# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2005

DateRun: 06/02/2005

Experimenters: Jason Marshall

ClientType: Environmental Service Firm

ProjectNumber: Project #1

Substrates: Wood

PartType: Coupon

Contaminants: Coatings

Cleaning Methods:

Analytical Methods: Performance Test

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 slightly drier, 40% relative humidity, but the temperature was within the given temperature range ~70 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. Some pieces of the flooring had to be sanded prior to making initial thickness readings to remove residual packing tape adhesive. With the boards cut into 8" coupons, three readings were made using a Brown & Sharpe Micrometer to measure each coupons initial board thickness. Each reading was made to 0.001" and the three values were averaged to give a baseline thickness for the coupons. In addition to the thickness baseline, baselines were established for Gloss, Coefficient of Friction, Impact, Small Area Loads. Procedures for each baseline measurements followed the procedures to be outlined.

Following the establishment of the baselines, 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 consistent coating application, the finish was leveled off using a 10 mils Precision Gage & Tool Co Dow Film Caster. Three coats were used for each floor finish as this was common number of coating layers suggested by the various manufacturers. Each coating layer was allowed to dry for 2 hours prior to the application of the next coat. 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.

| | | Coated Thickness | | | Drop Height | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleaner | Coupon | Middle | End 1 | End 2 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
| 2 | 22 | 7.506 | 7.506 | 7.502 | 7.503 | | 7.447 | 7.421 | | | | | | | | |
| | 22 Alt | 6.474 | 6.493 | | | 6.411 | | | | | | | | | | |
| | 23 | 7.490 | 7.489 | 7.470 | | | | | | 7.411 | 7.368 | 7.229 | | | | |
| | 23 Alt | 6.453 | 6.458 | 6.462 | | | | | 6.410 | | | | | | | |
| | 24 | 7.470 | 7.468 | 7.522 | | | | | | | | | 7.251 | 7.233 | 7.242 | 7.328 |
| 3 | 25 | 7.505 | 7.543 | 7.518 | 7.467 | 7.451 | 7.427 | 7.345 | | | | | | | | |
| | 26 | 7.590 | 7.582 | 7.538 | | | | | 7.400 | 7.383 | 7.376 | 7.351 | | | | |
| | 27 | 7.570 | 7.561 | 7.575 | | | | | | | | | 7.348 | 7.283 | | 7.248 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 27 Alt | 7.050 | 7.019 | 7.036 | | | | | | | | | | | 6.950 | |
| 4 | 28 | 7.539 | 7.541 | 7.530 | 7.476 | 7.431 | | 7.426 | | | | | | | | |
| | 28 Alt | 6.740 | 6.710 | 6.751 | | | 6.682 | | | | | | | | | |
| | 29 | 7.479 | 7.490 | 7.474 | | | | | 7.299 | 7.260 | 7.234 | 7.108 | | | | |
| | 30 | 7.546 | 7.560 | 7.522 | | | | | | | | | 7.331 | 7.339 | | 7.366 |
| | 30 Alt | 6.987 | 6.988 | 6.950 | | | | | | | | | | | 6.769 | |
| 5 | 31 | 7.566 | 7.558 | 7.557 | 7.548 | 7.507 | | 7.491 | | | | | | | | |
| | 31 Alt | 6.900 | 6.888 | 6.879 | | | 6.800 | 6.781 | | | | | | | | |
| | 32 | 7.557 | 7.560 | 7.545 | | | | | 7.442 | 7.412 | | 7.327 | | | | |
| | 32 Alt | 7.130 | 7.053 | 7.050 | | | | | | | 6.910 | | | | | |
| | 33 | 7.547 | 7.550 | 7.532 | | | | | | | | | 7.392 | 7.268 | 7.397 | |
| | 33 Alt | 6.450 | 6.443 | 6.451 | | | | | | | | | | | | 6.268 |

Summary Table

| Product | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 | Slope of Best Fit Line | Index of Indentation Resistance | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Polyurethane Gloss | 0.002 | 0.073 | 0.058 | 0.084 | 0.048 | 0.072 | 0.115 | 0.254 | 0.236 | 0.254 | 0.245 | 0.155 | 263.41 | 0.273 | 2 |
| WB Polyurethane | 0.055 | 0.071 | 0.095 | 0.177 | 0.170 | 0.187 | 0.194 | 0.219 | 0.221 | 0.286 | 0.085 | 0.321 | 217.66 | 0.331 | 3 |
| WB Sanding Sealer | 0.061 | 0.106 | 0.052 | 0.111 | 0.182 | 0.221 | 0.247 | 0.373 | 0.212 | 0.204 | 0.206 | 0.177 | 205.34 | 0.351 | 4 |
| Aqua Deva Metro | 0.012 | 0.053 | 0.089 | 0.069 | 0.112 | 0.142 | 0.168 | 0.227 | 0.151 | 0.275 | 0.146 | 0.180 | 277.07 | 0.260 | 1 |

Graphs for each product are shown in Figure 2.

*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 Alt (alternate).

| Product | Slope of Best Fit Line | Index of Resistance Indentation | Rank |
|---|---|---|---|
| Polyurethane Gloss | 263.41 | 0.273 | 2 |
| WB Polyurethane | 217.66 | 0.331 | 3 |
| WB Sander Sealer | 205.34 | 0.351 | 4 |
| Aqua Deva Metro | 277.07 | 0.26 | 1 |

The lower the index the less the indentation the better the coating's resistance

Summary:

Conclusion: Aqua Deva Metro had the lowest Index of Retention, followed by Capitol Polyurethane Gloss.