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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:

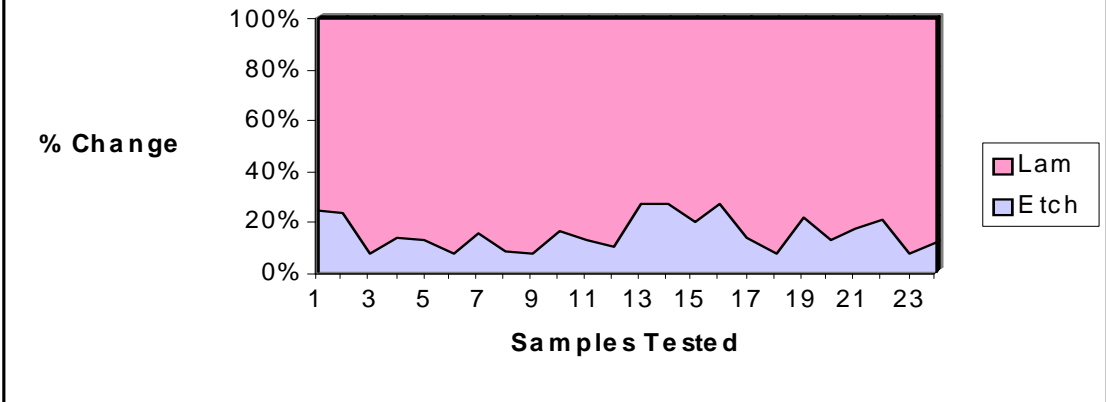
The following information was generated using a uniformly distributed dot matrix image encompassing the critical parameters illustrated in the matrix below. Rogers RO4450B standard lamination cycle was used as outlined in Rogers’ “RO4400 Series Prepreg Data Sheet and Processing Guidelines”. The machine 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

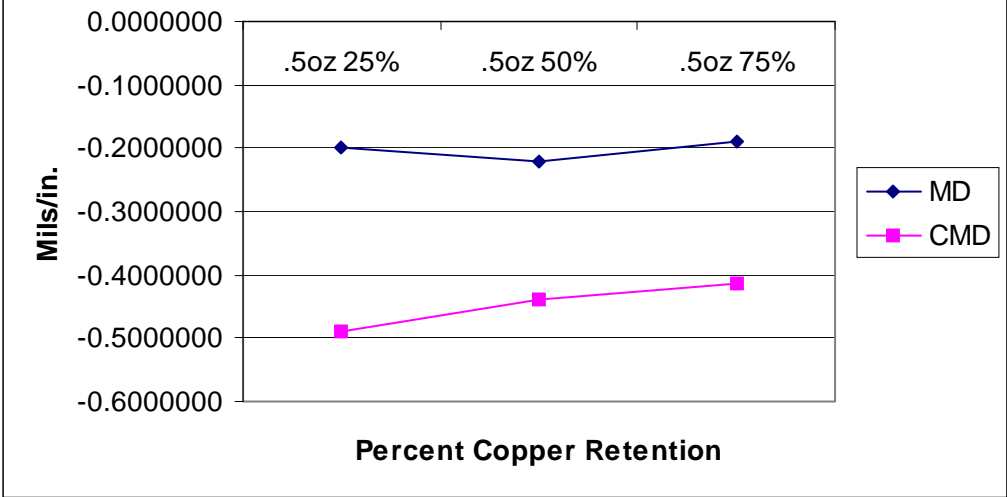
Product Grade	Dielectric Thickness	Copper Weight	% Cu. Etch	% Cu. Etch	% Cu. Etch	Post Process	Post Process
RO4350	0.0066	1 oz.	25%	50%	75%	X	X
	0.010	1 oz.	25%	50%	75%	X	X
	0.020	1 oz.	25%	50%	75%	X	X
RO4350	0.0066	0.5oz	25%	50%	75%	X	X
	0.010	0.5oz	25%	50%	75%	X	X
	0.020	0.5oz	25%	50%	75%	X	X

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.

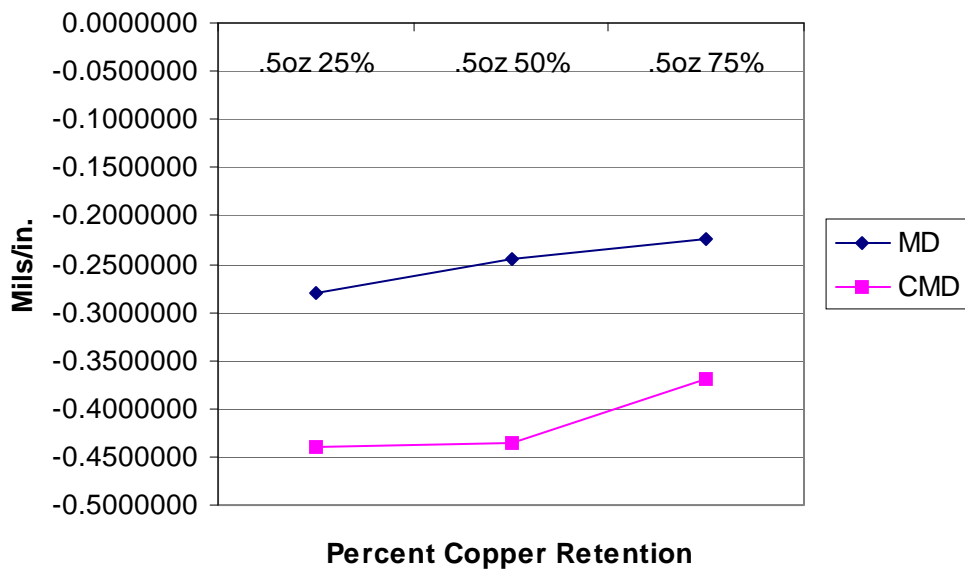
RO4350B Post Etch Movement vs. Post Lamination Movement



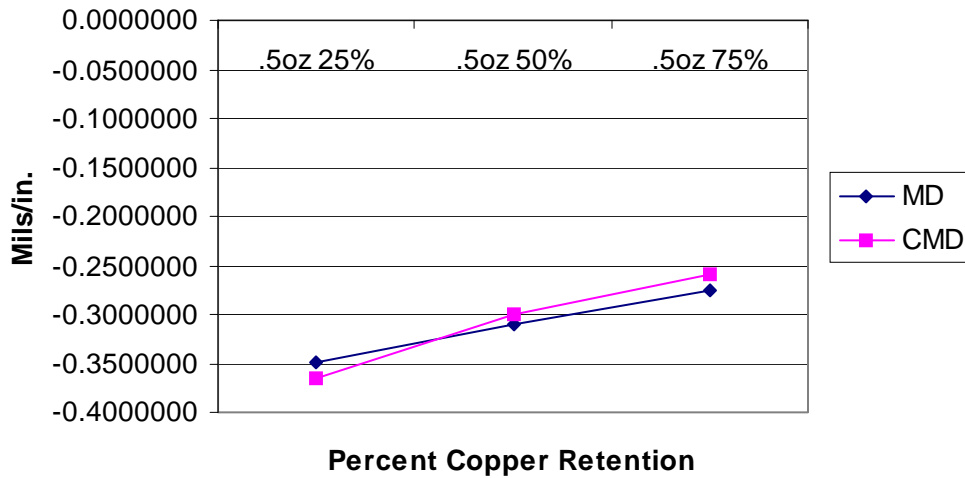
RO4350B 0.006" .5oz Post Lamination Movement



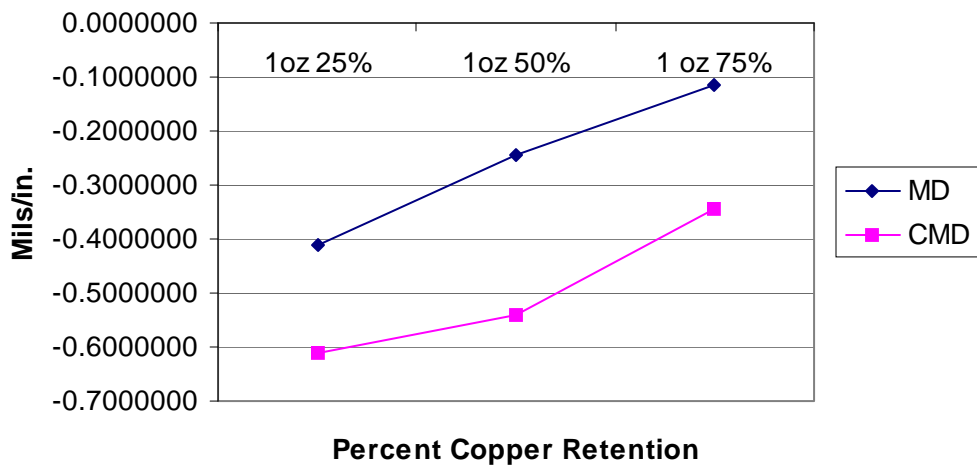
RO4350B 0.010" .5oz Post Lamination Movement



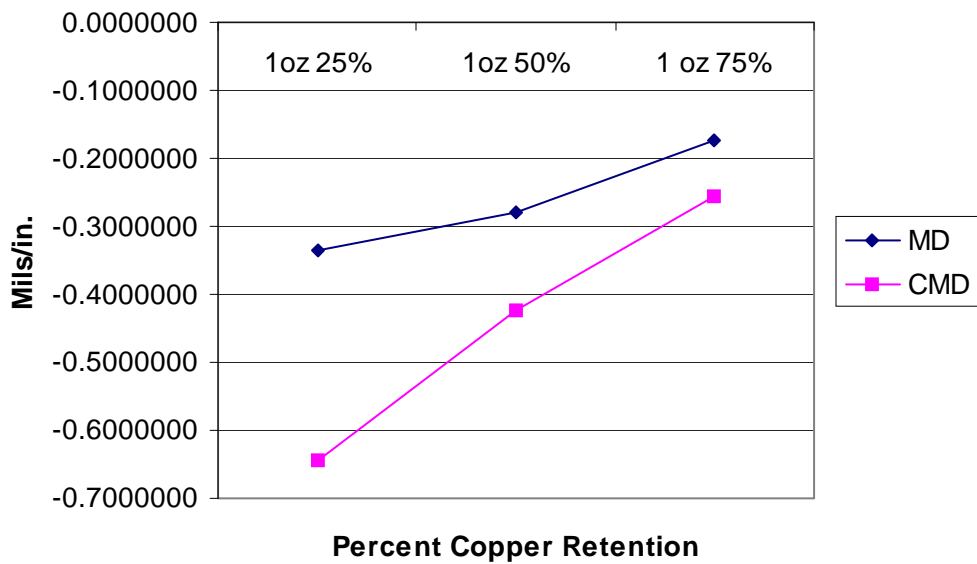
RO4350B 0.020" .5oz Post Lamination Movement



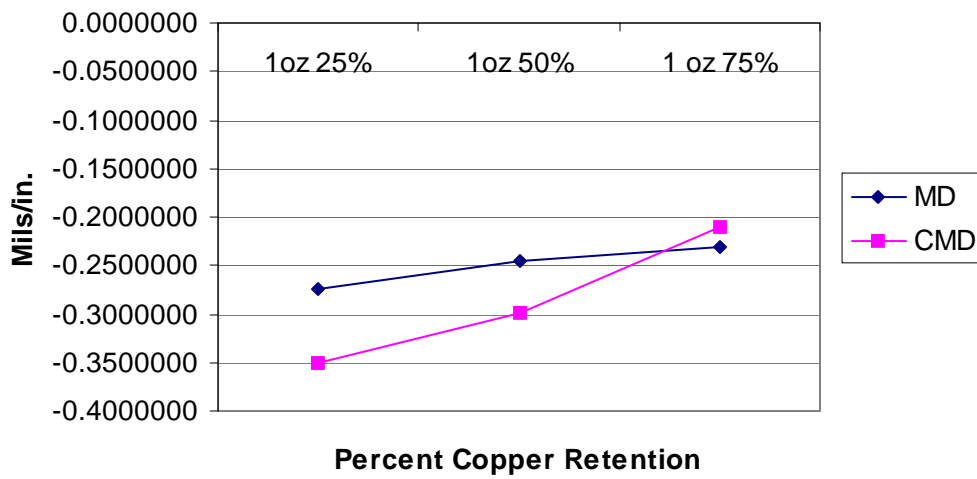
RO4350B 0.006" 1oz Post Lamination Movement



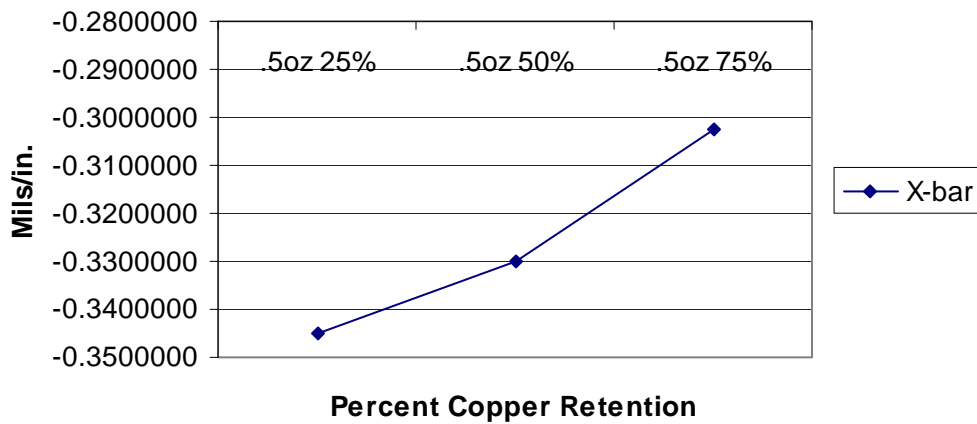
RO4350B 0.010" 1oz Post Lamination Movement



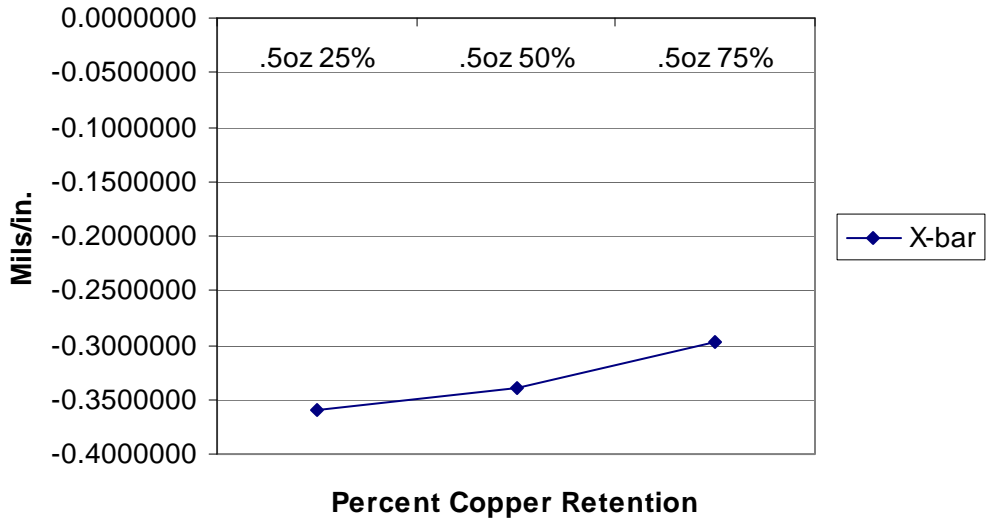
RO4350B 0.020" 1oz Post Lamination Movement



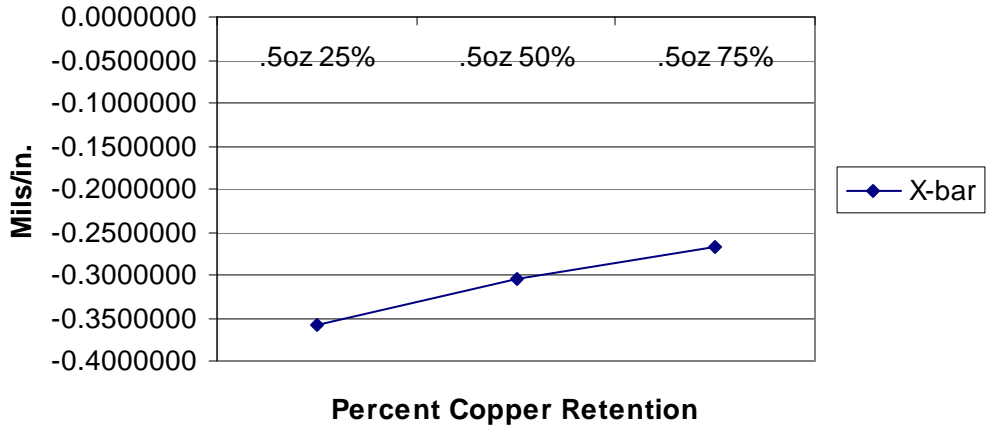
RO4350B 0.0066" .5oz Post Lamination Movement MD-CMD X-bar



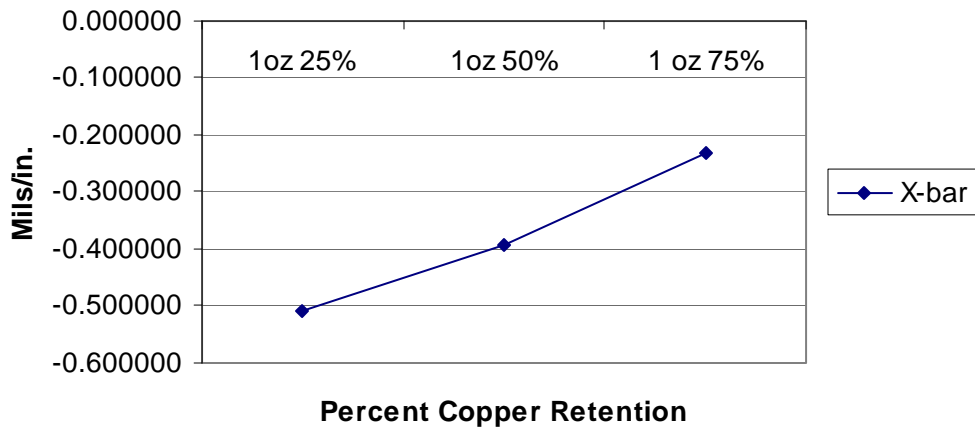
**RO4350B 0.010" .5oz Post Lamination Movement
MD-CMD X-bar**



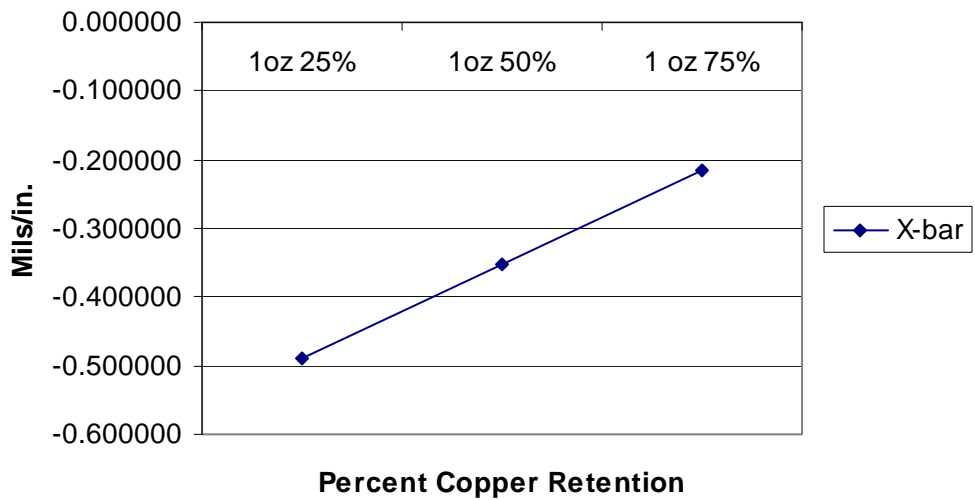
**RO4350B 0.020" .5oz Post Lamination Movement
MD-CMD X-bar**



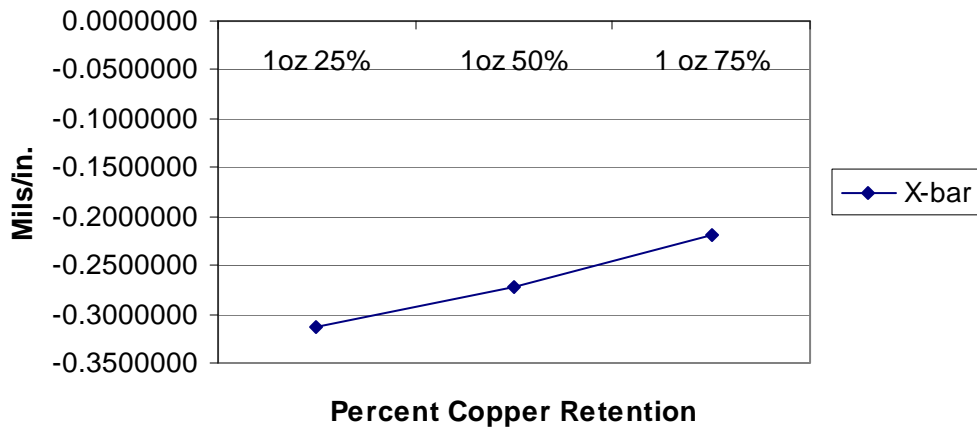
**RO4350B 0.0066" 1oz Post Lamination Movement
MD-CMD X-bar**



**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

0.0066" Thx.	Post MD	Etch CMD	Mils/in. X-bar	Post MD	Lamination CMD	Mils/in. X-bar
0.5oz 25%	-0.0075000	-0.1000000	-0.0537500	-0.2000000	-0.4900000	-0.3450000
0.5oz 50%	-0.0125000	-0.0800000	-0.0462500	-0.2200000	-0.4400000	-0.3300000
0.5oz 75%	-0.0425000	-0.0025000	-0.0225000	-0.1900000	-0.4150000	-0.3025000
0.010" Thx	MD	CMD	X-bar	MD	CMD	X-bar
0.5oz 25%	-0.0230000	-0.1050000	-0.0640000	-0.2800000	-0.4400000	-0.3600000
0.5oz 50%	-0.0280000	-0.0310000	-0.0295000	-0.2450000	-0.4350000	-0.3400000
0.5oz 75%	-0.0100000	-0.0350000	-0.0225000	-0.2250000	-0.3700000	-0.2975000
0.020" Thx	MD	CMD	X-bar	MD	CMD	X-bar
0.5oz 25%	-0.0450000	-0.0875000	-0.0662500	-0.3500000	-0.3650000	-0.3575000
0.5oz 50%	-0.0425000	-0.0375000	-0.0400000	-0.3100000	-0.3000000	-0.3050000
0.5oz 75%	-0.0225000	-0.0325000	-0.0275000	-0.2750000	-0.2600000	-0.2675000
	Post MD	Etch CMD	Mils/in. X-bar	Post MD	Lamination CMD	Mils/in. X-bar
0.0066" Thx	MD	CMD	X-bar	MD	CMD	X-bar
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
1oz 75%	0.0700000	-0.0350000	0.0175000	-0.1150000	-0.3450000	-0.2300000
0.010" Thx	MD	CMD	X-bar	MD	CMD	X-bar
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
1oz 75%	-0.0550000	-0.0350000	-0.0450000	-0.1750000	-0.2550000	-0.2150000
0.020" Thx	MD	CMD	X-bar	MD	CMD	X-bar
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
1oz 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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