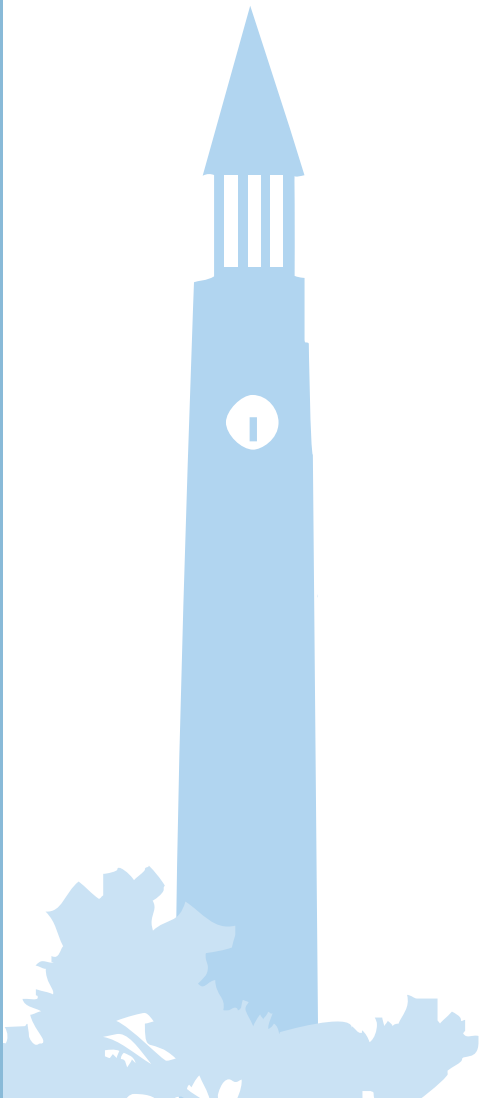


The University of North Carolina – Chapel Hill

(OS1)[®] EVALUATION COMMITTEE

Report on the Comparison of (OS1) and Zone Cleaning

October 2006





Executive Summary

This report contains the findings and recommendations of the (OS1) Evaluation Committee. The committee's stated purpose was to conduct a comparison evaluation of two types of housekeeping programs—the existing zone cleaning system and (OS1), which was in place in one building (Bioinformatics) and was in a pilot test in a second (Carroll Hall). The Committee's evaluation and analysis was to result in a recommendation to UNC Facilities Services whether or not to continue to implement the (OS1) cleaning system across campus. With regard to this important question, the Committee recommends that UNC continue to implement (OS1).

The report consists of an introduction that spells out the Committee's objectives, purposes, sponsorship and charter, along with a description of the membership. The members were drawn from across campus and included a housekeeper working under the zone system and a housekeeping manager, a professor, and representatives from student government, Office of Human Resources and the Employee Forum. The Committee Chair was a manager from UNC Environment, Health and Safety. The introduction concludes with a summary of Committee activities. The Committee was to effectively communicate directly with the stakeholders to gain their insight and experience; to gather and review factual information on both of the cleaning processes; and to take the gathered information and insight to make a comparison of the cleaning processes. This is followed by a list of highlights of the committee's activities.

The Committee's findings cover a wide variety of complex, broad topics such as: management and structure, communications, training, work load, health and safety, equipment and products, quality control/quality assurance, security, sustainability and indoor environmental quality. Each of these topics is covered in detail with regard to what the Committee found in its research and during its deliberations.

The Committee included among its ranks a non-voting technical consultant whose expertise includes indoor environmental quality, the cleaning industry and cleaning effectiveness research. A section herein contains a summary of the technical advisor's report (a separate document included in its entirety as an appendix). In the last section before the recommendations is an extensive list of the most pressing concerns expressed about the consequences of introducing (OS1) at UNC-CH, along with what the Committee found about each matter. A number of these were issues that some felt would keep the University from implementing (OS1). The Committee found, however, that many of these problems either did not exist in the pilot (OS1) projects at UNC or that these problems could be avoided with good management and practices, especially with regard to training.

The conclusion states that the Committee consensus is that (OS1) is the better overall cleaning system for UNC. The Committee concluded that this system offers many potential benefits for all, but that there are key points, comments and recommendations that should be considered. Those key points and recommendations cover several topics, including (OS1) training, teambuilding training, health and safety, backpack vacuums in use under zone cleaning, building assignments, language barriers and oversight/observation of the (OS1) implementation process.



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I. Introduction

A. Purpose and Primary Objective

At the request of the University's Director of Facilities Services a special committee called the (OS1) Evaluation Committee was formed in April 2006. The stated purpose of this committee was to conduct a comparison evaluation of two types of housekeeping programs, one being Zone Cleaning and the other (OS1) Cleaning which was being piloted for 90 days at Carroll Hall. Zone Cleaning is the type of housekeeping currently being practiced in most buildings on campus. Under Zone Cleaning, housekeepers are responsible for all cleaning tasks in a particular zone of a building. (OS1) cleaning is based on a team concept in which housekeepers are trained as specialists conducting a specific cleaning task (i.e. vacuuming, restrooms, etc...) and work as members of a team to clean buildings. At the completion of this evaluation the committee will provide a written report to the Director Facilities Services on its findings. Included in this report shall be a summary of the strengths and weaknesses of both Zone and (OS1) cleaning programs and which process would be expected to provide for the best overall service for the University.

B. Charter

The (OS1) Evaluation Committee, including its membership, purpose, results, and responsibilities, was established by a charter drafted by its Executive Sponsor, UNC's Director of Facilities Services, on March 24, 2006. The charter provided an outline of criteria for the development of a comprehensive strategy for the evaluation of both cleaning processes. The evaluation strategy developed included all topics listed in the charter and provided for the addition of several specific topic areas. The specific topic areas are covered in section 3 of this report. In addition, the charter also provided for the committee to seek out technical expertise from sources internal and external to the University. While the committee is the sponsored by Facilities Services, it is independent of the any University Department, Division, and Administration. A copy of the charter is attached at the end of this report.

C. Membership

The committee was made up of seven voting members representing a cross section of campus interests, including housekeeping, human resources, environment, health and safety, student government, faculty, and employee forum. The Housekeeping Department's representatives included both a housekeeper and management staff. An eighth non-voting member of the committee was Dr. Michael A. Berry. Dr. Berry served as a Technical Consultant to the committee. He is a retired UNC professor with expertise in the areas of indoor environmental quality, cleaning industry and research on the assessment of effectiveness of cleaning. The following is a list of committee members:

- Chairperson/ Environment, Health, and Safety, Ronald J. Howell
- Employee Forum Representative, Elizabeth Crowley
- Faculty Council Representative, Dr. Ellen Peirce
- Housekeeping Department (Housekeeper), Oscar Manuel
- Housekeeping Department (Management), Bobby G. McRae
- Student Government Representative, Tim Stallman
- Office of Human Resources Representative, Noreen Montgomery
- Technical Consultant – non-voting member, Dr Michael A. Berry.



D. Summary of Committee Activities

The core of the (OS1) Evaluation Committee's activities can be broken down into three areas. First and foremost, the committee was to effectively communicate directly with the stakeholders to gain their insight and experience. The next goal was to gather and review factual information on both of the cleaning processes. Finally, the committee was to take the gathered information and insight to make a comparison of the cleaning processes. A summary of highlights of the committee's activities is as follows:

- 12 Committee Meetings (April through September 2006)
- 3 Members Attended (OS1) Boot Camp and Zone Training Classes
- 5 Members Conducted Multiple Site Visits and Interviews with Housekeepers [Zone and (OS1)]
- Presentation to the Committee: Background on Zone and (OS1) (Bill Burston and Jim Alty)
- Presentation to the Committee: Team Building (Rob Kramer, Director, UNC Training & Development)
- Presentation to the Committee: Experience of Housekeeping Visit to (OS1) Sites (Ombuds Office)
- Presentation to the Committee: Overview and Q&A on (OS1) Building Set Up (Joe Ellison)
- Presentation to the Committee: Background and Q&A on Cleaning (John Walker, ManageMen)
- Presentation to the Committee: Safety and Ergonomics (Mary Crabtree and Ian Bertmaring)
- Written Communication Requesting Input (Employee Forum and Housekeepers)
- Presentation and Progress Report and Q&A (Employee Forum Meeting 08-02-2006)
- Copies of Training Materials/Information [(OS1) and Zone] Provided to Members
- Input from Zone and (OS1) Housekeepers Attending Committee Meetings
- Chair Participated in Cleaning Effectiveness Study of Carroll and Dey Halls
- Review Technical Advisor's Report on Findings and Recommendations

II. Findings on Specific Areas Evaluated

A. Management and Structure

Under the zone system there are approximately 400 housekeepers working in 21 zones on campus. The number of buildings in the zones range from 4 to over 20. Each zone manager has between 14 and 25 housekeepers to supervise. Given this ratio and number of buildings in some zones it appears to be very burdensome for many zone managers to be able to provide for adequate supervision for the housekeepers. This challenge was pointed out in the Executive Summary of the 2005 Facilities Services Customer Survey Project. This same survey also pointed toward general inconsistencies in housekeeping services, and that 41% of clients reported that they were not satisfied with the housekeeping service. Based on observations noted by committee members during site visits, there is visual evidence of inconsistencies in the level of cleanliness within buildings and across zones.

The (OS1) cleaning program is developed around the concept of team cleaning. Each team has four specialists; Light Duty, Vacuum, Restroom, and Utility. As part of the planned implementation of (OS1) clean-



ing at UNC, the Utility Specialist position would also be crew leader position. This position will be a Housekeeping Supervisor I (salary grade 54). The zone manager is salary grade 62. This will not only provide more direct level of supervision but will also allow for more advancement opportunity for housekeepers.

As noted previously there is high degree variability in cleaning under the current zone system. The (OS1) cleaning program provides for a more structured approach to cleaning. The housekeeping tasks and responsibilities are more clearly defined under (OS1) program than the current zone cleaning. Based on interviews with (OS1) pilot team members and zone manager for area 202 the consensus appears to be overall that this structure will be good for the worker and manager relationship. An area of concern expressed from the pilot members is that when conflicts arise, the team and crew leader need to be better prepared to handle these situations. On this same issue there were concerns expressed that crew leaders should not only be chosen based on their housekeeping experience, but also on their ability to be good supervisors.

B. Communication

With regards to housekeeping related communication issues, there were several specific areas that the committee felt needed to be considered. These were communications between building occupants and housekeeping staff, between housekeeping staff and management, and non-English speaking housekeeping staff.

With the current schedules (evenings and overnight) in most buildings, except residence halls, there is very little direct contact between the housekeeping staff and the building occupants. There are day porters in zones that have after hours housekeeping schedules, however since these individuals work in multiple buildings, their contact with occupants is still minimal. Under the current housekeeping program, there are online request-form and direct telephone contact with the main Housekeeping office (8:00 am-5:00 pm) and zone managers (varies with zone). It was noted during interviews/discussion that some of the Housekeeper felt the evening schedule (4:00 pm-12:00 am) would allow for more contact with occupants. A feature noted with (OS1) program is preprinted note cards used to communicate cleaning needed between occupants and housekeepers.

During the interviews with zone housekeepers there were concerns expressed that the zone managers needed to be more supportive, to speak up for their employees, and needed training on communication. There was also some distrust expressed by housekeepers regarding implementation of the (OS1) program. The primary concerns expressed were potential job loss, changing of buildings, and that their opinions would not be heard by management. During an Employee Forum (August 2, 2006) meeting, there was a concern expressed by a housekeeper that they had not been given enough opportunity to hear from the (OS1) Pilot team members regarding their experience with (OS1). Steps were taken by Housekeeping management to have zone managers meet with team members.

There are a growing number of non-English speaking housekeepers, particularly Burmese, being employed by UNC. Under the zone system, bilingual (Burmese-English) housekeepers are providing some oral trans-



lation assistance for non-English speaking Burmese. There are several features of the (OS1) program that would be beneficial for non- or limited-English speaking housekeepers. The (OS1) training program uses flow charts, pictograms, and places emphasis on learning key housekeeping terms. Also, team cleaning would allow for more direct interaction with translators, other housekeepers, and supervisors for non-English speaking staff. Even with these features, it appears additional steps are warranted to assure better communication.

C. Training

The primary training for new housekeepers under zone cleaning is an in-house 4 day orientation and training program. The first day of this program is primarily used to introduce the new employee to administrative issues such as an overview of the organization, timesheets, general expectations, and “Do’s and Don’ts.” On the 2nd day of training, more technical aspects of housekeeping are covered, including products (e.g. chemicals, mops, etc. . . .), procedures, and health and safety. On the third day of training, the focus is on specific tasks such as stripping and waxing floors and carpet care. On the final day, on the job training is conducted in the employee’s respected zone. This training program is developed and lead primarily by the Assistant Director of Housekeeping for Training.

To gain a better understanding of the training program under zone cleaning, two committee members attended day two of this training. Copies of the training materials were also supplied to all committee members. The following is a summary of their observations and comments on the zone training program:

- The instructor exhibited good communication skills and was very knowledgeable on housekeeping procedures. Overall, there appeared to be good rapport between the instructor and students.
- The information on the various (7-12) chemical cleaning products used under zone cleaning was confusing, difficult to follow, and there were inconsistencies between what was discussed and written information provided. For example, the specific material safety data sheet (MSDS) for one of cleaning product was not in the handout material. Another example is that the meaning of the numbering system (1L, 3H, 4L, 8L, 24H, 25L, & 26L) was unclear for many of the primary cleaning products (3M Twist Fill) and their various substitutes.
- As part of the training, students are provided with examples of personal protective equipment (goggles, gloves, and a respirator) used during housekeeping tasks. Of particular note was the implied required use of filtering face piece respirators (particulate) when handling cleaning products. The MSDS for example (3M) product stated that respiratory protection was not required when used as directed and with the Twist’n’Fill system. This MSDS also states that if the respiratory protection is worn then the minimum protection should be half face piece respirator with organic vapor cartridges. It was also noted that the example gloves provided during training were latex and labeled not to be used for chemical protection.
- As part of the training, a general safety video which depicts accidents and injuries in an industrial setting is shown. While this video provides general information on safety concepts, it doesn’t focus on the type of accidents/injuries a housekeeper may face.



- The housekeepers' on-the-job training is tracked by the use of a 5 page, 198 item check-off list, entitled "Housekeeping Training Record." This document, along with a listing of tasks/frequencies, makes up the core of the written directions for housekeepers to follow in performing their duties. Many of the items covered in the checklist appear somewhat subjective (i.e. wet mop floors completely), and the zone manager can move the person back to training status when he or she feels that a task is not being performed.
- The *Orientation for Permanent and Temporary Employee* pamphlet that is provided to new employees is the core of the written materials under zone cleaning training. While this document provides useful information, it is lacking in organization, detail, and overall quality (i.e. small print and pictograms.)

To gain an understanding of (OS1) housekeeping training processes, three committee members attended (OS1) Boot Camp training that was taught on site by Mr. John Walker of ManageMen on April 18-19, 2006. Copies of the training materials were also supplied to all committee members. The following is a summary of observations and comments on the (OS1) training program:

- The training program under (OS1) centers on establishing a philosophy of cleaning and simplifying that process. At the core of the philosophy are the concepts that housekeepers "Clean for Health First and Then Appearance" and that emphasis be placed on "Treating Cleaning Workers as First Class Citizens". The philosophy also emphasizes exceeding safety regulations and performing cleaning while minimizing potential environmental harm.
- The instructor, who is also a developer of the training program, exhibited good communication skills and rapport with students. Student participation and hands-on activities were a significant part of the two day training program. There was much interaction between students and the instructor. Under the proposed implementation of the (OS1) cleaning program at UNC, Housekeeping Trainers would attend training (Train the Trainer) at Janitor University, and then in turn would conduct the training [(OS1) Boot Camp, etc. . .] on site. It is imperative that Housekeeping Trainers be skilled in adult learning needs and in making training interactive. It is also important that they be involved in the development of the training materials, and that they have full management support in carrying out their jobs.
- The training materials provided under (OS1) include a training manual (Boot Camp for Cleaning Workers), instructional videos, posters, a field guide and other hand-outs. Several features such as color coding, pictograph/drawings, flow-charts, and listing key functions have been used to simplify concepts, equipment use, and information. Overall, the training materials are of professional quality and well thought out for ease of use.
- A comment repeated by several housekeepers that attended the (OS1) training is that another day should be added to the course. This would allow for more time for each section covered, hands on activities, and review.
- It was expressed by several housekeepers during one-on-one interviews that whether either (OS1) or zone were adopted, there was need for more training.



- As part of the evaluation process, UNC's Department of Environment, Health, and Safety, Workplace Safety conducted a review of the (OS1) training materials. While the (OS1) training program covers all key safety issues, there would be a need to make a few modifications to meet UNC's policy and training requirements. It should be noted that EHS requires Housekeeping employees to attend new employee safety orientation training, either instructor led or online. Such issues as hazard communication, blood-borne pathogens, and personal protective equipment are covered in both housekeeping and EHS training.

It should be noted that during the Committee's evaluation, Housekeeping Department was in the process of hiring a new training director. It has since been reported this position is now filled and improvements have been made in zone training.

D. Work Loading

Under both zone and (OS1), the determination of the number housekeepers needed is based on square footage and cleaning needed for the space. As part of the set up of (OS1), actual building measurements are collected in the space. This provides for an accurate determination of space, rather than relying on building plans, which is historically how the zone needs have been determined. During the set up of both of the (OS1) pilots at UNC (Bioinformatics and Carroll Hall), additional housekeeping staff were added in these buildings. It was also noted that several of the housekeepers interviewed expressed that some buildings under zone cleaning are understaffed and vacancies are left unfilled for extended periods of time.

The (OS1) cleaning program uses job cards for each of the team members (Light Duty, Vacuum, Restroom, and Utility). These cards layout duties, schedule, and estimated time required for each task/function. The estimated times are developed based on ISSA cleaning times, size of the areas, and specific cleaning needs. Some of the concerns initially expressed about job cards by some housekeepers dwelt on possible over structuring, burdensome work load, and reduced autonomy. With regards to these concerns, several key points were identified during the committee's evaluation. The development of job cards and setting up of a building under (OS1) is joint effort between the process manager and the housekeepers on the team. As for other concerns, based on comments from all pilot team members, they liked having the job cards and the work load had not been overly burdensome. Many reported they liked having cards because they had a clearer understanding of expectations and job duties. It was also expressed by several team members that they did not feel as tired at the end of their shift under (OS1).

An issue that has reportedly been a challenge under the current zone cleaning program has been how to adequately address short-staffing and absenteeism. By its design, team cleaning and (OS1) appears to be better suited to address these issues. Since cleaning tasks are clearly defined under (OS1), it is a straight forward process to determine which tasks need to covered during absences. During the (OS1) pilot at Carroll Hall, the team worked with the crew leader to cover for a short absence of another team member. It should also be noted that the absence-staffing plan under (OS1) was tailored to meet UNC's needs. This plan was developed as a joint effort between the UNC's process owner and ManageMen [(OS1) Developer].



The (OS1) system has also incorporated into its structure modifications to the process to address the needs of persons with physical ailment and disability, which allows for workers to return to work more quickly after an illness or injury. The (OS1) program has been implemented at a site (Hill Air Force Base) where contract housekeeping staff has physical and mental disabilities.

E. Health and Safety

Based on information provided to the Committee from UNC's Department of Environment, Health, and Safety, many improvements have been made with regards to housekeeping health and safety (H&S) over the last decade. Several examples include reduction in number of incidents, improvements in training, and safer cleaning chemicals. While there have been improvements, a concern expressed by EHS staff is that anytime there is a change in process there is the potential for an increase in H&S incidents. With this issue in mind, EHS stressed that with any change in process and/or equipment, such as the implementation of (OS1), proper training is essential. It was highlighted in their presentation to "train, retrain, and then train again."

One of the stated core aspects of the (OS1) philosophy of cleaning is "Go Beyond Compliance on Safety Regulations." In reviewing (OS1) training literature and observations made during attendance of the "Boot Camp," training, safety and health concerns are a prominent part of the (OS1) program. As noted previously in this report, H&S issues (MSDS, PPE, etc. . .) are addressed in zone training but in a less organized and detailed fashion. The following is a summary of H&S related issues noted as part of the evaluation of these housekeeping programs:

- The first section of the (OS1) training manual and instruction covered in "Boot Camp" is hazard communication on chemical use and safety. A real case report is provided which resulted in a death when cleaning product was poured into an improper container (vodka bottle). This section stresses the importance of conducting a hazardous material audit and the proper labeling of all products.
- The material safety data sheets (MSDS) for cleaning products used in (OS1) are color coded and provided in each training manual. Copies of the MSDS [(OS1) And Zone] are also placed in a notebook which is kept on site in each building.
- Under the (OS1) program the number of daily-use, concentrated, cleaning products is 3 vs. 5-8 used under zone cleaning. The (OS1) products (PortionPac) are certified by Green Seal, which is a nationally recognized, independent, non-profit organization that works with manufacturers on developing environmentally responsible products. One key aspect of the Green Seal approval process is using the least toxic chemical compound in the products. No such designation or independent review was identified for the zone products.
- During the evaluation process, inspections were conducted of both zone and (OS1) equipment and product storage rooms/closets. The (OS1) closets were noted to be very organized. It should also be noted there is an orderly procedure for the checking out and in of equipment and products under the (OS1). While some zone closets were orderly, there were conditions noted in



closets that would present significant safety hazard. These included unlabeled containers, water bottles stored with chemicals, and multiple containers of partially used, concentrated cleaning products, some of which contained chemical residue on the outside of the container.

- A cornerstone of the (OS1) cleaning process is the use of the backpack vacuums. Based on studies and information supplied by vacuum manufacturer (ProTeam) backpacks are more efficient and if properly fitted/worn provide less overall body strain than upright vacuums. As part of the Committee's evaluation, UNC's Ergonomist was asked to review the use of these backpack vacuums. The Ergonomist concurred that if worn/used correctly; the backpack vacuum would present overall less stress/strain and would be an appropriate tool. However in this assessment it was stressed that there would be a high risk of injury if used improperly, and that training, retraining, and supervisor mentoring would be essential. Based on information provide by EHS there were 3 safety incidents associated with backpack vacuums in 2005-6. It was also indicated in this assessment that one size may not fit all, and that alternative size vacuums should be considered for some certain individuals.
- In addition to backpack vacuums, other equipment/tools under the (OS1) program have been selected to be more ergonomically friendly. These include the mops, buckets, duster, and bowl brushes. In comparing these items with ones used under zone cleaning, it appears there is considerable improvement from an ergonomic standpoint. For example, there is significant weight difference between the mop/bucket (i.e. "Kentucky Mop") and flat mop/two sided bucket used under (OS1). While there are improvements in these items, EHS ergonomics review indicated there are even more ergonomically-enhanced products and designs on the market.

F. Equipment and Products

As part of the evaluation of these programs [zone and (OS1)], committee members had opportunities to observe and actually use various cleaning equipment/products. In addition, product information was reviewed and interviews were conducted with users at UNC and other institutions/facilities. A summary of the findings on these issues is as follows:

- The backpack vacuum (ProTeam's Super Coach) that is used under (OS1) has received the Carpet and Rug's Institute's certification under their "Green Label" program. <http://www.carpet-rug.org/index.cfm> To receive this certification these vacuums must meet three stringent performance factors. These criteria are soil removal ability, dust containment, and carpet appearance retention. The upright vacuums in use under zone cleaning have not been tested under such a program. Also, field dust measurements conducted by EHS staff indicated some of upright vacuums are performing poorly on dust containment.
- An overall positive response was provided by users of the backpack vacuums at other institutions and facilities. They all stressed that proper training and fit are key factors, but after getting used to them, housekeeping staff would be reluctant to go back to upright vacuums. This similar response was noted by members of the (OS1) pilot team members. Reportedly, there are also significant savings on repair cost with the backpack vacuums.



- Under the zone cleaning the standard mop (Kentucky (string) Mop) and bucket are used. The (OS1) program use a flat mop and two chamber (fresh solution and rinse) buckets. Based on observations and comments from users, the flat mop is considerable lighter than the standard mop. The two chamber bucket is not only lighter but provides for the added benefit to minimizing cross contamination.
- As noted previously in this report there is reduction in the number (3) of standard cleaning chemicals (PortionPac) under (OS1). These chemicals are in pre-portioned plastic bags and assigned to the specialists at the start of shift. The empty containers are returned and accounted for at the end of shift. Based on observations, this system would inherently be safer/cleaner and would also minimize waste disposal issues.
- Environmental microbiological field testing of restroom surfaces in Carroll Hall during piloting of (OS1) confirmed that the PortionPac disinfectant produced consistent sanitary results. For details see Dr. Berry's report in Appendix D.

G. Quality Control and Quality Assurance

Under the zone cleaning at UNC, there are no distinct mechanisms for quality control and assurance. It appears QA/QC are primarily left up to zone manager and housekeepers. There are no clear measurement methods or benchmarking tools in place to quantify results.

As for (OS1) process, QC/QA are hallmarks of this program and are addressed under multiple components. These include a rigorous benchmarking and auditing process; team cleaning, job cards, and various checklists.

H. Security

With regard to employee security, steps have been taken over the years in zone cleaning to address concerns in this area. These include issuance of two-way radios for all housekeepers, arrangement for escorts and transportation to cars. By its design (team cleaning) added security is built into the (OS1) process. Team members work together in building, job cards provide location of housekeepers during the shift, and doors are color coded indicating security level.

I. Sustainability

In comparing both cleaning processes with regards to sustainability, the (OS1) process contains several areas of improvements over the zone system. Several examples include use of "Green Seal" products, waste reduction, and promoting improvements in human health by providing healthy workspaces. These and other aspects of (OS1) are in line with goals and objectives outlined in UNC-CH Sustainability Policy <http://sustainability.unc.edu/index.asp>.



J. Indoor Environmental Quality

Good housekeeping and preventative maintenance are at the core of establishing and maintaining good indoor environmental quality (IEQ) in buildings. Poor or degraded IEQ can have a significant health impact on employees and occupants in buildings. In comparing both cleaning processes with guidance contained in EPA's model IEQ program (I-BEAM), (OS1) is clearly better structured to meet the elements of the housekeeping program under this model. The (OS1) program is also in line with ASTM's *Standard Guide for Stewardship for Cleaning of Commercial and Institutional Buildings*, (E1971-05). ASTM International is one of the largest voluntary standards development organizations in the world and ASTM standards are widely recognized by many disciplines (engineering, architecture, environmental, etc.).

III. Summary of Technical Advisor Report

To assist the (OS1) Evaluation Committee in the comparison of the cleaning programs, the University retained the services of Dr. Michael A. Berry. Dr. Berry served as technical advisor to the Committee, conducted assessment of the programs, and directed a cleaning effectiveness testing project in (OS1) and zone buildings. Dr. Berry is a retired UNC professor, former head of EPA's Indoor Air Quality Research Program, and is widely recognized as a national leader in research on cleaning effectiveness. One of Dr. Berry research projects was a major EPA-funded study on the assessment of cleaning effectiveness that was conducted at UNC's Frank Porter Graham Child Development Center in the early 1990s.

The following is a summary of findings from Dr. Berry's report on his assessment of housekeeping programs and cleaning effectiveness:

Based on the technical findings of this pilot study, the (OS1) system is recommended as a replacement to the current UNC zone system. From a technical point of view, the (OS1) housekeeping system is vastly superior to the zone cleaning system. The effectiveness of the (OS1) system resides in its comprehensive, scheduled, systematic cleaning coverage of the building; the use of cleaning equipment and technology tested and evaluated for effectiveness and safety; and most importantly the focused and specialized training provided to housekeepers. Professional training is at heart of the (OS1) system. Therefore, it is crucial that the University establish and support a high visibility training program and position for the implementation and sustained operation of the (OS1) housekeeping system.

(OS1) produces a measurable cleaning result that is (at least in this study) a factor of 2-5 times more effective in removing unwanted in the form of dust from the building envelope. Cleaning effectiveness is measured in terms of the quantity of unwanted matter removed. To aid in the assessment of cleaning effectiveness, environmental sampling of dusts, fungi, bacteria, and PM 10 air quality was conducted for Carroll Hall prior to and during the (OS1) pilot study. To better compare (OS1) to zone cleaning, samples were taken in Dey Hall, a zone cleaned building adjacent to Carroll Hall.



Dr. Berry’s full report is included in appendix D of this document.

IV. Review and Response to Questions/Concerns from Stakeholders

The following table contains compilation of questions and concerns expressed by various stakeholders to the Committee. These include questions from housekeepers, employee forum representatives and others.

Questions/Concerns	What the Committee found:
Job cards seem dehumanizing.	Housekeepers in both of the (OS1) pilots had unanimously positive feelings about the job cards; they felt like having an outline of their work gave a good sense of structure and accomplishment, and made their jobs less stressful. Also, job cards as used at UNC are much less detailed and rigid than some of the early publicity made it seem (see below).
Job cards are inflexible, make it harder to accommodate different cleaning situations; management will use them capriciously.	<p>Job cards in use at UNC tend to be fairly general (See Appendix B). Housekeepers interviewed view them more as guidelines or rough estimates than strict time limits, and for the most part team leaders did not enforce them strictly (sometimes housekeepers would switch around tasks on their job cards in order to clean more effectively from day-to-day). One housekeeper in the pilot did report that they had some problems with finishing their tasks too early.</p> <p>Concerns about job cards being inflexible and dehumanizing came mainly based on interviews at other (OS1) sites, where it is possible that bad management practice led to the job card system being wrongly applied to force workers into a strict timeline.</p>
Backpack vacuum is uncomfortable for long periods of time.	It appears housekeepers not in the (OS1) pilot were provided backpack vacuums reportedly without complete training or follow-up, as a result they didn’t properly adjust the backpack fit and this led to few problems. Housekeepers in the pilot who did receive training reported liking the backpack vacuums, though there are still some outstanding concerns about ergonomics, especially for shorter folks or those with prior back injuries. We recommend making alternate vacuums available to housekeepers.



<p>Backpack vacuum is unsafe (risk of electrical shock/burns)</p>	<p>There have been no reports provided to UNC’s Department of Environment, Health and Safety with regards to shocks or burns associated with these vacuums on campus. It is reported by the manufacturer (ProTeam) there is some risk of heating of the motor if the vacuum isn’t emptied as instructed in the training. For backpack vacuums used in zone buildings Housekeeping management should conduct retraining and monitoring on proper use including bag and filter changeout.</p>
<p>Job assignments will lead to repetitive stress injuries, more physical strain.</p>	<p>Although it hasn’t been much of a problem in the pilots, this is still a concern, especially given the issues discussed in the ergonomics section of this report. Most housekeepers in the pilots report that their work is either as physically straining as zone cleaning or less so (less walking around between doing different tasks). Also, pilot housekeepers reported that they’ll occasionally switch job assignments for a day or two (outside the standard two-week rotation), if needed. It’s important that this flexibility be maintained. It should be noted the original job rotation plan was for 90 days, however original (OS1) teams (Bioinformatics) members voted to change to 2 week time frame.</p>
<p>The specialist positions will cause more friction in the team (e.g. cleaning restrooms for two weeks).</p>	<p>Several housekeepers in the pilots brought this up as a concern. Teams must have the latitude to change the length of their rotation period to address this, and frequent communication within a team helps, as well as the fact that everyone eventually rotates to any given position.</p>
<p>(OS1) will hurt relations between building occupants and housekeepers.</p>	<p>Communication between occupants and housekeepers is poor to begin with, (OS1) contains some elements aimed at enhancing this (cards which housekeepers leave in each office to introduce themselves). One thing a number of housekeepers suggested, which would help relations with building occupants, was allowing workers to choose to move back to a 3:30 - 12:00 schedule.</p>
<p>Chemical packs are overly wasteful (packaging material).</p>	<p>Not a concern; the chemical packs dispose flat and produce much less waste than the current system.</p>



<p>(OS1) is a cost-cutting measure, will lead to job loss.</p>	<p>This is a logical concern, given that other universities have turned to (OS1) as a last-ditch cost-cutting measure, and given levels of under-staffing in the UNC housekeeping department (zone housekeepers consistently mentioned understaffing in interviews and some managers agreed). Our committee was assured that adequate staffing levels (which may mean hiring more employees than at present) will be maintained for (OS1). This is crucial – both pilot buildings were adequately staffed (which meant adding new housekeepers, in Carroll), and all of our information about the performance of (OS1) so far is based on adequate staffing levels. As we see it the system will not work unless each building is fully staffed.</p>
<p>(OS1) is an excuse to replace permanent employees with temp workers.</p>	<p>Again, a logical concern given the history of (OS1) at other campuses. This was outside the scope of our analysis. It should be noted that few buildings on campus have over years switched to outside or contract cleaning services. One reason reported is quality of cleaning coverage.</p>
<p>(OS1) will make it harder to deal with vacancies or absences.</p>	<p>UNC Housekeeping and ManageMen have developed a plan for dealing with temporary short-staffing in buildings. So far, the plan has not been used in one of the pilot buildings, and housekeepers in the other pilot building report that they’re still stressed and unable to meet all of the workload under short-staffing conditions. We recommend thinking about an (OS1) team specifically dedicated to filling in in short-staffed buildings.</p>
<p>Management under (OS1) will focus on strict control and oversight (too much paperwork), hurting worker autonomy and worker-management relations.</p>	<p>Some managers echoed this concern [(OS1) as a “scorched-earth” management policy]. We haven’t seen any problems yet, but do recommend further training of management prior to implementation of (OS1). Also, while both of the pilot team leaders are doing an exemplary job, when (OS1) becomes fully implemented team leader positions will be filled by currently-employed housekeepers, many of whom do not have significant leadership experience. We also recommend that Housekeeping implement leadership training for new team leaders.</p>



<p>(OS1) will cost too much; ManageMen is being given undue favorable consideration.</p>	<p>We weren't able to obtain any specific cost estimates from Housekeeping or Facilities Services. However, the Director Of Facilities Services has stated publicly on several occasions that implementation of (OS1) would be cost neutral. While specific evaluation of alternatives service providers was not conducted directly by UNC Housekeeping, prior evaluation of this type services were conducted at other institutions by current Facilities Services management. Also according to the Committees technical advisor there are very few housekeeping training providers, ones out there are tied to specific products, and have not developed complete programs that emphasize safety. It doesn't seem like ManageMen is being given undue favorable consideration.</p>
<p>Team dynamics will cause difficulties.</p>	<p>Team dynamics will always cause difficulties, for this reason we've recommended (and Housekeeping is implementing) team-building training for the new (OS1) teams. We also recommend that when possible housekeepers be given the choice to stay in their current buildings and form teams with coworkers of their choice; both of these will help to minimize friction within teams.</p>
<p>Concerns regarding the rigidity in the design and management of (OS1).</p>	<p>The Committee's inquiries and analysis lead to an apparent shift in this regard. UNC and (OS1) management initially seem to imply that nothing should be changed in the (OS1) process when implemented. However during committee's evaluation there are number of areas/issues that can be tailored to better fit needs at UNC.</p>



V. Conclusions and Recommendations

After carefully reviewing details of both programs it is the consensus of the Committee that (OS1) would be the best overall cleaning program for the University's academic, office, and other non-resident hall buildings. The implementation of the (OS1) program would provide for many improvements to the housekeeping process and raise the level of professionalism for housekeeping staff. While the Committee considers (OS1) to offer many potential benefits for housekeeping, there are several key points, comments, and recommendations that should be considered. These are as follows:

Recommendation 1

A cornerstone for a successful housekeeping program is management's full support for the training. As Dr. Berry stated in his recommendations, *"...it is crucial that the University establish and support a high visibility training program and position for the implementation and sustained operation of the (OS1) housekeeping system."* It is not only important that the trainers possess knowledge on housekeeping, but also be skilled adult learning needs and is an effective communicator.

Recommendation 2

Based on input from (OS1) pilot team members and zone housekeepers there is an apparent need for additional training in the areas of teambuilding and supervisory skills development. While (OS1) pilot team members reported an overall positive experience there were a few conflict related situations during start up that teambuilding training would help address. It should be noted that University's Department of Training and Development is currently developing this training. In addition it was also expressed by some zone housekeepers that housekeeping supervisor (zone manager) should have additional training to improve supervisory skills.

Recommendation 3

As part of the evaluation by the University's Department of Environment, Health, (EHS) and Safety the Committee was made aware that some modifications or additions to (OS1) should be considered to better adapt this program for specific needs of the University. Several examples included: adapting training to cover specific UNC's policy/procedures/training; optional size backpack vacuums; and implementing the use of certain more ergonomically improved tools. In regards to implementation of (OS1) or any other changes to the housekeeping program the Committee strongly recommends that EHS and Housekeeping work together in coming up with the best possible program from all aspects. Direct input from housekeepers should be considered.

Recommendation 4

During this evaluation it was learned that backpack vacuums had been introduced into the zone cleaning program on campus. Based on conversations with housekeepers, observations of improper use, and few reports of possible injury the Committee recommends that all zone housekeepers using backpack vacuums be retrained. This retraining should follow the model provided in the (OS1) training. Included in the



training should be proper donning and fitting, stressing potential safety issues from improper use, and importance of following bag/filter change out schedule. In additions load on/off stations that are available for these vacuums should be installed in the zone buildings and steps should be taken to predetermine electrical outlets. As noted above optional size backpack vacuums should be made available in situations were there are potential fitting problems or special needs.

Recommendation 5

One of the most commonly repeated concerns expressed by housekeepers interviewed was the issue of having to move from their current building. The Committee recommends that when possible housekeepers are given the choice to stay in their current buildings and form teams with co-workers of their choice; both of these will help to minimize friction within teams.

Recommendation 6

While (OS1) is more user friendly for persons with potential language barriers it would appears there is still a need to provide additional assistance in this area. The Committee recommends that Housekeeping explore option and implement steps to assure adequate communication (oral and written) for limited or non-English speaking employees both zone and (OS1).

Recommendation 7

While any major changes to University's housekeeping program or implementation (OS1) are taking place, the Committee recommends that an oversight group or committee be formed to review the progress and process. This group/committee should be made up a cross section of campus interest and provide periodic reports to the University's administration.



VI. Appendix

Appendix: A
(OS1) Evaluation Committee Charter



CHARTER (OS1) Evaluation Committee

Executive Sponsor: Jim Alty, Director of Facilities Services

Membership: The (OS1) Evaluation Committee will be appointed by the Director of Facilities Services to be broadly representative of campus constituencies and to bring their unique familiarity with various aspects of the campus community into assessing the (OS1) Cleaning Process.

Chairperson (Ron Howell)

Employee Forum Representative (Elizabeth Crowley)

Faculty Council Representative (Ellen Peirce)

Housekeeping Department (Bob McRae)

Student Government Representative (Tim Stallman)

Office of Human Resources Representative (Noreen Montgomery)

Housekeeping Dept. (Oscar Manuel)

Technical Consultant – non-voting member (Mike Berry)

Statement of Purpose: The (OS1) Evaluation Committee will evaluate the (OS1) Cleaning process as practiced in Carroll Hall during a 90-day trial period and compare that process to a representative sample of the current Zone Cleaning process to determine which process is expected to provide the best overall program to the UNC community.

Result: Upon completing their evaluation, the committee will develop a written report and make a recommendation to the Director of Facilities Services regarding the strengths and weaknesses of each cleaning program. The evaluation committee will be expected to develop criteria for evaluation prior to the start of the pilot project in order to ensure that a valid evaluation can be conducted. The evaluation should include review of cleanliness, customer satisfaction, and employee satisfaction in comparison to the current Zone Cleaning process.

Responsibilities:

- Develop a comprehensive evaluation program to fully assess the strengths and weaknesses of (OS1) Cleaning and Zone Cleaning. Evaluation criteria may include but are not limited to ergonomics, safety, security, equipment, chemicals, building health, building occupant opinions, housekeeper opinions, housekeeper empowerment, supervisor-housekeeper relationship and job work loading. Technical expertise from EHS, OHR, Public Health officials and other university or cleaning industry experts should be sought and considered.
- Using the developed evaluation program, evaluate the (OS1) process as implemented at Carroll Hall for a 90-day trial period.



- Using the evaluation program, evaluate the Zone Cleaning process at representative campus facilities selected by committee members
- Evaluate the (OS1) Training process and compare it to the Zone Cleaning training process.
- Present a written report of the committee's findings and conclusions to the Director of Facilities Services.

Background

The primary mission of the Housekeeping Services Department of the University of North Carolina at Chapel Hill is to provide cleaning services to the vast majority of the UNC campus. To accomplish that mission, The Housekeeping Department currently employs approximately 400 permanent SPA employees and is the largest single department on campus. The primary work shift is midnight to 8 AM, although a few facilities are cleaned between 4:30 PM and 12:30 AM. Accomplishment of the Housekeeping mission is critical to ensuring that campus facilities are maintained in the highest state of sanitation, hygiene and appearance so that UNC can achieve its mission of teaching, research and public service.

The Housekeeping Department currently cleans campus buildings using a “zone cleaning” process. With Zone Cleaning, the campus is divided into zones by geographic areas, and 15 to 25 housekeepers work under the leadership of a zone manager. Within each zone, each housekeeper is assigned a specific area of a building or buildings to accomplish all cleaning services (dusting, vacuuming, trash removal, restroom servicing, etc). For most large buildings, this means that each housekeeper cleans one or two floors of a facility.

The Housekeeping Department is considering implementing an alternate cleaning process, known as (OS1), which might allow for a higher quality of cleaning and improve the workplace environment for housekeepers and supervisors. (OS1) is an integrated and systematic program originally developed by ManageMen[®], Inc., based out of Salt Lake City, Utah. Founded in 1985, ManageMen is a cleaning industry education firm that produces information and educational materials for custodial organizations based on cleaning industry benchmarking and study projects.

The (OS1) program offers a systematic process that organizes housekeepers in teams of cleaning specialists. With (OS1), housekeepers perform the same tasks as performed under Zone Cleaning, but perform those duties as a specialist during the work shift. With the (OS1) process, each housekeeper is trained on each of the four cleaning specialties (Light Duty, Vacuum, Restroom and Utility). Specialties rotate duties among the team members on a schedule.

The (OS1) process proposes to offer advantages over zone cleaning to include a consistent level of cleaning, a standard training program, better cleaning equipment, less exposure to cleaning chemicals, improved safety and clear expectations of housekeepers and supervisors.



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Mike Berry 493-7409 dr.mike.berry@verizon.net (Technical Consultant)



Appendix: B
Example (OS1) Job Card



Example (OS1) Job Card

MANAGEMENT OF CLEANING ORGANIZATIONS

SIMPLIFIED — Job Cards / Supervisor

Supervisor GREY

Employee Schedule / Assignments

Specialists Type and Assigned location

↓

SUPERVISOR

Location

↓

Time schedule for assigned locations

↓

Estimated time to accomplish tasks

↓

Special notes or responsibilities

↓

Name, date of hire or assignment, assigned location

↓

Anthony Von Leewenhoeck
1 March 1993

Floor/Room	E.T.	Schedule	Notes
Check In		9:30	Leave notes in pass down log for the next shift supervisor.
Set-up check-in	15 min	9:30 – 9:45	
Check logs/Adm	15 min	9:45 – 10:00	Complete new employee paper work and return to Human Resources.
Check-in staff	10 min	10:00 – 10:10	
Perform training	30 min	10:10 – 10:40	
Work with staff	60 min	10:40 – 11:40	
Check completed work	20 min	11:40 – 12:00	
Lunch	30 min	12:00 – 12:30	
Work with staff	45 min	12:30 – 1:15	
Check out staff			
Administrative	45 min	1:15 – 2:00	

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Appendix C
Acknowledgments and Recognition



Acknowledgments and Recognition

There were many individuals and groups that were instrumental in assisting the (OS1) Evaluation Committee in their work. Although it is not possible to recognize each specific person, the committee wants to express its gratitude to the following groups and individuals for their special contributions.

Zone Housekeepers That Provided Comments and Insight

(OS1) Pilot Team Members (Bioinformatics and Carroll Hall)

Vivian Mabry/Pat Langelier, UNC Facilities Services Directors Office

Wayne Blair and Laurie Mesibov, UNC Ombuds Office

Rob Kramer, UNC Training and Development

Ernie Patterson, Chair, and Employee Forum Members

Joe Ellison, UNC Housekeeping Department

Bill Burston, Director of Housekeeping Department

Mary Crabtree and Ian Bertmaring, UNC EHS

John Walker, ManageMen

Michael A. Berry, Technical Advisor



Appendix: D

Carroll Hall (OS1) Pilot Study, Technical
Advisor's Findings and Recommendations



Carroll Hall (OS1) Pilot Study

April – July, 2006

Technical Advisor's Findings and Recommendations

By
Dr Michael A. Berry
August 23, 2006

Purpose of Report

The purpose of this report is to provide a technical evaluation of the zone housekeeping system currently used at the University of North Carolina at Chapel Hill and the ManageMen (OS1) cleaning system instituted on a pilot basis in Carroll Hall, which is currently occupied by the School of Journalism at UNC.

A special committee was formed in April 2006 to evaluate zone cleaning and a proposed (OS1) cleaning system that was being piloted in Carroll Hall for a 90-day period. The evaluation is intended to determine which of the two systems is better for the UNC community. The committee was made up of representatives from across the campus including housekeeping, human resources, health and safety, student government, faculty council, and employee forum. The committee is independent of the administration and was tasked with providing a written report on the findings to the Director of Facilities Services.

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The assignment of the Technical Advisor to the committee was intended to assist the committee by providing technical expertise in comparing and evaluating (OS1) and Zone Cleaning in terms of cleaning and housekeeping effectiveness, training, equipment, ergonomics, quality control, work loading, indoor environmental quality and building health, worker safety, physical security, and environmental sustainability.



Technical Advisor's Recommendation

Based on the technical findings of this pilot study, the (OS1) system is recommended as a replacement to the current UNC zone system. From a technical point of view, the (OS1) housekeeping system is vastly superior to the zone cleaning system. The effectiveness of the (OS1) system resides in its comprehensive, scheduled, systematic cleaning coverage of the building; the use of cleaning equipment and technology tested and evaluated for effectiveness and safety; and most importantly the focused and specialized training provided to housekeepers. Professional training is at heart of the (OS1) system. Therefore, it is crucial that the University establish and support a high visibility training program and position for the implementation and sustained operation of the (OS1) housekeeping system.

Quality Management System

(OS1) approaches cleaning in a systematic manner and incorporates, continuous improvement management processes. The (OS1) system cleans the entire environment in a comprehensive, effective, and consistent manner by using well-trained and equipped teams of housekeepers. UNC Zone housekeeping is not systematized. The zone system attempts to clean fragments of an environment, often cross contaminating, and failing to recognize environmental connectedness. Under the zone system, there is a high degree of cleaning variability, depending on the skill and motivation level of the individual housekeeper. Zone cleaning accepts inconsistency of cleaning effectiveness throughout multiple zones.

Communication and Housekeeper Recognition

The (OS1) system is designed to position housekeepers to be fully successful in a consistent fashion. The system evolves around a coordinated team in which each team member achieves a special cleaning objective. Housekeepers are involved in all aspects of cleaning operations. There is effective communication between team members, supervisors, and administrators. (OS1) assumes responsibility for cleaning knowledge and effectiveness at all levels - from management to supervisors to team members. The zone cleaning system at UNC tends to place the responsibility for performance primarily at the housekeeper level with limited informed guidance from supervisors or management. In zone cleaning housekeepers are generally left on their own, often not heard, and unsure of cleaning results or appreciation.

The UNC housekeeping program requires special attention to language barriers and translation, especially in regards to safety and housekeeper training. One particular translation need is found among the growing numbers of Burmese housekeepers. Translators are necessary but the (OS1) team structure provides an opportunity for more continuous translator-to-housekeeper contact than the current zone system where non- English speaking housekeepers are on their own for extended periods of time.

Training

(OS1) trains housekeepers and managers in a coordinated and comprehensive manner for the implementation of a specific and effective cleaning system. (OS1) training is far more professionally oriented, science based, and safety focused than the zone training currently conducted at UNC. (OS1) training begins with a



clear explanation of what cleaning is, why cleanings is important, and the history and importance of the “professional” housekeeper. UNC Zone training generalizes housekeeping and safety information without regard to specific housekeeping responsibilities and performance expectations. In this study observations of zone training found several significant deficiencies in safety instruction. Respiratory protection was not in compliance with OSHA regulations; wrong protective gloves were provide (latex gloves should be used only for biological material); and essential MSDS information was missing from notebooks and safety manuals.

Safety & Health

Safety is an integral part of (OS1) training throughout all portions of the program. (OS1) training is superior to zone training in that it is not generalized and is focused on the housekeeping process. The (OS1) safety documentation is easy to read and understand, even by non English speaking housekeepers. Safety information, equipment and supplies are color-coded for easy identification and access. (OS1) safety instruction—training films for example- addresses housekeeping. In zone training, safety instruction is too general and unspecific. For example, a safety film currently used in UNC zone training addresses safety in a manufacturing facility and does not in any part focus on or pertain to housekeeping operations in a university setting such as UNC.

Equipment and Storage

(OS1) cleaning technology have been tested, evaluated and employed for safety and cleaning effectiveness. The (OS1) prescribed vacuum cleaner reduces back strain and injuries, and has much lower particle emissions to the breathing zones of housekeepers than the typical upright machine used in zone cleaning. From an ergonomics standpoint the backpack vacuums provide overall reduced strain and better body position than standard upright vacuums being used under zone.

(OS1) mops are much easier to use and maintain than the mops used in the zone system. Along with their two chamber mop bucket, the (OS1) flat mop reduces cross contamination by separating fresh water from rinse water and provides for significantly higher levels of sanitation. Zone housekeepers clean hard floors with a much heavier #12 Kentucky mop. The zone mop bucket is a single chamber plastic bucket. The single chamber bucket is not designed to reduce cross contamination through the separation of fresh water and rinse water. There is also a considerable weight reduction on the (OS1) mop/bucket system over the standard “Kentucky Mop”.

Observations were made of the cleaning equipment and chemicals used and stored in both the zone system and (OS1) system. In the zone system each housekeeper is assigned a closet in which to store equipment, chemicals, and supplies. There are on average, one housekeeper closet for every two floors throughout campus.

System simplicity is a main component of the (OS1) system. There is far more organization of cleaning equipment supplies in the (OS1) system than in the zone system, resulting in safer and more sanitary



conditions. In the (OS1) system, multiple janitorial closets are replaced with a single, centrally located team check-in room that contains housekeeper lockers, and a regularly inventoried housekeeping supply cabinet. The entire (OS1) housekeeping team operates from this central location. A central “equipment room” provides storage for vacuums and heavy cleaning equipment. Paper supplies are restocked and stored in “pantries” located throughout the building for easy access.

Chemical (Safety/Efficacy)

The (OS1) system uses far less chemicals than the zone system with corresponding less risk of a significant chemical spill or accident. In the (OS1) system there are only two chemicals employed, a general purpose disinfectant and a detergent. Under (OS1) the number of concentrated chemicals has been reduced from an average of 7 to 2 ensuring less unnecessary chemical exposure to housekeepers and building occupants.

Typically a UNC zone housekeeper has 5-8 different cleaning chemicals in an assigned closet. Most of these chemicals are in concentrated form, in half-gallon size containers. When the chemical is used, it is mixed by using a manufacture’s supplied mixing machine. Many of cleaning chemicals used in zone cleaning are not necessary to effectively clean the zone area.

A number of zone housekeeping closets were observed in the course of this study. Unsafe and unhealthy conditions were observed in some closets to include dirty floors and surfaces, trash and extensive clutter, unlabeled or empty chemical containers, residue from cleaning chemicals, and drink bottles sitting beside cleaning chemicals.

Environmental

Clean is defined as an environmental condition free of unwanted matter - in the form of solids, liquids, gases, or living organisms - that has the potential to cause an adverse or undesirable effect. Cleaning, to include housekeeping, is the most basic form of indoor environmental management. It is the organized process of removing or repositioning unwanted matter so that human activities can take place in a built environment.

Cleaning/housekeeping is a systematic process of:

- 1) knowing the environment, sub-compartment, or an object to be made free of unwanted matter,
- 2) identification of the unwanted matter,
- 3) separation of matter from the object/environment,
- 4) containment of the matter so it can be effectively moved,
- 5) transporting the unwanted substance to a suitable location and
- 6) properly/safely disposing or repositioning the matter.



The primary purpose of any cleaning and a housekeeping program in any institution such as UNC is to maintain and sustain a built environment which is healthy for occupants and which promotes, supports, and enhances the purpose of the building and the activities carried out in the building. (OS1) seeks and gives primary attention to the environmental health and well-being needs of the institution and building occupants.

Zone cleaning at UNC fails to recognize an environmental health objective. For example, the condition of many UNC zone housekeeping closets, in which large quantities of concentrated chemicals are stored in a generally haphazard fashion, is contrary to the value UNC places on a healthy environment. The (OS1) system with its emphasis on simplicity, limited chemicals, and cleaning effectiveness, reduce wastes and subsequent environmental degradation.

(OS1) chemicals are in pre portioned plastic packaging and provided to specialists prior to each work shift according to their assignment and need. The PortionPac chemicals are specifically designed to reduce cleaning chemical injuries to housekeepers and minimize adverse environmental effects. The housekeeper carries the chemical packets and uses them only as required. The empty containers are returned to the check-in room at the end of each shift, accounted for and recycled.

The manufacturer of (OS1) cleaning chemicals, PortionPac, was recently recognized as a leader in environmental protection and sustainability. PortionPac products used in (OS1) are certified and labeled as green cleaning products by Green Seal. Green Seal is an independent non-profit organization dedicated to safeguarding the environment and transforming the marketplace by promoting the manufacture, purchase, and use of environmentally responsible products and services. Green Seal Certification ensures that a product meets rigorous, science-based environmental leadership standards. This gives manufacturers the assurance to back up their claims and purchasers confidence that certified products are better for human health and the environment. Government agencies increasingly recommend and require that only green certified products be purchased and used in facilities under their control.

Work Loading

The (OS1) program begins with a detailed assessment and evaluation of the building's cleaning needs, known as Building Profiling. Cleaning tasks are divided into 'routine tasks' to be done daily; 'detail tasks' to be done within a specific building quadrant/area on a specific day of the work week; and 'project work' such as carpet extraction and flooring stripping that is scheduled on one day of the week. Specialist duties are tailored to fit the cleaning needs of a particular building. Team member tasks and scheduling are based on the building size, layout, and special needs. Based on the cleaning needs assessment, job cards are prepared for each team member to simplify the process and aid the housekeeper in effective cleaning.

(OS1) is designed to respond to variability of needs and conditions. The (OS1) system is flexible in that it provides for a normal level of absenteeism and allows for the addition of team members should the environment require additional cleaning. (OS1) is elastic enough to accommodate unique needs of individual



housekeepers should those needs arise. Additional team members are added to a building should that be necessary. There is also housekeeping depth within a (OS1) team. When one or more team members are absent, an “(OS1) Absence Staffing Plan” adjusts the team schedules and tasks to ensure critical housekeeping tasks are addressed without placing excessive demands on the team. The (OS1) system is elastic enough to accommodate special needs—for example light work assignments for particular housekeepers who may have a physical ailment or temporary disability. In the zone process, there is no assurance that changing or unexpected conditions will permit consistent housekeeping services. For example, for unexpected absences, each supervisor must decide what cleaning tasks are to be changed and must inform each housekeeper in the zone of the changes. There is no consistency or reliability in this effort, as it relies on the differing judgment and experience of each supervisor. The zone process does not plan for the unexpected to the same extent as (OS1).

Quality Control

Housekeeping quality is provided by (OS1) in a number of ways beginning with compliance auditing and focused training.. (OS1) uses benchmarking and compliance auditing to periodically verify the management process is on track and being properly followed and implemented. It is likely that a high level of environmental quality will be achieved and maintained if the (OS1) management process is followed as designed. Zone cleaning at UNC has no systematic evaluation or environmental quality measure program.

In the (OS1) system, through focused training and effective equipment, housekeepers are ensured of a high quality cleaning results.

The (OS1) system has quality control built into the team cleaning process that ensures a high level of cleaning effectiveness. For example as the vacuuming specialist follows the light duty specialist, the vacuum specialist checks that the waste baskets are empty and have not been overlooked. The zone system has no equivalent provision for quality control.

Job cards serve as a check list and allow clear understanding of the specific tasks to be accomplished, the approximate schedule, and the estimated time for each task or function. These cards also give supervisors, team leaders, and team members a general awareness of where to find team member at any point in the housekeeping process should there be an emergency. A standardized (OS1) Team Checklist helps supervisors in conducting quality control assessments of the building on a monthly basis.

Security

Security is built into the (OS1) system. The job cards indicate a location the housekeep can be located during a housekeeping shift. Doors and entrances are marked with colored dots indicating their security level. The vacuum specialist turns out all lights and locks all doors after moving through an area.



Cleaning Effectiveness and Building Health

(OS1) recognizes more fully the purpose of cleaning. (OS1) recognizes the health protection value and importance of effective cleaning throughout the entire institution and expects a consistent high level of performance. *'Clean for Health Protection First and Appearance Second'* is a central part of the (OS1) philosophy of cleaning. Zone cleaning at UNC claims no such philosophy. The current zone cleaning process tends to execute cleaning as a common, mundane task with limited health and sanitation value.

Effective housekeeping, such as that provided by (OS1) creates a healthy condition by reducing exposures and risks. It enables sanitation, breaks the transmission chain of infectious agents, and prevents illness. Housekeeping provides living and working space. It protects valuable materials and equipment, and maintains the value of property. Housekeeping encourages topophilia —attraction to or “love of place”. It accents aesthetics, promotes human dignity, sends caring messages, instills a sense of ownership. It projects a professional image and enhances human productivity. It is a form of insurance that prevents crisis and reduces the full range of costs related to property and real estate. Cleaning manages wastes and contributes to environmental protection and sustainability.

Environmental sampling of dusts, fungi, bacteria, and aerosol(PM10) was conducted for Carroll Hall prior to and during the (OS1) pilot study. To compare (OS1) to zone cleaning, samples were also taken in Dey Hall, a zone cleaned building adjacent to Carroll Hall.

Cleaning effectiveness is measured in terms of the quantity of unwanted matter removed. During the Carroll Hall pilot, (OS1) produced a measurable cleaning result that is (at least in this study) a factor of 2-5 times more effective in removing dust from the building envelope. The data suggest that the (OS1) system better manages fungal spores and reduces the risk of allergic reaction of occupants. The two highest fungal levels as indicated by TNTC (To Numerous To Count) plates were found in zone cleaned processes.

A measure of cleaning effectiveness and sanitation in restrooms is aerobic bacteria counts. The data suggests (OS1) cleaning system produces a sanitary condition consistently higher than zone cleaning. In two post cleaning measurements of Dey Hall, it was observed that some restrooms were not cleaned at all. This is an artifact of inconsistent and fragmented zone cleaning. Another significant difference is that (OS1) produced a consistent sanitary condition using a single portioned disinfectant. No E-coli bacteria were found after restroom cleaning in both (OS1) and zone processes when the restroom was cleaned.

Throughout the pilot study, there was building construction adjacent to Carroll Hall. The construction activity added to housekeeping requirements and also affected indoor air quality. In the face of this extraordinary and less than desirable outside conditions, over the course of the pilot study, the (OS1) cleaning program reduced dust concentration in Carroll Hall by a factor of 2, (40-50%). The IAQ data are remarkably similar to the data collected in the Frank Porter Graham Child Development Center Study in 1990 that demonstrated that any systematic cleaning program has a positive influence on IAQ.



Summary of Findings

There is evident need and demand for improved housekeeping at UNC. Based on frequent observations over a four month study period and a comparative environmental assessment of a zone cleaned and (OS1) cleaned buildings along with a consideration of housekeeping satisfaction survey where 47% of respondents are dissatisfied with the university housekeeping program, there is a clear need to improve or change the current UNC housekeeping system.

In 2005 the Director of Facility Services at the University of North Carolina at Chapel Hill discovered a number of housekeeping issues at UNC. In June 2005, a customer satisfaction survey was conducted campus wide. A central finding of that survey was that 47 percent of respondents indicated they were dissatisfied with their current housekeeping service and the resulting environmental conditions. Other issues noted with UNC housekeeping were: outdated and physically demanding equipment that was harmful to housekeepers, less ergonomically appropriate cleaning practices, limited training program to include no training of supervisors, cleaning that did not reflect the standards expected of the housekeeping department, and an apparent management/employee relationship culture that was oppressive and adversarial.

(OS1) was selected for pilot testing at UNC because it addresses many of the problems identified in the UNC. (OS1) is an enhanced form of team cleaning that produces high performance cleaning results. (OS1), designed by ManageMen, Inc., is unique in that it is a comprehensive quality or high performance management system. Unlike most cleaning programs, (OS1) does not advocate or sell any equipment or chemicals that are manufactured by ManageMen itself. The only “product” that ManageMen sells is a housekeeping cleaning management system and a training program that implements the system.

(OS1) is recommended by other institutions and found to offer an excellent opportunity to improve cleaning effectiveness and provide a better work environment for the housekeepers. The system has been pilot tested, evaluated, and implemented by a number of universities, research, and industrial institutions throughout the country. Large universities currently using (OS1) include the University of Texas Austin; University of New Mexico, University of Massachusetts Amherst. Yale University is currently evaluating the program. Research institutes, manufacturing and government facilities using (OS1) include Sandia National Laboratories; Boeing Aircraft Corporation; and Hill Air Force Base, Utah

Definition and Purpose of Cleaning

The evaluation of any cleaning program begins with an understanding of what constitutes effective cleaning/housekeeping and clear recognition of the purpose and value of the housekeeping activity. The purpose and value of cleaning and housekeeping must be recognized. (OS1) recognizes more fully the purpose of cleaning. (OS1) recognizes the health protection value and importance of effective cleaning throughout the entire institution and expects a consistent high level of performance. ‘Clean for Health Protection First and Appearance Second’ is a central part of the (OS1) philosophy of cleaning. Zone cleaning at UNC claims no such philosophy. The current zone cleaning process tends to execute cleaning as a common, mundane task with limited value.



Clean is an environmental condition free of unwanted matter in the form of solids, liquids, gases, or living organisms that have the potential to cause an adverse or undesirable effect. These unwanted, out of place substances, whether derived from humans or nature, are pollutants. They are commonly referred to with names such as waste, dirt, dust, trash, or germs.

There are many reasons and benefits for providing an effective housekeeping program. Housekeeping creates a healthy condition by reducing exposures and risks. It enables sanitation, breaks the transmission chain of infectious agents, and prevents illness. Housekeeping provides living and working space. It protects valuable materials and equipment, and maintains the value of property. Housekeeping encourages topophilia — attraction to or “love of place”. It accents aesthetics, promotes human dignity, sends caring messages, instills a sense of ownership. It projects a professional image and enhances human productivity. It is a form of insurance that prevents crisis and reduces the full range of costs related to property and real estate. Cleaning manages wastes and contributes to environmental protection and sustainability.

Cleaning, to include housekeeping, is the most basic form of indoor environmental management. It is the organized process of removing or repositioning unwanted matter so human activities can take place in a built environment. Cleaning is a systematic process of 1) knowing the environment, sub-compartment, or object to be made free of unwanted matter 2) identification of the unwanted matter 3) separation of matter from the object/environment, 4) containment of the matter so it can be effectively moved, 5) transporting the unwanted substance to a suitable location and 6) properly/safely disposing or repositioning the matter.

The primary purpose of a cleaning or housekeeping program in an institution such as UNC is to maintain and sustain a built environment/building which is healthy and sanitary for occupants and which promotes, supports, and enhances the purpose of the building and the activities carried out in the building. A useful UNC housekeeping program must primarily address the needs of building occupants and the value of cleaning. (OS1) seeks and gives primary attention to the health and well-being needs of the institution and building occupants. Zone cleaning at UNC acknowledges these needs but because of its management structure, the program is often distracted from its primary purpose and tends to focus mostly on the problems of housekeepers and supervisors and secondarily on the needs of occupants.

Effective cleaning and housekeeping is a systematic management process. (OS1) approaches cleaning as a systematic management process. The (OS1) system cleans the entire environment in a comprehensive and consistent manner. (OS1) cleaning seeks a consistent housekeeping result throughout the entire region of team responsibility.

The (OS1) system is designed to position housekeepers to be fully successful in a consistent manner. The system evolves around well trained and equipped teams to achieve clearly-defined cleaning objectives. In (OS1), housekeepers are involved in all aspects of cleaning operations and decisions.



“Zone Cleaning” is the traditional and primary method of housekeeping at UNC. Zone cleaning is a management system wherein one housekeeper is assigned a compartmentalized zone or section of a building to clean. A single housekeeper, working alone with only periodic direction and supervision of a zone manager, is held responsible for the special cleaning needs of the zone-environment. The zone cleaning management system is intended to give the housekeeper an optimum level of familiarity with the cleaning zone and a sense of “ownership” for the quality of the zone. In zone cleaning the housekeeper is a cleaning generalist and is responsible for all housekeeping services related to the zone. The zone housekeeper is responsible for trash collection, dusting, vacuuming, and restroom cleaning. (Standard tasks and frequencies for UNC Housekeeping are shown on the zone frequency table.)

Zone housekeeping is not systematized and does not have a clear, specific, environmental quality objective. The zone system cleans fragments of an environment, often cross contaminating, and failing to recognize environmental connectedness. Under the zone system there is a high degree of cleaning variability, depending on the skill and motivation level of the individual housekeeper. Zone cleaning accepts inconsistency of cleaning effectiveness throughout multiple zones.

The (OS1) Cleaning System

(OS1) is an enhanced version of “team cleaning.” Team cleaning is a management process that employs housekeeping specialists in working together to clean a building or defined area. The (OS1) system includes many coordinated and integrated components that are not typically found in other cleaning programs.

The team of specialists goes through an area systematically. Each individual on the team performs specific tasks:

- Light duty specialist: Dusting, emptying trash, spot cleaning
- Vacuum specialist: Vacuum carpet and hard floors
- Restroom specialist: Clean, sanitize, and restock the rest room.
- Utility specialist: Clean lobby areas, spot clean glass, mopping and scrubbing hard floors, and hauling trash to the dumpster from central points.

Specialists’ duties are tailored to fit the cleaning needs of a particular building. Team member tasks and scheduling are based on the building size, layout, and special needs.

The (OS1) program begins with a detailed assessment and evaluation of the building’s cleaning needs. Cleaning tasks are divided into ‘routine tasks’ to be done everywhere daily; ‘detail tasks’ to be done in a specific building quadrant/area on a specific day of the work week; and ‘project work’ such as carpet extraction and flooring stripping that is focused on one day of the week. Based on the cleaning needs assessment, job cards are prepared for each team member.



Job cards serve as a check list and provide clear understanding of the specific tasks to be accomplished, as well as providing an approximate schedule for each task or function. These cards also give supervisors, team leaders, and team members a general idea of where to find a team member at any point in the housekeeping process.

The (OS1) system has quality control built into the process that ensures a high level of cleaning effectiveness. For example as the vacuuming specialist follows the light duty specialist, waste baskets are checked to verify they are empty and have not been overlooked. The system also includes a Team Checklist in which supervisors and housekeepers jointly verify that the proper equipment is available to the housekeeper and that the tasks are accomplished to standard.

Security is also built into the (OS1) system. The job cards indicate an approximate location where the specialist can be located during a housekeeping shift. Door frames are marked with colored dots indicating their security level so as to assist the specialist in maintaining the appropriate door security. The vacuum specialist turns out all lights and locks all doors after moving through an area.

Variability and flexibility must be a part of any housekeeping program. (OS1) is designed to respond to variability of needs and conditions. The (OS1) system is flexible in that it adjusts the work load and schedule for a normal level of absenteeism. In cases of team member absences, an “(OS1) Absence Staffing Plan” adjusts schedules and tasks to ensure that critical housekeeping tasks are addressed.

Under (OS1), additional team members may be added to a building should that be necessary. There is housekeeping depth within a (OS1) team.

(OS1) is elastic enough to accommodate unique or special needs of individual housekeepers should those needs arise. For example, light work assignments can be assigned for particular housekeepers who may have temporary physical ailments or disabilities. In the zone process, there is no specific plan for changing or unexpected conditions that will assure consistent housekeeping services. For each absence or vacancy under zone cleaning, each supervisor independently identifies the tasks which should be accomplished or not accomplished, inform each housekeeper of that change, walk the housekeeper through the absent housekeepers area and then ensure the housekeeper has the equipment and knowledge to handle the additional workload. This allows for inconsistent levels of cleaning in the cases of absences. The zone process does not plan for the unexpected to the same extent as (OS1).

Leadership, Professionalism and Training

Effective housekeeping requires leadership and professionalism. (OS1) assumes responsibility for cleaning knowledge and effectiveness at all levels starting at the top. Zone cleaning at UNC tends to place the responsibility for performance primarily at housekeeper level with limited informed guidance from the top.



Training is an integral and crucial component of (OS1) system. The (OS1) training program involves training of both supervisors and housekeepers with specific focus on the (OS1) system and its cleaning objectives. Prior to (OS1) implementation, managers and supervisors attend a week long training session at ManageMen's "Janitor University" in Salt Lake City where they learn the fundamentals of cleaning and the administrative, managerial and operational components of the (OS1) system.

Housekeeper training, for all four of the (OS1) specialties are provided at the implementing institution over a 2-day period. (OS1) training at UNC was observed during the nights of April 18th and 19th.

The training centers around a well structure and illustrated syllabus and emphasizes a philosophy of cleaning that includes:

- Treating cleaning workers as first class citizens
- Cleaning for health first then appearance
- Simplification and economy in the cleaning process
- The "clean syndrome"- a generalized description of the systematic cleaning process-
- Beyond compliance policy for safety regulations
- Minimization of environmental impact
- High performance culture of exceeding all expectations.

The (OS1) system is designed to provide complete and consistent cleaning coverage to an indoor environment. All cleaning needs of the building are constantly accounted for. (OS1) Housekeepers rotate special duties on an agreed to schedule. Every housekeeper is trained in detail to perform all four of the specialist roles and duties.

Light Duty Specialist tasks include:

- Empty trash and reinstall liners
- Clean any pencil sharpeners, ask, chalk trays
- Dust all horizontal surfaces
- Pickup paper clips, paper, pencils
- Cleaning of switch plates
- Cleaning and disinfection of phones spot clean door glass.

The light duty specialist is trained and equipped with a well designed and organized set of cleaning tools. These tools and equipment are all the housekeeper requires to carry out duties. The (OS1) training is thorough in explaining the purpose and safe use of each item of equipment. They include a trash barrel on a dolly, an apron caddie, trash can liners, pre packaged and portioned detergent, a spray bottle for the detergent, a special cutting tool for the detergent package, putty knife, request forms and pencils, micro fiber dust cloths, wooly duster, job card, keys, protective gloves, and a field guide.



The Vacuum Specialist follows behind the Light Duty Specialist with the following tasks:

- Check the trash can in each office
- Vacuum all traffic areas
- Spot vacuum all other areas
- Vacuum visible matter on furniture
- Reposition furniture
- Turnout lights upon completion of a room
- Secure the area as required.

As with the zone training at UNC, housekeepers are taught how to properly wear, operate, and maintain the back pack vacuum. In actuality, the vacuum cleaner is supported on the housekeepers' hips and, if properly worn as designed, is intended to prevent strain on the back. In addition to proper fit, electrical safety is taught and emphasized.

The functions of the Rest Room Specialist include:

- Refilling toilet tissue and other dispensers
- Emptying rest room trash
- Cleaning and disinfecting all fixtures, mirrors and drinking fountains
- Spot cleaning and disinfecting partitions and doors
- Sweeping and mopping floors
- Turning out lights

Housekeepers are trained to execute a systematic flow of work in a safe, hygienic manner to include removing objects with the "nifty nabber", use of and application of disinfectant, the proper application of disinfecting spray, scrubbing of urinals and toilets, the disinfection of the floor. The restroom cleaning instruction emphasizes the proper mixing of and application of a single germicidal chemical.

The restroom cleaning tools and chemicals introduced in the program are specially designed for effective and safe cleaning. They include pre-portioned germicidal/disinfectant packs and dispenser bottles, flat mop and two sided bucket to reduce cross contamination, a mechanical "nabber" to remove unsanitary materials, safety glasses and protective gloves, appropriated dusting supplies and safety signs.



The Utility Specialist is responsible for the following tasks:

- Police stairs and vacuum stair wells
- Clean glass
- Polish brass
- Pick up trash pre-positioned on specific floors
- Spot carpet Clean 1st impression areas
- Clean high visibility carpet
- Haul trash to dumpster

Zone training was observed on May 16th.

Prior to the mid 1990's there was no formal housekeep training at UNC. Knowledge and housekeeper skill training was either introduced to the job through existing housekeeper experience or was acquired on the job over time. During the decade of the 1990's, UNC established an entry level, 4-day, training program. Zone training at UNC begins with an introduction to how housekeeping is conducted at UNC, the zone system. The administrative portion of the training program is conducted in the first day. In the first session of training, housekeepers are processed and welcomed into the department, informed of the organizational and supervisory structure of the housekeeping department, informed of timekeeping and attendance standards, management of keys, and security devices such as radios. It was emphasized in the early portion of zone training that the purpose of housekeeping at UNC was for the "wellbeing of the students."

The technical training begins on day 2 with an introduction to the different chemicals house keepers will use in their cleaning tasks. In that training, housekeepers are told which chemicals are used in different parts of different zones. They are told how chemicals are mixed properly. They are introduced to the MSDS for each chemical and where to find the MSDS sheets. They are taught how to read the different chemical labels.

The chemical safety aspect of the zone training was very complex, confusing, and incomplete. Twelve (12) different chemicals were introduced. The MSDS sheets were difficult to find and read—some were missing altogether. The requirements of "Hazardous Communication" were not followed. (This portion of zone training needs significant improvement.)

Housekeepers are introduced to personal protective equipment (PPE) and told how and when to use that equipment. Gloves, goggles, grippers, aprons, and safety shoes are discussed and demonstrated. Housekeepers are taught how to properly wear and use the backpack vacuuming cleaner used across UNC. They are taught how to change filters, and how often to change them. (There was no demonstration of vacuum cleaner maintenance.) The proper use of the Kentucky floor mop is also demonstrated as part of zone training. One areas of discussion that was only glossed over was the frequency of water replacement and steps to be taken to reduce cross contamination when cleaning restrooms.



As part of the 2nd day of zone training, new housekeepers are taught how to properly empty a trash bin. Emphasis is placed on lowering the trash receptacle to the ground, sliding the trash bag out of the container, and lifting the trash bag with use legs more than a bent back.

A general safety film was shown as part of zone training on the 2nd day. The film is generally useful but does not in any part focus on or pertain to housekeep operations at UNC.

The third day of zone training concentrated on the proper way to strip and wax floors, the use floor scrubbers, high speed and low speed burnishes, and the elements of carpet care. The fourth phase of zone training is an orientation visit to the zone in which the new housekeeper is assigned.

Housekeeper success must be ensured. In the (OS1) system, through focused training and effective equipment, housekeepers are ensured of a high quality cleaning results and subsequent recognition. In zone cleaning housekeepers are left on their own, often not heard, and unsure of cleaning results or appreciation.

(OS1) trains housekeepers in a coordinated and comprehensive manner for the implementation of a specific and effective cleaning system. (OS1) training is far more professionally oriented, science based, safety focused than other training programs found in the cleaning industry including the zone training conducted at UNC. (OS1) training begins with a clear explanation of what cleaning is, why cleanings is important, and the history and importance of the “professional” housekeeper.

(OS1) training is superior to zone training in that it is not generalized and is focused on the housekeeping process.

Safety

Safety is an integral part of (OS1) training throughout all portions of the two day program. The (OS1) safety documentation is easy to read and understand. Safety information is color-coded for easy identification and access. There is a complete MSDS for all chemicals. Housekeepers are informed of their legal worker-right-to-know rights, how to identify hazardous materials, the use of protective equipment, how to read MSDS labels, how to safely handle materials and equipment they use, and how to respond to various situations.

Safety steps to manage blood borne pathogens are covered in detail in (OS1) training. This aspect of housekeeper safety was not adequately covered in the zone training observed at UNC. Bodily substance cleanup instruction was follow-on to the restroom cleaning instruction. It introduces the housekeeper to “Universal Precautions” for defense against biobazards. The training includes the use of protective equipment, management of sharps, absorbents, disinfectants, proper disposal of biobazard materials.



Safe lifting and hauling of trash is emphasized in (OS1) of training. In addition the utility specialist training includes the safe and effective use of floor machines and pads, and carpet extractors.

Zone cleaning training generalizes housekeeping and safety information without regard to specific housekeeping responsibilities and performance expectations.

Efficiency and Minimizing Waste, Cost and Injuries

(OS1) provides comprehensive and scheduled cleaning coverage by way of an economically efficient and simplified cleaning system. Simplified streamlined processes reduce cost, wastes, and worker injuries. (OS1) employs limited, standardized, quality, tested equipment in the cleaning process with emphasis on cleaning effectiveness, safety, and ergonomics.

(OS1) limits and standardizes cleaning equipment and supplies, thereby reducing material usage and waste. On the other hand, UNC zone housekeeping uses a wide variety of equipment and cleaning technology - mostly untested and ineffective. Many of cleaning chemicals used in zone cleaning are not necessary to accomplish effective cleaning.

Under (OS1) the number of concentrated chemicals has been reduced from an average of 7 to 2 ensuring less unnecessary chemical exposure to housekeepers and building occupants.

System simplicity is a main component of the (OS1) system. There is far more organization and safe and sanitary storage of cleaning equipment supplies in the (OS1) system than in the zone system. (See the attached photos as examples.)

The (OS1) system uses far less chemical than the zone system with less risk for a significant chemical spill or accident. The mops are much easier to use and maintain in the (OS1) system than the zone system. The two chamber mop bucket reduces cross contamination and provides for significantly higher level of sanitation.

Observations were made of the cleaning equipment and chemicals used in both the zone system and (OS1) system. In the zone system each housekeeper is assigned a closet in which to store equipment, chemicals, and supplies. There are on average, one housekeeper closet for every two floors throughout campus. Typically a UNC zone housekeeper has 5-8 different cleaning chemicals in the closet. Most of these chemicals are in concentrated form, in half-gallon size containers. When the chemical is used, it is mixed by using a manufacture's supplied mixing machine. All zone housekeepers are supplied with a cleaning cart, micro fiber dust cloths, and spray bottles. They typically mop floors with a #12 Kentucky mop. The mop bucket is a single chamber plastic bucket. The bucket is not designed to reduce cross contamination through the separation of fresh water and rinse water.



In the (OS1) system, multiple janitorial closets are replaced with a single, centrally located team room that contains housekeeper lockers, and a constantly inventoried housekeeping supply cabinet. The entire (OS1) housekeeping team operates from this central location. A central “equipment room” provides storage for vacuums and heavy cleaning equipment. Paper supplies are restocked and stored in central “pantry” locations throughout the building.

(OS1) has a research program that constantly assesses the most effective and suitable equipment chemicals; supplies and equipment that are ergonomically improved, provides sanitation and hygiene, and are environmentally sustainable. In the (OS1) system there are only two or three chemicals employed, a general purpose disinfectant and a detergent.

(OS1) chemicals are in pre-portioned plastic bags and assigned to specialists at the start of each work shift according to their assignment and need. The portion pac chemicals are especially designed to reduce cleaning chemical injuries to housekeepers. The housekeeper carries the chemical packets in a distribution tray and uses them as required. The empty containers are returned to the check-in room and accounted for after each shift.

The manufacturer of (OS1) cleaning chemicals was recently recognized as a leader in environmental protection and sustainability. PortionPac products used in (OS1) are certified and labeled as green cleaning products by Green Seal. Green Seal is an independent non-profit organization dedicated to safeguarding the environment and transforming the marketplace by promoting the manufacture, purchase, and use of environmentally responsible products and services. Green Seal Certification ensures that a product meets rigorous, science-based environmental leadership standards. This gives manufacturers the assurance to back up their claims and purchasers confidence that certified products are better for human health and the environment. Government agencies increasingly recommend and require that only green certified products be purchased and used in facilities under their control.

In the (OS1) system, the traditional Kentucky mop is replaced with a much lighter flat floor mop. The flat cloth mop head is removed after each work shift and washed and dried. The bucket used with the flat mop has two chambers, one for fresh water and cleaning solution, and rinse section for depositing waste water. *The (OS1) mop system greatly reduced cross or recontamination when mopping and unsanitary floor, especially in a restroom.*

The micro-fiber dust cloths used in (OS1) are also washed for reuse after every work shift.

(OS1) cleaning technology have been tested, evaluated and employed for their safety and cleaning effectiveness attributes.



Compliance

(OS1) uses benchmarking and compliance auditing to periodically verify the management process is on track and being properly followed and implemented. It is likely that a high level of environmental quality will be achieved and maintained if the (OS1) management process is followed as designed. Zone cleaning at UNC has no systematic evaluation or environmental quality measure program.

The (OS1) compliance audit and the environmental conditions produced by the system was not statistically correlated or quantified as part of this pilot study. However, it is anticipated that compliance with the prescribed (OS1) management system is a strong indicator of a well managed housekeeping program that produces highly sanitary and healthy environmental conditions. In the first (OS1) pilot study conducted in the UNC Bioinformatics Building, a baseline audit score of 14% was achieved for UNC's standard zone cleaning program. After 90 days of the (OS1) program, the visibly improved environmental conditions in the Bioinformatics building were similar if not identical to those also observed in the Carroll Hall (OS1) Pilot. The (OS1) audit score after 90 days in Bioinformatics was 80% which is considered to indicate a well managed, high performance cleaning program.

Vacuum Cleaner Performance

The (OS1) prescribed vacuum cleaners reduce back strain and injuries, and have much lower particle emissions to the breathing zones of house keepers than the typical upright machine used in zone cleaning.

In recent years, UNC has begun to issue ProTeam—Green label—Backpack Vacuum cleaners. However, throughout the campus there are a variety of upright, push pull vacuum cleaners used by individual housekeepers. The newly acquired and implemented back pack vacuum cleaners are “Green Label Vacuums” tested and certified by the Carpet and Rug Institute (CRI). Green Label Vacuum Cleaners are increasingly recognized and recommended by environmental health authorities as useful in maintaining a healthy indoor environment. Households, offices, and institutions such as universities, schools and health care facilities have become more concerned about allergies and health effects exacerbated by exposure to a variety of dusts and particles. Studies show that effective vacuuming makes a big contribution to keeping particle levels sanitary levels indoors. The health science clearly indicates that regularly scheduled vacuuming is very effective in allergen exposure reduction.

The biggest contribution of a well designed vacuum cleaner is reducing unwanted substances (including common allergens) to concentration levels where adverse or unwanted effects, including damages to valuable materials, are unlikely to occur. The vast majority of matter that can build-up and cause problems indoors can be easily and effectively be removed by a Green Label tested vacuum cleaner.



Prior to the CRI Green Label Program for Vacuum Cleaners, there was no comprehensive test for determining collectively the dust removal efficiency; the amount of particulate matter actually retained by the vacuum cleaner compared to the amount emitted to the indoor air; and the effect vacuuming cleaning has on carpet construction and appearance. To receive a CRI Green Label, a vacuum cleaner must pass test standards in three areas: soil removal, dust containment (IAQ protection), and carpet appearance.

Throughout the pilot study, beginning in the training sessions, measurements were made of particulate matter emissions associated with the (OS1) “green label” back pack vacuums and other vacuums currently in use as part of the zone cleaning system. During the (OS1) training a dust measurement was made on a green label back pack vacuum and an upright vacuum. There was virtually no detectable emission from the green label vacuum (32 ug/m³) compared to a very high emission (240 ug/m³) from the upright. A level greater than 100 ug/m³ is considered unsanitary and potentially harmful to a large segment of the population.

Similar measurements were collected using TSI, DustTrak Aerosol Monitor (model 8520) with 10 micrometer nozzle at various times during May and June. Peak readings at the exhaust of vacuums were taken during initial first few minutes of operation. In addition area measurements were collected around head height (5 to 6 feet) during vacuuming of carpet.

The standard (OS1) vacuuming was found to be vastly superior to the zone vacuum in all measurements particle retention and reduced air emissions.

Building/Location	Date	Vacuum Type	Measurement (ug/m³)
Carroll Hall	5-3-06	Backpack (ProTeam Super Coach)	30 to 45
Carroll Hall	6-7-06	Backpack (ProTeam Super Coach)	26 to 47*
Gardner Hall	5-3-06	Upright (Advance Carpet win14)	100 to 2000
Dey Hall (Toy Lounge)	6-7-06	Upright (Mastercraft 4th Floor Unit)	15 to 98 (peak) 40-50 (avg.)
Dey Hall (2nd floor Office)	6-7-06	Upright (Mastercraft 2nd Floor Unit)	35 to 150
Dey Hall (1st Floor)	6-7-06	Upright (Eureka)	40 to 50



Measurement Program: Overview

(OS1) produces a measurable cleaning result that is (at least in this study) a factor of 2-5 times more effective in removing unwanted in the form of dust from the building envelope. Cleaning effectiveness is measured in terms of the quantity of unwanted matter removed. To aid in the assessment of cleaning effectiveness, environmental sampling of dusts, fungi, bacteria, and PM 10 air quality was conducted for Carroll Hall prior to and during the (OS1) pilot study. To better compare (OS1) to zone cleaning, samples were taken in Dey Hall, a zone cleaned building adjacent to Carroll Hall.

Studies have shown that cleaning when consistently implemented is cost effective and can lead to measurable environmental improvements. For example, a 1990 EPA sponsored study (“The Total Building Cleaning Effectiveness Study,”) in collaboration with Research Triangle Institute, the University of North Carolina Medical School, and the professional cleaning industry, demonstrated that an organized cleaning program contributes to reductions in particles, volatile organic compounds (VOCs), and biological pollutants in excess of 50%. In the pilot study, comparable environmental quality improvements were found in the (OS1) cleaning system.

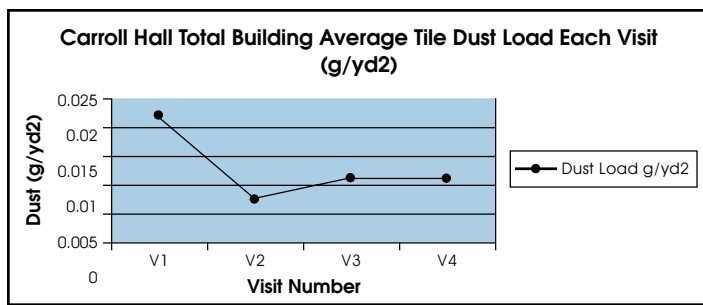
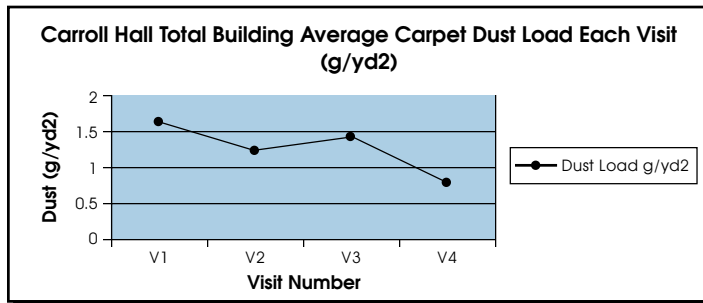
Measurement Program: Dusts Removal

Carpet dusts, hard floor dusts, and dusts on counters/ horizontal surfaces were all measured using the following protocol.

- Carpet dusts were measured using a *Miele Composite Samples Protocol* where five locations on each floor are selected and sampled as a composite. Approximately 10' x 10' (typically 4' x 8") (or other measured) areas are sampled at each location with a pre weighed Miele bag. The traverse rate is approximately 0.38 seconds per foot of travel. Each lane is traversed front to back. Five locations on each floor are consolidated in one Miele bag. Each Miele bag is reweighed after sampling. On subsequent visits, adjacent areas are sampled. Carpet dusts are listed as grams of dust per square yard.
- Tile floor dusts were measured a *Swiffer Composite Samples Protocol*. Five locations on each floor are selected and sampled as a composite. Approximately 10' x 10' 4' x 8' (or other measured) areas are sampled at each location with a Pre weighed dry Swiffer cloth. The traverse rate is approximately 0.38 seconds per foot of travel. Each lane is traversed front to back. Five locations on each floor are consolidated in one Swiffer cloth. If any dust is collected that does not stay on the Swiffer, it is hand collected for measurement. Each Swiffer cloth is reweighed after sampling. On subsequent visits, adjacent areas are sampled. Tile floor dusts are listed as grams of dust per square yard.
- Dusts on elevated horizontal surfaces were measured using the following protocol. For each sampling excursion, one pre-weighed Swiffer cloth is used per floor to collect composite surface dust. 25 measured surfaces such as shelves, tables, file cabinets, ledges, etc., are composited on each floor. Surface types and areas are recorded. The composite content dust Swiffer from each floor is then be weighed and divided by the total area sampled. Results are listed as grams of dust per square yard.



Carroll Hall	Pre-(OS1) 4/22/06	(OS1) 6/3/06	(OS1) 6/24/06	(OS1) 7/21/06	Comments
Carpet Dust	1.5	1.23	1.4	0.81	31% average reduction
Hard Floor Dust	0.022	0.008	0.011	0.011	120% average reduction
Counter Dust	0.093	0.025	0.020	0.020	342% average reduction
Dey Hall			Zone 6/16/06	Zone 7/14/06	
Carpet Dust			6.4	2.79	Unsanitary > 2 gm/yd ²
Hard Floor Dust			0.022	0.031	No significant change
Counter Dust			0.043	0.031	No significant change



(OS1) cleaning system reduces dust levels found in cleaned environments by a factor of 2 or more. Carpet dusts were cut in half by the end of the end of the (OS1) pilot study and well within the sanitary zone (< 2 gm/yd²). Dust levels under the zone system are higher and probably influence/ deteriorate particle IAQ, especially with regard to high loads of carpet dusts. The level of carpet dusts in the zone cleaned building is judged to be unsanitary (> 2 gm/yd²).



Measurement Program: Fungal Spores

Fungal spores are a part of all house dusts. Vacuuming is a means of removing most fungal spores. When there are numerous spores indoors, the likelihood of allergic response, to include asthma, increases. Samples of fungi CFU's are to numerous to count (TNTC) are often the indication of a problems related to ineffective cleaning or water intrusion.

Fungal spores measures are made using swab and Petri-film method. For each sampling session, there are 25 swabs collected on each of four floors from shelves, tables, cabinets, etc., Total = 100 fungal swab samples. A template of 100 cm² (10 x 10 cm) area is used. Each swab is eluted in two ml of AOAC buffer and 1 ml is pipetted onto fungal Petri strips. Petri strips are then placed into zip lock bags in a 25 C incubator. Results are the Total CFU counts per 100 cm².

Carroll Hall	Pre-(OS1) 4/22/06	(OS1) 6/3/06	(OS1) 6/24/06	(OS1) 7/21/06	Comments
Fungal Spore	15% TNTC	0% TNTC	3% TNTC	3% TNTC	Significant spore reduction
Fungal Spore Average CFU/100cm ²	24.5	55	17	26	Normal seasonal variation
Dey Hall			Zone 6/16/06	Zone 7/14/06	
Fungal Spore			6% TNTC	3% TNTC	Unsanitary > 5%
Fungal Average CFU/100cm ²			44	34	Higher than (OS1)

The two highest fungal levels as indicated by TNTC plates were found in zone cleaned processes. The data suggest that (OS1) systems better manages fungal spores and reduces the risk of allergic reaction of occupants.

Measurement Program: Restroom Bacteria

Bacteria levels are measured as an indication of cleaning effectiveness in restrooms. Both aerobic and e-coli bacteria are sampled using Petri-film. The sampling protocol is as follows: For each visit a total of five swabs for both aerobic bacteria and e-coli bacteria are collected from each of two restrooms on each floor for a total of 40 bacterial swabs for each type of bacteria. A template of 1 in 2 is used. Restroom surfaces sampled are 1) inside door handle, 2) sink basin, 3) sink spigot area, 4) toilet rim, 5) toilet seat. Each swab



will be eluted in two ml of AOAC buffer. One ml is placed onto one aerobic Petri strip, and one ml is placed onto one E.-coli Petri strip. Petri strips are placed in zip lock bags and into 35 C incubators. Results for each will be Total CFU counts per 1 in 2 area.

Aerobic Bacteria

Carroll Hall	Pre-Cleaning (OS1) 6/23/06	Post Cleaning (OS1) 6/26/06	Pre-Cleaning (OS1) 7/21/06	Post Cleaning (OS1) 7/24/06	
Door Handel	44	3	36	6	
Sink Basin	31	1	28	1	
Sink Faucet	45	0	33	0	
Toilet Seat	83	4	25	1	
Toilet Rim	48	13	20	0	
Dey Hall	Pre-Cleaning Zone 6/16/06	Post Cleaning Zone 6/26/06	Pre-Cleaning Zone 7/14/06	Post Cleaning Zone 7/17/06	Post Cleaning Zone 7/24/06
Door Handel	171	7	69	1	4
Sink Basin	23	1	129	2	13
Sink Faucet	28	2	65	32	14
Toilet Seat	57	1	408	3	6
Toilet Rim	8	1	1	0	0

A measure of cleaning effectiveness and sanitation in restrooms is aerobic bacteria counts. The data suggests (OS1) cleaning system produces a sanitary result consistently better than zone cleaning. In post cleaning measurements of Dey Hall, it was found that some zone restrooms were not cleaned at all. This is the common consequence of the fragmented cleaning coverage found in the zone system. Another significant difference is that (OS1) produced a sanitary condition using a single portioned disinfectant. No E-coli bacteria were found after restroom cleaning in both (OS1) and zone processes when the restroom was cleaned



Measurement Program: Indoor Air Quality

Indoor air quality as measured by particulate matter can often serve as an indicator and measure of cleaning effectiveness related to house dusts. However, in using IAQ as a measure of cleaning effectiveness it needs to be realized that IAQ is significantly influenced by the quality of ambient or outside air, ventilation, activities of building occupants, and special outside activities and conditions—such as agriculture and construction.

Throughout the pilot study dust tract measures were periodically made of indoor air concentrations of particulate matter (PM10), (airborne dusts in the size range less than 10 microns). These particulate matter measures were not as technically exact as previous measurements made in research projects, but are suggestive of the positive influence cleaning has indoor air quality.

The data tabled below, for both Carroll Hall Library and a Dey Hall lecture room are approximate ranges of particulate matter. It should also be noted that throughout the pilot study, there was building construction adjacent to Carroll Hall. The construction activity added to housekeeping requirements and also affected indoor air quality. In the face of this extra-ordinary and less than desirable outside condition, over the course of the pilot study, the (OS1) cleaning program reduced dust concentration in Carroll Hall as measured as PM10 by more than a factor of 2 or in an improved airborne particulate matter reduction range 40-50%.

The Dey Hall data is related to Zone Cleaning. The contestations of PM10 are similar to the levels of airborne dusts observed in Carroll Hall when it was under Zone Cleaning.

These data are remarkably similar to the data collected in the Frank Porter Graham Child Development Center Study in 1990 that demonstrated that any systematic cleaning program has a positive influence on IAQ, i.e., 40-50% airborne PM reduction.

Aerosol Monitoring

Sampling Dates	Approximate PM10 conc
April 20-22	20-40 ug/m3
May 1-2	10-30 ug/m3
June 26-29	5-25 ug/m3
July 13-14	10-25 ug/m3

PM 10 Dey Hall Lecture Room (3rd Floor)

Sampling Dates	Approximate PM10 conc.
June 20-21	15-40 ug/m3