



COMMERCIAL

Cordless Upright Vacuum Cleaner
Time and Motion Study
3-15-17



This AICS time study was approved by Hoover Commercial.

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1. Introduction

The American Institute for Cleaning Sciences (AICS) is pleased to submit this report detailing the results of a time-and-motion study using a commercial cordless, two-speed upright vacuum. The time study was conducted at the Jefferson County Municipal Building in Golden, Colorado. The Jefferson County Municipal Building is a 530,000 sq. ft. class A office building with diverse area types and interior finishes. The Building Owners and Managers Association (BOMA) defines class A office buildings as the most prestigious buildings competing for premier office users with rents above average for the area. These are buildings that have high-quality standard finishes, state of the art systems, exceptional accessibility and a definite market presence.

The American Institute for Cleaning Sciences (AICS) is the cleaning industry's preeminent consulting firm in the commercial cleaning industry serving property managers, building service contractors, in-house service providers, manufacturers and distributors. AICS is the architect of the comprehensive Cleaning Industry Management Standard Green Building (CIMS-GB) and acts as the registrar for the ISSA certification program.

AICS is focused exclusively on the commercial cleaning industry. Our involvement with hundreds of industry firms expands our expertise and knowledge to bring you the most comprehensive information and business solutions available.

2. Scope of the Study

This study focuses on vacuuming hallways and office cubicles in a class A office building to verify the practical cleaning times of a commercial cordless upright vacuum. The principles of a practical time-and-motion study can be applied in any building type to verify the production rates of vacuuming and other cleaning tasks.

3. Purpose

The purpose of this study is to verify average practical production rates for vacuuming using a Hoover® HUSHTONE™ Cordless two-speed motor upright vacuum in a commercial office building.

4. Current State of Vacuuming

Vacuuming is one of the core cleaning tasks in the commercial cleaning industry. It represents a large financial commitment when establishing labor budgets, performing job costing, determining staffing standards and applying computerized workloading principles. The purpose of vacuuming is to enhance the appearance of an area, extend the life cycle of the carpet, improve indoor air quality and comply with the carpet mill's warranty specifications.

The average commercial cleaning workers use a vacuum for approximately 1-3 hours per day. Part time and full time workers' daily vacuuming hours may vary. There are numerous variables that impact production rates. The building classification, age of the building, soil loads, carpet construction, building occupants, weather, obstructions, density, square foot of carpet, work interruptions and other factors can increase or decrease the hours needed to vacuum.

5. Time-and-Motion Study Method

A time-and-motion study defines the task and work performed in a given period of time. The workers should perform the work according to standard operating procedures (SOP), under average conditions, and at a pace which will produce an average production rate. All of the working conditions should be carefully considered for the time-and-motion study to be practical.

5.1. History of Time-and-Motion Studies

AICS uses a methodology founded on Scientific Management principles practiced by Frederick Winslow Taylor. The key element in Taylor's technology of work, to which he gave the name "scientific management," was the time-and-motion study. This was, and is, a technique for determining how fast a job can reasonably be performed, and for identifying, and eliminating, inefficient and time-wasting practices.

5.2. Practical versus Theoretical Time Studies

The cleaning industry recognizes two types of time studies conducted by manufacturers, service providers and third party-firms. AICS used practical cleaning time practices for the time-and-motion study.

(1) Theoretical Cleaning Times

Theoretical times are calculated based on the cleaning width of a machine or tool and the forward walking pace of the cleaning worker. The average walking speed of a cleaning worker may be 1-2 miles per hour (mph). This number is then multiplied by 5280 (feet in a mile) and then divided by 12 inches. The final calculation is sq. ft. per hour that the cleaning equipment or machine will yield. Theoretical numbers do not represent the numerous variables of real world production rates.

(2) Practical Cleaning Times

Practical times account for real world conditions and a consistent set of variables that can be defined by managers or supervisors in the building. These variables may include area type, soil conditions, floor surfaces, building type, travel time, setup time, equipment and worker skill levels. Many operations managers make an attempt to “guesstimate” these times. For accurate job costing and budgeting, it is considered a best practice for managers to conduct a time-and-motion study of common tasks such as restroom cleaning, vacuuming, pulling trash and floor cleaning.

6. Time-and-Motion Study Protocol

Although the conditions of the obstructed and unobstructed area types were different, workers used the same protocol for the time study.

- 6.1. Two male and two female workers were asked to participate in the study. All of the workers had experience in the commercial cleaning industry. The ages and physical abilities of the test subjects were diverse. The workers did not have any special needs or learning disabilities.
- 6.2. The substrate for the unobstructed hallway was dense, low profile, standard carpet roll construction. The substrate for the office cubicle area was dense, low profile commercial carpet tile construction.
- 6.3. There were 8 cubicles in the 1,000 sq. ft obstructed area with modular desks, chairs, trash cans, boxes, chair mats, files cabinets and other business-related items in each cubicle.

- 6.4. 1,000 sq. ft. areas were measured using a Disto 330 Laser measuring device, and then the distances were reconfirmed using a commercial walk wheel.
- 6.5. The 1,000 sq. ft area was framed using blue masking tape. Start and stop points for the workers were marked as indicators.
- 6.6. The workers were not trained on any specific vacuuming technique to simulate practical or real-world cleaning times.
- 6.7. Confetti was dispersed on the carpet to simulate “traffic vacuuming.” Traffic vacuuming is a practical or real-world method commonly used by cleaning workers. The worker identifies soil visually and then they move the cordless upright vacuum from soiled area to soiled area to vacuum the debris. The confetti encouraged the workers to vacuum under desks, move chairs and remove debris from traffic patterns at each cycle of the time study. Edge vacuuming and wall-to-wall vacuuming were not part of this time study.
- 6.8. The workers each took turns with the cordless upright vacuum in hallways and cubicles areas and were observed a total of eleven times in the hallway area and six times in the cubicle areas.
- 6.9. Cleaning time was recorded for each worker at the end of the 1,000 sq. ft. area using a stopwatch, clipboard and time sheet.
- 6.10. The Hoover Commercial HUSHTONE Cordless Upright Vacuum has a high and low power feature. The machines in the study were run on the high-power mode.
- 6.11. Travel time from the closet to the work area was not measured.
- 6.12. Cleaning times and worker vacuuming techniques were videotaped.
- 6.13. After all data was collected, the production rates, data and videos were thoroughly reviewed by AICS.

7. Published Production Rates

Industry published rates are measured in minutes per thousand sq. ft. These times are then translated into sq. ft. per hour. The ISSA 612 Cleaning Times table below demonstrates published times for vacuuming.

Table 1. ISSA 612 Published Vacuum Cleaning Times Example

ISSA 612 Cleaning Times - Vacuums		Sq. Ft	Minutes	Sq. Ft. Hr.
295	Vacuum w/ 12" Upright Vacuum (corded)	1,000	26.80	2,239
296	Vacuum w/ 12" Upright Vacuum w/ automatic brush adjustment & bag fill control (corded)	1,000	24.60	2,439
297	Vacuum w/ 14" Upright Vacuum (corded)	1,000	21.00	2,857
298	Vacuum w/ 14" Twin Motor Upright (corded)	1,000	18.50	3,243
313	Vacuum w/ Back-Pack Vacuum & 14" Orifice Carpet Tool (corded)	1,000	8.10	7,407
598	Vacuum Specialist with Battery Powered Backpack with 14" tool	—	—	14,286

8. Hoover Commercial Practical Time-and Motion Study

The production rates of the vacuums below are an average of the workers' practical cleaning times obtained as a result of a practical time-and-motion study. Users may experience site-specific variables that can increase or decrease the production rates and annual labor cost. The time-and-motion test protocol can be replicated using similar vacuums to establish a practical production rate in schools, universities, manufacturing, healthcare or any building type.

Table 2. AICS Time-and-Motion Study Findings

Vacuum Type	Sq. Ft	Minutes	Sq. Ft. Hr.
13" Hoover Commercial HUSHTONE Cordless Upright Vacuum - Hallways	1,000	3.27	18,547
13" Hoover Commercial HUSHTONE Cordless Upright Vacuum - Cubicles	1,000	3.08	19,572

9. Observations and Commentary

AICS observations and comments are as follows:

- (a) The unobstructed hallways in the study were 3-4' wide. There were five connecting hallways that had 90-degree turns connecting them. Area types, substrates, floor plans, and building layouts may vary.

- (b) The cleaning workers in the time study increased their production rates as they became more familiar with the area they were cleaning.
- (c) The cleaning workers stated that they preferred using the cordless upright vacuum for cleaning hallways and office cubicles compared to a traditional corded upright vacuum. Power cord management, outlet discovery and untangling the cord from door jams and partitions can decrease productivity. Power cords may also cause costly asset damage to the corners of walls, baseboards and furniture.
- (d) Cleaning workers don't always walk to an outlet to remove the plug. Pulling on the power cable from a distance to remove the plug end may crack power outlets, damage walls and break three-prong plugs.
- (e) The workers were not trained on a specific vacuuming technique to simulate practical cleaning times. Each worker had several years of industry experience.

10. Conclusions

Practical production rates for vacuuming are essential to determine accurate staffing levels in all types of commercial buildings. Vacuuming can represent 15-25% of the total cost of cleaning a building when analyzing the scope of work, cleaning frequencies, square feet of carpet and the practical production rates.

Standard operating procedures, worker training, work flow design and utilizing specialists may generate additional efficiencies beyond a practical production rate. The elimination of non-productive time and defining production rates will assist service providers who are seeking labor efficiencies that can reduce hours or dollars from the bottom line.