Heat Retention in Ceramic Dollarware Vessels:
What We Need More Of Is Science

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Abstract: Heat retention, an important trait of ceramic drinking vessels, varies with certain physical traits of a mug. In our study we hoped to show what traits cause these effects and how, in both distinct mug types and the more common 'general type,' represented by a set of stratified random samples. Though our results showed some significant variation in heat retention in the distinct types, our methods were shown to be inadequate in judging the general-type mugs and must be retooled for further investigations on the matter.

Introduction

Mugs have a specific set of functional purposes, namely drinking hot beverages (though they can of course be used for cold beverages; we consider this a secondary function of a vessel designed for heated liquids). The requirements for a vessel which supports this endeavor are simple: one main storage body for the beverage and dimensions which allow the user time in which to drink the beverage before it cools significantly. With the advent of the microwave this has become less of a strict need, and mugs are now made more cheaply, with lighter materials and less of them, but with in-microwave safety in mind. Assuming heat loss is still the key factor in one's choice of mugs, (which it may or may not be - see Groves, 2008, Bedard, 2008 and others) then certain physical traits leap to mind. Anecdotal and "common sense" ideas about what makes the most heat retentive mug are quite common- a thick mug, for example, is thought by many to be a better heat retainer than a thin one, a large one better than a small one, and various diameter ratios and so forth as other affecting factors.

In our study, we took a variety of purportedly relevant factors (weight, height, volume, top external diameter, top external to bottom external diameter ratio, top external diameter to height ratio, density, and Vessel Volume Index, defined as the displacement to content volume ratio (Gravel Miguel and Guiducci, 2008) and compared heat retention performance across their gradients. By these tests we hoped to show that these factors do indeed affect heat retention in significant ways at functional or near-functional levels of use.

Methods

The selection of types was done via histogram analysis, to identify modal groups and extreme statistical outliers, and by visual identification. From this we identified six outlier types and a large modal group from which stratified samples were extracted. The outlier groups (henceforth referred to as typed groups) were identified as follows: the tall type, typed with histogram (See Appendix) and visual analysis, the espresso type, typed with histogram (See

Appendix) and visual analysis, the teacup type, visually identified, the chowda type, visually identified, the pedestal type, visually identified, and the bowl type, also visually identified. Our modal group was identified as all other ceramic vessels that do not fall within the typed groups, and which fit the normal curve of variation within a broad standard of coffee mugs. From this modal group of vessels (n=245) a 20-60-20% stratified sample method (where one seventh of each percentile group was selected) using a random number generator was used to select a sample to correspond with each characteristic we were testing for. This became problematic as the samples selected were too small and gave non-significant results, and thus all data from these tests were combined into one large modal type (n=175) to be compared across all characteristics. Our sample process for our second temperature test was a completely random sample (n=51) of the initial modal groups (n=246). (See Appendix for all type data).

Since our primary objective was to test the heat retention of a large variety of mugs within a limited time span, the method used by Bourgoin-Horne (2008) (a one-liter electric kettle) was ineffective, allowing only three mugs to be tested at a time. We discovered, however, that the tap water in the Peterson Hall lab reached approximately 60º C, which is a near-functional temperature for beverages (a coffee purchased the first day of the investigation registered at 61.2º, albeit in a double paper cup with a lid). This temperature also made the handling of the tests much easier, causing us no physical harm (which became a factor in later tests) and increasing the speed with which we could conduct tests. We settled on ten minutes as a time span which would give us an adequate amount of temperature loss while allowing us to conduct a large number of tests. For a second test set, we used hotter water (approx 90º) to get a greater range of loss. This required boiling water in a large pot and transferring it to the mugs via Pyrex beakers. Though the speed of transfer was adequate, we did sustain some mild scalding injuries. The transfer occurred over a maximum of five feet, and should not have cooled the water significantly in a warm room (though any cooling would be comparable to the real-life situation of taking a coffee pot or kettle from the burner to a mug on an adjacent table, a common enough practice).

For each test, we had to rely on a five minute timer. The start point was considered the filling of the first mug; the subsequent six to nine mugs were filled as a thermometer was brought up to temperature in the first mug (we can only hope that the presence of the thermometer did not cool the water in that mug). This timing, though not producing an exact five-minute time span between each measurement, was held consistently across all samples and should not be a source of error. The mugs were filled to within one-half centimeter of the rim, or in cases of unusually shaped mugs to the best available level. We approximated this to be a functional level of fullness, assuming one had an unlimited amount of beverage to pour. Though this of course meant each mug had a different amount of liquid in it, but the alternative- filling each mug with a standard amount of water, say 100 mL- would in no way approximate real-life situations and could therefore have been of little practical application.

The electronic thermometers could produce level temperatures in five to fifteen seconds, approximately the same amount of time needed to fill a mug. The sensor of the thermometers is located very near the point of the probe, so in cases where the thermometer could not be fully submerged the temperature taken was nonetheless reliable (this makes sense, given the normal use of the thermometers to check meat's internal temperature, where input from the shaft of the probe would produce completely erroneous results). It is difficult to say if this attention to probe location was strict enough- vessel sides often registered higher than the liquid center and are a potential source of error. The thermometer was suspended in the center of the mug, with approximately one centimeter to the bottom as judged by the distance of the shadow from the tip of the thermometer. This method produced five-minute increments of loss, which were then transformed into per-minute heat loss rates. Data was recorded into immediately available notebooks, and then transferred to Excel spreadsheets for analysis purposes.

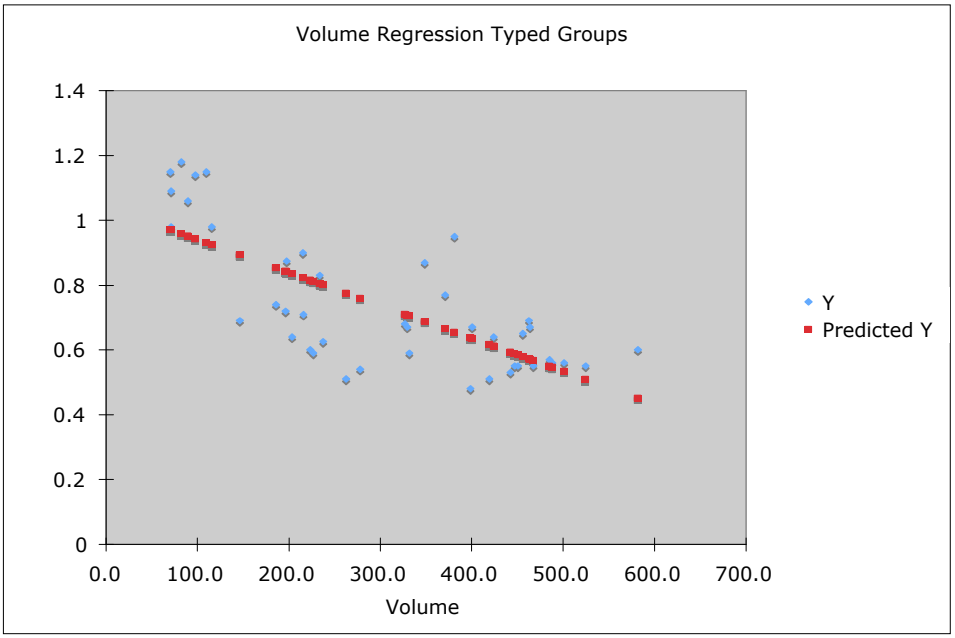
Metric and other data was collected by the class as a whole, and has been shown to be relatively reliable on re-measuring (http://dollarware.org/).

One could argue that the density of water is less than any other beverage one would drink from a mug (coffee, tea with bag, cocoa and so on). This was unavoidable, unfortunately, due to budget and time constraints. It is perhaps better that water was our testing liquid, as it loses heat faster (thus giving us larger heat losses per minute) than more dense liquids, and the result could be extrapolated to other liquids with a few tests once significant variables had been defined.

RESULTS

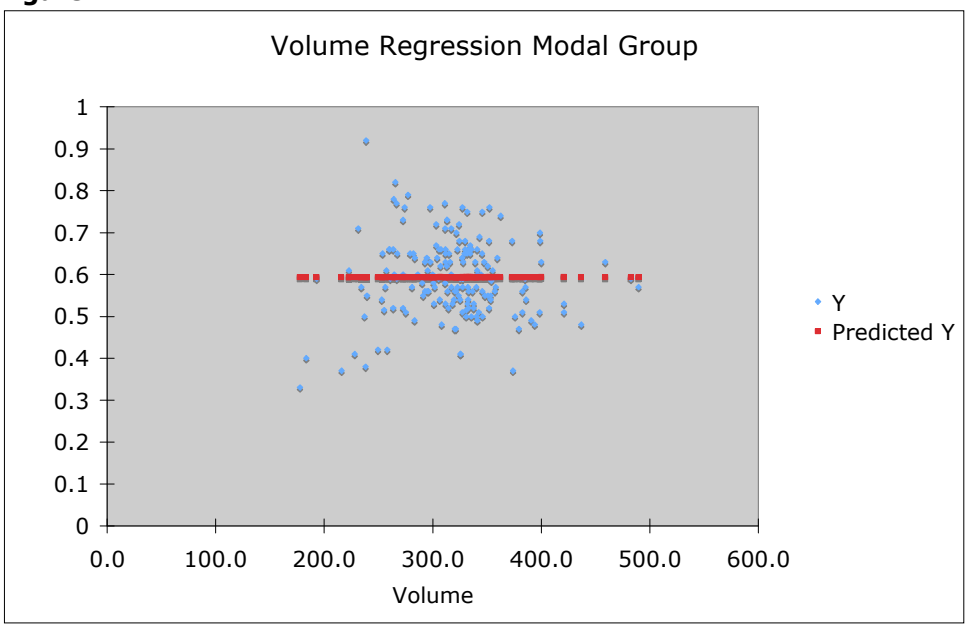
The following sixteen figures are the regressions from the first temperature test. The Y axis in each case is measured in degrees Celsius of temperature loss per minute.

Figure 1:



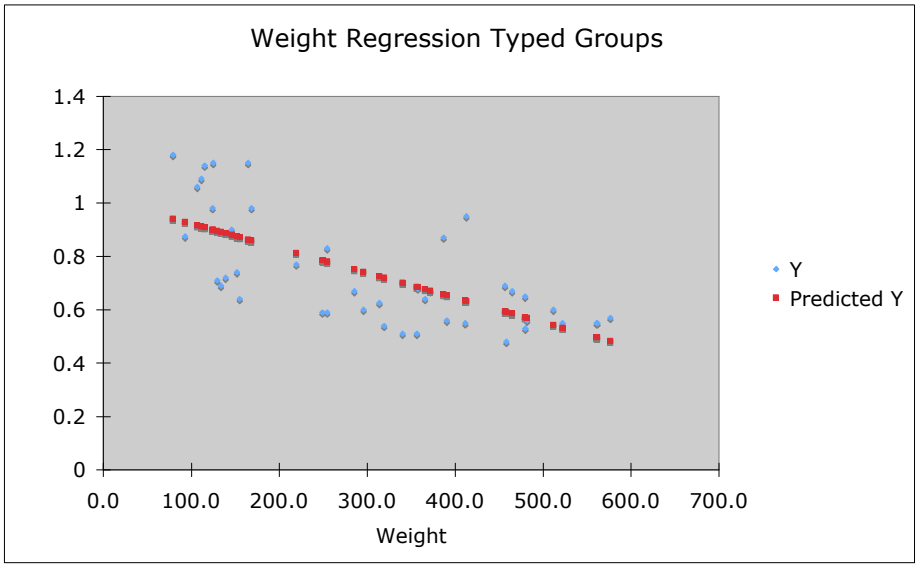
R Square	0.543740785
P-Value	1.70188E-08

Figure 2:



R Square	7.13386E-06
P-Value	0.97193505

Figure 3:

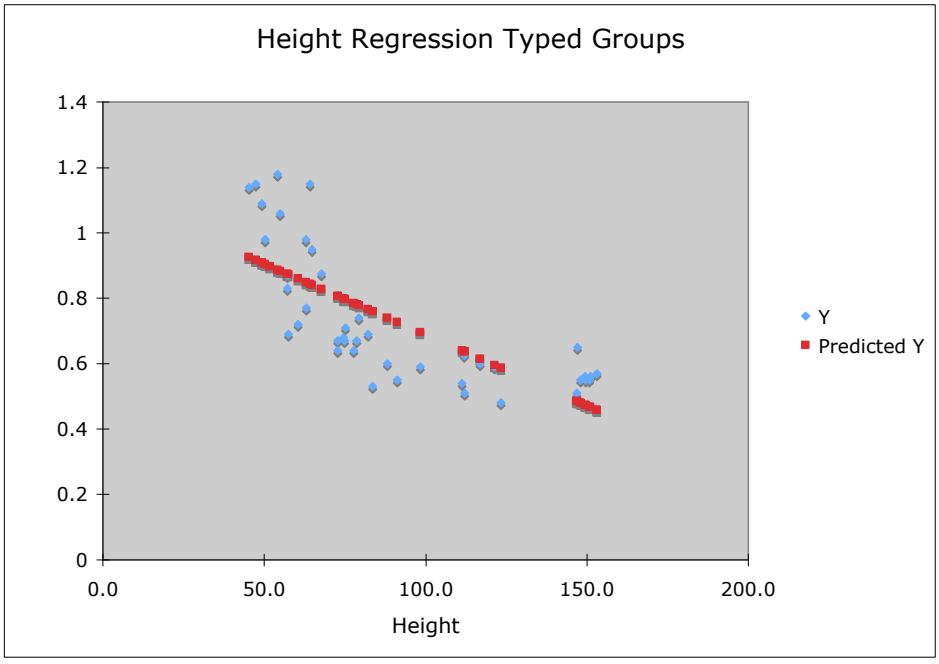


R Square	0.475342741
P-Value	3.17184E-07

Figure 4:

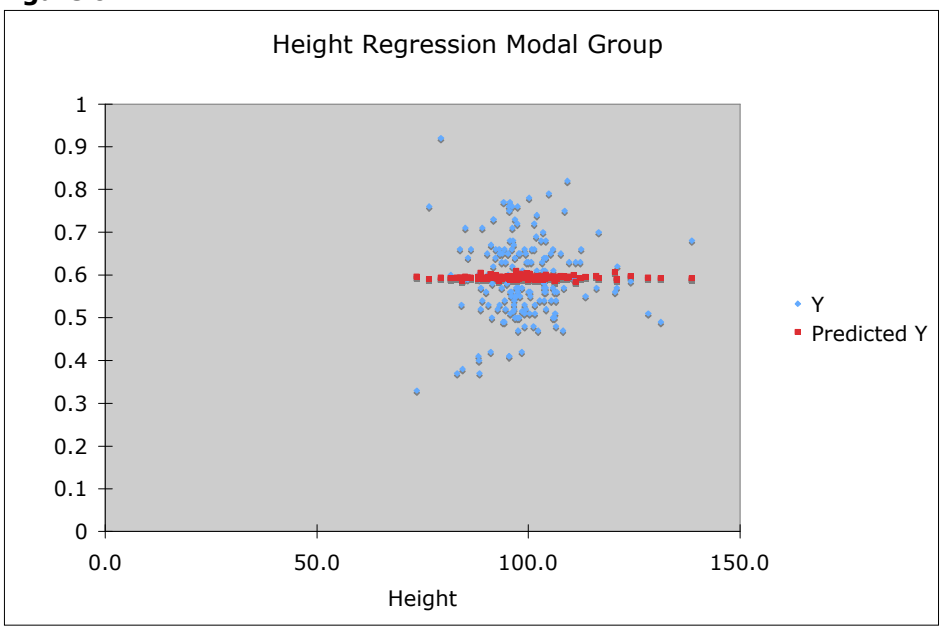
R Square	7.13386E-06
P-Value	0.97193505

Figure 5:



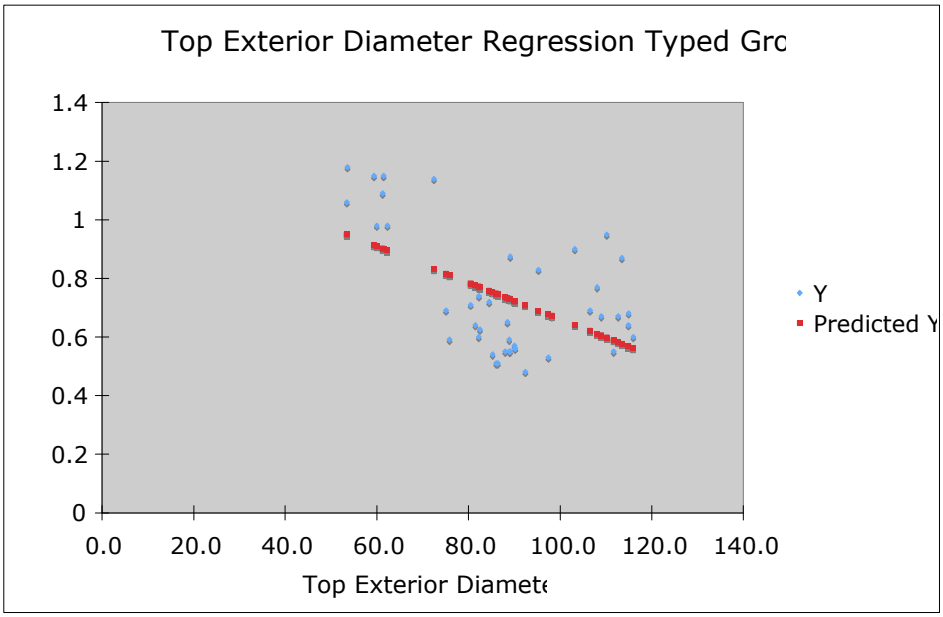
R Square	0.556027732
P-Value	9.62521E-09

Figure 6:



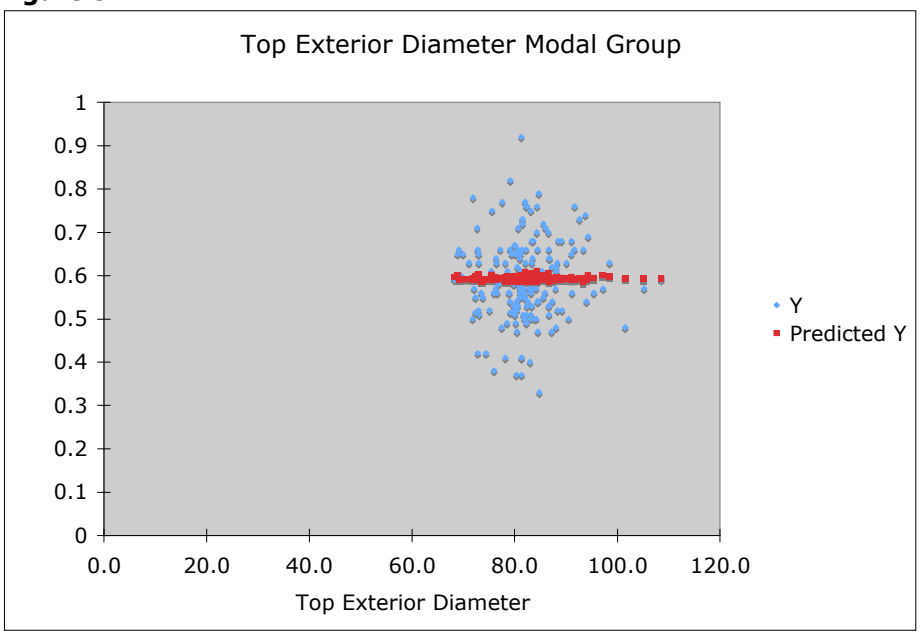
R Square	0.001458262
P-Value	0.614834843

Figure 7:



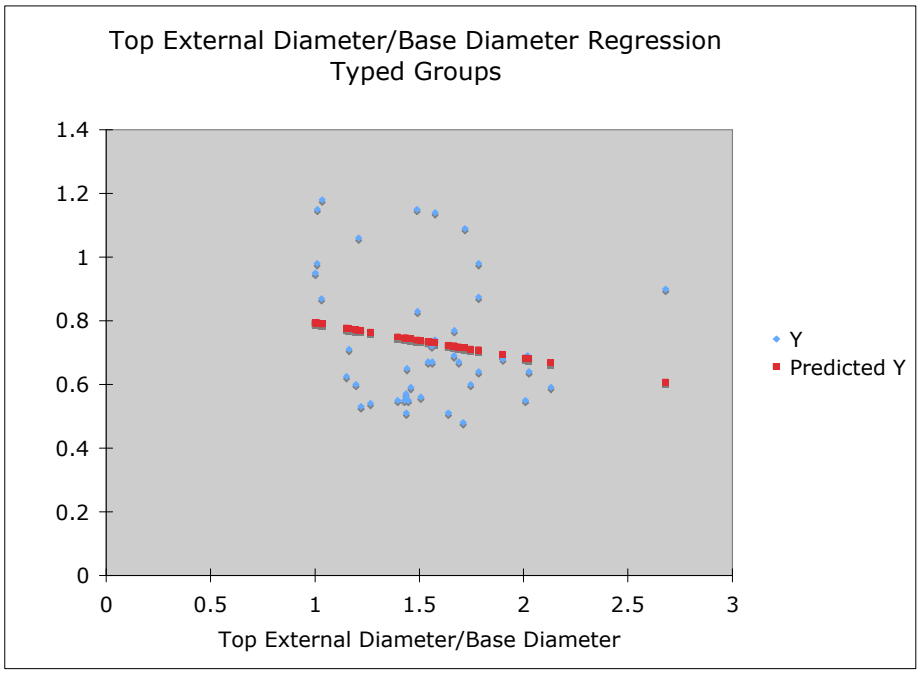
R Square	0.28401851
P-Value	0.000233936

Figure 8:



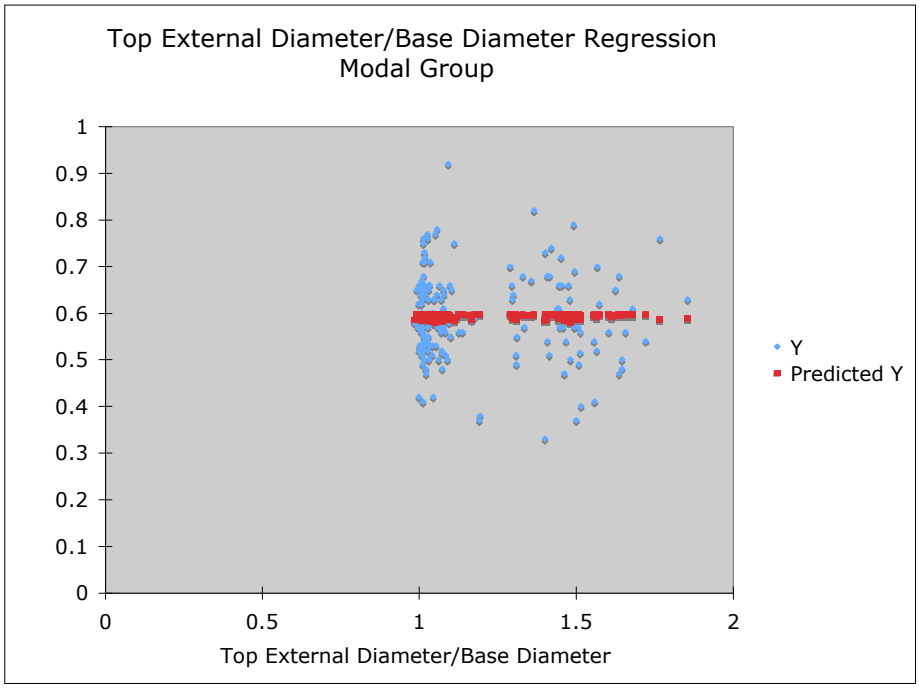
R Square	0.001951314
P-Value	0.560473332

Figure 9:



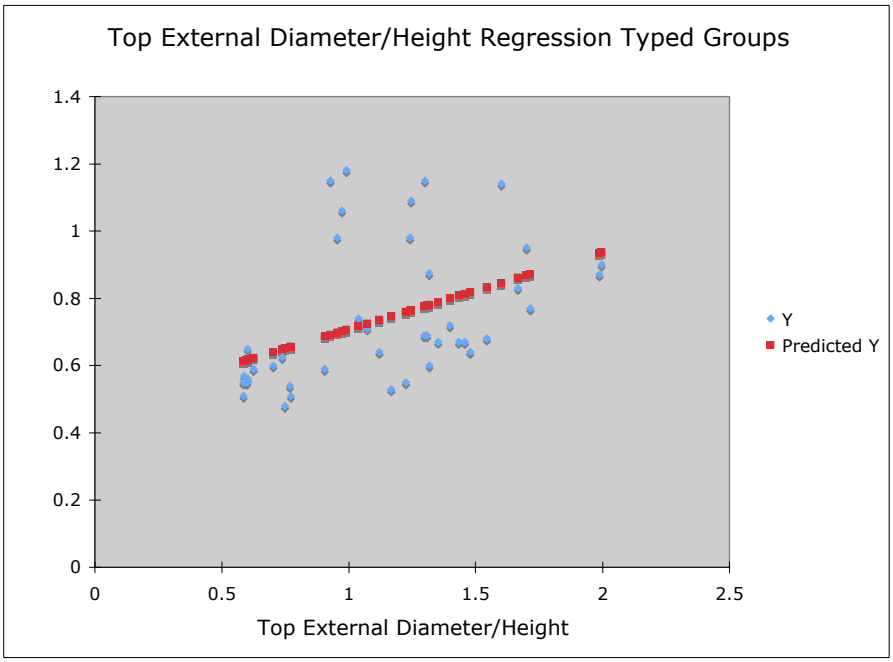
R Square	0.034689048
P-Value	0.231762262

Figure 10:



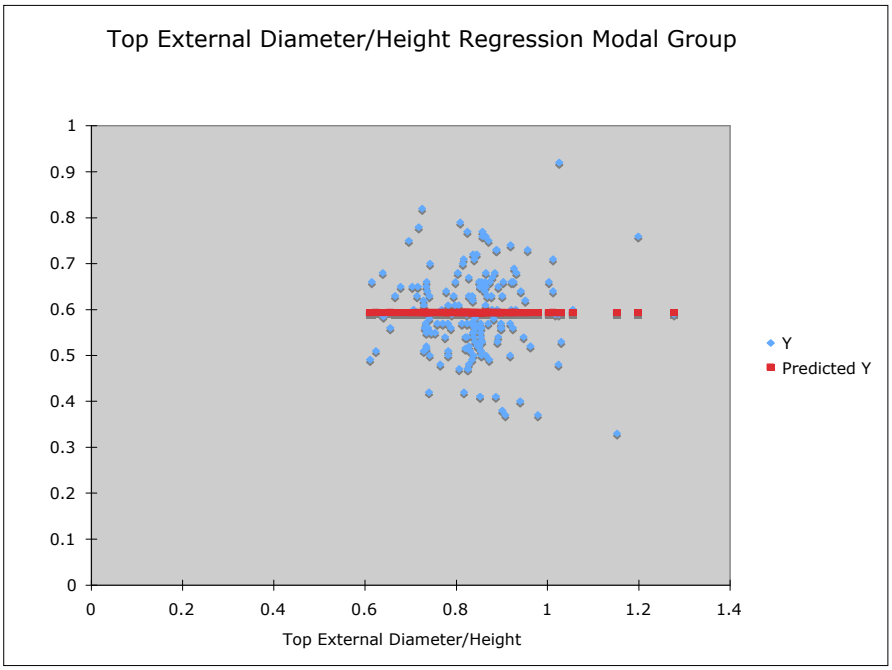
R Square	0.002552116
P-Value	0.505505054

Figure 11:



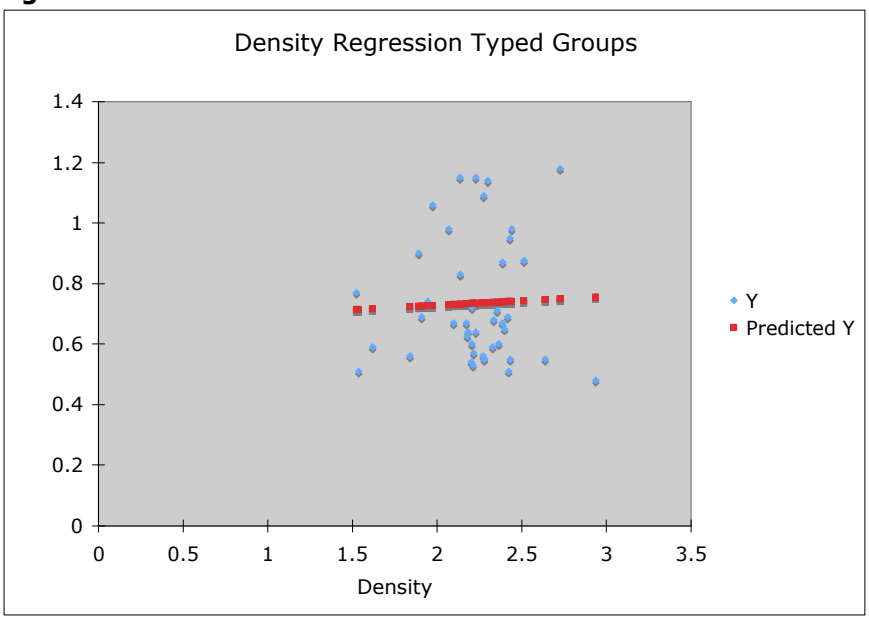
R Square	0.202263528
P-Value	0.002480543

Figure 12:



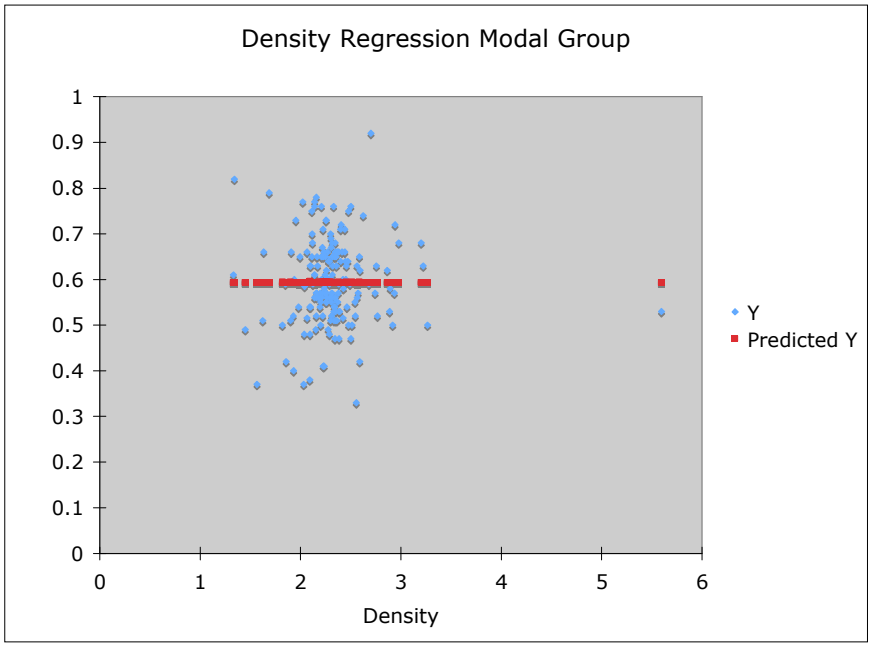
R Square	1.53927E-06
P-Value	0.986961466

Figure 13:



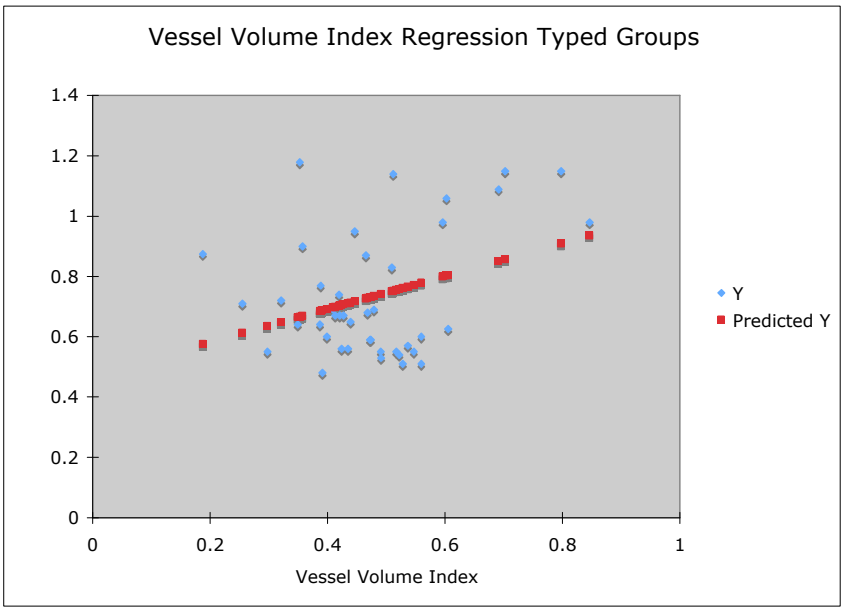
R Square	0.001583607
P-Value	0.799989066

Figure 14:



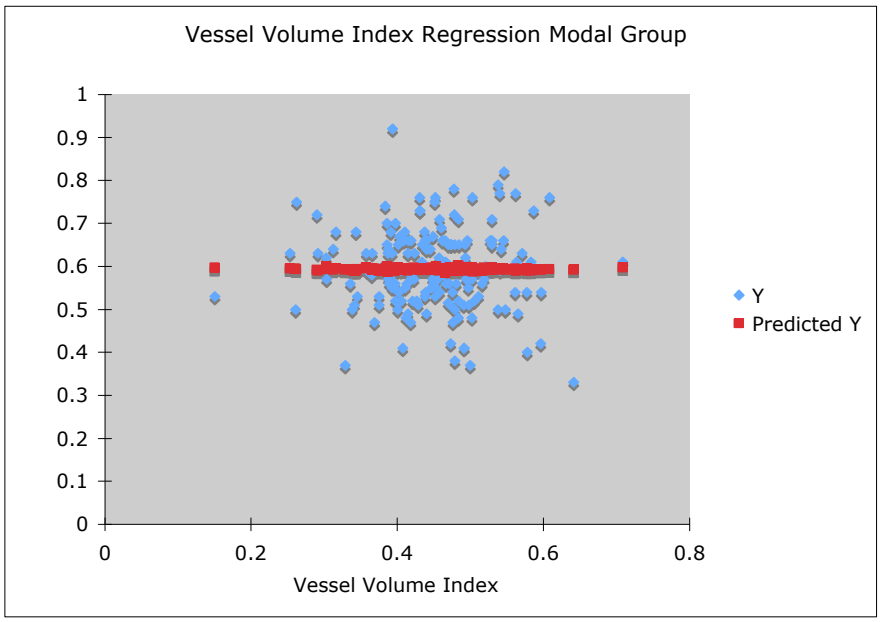
R Square	8.86715E-06
P-Value	0.968712387

Figure 15:



R Square	0.117085325
P-Value	0.024706205

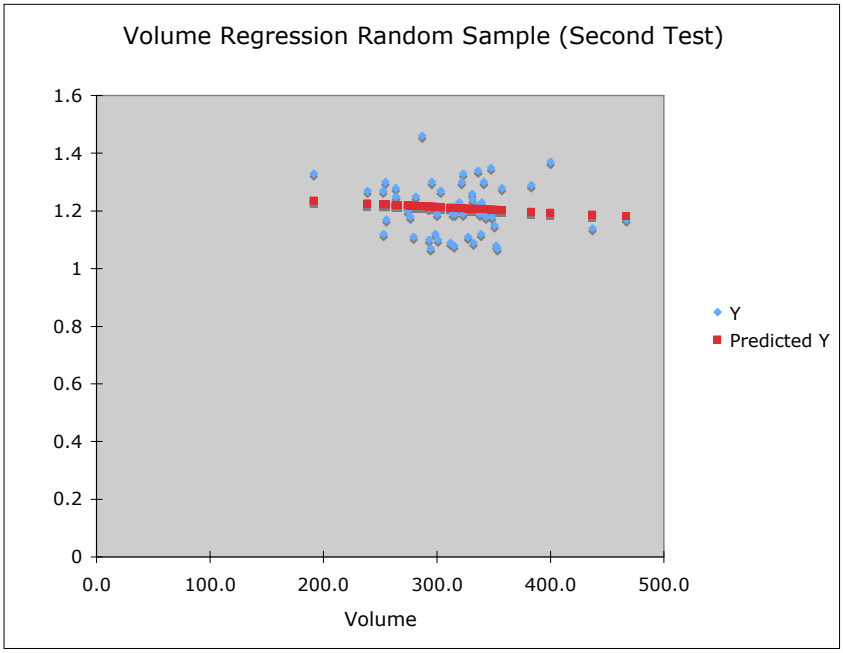
Figure 16:



R Square	0.000665956
P-Value	0.733876135

The following eight regressions are from the second temperature test.

Figure 17:

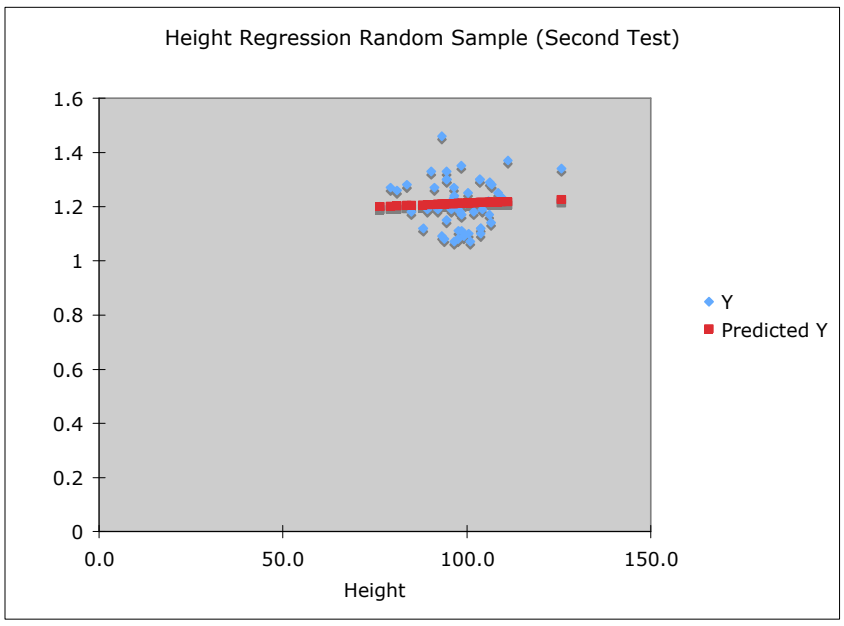


R Square	0.011196703
P-Value	0.459900258

Figure 18:

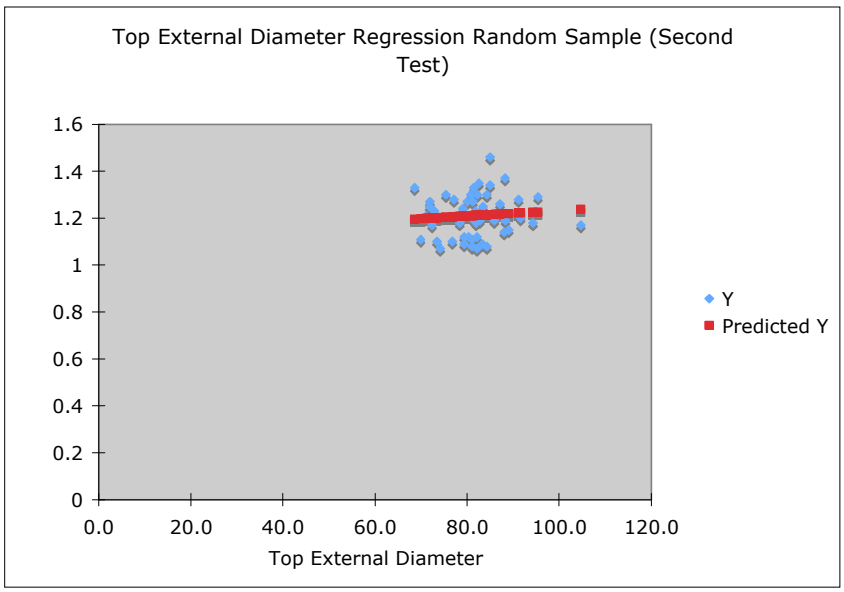
R Square	0.01172863
P-Value	0.449371399

Figure 19:



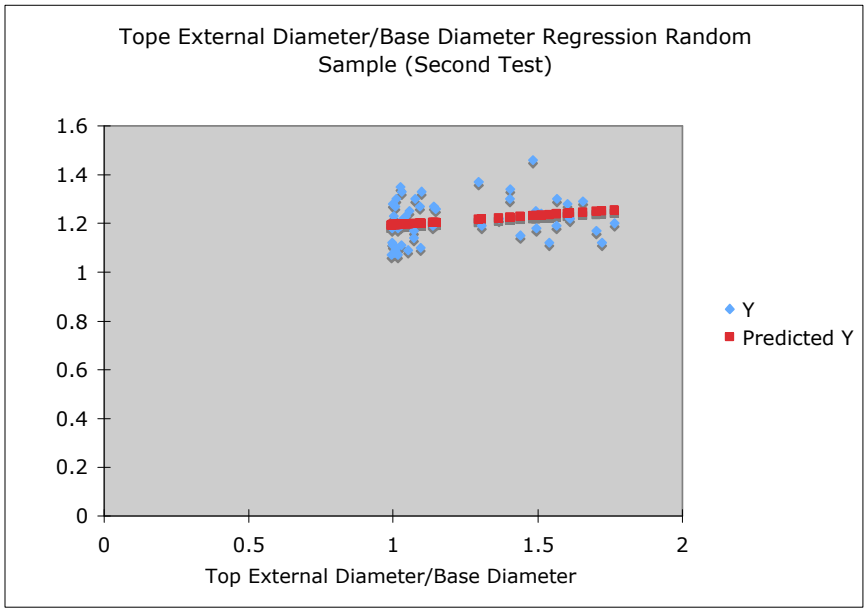
R Square	0.002561086
P-Value	0.724332919

Figure 20:



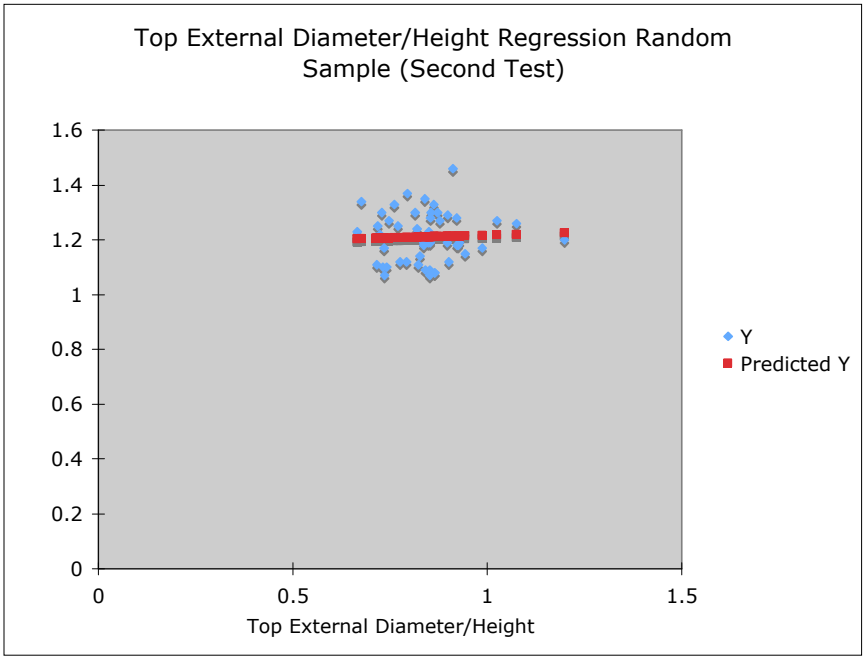
R Square	0.00754364
P-Value	0.544493164

Figure 21:



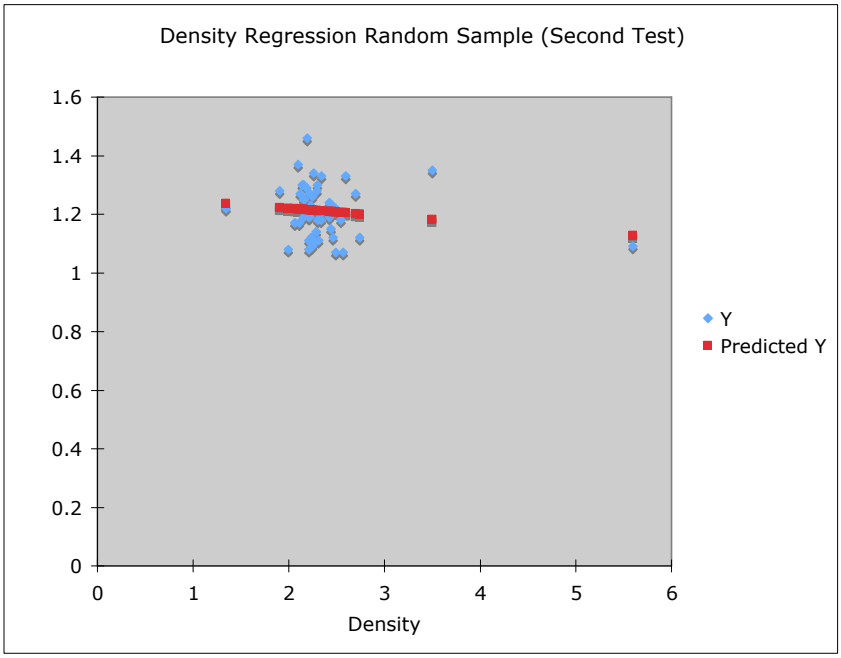
R Square	0.048597681
P-Value	0.12006926

Figure 22:



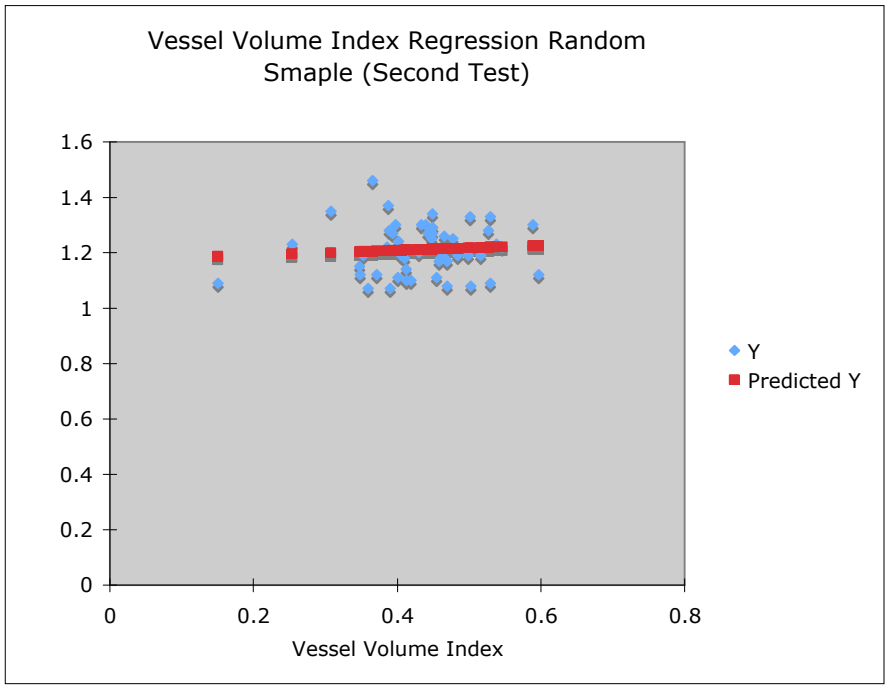
R Square	0.002008764
P-Value	0.754816052

Figure 23:



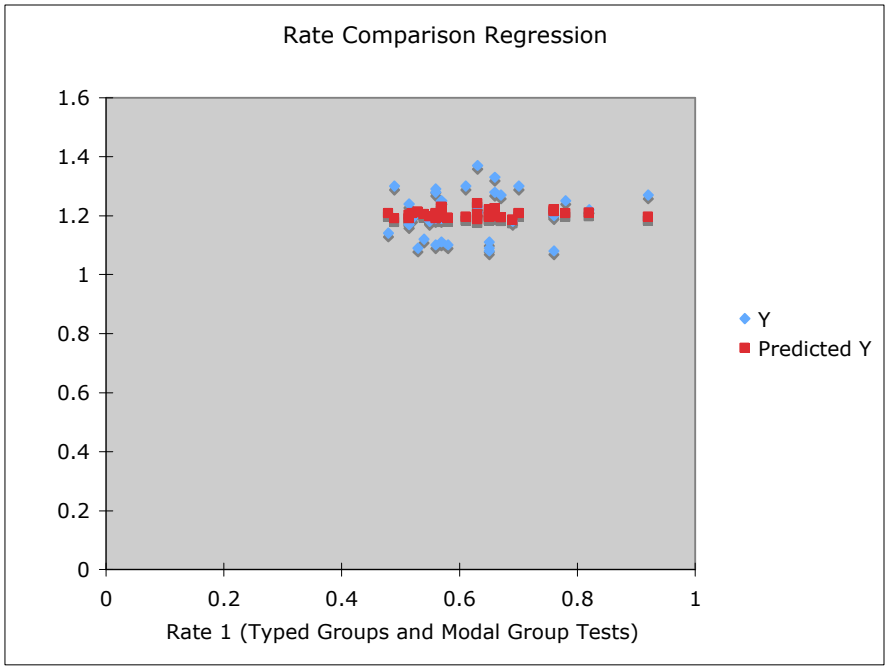
R Square	0.023161222
P-Value	0.286368588

Figure 24:



R Square	0.005729338
P-Value	0.597562338

Figure 25:



R Square	0.024977316
P-Value	0.379718278

Discussion

To begin, volume was in the typed sample a significant indicator of heat retention in our typed data (P=1.7E-08), with greater volumes reducing the heat lost. The modal data showed almost no relationship with 3% confidence (P=.97), meaning no significant result. The second test of the modal data also showed no relationship (r^2=.01) with 54% confidence (P=.46), again showing no relationship.

Weight proved to be a significant (P=3.17E-07) indicator for heat retention in our typed specimens, with greater weight correlating to greater retention. In the modal sample, however, weight of mug was not an indicator of heat retention, almost no relationship with 3% confidence (P=.97). In the second test, weight still did not effect temperature, with 55% confidence (P=.45).

Height, though a positive indicator of retention in the typed sample (P=9.6E-09), had little significance in the modal sample (P=.61). The second test showed even less relationship (P=.72).

The top external diameter was a good indicator of heat retention in our typed sample (P=2E-04), with increased diameter heat retention increased. In the modal sample, both tests showed no relationship, with 44% confidence in the first test (P=.56) and 46% confidence (P=.54) in the second test.

The ratio of top and bottom external diameters did not relate to heat loss in either our typed or modal sample, due perhaps in part to the small range of ratios (between 1 and 3). The confidence did increase in the second of the modal tests.

The ratio of top external diameter to height showed some relationship to heat retention in the typed specimens (r^2=.2, P=.002) though not as strongly as other traits and with many outliers. The modal sample showed no relationship and basically no confidence (P=.98). The second modal test had again, no relationship, but higher confidence (P=.75).

Density did not prove to be any indicator of heat retention in either group. The typed specimens had slightly more confidence than the modal (P=.8 versus P=.97), but the second test left the modal type with higher confidence (P=.29), though still no significant relationship.

The Vessel Volume Index was a weak indicator of heat retention in the typed samples (r^2=.12, P=.02), but showed no relationship in the modal sample in the first (P=.73) or second (P=.6) sample.

It is clear that the results from our typed and modal data differ greatly in their meaning. Our typed values generally had distinct trends, with significant values (P<.05), while the modal data sets has very little trend and no significance (high P values). The higher-temperature test (second test) showed greater heat loss *in situ*, however the results were as insignificant as those of the first test. A regression of data from both tests (**figure 25**) taken on the same mugs, however, showed no trend and no significance; the data sets could almost have come from completely different specimens, meaning our method was, in short, bunk. Yet the results from the typed Dollarware, significant as they were, show that our method does indeed work in some instances, even at the lower temperature. Thus we can say with some confidence that the slight variation in metrics between ceramic dollarware drinking vessels of the non typed group do not influence heat retention characteristics as much as we had predicted, and not at all visibly with the methods we used. This could be due to the extreme nature of the typed specimens' metric

values- the very smallest and largest/tallest mugs - meaning even slightly 'fuzzy' data from one type would differ from the 'fuzzy' data of a highly different type.

The overall error could result from slight changes in the method that occurred between the testing of the typed specimens (which occurred first) and the modal samples' tests (over the week following the first test). Or, random effects may account for more heat loss than we expected (an unusual breeze, placement nearer to the window, door, or tester). This would also explain why, though there was no increase in correlation, the confidence generally increased between the tests. We may even have missed the more important traits- stoneware, for example, is reputed to have a higher heat retention than cheaper ceramics, and we had no way to use this.

Another source of this error might be the intercorrelatedness of certain traits- very tall mugs, for example, had inevitably large volumes, very heavy mugs always had large height and/or width and therefore large volumes, and so on. If this is the case it may be said simply that large mugs tend to retain heat much better than their smaller counterparts. Multivariate statistics may serve to sort this problem out, but as neither of the conductors of this experiment have any experience with multivariate statistics this examination will have to be conducted by another interested party.

The potentials for future research in this area are manifold as a rethinking of methods and the use of more rigorous analysis tools could lead to a suite of much more conclusive findings.

References

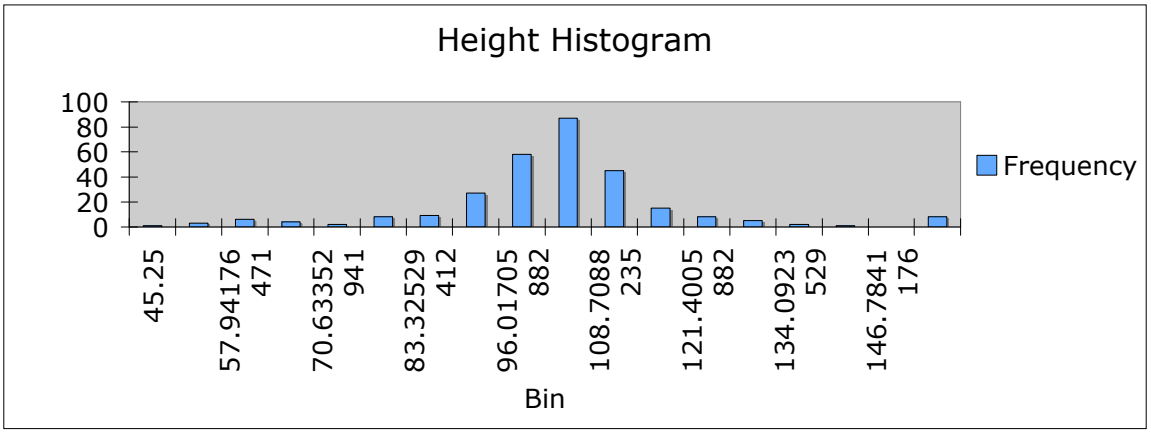
Bedard, Sarah. 2008. Getting a Grip: The Question of Dollarware Handle Design. Dollarware Project, report 08. http://dollarware.org/report08.pdf.

Bourgoin-Horne, Andre. 2008. The Economics of Dollarware. Dollarware Project, report 03. http://dollarware.org/report03.pdf.

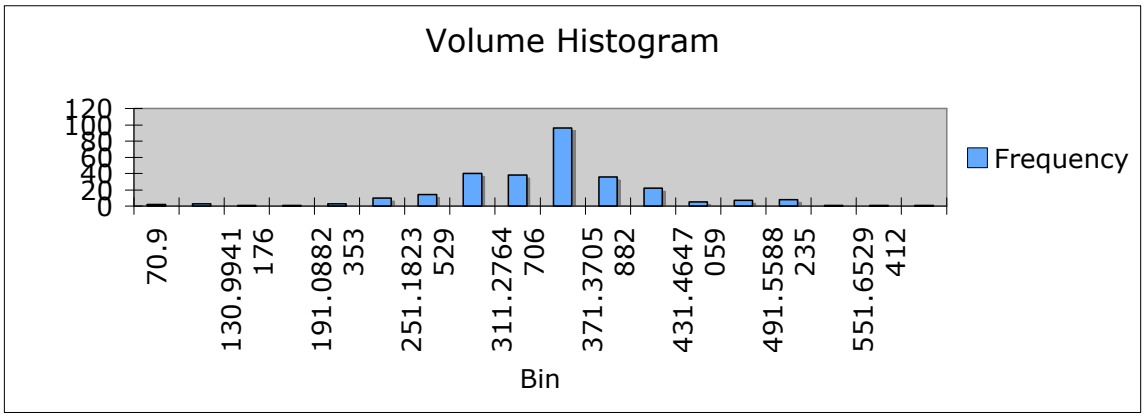
Gravel Miguel, Claudine and Dario Guiducci. 2008. Statistical Breakthrough or Numerical Nonsense? The logic and utility behind a Vessel Volume Index in studying Dollarware. Dollarware Project, report 04. http://dollarware.org/report02.pdf.

Groves, David. 2008. The Dollarware Cultural Tradition: An examination of the connection between ideography, low-quality drinking vessels, and the globalization of consumption and production. Dollarware Project, report 02. http://dollarware.org/report02.pdf.

Appendix



(Tall type visible on far right of histogram)



(Volume type selected from four bins on far left of histogram)

Typed and modal data, columns are in the following order: specimen, weight, top external diameter, top internal diameter, height, rim thickness, base diameter, content volume, external diameter/height, external diameter/base diameter, displacement volume, density, average heat loss rate per minute.

	Wt	Top Ext	Top Int	Ht	Rim Thick	Base Diam	Cont Vol	Top Ext / Ht	Top Ext / Base	Disp	Dens	Heat Loss/ Min.
Tall												
A-15	479.6	88.5	81.5	147.2	3.6	61.4	455.7	0.601	1.441	200	2.398	0.65
E-02	560.7	88.9	78.4	148.0	5.0	62.2	450.4	0.601	1.429	246	2.279	0.55
E-05	339.9	86.0	79.0	146.8	3.4	59.8	419.0	0.586	1.438	221	1.538	0.51

E-08	522.1	89.1	80.2	149.7	4.2	61.5	467.3	0.595	1.449	229	2.280	0.55
E-13	561.7	88.0	75.0	150.8	4.9	63.0	446.8	0.584	1.397	231	2.432	0.55
E-20	576.3	90.0	82.8	153.1	3.6	62.6	485.0	0.588	1.437	260	2.217	0.57
M-10	481.6	90.2	82.0	149.5	4.3	59.8	500.8	0.603	1.508	212	2.272	0.56
N-12	390.4	90.2	79.6	151.1	5.2	62.8	488.0	0.597	1.436	212	1.842	0.56
Espresso												
A-07	164.4	59.4	52.5	64.1	3.1	58.7	109.6	0.926	1.011	77	2.135	1.15
A-08	124.8	61.5	51.7	47.3	4.7	41.3	70.2	1.299	1.490	56	2.229	1.15
C-13	115.0	72.5	63.4	45.3	4.6	46.0	97.8	1.602	1.576	50	2.300	1.14
C-16	106.6	53.5	44.9	55.0	4.0	44.2	89.6	0.973	1.209	54	1.974	1.06
F-02	168.4	60.0	51.8	62.9	3.0	59.4	115.7	0.954	1.010	69	2.441	0.98
I-04	111.5	61.3	48.4	49.3	4.0	35.7	70.9	1.245	1.719	49	2.276	1.09
K-18	124.2	62.3	53.2	50.2	5.3	34.9	70.9	1.241	1.785	60	2.070	0.98
M-19	79.1	53.6	49.2	54.1	2.4	51.8	82.3	0.991	1.035	29	2.728	1.18
Chowda!												
A-10	412.9	110.2	101.3	64.8	4.6	110.1	381.4	1.701	1.001	170	2.429	0.95
N-40	386.5	113.5	104.5	57.1	4.0	110.0	348.7	1.988	1.032	162	2.386	0.87
Pedestal												
A-19	254.2	88.9	76.9	98.3	5.5	60.9	331.9	0.904	1.459	157	1.619	0.59
B-17	295.5	82.2	75.0	117.0	4.7	68.7	223.5	0.703	1.197	125	2.364	0.6
C-17	313.6	82.5	74.3	111.9	4.5	71.7	237.7	0.737	1.151	144	2.178	0.625
C-18	319.1	85.3	77.3	111.2	4.1	67.3	278.1	0.767	1.267	145	2.201	0.54
N-22	249.1	75.9	68.0	121.4	3.7	35.6	226.8	0.625	2.132	107	2.328	0.59
N-26	356.1	86.4	79.0	112.0	3.7	52.7	262.7	0.771	1.639	147	2.422	0.51
N-35	458.3	92.4	80.5	123.4	4.4	54.0	398.9	0.749	1.711	156	2.938	0.48
Teacup												
C-02	154.9	81.5	76.0	72.7	2.3	45.7	203.5	1.120	1.784	71	2.182	0.64
D-11	145.6	103.2	96.2	51.7	2.7	38.5	215.4	1.996	2.681	77	1.891	0.9
J-10	133.6	75.2	66.0	57.5	4.4	45.1	146.3	1.308	1.667	70	1.909	0.69
J-16	139.0	84.5	78.1	60.4	3.0	54.1	196.5	1.399	1.561	63	2.206	0.72
K-19	151.6	82.3	77.1	79.3	2.8	52.2	186.1	1.038	1.577	78	1.944	0.74
N-18	93.0	89.1	84.1	67.7	3.1	49.9	197.4	1.316	1.786	37	2.514	0.875
N-59	129.5	80.5	72.2	75.1	4.0	69.2	215.9	1.072	1.163	55	2.355	0.71
Bowl												
B-04	511.6	116.0	105.4	88.1	5.5	66.4	581.7	1.317	1.747	232	2.205	0.6
B-18	464.9	112.7	103.1	78.6	6.3	73.1	463.5	1.434	1.543	195	2.384	0.67
D-15	357.1	115.0	108.5	74.5	3.2	60.5	326.9	1.544	1.901	153	2.334	0.68
F-11	219.4	108.1	100.2	63.0	5.3	64.8	371.3	1.716	1.668	144	1.524	0.77
F-15	371.6	109.0	100.0	74.8	4.0	69.8	400.7	1.457	1.562	171	2.173	0.67

I-05	456.6	106.5	95.1	82.1	4.4	52.8	462.6	1.297	2.019	189	2.416	0.69
J-05	285.2	98.2	89.5	72.7	4.5	58.1	329.5	1.351	1.690	136	2.097	0.67
J-15	254.3	95.3	86.5	57.1	4.8	63.9	233.7	1.667	1.492	119	2.137	0.83
K-20	365.7	114.9	110.0	77.7	3.9	56.7	423.9	1.479	2.026	164	2.230	0.64
N-44	411.5	111.7	102.7	91.2	4.1	55.6	524.5	1.225	2.009	156	2.638	0.55
N-47	479.9	97.4	87.6	83.5	4.4	79.8	442.1	1.166	1.221	217	2.212	0.53

Modal Types

Weight

J-17	193.0	81.3	72.4	83.1	4.9	68.3	373.9	0.979	1.190	123	1.569	0.37
C-09	238.7	76.0	67.1	84.4	3.8	63.7	238.2	0.900	1.193	114	2.094	0.38
F-01	231.9	78.5	67.1	94.0	5.2	60.0	283.2	0.835	1.308	160	1.449	0.49
J-04	235.4	72.4	65.8	97.2	2.9	65.8	239.5	0.745	1.100	107	2.200	0.55
J-09	208.1	78.2	71.3	88.2	3.8	50.2	228.2	0.887	1.558	93	2.238	0.41
J-20	219.5	80.3	71.2	88.5	4.3	53.5	216.1	0.908	1.500	108	2.032	0.37
L-03	260.2	68.3	64.0	92.7	3.0	61.1	193.1	0.737	1.118	97	2.682	0.59
N-39	247.4	73.1	66.1	100.3	3.1	67.4	275.2	0.729	1.085	130	1.903	0.51
A-06	370.2	82.4	73.9	96.2	4.1	80.2	327.3	0.857	1.028	148	2.501	0.76
A-11	351.9	93.4	84.8	100.8	4.6	63.3	333.2	0.926	1.474	155	2.270	0.66
A-18	364.1	94.3	86.1	101.8	4.0	63.1	343.1	0.926	1.494	158	2.304	0.69
B-01	269.2	76.4	70.9	103.7	2.9	70.8	283.6	0.736	1.078	110	2.447	0.64
B-09	276.9	89.1	81.5	95.7	3.0	63.3	373.1	0.932	1.408	118	2.347	0.68
B-11	330.7	84.5	74.5	105.8	5.3	58.1	329.9	0.798	1.454	137	2.414	0.66
E-06	366.9	80.7	71.2	96.2	5.0	79.8	311.5	0.839	1.011	165	2.224	0.71
E-12	365.1	93.8	87.7	102.0	3.4	66.0	362.6	0.919	1.420	139	2.627	0.74
E-17	326.1	86.6	74.4	116.6	5.5	67.2	398.7	0.743	1.289	154	2.118	0.7
G-01	294.4	84.3	73.7	103.5	5.5	53.8	321.8	0.814	1.567	128	2.300	0.7
G-02	307.8	83.6	77.6	104.1	3.6	51.1	324.5	0.803	1.636	133	2.314	0.68
H-02	329.9	83.2	71.2	95.5	6.5	82.1	345.6	0.871	1.013	156	2.115	0.75
I-03	269.7	76.6	70.2	103.8	3.2	70.7	294.9	0.738	1.083	117	2.305	0.56
K-05	355.0	78.6	63.9	98.6	6.2	54.4	222.9	0.797	1.445	158	2.247	0.61
K-14	342.6	81.0	76.1	103.7	2.6	76.0	317.3	0.781	1.066	133	2.576	0.57
L-09	321.0	79.0	72.8	120.5	3.3	52.2	321.6	0.656	1.513	150	2.140	0.56
M-08	352.4	87.1	80.0	85.6	3.8	82.9	327.3	1.017	1.050	148	2.381	0.59
M-09	355.9	86.7	79.3	86.4	3.8	85.5	341.0	1.003	1.014	150	2.373	0.66
M-17	336.2	86.1	79.9	81.6	2.9	85.2	341.5	1.055	1.011	146	2.303	0.6
N-48	332.9	83.2	76.0	90.0	3.7	82.5	320.6	0.924	1.008	154	2.162	0.56
N-55	315.1	81.2	71.5	88.2	4.7	77.8	272.6	0.921	1.044	130	2.424	0.6
A-21	386.5	98.5	89.4	112.3	4.1	53.1	459.1	0.877	1.855	164	2.357	0.63
D-10	400.9	81.4	71.9	94.4	6.3	79.0	322.9	0.863	1.031	171	2.344	0.66
M-02	371.0	80.5	73.0	96.3	3.9	79.9	312.9	0.836	1.008	143	2.594	0.62
M-20	370.9	79.4	73.1	93.2	3.5	78.7	311.7	0.852	1.009	165	2.248	0.65
N-08	396.7	83.3	72.4	100.7	4.7	79.4	347.5	0.827	1.049	144	2.755	0.63
N-23	373.9	82.1	69.3	94.6	6.4	81.2	311.8	0.868	1.011	178	2.101	0.63
N-58	383.8	83.5	74.6	96.8	3.5	83.1	359.6	0.863	1.005	160	2.399	0.64
N-19	570.6	105.2	96.5	120.9	4.3	72.7	489.8	0.870	1.447	254	2.246	0.57

Volume

D-20	291.5	84.8	72.3	73.6	6.1	60.6	177.8	1.152	1.399	114	2.557	0.33
A-13	288.1	78.1	70.8	93.3	4.0	74.1	260.8	0.836	1.054	141	2.043	0.59
C-05	305.7	74.4	64.5	91.1	4.0	71.2	249.6	0.817	1.045	118	2.591	0.42
E-19	256.3	73.0	67.7	99.4	3.1	68.0	263.7	0.734	1.072	111	2.309	0.52
J-08	204.8	83.0	75.2	88.3	4.3	54.8	183.5	0.940	1.515	106	1.932	0.4
J-19	238.9	71.9	64.2	96.9	3.2	65.9	237.3	0.742	1.090	95	2.515	0.5
N-21	285.9	72.8	61.5	98.4	5.6	72.9	258.2	0.740	0.999	154	1.856	0.42
N-37	247.8	72.4	64.7	98.5	3.6	67.5	255.4	0.735	1.073	120	2.065	0.515
A-03	374.8	82.0	74.1	95.7	3.9	79.9	311.3	0.857	1.026	175	2.142	0.77
B-12	379.0	91.0	81.7	105.3	4.3	56.0	334.6	0.864	1.625	162	2.340	0.65
B-14	340.4	85.4	75.4	106.0	5.0	59.1	341.0	0.806	1.444	159	2.141	0.61
C-06	384.3	91.1	79.3	103.0	4.4	64.4	329.9	0.884	1.415	129	2.979	0.68
C-20	259.0	85.6	79.6	101.4	2.8	59.0	303.2	0.844	1.451	88	2.943	0.72
D-16	311.4	79.9	73.3	96.6	2.5	58.9	334.6	0.828	1.357	135	2.307	0.67
F-21	215.7	75.6	65.9	108.6	2.5	68.0	331.8	0.696	1.112	87	2.479	0.75
G-02	307.8	83.6	77.6	104.1	3.6	51.1	324.5	0.803	1.636	133	2.314	0.68
H-03	295.5	80.7	67.0	92.3	6.0	78.0	305.8	0.874	1.034	125	2.364	0.66
H-05	304.5	81.5	70.0	91.8	6.1	80.2	313.2	0.888	1.017	135	2.256	0.73
K-02	367.2	81.3	69.0	97.7	6.1	81.6	332.4	0.832	0.996	167	2.199	0.57
K-13	375.2	81.7	74.6	95.7	3.5	81.0	327.4	0.854	1.009	163	2.302	0.51
L-01	359.7	82.0	73.9	97.6	3.7	80.9	325.2	0.840	1.014	160	2.248	0.59
L-02	335.3	80.5	72.8	97.6	3.8	78.7	320.3	0.825	1.023	134	2.502	0.47
L-10	365.1	84.5	74.3	102.3	4.7	57.8	321.4	0.826	1.462	153	2.386	0.47
L-16	273.8	73.5	67.6	100.4	2.8	72.7	292.9	0.732	1.011	121	2.263	0.56
M-16	282.0	76.8	70.1	103.7	3.3	70.1	300.6	0.741	1.096	126	2.238	0.58
N-23	373.9	82.1	69.3	94.6	6.4	81.2	311.8	0.868	1.011	178	2.101	0.63
N-34	395.3	82.3	71.5	99.1	5.1	81.5	342.5	0.830	1.010	168	2.353	0.51
N-38	338.3	82.6	76.4	88.8	3.3	80.1	317.1	0.930	1.031	138	2.451	0.6
N-43	331.0	80.1	73.5	93.4	2.7	78.6	331.7	0.858	1.019	128	2.586	0.65
A-16	381.4	97.2	89.0	105.8	4.3	64.5	358.1	0.918	1.506	139	2.744	0.57
B-05	314.5	85.6	79.0	113.5	4.2	65.3	353.6	0.754	1.310	139	2.263	0.55
D-14	329.3	81.0	70.0	96.8	5.5	79.0	351.0	0.837	1.026	139	2.369	0.55
F-08	376.7	95.4	86.0	106.2	4.2	57.6	382.8	0.898	1.656	172	2.190	0.56
I-12	516.5	108.6	96.9	85.0	5.6	102.9	482.6	1.278	1.055	243	2.126	0.59
I-14	368.6	86.7	76.4	101.5	3.3	83.3	420.9	0.854	1.041	158	2.333	0.53
N-50	281.6	79.5	71.3	124.2	3.9	68.1	354.0	0.640	1.167	138	2.041	0.585
N-19	570.6	105.2	96.5	120.9	4.3	72.7	489.8	0.870	1.447	254	2.246	0.57

Top Ext. Diam.

L-03	260.2	68.3	64.0	92.7	3.0	61.1	193.1	0.737	1.118	97	2.682	0.59
C-05	305.7	74.4	64.5	91.1	4.0	71.2	249.6	0.817	1.045	118	2.591	0.42
E-16	265.1	77.2	68.3	83.8	5.5	77.2	263.7	0.921	1.000	139	1.907	0.66
G-04	288.0	71.1	65.2	99.6	3.4	69.1	292.8	0.714	1.029	124	2.323	0.63
J-11	210.9	69.1	61.0	112.5	4.3	53.4	260.2	0.615	1.295	129	1.635	0.66
M-07	247.4	69.9	63.4	97.7	3.0	67.9	279.2	0.716	1.030	112	2.209	0.65
N-37	247.8	72.4	64.7	98.5	3.6	67.5	255.4	0.735	1.073	120	2.065	0.515

N-53	271.9	71.9	65.0	100.2	3.0	68.0	264.0	0.718	1.057	126	2.158	0.78
A-04	391.1	84.3	75.9	97.5	4.4	83.3	352.2	0.865	1.013	177	2.210	0.76
B-10	373.0	81.5	72.6	97.4	4.6	80.0	324.3	0.837	1.019	155	2.406	0.72
B-14	340.4	85.4	75.4	106.0	5.0	59.1	341.0	0.806	1.444	159	2.141	0.61
C-19	194.6	79.2	74.5	109.2	2.3	58.0	265.6	0.725	1.365	145	1.342	0.82
D-05	251.4	84.7	78.3	104.8	3.5	56.8	277.2	0.808	1.491	149	1.687	0.79
E-18	358.9	82.2	71.1	96.1	4.5	81.0	335.6	0.855	1.015	147	2.441	0.66
F-01	231.9	78.5	67.1	94.0	5.2	60.0	283.2	0.835	1.308	160	1.449	0.49
H-01	326.6	83.3	71.3	96.4	6.5	82.2	351.9	0.865	1.014	154	2.121	0.68
H-02	329.9	83.2	71.2	95.5	6.5	82.1	345.6	0.871	1.013	156	2.115	0.75
H-03	295.5	80.7	67.0	92.3	6.0	78.0	305.8	0.874	1.034	125	2.364	0.66
H-04	301.8	80.1	69.0	91.2	6.0	79.5	303.1	0.879	1.008	136	2.219	0.67
H-05	304.5	81.5	70.0	91.8	6.1	80.2	313.2	0.888	1.017	135	2.256	0.73
K-08	345.0	79.8	72.3	103.9	3.4	76.3	299.8	0.768	1.047	156	2.212	0.6
K-11	387.5	82.2	72.0	95.4	5.4	81.0	297.7	0.862	1.015	181	2.141	0.76
K-15	371.9	80.4	70.3	103.7	4.3	46.7	253.1	0.775	1.722	151	2.463	0.54
L-08	348.2	86.0	78.5	85.0	3.4	84.6	316.9	1.012	1.017	145	2.401	0.71
N-10	298.5	83.6	71.3	95.2	4.8	80.2	344.4	0.878	1.042	131	2.279	0.6
N-13	306.7	80.7	73.2	91.5	3.3	77.9	290.4	0.882	1.036	106	2.893	0.58
N-23	373.9	82.1	69.3	94.6	6.4	81.2	311.8	0.868	1.011	178	2.101	0.63
N-41	361.8	81.1	74.4	95.2	3.1	80.0	329.5	0.852	1.014	156	2.319	0.65
N-60	324.6	80.5	72.4	90.3	2.5	81.2	345.4	0.891	0.991	150	2.164	0.65
N-61	253.8	81.3	68.3	79.3	4.6	74.4	238.8	1.025	1.093	94	2.700	0.92
A-11	351.9	93.4	84.8	100.8	4.6	63.3	333.2	0.926	1.474	155	2.270	0.66
C-06	384.3	91.1	79.3	103.0	4.4	64.4	329.9	0.884	1.415	129	2.979	0.68
D-03	438.8	88.5	80.4	138.6	3.9	66.6	399.2	0.639	1.329	137	3.203	0.68
D-07	325.4	88.3	77.2	111.2	5.1	68.1	400.0	0.794	1.296	155	2.099	0.63
F-08	376.7	95.4	86.0	106.2	4.2	57.6	382.8	0.898	1.656	172	2.190	0.56
K-07	351.2	91.6	82.4	101.4	5.3	63.4	311.8	0.903	1.445	170	2.066	0.66
M-05	390.7	87.3	78.5	91.7	4.5	87.4	350.8	0.951	0.998	173	2.258	0.62
I-12	516.5	108.6	96.9	85.0	5.6	102.9	482.6	1.278	1.055	243	2.126	0.59

Top Ext Diam/Base Diam

L-07	349.5	79.8	69.1	94.9	5.7	81.0	311.5	0.841	0.985	144	2.427	0.58
H-06	322.7	82.3	70.7	94.4	6.3	81.4	341.1	0.872	1.012	150	2.151	0.49
I-19	356.7	81.4	70.9	95.5	4.0	80.4	325.5	0.852	1.012	160	2.229	0.41
J-06	362.8	82.8	74.8	97.1	4.7	81.9	340.1	0.853	1.011	168	2.160	0.57
M-05	390.7	87.3	78.5	91.7	4.5	87.4	350.8	0.951	0.998	173	2.258	0.62
M-13	274.8	69.6	64.7	98.5	3.1	69.1	264.6	0.707	1.007	121	2.271	0.6
N-17	296.6	78.2	67.6	93.7	4.1	77.4	316.0	0.835	1.010	92	3.224	0.63
N-34	395.3	82.3	71.5	99.1	5.1	81.5	342.5	0.830	1.010	168	2.353	0.51
A-13	288.1	78.1	70.8	93.3	4.0	74.1	260.8	0.836	1.054	141	2.043	0.59
A-14	291.3	77.6	70.2	94.2	3.9	73.8	266.6	0.824	1.052	144	2.023	0.77
A-20	274.5	76.0	70.8	104.1	2.5	71.0	296.2	0.730	1.070	117	2.346	0.56
C-05	305.7	74.4	64.5	91.1	4.0	71.2	249.6	0.817	1.045	118	2.591	0.42
D-08	266.4	88.1	77.8	102.0	5.6	61.2	355.3	0.864	1.440	200	1.332	0.61
D-14	329.3	81.0	70.0	96.8	5.5	79.0	351.0	0.837	1.026	139	2.369	0.55
E-10	343.7	88.0	81.6	116.1	3.3	66.0	385.6	0.758	1.334	117	2.938	0.57

I-09	266.3	83.2	73.1	106.4	2.8	58.8	382.7	0.782	1.414	164	1.624	0.51
I-11	266.6	76.3	69.1	104.1	2.4	70.8	301.9	0.733	1.078	118	2.259	0.57
I-14	368.6	86.7	76.4	101.5	3.3	83.3	420.9	0.854	1.041	158	2.333	0.51
I-20	338.3	79.1	69.1	93.1	3.7	72.1	307.7	0.850	1.098	142	2.382	0.66
L-06	402.6	84.4	75.3	89.1	3.8	82.2	306.4	0.947	1.027	172	2.341	0.54
L-08	348.2	86.0	78.5	85.0	3.4	84.6	316.9	1.012	1.017	145	2.401	0.71
L-11	368.0	86.6	77.8	84.1	3.2	83.8	301.2	1.030	1.033	154	2.390	0.53
L-13	247.0	79.1	68.6	100.2	4.3	68.1	266.8	0.789	1.162	108	2.287	0.59
M-03	312.3	77.4	70.1	101.2	3.8	75.9	308.1	0.765	1.020	149	2.096	0.48
M-14	395.6	89.2	82.2	92.7	2.9	86.8	352.1	0.962	1.028	178	2.222	0.52
N-28	255.3	90.6	78.8	88.4	4.4	77.1	305.5	1.025	1.175	138	1.850	0.59
N-32	227.5	86.8	72.6	92.2	4.1	66.8	294.7	0.941	1.299	92	2.473	0.64
N-39	247.4	73.1	66.1	100.3	3.1	67.4	275.2	0.729	1.085	130	1.903	0.51
N-49	235.5	72.1	66.2	88.8	2.8	68.0	234.2	0.812	1.060	99	2.379	0.57
B-08	295.9	88.4	78.9	104.2	4.5	56.5	337.6	0.848	1.565	137	2.160	0.52
B-15	403.9	90.5	79.7	105.8	5.0	55.0	340.4	0.855	1.645	163	2.478	0.5
D-05	251.4	84.7	78.3	104.8	3.5	56.8	277.2	0.808	1.491	149	1.687	0.79
D-19	368.7	80.2	71.8	131.3	3.6	53.2	390.7	0.611	1.508	162	2.276	0.49
F-04	327.8	87.2	79.3	108.2	3.5	53.3	379.4	0.806	1.636	140	2.341	0.47
F-07	403.5	101.5	87.3	99.1	6.4	61.7	394.0	1.024	1.645	198	2.038	0.48
I-16	319.0	91.2	86.0	106.7	2.8	56.9	357.3	0.855	1.603	139	2.295	0.56
A-21	386.5	98.5	89.4	112.3	4.1	53.1	459.1	0.877	1.855	164	2.357	0.63

Top Ext Diam/Height

D-19	368.7	80.2	71.8	131.3	3.6	53.2	390.7	0.611	1.508	162	2.276	0.49
B-01	269.2	76.4	70.9	103.7	2.9	70.8	283.6	0.736	1.078	110	2.447	0.64
C-10	254.1	76.5	67.2	103.3	2.3	71.4	297.8	0.741	1.071	117	2.172	0.63
F-12	211.3	73.0	64.7	109.6	2.0	69.8	339.2	0.666	1.046	86	2.457	0.63
I-03	269.7	76.6	70.2	103.8	3.2	70.7	294.9	0.738	1.083	117	2.305	0.56
L-12	243.5	72.8	66.8	99.1	3.8	68.4	260.0	0.735	1.064	109	2.234	0.66
M-16	282.0	76.8	70.1	103.7	3.3	70.1	300.6	0.741	1.096	126	2.238	0.58
N-42	309.5	73.0	66.0	107.7	3.0	66.1	282.3	0.678	1.104	139	2.227	0.65
A-02	405.1	84.2	76.0	97.4	4.1	82.9	335.7	0.865	1.016	184	2.202	0.5
C-14	279.8	83.3	77.0	99.1	4.1	79.1	332.2	0.841	1.053	50	5.596	0.53
D-09	365.8	81.9	75.0	97.8	3.4	79.5	330.8	0.837	1.030	112	3.266	0.5
D-18	322.6	79.1	68.6	96.5	5.3	52.3	331.2	0.820	1.513	133	2.426	0.515
E-03	356.9	81.9	72.1	97.5	6.1	81.4	345.8	0.840	1.006	163	2.190	0.56
E-06	366.9	80.7	71.2	96.2	5.0	79.8	311.5	0.839	1.011	165	2.224	0.71
E-14	357.4	81.6	68.4	97.5	6.1	79.4	322.9	0.837	1.028	161	2.220	0.57
F-13	344.1	91.1	80.3	110.7	3.5	56.5	385.3	0.823	1.612	138	2.493	0.59
F-20	312.0	79.1	70.5	94.4	4.1	78.0	325.3	0.838	1.014	149	2.094	0.54
G-01	294.4	84.3	73.7	103.5	5.5	53.8	321.8	0.814	1.567	128	2.300	0.7
I-06	361.9	80.1	68.6	96.7	3.2	79.9	332.9	0.828	1.002	142	2.549	0.52
I-09	266.3	83.2	73.1	106.4	2.8	58.8	382.7	0.782	1.414	164	1.624	0.51
I-19	356.7	81.4	70.9	95.5	4.0	80.4	325.5	0.852	1.012	160	2.229	0.41
J-12	268.1	84.1	76.3	93.7	3.6	57.7	256.3	0.898	1.458	116	2.311	0.57
J-13	346.0	80.4	70.9	94.6	4.6	80.5	314.6	0.850	0.999	125	2.768	0.52
L-02	335.3	80.5	72.8	97.6	3.8	78.7	320.3	0.825	1.023	134	2.502	0.47

N-07	254.8	75.1	68.4	88.7	3.4	74.2	272.8	0.847	1.012	132	1.930	0.52
N-15	336.2	79.8	71.6	93.2	4.8	78.5	311.7	0.856	1.017	141	2.384	0.53
N-31	319.4	84.6	70.2	102.7	6.2	60.1	319.6	0.824	1.408	152	2.101	0.54
N-41	361.8	81.1	74.4	95.2	3.1	80.0	329.5	0.852	1.014	156	2.319	0.65
N-45	358.1	85.9	77.8	95.7	3.2	75.5	313.8	0.898	1.138	162	2.210	0.56
A-09	275.1	91.7	81.4	76.5	4.9	51.9	274.2	1.199	1.766	118	2.331	0.76
A-11	351.9	93.4	84.8	100.8	4.6	63.3	333.2	0.926	1.474	155	2.270	0.66
B-09	276.9	89.1	81.5	95.7	3.0	63.3	373.1	0.932	1.408	118	2.347	0.68
C-15	307.5	90.1	81.6	100.0	4.1	60.9	328.0	0.901	1.479	120	2.563	0.63
J-18	329.6	86.7	79.1	85.7	3.7	85.2	327.1	1.012	1.018	144	2.289	0.64
L-08	348.2	86.0	78.5	85.0	3.4	84.6	316.9	1.012	1.017	145	2.401	0.71
N-09	312.6	92.6	71.0	96.8	3.2	66.1	272.8	0.957	1.401	160	1.954	0.73
I-12	516.5	108.6	96.9	85.0	5.6	102.9	482.6	1.278	1.055	243	2.126	0.59

Height

D-20	291.5	84.8	72.3	73.6	6.1	60.6	177.8	1.152	1.399	114	2.557	0.33
C-09	238.7	76.0	67.1	84.4	3.8	63.7	238.2	0.900	1.193	114	2.094	0.38
D-02	338.5	83.9	71.8	91.4	6.9	79.0	345.9	0.918	1.062	186	1.820	0.5
J-08	204.8	83.0	75.2	88.3	4.3	54.8	183.5	0.940	1.515	106	1.932	0.4
J-17	193.0	81.3	72.4	83.1	4.9	68.3	373.9	0.979	1.190	123	1.569	0.37
N-13	306.7	80.7	73.2	91.5	3.3	77.9	290.4	0.882	1.036	106	2.893	0.58
N-27	317.7	80.6	68.3	90.5	5.6	80.5	318.2	0.891	1.001	110	2.888	0.53
N-49	235.5	72.1	66.2	88.8	2.8	68.0	234.2	0.812	1.060	99	2.379	0.57
A-01	371.6	81.9	74.5	95.9	4.0	80.6	323.7	0.853	1.015	161	2.308	0.55
B-02	344.7	81.1	74.1	98.5	3.6	81.1	327.5	0.823	1.000	149	2.313	0.57
C-12	264.8	78.9	71.8	100.1	3.3	70.0	336.6	0.788	1.126	113	2.343	0.56
D-10	400.9	81.4	71.9	94.4	6.3	79.0	322.9	0.863	1.031	171	2.344	0.66
E-07	347.9	82.4	73.9	96.6	3.6	81.8	337.9	0.853	1.007	148	2.351	0.53
E-14	357.4	81.6	68.4	97.5	6.1	79.4	322.9	0.837	1.028	161	2.220	0.57
I-02	338.5	81.1	70.1	96.1	3.2	80.3	333.2	0.844	1.009	132	2.564	0.56
I-10	274.2	75.5	65.6	103.5	2.5	70.1	295.3	0.729	1.077	128	2.142	0.61
I-20	338.3	79.1	69.1	93.1	3.7	72.1	307.7	0.850	1.098	142	2.382	0.66
J-04	235.4	72.4	65.8	97.2	2.9	65.8	239.5	0.745	1.100	107	2.200	0.55
J-13	346.0	80.4	70.9	94.6	4.6	80.5	314.6	0.850	0.999	125	2.768	0.52
K-03	295.5	81.1	72.3	93.8	4.6	80.6	315.1	0.865	1.006	148	1.997	0.65
K-05	355.0	78.6	63.9	98.6	6.2	54.4	222.9	0.797	1.445	158	2.247	0.61
K-06	375.9	81.0	69.4	104.2	4.1	76.7	304.2	0.777	1.056	165	2.278	0.64
K-12	347.8	81.3	71.4	103.9	4.5	48.4	257.3	0.782	1.679	150	2.319	0.61
L-02	335.3	80.5	72.8	97.6	3.8	78.7	320.3	0.825	1.023	134	2.502	0.47
M-02	371.0	80.5	73.0	96.3	3.9	79.9	312.9	0.836	1.008	143	2.594	0.62
M-07	247.4	69.9	63.4	97.7	3.0	67.9	279.2	0.716	1.030	112	2.209	0.65
M-15	270.5	73.0	66.5	99.4	3.4	67.7	267.3	0.734	1.078	128	2.113	0.65
N-10	298.5	83.6	71.3	95.2	4.8	80.2	344.4	0.878	1.042	131	2.279	0.6
N-31	319.4	84.6	70.2	102.7	6.2	60.1	319.6	0.824	1.408	152	2.101	0.54
C-08	266.3	88.1	77.6	121.0	2.7	56.0	307.1	0.728	1.573	93	2.863	0.62
C-19	194.6	79.2	74.5	109.2	2.3	58.0	265.6	0.725	1.365	145	1.342	0.82
E-01	412.0	88.1	78.2	106.5	5.6	82.1	436.8	0.827	1.073	180	2.289	0.48
F-05	362.3	94.0	83.3	105.4	3.8	60.4	385.9	0.892	1.556	155	2.337	0.54

F-13	344.1	91.1	80.3	110.7	3.5	56.5	385.3	0.823	1.612	138	2.493	0.59
M-01	272.4	83.5	76.8	108.4	4.2	55.9	281.1	0.770	1.493	126	2.162	0.57
N-11	286.0	83.1	76.2	106.2	3.3	56.1	375.9	0.782	1.481	98	2.918	0.5
D-03	438.8	88.5	80.4	138.6	3.9	66.6	399.2	0.639	1.329	137	3.203	0.68
Density												
D-08	266.4	88.1	77.8	102.0	5.6	61.2	355.3	0.864	1.440	200	1.332	0.61
A-14	291.3	77.6	70.2	94.2	3.9	73.8	266.6	0.824	1.052	144	2.023	0.77
C-09	238.7	76.0	67.1	84.4	3.8	63.7	238.2	0.900	1.193	114	2.094	0.38
I-15	380.1	82.6	70.8	96.7	3.4	80.6	332.5	0.854	1.024	192	1.980	0.54
M-03	312.3	77.4	70.1	101.2	3.8	75.9	308.1	0.765	1.020	149	2.096	0.48
N-07	254.8	75.1	68.4	88.7	3.4	74.2	272.8	0.847	1.012	132	1.930	0.52
N-25	275.1	80.4	66.8	90.4	5.4	75.1	286.4	0.889	1.071	142	1.937	0.6
N-31	319.4	84.6	70.2	102.7	6.2	60.1	319.6	0.824	1.408	152	2.101	0.54
A-03	374.8	82.0	74.1	95.7	3.9	79.9	311.3	0.857	1.026	175	2.142	0.77
A-21	386.5	98.5	89.4	112.3	4.1	53.1	459.1	0.877	1.855	164	2.357	0.63
B-09	276.9	89.1	81.5	95.7	3.0	63.3	373.1	0.932	1.408	118	2.347	0.68
B-11	330.7	84.5	74.5	105.8	5.3	58.1	329.9	0.798	1.454	137	2.414	0.66
D-17	321.3	80.0	69.3	128.3	5.6	61.2	398.5	0.624	1.308	136	2.363	0.51
F-04	327.8	87.2	79.3	108.2	3.5	53.3	379.4	0.806	1.636	140	2.341	0.47
F-09	340.1	87.3	79.2	106.5	3.8	59.5	353.5	0.819	1.467	155	2.194	0.54
I-03	269.7	76.6	70.2	103.8	3.2	70.7	294.9	0.738	1.083	117	2.305	0.56
I-07	373.8	80.7	71.0	95.3	4.5	80.1	327.7	0.847	1.007	167	2.238	0.59
I-19	356.7	81.4	70.9	95.5	4.0	80.4	325.5	0.852	1.012	160	2.229	0.41
J-18	329.6	86.7	79.1	85.7	3.7	85.2	327.1	1.012	1.018	144	2.289	0.64
K-08	345.0	79.8	72.3	103.9	3.4	76.3	299.8	0.768	1.047	156	2.212	0.6
K-12	347.8	81.3	71.4	103.9	4.5	48.4	257.3	0.782	1.679	150	2.319	0.61
L-06	402.6	84.4	75.3	89.1	3.8	82.2	306.4	0.947	1.027	172	2.341	0.54
L-07	349.5	79.8	69.1	94.9	5.7	81.0	311.5	0.841	0.985	144	2.427	0.58
L-08	348.2	86.0	78.5	85.0	3.4	84.6	316.9	1.012	1.017	145	2.401	0.71
L-15	297.5	73.8	67.8	100.5	2.9	71.7	291.4	0.734	1.029	132	2.254	0.55
M-08	352.4	87.1	80.0	85.6	3.8	82.9	327.3	1.017	1.050	148	2.381	0.59
M-12	282.6	68.9	62.3	98.0	2.2	68.4	253.8	0.703	1.007	120	2.355	0.65
N-16	273.5	72.7	63.6	89.1	4.9	70.2	231.5	0.816	1.036	112	2.442	0.71
N-42	309.5	73.0	66.0	107.7	3.0	66.1	282.3	0.678	1.104	139	2.227	0.65
A-06	370.2	82.4	73.9	96.2	4.1	80.2	327.3	0.857	1.028	148	2.501	0.76
C-06	384.3	91.1	79.3	103.0	4.4	64.4	329.9	0.884	1.415	129	2.979	0.68
D-06	364.1	82.0	71.6	98.1	6.7	80.7	348.3	0.837	1.017	143	2.546	0.55
E-10	343.7	88.0	81.6	116.1	3.3	66.0	385.6	0.758	1.334	117	2.938	0.57
E-12	365.1	93.8	87.7	102.0	3.4	66.0	362.6	0.919	1.420	139	2.627	0.74
J-13	346.0	80.4	70.9	94.6	4.6	80.5	314.6	0.850	0.999	125	2.768	0.52
L-03	260.2	68.3	64.0	92.7	3.0	61.1	193.1	0.737	1.118	97	2.682	0.59
C-14	279.8	83.3	77.0	99.1	4.1	79.1	332.2	0.841	1.053	50	5.596	0.53

Vessel Volume Index (Displacement/Contents) data for typed and modal groups

A-01	0.497374112	**E-16**	0.527114145	**K-20**	0.386883699
A-02	0.54810843	**E-17**	0.38625533	**L-01**	0.49200492
A-03	0.562158689	**E-18**	0.438021454	**L-02**	0.41835779
A-04	0.502555366	**E-19**	0.420932878	**L-03**	0.502330399
A-06	0.45218454	**E-20**	0.536082474	**L-06**	0.561357702
A-07	0.702554745	**F-01**	0.564971751	**L-07**	0.462279294
A-08	0.797720798	**F-02**	0.596369922	**L-08**	0.457557589
A-09	0.430342815	**F-04**	0.36900369	**L-09**	0.46641791
A-10	0.445726272	**F-05**	0.401658461	**L-10**	0.476042315
A-11	0.465186074	**F-07**	0.502538071	**L-11**	0.511288181
A-13	0.540644172	**F-08**	0.449320794	**L-12**	0.419230769
A-14	0.540135034	**F-09**	0.438472419	**L-13**	0.404797601
A-15	0.438885232	**F-11**	0.387826555	**L-15**	0.452985587
A-16	0.388159732	**F-12**	0.253537736	**L-16**	0.413110277
A-18	0.460507141	**F-13**	0.358162471	**M-01**	0.448239061
A-19	0.473034046	**F-15**	0.426753182	**M-02**	0.457015021
A-20	0.395003376	**F-20**	0.458038733	**M-03**	0.483609218
A-21	0.357220649	**F-21**	0.262206148	**M-05**	0.493158495
B-01	0.38787024	**G-01**	0.397762585	**M-07**	0.401146132
B-02	0.454961832	**G-02**	0.409861325	**M-08**	0.45218454
B-04	0.398831013	**G-04**	0.423497268	**M-09**	0.439882698
B-05	0.393099548	**H-01**	0.437624325	**M-10**	0.423322684
B-08	0.405805687	**H-02**	0.451388889	**M-12**	0.472813239
B-09	0.316269097	**H-03**	0.408763898	**M-13**	0.457294029
B-10	0.477952513	**H-04**	0.4486968	**M-14**	0.505538199
B-11	0.415277357	**H-05**	0.431034483	**M-15**	0.478862701
B-12	0.484160191	**H-05**	0.431034483	**M-16**	0.419161677
B-14	0.46627566	**H-06**	0.439753738	**M-17**	0.427525622
B-15	0.478848414	**I-02**	0.396158463	**M-19**	0.35236938
B-17	0.559284116	**I-03**	0.396744659	**M-20**	0.529355149
B-18	0.420711974	**I-04**	0.691114245	**N-07**	0.483870968
C-02	0.348894349	**I-05**	0.408560311	**N-08**	0.414388489
C-05	0.47275641	**I-06**	0.426554521	**N-09**	0.586510264
C-06	0.391027584	**I-07**	0.50961245	**N-10**	0.380371661
C-08	0.302832953	**I-09**	0.4285341	**N-11**	0.260707635
C-09	0.478589421	**I-10**	0.433457501	**N-12**	0.43442623
C-10	0.392947103	**I-11**	0.3908579	**N-13**	0.365013774
C-12	0.335710042	**I-12**	0.503522586	**N-15**	0.452358037
C-13	0.511247444	**I-14**	0.375386077	**N-16**	0.483801296
C-14	0.15051174	**I-14**	0.375386077	**N-17**	0.291139241
C-15	0.365853659	**I-15**	0.577443609	**N-18**	0.187436677
C-16	0.602678571	**I-16**	0.389028827	**N-19**	0.518579012
C-17	0.605805637	**I-19**	0.491551459	**N-21**	0.596436871
C-18	0.521395182	**I-19**	0.491551459	**N-22**	0.471781305
C-19	0.545933735	**I-20**	0.461488463	**N-23**	0.570878768
C-20	0.290237467	**J-04**	0.446764092	**N-25**	0.495810056
D-02	0.537727667	**J-05**	0.412746586	**N-26**	0.559573658

D-03	0.343186373	**J-06**	0.493972361	**N-27**	0.345694532
D-05	0.537518038	**J-08**	0.577656676	**N-28**	0.451718494
D-06	0.410565604	**J-09**	0.407537248	**N-31**	0.475594493
D-07	0.3875	**J-10**	0.4784689	**N-32**	0.31218188
D-08	0.562904588	**J-11**	0.495772483	**N-34**	0.490510949
D-09	0.338573156	**J-12**	0.452594616	**N-35**	0.391075458
D-10	0.52957572	**J-13**	0.397329943	**N-37**	0.469851214
D-11	0.357474466	**J-15**	0.509199829	**N-38**	0.435193945
D-14	0.396011396	**J-16**	0.320610687	**N-39**	0.472383721
D-15	0.468033038	**J-17**	0.328964964	**N-40**	0.464582736
D-16	0.403466826	**J-18**	0.440232345	**N-41**	0.473444613
D-17	0.341279799	**J-19**	0.400337126	**N-41**	0.473444613
D-18	0.401570048	**J-20**	0.499768626	**N-42**	0.492383989
D-19	0.414640389	**K-02**	0.502406739	**N-43**	0.385890865
D-20	0.641169854	**K-03**	0.469692161	**N-44**	0.29742612
E-01	0.412087912	**K-05**	0.708838044	**N-45**	0.51625239
E-02	0.546181172	**K-06**	0.542406312	**N-47**	0.490839177
E-03	0.471370735	**K-07**	0.545221296	**N-48**	0.480349345
E-05	0.527446301	**K-08**	0.520346898	**N-49**	0.422715628
E-06	0.529695024	**K-11**	0.607994625	**N-50**	0.389830508
E-07	0.437999408	**K-12**	0.58297707	**N-53**	0.477272727
E-08	0.490049219	**K-13**	0.497861943	**N-55**	0.476889215
E-10	0.303423237	**K-14**	0.419161677	**N-58**	0.444938821
E-12	0.383342526	**K-15**	0.596602134	**N-59**	0.254747568
E-13	0.517009848	**K-18**	0.846262341	**N-60**	0.434279097
E-14	0.49860638	**K-19**	0.4191295	**N-61**	0.393634841

Typed and modal groups' temperature data

Specimen	**Initial temp**	**5min temp**	**Final Temp**	**Rate(ti-t5)**	**Rate(t5-tf)**	**Rate(ave)**
Tall						
A-15	52	48.7	45.5	0.66	0.64	0.65
E-02	50	47.3	44.5	0.54	0.56	0.55
E-05	48.1	46	43	0.42	0.6	0.51
E-08	50.8	48.3	45.3	0.5	0.6	0.55
E-13	50.5	47.8	45	0.54	0.56	0.55
E-20	51	48.4	45.3	0.52	0.62	0.57
M-10	52.1	49.4	46.5	0.54	0.58	0.56
N-12	52.6	50	47	0.52	0.6	0.56
Espresso						
A-07	50.6	43.6	39.1	1.4	0.9	1.15
A-08	50.6	43.6	39.1	1.4	0.9	1.15
C-13	49.9	42.8	38.5	1.42	0.86	1.14

C-16	49.2	43	38.6	1.24	0.88	1.06
F-02	48.2	42.9	38.4	1.06	0.9	0.98
I-04	47.2	41.1	36.3	1.22	0.96	1.09
K-18	44.8	39.35	35	1.09	0.87	0.98
M-19	47.5	40.7	35.7	1.36	1	1.18

Chowda!

A-10	52.9	47	43.4	1.18	0.72	0.95
N-40	50.8	45.8	42.1	1	0.74	0.87

Pedestal

A-19	49.9	47.1	44	0.56	0.62	0.59
B-17	48	45.3	42	0.54	0.66	0.6
C-17	47.8	44.8	41.55	0.6	0.65	0.625
C-18	47.6	45.3	42.2	0.46	0.62	0.54
N-22	48	45.4	42.1	0.52	0.66	0.59
N-26	46.3	44	41.2	0.46	0.56	0.51
N-35	48	45.7	43.2	0.46	0.5	0.48

Teacup

C-02	49.3	45.9	42.9	0.68	0.6	0.64
D-11	49.4	44.4	40.4	1	0.8	0.9
J-10	48.7	45	41.8	0.74	0.64	0.69
J-16	49.4	45.5	42.2	0.78	0.66	0.72
K-19	49.3	45.5	41.9	0.76	0.72	0.74
N-18	49.6	44.8	40.85	0.96	0.79	0.875
N-59	49.9	46.2	42.8	0.74	0.68	0.71

Bowl

B-04	50.2	47.5	44.2	0.54	0.66	0.6
B-18	50	46.9	43.3	0.62	0.72	0.67
D-15	49.6	46.4	42.8	0.64	0.72	0.68
F-11	51.2	47.55	43.5	0.73	0.81	0.77
F-15	50.1	46.9	43.4	0.64	0.7	0.67
I-05	50.3	47.1	43.4	0.64	0.74	0.69
J-05	52.4	48.7	45.7	0.74	0.6	0.67
J-15	51.2	46.4	42.9	0.96	0.7	0.83
K-20	51.5	48.1	45.1	0.68	0.6	0.64
N-44	51.9	49	46.4	0.58	0.52	0.55
N-47	51.5	48.6	46.2	0.58	0.48	0.53

Modal Types

Weight

J-17	49.6	48.4	45.9	0.24	0.5	0.37
C-09	47.2	46.3	43.4	0.18	0.58	0.38
F-01	51.3	49.1	46.4	0.44	0.54	0.49
J-04	48.6	46.4	43.1	0.44	0.66	0.55
J-09	46.4	44.3	42.3	0.42	0.4	0.41
J-20	45.2	44.7	41.5	0.1	0.64	0.37
L-03	48.4	45.6	42.5	0.56	0.62	0.59
N-39	48.4	46.2	43.3	0.44	0.58	0.51
A-06	51.5	48.8	43.9	0.54	0.98	0.76
A-11	49.9	48.4	43.3	0.3	1.02	0.66
A-18	50.2	47.9	43.3	0.46	0.92	0.69
B-01	51.4	47.95	45	0.69	0.59	0.64
B-09	51.5	49	44.7	0.5	0.86	0.68
B-11	51	48.8	44.4	0.44	0.88	0.66
E-06	50.4	47.9	43.3	0.5	0.92	0.71
E-12	50.9	47.8	43.5	0.62	0.86	0.74
E-17	52	49.3	45	0.54	0.86	0.7
G-01	50.6	48	43.6	0.52	0.88	0.7
G-02	50.7	48.3	43.9	0.48	0.88	0.68
H-02	51.2	47.7	43.7	0.7	0.8	0.75
I-03	52.4	49.8	46.8	0.52	0.6	0.56
K-05	50.3	47.5	44.2	0.56	0.66	0.61
K-14	51.3	48.85	45.6	0.49	0.65	0.57
L-09	51.6	49.1	46	0.5	0.62	0.56
M-08	50.8	48.3	44.9	0.5	0.68	0.59
M-09	50.9	48	44.3	0.58	0.74	0.66
M-17	50.9	48.2	44.9	0.54	0.66	0.6
N-48	50.2	47.6	44.6	0.52	0.6	0.56
N-55	50.1	47.1	44.1	0.6	0.6	0.6
A-21	52.7	49.2	46.4	0.7	0.56	0.63
D-10	51	46.7	44.4	0.86	0.46	0.66
M-02	51.2	47.7	45	0.7	0.54	0.62
M-20	50.5	47.2	44	0.66	0.64	0.65
N-08	51.1	47.6	44.8	0.7	0.56	0.63
N-23	50.3	46.9	44	0.68	0.58	0.63
N-58	51.2	47.7	44.8	0.7	0.58	0.64
N-19	50.6	47.6	44.9	0.6	0.54	0.57

Volume

D-20	40.7	38.8	37.4	0.38	0.28	0.33
A-13	48.4	46.2	42.5	0.44	0.74	0.59
C-05	46	42.1	41.8	0.78	0.06	0.42
E-19	47.8	45.4	42.6	0.48	0.56	0.52
J-08	44.1	42.7	40.1	0.28	0.52	0.4
J-19	46.7	44.4	41.7	0.46	0.54	0.5
N-21	46.4	44.2	42.2	0.44	0.4	0.42
N-37	47.4	45.1	42.25	0.46	0.57	0.515
A-03	49.1	47	41.4	0.42	1.12	0.77

B-12	49.1	47.3	42.6	0.36	0.94	0.65
B-14	48.9	46.8	42.8	0.42	0.8	0.61
C-06	47.3	43.8	40.5	0.7	0.66	0.68
C-20	50	46.9	42.8	0.62	0.82	0.72
D-16	49.8	46.5	43.1	0.66	0.68	0.67
F-21	51.4	48	43.9	0.68	0.82	0.75
G-02	50.7	48.3	43.9	0.48	0.88	0.68
H-03	49.9	46.4	43.3	0.7	0.62	0.66
H-05	50.3	46.1	43	0.84	0.62	0.73
K-02	50.4	48	44.7	0.48	0.66	0.57
K-13	49	46.8	43.9	0.44	0.58	0.51
L-01	50.1	47.6	44.2	0.5	0.68	0.59
L-02	48	46.7	43.3	0.26	0.68	0.47
L-10	48.6	47.3	43.9	0.26	0.68	0.47
L-16	50.4	48.6	44.8	0.36	0.76	0.56
M-16	50.7	48.3	44.9	0.48	0.68	0.58
N-23	50.3	46.9	44	0.68	0.58	0.63
N-34	49	44.3	43.9	0.94	0.08	0.51
N-38	49.5	44.1	43.5	1.08	0.12	0.6
N-43	50.3	47.6	43.8	0.54	0.76	0.65
A-16	50	47.7	44.3	0.46	0.68	0.57
B-05	50.6	48.3	45.1	0.46	0.64	0.55
D-14	50.3	48.2	44.8	0.42	0.68	0.55
F-08	49.9	47.6	44.3	0.46	0.66	0.56
I-12	49.6	47.2	43.7	0.48	0.7	0.59
I-14	50	47.9	44.7	0.42	0.64	0.53
N-50	50.3	48	44.45	0.46	0.71	0.585
N-19	50.6	47.6	44.9	0.6	0.54	0.57

Top Ext. Diam.

L-03	48.4	45.6	42.5	0.56	0.62	0.59
C-05	46	42.1	41.8	0.78	0.06	0.42
E-16	50.3	48.1	43.7	0.44	0.88	0.66
G-04	51.8	49.6	45.5	0.44	0.82	0.63
J-11	51.5	48.9	44.9	0.52	0.8	0.66
M-07	51.3	49.2	44.8	0.42	0.88	0.65
N-37	47.4	45.1	42.25	0.46	0.57	0.515
N-53	50.5	47.4	42.7	0.62	0.94	0.78
A-04	51.4	49.7	43.8	0.34	1.18	0.76
B-10	50.9	49.4	43.7	0.3	1.14	0.72
B-14	48.9	46.8	42.8	0.42	0.8	0.61
C-19	51.9	49.4	43.7	0.5	1.14	0.82
D-05	51.1	48.7	43.2	0.48	1.1	0.79
E-18	50.3	48.8	43.7	0.3	1.02	0.66
F-01	51.3	49.1	46.4	0.44	0.54	0.49
H-01	51.4	49	44.6	0.48	0.88	0.68
H-02	51.2	47.7	43.7	0.7	0.8	0.75
H-03	49.9	46.4	43.3	0.7	0.62	0.66

H-04	50.7	48.4	44	0.46	0.88	0.67
H-05	50.3	46.1	43	0.84	0.62	0.73
K-08	49.7	46.8	43.7	0.58	0.62	0.6
K-11	49.3	46.4	41.7	0.58	0.94	0.76
K-15	46.3	42.1	40.9	0.84	0.24	0.54
L-08	50.2	47.2	43.1	0.6	0.82	0.71
N-10	48.4	44.8	42.4	0.72	0.48	0.6
N-13	47.8	44.6	42	0.64	0.52	0.58
N-23	50.3	46.9	44	0.68	0.58	0.63
N-41	49.8	46.6	43.3	0.64	0.66	0.65
N-60	50.2	47	43.7	0.64	0.66	0.65
N-61	50.2	44.3	41	1.18	0.66	0.92
A-11	49.9	48.4	43.3	0.3	1.02	0.66
C-06	47.3	43.8	40.5	0.7	0.66	0.68
D-03	51.9	49.2	45.1	0.54	0.82	0.68
D-07	50.6	48.5	44.3	0.42	0.84	0.63
F-08	49.9	47.6	44.3	0.46	0.66	0.56
K-07	50.9	48.2	44.3	0.54	0.78	0.66
M-05	50.5	47.6	44.3	0.58	0.66	0.62
I-12	49.6	47.2	43.7	0.48	0.7	0.59

Top Ext Diam/Base Diam

L-07	50.6	48	44.8	0.52	0.64	0.58
H-06	49.5	48.5	44.6	0.2	0.78	0.49
I-19	49.4	48.3	45.3	0.22	0.6	0.41
J-06	50.8	48.9	45.1	0.38	0.76	0.57
M-05	50.5	47.6	44.3	0.58	0.66	0.62
M-13	50.9	48.9	44.9	0.4	0.8	0.6
N-17	51.2	48.8	44.9	0.48	0.78	0.63
N-34	49	44.3	43.9	0.94	0.08	0.51
A-13	48.4	46.2	42.5	0.44	0.74	0.59
A-14	50.3	47.8	42.6	0.5	1.04	0.77
A-20	50.9	48.8	45.3	0.42	0.7	0.56
C-05	46	42.1	41.8	0.78	0.06	0.42
D-08	51	48.6	44.9	0.48	0.74	0.61
D-14	50.3	48.2	44.8	0.42	0.68	0.55
E-10	51	48.8	45.3	0.44	0.7	0.57
I-09	51.9	50.1	46.8	0.36	0.66	0.51
I-11	50.7	48.4	45	0.46	0.68	0.57
I-14	51.1	49	46	0.42	0.6	0.51
I-20	50.6	48.1	44	0.5	0.82	0.66
L-06	49.8	47.4	44.4	0.48	0.6	0.54
L-08	50.2	47.2	43.1	0.6	0.82	0.71
L-11	49.4	47	44.1	0.48	0.58	0.53
L-13	51.2	48.2	45.3	0.6	0.58	0.59
M-03	50.6	48.7	45.8	0.38	0.58	0.48
M-14	49.8	47.5	44.6	0.46	0.58	0.52
N-28	50.8	48.2	44.9	0.52	0.66	0.59

N-32	50.5	47.6	44.1	0.58	0.7	0.64
N-39	48.4	46.2	43.3	0.44	0.58	0.51
N-49	49.4	46.2	43.7	0.64	0.5	0.57
B-08	49.8	48.6	44.6	0.24	0.8	0.52
B-15	48.7	47.4	43.7	0.26	0.74	0.5
D-05	51.1	48.7	43.2	0.48	1.1	0.79
D-19	49.7	48.1	44.8	0.32	0.66	0.49
F-04	49.1	47.8	44.4	0.26	0.68	0.47
F-07	49.4	48.3	44.6	0.22	0.74	0.48
I-16	50.6	48.8	45	0.36	0.76	0.56
A-21	52.7	49.2	46.4	0.7	0.56	0.63

Top Ext Diam/Height

D-19	49.7	48.1	44.8	0.32	0.66	0.49
B-01	51.4	47.95	45	0.69	0.59	0.64
C-10	51.7	48.8	45.4	0.58	0.68	0.63
F-12	53.1	49.9	46.8	0.64	0.62	0.63
I-03	52.4	49.8	46.8	0.52	0.6	0.56
L-12	51.6	48.4	45	0.64	0.68	0.66
M-16	50.7	48.3	44.9	0.48	0.68	0.58
N-42	51.2	48.2	44.7	0.6	0.7	0.65
A-02	49.7	47.8	44.7	0.38	0.62	0.5
C-14	50.1	47.7	44.8	0.48	0.58	0.53
D-09	49.3	47.4	44.3	0.38	0.62	0.5
D-18	49.2	46.9	44.05	0.46	0.57	0.515
E-03	49.5	47.1	43.9	0.48	0.64	0.56
E-06	50.4	47.9	43.3	0.5	0.92	0.71
E-14	49.5	47.1	43.8	0.48	0.66	0.57
F-13	50	47.3	44.1	0.54	0.64	0.59
F-20	47.9	44.8	42.5	0.62	0.46	0.54
G-01	50.6	48	43.6	0.52	0.88	0.7
I-06	47.5	44.5	42.3	0.6	0.44	0.52
I-09	51.9	50.1	46.8	0.36	0.66	0.51
I-19	49.4	48.3	45.3	0.22	0.6	0.41
J-12	46.9	43.7	41.2	0.64	0.5	0.57
J-13	46.4	43.5	41.2	0.58	0.46	0.52
L-02	48	46.7	43.3	0.26	0.68	0.47
N-07	46.3	43.6	41.1	0.54	0.5	0.52
N-15	47.3	44.2	42	0.62	0.44	0.53
N-31	48	44.8	42.6	0.64	0.44	0.54
N-41	49.8	46.6	43.3	0.64	0.66	0.65
N-45	47.4	44.2	41.8	0.64	0.48	0.56
A-09	50.7	47.6	43.1	0.62	0.9	0.76
A-11	49.9	48.4	43.3	0.3	1.02	0.66
B-09	51.5	49	44.7	0.5	0.86	0.68
C-15	51.1	48.5	44.8	0.52	0.74	0.63
J-18	50.9	48.4	44.5	0.5	0.78	0.64
L-08	50.2	47.2	43.1	0.6	0.82	0.71

N-09	50.3	46.8	43	0.7	0.76	0.73
I-12	49.6	47.2	43.7	0.48	0.7	0.59
Height						
D-20	40.7	38.8	37.4	0.38	0.28	0.33
C-09	47.2	46.3	43.4	0.18	0.58	0.38
D-02	51.6	49.6	46.6	0.4	0.6	0.5
J-08	44.1	42.7	40.1	0.28	0.52	0.4
J-17	49.6	48.4	45.9	0.24	0.5	0.37
N-13	47.8	44.6	42	0.64	0.52	0.58
N-27	51.7	48.9	46.4	0.56	0.5	0.53
N-49	49.4	46.2	43.7	0.64	0.5	0.57
A-01	51.4	48.8	45.9	0.52	0.58	0.55
B-02	51.7	49.1	46	0.52	0.62	0.57
C-12	53.1	50.4	47.5	0.54	0.58	0.56
D-10	51	46.7	44.4	0.86	0.46	0.66
E-07	52.1	49.8	46.8	0.46	0.6	0.53
E-14	49.5	47.1	43.8	0.48	0.66	0.57
I-02	51.9	49.4	46.3	0.5	0.62	0.56
I-10	51.8	49.2	45.7	0.52	0.7	0.61
I-20	50.6	48.1	44	0.5	0.82	0.66
J-04	48.6	46.4	43.1	0.44	0.66	0.55
J-13	46.4	43.5	41.2	0.58	0.46	0.52
K-03	53	49.7	46.5	0.66	0.64	0.65
K-05	50.3	47.5	44.2	0.56	0.66	0.61
K-06	52	49	45.6	0.6	0.68	0.64
K-12	50.4	47.6	44.3	0.56	0.66	0.61
L-02	48	46.7	43.3	0.26	0.68	0.47
M-02	51.2	47.7	45	0.7	0.54	0.62
M-07	51.3	49.2	44.8	0.42	0.88	0.65
M-15	52.2	48.9	45.7	0.66	0.64	0.65
N-10	48.4	44.8	42.4	0.72	0.48	0.6
N-31	48	44.8	42.6	0.64	0.44	0.54
C-08	51	48.1	44.8	0.58	0.66	0.62
C-19	51.9	49.4	43.7	0.5	1.14	0.82
E-01	51.5	49.4	46.7	0.42	0.54	0.48
F-05	51.5	49.1	46.1	0.48	0.6	0.54
F-13	50	47.3	44.1	0.54	0.64	0.59
M-01	50.9	48.5	45.2	0.48	0.66	0.57
N-11	52	49.8	47	0.44	0.56	0.5
D-03	51.9	49.2	45.1	0.54	0.82	0.68
Density						
D-08	51	48.6	44.9	0.48	0.74	0.61
A-14	50.3	47.8	42.6	0.5	1.04	0.77
C-09	47.2	46.3	43.4	0.18	0.58	0.38
I-15	51	48.7	45.6	0.46	0.62	0.54

M-03	50.6	48.7	45.8	0.38	0.58	0.48
N-07	46.3	43.6	41.1	0.54	0.5	0.52
N-25	51.2	48.3	45.2	0.58	0.62	0.6
N-31	48	44.8	42.6	0.64	0.44	0.54
A-03	49.1	47	41.4	0.42	1.12	0.77
A-21	52.7	49.2	46.4	0.7	0.56	0.63
B-09	51.5	49	44.7	0.5	0.86	0.68
B-11	51	48.8	44.4	0.44	0.88	0.66
D-17	51.9	49.4	46.8	0.5	0.52	0.51
F-04	49.1	47.8	44.4	0.26	0.68	0.47
F-09	50.8	48.2	45.4	0.52	0.56	0.54
I-03	52.4	49.8	46.8	0.52	0.6	0.56
I-07	50.5	47.8	44.6	0.54	0.64	0.59
I-19	49.4	48.3	45.3	0.22	0.6	0.41
J-18	50.9	48.4	44.5	0.5	0.78	0.64
K-08	49.7	46.8	43.7	0.58	0.62	0.6
K-12	50.4	47.6	44.3	0.56	0.66	0.61
L-06	49.8	47.4	44.4	0.48	0.6	0.54
L-07	50.6	48	44.8	0.52	0.64	0.58
L-08	50.2	47.2	43.1	0.6	0.82	0.71
L-15	50.4	47.8	44.9	0.52	0.58	0.55
M-08	50.8	48.3	44.9	0.5	0.68	0.59
M-12	50.2	46.8	43.7	0.68	0.62	0.65
N-16	49.6	45.9	42.5	0.74	0.68	0.71
N-42	51.2	48.2	44.7	0.6	0.7	0.65
A-06	51.5	48.8	43.9	0.54	0.98	0.76
C-06	47.3	43.8	40.5	0.7	0.66	0.68
D-06	50.8	48.4	45.3	0.48	0.62	0.55
E-10	51	48.8	45.3	0.44	0.7	0.57
E-12	50.9	47.8	43.5	0.62	0.86	0.74
J-13	46.4	43.5	41.2	0.58	0.46	0.52
L-03	48.4	45.6	42.5	0.56	0.62	0.59
C-14	50.1	47.7	44.8	0.48	0.58	0.53

Second test specimen data. Columns are in the following order: specimen, weight, top external diameter, top internal diameter, height, rim thickness, base diameter, content volume, external diameter/height, external diameter/base diameter, displacement volume, density, vessel volume index, average heat loss rate.

A-04	391.1	84.3	75.9	97.5	4.4	83.3	352.2	0.865100533	1.012851309	177	2.210	0.503	1.08
A-09	275.1	91.7	81.4	76.5	4.9	51.9	274.2	1.199189118	1.765986133	118	2.331	0.430	1.2
A-17	263.7	82.1	77.2	103.7	2.1	53.3	338.6	0.792092575	1.539932508	118	2.235	0.348	1.12
A-18	364.1	94.3	86.1	101.8	4.0	63.1	343.1	0.925962294	1.494453249	158	2.304	0.461	1.18
B-02	344.7	81.1	74.1	98.5	3.6	81.1	327.5	0.823350254	1	149	2.313	0.455	1.11
B-	295.9	88.4	78.9	104.2	4.5	56.5	337.6	0.847888676	1.56510186	137	2.160	0.406	1.19

08													
B-16	298.1	89.1	80.3	94.4	4.8	61.9	350.6	0.943855932	1.439418417	122	2.443	0.348	1.15
B-20	346.5	87.2	78.3	81.1	4.9	76.0	330.8	1.075879087	1.147368421	154	2.250	0.466	1.26
C-14	279.8	83.3	77.0	99.1	4.1	79.1	332.2	0.840989399	1.053097345	50	5.596	0.151	1.09
C-19	194.6	79.2	74.5	109.2	2.3	58.0	265.6	0.72481685	1.364655172	145	1.342	0.546	1.22
D-01	374.4	82.6	70.4	98.4	6.2	80.5	347.6	0.839634146	1.026335404	107	3.499	0.308	1.35
D-06	364.1	82.0	71.6	98.1	6.7	80.7	348.3	0.836715961	1.017234966	143	2.546	0.411	1.18
D-07	325.4	88.3	77.2	111.2	5.1	68.1	400.0	0.794421952	1.295861462	155	2.099	0.388	1.37
D-10	400.9	81.4	71.9	94.4	6.3	79.0	322.9	0.863169051	1.030886076	171	2.344	0.530	1.33
D-18	322.6	79.1	68.6	96.5	5.3	52.3	331.2	0.820103627	1.512614679	133	2.426	0.402	1.24
E-01	412.0	88.1	78.2	106.5	5.6	82.1	436.8	0.827230047	1.073081608	180	2.289	0.412	1.14
E-14	357.4	81.6	68.4	97.5	6.1	79.4	322.9	0.836923077	1.027707809	161	2.220	0.499	1.19
E-16	265.1	77.2	68.3	83.8	5.5	77.2	263.7	0.92124105	1	139	1.907	0.527	1.28
F-03	341.4	85.0	77.3	125.7	3.3	60.5	336.1	0.676213206	1.404958678	151	2.261	0.449	1.34
F-06	230.1	85.0	77.2	93.2	3.1	57.3	286.9	0.912017167	1.483420593	105	2.191	0.366	1.46
F-08	376.7	95.4	86.0	106.2	4.2	57.6	382.8	0.898305085	1.65625	172	2.190	0.449	1.29
F-10	451.7	104.7	88.6	106.0	7.9	61.5	466.8	0.987735849	1.702439024	214	2.111	0.458	1.17
F-12	211.3	73.0	64.7	109.6	2.0	69.8	339.2	0.666058394	1.045845272	86	2.457	0.254	1.23
F-18	323.7	80.8	70.8	94.5	4.6	57.6	254.7	0.855026455	1.402777778	150	2.158	0.589	1.3
G-01	294.4	84.3	73.7	103.5	5.5	53.8	321.8	0.814492754	1.566914498	128	2.300	0.398	1.3
G-03	321.3	86.3	78.7	105.9	3.4	53.6	334.7	0.815304676	1.611577965	129	2.491	0.385	1.22
G-04	288.0	71.1	65.2	99.6	3.4	69.1	292.8	0.713855422	1.02894356	124	2.323	0.423	1.21
H-04	301.8	80.1	69.0	91.2	6.0	79.5	303.1	0.878771256	1.008181246	136	2.219	0.449	1.27
H-06	322.7	82.3	70.7	94.4	6.3	81.4	341.1	0.872284049	1.011677935	150	2.151	0.440	1.3
I-10	274.2	75.5	65.6	103.5	2.5	70.1	295.3	0.728985507	1.077087794	128	2.142	0.433	1.3
I-16	319.0	91.2	86.0	106.7	2.8	56.9	357.3	0.854732896	1.602811951	139	2.295	0.389	1.28
J-02	237.5	72.0	65.0	96.4	2.8	63.1	252.8	0.746887967	1.141045959	112	2.121	0.443	1.27
J-03	338.4	78.5	71.1	92.0	4.8	79.0	315.8	0.85326087	0.993670886	153	2.212	0.484	1.19
K-03	295.5	81.1	72.3	93.8	4.6	80.6	315.1	0.864605544	1.006203474	148	1.997	0.470	1.08
K-04	382.9	81.9	72.7	96.3	6.2	81.7	319.6	0.85046729	1.00244798	172	2.226	0.538	1.23
K-15	371.9	80.4	70.3	103.7	4.3	46.7	253.1	0.775313404	1.721627409	151	2.463	0.597	1.12
L-05	249.2	68.6	64.2	90.2	3.2	62.4	191.4	0.760532151	1.099358974	96	2.596	0.502	1.33
L-14	286.8	74.2	68.5	100.9	2.9	72.9	294.5	0.735381566	1.017832647	115	2.494	0.390	1.07

L-16	273.8	73.5	67.6	100.4	2.8	72.7	292.9	0.732071713	1.011004127	121	2.263	0.413	1.1
M-01	272.4	83.5	76.8	108.4	4.2	55.9	281.1	0.77039498	1.493381038	126	2.162	0.448	1.25
M-07	247.4	69.9	63.4	97.7	3.0	67.9	279.2	0.715660184	1.029749632	112	2.209	0.401	1.11
M-16	282.0	76.8	70.1	103.7	3.3	70.1	300.6	0.740597878	1.095577746	126	2.238	0.419	1.1
M-20	370.9	79.4	73.1	93.2	3.5	78.7	311.7	0.85193133	1.008894536	165	2.248	0.529	1.09
N-01	326.5	82.2	72.6	96.5	4.1	82.6	353.2	0.851813472	0.995157385	127	2.571	0.360	1.07
N-03	304.6	79.4	72.6	88.1	4.2	79.6	298.5	0.901248581	0.997487437	111	2.744	0.372	1.12
N-06	257.1	82.8	72.7	89.2	6.1	63.4	300.0	0.928251121	1.305993691	106	2.425	0.353	1.19
N-37	247.8	72.4	64.7	98.5	3.6	67.5	255.4	0.735025381	1.072592593	120	2.065	0.470	1.17
N-45	358.1	85.9	77.8	95.7	3.2	75.5	313.8	0.897596656	1.137748344	162	2.210	0.516	1.19
N-53	271.9	71.9	65.0	100.2	3.0	68.0	264.0	0.71756487	1.057352941	126	2.158	0.477	1.25
N-56	301.7	78.4	70.5	85.0	3.2	78.6	276.6	0.922352941	0.997455471	129	2.339	0.466	1.18
N-61	253.8	81.3	68.3	79.3	4.6	74.4	238.8	1.025220681	1.092741935	94	2.700	0.394	1.27

Second test specimen temperature data

Specimen	t1	t2	tf	rate12	rate2f	Rate(ave)
A-04	74.5	69.4	63.7	1.02	1.14	1.08
A-09	73.2	67.6	61.2	1.12	1.28	1.2
A-17	75.5	70.4	64.3	1.02	1.22	1.12
A-18	72.6	67.1	60.8	1.1	1.26	1.18
B-02	74.3	69.2	63.2	1.02	1.2	1.11
B-08	75.2	69.4	63.3	1.16	1.22	1.19
B-16	74.4	68.7	62.9	1.14	1.16	1.15
B-20	74.9	68.6	62.3	1.26	1.26	1.26
C-14	72.6	67.4	61.7	1.04	1.14	1.09
C-19	73.6	67.9	61.4	1.14	1.3	1.22
D-01	75.4	68.4	61.9	1.4	1.3	1.35
D-06	73.8	67.8	62	1.2	1.16	1.18
D-07	74	66.8	60.3	1.44	1.3	1.37
D-10	73.8	66.8	60.5	1.4	1.26	1.33
D-18	74	67.8	61.6	1.24	1.24	1.24
E-01	74.7	69.4	63.3	1.06	1.22	1.14
E-14	72.3	66.6	60.4	1.14	1.24	1.19
E-16	71.9	65.9	59.1	1.2	1.36	1.28
F-03	73.3	67	59.9	1.26	1.42	1.34
F-06	73.1	66.5	58.5	1.32	1.6	1.46
F-08	75.7	68.5	62.8	1.44	1.14	1.29
F-10	74.8	68.8	63.1	1.2	1.14	1.17
F-12	75.9	70.2	63.6	1.14	1.32	1.23
F-18	72.7	66.2	59.7	1.3	1.3	1.3

G-01	74.9	68	61.9	1.38	1.22	1.3
G-03	73.2	66.9	61	1.26	1.18	1.22
G-04	73.9	67.9	61.8	1.2	1.22	1.21
H-04	73.2	66.8	60.5	1.28	1.26	1.27
H-06	74.8	68.3	61.8	1.3	1.3	1.3
I-10	73.7	67.1	60.7	1.32	1.28	1.3
I-16	76.7	70.1	63.9	1.32	1.24	1.28
J-02	76	69.5	63.3	1.3	1.24	1.27
J-03	74.5	68.4	62.6	1.22	1.16	1.19
K-03	72.6	67	61.8	1.12	1.04	1.08
K-04	74.6	68	62.3	1.32	1.14	1.23
K-15	70.8	65.4	59.6	1.08	1.16	1.12
L-05	73.4	66.5	60.1	1.38	1.28	1.33
L-14	74.1	68.8	63.4	1.06	1.08	1.07
L-16	74	68.1	63	1.18	1.02	1.1
M-01	72.4	66	59.9	1.28	1.22	1.25
M-07	72.8	67	61.7	1.16	1.06	1.11
M-16	71.5	66.4	60.5	1.02	1.18	1.1
M-20	70	64.8	59.1	1.04	1.14	1.09
N-01	71.6	66.6	60.9	1	1.14	1.07
N-03	71.2	66.2	60	1	1.24	1.12
N-06	73	67.5	61.1	1.1	1.28	1.19
N-37	71.3	66.1	59.6	1.04	1.3	1.17
N-45	71.1	65.6	59.2	1.1	1.28	1.19
N-53	71.8	65.9	59.3	1.18	1.32	1.25
N-56	70.2	64.8	58.4	1.08	1.28	1.18
N-61	69.7	63.8	57	1.18	1.36	1.27

Rate Comparison Data

Specimen	**Rate(ave)N**	**Rate(ave)O**
A-04	1.08	0.76
K-03	1.08	0.65
C-14	1.09	0.53
M-20	1.09	0.65
L-16	1.1	0.56
M-16	1.1	0.58
B-02	1.11	0.57
M-07	1.11	0.65
K-15	1.12	0.54
E-01	1.14	0.48
N-37	1.17	0.515
A-18	1.18	0.69
D-06	1.18	0.55
B-08	1.19	0.52
E-14	1.19	0.57
N-45	1.19	0.56
A-09	1.2	0.76
G-04	1.21	0.63

C-19	1.22	0.82
F-12	1.23	0.63
D-18	1.24	0.515
M-01	1.25	0.57
N-53	1.25	0.78
H-04	1.27	0.67
N-61	1.27	0.92
E-16	1.28	0.66
I-16	1.28	0.56
F-08	1.29	0.56
G-01	1.3	0.7
H-06	1.3	0.49
I-10	1.3	0.61
D-10	1.33	0.66
D-07	1.37	0.63