CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2004
DateRun:	05/20/2004
Experimenters:	Jason Marshall
ClientType:	State Agency
ProjectNumber:	Project #3
Substrates:	Textile
PartType:	Coupon
Contaminants:	Dirt
Cleaning Methods:	Manual Wipe
Analytical Methods:	Light Meter, Photography
Purpose:	To evaluate carpet cleaning method using an industry suggested cleaning product

Experimental Procedure:

Trial I: Experimental Design and Procedure for Testing Carpet Cleaners Standard, Carpet and Soil Selection. The procedure followed is a modified version of the Institute of Inspection Cleaning and Restoration Certification (IICRC) Standard and Reference Guide S100. Information about this document for the establishment of minimum cleaning standards can be obtained at www.iicrc.org. Much of the testing was modeled after Appendix D, IICRC Carpet Cleaning Methods Testing Protocol. The carpet substrate was donated by Shaw Industries of Dalton, GA. This carpet type is specifically designated in the IICRC Appendix method. An AATCC (Research Triangle Park, NC) soil was obtained from Textile Innovators, a division of SDL Atlas of Charlotte, NC, as suggested by DuPont Antron® of Kennesaw, GA.

Carpet Preparation. Prior to soiling, a SPER Scientific Light Meter 840021 was used to measure Foot Candles from the surface of the carpet. Each carpet was marked-off into 6 sections measuring 3.5" (w) and 6" (l). (The carpeting was not cut into individual pieces as it would be too difficult to physically soil and clean smaller carpet sections.) Six readings were taken in each grid area to obtain baseline readings.

Modifications to the above mentioned standard included: (1) omitting the use of milling stones and (2) replacing the Zytel® Type 6,6 nylon pellets with Nalgene® tubing cut into 1/8" pieces, or 'pellets'. According to the standard, approximately 1000 grams of pellets should be used for every 12 grams of soil. Or, 83 grams of pellets used per gram of soil. S100 also suggests using 500 grams of pellets for each soil under investigation (in this case, one) for carpet measuring 10.375" x 39.375" (408.5 sq. in.). This equals 1.22 (500/408.5 = 1.22) grams of pellets per square inch of carpet. Since the Lab had 174 grams of tubing/ pellets at its disposal, two (2) grams of the AATCC soil were needed to artificially contaminate the carpet.

The carpet was cut into 7.375" x 19.6" (144.54 sq. in.) pieces. The carpet pieces were soiled by placing one piece of carpet into a 1-gallon can, making sure the carpet lined the inner wall of the can. The plastic-tubing pieces were poured into the bucket and the soil was distributed along the width of the can. The can was lidded and placed into a harness attached to a crank shaft. The crank was turned at an average rate of 42 rpm by hand for 5 minutes in one direction, followed by 5 minutes of rotation in the opposite direction.

Carpet Cleaning. At the end of the 10-minute soiling regime, the carpet was placed onto a carpet template and vacuumed with a Eureka SuperBroom (Brush-Up, Motor-Driven/Brush-Roll) vacuum for 3 strokes in the forward direction followed by 3 strokes in the backward direction. The carpet pieces were evaluated again for Foot Candles.

The carpet sections were then cut down the middle, length-wise to allow carpet samples to fit into the Gardner Straight Line Washability Unit. Each piece was marked-off into three sections. Each section was sprayed 15 times with the cleaning product and allowed to soak for 30 seconds. A Professional Painter's Rag was attached to the Unit's cleaning sled. The rag was also sprayed with the same cleaning product until the rag was saturated (approx. 15 sprays).
After soaking, the rag/sled was placed on one end of the carpet section and the Unit run for 91 cycles (approx. 2.5 minutes). Every 30 cycles, each section of carpet was sprayed 6 times with the cleaning solution. The carpet was removed from the Unit and allowed to dry overnight. Figure 1 contains a representation of the Gardner Straightline Washability Unit. A third and final series of light meter readings were recorded for each cleaned section. Photographs of all carpet samples were taken with a Sony Handycam® camera.

Results:

Light Meter. Initial light meter readings of unsoiled carpet samples were used as cleanliness baselines. The average 'soiled' readings were subtracted from the average initial readings to establish the degree of soiling for any particular carpet sample before cleaning. To determine the level of cleanliness achieved upon testing, the average soiled readings were subtracted from the average final (i.e., cleaned) readings taken after testing and divided by the average initial readings. Table 1 contains the results of the light meter readings for the industry product.

2.5 minutes							
	Cleaner	Average Readings			Calculations		
		Soiled	Cleaned	*Soiling		Percent	

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	Un-soiled				*Cleaning Differential (Dc)		Average Results
	(U)	(S)	(C)	Differential (Ds)	C-S	Change	
				U-S		Dcx100/ Ds	
Sample 1	9.79	2.53	3.43	7.27	0.91	12.48	
Sample 2	10.42	3.31	3.97	7.11	0.67	9.36	8.33
Sample 3	10.39	4.65	4.83	5.74	0.18	3.16	

Visual. The cleaned carpet pieces were visually ranked from the cleanest to the dirtiest by two Laboratory staff members, both individually and jointly, for comparison with similarly ranked light meter readings. Every effort was taken to ensure that a consistent methodology was utilized during this process. Product identification (ID) numbers were randomly assigned by SSL so that each carpet cleaner could also be ranked in comparison to other vendors' products, without revealing the identity of the cleaners to competitors. Table 2 lists these comparative rankings, in the industry standard is known as Product ID Number 11.

Product ID

Number	*Staff 1 Ranking	*Staff 2 Ranking	*Joint Ranking	*Light Meter Ranking
1	7	10	10	4
2	6	9	9	10
3	2	5	5	9
4	5	6	6	8
5	8	7	8	6
6	3	4	3	3
7	4	2	2	2
8	10	8	7	5
9	1	1	1	1
10	9	3	4	7
Performed at a later date				
11			~9	~9

Product 11 would have been the 10th out of 11 visually.

Photographs of carpet samples before and after cleaning with Carpet Extraction are shown in Figures 2.

Observations and Conclusions
The cleaning-cycle time of 2.5 minutes and a soak time of 30 seconds resulted in marginal soil removal. Consequently, an additional cleaning cycle was performed on the carpet samples.

Trial II: Experimental Design and Procedure for Extended Testing of Carpet Cleaners
Carpet samples from the previous trial were subjected to an additional 2.5 minutes of cleaning utilizing the same method. Each section was sprayed 15 times with a cleaning product and allowed to soak for 30 seconds. A Professional Painter's Rag was attached to the Gardner Straightline Washability Unit's cleaning sled. The rag was also sprayed with the same cleaning product until the rag was saturated (usually about 15 sprays).
After the soaking, the rag/sled was placed on one end of the carpet section and the Unit was run for 91 cycles or approx. 2.5 minutes. Every 30 cycles, each section of carpet was sprayed 6 times with the cleaning solution. At the end of the cleaning, the carpet piece was removed from the cleaning unit and allowed to dry overnight. Photographs of carpet samples were not re-taken.

Results
Light meter readings were again recorded on each sample as described in Trial I. Table 3 lists those results.

5 minutes							
	Cleaner	Average Readings			Calculations		
	Un-soiled	Soiled	Cleaned	*Soiling	*Cleaning Differential (Dc)	Percent	Average Results
	(U)	(S)	(C)	Differential (Ds)	C-S	Change	
				U-S		Dcx100/ Ds	
	9.79	2.53	3.87	7.27	1.35	18.53	

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Sample 1							
Sample 2	10.42	3.31	4.46	7.11	1.15	16.20	15.75
Sample 3	10.39	4.65	5.37	5.74	0.72	12.51	

Lastly, light meter readings were comparatively ranked as described in Trial I. Table 4 lists those results.

Product ID Number	*Light Meter Rankings at 2.5 Minutes	Light Meter Rankings at 5 Minutes
1	4	3
2	10	9
3	9	8
4	8	10
5	6	6
6	3	4
7	2	2
8	5	5
9	1	1
10	7	7
11	~9	~9

Product 11 would have been 9th out of 11 after five minutes of cleaning.

Summary:

Substrates:	Textile				
Contaminants:	Dirt				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Chemspec	Liquid Formula 90	0.156	0.00	☑	

Conclusion:

Observations and Conclusions
While no cut-off point was established for soil removal in this carpet cleaning procedure, the performance of the industry product improved with the second cleaning cycle, as evidenced by the light-meter results of 8.33 vs. 15.75, respectively (Tables 1 and 3).