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### SP200501 - RO4350B Starting Point Compensation Factors

This study was conducted to evaluate dimensional movement of Rogers RO4350B Product through the circuit fabrication process. The study was conducted using Six Sigma tools and the DMAIC process as a guideline for the evaluation (Define, Measure, Analyze, Improve, and Control). The Six Sigma project was initiated as a joint exercise between Rogers Corporation and printed circuit board manufacturer Cirtech Inc.

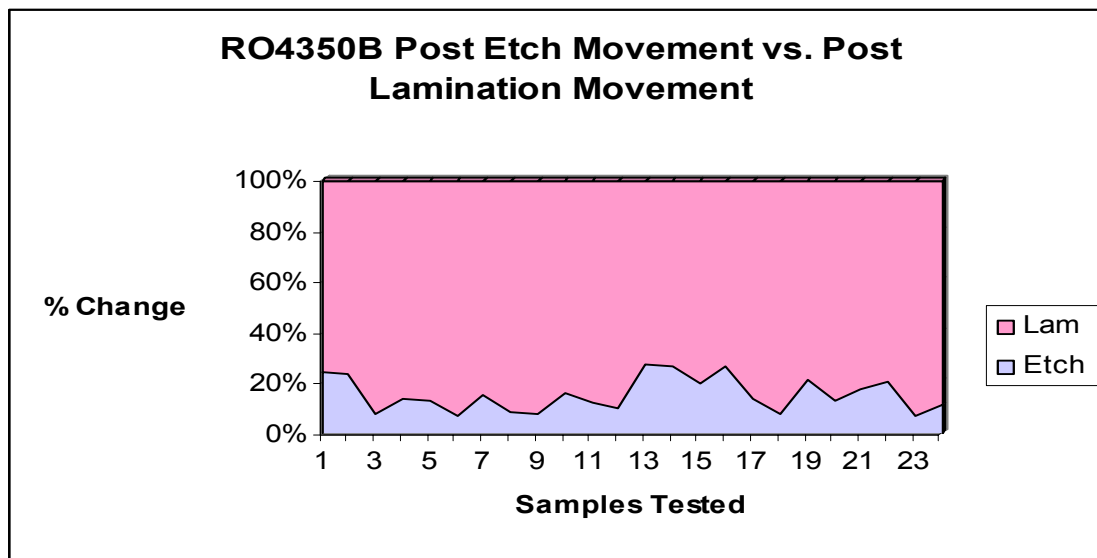
**Notes:**

The following information was generated using a uniformly distributed dot matrix image encompassing the critical parameters illustrated in the matrix below. Rogers RO4450B standard lamination cycle was used as outlined in Rogers’ “RO4400 Series Prepreg Data Sheet and Processing Guidelines”. The machine and cross machine directions (MD, CMD) are based on an 18” X 24” panel size. MD is the 18” dimension and CMD is the 24” dimension.

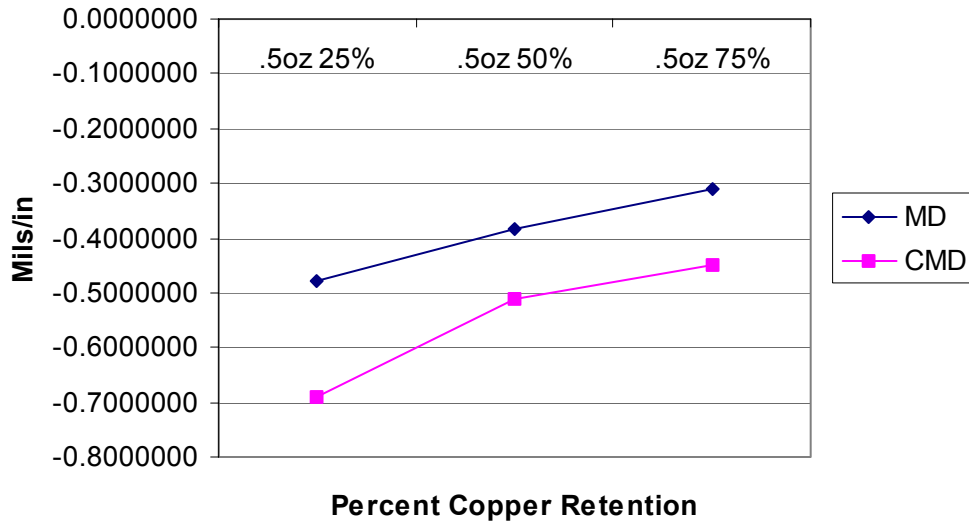
**Critical Parameters**

Product Grade	Dielectric Thickness	Copper Weight	% Cu. Etch	% Cu. Etch	% Cu. Etch	Post Etch Process	Post Lam Process
RO4350B	0.004"	1oz	25%	50%	75%	X	X
	0.0066"	1oz	25%	50%	75%	X	X
	0.010"	1oz	25%	50%	75%	X	X
	0.020"	1oz	25%	50%	75%	X	X
RO4350B	0.004"	.5oz	25%	50%	75%	X	X
	0.0066"	.5oz	25%	50%	75%	X	X
	0.010"	.5oz	25%	50%	75%	X	X
	0.020"	.5oz	25%	50%	75%	X	X

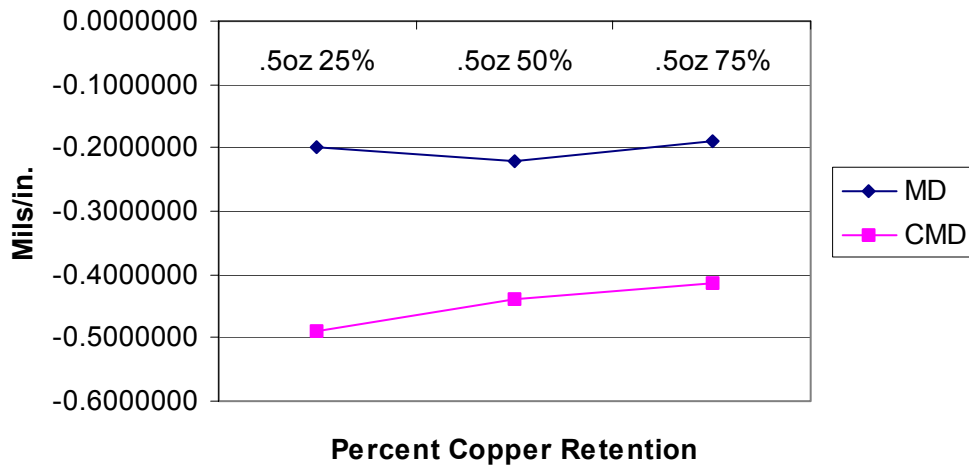
Materials were measured for dimensional change in both the post etch and post lamination conditions. Results of this analysis indicate that generally 80% of the movement generated from these two processes is experienced during the lamination cycle.



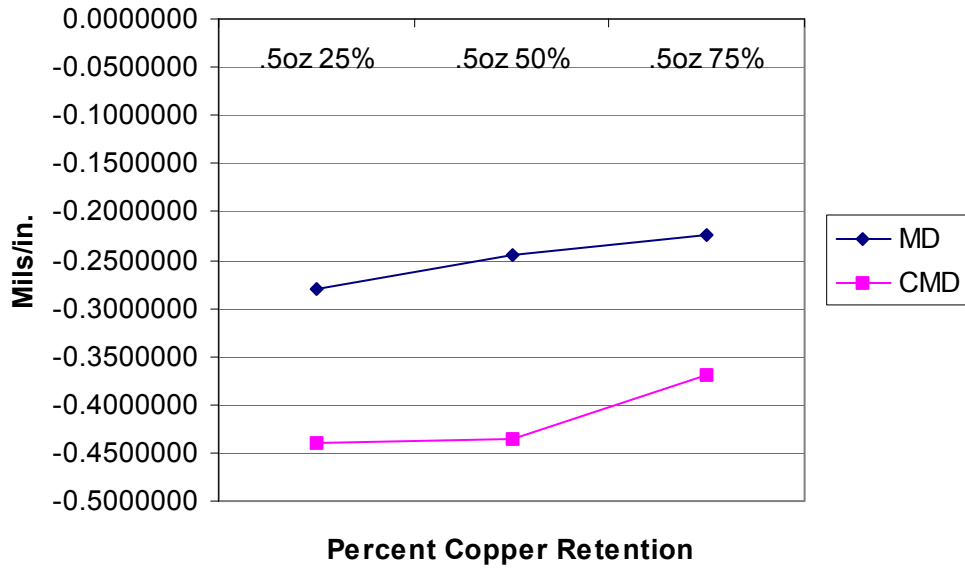
### RO4350B 0.004" .5oz Post Lamination Movement



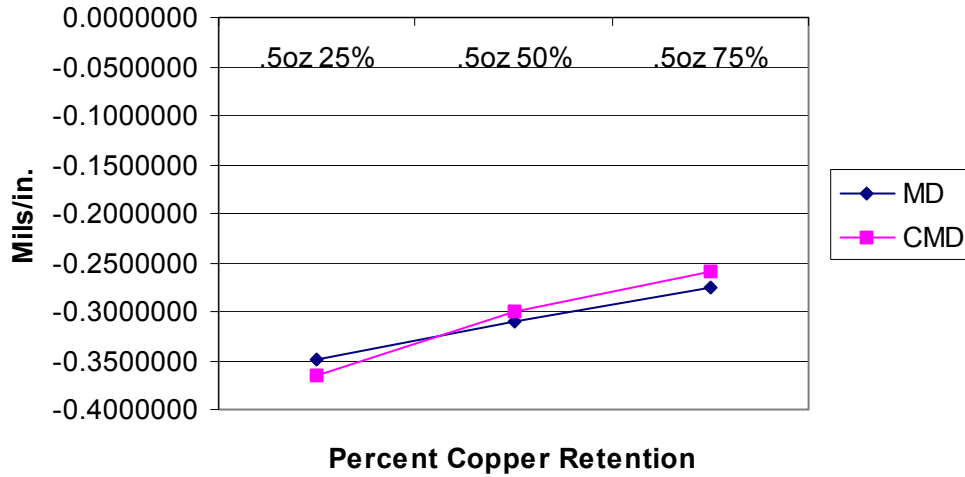
### RO4350B 0.0066" .5oz Post Lamination Movement



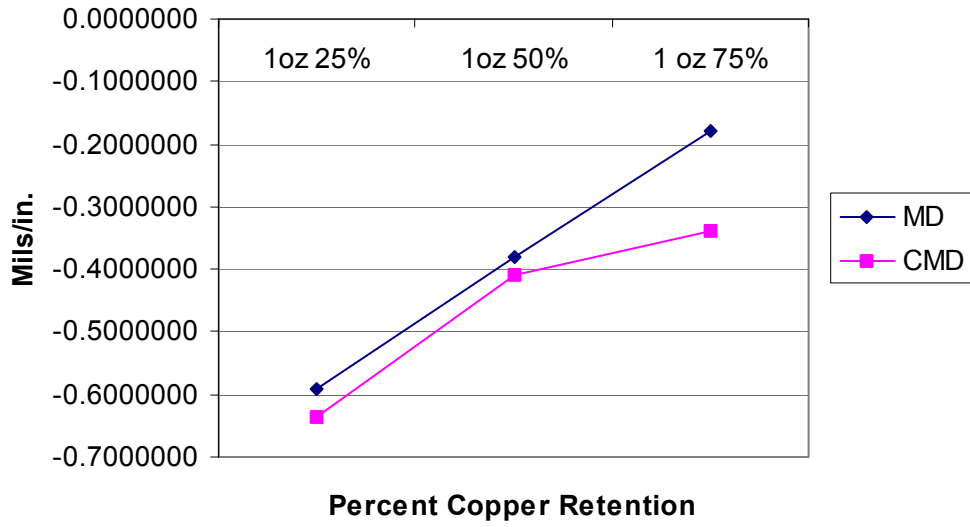
### RO4350B 0.010" .5oz Post Lamination Movement



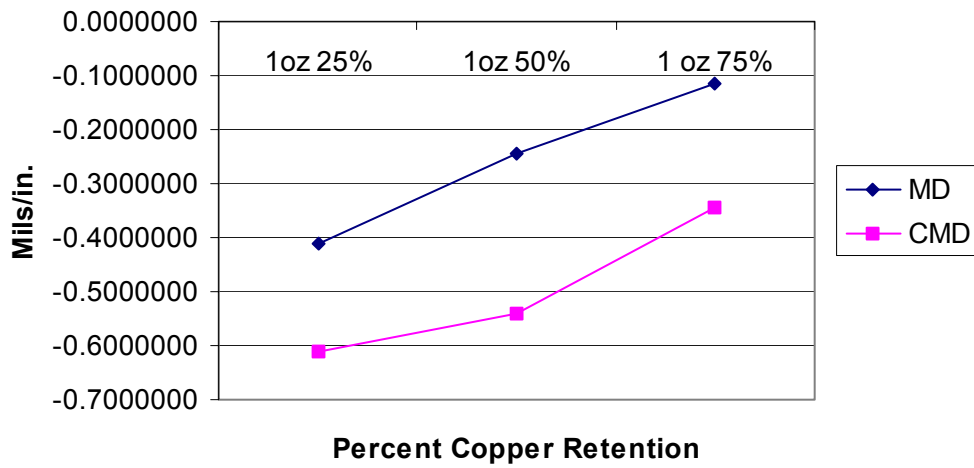
### RO4350B 0.020" .5oz Post Lamination Movement



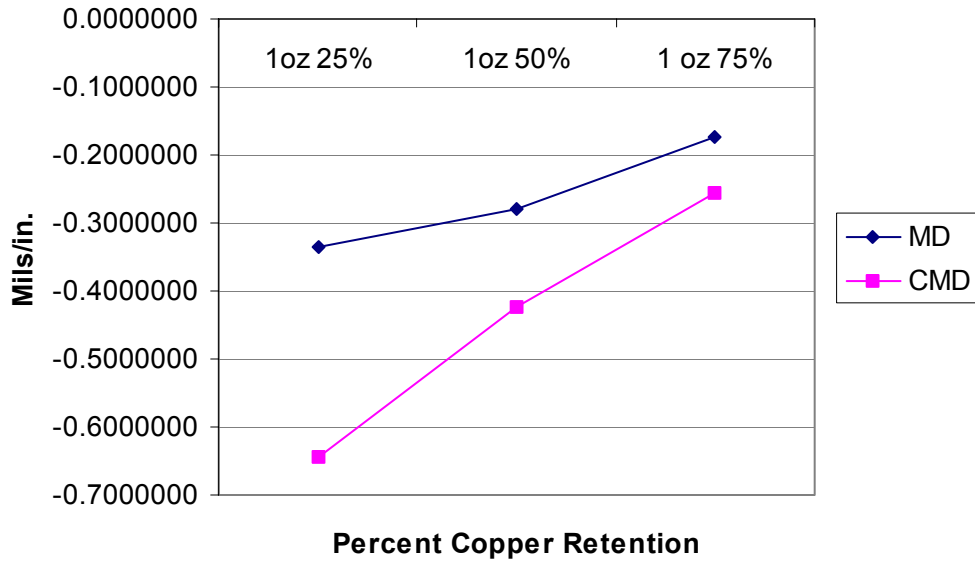
### RO4350B 0.004" 1oz Post Lamination Movement



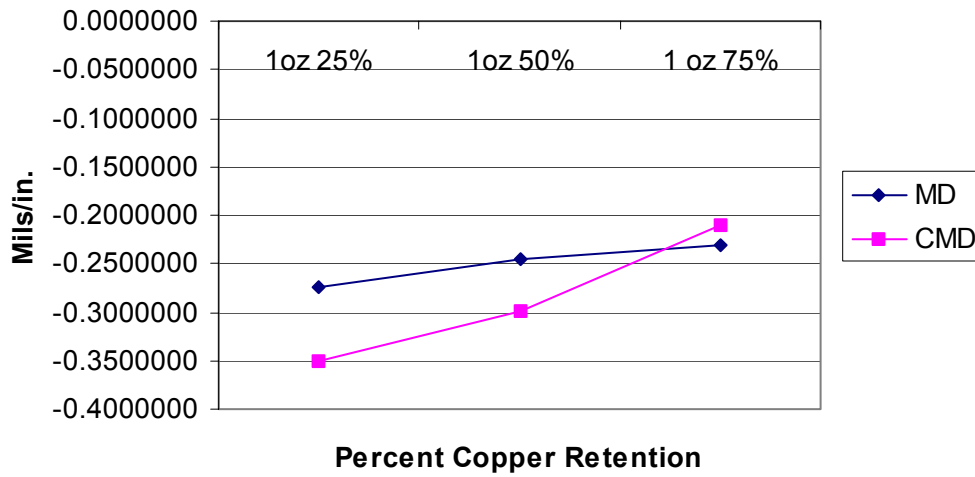
### RO4350B 0.0066" 1oz Post Lamination Movement



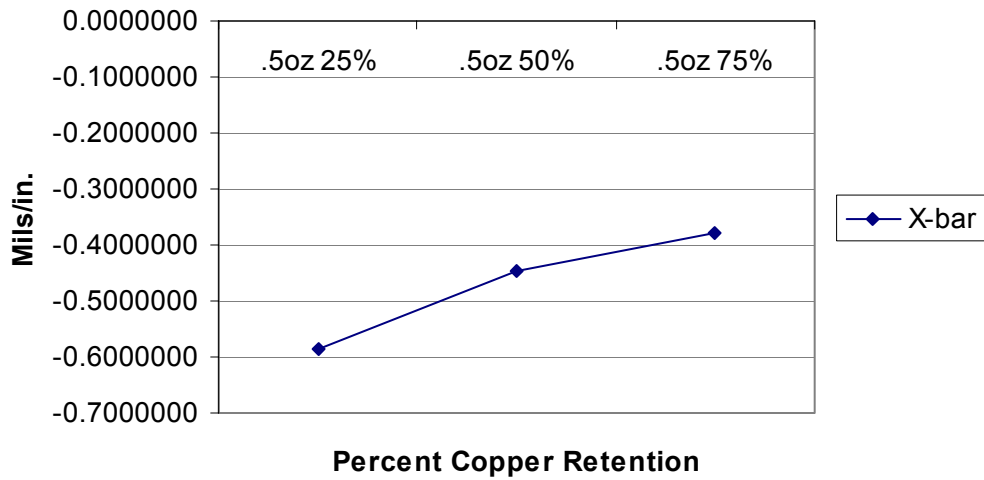
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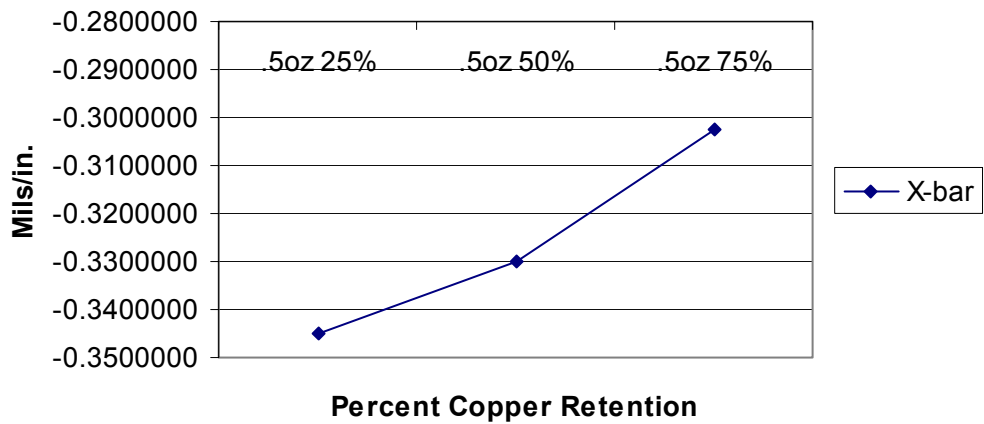
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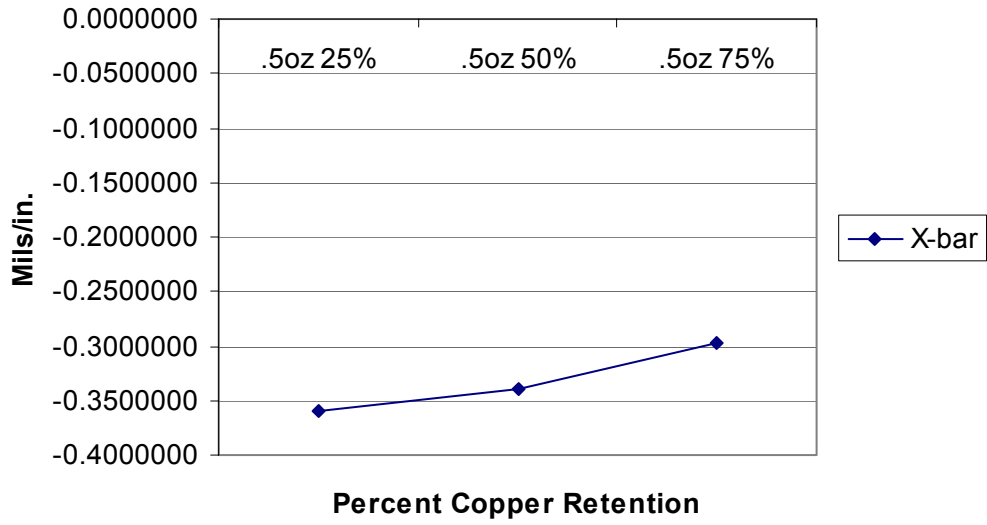
**RO4350B 0.004" .5oz Post Lamination Movement  
MD-CMD X-bar**



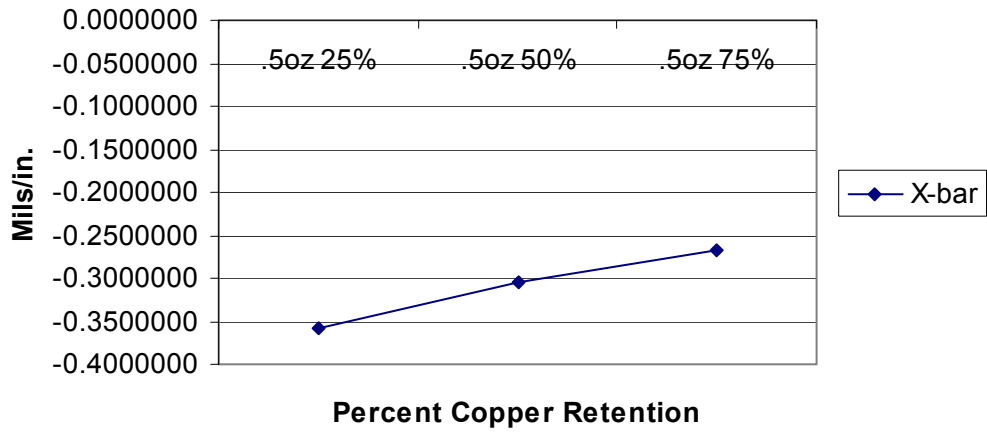
**RO4350B 0.0066" .5oz Post Lamination Movement  
MD-CMD X-bar**



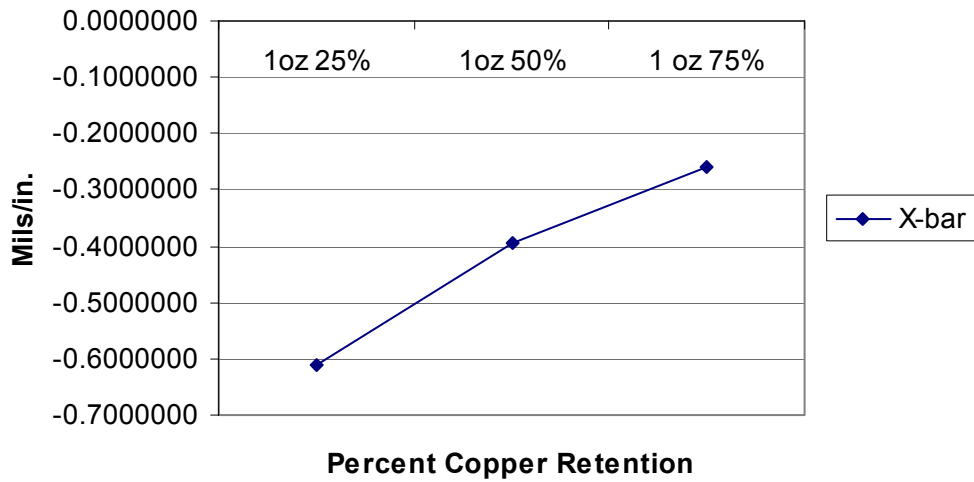
**RO4350B 0.010" .5oz Post Lamination Movement  
MD-CMD X-bar**



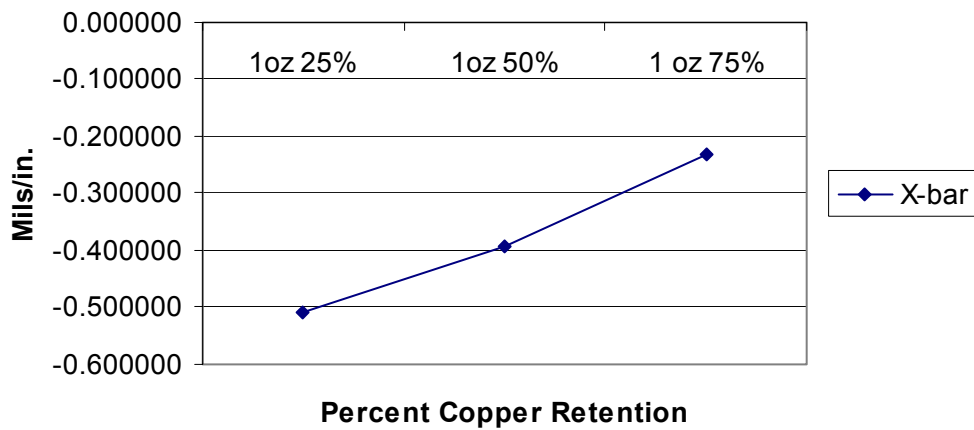
**RO4350B 0.020" .5oz Post Lamination Movement  
MD-CMD X-bar**



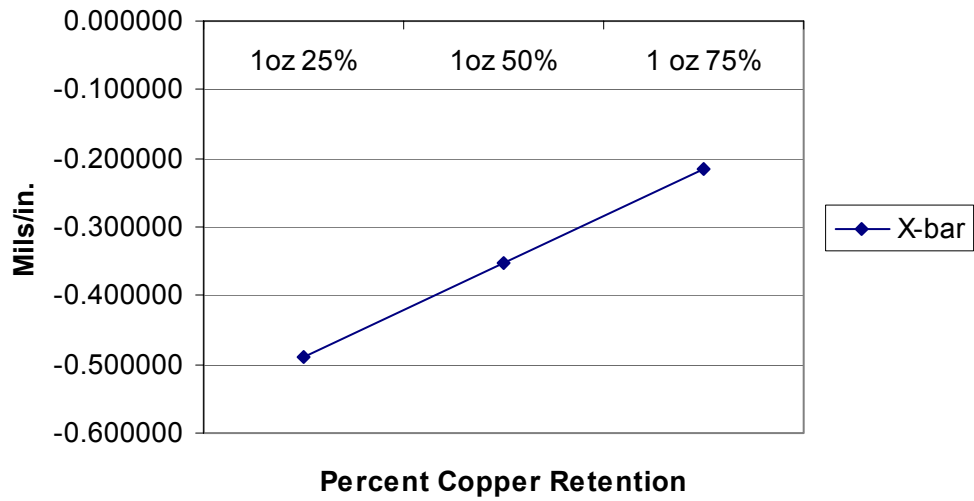
**RO4350B 0.004" 1oz Post Lamination Movement  
MD-CMD X-bar**



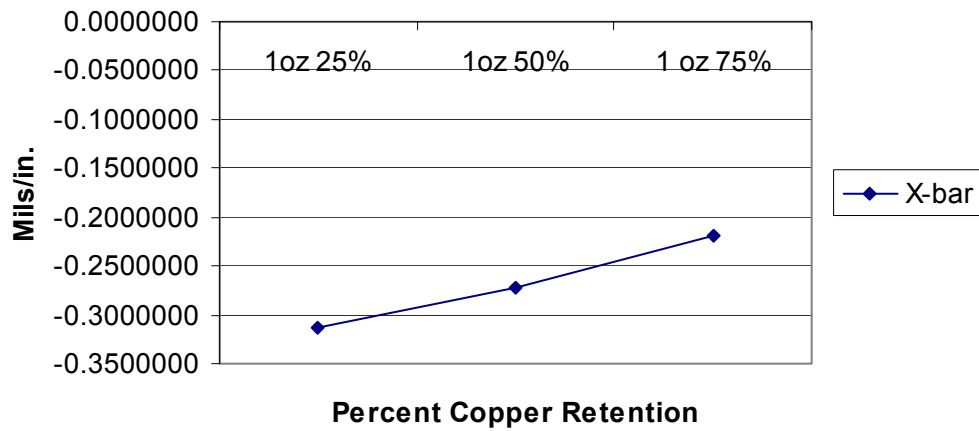
**RO4350B 0.0066" 1oz Post Lamination Movement  
MD-CMD X-bar**



**RO4350B 0.010" 1oz Post Lamination Movement  
MD-CMD X-bar**



**RO4350B 0.020" 1oz Post Lamination Movement  
MD-CMD X-bar**



Dielectric Thickness  
%Copper Retention

0.004" Thx	Post MD	Etch CMD	Mils/in. X-bar	Post MD	Lamination CMD	Mils/in. X-bar
.5oz 25%	-0.2250000	-0.1400000	-0.1825000	-0.4800000	-0.6900000	-0.5850000
.5oz 50%	-0.1800000	-0.0900000	-0.1350000	-0.3850000	-0.5100000	-0.4475000
.5oz 75%	-0.0550000	-0.0075000	-0.0312500	-0.3100000	-0.4500000	-0.3800000
<b>0.0066" Thx.</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>
.5oz 25%	-0.0075000	-0.1000000	-0.0537500	-0.2000000	-0.4900000	-0.3450000
.5oz 50%	-0.0125000	-0.0800000	-0.0462500	-0.2200000	-0.4400000	-0.3300000
.5oz 75%	-0.0425000	-0.0025000	-0.0225000	-0.1900000	-0.4150000	-0.3025000
<b>0.010" Thx.</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>
.5oz 25%	-0.0230000	-0.1050000	-0.0640000	-0.2800000	-0.4400000	-0.3600000
.5oz 50%	-0.0280000	-0.0310000	-0.0295000	-0.2450000	-0.4350000	-0.3400000
.5oz 75%	-0.0100000	-0.0350000	-0.0225000	-0.2250000	-0.3700000	-0.2975000
<b>0.020" Thx.</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>
.5oz 25%	-0.0450000	-0.0875000	-0.0662500	-0.3500000	-0.3650000	-0.3575000
.5oz 50%	-0.0425000	-0.0375000	-0.0400000	-0.3100000	-0.3000000	-0.3050000
.5oz 75%	-0.0225000	-0.0325000	-0.0275000	-0.2750000	-0.2600000	-0.2675000
	<b>Post</b>	<b>Etch</b>	<b>Mils/in.</b>	<b>Post</b>	<b>Lamination</b>	<b>Mils/in.</b>
<b>0.004" Thx</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>
1oz 25%	-0.2100000	-0.2475000	-0.2287500	-0.5900000	-0.6350000	-0.6125000
1oz 50%	-0.1400000	-0.1425000	-0.1412500	-0.3800000	-0.4100000	-0.3950000
1 oz 75%	-0.0625000	-0.0650000	-0.0637500	-0.1800000	-0.3400000	-0.2600000
<b>0.0066" Thx.</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>
1oz 25%	-0.1175000	-0.2400000	-0.1787500	-0.4100000	-0.6100000	-0.5100000
1oz 50%	0.0000000	-0.1175000	-0.0587500	-0.2450000	-0.5400000	-0.3925000
1 oz 75%	0.0700000	-0.0350000	0.0175000	-0.1150000	-0.3450000	-0.2300000
<b>0.010" Thx.</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>
1oz 25%	-0.1075000	-0.1500000	-0.1287500	-0.3350000	-0.6450000	-0.4900000
1oz 50%	-0.0150000	-0.0850000	-0.0500000	-0.2800000	-0.4250000	-0.3525000
1 oz 75%	-0.0550000	-0.0350000	-0.0450000	-0.1750000	-0.2550000	-0.2150000
<b>0.020" Thx.</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>	<b>MD</b>	<b>CMD</b>	<b>X-bar</b>
1oz 25%	-0.1175000	-0.0400000	-0.0787500	-0.2750000	-0.3500000	-0.3125000
1oz 50%	-0.0250000	-0.0150000	-0.0200000	-0.2450000	-0.3000000	-0.2725000
1 oz 75%	-0.0240000	-0.0300000	-0.0270000	-0.2300000	-0.2100000	-0.2200000

For questions or comments please do not hesitate to contact your Rogers Corporation representative.

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