

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2011

DateRun: 07/01/2011

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ClientType: Cleaning Equipment Mfr

ProjectNumber: Project #1

Substrates: Plastic, Vinyl Composite Tiles

PartType: Coupon

Contaminants: Dirt

Cleaning Methods: Mechanical Agitation

Analytical Methods: Gravimetric, Timing

Purpose: To compare vacuum cleaning against dry mop for hard surface cleaning.

Experimental Procedure: The supplied ProTeam Super Coach vacuum cleaner was operated for one hour with a wide-open inlet (without the hose). Upon completion of the conditioning of the vacuum cleaner, the vacuum bag (ProTeam Intercept Micro hose) was weighed three times on an analytical balance and reinserted into the vacuum cleaner.

In this test, we applied three cleaning methods to three types of surfaces: a 4'x8' vinyl composite tile, an 8'x8' non-porous resin floor and an 8'x8' section of a vinyl composite tiled hallway.

For the 4'x8' floor, a  $\frac{3}{4}$ " thick piece of plywood was covered with 32 vinyl composite tile floor of which the center four tiles were not adhered to the plywood. The loose tiles would allow for additional evaluation of the soil removal from cracks in the flooring. For the non-porous resin floor, a section of a laboratory was marked off into an 8'x8' area. And lastly, the larger VCT floor was used from the hallway outside the laboratory.

Silica Sand, sieve size range, 40/+50 was applied to the tile surface at about 3 grams of soil per tile (100 grams total soil added). This sand size was selected based on existing standards for the comparison of vacuum cleaners. The soil was spread across each tile using a small paint brush to assist in even distribution.

The vacuum cleaner nozzle was placed on the hard surface floor so that the front edge of the vacuum cleaner nozzle lip was aligned with the edge. The nozzle was lifted off the hard surface floor and then the vacuum cleaner was turned on. The nozzle was then lowered to begin testing. Once the nozzle touched the floor, the timing began. Vacuum proceeded from one end of the floor to the other (8 feet) and then the nozzle was turned and headed back up the floor in the opposite direction. This back-and-forth cleaning proceeded until the entire floor was cleaned. When the nozzle reached the last corner of the flooring, the timer was stopped, and the clean time was recorded. The vacuum was run for an additional 10 seconds to capture soil into the filter bag.

The filter bag was then removed and weighed three times to determine the amount of soil collected.

The floor was then swept with a handheld brush to collect any missed soil. In addition, the center four tiles were removed, and the hand brush was used to collect soil trapped in the cracks of the floor. A final sweep along the sub floor outside the 8'x4' plywood floor was performed to collect any soil pushed outside the tile floor. This collected soil was added to the residual soil left on the tile flooring to determine the total soil left behind after cleaning.

Following the vacuum cleaning, the same basic procedure was followed using two types of dust mops. The first was a Rubbermaid Commercial Products Select-a-length cotton dust mop (cut to 24"). The second was also from Rubbermaid Commercial Products was a 24" Fringed Microfiber dust mop (Q426). For both, a fresh mop head was used for each run. Timing started when the dust mop began to move on the floor and stopped once the collected soil was swept into a dustpan. This collected soil was weighed. The same post cleaning procedure was followed as in the vacuum cleaning to determine the amount of soil left after cleaning. Three runs were completed for the vacuum, cotton mop, and microfiber mop.

Results: There was no significant difference of removing soil (sand) between vacuum cleaner, microfiber and cotton on simulated vinyl tile floor. On average the vacuum cleaner removed more than 82% of the sand in 57 seconds from a 32 square foot area. The cotton mop removed about 83% of the sand in 21 seconds and the microfiber mop removed around 82% in 27 seconds. At resin surface, the test result showed similar trend like VCT. However, the cotton mop on the VCT in the hallway resulted in only 40% collection of sand. Based on observation, using cotton mop on hallway had some limitation for moving and cornering. The cotton mop design made it more difficult to turn and collect the sand in corners.

In each case the total soil collected after cleaning was less than the initial 100 grams added to the floor. Some of the fugitive soil can be accounted for in losses in transfer from the container to the floor, some to soil being moved outside the collection area or under the plywood flooring. Observations were made that the collected soil from the vacuum cleaner was drier than the soil applied, contributing to the decrease in collected soil weights.

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|---------------|--|--|--|--|
| Result table: |  |  |  |  |
|---------------|--|--|--|--|

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|                            |         |             |            |                     |
|----------------------------|---------|-------------|------------|---------------------|
| Floor Type:<br>VCT 4'x8'   |         |             |            |                     |
| Pattern: Up<br>and back    |         |             |            |                     |
| Equipment                  | Removal | Ave<br>soil | Std<br>Dev | Time for<br>removal |
| Vacuum                     | 80.9    | 82.1        | 1.1        | 47                  |
|                            | 82.3    |             |            |                     |
|                            | 83.1    |             |            |                     |
| Microfiber                 | 78.9    | 82          | 3.2        | 27                  |
|                            | 85.3    |             |            |                     |
|                            | 81.9    |             |            |                     |
| Cotton                     | 84.8    | 82.9        | 2.3        | 21                  |
|                            | 80.4    |             |            |                     |
|                            | 83.6    |             |            |                     |
| Floor Type:<br>Resin 8'x8' |         |             |            |                     |
| Pattern: Up<br>and back    |         |             |            |                     |
| Vacuum                     | 82.2    | 84.6        | 2.1        | 67                  |
|                            | 86.1    |             |            |                     |
|                            | 85.4    |             |            |                     |
| Microfiber                 | 89.5    | 86.4        | 5.6        | 44                  |
|                            | 80      |             |            |                     |
|                            | 89.8    |             |            |                     |
| Cotton                     | 87.7    | 83          | 5.1        | 44                  |
|                            | 83.7    |             |            |                     |
|                            | 77.6    |             |            |                     |
| Floor Type:<br>VCT 8'x8'   |         |             |            |                     |
| Pattern: Up<br>and back    |         |             |            |                     |
| Vacuum                     | 78.3    | 83.6        | 4.6        | 62                  |
|                            | 86.1    |             |            |                     |
|                            | 86.4    |             |            |                     |
| Microfiber                 | 86.4    | 81.5        | 8.8        | 49                  |
|                            | 86.8    |             |            |                     |
|                            | 71.4    |             |            |                     |
| Cotton                     | 33.8    | 39.6        | 15.3       | 48                  |
|                            | 28.1    |             |            |                     |
|                            | 57      |             |            |                     |

Summary:

|                      |                                |               |                    |                                     |                      |
|----------------------|--------------------------------|---------------|--------------------|-------------------------------------|----------------------|
| <b>Substrates:</b>   | Plastic, Vinyl Composite Tiles |               |                    |                                     |                      |
| <b>Contaminants:</b> | Dirt                           |               |                    |                                     |                      |
| <b>Company Name:</b> | <b>Product Name:</b>           | <b>Conc.:</b> | <b>Efficiency:</b> | <b>Effective:</b>                   | <b>Observations:</b> |
| ProTeam              | ProTeam ProVac                 |               |                    | <input checked="" type="checkbox"/> |                      |

Conclusion:

For sand removal from a vinyl composite tiled floor and resin floor, there is no difference of collecting soil between vacuum cleaner and mop (microfiber mop and cotton mop). This test also indicated that the bigger size of mop increased the collection rate of sand when the worker had enough space to move. Further testing should be conducted to better characterize the ability of the equipment. Previous tests showed a loss of moisture between 5-9 percent when vacuuming which could affect the results. Additionally, the vacuum head had bristles on it that were limiting/ preventing easy uptake of the soil. Compared to the other equipment, the vacuum head was only 14 inches wide (compared to 27 inches and 28 inches for the mops). This difference in size would represent an explanation for the additional time needed to clean the floor.