CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2006

DateRun: 06/30/2006

Experimenters: Jason Marshall

ClientType: Consultant

ProjectNumber: Project #1

Substrates: Wood

PartType: Coupon

Contaminants: Coatings

Cleaning Methods:

Analytical Methods: Performance Test, Visual

Purpose: To evaluate impact resistance for various floor finishes

Experimental Procedure: The moisture content at the time of testing will influence results due to the hydroscopic nature of the base materials. Therefore, efforts must be taken to ensure that the moisture content and temperature remain constant during the evaluation period. Ideally, the sample floor should be kept at 65+/-1% relative humidity and 68+/-6 F. During laboratory testing, conditions were 64% relative humidity and the temperature was ~74 F.

Sample Preparation
The flooring material supplied was Hardwood flooring made from Red Oak. The boards were ¾" thick, 2 ¼" wide and cut into 8" sections.

Three coupons were coated with a supplied floor finish according to the manufacturers' specifications. The finish was applied using a 1" Pure Bristle 1500 paint brush. To ensure proper coating application rates, the coatings were applied via pipettes to surface. Three coats were used for each floor finish as this was common number of coating layers suggested by the various manufacturers.

The first two coatings were allowed to dry for 2 hours prior to the application of the next coat. The second coat for the current process was allowed to dry overnight before the application of final coat. The Completed coupons were allowed to sit for a minimum period of 24 hours before performance evaluations were conducted.

Falling-Ball Indentation
This test is designed to obtain a measure of the resistance of a flooring finish to impacts from dropped objects. Four drops were made for each coupon for a total of twelve drops per finish. Each drop was made at a 6" intervals starting at 6" and ending at 72". The ball used for the drops was a 440-C stainless steel 2" diameter ball, grade 100. The dropping apparatus used is shown in Figure 2. Carbon paper was placed on the coupon surface to assist in determining where the indentation was made.
Figure 2. Dropping Apparatus
The same Brown & Sharpe Micrometer was used to measure the indentations to the coated coupons. A plot was made of the height of drop and residual indentation and the slope of the best fit line was calculated. From the plots, the intercept of the height of drop at 72" was recorded as the index of indentation resistance. Results for each finish were compared each other.

Results: Impact depth was calculated by subtracting the average initial coating thickness from the thickness measured at the point of impact for each drop height. The initial average coating thickness was calculated from the three initial coating measurements made for each coupon.

*Due to the construction of the floor boards and the location of the impact from the ball, additional baseline readings had to be recorded for certain areas on the coupons. These values are designated by the coupon number and "A" (alternate).

	Coated Thickness			Drop Height											
Coupon	Middle	End 1	End 2	6	12	18	24	30	36	42	48	54	60	66	72
1	0.7512	0.7498	0.7549	0.7437			0.7320								
1A	0.6755	0.6770	0.6693		0.6717	0.6554									
2	0.7535	0.7566	0.7560					0.7397	0.7288						
2A	0.6751	0.6699	0.6811							0.6518	0.6486				
3	0.7588	0.7609	0.7585										0.7227		
3A	0.6767	0.6722	0.6776									0.6549		0.6470	0.63
4	0.7648	0.7702	0.7655			0.7521	0.7491								
4A	0.6727	0.6742	0.6751	0.6720	0.6667										
5	0.7560	0.7582	0.7601					0.7518	0.7266		0.7176				
5A	0.6707	0.6682	0.6744							0.6543					

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6	0.7548	0.7591	0.7598									0.7359	0.7291	0.7208	0.71
6A	0.6702	0.6714	0.6685												
7	0.7575	0.7555	0.7611		0.7508		0.7264								
7A	0.6580	0.6719	0.6549	0.6541		0.6501									
8	0.7427	0.7477	0.7460					0.7350		0.7255					
8A	0.6627	0.6676	0.6661						0.6449		0.6407				
9	0.7548	0.7574	0.7547											0.7252	
9A	0.6748	0.6772	0.6682									0.6461	0.6449	0.6378	0.63
10	0.7456	0.7467	0.7503	0.7435	0.7391	0.7287	0.7203								
10A	0.6778	0.6830	0.6750												
11	0.7582	0.7613	0.7652						0.7317		0.7311				
11A	0.6709	0.6683	0.6807					0.6653		0.6477					
12	0.7657	0.7644	0.7653										0.7431		
12A	0.6860	0.6844	0.6856									0.6539		0.6483	0.63
13	0.7501	0.7471	0.7470	0.7487	0.7455	0.7373	0.7312								
13A	0.6667	0.6700	0.6685												
14	0.7582	0.7575	0.7539					0.7385	0.7316		0.7287				
14A	0.6870	0.6822	0.6837							0.6737					
15	0.7471	0.7448	0.7484											0.7231	0.71
15A	0.6744	0.6721	0.6682									0.6458	0.6429		

Calculated Impact Depths

		Drop Height											
Coating	Coupon	6	12	18	24	30	36	42	48	54	60	66	72
	1	0.0112	0.0053	0.0201	0.0178								
CP	2					0.0163	0.0272	0.0233	0.0265				
	3									0.0227	0.0361	0.0297	0.0420
	4	0.0031	0.0075	0.0127	0.0164								
MCP	5					0.0083	0.0316	0.0164	0.0384				
	6									0.0239	0.0307	0.0340	0.0413
	7	0.0008	0.0103	0.0079	0.0291								
BO	8					0.0110	0.0212	0.0172	0.0269				
	9									0.0221	0.0233	0.0370	0.0421
	10	0.0068	0.0112	0.0169	0.0264								
BW	11					0.0154	0.0335	0.0232	0.0302				
	12									0.0317	0.0222	0.0377	0.0461
	13	-0.0017	0.0015	0.0128	0.0159								
Blank	14					0.0154	0.0223	0.0133	0.0288				
	15									0.0224	0.0253	0.0240	0.0313

Graphs for each product are shown in Figure 2
From the graphs, slopes were calculated and the index was calculated for the interception point for 72".
The lower the index, the less the indentation and the better the coating's resistance.

Product Slope of Best Fit Line Index of Indentation Resistance

Uncoated		0.196			
Product	Slope of Best Fit Line	Index of Indentation Resistance	Rank	x	y
CP	1714.8	0.0420	4	0.0419	72
MCP	1692.1	0.0426	3	0.0425	72
BO	1791	0.0402	5	0.0402	72
BW	1560.4	0.0461	2	0.0461	72
Blank	2138	0.0337	1	0.0336	72

Summary:

Conclusion: The Bona Water based coating mix had the lowest index of indention for the coated boards followed by the modified current practice.

The uncoated wood samples had a lower index of indention than any of the coated samples. The coating thicknesses were easier to displace by the steel ball then the hard wood surface was.