7.03	**6.94**	0.12	0.111	0.002	1.74
3	272009	8.36	8.36	8.42	1.03	2.02	2.09	1.04	2.03	2.09	1.03	2.03	2.08	4.35	4.41	4.35	7.33	7.22	7.38	**7.31**	0.08	0.117	0.001	1.10
3	272011	8.81	9.19	8.26	1.02	2.04	2.03	1.06	2.04	2.01	0.94	2.05	2.03	4.22	4.35	3.91	7.95	8.06	8.05	**8.02**	0.06	0.128	0.001	0.75
3	320664	7.30	7.49	7.38	1.02	2.07	2.06	1.02	2.10	2.07	1.01	2.05	2.12	4.35	4.43	4.39	6.39	6.44	6.41	**6.41**	0.02	0.103	0.000	0.33
4	272009	5.92	6.01	6.12	1.02	2.07	2.04	1.03	2.04	2.10	1.00	2.11	2.02	4.31	4.41	4.26	5.24	5.19	5.47	**5.30**	0.15	0.085	0.002	2.84
4	272011	7.53	7.65	7.56	1.00	2.05	2.05	1.01	2.05	2.05	1.00	2.06	2.05	4.20	4.24	4.22	6.83	6.87	6.82	**6.84**	0.03	0.109	0.000	0.37
4	320664	8.85	9.09	8.70	1.04	2.06	2.09	1.03	2.08	2.08	1.02	2.07	2.09	4.48	4.46	4.41	7.53	7.77	7.51	**7.61**	0.15	0.122	0.002	1.91
5	272009	7.84	7.97	7.29	1.01	2.01	2.08	1.03	2.02	2.05	0.97	2.00	2.02	4.22	4.27	3.92	7.07	7.12	7.09	**7.09**	0.02	0.114	0.000	0.33
5	272011	9.02	9.35	9.62	1.06	2.03	2.08	1.06	2.03	2.08	1.06	2.05	2.08	4.48	4.48	4.52	7.68	7.96	8.11	**7.92**	0.22	0.127	0.003	2.76
5	320664	8.71	9.23	8.62	1.02	2.08	2.05	1.02	2.06	2.06	1.02	2.04	2.07	4.35	4.33	4.31	7.63	8.12	7.63	**7.79**	0.29	0.125	0.005	3.68
6	272009	7.75	7.62	7.78	1.04	2.06	1.97	1.04	2.02	2.04	1.03	2.02	2.03	4.22	4.29	4.22	7.00	6.77	7.02	**6.93**	0.13	0.111	0.002	1.95
6	272011	8.74	8.67	8.82	1.01	2.02	2.05	1.02	2.03	2.03	1.03	2.02	2.00	4.18	4.20	4.16	7.96	7.86	8.08	**7.97**	0.11	0.127	0.002	1.36
6	320664	7.44	7.54	7.11	1.04	2.09	2.03	1.05	2.00	2.08	1.04	2.02	2.09	4.41	4.37	4.39	6.42	6.58	6.17	**6.39**	0.21	0.102	0.003	3.22
Avg.	272009															Container to container			0.78	**6.85**	0.10			
Avg.	272011																	standard	0.46	**7.76**	0.09			
Avg.	320664																	deviations	0.62	**6.95**	0.17			

272009 = Rebond Foam, Lower Pad
272011 = Virgin Foam, Bottom Cushion
320664 = Rebond Foam, Mid Pad

1 = JAW-2770-F71
2 = MBZ-R/A-B78
3 = JAW-1133-00 (MBZ-R/A-C71)

4 = JAW-2627
5 = JAW-1334-F0 (MBZ-R/A-C71)
6 = JAW-1521-H0 (MCA-R/A-B71)

Container Foam Densities: 2001 Data

2001 Polyurethane Foam Densities (using 2 x 2 x 1 inch compression set samples)

Unit	Foam No.	Wt - 1 grams	Wt - 2 grams	Wt - 3 grams	Size - 1 in x in x in			Size - 2 in x in x in			Size - 3 in x in x in			Vol - 1 in3	Vol - 2 in3	Vol - 3 in3	Den - 1 lbs/ft3	Den - 2 lbs/ft3	Den - 3 lbs/ft3	**Avg. lbs/ft3**	Std. Dev. lbs/ft3	Avg. g/cc	Std. Dev. g/cc	Coef. Var.
1	272009	8.68	8.64	8.75	1.10	2.06	2.06	1.10	2.04	2.00	1.10	2.03	2.00	4.67	4.49	4.47	7.09	7.34	7.47	**7.30**	0.19	0.117	0.003	2.65
1	272011	9.05	9.26	9.18	1.08	2.02	2.01	1.10	2.01	2.00	1.07	2.08	2.01	4.39	4.42	4.47	7.86	7.98	7.82	**7.89**	0.08	0.126	0.001	1.05
1	320664	7.80	7.73	8.40	1.09	2.00	2.00	1.07	2.02	2.01	1.12	2.04	2.00	4.36	4.34	4.57	6.82	6.78	7.00	**6.87**	0.12	0.110	0.002	1.75
2	272009	9.12	7.81	9.03	1.07	2.07	2.10	1.09	2.10	1.85	1.08	2.04	2.08	4.65	4.23	4.58	7.47	7.03	7.51	**7.34**	0.27	0.117	0.004	3.65
2	272011	8.92	9.25	10.40	1.03	2.05	2.08	1.03	2.10	2.08	1.18	2.05	2.10	4.39	4.50	5.08	7.74	7.83	7.80	**7.79**	0.05	0.125	0.001	0.62
2	320664	8.37	7.15	7.90	1.06	2.12	2.08	0.98	2.09	2.11	1.07	2.06	2.10	4.67	4.32	4.63	6.82	6.30	6.50	**6.54**	0.26	0.105	0.004	4.00
3	272009	8.35	8.57	8.66	1.04	2.02	2.09	1.07	2.07	2.08	1.05	2.07	2.08	4.39	4.61	4.52	7.25	7.09	7.30	**7.21**	0.11	0.115	0.002	1.52
3	272011	8.69	8.36	9.79	1.01	2.01	2.09	1.00	2.05	2.01	1.14	2.08	1.97	4.24	4.12	4.67	7.80	7.73	7.99	**7.84**	0.13	0.125	0.002	1.67
3	320664	7.75	6.89	7.65	1.08	2.03	2.08	0.97	2.03	2.02	1.05	2.02	2.07	4.56	3.98	4.39	6.48	6.60	6.64	**6.57**	0.09	0.105	0.001	1.30
4	272009	6.43	7.13	6.72	1.04	2.05	2.10	1.09	2.09	2.07	1.03	2.10	2.10	4.48	4.72	4.54	5.47	5.76	5.64	**5.62**	0.14	0.090	0.002	2.58
4	272011	7.62	7.64	7.96	1.05	2.02	2.01	1.02	2.08	2.06	1.04	2.02	2.10	4.26	4.37	4.41	6.81	6.66	6.87	**6.78**	0.11	0.109	0.002	1.62
4	320664	9.19	7.29	7.47	1.10	2.06	2.02	0.93	2.02	2.05	0.95	2.02	2.00	4.58	3.85	3.84	7.65	7.21	7.42	**7.43**	0.22	0.119	0.004	2.95
5	272009	8.61	8.51	8.66	1.11	2.05	2.00	1.12	2.00	2.00	1.11	2.07	2.02	4.55	4.48	4.64	7.21	7.24	7.11	**7.19**	0.07	0.115	0.001	0.94
5	272011	9.83	10.05	9.62	1.11	2.07	2.10	1.11	2.10	2.10	1.09	2.10	2.09	4.83	4.90	4.78	7.76	7.82	7.66	**7.75**	0.08	0.124	0.001	1.05
5	320664	9.23	9.10	8.58	1.10	2.10	2.05	1.09	2.03	2.07	1.03	2.00	2.10	4.74	4.58	4.33	7.43	7.57	7.56	**7.52**	0.08	0.120	0.001	1.06
6	272009	7.84	7.76	7.67	1.06	2.04	2.04	1.09	2.00	2.02	1.08	2.00	2.03	4.41	4.40	4.38	6.77	6.71	6.66	**6.72**	0.05	0.107	0.001	0.80
6	272011	9.90	9.99	9.73	1.10	2.12	2.07	1.10	2.11	2.08	1.08	2.13	2.18	4.83	4.83	5.01	7.81	7.88	7.39	**7.70**	0.27	0.123	0.004	3.46
6	320664	6.98	7.55	7.31	1.04	1.98	2.07	1.02	2.00	2.10	1.07	2.05	2.07	4.26	4.28	4.54	6.24	6.72	6.13	**6.36**	0.31	0.102	0.005	4.86
Avg.	272009															Container to container			0.66	**6.89**	0.14			
Avg.	272011																standard		0.42	**7.62**	0.12			
Avg.	320664																deviations		0.49	**6.88**	0.18			

272009 = Rebond Foam, Lower Pad
272011 = Virgin Foam, Bottom Cushion
320664 = Rebond Foam, Mid Pad

1 = JAW-2770-F71
2 = MBZ-R/A-B78
3 = JAW-1133-00 (MBZ-R/A-C71)

4 = JAW-2627
5 = JAW-1334-F0 (MBZ-R/A-C71)
6 = JAW-1521-H0 (MCA-R/A-B71)

Container Foam Compression Set Values: 1997 Data

Unit	Foam	Init.-1	Init.-2	Init -3	Final-1	Final-2	Final-3	Diff.-1	Diff.-2	Diff.-3	Avg Ht.	Avg Ht.	Avg.	**CS**	CS	CS	CS	Std.
		inches	inches	inches	inches	inches	inches	inches	inches	inches	Init.	Final	Diff.	**%**	No.1	No.2	No.3	Dev.
1	272009	0.998	1.010	1.016	0.902	0.914	0.915	0.096	0.096	0.101	1.008	0.910	0.098	**19.2**	19.3	18.8	19.6	0.38
1	272011	0.975	0.918	0.977	0.922	0.880	0.942	0.053	0.038	0.035	0.957	0.915	0.042	**9.2**	11.2	9.1	7.3	1.91
1	320664	1.084	1.031	1.038	0.939	0.910	0.924	0.145	0.121	0.114	1.051	0.924	0.127	**23.0**	24.8	22.8	21.2	1.82
2	272009	1.045	1.048	1.046	0.979	0.976	0.975	0.066	0.072	0.071	1.046	0.977	0.070	**12.8**	12.1	13.1	13.0	0.56
2	272011	0.953	1.042	1.026	0.891	0.975	0.962	0.062	0.067	0.064	1.007	0.943	0.064	**12.7**	13.7	12.4	12.2	0.83
2	320664	1.044	1.002	1.038	0.934	0.883	0.937	0.110	0.119	0.101	1.028	0.918	0.110	**20.8**	20.2	23.7	18.8	2.54
3	272009	1.015	1.020	1.021	0.935	0.943	0.938	0.080	0.077	0.083	1.019	0.939	0.080	**15.4**	15.5	14.8	15.9	0.57
3	272011	0.980	0.979	0.988	0.912	0.912	0.926	0.068	0.067	0.062	0.982	0.917	0.066	**13.6**	14.2	14.0	12.7	0.80
3	320664	1.023	1.022	1.000	0.905	0.907	0.876	0.118	0.115	0.124	1.015	0.896	0.119	**23.1**	22.6	22.0	24.8	1.47
4	272009	1.013	1.022	1.011	0.855	0.862	0.856	0.158	0.160	0.155	1.015	0.858	0.158	**30.6**	30.8	30.7	30.3	0.24
4	272011	0.950	0.970	0.969	0.870	0.905	0.886	0.080	0.065	0.083	0.963	0.887	0.076	**16.4**	17.8	13.8	17.7	2.26
4	320664	1.061	1.057	1.051	0.926	0.926	0.913	0.135	0.131	0.138	1.056	0.922	0.135	**24.2**	24.1	23.5	25.0	0.77
5	272009	1.059	1.043	1.057	0.950	0.935	0.949	0.109	0.108	0.108	1.053	0.945	0.108	**19.6**	19.5	19.9	19.4	0.26
5	272011	0.993	1.020	1.023	0.932	0.930	0.930	0.061	0.090	0.093	1.012	0.931	0.081	**15.9**	12.4	17.3	17.8	3.00
5	320664	1.087	1.079	1.083	0.970	0.978	0.968	0.117	0.101	0.115	1.083	0.972	0.111	**19.0**	19.9	17.4	19.7	1.38
6	272009	1.015	1.017	1.044	0.910	0.908	0.932	0.105	0.109	0.112	1.025	0.917	0.109	**20.7**	20.4	21.1	20.6	0.36
6	272011	0.983	0.990	1.009	0.926	0.946	0.961	0.057	0.044	0.048	0.994	0.944	0.050	**10.1**	11.8	9.0	9.4	1.52
6	320664	1.060	1.110	1.130	0.932	0.925	0.972	0.128	0.185	0.158	1.100	0.943	0.157	**26.2**	22.9	30.3	25.1	3.84
															Std. Dev.			
Avg.	272009											Container to container		**19.7**	6.1			0.4
Avg.	272011											standard		**13.0**	3.1			1.7
Avg.	320664											deviations		**22.7**	2.5			2.0

Heights measured on laser micrometer using lowest cross-section height obtained on four faces.

CS = (100 x avg. height diff.)/(init. height-0.5). This is equivalent to averaging three separate CS values.

					Spec. Maximum
Unit 1: JAW-2770	Unit 4: JAW-2627		272009 = Rebond Foam, Lower Pad		20%
Unit 2: MBZ-R/A-B78	Unit 5: JAW-1334		272011 = GP Foam, Bottom Cushion		8%
Unit 3: JAW-1133	Unit 6: JAW-1521		320664 = Rebond Foam, Mid Pad		20%

Container Foam Compression Set Values: 1998 Data

Unit	Foam	Init.-1	Init.-2	Init -3	Final-1	Final-2	Final-3	Diff.-1	Diff.-2	Diff.-3	Avg Ht.	Avg Ht.	Avg.	**CS**	CS	CS	CS	Std.
		inches	inches	inches	inches	inches	inches	inches	inches	inches	Init.	Final	Diff.	%	No.1	No.2	No.3	Dev.
1	272009	1.044	1.029	1.035	0.922	0.928	0.934	0.122	0.101	0.101	1.036	0.928	0.108	**20.1**	22.4	19.1	18.9	1.99
1	272011	1.040	1.029	1.042	1.000	0.968	0.991	0.040	0.061	0.051	1.037	0.986	0.051	**9.4**	7.4	11.5	9.4	2.06
1	320664	1.031	1.049	1.032	0.898	0.910	0.891	0.133	0.139	0.141	1.037	0.900	0.138	**25.6**	25.0	25.3	26.5	0.77
2	272009	1.013	1.012	1.038	0.937	0.933	0.966	0.076	0.079	0.072	1.021	0.945	0.076	**14.5**	14.8	15.4	13.4	1.05
2	272011	1.023	0.996	1.004	0.953	0.945	0.936	0.070	0.051	0.068	1.008	0.945	0.063	**12.4**	13.4	10.3	13.5	1.82
2	320664	1.057	1.058	1.036	0.937	0.937	0.909	0.120	0.121	0.127	1.050	0.928	0.123	**22.3**	21.5	21.7	23.7	1.20
3	272009	1.063	1.093	1.050	0.943	0.974	0.939	0.120	0.119	0.111	1.069	0.952	0.117	**20.5**	21.3	20.1	20.2	0.69
3	272011	1.004	1.010	1.027	0.925	0.935	0.959	0.079	0.075	0.068	1.014	0.940	0.074	**14.4**	15.7	14.7	12.9	1.41
3	320664	1.043	1.070	1.008	0.918	0.935	0.883	0.125	0.135	0.125	1.040	0.912	0.128	**23.8**	23.0	23.7	24.6	0.80
4	272009	1.058	1.086	1.053	0.878	0.915	0.877	0.180	0.171	0.176	1.066	0.890	0.176	**31.1**	32.3	29.2	31.8	1.67
4	272011	0.979	1.031	1.002	0.919	0.963	0.948	0.060	0.068	0.054	1.004	0.943	0.061	**12.0**	12.5	12.8	10.8	1.11
4	320664	1.010	1.015	1.018	0.892	0.901	0.885	0.118	0.114	0.133	1.014	0.893	0.122	**23.7**	23.1	22.1	25.7	1.82
5	272009	1.052	1.076	1.049	0.926	0.955	0.939	0.126	0.121	0.110	1.059	0.940	0.119	**21.3**	22.8	21.0	20.0	1.42
5	272011	1.028	1.026	0.997	0.969	0.984	0.966	0.059	0.042	0.031	1.017	0.973	0.044	**8.5**	11.2	8.0	6.2	2.50
5	320664	1.013	1.000	1.074	0.898	0.893	0.959	0.115	0.107	0.115	1.029	0.917	0.112	**21.2**	22.4	21.4	20.0	1.20
6	272009	1.038	1.055	1.038	0.903	0.911	0.897	0.135	0.144	0.141	1.044	0.904	0.140	**25.8**	25.1	25.9	26.2	0.58
6	272011	1.006	1.040	1.022	0.959	0.991	0.959	0.047	0.049	0.063	1.023	0.970	0.053	**10.1**	9.3	9.1	12.1	1.67
6	320664	1.105	1.123	0.981	0.968	0.996	0.874	0.137	0.127	0.107	1.070	0.946	0.124	**21.7**	22.6	20.4	22.2	1.21
															Std. Dev.			
Avg.	272009										Container to container			**22.2**	5.6			1.2
Avg.	272011												standard	**11.2**	3.3			1.8
Avg.	320664												deviations	**23.0**	1.6			1.2

Heights measured on laser micrometer using lowest cross-section height obtained on four faces.

CS = (100 x avg. height diff.)/(init. height-0.5). This is equivalent to averaging three separate CS values.

												Spec. Maximum						
Unit 1: JAW-2770			Unit 4: JAW-2627			272009 = Rebond Foam, Lower Pad							20%					
Unit 2: MBZ-R/A-B78			Unit 5: JAW-1334			272011 = GP Foam, Bottom Cushion							8%					
Unit 3: JAW-1133			Unit 6: JAW-1521			320664 = Rebond Foam, Mid Pad							20%					

Container Foam Compression Set Values: 2000 Data

Unit	Foam	Init.-1	Init.-2	Init -3	Final-1	Final-2	Final-3	Diff.-1	Diff.-2	Diff.-3	Avg Ht.	Avg Ht.	Avg.	**CS**	CS	CS	CS	Std.
		inches	inches	inches	inches	inches	inches	inches	inches	inches	Init.	Final	Diff.	**%**	No.1	No.2	No.3	Dev.
1	272009	1.067	1.066	1.032	0.944	0.956	0.929	0.123	0.110	0.103	1.055	0.943	0.112	**20.2**	21.7	19.4	19.4	1.33
1	272011	1.048	1.064	1.080	1.005	1.019	1.038	0.043	0.045	0.042	1.064	1.021	0.043	**7.7**	7.8	8.0	7.2	0.39
1	320664	1.058	1.076	1.046	0.913	0.931	0.899	0.145	0.145	0.147	1.060	0.914	0.146	**26.0**	26.0	25.2	26.9	0.88
2	272009	1.037	1.078	1.070	0.957	0.995	0.981	0.080	0.083	0.089	1.062	0.978	0.084	**15.0**	14.9	14.4	15.6	0.63
2	272011	1.043	1.064	1.094	0.976	0.994	1.022	0.067	0.070	0.072	1.067	0.997	0.070	**12.3**	12.3	12.4	12.1	0.15
2	320664	1.076	1.095	1.087	0.940	0.955	0.947	0.136	0.140	0.140	1.086	0.947	0.139	**23.7**	23.6	23.5	23.9	0.17
3	272009	1.062	1.073	1.072	0.951	0.962	0.961	0.111	0.111	0.111	1.069	0.958	0.111	**19.5**	19.8	19.4	19.4	0.21
3	272011	1.049	1.087	0.968	0.995	1.031	0.911	0.054	0.056	0.057	1.035	0.979	0.056	**10.4**	9.8	9.5	12.2	1.45
3	320664	1.057	1.056	1.053	0.934	0.937	0.941	0.123	0.119	0.112	1.055	0.937	0.118	**21.2**	22.1	21.4	20.3	0.92
4	272009	1.057	1.075	1.059	0.898	0.919	0.909	0.159	0.156	0.150	1.064	0.909	0.155	**27.5**	28.5	27.1	26.8	0.91
4	272011	1.006	1.027	1.018	0.953	0.971	0.965	0.053	0.056	0.053	1.017	0.963	0.054	**10.4**	10.5	10.6	10.2	0.20
4	320664	1.075	1.060	1.054	0.951	0.942	0.927	0.124	0.118	0.127	1.063	0.940	0.123	**21.8**	21.6	21.1	22.9	0.96
5	272009	1.036	1.062	0.995	0.923	0.948	0.886	0.113	0.114	0.109	1.031	0.919	0.112	**21.1**	21.1	20.3	22.0	0.87
5	272011	1.096	1.082	1.078	1.048	1.022	1.023	0.048	0.060	0.055	1.085	1.031	0.054	**9.3**	8.1	10.3	9.5	1.14
5	320664	1.075	1.047	1.068	0.958	0.947	0.960	0.117	0.100	0.108	1.063	0.955	0.108	**19.2**	20.3	18.3	19.0	1.05
6	272009	1.070	1.068	1.065	0.943	0.940	0.942	0.127	0.128	0.123	1.068	0.942	0.126	**22.2**	22.3	22.5	21.8	0.39
6	272011	1.044	1.048	1.060	0.987	0.987	1.006	0.057	0.061	0.054	1.051	0.993	0.057	**10.4**	10.5	11.1	9.6	0.75
6	320664	1.097	1.091	1.069	0.979	0.972	0.958	0.118	0.119	0.111	1.086	0.970	0.116	**19.8**	19.8	20.1	19.5	0.32
															Std. Dev.			
Avg.	272009											Container to container		**20.9**	4.1			0.7
Avg.	272011											standard		**10.1**	3.2			0.7
Avg.	320664											deviations		**22.0**	2.5			0.7

Heights measured on laser micrometer using lowest cross-section height obtained on four faces.

CS = (100 x avg. height diff.)/(init. height-0.5). This is equivalent to averaging three separate CS values.

					Spec. Maximum
Unit 1: JAW-2770	Unit 4: JAW-2627	272009 = Rebond Foam, Lower Pad			20%
Unit 2: MBZ-R/A-B78	Unit 5: JAW-1334	272011 = GP Foam, Bottom Cushion			8%
Unit 3: JAW-1133	Unit 6: JAW-1521	320664 = Rebond Foam, Mid Pad			20%

Container Foam Compression Set Values: 2001 Data

Unit	Foam	Init.-1	Init.-2	Init -3	Final-1	Final-2	Final-3	Diff.-1	Diff.-2	Diff.-3	Avg Ht.	Avg Ht.	Avg.	**CS**	CS	CS	CS	Std.
		inches	inches	inches	inches	inches	inches	inches	inches	inches	Init.	Final	Diff.	**%**	No.1	No.2	No.3	Dev.
1	272009	1.124	1.130	1.138	1.007	1.003	1.005	0.117	0.127	0.133	1.131	1.005	0.126	**19.9**	18.8	20.2	20.8	1.07
1	272011	1.087	1.118	1.079	1.040	1.070	1.033	0.047	0.048	0.046	1.095	1.048	0.047	**7.9**	8.0	7.8	7.9	0.12
1	320664	1.141	1.086	1.156	0.982	0.935	0.994	0.159	0.151	0.162	1.128	0.970	0.157	**25.1**	24.8	25.8	24.7	0.59
2	272009	1.099	1.129	1.108	1.010	1.033	1.011	0.089	0.096	0.097	1.112	1.018	0.094	**15.4**	14.9	15.3	16.0	0.55
2	272011	1.043	1.053	1.185	0.957	0.970	1.094	0.086	0.083	0.091	1.094	1.007	0.087	**14.6**	15.8	15.0	13.3	1.30
2	320664	1.100	1.001	1.084	0.950	0.869	0.941	0.150	0.132	0.143	1.062	0.920	0.142	**25.2**	25.0	26.3	24.5	0.96
3	272009	1.075	1.086	1.087	0.956	0.970	0.976	0.119	0.116	0.111	1.083	0.967	0.115	**19.8**	20.7	19.8	18.9	0.89
3	272011	1.025	1.014	1.168	0.962	0.954	1.095	0.063	0.060	0.073	1.069	1.004	0.065	**11.5**	12.0	11.7	10.9	0.55
3	320664	1.112	0.986	1.076	0.955	0.858	0.922	0.157	0.128	0.154	1.058	0.912	0.146	**26.2**	25.7	26.3	26.7	0.55
4	272009	1.062	1.139	1.055	0.851	0.940	0.885	0.211	0.199	0.170	1.085	0.892	0.193	**33.0**	37.5	31.1	30.6	3.85
4	272011	1.064	1.030	1.048	0.994	0.962	0.987	0.070	0.068	0.061	1.047	0.981	0.066	**12.1**	12.4	12.8	11.1	0.89
4	320664	1.158	0.969	0.984	1.012	0.850	0.858	0.146	0.119	0.126	1.037	0.907	0.130	**24.3**	22.2	25.4	26.0	2.06
5	272009	1.139	1.149	1.136	1.015	1.022	0.996	0.124	0.127	0.140	1.141	1.011	0.130	**20.3**	19.4	19.6	22.0	1.46
5	272011	1.137	1.133	1.093	1.081	1.075	1.053	0.056	0.058	0.040	1.121	1.070	0.051	**8.3**	8.8	9.2	6.7	1.30
5	320664	1.122	1.116	1.073	1.019	1.021	0.977	0.103	0.095	0.096	1.104	1.006	0.098	**16.2**	16.6	15.4	16.8	0.72
6	272009	1.071	1.100	1.098	0.933	0.955	0.950	0.138	0.145	0.148	1.090	0.946	0.144	**24.4**	24.2	24.2	24.7	0.34
6	272011	1.110	1.120	1.088	1.055	1.068	1.030	0.055	0.052	0.058	1.106	1.051	0.055	**9.1**	9.0	8.4	9.9	0.74
6	320664	1.076	1.073	1.082	0.946	0.959	0.964	0.130	0.114	0.118	1.077	0.956	0.121	**20.9**	22.6	19.9	20.3	1.45
															Std. Dev.			
Avg.	272009											Container to container		**22.1**	6.1			1.4
Avg.	272011												standard	**10.6**	3.7			0.8
Avg.	320664												deviations	**23.0**	3.8			1.1

Heights measured on laser micrometer using lowest cross-section height obtained on four faces.

CS = (100 x avg. height diff.)/(init. height-0.5). This is equivalent to averaging three separate CS values.

					Spec. Maximum
Unit 1: JAW-2770	Unit 4: JAW-2627		272009 = Rebond Foam, Lower Pad		20%
Unit 2: MBZ-R/A-B78	Unit 5: JAW-1334		272011 = GP Foam, Bottom Cushion		8%
Unit 3: JAW-1133	Unit 6: JAW-1521		320664 = Rebond Foam, Mid Pad		20%

Container Foam Compression Set Values: Standard Deviations

Unit	Foam		1997			1998			2000			2001		1997-2001 Avg.		
		CS%	Std. Dev.(1)		CS%	Std. Dev.(1)		CS%	Std. Dev.(1)		CS%	Std. Dev.(1)		CS%	Std. Dev.(1)	
1	272009	19.2		0.38	20.1		1.99	20.2		1.33	19.9		1.07	19.9		1.19
1	272011	9.2		1.91	9.4		2.06	7.7		0.39	7.9		0.12	8.6		1.12
1	320664	23.0		1.82	25.6		0.77	26.0		0.88	25.1		0.59	24.9		1.02
2	272009	12.8		0.56	14.5		1.05	15.0		0.63	15.4		0.55	14.4		0.70
2	272011	12.7		0.83	12.4		1.82	12.3		0.15	14.6		1.30	13.0		1.03
2	320664	20.8		2.54	22.3		1.20	23.7		0.17	25.2		0.96	23.0		1.22
3	272009	15.4		0.57	20.5		0.69	19.5		0.21	19.8		0.89	18.8		0.59
3	272011	13.6		0.80	14.4		1.41	10.4		1.45	11.5		0.55	12.5		1.05
3	320664	23.1		1.47	23.8		0.80	21.2		0.92	26.2		0.55	23.6		0.93
4	272009	30.6		0.24	31.1		1.67	27.5		0.91	33.0		3.85	30.5		1.67
4	272011	16.4		2.26	12.0		1.11	10.4		0.20	12.1		0.89	12.8		1.11
4	320664	24.2		0.77	23.7		1.82	21.8		0.96	24.3		2.06	23.5		1.40
5	272009	19.6		0.26	21.3		1.42	21.1		0.87	20.3		1.46	20.6		1.00
5	272011	15.9		3.00	8.5		2.50	9.3		1.14	8.3		1.30	10.5		1.99
5	320664	19.0		1.38	21.2		1.20	19.2		1.05	16.2		0.72	18.9		1.09
6	272009	20.7		0.36	25.8		0.58	22.2		0.39	24.4		0.34	23.2		0.42
6	272011	10.1		1.52	10.1		1.67	10.4		0.75	9.1		0.74	9.9		1.17
6	320664	26.2		3.84	21.7		1.21	19.8		0.32	20.9		1.45	22.1		1.70
		Std. Dev.(2)			Std. Dev.(2)			Std. Dev.(2)			Std. Dev.(2)			Std. Dev.(2)		
Avg.	272009	19.7	6.11	0.39	22.2	5.62	1.23	20.9	4.08	0.72	22.1	6.05	1.36	21.2	**5.46**	**0.93**
Avg.	272011	13.0	3.10	1.72	11.2	3.26	1.76	10.1	3.23	0.68	10.6	3.72	0.82	11.2	**3.33**	**1.24**
Avg.	320664	22.7	2.51	1.97	23.0	1.62	1.17	22.0	2.53	0.71	23.0	3.78	1.05	22.7	**2.61**	**1.23**

(Values above are averages of the 1997 to 2001 values.)

Std. Dev.(1) is the standard deviation of the 3 specimans cut from and tested for each foam sample.
This is the material/test variability.

Std. Dev.(2) is the standard deviation of the average compression set calculated from the values obtained for each container.
This is the container to container variability and is clearly higher than the material variability

				Spec. Maximum	
Unit 1: JAW-2770	Unit 4: JAW-2627		272009 = Rebond Foam, Lower Pad	20%	
Unit 2: MBZ-R/A-B78	Unit 5: JAW-1334		272011 = GP Foam, Bottom Cushion	8%	
Unit 3: JAW-1133	Unit 6: JAW-1521		320664 = Rebond Foam, Mid Pad	20%	

Container Foam Compressive Strength Properties: 1997 Data

1997 Polyurethane foam specimens

Out-of-spec values

Unit	Foam	4th Compression: Strength at 10% (psi)						4th Compression: Strength at 50% (psi)					
		# 1	# 2	# 3	# 4	Average	Std. Dev.	# 1	# 2	# 3	# 4	Average	Std. Dev.
1	272009	0.766	0.628	0.772		0.722	0.081	4.857	4.609	5.340		4.935	0.372
1	272011	0.877	1.174	1.210		1.087	0.183	3.647	3.762	4.019		3.809	0.190
1	320664	0.611	0.795	0.813		0.740	0.112	4.208	4.526	4.890		4.541	0.341
2	272009	0.551	0.584	0.581		0.572	0.018	3.381	3.527	3.255		3.388	0.136
2	272011	0.542	1.851	2.797		1.730	1.132	5.085	5.779	6.660		5.841	0.789
2	320664	0.636	0.354	0.584		0.525	0.150	4.132	3.887	4.066		4.028	0.127
3	272009	1.075	0.980	0.818		0.958	0.130	6.562	6.045	5.602		6.070	0.480
3	272011	1.070	2.346	0.804		1.407	0.824	5.493	6.398	5.638		5.843	0.486
3	320664	0.775	0.921	0.672		0.789	0.125	4.710	5.310	4.656		4.892	0.363
4	272009	0.494	0.490	0.551		0.512	0.034	3.627	3.880	3.527		3.678	0.182
4	272011	1.910	1.609	1.294		1.604	0.308	4.187	4.091	4.164		4.147	0.050
4	320664	0.698	0.376	0.651		0.575	0.174	4.775	4.050	4.665		4.497	0.391
5	272009	0.687	0.702	0.961		0.783	0.154	4.969	5.061	5.731		5.254	0.416
5	272011	1.335	1.441	1.926		1.567	0.315	5.777	4.344	4.657		4.926	0.753
5	320664	0.613	0.637	0.515		0.588	0.065	3.742	3.696	3.225		3.554	0.286
6	272009	0.294	1.067	0.961		0.774	0.419	4.397	5.884	5.831		5.371	0.844
6	272011	2.009	1.452	1.820		1.760	0.283	4.442	5.008	4.218		4.556	0.407
6	320664	0.341	0.374	0.443		0.386	0.052	2.384	2.461	2.743		2.529	0.189
Avg.	272009	Container to container			0.160	0.720	0.139	Container to container			1.041	4.783	0.405
Avg.	272011	standard			0.250	1.526	0.508	standard			0.853	4.854	0.446
Avg.	320664	deviations			0.147	0.601	0.113	deviations			0.860	4.007	0.283

			10% Comp. spec.	50% Comp. spec.
Unit 1: JAW-2770	Unit 4: JAW-2627	272009 = Rebond Foam, Lower Pad	0.7-1.3 psi	5.0-9.0 psi
Unit 2: MBZ-R/A-B78	Unit 5: JAW-1334	272011 = GP Foam, Bottom Cushion	1.5-3.5 psi	4.5-7.5 psi
Unit 3: JAW-1133	Unit 6: JAW-1521	320664 = Rebond Foam, Mid Pad	0.7-1.3 psi	5.0-9.0 psi

Container Foam Compressive Strength Properties: 1998 Data

1998 Polyurethane foam specimens

Out-of-spec values

Unit	Foam	4th Compression: Strength at 10% (psi)						4th Compression: Strength at 50% (psi)					
		# 1	# 2	# 3	# 4	Average	Std. Dev.	# 1	# 2	# 3	# 4	Average	Std. Dev.
1	272009	0.765	0.868	0.818	0.922	0.843	0.067	4.625	5.085	4.703	5.317	4.933	0.326
1	272011	2.086	1.878	2.258	2.163	2.096	0.162	4.613	4.452	5.069	4.960	4.774	0.289
1	320664	1.493	0.961	1.201	1.097	1.188	0.226	5.555	4.828	4.982	4.761	5.032	0.361
2	272009	0.823	0.760	0.780	0.783	0.787	0.026	4.542	4.284	4.337	4.323	4.372	0.116
2	272011	2.722	2.993	1.809	2.680	2.551	0.514	6.491	7.044	6.026	6.900	6.615	0.457
2	320664	1.023	1.472	1.222	1.151	1.217	0.189	4.243	6.050	5.323	5.222	5.210	0.742
3	272009	0.889	0.977	0.955	0.808	0.907	0.076	5.220	5.703	5.635	5.107	5.416	0.297
3	272011	2.771	2.737	2.927	2.732	2.792	0.092	6.856	6.671	7.064	6.744	6.834	0.171
3	320664	0.867	0.867	0.888	0.823	0.861	0.027	4.739	4.589	4.841	4.623	4.698	0.115
4	272009	0.501	0.536	0.544	0.498	0.520	0.024	3.176	3.347	3.478	3.108	3.277	0.167
4	272011	2.147	2.092	2.155	2.170	2.141	0.034	4.446	4.292	4.513	4.539	4.448	0.111
4	320664	1.195	1.135	1.244	1.101	1.169	0.063	4.745	4.841	5.318	4.463	4.842	0.356
5	272009	0.944	0.907	0.864	0.889	0.901	0.034	5.422	5.283	4.992	5.582	5.320	0.250
5	272011	2.756	2.259	2.732	3.493	2.810	0.510	5.625	4.876	5.436	7.388	5.831	1.085
5	320664	0.761	0.624	0.782	0.768	0.734	0.074	4.509	4.266	4.412	4.505	4.423	0.114
6	272009	1.277	1.093	1.139	1.027	1.134	0.106	7.030	6.563	6.519	6.008	6.530	0.418
6	272011	1.960	2.321	2.122	2.861	2.316	0.392	4.422	4.870	4.488	6.183	4.991	0.819
6	320664	0.454	0.433	0.446	0.538	0.468	0.048	2.690	2.569	2.566	3.036	2.715	0.221
Avg.	272009	Container to container			0.200	0.849	0.055	Container to container			1.094	4.975	0.262
Avg.	272011	standard			0.315	2.451	0.284	standard			0.999	5.582	0.489
Avg.	320664	deviations			0.304	0.939	0.104	deviations			0.909	4.487	0.318

Unit 1: JAW-2770
Unit 2: MBZ-R/A-B78
Unit 3: JAW-1133
Unit 4: JAW-2627
Unit 5: JAW-1334
Unit 6: JAW-1521

272009 = Rebond Foam, Lower Pad
272011 = GP Foam, Bottom Cushion
320664 = Rebond Foam, Mid Pad

	10% Comp. spec.	50% Comp. spec.
272009 = Rebond Foam, Lower Pad	0.7-1.3 psi	5.0-9.0 psi
272011 = GP Foam, Bottom Cushion	1.5-3.5 psi	4.5-7.5 psi
320664 = Rebond Foam, Mid Pad	0.7-1.3 psi	5.0-9.0 psi

Container Foam Compressive Strength Properties: 2000 Data

2000 Polyurethane foam specimens

Out-of-spec values

Unit	Foam	4th Compression: Strength at 10% (psi)						4th Compression: Strength at 50% (psi)					
		# 1	# 2	# 3	# 4	Average	Std. Dev.	# 1	# 2	# 3	# 4	Average	Std. Dev.
1	272009	1.319	0.920	1.290	1.037	1.141	0.195	6.587	5.735	6.664	6.031	6.254	0.447
1	272011	2.357	2.207	2.367	2.263	2.299	0.077	5.044	4.758	5.125	4.881	4.952	0.164
1	320664	1.023	1.005	1.202	1.099	1.082	0.090	5.152	4.991	5.631	5.392	5.292	0.280
2	272009	1.090	0.899	1.037	1.145	1.043	0.106	4.934	4.636	4.921	5.138	4.907	0.206
2	272011	3.278	3.289	3.187	3.175	3.232	0.060	7.718	8.355	7.581	8.242	7.974	0.381
2	320664	1.029	1.110	1.079	1.103	1.080	0.037	5.692	5.740	5.278	5.476	5.547	0.213
3	272009	1.181	1.214	1.222	1.515	1.283	0.156	6.063	6.149	6.256	7.305	6.443	0.580
3	272011	3.323	2.642	3.278	3.306	3.137	0.330	7.516	7.383	7.948	7.612	7.615	0.241
3	320664	1.078	0.984	1.002	1.101	1.041	0.057	5.116	5.007	4.726	5.230	5.019	0.216
4	272009	0.739	0.790	0.810	0.779	0.780	0.030	4.099	4.415	4.373	4.205	4.273	0.147
4	272011	2.210	2.358	2.211	2.227	2.251	0.071	4.775	5.009	4.860	4.845	4.872	0.098
4	320664	1.009	1.175	1.220	1.072	1.119	0.096	5.942	6.316	6.371	5.911	6.135	0.242
5	272009	1.013	1.301	1.222	1.253	1.197	0.127	6.040	6.587	6.411	6.476	6.378	0.237
5	272011	3.272	2.718	3.228	2.712	2.983	0.309	6.858	5.468	6.674	5.356	6.089	0.787
5	320664	0.903	1.000	0.767	0.816	0.871	0.103	4.566	5.047	3.957	4.111	4.420	0.491
6	272009	1.728	1.533	1.883	1.646	1.698	0.147	8.065	7.590	8.798	8.015	8.117	0.501
6	272011	2.555	2.448	2.424	2.477	2.476	0.057	5.550	5.478	5.541	5.439	5.502	0.052
6	320664	0.611	0.636	0.630	0.761	0.659	0.069	2.931	3.086	3.118	3.485	3.155	0.235
Avg.	272009	Container to container			0.303	1.190	0.127	Container to container			1.344	6.062	0.353
Avg.	272011	standard			0.439	2.730	0.151	standard			1.339	6.167	0.287
Avg.	320664	deviations			0.178	0.976	0.075	deviations			1.037	4.928	0.279

Unit 1: JAW-2770
Unit 2: MBZ-R/A-B78
Unit 3: JAW-1133
Unit 4: JAW-2627
Unit 5: JAW-1334
Unit 6: JAW-1521

	10% Comp. spec.	50% Comp. spec.
272009 = Rebond Foam, Lower Pad	0.7-1.3 psi	5.0-9.0 psi
272011 = GP Foam, Bottom Cushion	1.5-3.5 psi	4.5-7.5 psi
320664 = Rebond Foam, Mid Pad	0.7-1.3 psi	5.0-9.0 psi

Container Foam Compressive Strength Properties: 2001 Data

2001 Polyurethane foam specimens

Out-of-spec values

Unit	Foam	4th Compression: Strength at 10% (psi)						4th Compression: Strength at 50% (psi)					
		# 1	# 2	# 3	# 4	Average	Std. Dev.	# 1	# 2	# 3	# 4	Average	Std. Dev.
1	272009	0.750	0.828	0.838		0.805	0.048	4.457	4.922	5.189		4.856	0.370
1	272011	1.979	2.114	2.022		2.038	0.069	4.282	4.459	4.348		4.363	0.089
1	320664	1.114	1.159	1.177		1.150	0.032	4.180	4.530	4.429		4.380	0.180
2	272009	0.755	0.753	0.978		0.829	0.129	4.675	4.428	4.874		4.659	0.223
2	272011	2.844	1.747	2.790		2.460	0.618	6.762	5.979	6.843		6.528	0.477
2	320664	0.627	0.593	0.609		0.610	0.017	3.762	3.686	3.645		3.698	0.059
3	272009	0.838	0.880	0.866		0.861	0.021	5.222	5.279	5.463		5.321	0.126
3	272011	2.449	2.400	2.223		2.357	0.119	5.887	5.897	5.749		5.844	0.083
3	320664	0.780	0.677	0.768		0.742	0.056	4.449	4.460	4.674		4.528	0.127
4	272009	0.528	0.562	0.550		0.547	0.017	3.493	3.637	3.622		3.584	0.079
4	272011	2.353	2.074	1.971		2.133	0.198	4.660	4.330	4.208		4.399	0.234
4	320664	0.491	0.657	0.511		0.553	0.091	4.189	4.744	4.272		4.402	0.299
5	272009	0.841	0.841	0.763		0.815	0.045	5.148	4.973	4.925		5.015	0.117
5	272011	2.301	2.394	2.590		2.428	0.148	4.774	4.971	5.328		5.024	0.281
5	320664	1.143	1.065	1.010		1.073	0.067	4.716	4.637	4.736		4.703	0.065
6	272009	1.130	1.130	1.091		1.117	0.023	6.235	6.428	6.136		6.266	0.149
6	272011	2.215	2.022	2.095		2.111	0.097	4.693	4.306	4.449		4.483	0.196
6	320664	0.326	0.333	0.270		0.310	0.035	2.200	2.381	2.137		2.239	0.127
Avg.	272009	Container to container			0.181	0.829	0.047	Container to container			0.876	4.950	0.177
Avg.	272011	standard			0.182	2.255	0.208	standard			0.896	5.107	0.227
Avg.	320664	deviations			0.321	0.739	0.050	deviations			0.934	4.002	0.143

Unit 1: JAW-2770
Unit 2: MBZ-R/A-B78
Unit 3: JAW-1133
Unit 4: JAW-2627
Unit 5: JAW-1334
Unit 6: JAW-1521

272009 = Rebond Foam, Lower Pad
272011 = GP Foam, Bottom Cushion
320664 = Rebond Foam, Mid Pad

	10% Comp. spec.	50% Comp. spec.
272009 = Rebond Foam, Lower Pad	0.7-1.3 psi	5.0-9.0 psi
272011 = GP Foam, Bottom Cushion	1.5-3.5 psi	4.5-7.5 psi
320664 = Rebond Foam, Mid Pad	0.7-1.3 psi	5.0-9.0 psi

Container Foam Compressive Strength Properties: Standard Deviations

Unit	Foam		1997			1998			2000			2001		1997-2001 Avg.		
		CS%	Std. Dev.(1)		CS%	Std. Dev.(1)		CS%	Std. Dev.(1)		CS%	Std. Dev.(1)		CS%	Std. Dev.(1)	
1	272009	19.2		0.38	20.1		1.99	20.2		1.33	19.9		1.07	19.9		1.19
1	272011	9.2		1.91	9.4		2.06	7.7		0.39	7.9		0.12	8.6		1.12
1	320664	23.0		1.82	25.6		0.77	26.0		0.88	25.1		0.59	24.9		1.02
2	272009	12.8		0.56	14.5		1.05	15.0		0.63	15.4		0.55	14.4		0.70
2	272011	12.7		0.83	12.4		1.82	12.3		0.15	14.6		1.30	13.0		1.03
2	320664	20.8		2.54	22.3		1.20	23.7		0.17	25.2		0.96	23.0		1.22
3	272009	15.4		0.57	20.5		0.69	19.5		0.21	19.8		0.89	18.8		0.59
3	272011	13.6		0.80	14.4		1.41	10.4		1.45	11.5		0.55	12.5		1.05
3	320664	23.1		1.47	23.8		0.80	21.2		0.92	26.2		0.55	23.6		0.93
4	272009	30.6		0.24	31.1		1.67	27.5		0.91	33.0		3.85	30.5		1.67
4	272011	16.4		2.26	12.0		1.11	10.4		0.20	12.1		0.89	12.8		1.11
4	320664	24.2		0.77	23.7		1.82	21.8		0.96	24.3		2.06	23.5		1.40
5	272009	19.6		0.26	21.3		1.42	21.1		0.87	20.3		1.46	20.6		1.00
5	272011	15.9		3.00	8.5		2.50	9.3		1.14	8.3		1.30	10.5		1.99
5	320664	19.0		1.38	21.2		1.20	19.2		1.05	16.2		0.72	18.9		1.09
6	272009	20.7		0.36	25.8		0.58	22.2		0.39	24.4		0.34	23.2		0.42
6	272011	10.1		1.52	10.1		1.67	10.4		0.75	9.1		0.74	9.9		1.17
6	320664	26.2		3.84	21.7		1.21	19.8		0.32	20.9		1.45	22.1		1.70
			Std. Dev.(2)			Std. Dev.(2)			Std. Dev.(2)			Std. Dev.(2)			Std. Dev.(2)	
Avg.	272009	19.7	6.11	0.39	22.2	5.62	1.23	20.9	4.08	0.72	22.1	6.05	1.36	21.2	**5.46**	**0.93**
Avg.	272011	13.0	3.10	1.72	11.2	3.26	1.76	10.1	3.23	0.68	10.6	3.72	0.82	11.2	**3.33**	**1.24**
Avg.	320664	22.7	2.51	1.97	23.0	1.62	1.17	22.0	2.53	0.71	23.0	3.78	1.05	22.7	**2.61**	**1.23**

(Values above are averages of the 1997 to 2001 values.)

Std. Dev.(1) is the standard deviation of the 3 specimans cut from and tested for each foam sample.
This is the material/test variability.

Std. Dev.(2) is the standard deviation of the average compression set calculated from the values obtained for each container.
This is the container to container variability and is clearly higher than the material variability.

		Spec. Maximum	
Unit 1: JAW-2770	Unit 4: JAW-2627	272009 = Rebond Foam, Lower Pad	20%
Unit 2: MBZ-R/A-B78	Unit 5: JAW-1334	272011 = GP Foam, Bottom Cushion	8%
Unit 3: JAW-1133	Unit 6: JAW-1521	320664 = Rebond Foam, Mid Pad	20%

Distribution

Honeywell FM&T
Milt Bryan
D/ME2
PO Box 419159
Kansas City, MO 64141-6159

Honeywell FM&T
Alan Rahe
D/465
PO Box 419159
Kansas City, MO 64141-6159

Honeywell FM&T
Amy Swan
D/ME2
PO Box 419159
Kansas City, MO 64141-6159

1 Lawrence Livermore National Laboratory
Attn: B. R. Jorgensen, L125
P.O. Box 808
Livermore, CA 94550

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