How To Select And Use Safe Janitorial Chemicals

Project Completion Report

Pollution Prevention
Incentives For States

U.S. EPA Region IX
California EPA
County of Santa Clara

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Preface

This report is an account of a pilot project to evaluate pollution prevention opportunities in the janitorial industry. The project was a collaboration of many individuals, businesses, and agencies whom the authors wish to acknowledge for their valuable contribution. The project would not have been a success without their support.

"Although the work described in this report has been funded in part by the United States Environmental Protection Agency through Grant Number NP-999-729-01-0 to the State of California, it has not been subjected to the Agency's required peer and policy review and therefore does not necessarily reflect the views of the Agency, and no official endorsement should be inferred."

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Abstract

This report is an account of an 18-month Pollution Prevention Incentives for States project undertaken in Santa Clara County, California. The report describes both how the team performed its work and the results that it obtained. Additional information about janitorial pollution prevention appears in the accompanying volume of Appendices, on the project website, and in the completion report prepared for the related outreach effort for small janitorial organizations in Richmond, California.

Needs Assessment - Workers' compensation data adapted from Washington State show that janitors are injured fairly frequently by the chemicals that they use:

- Six out of every hundred janitors in Santa Clara County injure themselves with chemicals every year;
- 27,000 janitors working in the county experience a total of about 1,200 injuries each year;
- 20% of these injuries are serious burns to the eyes or skin; and
- Medical treatment and lost job time for these chemical injuries in Santa Clara County is about $750,000 per year.

Making a rough extrapolation of these estimates to the national level, the team believes that medical expenses and lost time for chemical injuries to janitors throughout the United States total about $75 million per year.

The Santa Clara team identified pollution prevention information that janitors working in large organizations do not have, and found out that assistance could best be delivered via fact sheets, training workshops, and on-site product reviews and assistance.

Because safety is a key issue for janitors, the team emphasized hazards associated with specific high-risk cleaning work, techniques for safe storage and mixing, and methods for janitors to learn on their own the health consequences of specific chemical ingredients.

Janitorial Product Use - The average janitor uses an estimated 28 gallons of chemicals per year, weighing 234 pounds. Hazardous ingredients comprise about 25% of the total, or 58 pounds. The Santa Clara team focused its efforts upon chemicals appearing in 19 key products that are used for care of hard floors, carpets, restrooms, windows, and miscellaneous tasks. The cost for these products is estimated as $250 per worker, which is only about 1% of the annual salary of $20,000 typically earned by that same worker.

The project team worked with 47 organizations, two-thirds of which were janitorial contractors. These organizations employ about 6,800 people, representing about 25% of the janitors working in Santa Clara County. Each year the employees of the 47 firms use a combined total of 1,140 chemical products that contain an estimated 400,000 lbs. of hazardous materials.

Pollution Prevention – Safety and environmental improvement are both accomplished by changing from products with highly-toxic ingredients to ones that are less hazardous. Some cleaning tasks must use hazardous products because there are no effective substitutes. In these instances the best pollution prevention strategy is to have the janitor dilute each product as much as possible, and to use it only when absolutely necessary.

Managing the entry of dirt into the building is another way of accomplishing source reduction. Less soil in the building means less frequent cleaning, which in turn requires less chemical usage. Daily vacuuming also helps accomplish this goal.

Other, longer-term pollution prevention strategies include designing buildings with easy-to-clean architectural features (e.g., keep carpets out of locker rooms), taking care that features with incompatible cleaning needs are kept apart from each other (e.g., not situating carpets and vinyl tiles together), and operating air conditioning systems so as to minimize the movement of dust.

Forecast Results - Exhibit A shows that use of hazardous janitorial chemicals at the 47 participating organizations could decrease by 131,306 lbs. per year if all of the recommendations the team made during site visits, workshops, and other local outreach efforts were to be followed. About 25%, or 29,260 lbs. of this potential annual reduction are actually expected to occur.

Exhibit A

Forecast Reduction In Use Of Hazardous Materials (Santa Clara County)

		Hazardous Materials (lbs per year)		
		Amounts	Forecast Reductions	
	Janitors	Used Before	Potential	Expected
Contractors				
Assisted Sites	4,629	221,593	88,637	16,606
Others	3,324	159,122	63,649	5,962
Total	7,953	380,714	152,286	22,568
Site Employees				
Assisted Sites	2,228	106,673	42,669	12,654
Others	16,650	797,026	318,811	47,275
Total	18,878	903,699	361,480	59,930
Combined Totals				
Assisted Sites	6,857	328,266	131,306	29,260
Others	19,974	956,148	382,459	53,237
Total	26,831	1,284,414	513,765	82,497
				Already Reduced: About 15,000 lbs/yr

If the other contractors and individuals doing janitorial work in Santa Clara County were to make similar changes, the total use of hazardous janitorial chemicals throughout the county could decrease by 513,765 lbs. per year. Motivated by a continuing outreach effort, 82,497 lbs. of this potential reduction might actually occur.

For more information visit the project website: <http://www.westp2net.org/janitorial/jp4.htm>

1. Introduction

This report is an account of an 18-month Pollution Prevention Incentives for States project undertaken in Santa Clara County, California. The project team was comprised of staff from a number of organizations, including:

- US EPA Region IX (San Francisco);
- Cal/EPA – Department of Toxics Substances Control;
- County of Santa Clara – Pollution Prevention Program;
- Technical consultants;
- Stakeholders from the janitorial industry; and
- Forty-seven organizations and their suppliers that participated by having detailed, on-site reviews done of their janitorial products.

The report describes both how the team performed its work and the results that it obtained. Following a summary in Section 2, the report discusses:

- The needs assessment that was done;
- Patterns discovered in janitorial chemical use;
- Pollution prevention opportunities available to janitors;
- Outreach efforts that were undertaken, and
- Expected reductions in hazardous materials use that this outreach caused.

Additional information about janitorial pollution prevention appears in the accompanying volume of Appendices, on the project website, and in the completion report prepared for the related outreach effort for small janitorial organizations in Richmond, California.

2. Summary

The Santa Clara project team reached all six objectives established in September 1998:

1. Determine attitudes and needs of facility managers and janitors with respect to the chemicals that they use;

2. Conduct a series of on-site product reviews to identify cleaning and maintenance chemicals that have health, safety, or environmental issues;

3. Develop checklists, fact sheets, and other references that facility managers may use to evaluate their janitorial chemicals;

4. Find effective products for sites to try as environmentally preferable substitutes for hazardous chemicals that they have been using;

5. Conduct pollution prevention outreach education via workshops, on-site assistance, and demonstrations; and

6. Estimate the amount by which annual hazardous materials use is reduced by janitors that the project team worked with.

2.1 Needs Assessment

The Santa Clara team began its outreach effort with a needs assessment that identified pollution prevention information that janitors do not have, and found out that assistance could best be delivered via fact sheets, training workshops, and on-site product assistance.

Because safety is a key issue for janitors, the team decided to emphasize hazards associated with specific high-risk cleaning work, techniques for safe storage and mixing, and methods for janitors to learn on their own the health consequences of specific chemical ingredients.

The highest risk janitorial products are generally ones that:

- Are corrosive to the eyes and skin (e.g., acid toilet bowl cleaner; floor finish stripper);

- Are flammable (chewing gum freezer; metal polish);

- Give off toxic fumes (metal polish; graffiti remover); or

- Are poisonous (metal polish; graffiti remover; degreasers).

2.2 Chemical Injuries To Janitors

In addition to reviewing products and conducting surveys, the Santa Clara project team also identified the frequency and severity of accidents that janitors actually experience with chemicals. Workers' compensation data adapted from Washington State suggest that:

- Six out of every hundred janitors in Santa Clara County injure themselves with chemicals every year;
- 27,000 janitors working in the county experience a total of about 1,200 injuries each year;
- 20% of these injuries are serious burns to the eyes or skin; and
- Medical treatment and lost job time for these chemical injuries in Santa Clara County is about $750,000 per year.

Making a rough extrapolation of these estimates to the national level, the team believes that medical expenses and lost time for chemical injuries to janitors throughout the United States total about $75 million per year.

2.3 Janitorial Chemical Use

Janitors use a wide variety of chemicals in their work, including products for floor care, restroom maintenance, and general cleaning. Suppliers furnish these items ready to use ("RTU") in trigger bottles and aerosol cans, or as liquid and solid concentrates that are to be mixed at the site with water.

The amounts of each chemical that a janitor uses vary according to the types of buildings the firms maintain. For example, hotels and airports often have extensive carpeted areas and busy public restrooms. Such high-traffic buildings require more products for carpet and restroom maintenance than do offices or manufacturing plants.

The average janitor uses an estimated 23 gallons of chemicals per year, weighing 194 pounds. Hazardous ingredients comprise about 25% of the total, or 48 pounds. The cost for these products is estimated as $250 per worker, which is only about 1% of the annual salary of $20,000 typically earned by that same worker.

2.4 Janitorial Pollution Prevention Measures

Every janitor that employs all of the chemical substitutions and other pollution prevention measures identified by the Santa Clara team will reduce his or her hazardous materials use by 40%, or 19 lbs. per year.

Chemical Substitutions – Pollution prevention can be accomplished by changing from products with highly-toxic ingredients to ones that are less hazardous. For example, converting from:

- Glass cleaner containing butoxyethanol to one formulated with isopropanol or other less-hazardous ingredients (Potential annual hazardous materials use reduction: 0.75 lbs per user);

- General purpose cleaners with alkyl phenyl ethoxylates, ethanolamine, or butoxyethanol to ones formulated with linear alcohol ethoxylates, citric acid, or other less-hazardous ingredients (Potential reduction: 0.3 lbs per user); and

- Metal polishes with either tetrachloroethylene or volatile organic compounds. to ones with low-volatility hydrocarbons or non-toxic ingredients (Potential annual reduction: 0.2 lbs per user).

Chemical Use Reduction - Some cleaning tasks must use hazardous products because there are no effective substitutes. In these instances the best pollution prevention strategy is to have the janitor dilute each product as much as possible, and to use it only when absolutely necessary.

Examples of chemical use reduction include starting a program of tracking product quantities, changing floor stripping techniques, and using two products instead of one to clean toilet bowls. The potential hazardous materials use reduction from these steps is conservatively estimated as 10 lbs per year for each janitor.

Monitoring the use of any product usually leads to less of it being consumed. Firms that begin to track floor stripper or toilet cleaner quantities report realizing reductions of 10% to 20%. However, this monitoring must be continued for the change to be permanent. The potential hazardous materials use reduction from such administrative procedure changes is conservatively estimated as 1.0 lbs per year for each janitor.

Floor strippers often contain ammonium hydroxide, ethanolamine, and butoxyethanol, making this product one of the most dangerous handled by janitors. These strong ingredients are needed to dissolve and remove modern, highly-resistant polymer floor finishes. However, minimizing floor stripper use by 50% or more is possible by:

- Scheduling floor renewal work according to wear patterns rather than simply following a calendar;

- Diluting the stripper with as much water as possible (but not so much that the floor finish is removed unevenly);

- Carefully applying the diluted stripper with a rotating pad scrubber; and

- Thoroughly rinsing the stripped floor so as to neutralize the surface prior to applying the new floor finish.

The potential hazardous materials use reduction from these changes is 40 lbs per year for each janitor actively involved with floor finish work, or 4.0 lbs per year spread across all of the workers in the typical janitorial contracting firm.

Acidic porcelain cleaners are another of the most hazardous janitorial products. Formulated with hydrochloric, phosphoric, or hydroxyacetic acid, these cleaners are very effective in removing hard water deposits and stubborn stains.

However, this much cleaning power is not normally needed every day. Therefore, a good pollution prevention strategy is to use two cleaners - a mild product for daily cleaning, and an acid cleaner that is only used when absolutely necessary. Adopting this strategy will potentially decrease hazardous material use by an 1.8 lbs per user per year.

Other Pollution Prevention Measures - The ideas presented so far have been ones with a direct impact on chemical use. In other words, switching to less hazardous products causes the amount of hazardous materials used by janitors will go down. Several "indirect" methods can significantly reduce chemical usage as well.

Managing the entry of dirt into the building is another way of accomplishing source reduction. Cleanable floor mats, double-door entry chambers, and positive air pressure are all very effective in preventing foot-borne dirt from entering the building in the first place. Less soil in the building means less frequent cleaning, which in turn requires less chemical usage.

Daily vacuuming with strong suction, tight filter, rotating brush machines removes up to half or more of the soil that falls onto carpets. Routine vacuuming, with up to four back and forth strokes of the wand across the carpet, is sufficient for low traffic areas. Up to ten wand strokes may be needed at outside doorways and other high traffic areas. Supplemental vacuuming will also be needed along walls and carpet edges where soil tends to accumulate.

Other, longer-term pollution prevention strategies include designing buildings with easy-to-clean architectural features (e.g., keep carpets out of locker rooms), taking care that features with incompatible cleaning needs are kept apart from each other (e.g., not situating carpets and vinyl tiles together), and operating air conditioning systems so as to minimize the movement of dust.

Chemical use reductions for floor mats, vacuuming procedures, and other indirect strategies is on the order of 2 lbs. per average janitor per year.

2.5 Pollution Prevention Outreach Materials

Janitors participating in the needs assessment convinced the Santa Clara team to concentrate its local outreach efforts in five key areas. Items produced for each area appear in the Appendices and on the project website.

1. ***Fact Sheets*** with information about safer ways to clean.

2. ***Tools*** for people to use in evaluating the chemical products they use, including forms, checklists, ingredient hazard tables, and guidance on how to find internet sites that feature chemical data.

3. ***Commentaries*** about how to successfully change from strong chemicals to environmentally preferable ones. This category includes success stories and

articles written by the project team, as well as materials furnished by other agencies.

4. ***Workshops*** for training janitorial professionals about product health, safety, and environmental issues. The project held three major workshops to share project results with janitors, facility managers, and agency staff. These sessions emphasized evaluating product risks, finding environmentally preferable products, trying out sample products, and safely managing chemicals.

    - July 1999 Industry Workshop - Attendance: ±60. Time: 4 hours. Sponsored by the County of Santa Clara and the University of California, Santa Cruz, Extension Service.

    - September 1999 Industry Workshop - Attendance: ±25. Time: 90 minutes. Sponsored by the Pacific Association of Building Services Contractors.

    - October 1999 Agency Workshop - Attendance ±45. Time: 2 hours. Sponsored by the Western Regional Pollution Prevention Network.

    Workshop results and other feedback were universally positive, indicating that the materials presented were both informative and important to the attendees.

5, Free On-site Assistance in reviewing janitorial chemicals, recommending alternatives, and providing samples of environmentally preferable products.

Based upon repeated requests from sites and contractors, the Santa Clara team decided to find, test, and distribute samples of environmentally preferable products. This effort took four months, and resulted in the identification of about 20 products for use as samples.

Following the initial trials, the project team delivered samples as pre-packaged kits consisting of three or more alternative products, a 2-quart plastic bucket featuring a safety message in both English and Spanish, MSDSs, other product literature, gloves, goggles, and product evaluation forms.

In hindsight, the Santa Clara team believes that industry outreach efforts for future projects could be improved by preparing and presenting more materials in Spanish and other languages spoken by janitorial workers. In addition, with addresses now readily available on the internet, it is possible to mail outreach materials directly to owners and managers of janitorial companies.

2.6 Agency Outreach Efforts

The project scope required the Santa Clara team to share its findings, methodology, and outreach materials with other government agencies. This goal was accomplished via e-mail announcements, direct mailings, technical articles, and professional conferences.

- E-mail Announcements - The team posted e-mail messages about the project to several regional and national list servers to which agency P2 staff subscribe. In addition, e-mail was used to tell local agencies in the San Francisco area about

workshops and other events. Finally, the project arranged for links to its website to be added to the websites maintained by the National Association of Counties and other organizations with an interest in environmentally preferable purchasing.

- Direct Mailings - Project events, publications, and other resources were announced in a number of postal mailings. For example, newsletters were sent locally via the County of Santa Clara's P2 mailing list, and the project website was announced through-out the state to members of the California Association of Public Purchasing Officials.

- Pollution Prevention Conferences - The project's approach to janitorial pollution prevention was featured at a number of conferences, such as the 1998 and 1999 Western Regional Pollution Prevention Network meetings in San Diego and Monterey.

It is estimated that the project reached a total of about 1,500 agency staff through these efforts. About 250 individuals attended workshops and technical presentations that the Santa Clara team made. Three hundred others received announcements mailed directly to them. The balance received e-mail messages, visited the project website, read articles published about the project, or learned of the project through personal referrals.

Several agencies have advised the Santa Clara team that they are using materials and lessons learned from the project. For example, Sonoma County is beginning an effort to shift a dozen local agencies into purchasing environmentally preferable janitorial products. The City and County of San Francisco is undertaking a similar program for its departments. In addition, several hundred agency staff have shown their interest in janitorial pollution prevention by visiting the project website and downloading the fact sheets and working tools that it provides.

2.7 Results

The project team assisted 47 sites and companies employing 6,900 janitors in Santa Clara County. As shown by Exhibit 2-1, the amount of hazardous materials these janitors use is 328,266 lbs. per year. Implementing all pollution prevention opportunities at the 47 organizations could reduce hazardous materials use by 131,306 lbs. per year. For example:

- City of San José - As a result of project-sponsored product trials, janitors working in the City of San Jose Main Library changed to safer alternative cleaners that reduce the use of:
  - Butoxy Ethanol (poisons blood, liver, and kidneys);
  - Sodium Hydroxide (corrosive to eyes and skin);
  - Alkyl Phenol Ethoxylates (affect hormone systems); and
  - Hydrochloric Acid (corrosive to eyes and skin).

  The project team estimates that changing away from products with these ingredients has decreased the Main Library's hazardous chemical usage by about 1300 lbs. per year.

- Stanford University - Heather Perry, Environmental Health and Safety Coordinator for Student Housing Services at Stanford University contacted the

Santa Clara Project to learn more about safety and health related risks regarding products used by the janitors in her department. Of the 50 or so items reviewed, Ms. Perry arranged for the cleaning crews to completely stop using a dozen products with serious health and/or environmental risks. Among those eliminated were products with ozone depleting substances, cancer causing ingredients and reproductive hazards.

Although it was easy to make these initial changes, further product adjustments will prove to be more challenging. The project team estimates that by switching to all of the suggested alternative products, Stanford janitors will reduce their hazardous materials usage by about 4,200 lbs. per year.

Based upon these and other reductions seen so far, the Santa Clara team conservatively estimates that 29,260 lbs. per year of the potential 131,306 lbs. per year of hazardous materials reduction will probably occur at the 47 participating sites. About half of this expected amount has already been accomplished. More of the potential total could be attained were continued outreach undertaken with the 47 sites to encourage them to make all of the changes available.

If future outreach efforts were to reach all 26,831 of the janitors working in Santa Clara County, the amount of hazardous materials reduction could be 513,765 lbs. per year. An estimated 82,497 lbs. per year of this total would probably occur.

Exhibit 2-1
Forecast Reduction In Use Of Hazardous Materials (Santa Clara County)

		Hazardous Materials (lbs per year)		
		Amounts	Forecast Reductions	
	Janitors	Used Before	Potential	Expected
Contractors				
Assisted Sites	4,629	221,593	88,637	16,606
Others	3,324	159,122	63,649	5,962
Total	7,953	380,714	152,286	22,568
Site Employees				
Assisted Sites	2,228	106,673	42,669	12,654
Others	16,650	797,026	318,811	47,275
Total	18,878	903,699	361,480	59,930
Combined Totals				
Assisted Sites	6,857	328,266	131,306	29,260
Others	19,974	956,148	382,459	53,237
Total	26,831	1,284,414	513,765	82,497
				Already Reduced: About 15,000 lbs/yr

2.8 Recommendations

The Santa Clara team offers the following ideas and recommendations to other agencies, facility managers, janitorial contractors who wish to reduce their usage of hazardous chemicals.

2.8.1 Recommendations To P2 Outreach Providers

Agencies that wish to begin a pollution prevention outreach program for janitors should:

- Do what's important. Conduct a needs assessment to identify issues and priorities that janitors in their area have. An initial list of questions can be drawn from those used by the Santa Clara team (see ¶3.6 and the project website).

- Get advice. Form an industry stakeholder panel, and use the collective experience of the members to guide the needs assessment and outreach process (See ¶3.8).

- Communicate effectively. Identify the languages spoken by janitorial workers in the area, and tailor outreach materials accordingly (See ¶6.1).

- Lead by example. Reduce the amounts of hazardous chemicals used by janitors who maintain the agency's own offices.

- Understand the problem. Estimate the numbers and costs for chemical injuries that occur to janitors in the area. These statistics are useful for showing how important it is to change to less hazardous products (See ¶3.7).

- Emphasize personal safety. Safety is one of the most important personal values expressed by janitors. Therefore, focus primarily upon the theme of increasing worker safety by having janitors change to less hazardous products. Environmental improvement will occur automatically as changes are made to safer products (See ¶3.6).

- Set goals and measure results. Set a goal for the amount by which hazardous materials usage by each individual doing janitorial work is to be reduced. The short-term goal for the Santa Clara project was 2 lbs. per person per year, which is 10% out of the total hazardous materials reduction of 23 lbs. per person that could reasonably be expected from an on-going outreach effort (See ¶5).

- Follow existing routes. Plan to do a significant amount of outreach via building owners, store managers, construction contractors, and other customers that janitorial contractors serve.

- Target the audience. Use internet and business license databases to compile lists of janitorial contractors, and used targeted mailings to announce workshops and other project events. Involve janitorial trade associations in arranging these events.

- Use effective tools. On-site P2 assistance and free product samples are the most popular and impactful forms of outreach effort. Plan to include these elements in any outreach program (See ¶6.8).

2.8.2 Recommendations To Facility Managers And Janitorial Contractors

Sites or businesses that wish to shift toward environmentally preferable janitorial products should include the following steps to assure a smooth transition:

- Involve people throughout the organization (See ¶3.2.1).
- Identify the highest risk products currently being used, and change those first (See ¶4.3).
- Get rid of old products that are no longer used.
- Begin tracking how much of each product is being used. This step alone will reduce consumption (See ¶5.2.1).
- Organize a special crew to test new products, and work closely with the members of that crew as they do their initial product trials (See ¶6.7).
- Be sure that vendor representatives are available and involved during trails of their products. Be prepared to modify cleaning procedures slightly to get the most out of the new chemical products (See ¶6.7.4).

2.8.3 General Recommendations

The Santa Clara team discovered three major problem areas that it believes need to be addressed jointly by environmental professionals, janitorial product suppliers, and the chemicals manufacturing industry.

Better MSDSs - To be truly useful for making health and environmental decisions, material safety data sheets need to voluntarily list all ingredients in the product, not just those mandated by regulations. The relative quantity of each ingredient also needs to be stated, although providing a range such as “15% to 20%” is sufficient for most purposes.

In addition, printed MSDSs need to be clearly written, well organized, and legible. About a tenth of all MSDSs that the team evaluated either could not be read because of small or distorted print, or were difficult to use because some of the information was in non-standard locations.

Finally, the team encourages all product suppliers to post their MSDSs on the internet. Direct and instant access is far better than waiting weeks or months to receive a requested data sheet.

Better Technical Information – The team recommends that vendors begin providing more information to janitors who wish to use their products. For example, product literature should emphasize:

- How to store, mix, and use products;
- How to avoid incompatibilities with other products;
- How to easily access the supplier's customer service system with health, safety, and environmental questions; and
- How to properly dispose of unused product, wastes, and containers.

Better Product Labels – The Santa Clara team encourages nation-wide development of standard janitorial product labels like those now being used for food packaging. Key information to display includes explicit identification of dangers that the product poses, a list of toxic ingredients, recommended personal protective equipment, and guidance for proper emergency response. Containers should also explain where to obtain more information.

3. Needs Assessment

This section of the report describes how the Santa Clara project team learned what janitors already know about health, safety, and environmental aspects of chemical products, and then identified useful roles that the team could take to increase their awareness of these issues. In essence, the needs assessment process helped set priorities and then focused the team's resources. Section 4 continues the discussion with a profile of janitorial chemical use that the on-site interviews revealed.

3.1 Needs Assessment Goals

The goals of the needs assessment were to identify the pollution prevention information and other useful assistance that janitors do not have, and to find out how this help could best be delivered. In addition, the project wanted to identify those needs that are already being met, and to determine the technical assistance role the team should play.

To answer these questions the project team interviewed agency staff working on other projects, interviewed janitorial contractors, and met with other interested stakeholders. The results of these contacts helped the team direct its efforts into developing pollution prevention materials most useful to janitors, which the team delivered along existing outreach channels.

Industry feedback convinced the project team that it should focus upon preparing fact sheets, holding training workshops, and offering on-site product reviews. The team decided that these outreach efforts should supplement rather than duplicate existing vendor data, trade press articles, internet sites, and other information sources that janitors already use. Therefore, materials that the team proposed to develop emphasized hazards associated with specific high-risk cleaning work, techniques for safe storage and mixing, and methods by which janitors could learn, on their own, the health consequences of specific chemical ingredients.

The Santa Clara team confirmed the scope and potential usefulness of these proposed materials by presenting its needs assessment results and subsequent outreach plans to a group of stakeholders that included janitorial contractors, agency staff, and chemical suppliers. As described in Section 5, the team incorporated comments received from these advisors into the outreach program that it undertook.

3.2 Input From Other Projects

Early in the needs assessment process it was discovered that several government agencies had already established health, safety, and environmental requirements for janitorial chemicals and were purchasing products accordingly. The Santa Clara project team conducted telephone and in-person interviews with representatives from these agencies to learn how these requirements were established, how they were being used, and which commercially-available products satisfied these criteria.

3.2.1 City of Santa Monica

In November and December of 1998, two meetings were held with Ms. Debbie Raphael and Mr. Brian Johnson of the City of Santa Monica Environmental Programs Division. By that date their agency had been working for more than 5 years on specifying and purchasing environmentally preferable products. The lessons from this effort that most impacted the Santa Clara Project are listed below: [3-1, 3-2]

- It is important to initially focus upon products that pose the highest risks, and that janitors will therefore be the most willing to shift away from. Cooperative relationships established in this process lead to easier acceptance of other changes proposed later.

- Lasting changes take a long time to accomplish (i.e., years rather than months).

- In order for these lasting changes to occur, people throughout the organization must participate, and all must believe that the changes are in their best interest. It is extremely helpful to have a proclamation or directive from the mayor's office which endorses the conversion.

- Not many janitorial product suppliers have previous experience responding to technical bid requests, where they must submit detailed health, safety, environmental, and performance data for their chemicals. Managing this unfamiliarity with technical submittals requires extra time and staff efforts compared to routine purchasing.

- It would have been helpful and perhaps saved time to prequalify individual suppliers and their products before the actual bidding process. That way bid invitations could have been sent to a smaller, more manageable number of potential suppliers.

- A mandatory pre-bid conference is essential.

- Environmental staff need to get personally involved with agency janitors and their work. Personally cleaning city facilities leads to a first-hand understanding of chemical products and the ways in which they are used.

- Extensive product training is important because many environmentally preferable products are used differently than stronger chemicals. Janitors will usually not get the cleaning results they want unless they are properly trained.

Santa Monica staff provided the project team with lists of suppliers who responded to the City's request for bids, as well as ratings summaries for products that were evaluated. These ratings characterized the health, safety, and environmental aspects of each product, and established the cleaning applications for each product was best suited.

3.2.2 State of Minnesota

In December 1998, the Santa Clara project team conducted telephone interviews with Ms. Kelly Luck and Ms. Joan Bressler who are responsible for state-wide purchasing of environmentally preferable products. Ms. Luck is with the Minnesota Office of Environmental Assistance, while Ms. Bressler is a purchasing representative with the State Materials Management Division. [3-3]

Ms. Luck suggested a number of ideas about criteria used to screen alternative products with respect to their environmental, health, and safety risks:

- Criteria can either be “pass/fail” or “relative”. The former generally take less time to evaluate, but are more arbitrary. On the other hand, relative scores take longer to develop but provide more accurate results.

- In order to be at all useful, relative scores require accurate, quantitative data about each product and its ingredients. For example, if numerical eye irritation test scores are known for a product, one can easily assign a relative score for that health hazard. Only knowing that a product causes “mild eye irritation” makes it more difficult to assign a relative score.

- It took the State’s working group about 10 weeks to develop a set of criteria and approaches for scoring the products. Much effort went into assigning relative weights to the various criteria that were used. For example, “Should a product’s potential for causing skin irritation be weighted the same as its potential for depleting atmospheric ozone?”

Ms. Bressler offered these ideas from her perspective as a purchasing agent:

- Tracking product usage is a big effort, particularly in situations like those in Minnesota where 15 suppliers are providing about 300 products in 30 categories. The state’s strategy has been to ask the suppliers themselves to track product orders and report annually to the State on amounts shipped.

- Prequalification interviews were used to narrow the bid solicitation to firms that had a reasonable chance of supplying products meeting the State’s technical specifications.

- Minnesota placed purchase orders for any product scoring 67% or above in both the screening criteria and performance tests. Individual agencies in the State could then order any product from any supplier.

Minnesota has posted on the internet a number of articles about this project. For example, one fact sheet addresses “Choosing Environmentally Preferable Cleaners”, suggesting among other things that buyers select products that:

- Do not contain carcinogens, poisons, or flammable ingredients;

- Are low in phosphate content;

- Have organic ingredients that are readily biodegradable;

- Have a neutral pH; and
- Do not have fragrances and dyes.

3.2.3 Commonwealth of Massachusetts

In December 1998, the project team contacted Ms. Lara Sutherland and Mr. Eric Friedman who are involved with environmentally preferable purchasing for the Commonwealth of Massachusetts. Ms. Sutherland is with the Office of Technical Assistance, and Mr. Friedman is with the Operational Services Division. [3-4]

Massachusetts advanced the cause of environmentally sensitive procurement by issuing its bid request entirely via the internet rather than printing paper copies. Questions arising during the bid process were posted to the project web site as well. For legal reasons, however, supplier responses had to be accepted in paper form.

As part of the process, the agency held a mandatory conference to explain its requirements for technical information it wished submitted with each bid. Agency staff consider that the time taken for this meeting was well spent, noting however, that many of the submitted bids at first lacked the complete detail necessary to evaluate the suitability of proposed products.

Ten sites conducted field trials for products that scored high in the health, safety, and environmental screening. The agency believes that involvement of vendor representatives helped the test crews learn how to use each product, which contributed to the success of these trials.

3.3 Trade Press

In the 1997-99 timeframe Maintenance Solutions, Cleaning & Maintenance Management, and similar trade publications featured several dozen general articles dealing with safe and effective use of chemicals. Several of these articles mentioned the challenges that suppliers encounter when introducing new products, such as demonstrating product effectiveness, creating sufficient demand, and achieving competitive pricing.

In addition, several articles appeared on related concepts such as indoor air quality, employee training, use of protective gear, and product dispensing systems. The focus and depth of these articles clearly showed an industry readership that is becoming increasingly aware of chemical product issues, and that is seeking information to relate these issues to their daily practices.

Articles written for building professionals revealed a different picture. One article in the Journal of Architectural Engineering shows that ease of cleaning ranked next to lowest in a list of 22 important issues architects usually consider in designing their projects. [3-5] This low priority contrasts sharply with the views of building users who ranked cleaning as most important of the 22 issues. [3-6]

3.4 Internet Discussion Groups

Throughout the project, the team used existing internet discussion groups to follow janitorial industry trends, pose key questions for industry input, and interact with other projects that were involved with janitorial product safety. The three groups that provided the greatest help were:

1. Cleaning & Maintenance Email Forum - A discussion group with participants from janitorial contracting firms, facility managers, chemical suppliers, and janitorial industry consultants. Web address: <forum@listserv.facility-maintenance.com>

2. P2Tech - A collection of agency, industry, and consulting people interested in pollution prevention topics and tools. Web address: <p2tech@great-lakes.net>

3. Environmentally Preferable Products Procurement - A discussion group that includes purchasing officials, environmental staff, and technical consultants sharing a common interest in products that have recycled content, which are themselves recyclable, or that contain low risk chemical ingredients. Web address: <eppnet@lilith.webrover.com>

3.5 On-Site Product Reviews

As part of the initial needs assessment process, the Santa Clara project team reviewed about 250 janitorial products in use at approximately a dozen local facilities (e.g., schools, cities, industrial sites, hospitals, and businesses). In these initial reviews the team concluded that: [3-7]

1. Six percent of the encountered products should not be used because they contain ingredients that:

   - Are carcinogenic;
   - Are banned by the Montreal Protocol; or
   - Cause global warming.

2. Thirty-five percent of the products require extreme care in order to be used safely because they contain ingredients that:

   - Can blind the unprotected user;
   - Can cause severe skin damage and scars;
   - May interfere with the hormone system of humans and animals; or
   - Can be absorbed through the skin or be inhaled and then may damage blood, liver, kidneys, the nervous system, or a developing fetus.

3. Forty-six percent of the products require routine care during use because their ingredients:

   - May temporarily irritate eyes and skin;
   - Will evaporate and affect the quality of air inside the building; or
   - May in some cases exceed the building's allowable sewer discharge limits for zinc or hydrocarbons.

3.6 Local Needs Assessment Surveys

As shown by Exhibit 3-1, the Santa Clara team contacted about 100 property managers, facility managers, janitors, and other individuals to gauge their awareness of chemical health and safety issues related to janitorial products. The team also asked for opinions as to how it in particular and government agencies in general could best help the janitorial industry with these issues. [3-8]

The data in Exhibit 3-1 show the number of people contacted versus the number responding. In this table, "facility managers" are employees of firms that occupy the site that was surveyed. On the other hand, "property managers" are employees of off-site management companies that administer leases for a landlord. Opinions expressed to the Santa Clara team during these interviews are discussed below.

Exhibit 3-1
Needs Assessment Contacts Made

	Phone	Mail	e-mail	In Person
Janitorial Contractors	5/5	25/5	500/12	4/4
Facility Mgrs./Staff	23/16	250/10	0/0	16/16
Property Managers	4/4	25/4	0/0	2/1
Hotels & Motels	15/6	0/0	0/0	8/8
Product Suppliers	5/5	0/0	0/0	4/3
Totals:	52/36	300/19	500/12	34/32

The table shows attempts made / actual contacts.

Exhibit 3-2 introduces several key points that the Santa Clara project team discovered in its needs assessment surveys. Generally speaking, product effectiveness and worker safety are key issues for people who actually use janitorial products. Product cost, being only 1% or so of janitorial service fees, is far less important than safety, effectiveness, and ease of use.

Exhibit 3-2
Important Janitorial Product Issues

How important are the following issues for the cleaning products that you use?	Property Managers	Facility Managers	Janitorial Contractors
Minimizing Cost	Not	Not	Somewhat
Maximizing Safety	Somewhat	Very	Some to Very
Maximizing Effectiveness	Somewhat	Somewhat	Very
Easy To Use	Not	Somewhat	Very
Vendor Support & Training	Not	Not	Some to Very
Compliance With Regulations	Some to Very	Very	Very
Minimizing Environmental Impact	Somewhat	Some to Very	Some to Very

Exhibit 3-3 addresses the awareness that interviewees showed for general health, safety, and environmental issues. While perhaps being concerned in general, off-site property managers tend to leave the specifics of chemical use to building tenants and their janitorial contractors. Exceptions to this finding may arise in multi-use facilities where property managers get involved with resolving conflicts over the indoor air quality needs of adjacent tenants.

Exhibit 3-3
Awareness of Health, Safety & Environmental Issues

How aware are you of the following issues?	Property Managers	Facility Managers	Janitorial Contractors
OSHA requirements for chemicals?	Not	Somewhat	Some to Very
Sanitary sewer discharge requirements?	Somewhat	Very	Some to Very
Stormwater protection requirements?	Somewhat	Very	Somewhat
Indoor air quality issues?	Some to Very	Some to Very	Some to Very
Workers' compensation costs for janitors?	Not	Not	Some to Very
Health or environmental risks of:			
Glycol ethers (such as Butoxyethanol)?	Not	Not	Somewhat
Perchloroethylene?	Not	Not	Somewhat
Alkyl Phenol Ethoxylates?	Not	Not	Not

As presented in Exhibit 3-4, property managers, facility managers, and janitorial contractors that were surveyed told that they learn from a number of sources about health, safety, and environmental issues related to cleaning products.

People whom the Santa Clara team spoke to identified several areas in which local government agencies could play an important role in providing them with information. Exhibit 3-5 on the next page summarizes these suggestions.

Exhibit 3-4
Sources of Product and Safety Information

Sources of Information	Property Managers	Facility Managers	Janitorial Contractors
Trade Associations	Important	Important	Some
Conferences/Trade Shows	Some	Some	Some
Magazines	Important	Important	Important
Vendors	Not Important	Important	Important
Peers	Important	Important	Some
Internet	Not Important	Important	Some

Exhibit 3-5
How Can Local Government Help Janitors?

	Property Managers	Facility Managers	Janitorial Contractors
Host Workshops	Useful	Useful	Some Use
Publish Chemical Fact Sheets	Not Useful	Useful	Useful
Publish Success Stories	Some Use	Useful	Useful
Make Training Videos	Not Useful	Some Use	Some Use
Certify Cleaning Products	Some Use	Some Use	Very Useful
Organize Mentoring Program	Not Useful	Some Use	Some Use
Provide On-Site Assistance	Useful	Very Useful	Very Useful
Operate a Hot Line	Some Use	Some Use	Very Useful
Promote Better Labels	Useful	Very Useful	Very Useful
Provide Spanish Language Items	Useful	Useful	Very Useful
Conduct Product Demos	Not Useful	Some Use	Some Use
Provide Product Samples	Some Use	Useful	Some Use

3.7 Chemical Injuries That Occur

In addition to reviewing products and conducting surveys, the Santa Clara project team also reviewed workers' compensation data from several states to identify the frequency and severity of accidents that janitors actually experience with chemicals.

These data suggest that six out of every hundred janitors in Santa Clara County injure themselves with chemicals every year. With an estimated 27,000 janitors working in the county, that rate extends to a total of about 1,200 injuries happening each year. About 20% of these injuries are serious burns to the eyes or skin. The cost of medical treatment and lost job time for these chemical injuries in Santa Clara County is believed to be about $750,000 per year.

3.7.1 Sources of Workers' Compensation Injury Data

The Santa Clara team researched occupation and injury data from three primary sources:

1. Federal Level - Bureau of the Census, OSHA, and Bureau of Labor Statistics;

2. State Level - California, Colorado, Minnesota, New Jersey, New York, Texas, and Washington; and

3. Local Level - Interviews with facility managers and their janitorial contractors.

Most of these sources offer only partial evaluations of injuries that janitors experience, and few have estimates of their cost. This situation arises because in most states there are many public and private organizations that provide workers' compensation insurance, making it very difficult to assemble complete summaries. Also, data reported at the national level generally combine janitors with other service industries.

3.7.2 Injury Estimates for Washington State

The most comprehensive picture emerged for Washington State, where the Department of Labor and Industry and the Department of Employment Security have compiled complete sets of detailed janitorial employment and injury data. The Santa Clara team obtained electronic copies of these data for the period 1995 - 1997. [3-9]

The workers' compensation data for the State of Washington reveal that about 290 janitors per year submit claims for lost time injuries from chemical exposure. As there are reported to be 38,440 janitors working in Washington State, this experience is equivalent to an annual claim rate of about 0.8 injuries per hundred janitors. [3-10]

- 43% of these injuries involve eye irritation or burns;
- 36% involve skin irritation or burns; and
- 12% involve inhalation of chemical fumes.

For reasons that are not yet clear, some types of janitors appear to have significantly higher rates of injury claims. As shown by Exhibit 3-6, workers' compensation claims for hotels, colleges, and hospitals in Washington State range up to 7 injuries per year for every hundred janitors, or nine times the state's average rate. It is speculated that either the number of accidents in these industries is actually higher, or alternatively that more injuries are reported as claims by hotels, colleges, and hospitals.

Exhibit 3-6
Annual Janitor Chemical Exposure Injuries in Washington State

SIC	Industry	Workers [1] No.	Workers [1] %	Injuries [2] No.	Injuries [2] %	Injuries [2] Per Worker
7340	Janitorial Contractors	11,394	29.6%	59	20.4%	0.005
7010	Hotels & Motels	618	1.6%	44	15.3%	0.072
8220	Colleges	1,570	4.1%	25	8.5%	0.016
5810	Restaurants	1,502	3.9%	17	5.8%	0.011
6510	Property Management	961	2.5%	15	5.1%	0.015
8640	Civic Organizations	570	1.5%	9	3.1%	0.016
8210	Schools	6,552	17.0%	7	2.5%	0.001
8060	Hospitals	313	0.8%	4	1.5%	0.014
8050	Nursing Homes	438	1.1%	4	1.3%	0.008
5410	Food Stores	836	2.2%	3	0.9%	0.003
8330	Job Corps Training	360	0.9%	2	0.8%	0.006
7990	Amusement Services	581	1.5%	2	0.8%	0.004
3720	Aerospace Mfg.	501	1.3%	0	0.1%	0.001
7210	Laundry Services	667	1.7%	0	0.1%	0.000
- - -	All Other	11,577	30.1%	98	33.7%	0.008
		38,440 Workers		289 per year		0.008 Average

Sources

[1] John Haws, Washington State Dept. of Employment Security <jhaws@esd.wa.gov>
[2] Patricia Ames, Washington State Dept. of Labor & Industry <ames235@lni.wa.gov>

Exhibit 3-7 shows that chemical-related injury claims in Washington State most frequently involve irritation or burns to the eyes and skin. Ingestion of chemicals rarely occurs, with only one incident in three years. The project team assumes that the distribution of injuries in Santa Clara County is similar.

Exhibit 3-7
Types of Chemical Injury Claims in Washington State

Eye - Burns	10.8%
Eye - Irritation	32.5%
Skin - Burns	9.3%
Skin - Irritation	27.1%
Ingestion - Toxic	0.1%
Inhaled - Toxic	1.0%
Inhaled - Irritation	11.4%
Other - Toxic	3.2%
Other - Unspecified	4.4%
	100.0%

How significant are the reported claims? The Washington State data in Exhibit 3-8 show that an average incident requiring medical treatment resulted in an average absence of 18 hours (i.e., a total of 657 lost days for 289 claims). Medical costs averaged $375 per claim, while lost time for the worker and his or her supervisor is estimated as $240 per claim, bringing the total to $617 per claim. In 1997, the total cost of these reported claims and lost time was $178,248 for all of Washington State. [3-11]

Exhibit 3-8
Annual Costs of Janitorial Chemical Exposure Injuries In Washington State

SIC	Business Type	Injuries [1]	Medical	Lost Days	Labor [2]	Total Cost
7349	Janitorial Contractors	59	$14,017	56	$8,060	$22,077
7011	Hotels & Motels	44	$34,000	379	$33,007	$67,007
8221	Colleges	25	$11,639	15	$2,673	$14,312
5812	Restaurants	17	$3,433	7	$1,560	$4,993
6510	Property Management	15	$2,954	2	$1,060	$4,014
8640	Civic Organizations	9	$1,508	0	$540	$2,048
8211	K-12 Schools	7	$2,100	4	$787	$2,887
8060	Hospitals	4	$1,500	11	$1,093	$2,593
8050	Nursing Homes	4	$5,500	12	$1,200	$6,700
---	All Others	105	$31,670	171	$19,947	$51,617
	Totals	289	$108,321	657	$69,927	$178,248
					Average total cost per claim:	$617

Notes:
[1] Annual injury and cost data from Washington State Dept. of Labor & Industry.
[2] Estimated labor cost: $10/hr for custodian & $15/hr for supervisor.

The team found general confirmation of the importance of these costs by checking insurance premiums for industries that show high worker injury rates. As a result of actual underwriting experiences, janitorial contractors in Washington State pay workers' compensation premiums that are noticeably higher than those for either auto repair shops or metal finishing firms. [3-10]

- Janitors $9.61/$1,000 of Salary
- Auto Repair $9.26
- Metal Finishing $9.25
- Office Work $9.08

3.7.3 Injury Estimates For California And Santa Clara County

Reported Injuries - The project team extrapolated from the Washington State data to develop an estimate of janitorial injuries in its area. As shown by Exhibit 3-9, janitors in Santa Clara County are believed to submit 202 workers' compensation claims for chemical injuries every year. The medical expenses and lost time costs of these claims are estimated as $124,418 per year.

Exhibit 3-9
Estimate of Chemical Injury Claims in Santa Clara County

	Workers	Claimed Injuries Number	Claimed Injuries Costs
Washington			
Contractors	11,394	59	$36,390
Employees	27,046	230	$141,858
Total	38,440	289	$178,248
All of California			
Contractors [1]	77,656	402	$248,014
Employees [2]	184,332	1,568	$966,834
Total	261,988	1,970	$1,214,848
Santa Clara			
Contractors [1]	7,953	41	$25,400
Employees [2]	18,878	161	$99,017
Total	26,831	202	$124,417

Sources:
[1] Bureau of the Census - 1996 County Business Patterns.
[2] Ratio of Employees/Contractors assumed to be same ratio as Washington State.

Adjusted Injury Estimate - According to insurance analysts that the Santa Clara team contacted, not many facts are known about unreported injuries. Some studies indicate that unreported injuries equal or exceed those that are claimed to workers' compensation. [3-11] Based upon interviews with janitors in the San Francisco Bay Area, the team believes that some firms report as claims only the most serious injuries that their employees experience.

As a consequence, the team estimates that the total number of injuries in Santa Clara County is six times the number of reported claims. Therefore, it is estimated that about 1,200 chemical injuries actually occur in Santa Clara County each year. Exhibit 3-10 shows that the total cost of these injuries is on the order of $750,000 per year. [3-12]

Exhibit 3-10
Adjusted Estimate of Total Chemical Injuries in Santa Clara County

		Annual Injuries and Costs					
		Reported		Unreported [3]		Total	
	Workers	No.	Cost	No.	Cost	No.	Cost
Washington							
Contractors	11,394	59	$36,390	295	$181,948	354	$218,338
Employees	27,046	230	$141,857	1,150	$709,289	1,380	$851,146
Total	38,440	289	$178,247	1,445	$891,237	1,734	$1,069,484
All of California							
Contractors [1]	77,656	402	$248,014	2,011	$1,240,069	2,413	$1,488,083
Employees [2]	184,332	1,568	$966,834	7,838	$4,834,169	9,406	$5,801,003
Total	261,988	1,970	$1,214,848	9,849	$6,074,238	11,819	$7,289,086
Santa Clara County							
Contractors [1]	7,953	41	$25,400	206	$126,999	247	$152,399
Employees [2]	18,878	161	$99,016	803	$495,083	964	$594,099
Total	26,831	202	$124,416	1,009	$622,082	1,211	$746,498

Sources:
[1] US Dept. of Commerce, Bureau of the Census - 1996 County Business Patterns.
[2] Employees/Contractors assumed to be same ratio as Washington State.
[3] Ratio of unreported injuries are estimates by Santa Clara team.

3.8 Project Stakeholder Input

The Santa Clara team invited a number of industry, agency, supplier, and citizens' group representatives to participate as stakeholders to guide the project. Exhibit 3-11 lists the numbers of people whom the team invited, as well as those that actually participated. Stakeholders not attending project meetings in person generally offered their advice via telephone, e-mail, and FAX.

Stakeholder provided their input to the team in three main areas:

1. Cleaning chemicals and their use;
2. Review of the needs assessment and proposed outreach activities; and
3. Critical review of draft outreach materials.

Each of these areas is described in the following paragraphs.

Exhibit 3-11
Project Stakeholders

	Invited	Participating as Stakeholders In Person	Remotely
Janitorial Contractors	5	1	3
Custodian Employees	1	1	0
Product Suppliers & Distributors	5	3	1
Chemical Manufacturers	5	2	2
Facility Managers	2	1	0
Facility Safety Staff	1	1	0
Agency Staff - Federal	2	2	0
Agency Staff - State	4	2	2
Agency Staff - Local	5	4	1
Citizens' Groups	3	0	0
Totals:	33	17	9

3.8.1 Industry Input

The industry stakeholders and respondents to the project's various surveys provided technical information about a number of janitorial chemical issues, including:

- Concentrated Chemical Products (Handling, mixing, use, & disposal)
- Dispensing Systems (Types, benefits, costs, & best places to use)
- Toxicology of Certain Common Ingredients
- Environmental Fates of Certain Common Ingredients
- Alternatives to Certain Toxic Ingredients
- Alternative Approaches to Health & Safety Training
- Typical Product Distribution & Purchasing Patterns
- New Janitorial Chemical Trends
- Typical Product Usages and Costs (e.g., gal./sq. ft. and $/sq. ft.)
- Effective Techniques for Demonstrating New Products

This input provided the project team with both technical content and editorial guidelines for writing fact sheets and other materials, and included suggestions on how to successfully deliver these items to janitors.

3.8.2 Stakeholder Review Meeting

In December 1998 the Santa Clara team held a half-day meeting with about a dozen project stakeholders. The meeting featured discussions of both the recently completed needs assessment and the team's proposed outreach efforts.

As an orientation, the project team published a 100-page briefing book that provided discussion questions, example outreach materials, and general background reading. The briefing book asked the advisory group members to be prepared to share their experience and knowledge, give guidance at key decision points, and comment upon example outreach materials.

In particular, advisors were each asked to highlight areas where the project team:

- Missed something;
- Did something to bias their results;
- Should talk to someone else who had important information;
- Could do something to increase its chances for success; and
- Seemed unaware of key issues in their area of interest.

During the four-hour meeting the stakeholder group commented upon needs assessment findings in the following areas:

- Janitorial product usage (types, amounts, & ingredients)
- Profiles of typical janitorial product users & practices
- Health, safety & environmental issues
- Opportunities to reduce use of toxic chemicals
- Existing training and outreach efforts within the industry

The stakeholder group also suggested improvements to the example fact sheets, workshop plans, and other outreach activities that the project team proposed. As a result, the team decided to focus its outreach program into:

- Janitorial product guides & P2 fact sheets
- Janitorial pollution prevention success stories;
- On-site demonstrations of alternative products; and
- Facility manager workshops.

Additional stakeholders participated electronically, sending their comments and feedback to the team via FAX and e-mail.

3.9 Footnotes To Section 3

[3-1] Information about the City of Santa Monica's efforts to accomplish environmentally preferable purchasing appears on the internet as an EPA-sponsored case study at <http://www.epa.gov/opptintr/epp/santa.pdf>. The City's purchasing specification is available at the Santa Monica website: <http://www.ci.santa-monica.ca.us/environment/policy/purchasing/bidspecs.htm>.

[3-2] Other information about the City of Santa Monica's program is summarized in an article co-authored by Ms. Debbie Raphael that will appear in the Spring 2000 issue of Pollution Prevention Review.

[3-3] Information about the Minnesota program for purchasing environmentally preferable products is available at <http://www.moea.state.mn.us/lc/cleaning.cfm>.

[3-4] Information about the Massachusetts Environmentally Preferable Products Purchasing Program is at: < http://www.state.ma.us/osd/enviro/enviro.htm>. Other information about the Massachusetts program is summarized in an article co-authored by Ms. Lara Sutherland that will appear in the Spring 2000 issue of Pollution Prevention Review.

[3-5] Arditi, David, and M. Nawakorawit, "Designing Buildings For Maintenance: Property Managers' Perspective," Journal Of Architectural Engineering, Vol. 5, No. 4, p107-116, 12/99, ASCE. Copies are available at <http://www.asce.org>.

[3-6] Arditi, David, and M. Nawakorawit, "Designing Buildings For Maintenance: Designers' Perspective," Journal Of Architectural Engineering, Vol. 5, No. 4, p117-132, 12/99, ASCE. Copies are available at <http://www.asce.org>.

[3-7] Somewhat different percentages emerged as chemical use at other sites was evaluated throughout the project. The combined recommendations for 1,137 products being used by 47 organizations are:

- Stop Using 15%
- Use With Extreme Care 44%
- Use With Care / OK 41%

[3-8] The form developed for these local surveys is in the Appendices, and is available at the project's website: <http://www.westp2net.org/Janitorial/tools/siteform.pdf>.

[3-9] Unpublished employment pattern data were provided by Mr. John Haws of the Washington State Department of Employment Security. Mr. Haws may be reached at <jhaws@esd.wa.gov>. Various pre-sorted sets of data are available on the agency's web site <http://www.esd.wa.gov>.

Three years of unpublished workers' compensation data for janitors were provided by Ms. Patricia Ames of the Washington State Department of Labor and Industry. She may be reached at <ames235@lni.wa.gov>. Various pre-sorted sets of data are available on the agency's web site <http://www.wa.gov/lni>.

[3-10] These percentages add to 91%. The balance of injuries are listed in the injury database as "unspecified", or were judged as incorrect because of inconsistencies. A fact sheet describing this evaluation of the Washington State chemical injury data appears at <http://www.westp2net.org/Janitorial/jp4.htm>.

[3-11] Estimates of reported versus un-reported injuries are few. Leigh suggests that the actual number of workplace injuries is about twice the total reported by the Bureau of Labor Statistics. In addition, the latter total includes both injuries reported as workers' compensation claims and other reported injuries that occur. Therefore, we estimate that the total actual injury rate for janitors is 6 times the number of submitted workers' compensation claims.

For a discussion of unreported injuries, refer to Leigh, J.P. et al., Arch. Internal Medicine, v157, 7/27/97, pg. 1557-1568, as cited by J.A. Brown, MD, at <http://www.haz-map.com/iceberg.htm>. Additional information is provided by Markowitz, S.B. et al., Occupational Disease in New York State, Am Journal of Internal Medicine, 1989:16(4), pg 417-435 as cited by the PubMed website at <http://www.ncbi.nlm.nih.gov>.

[3-12] Workers' compensation rates are from the Washington State Dept. of Labor and Industry, and are available on the internet at <http://www.wa.gov/lni>.

[3-13] The number of chemical injuries per year was estimated by weighting the number of injuries per SIC code by the numbers of janitors in each SIC code, and then factoring in the unreported injuries mentioned by facility managers in the San Francisco Bay Area surveys. This estimate also uses County Business Pattern data obtained from the US Dept. of Commerce.

4. Profile of Janitorial Chemical Use

This section of the report discusses the types and amounts of chemicals that janitors use in their work, and describes how these products are commonly purchased. Section 5 presents a number of pollution prevention opportunities for reducing chemical use, while Section 7 forecasts the amounts of reduction that the project expects to accomplish through its efforts.

The average janitor uses an estimated 28 gallons of chemicals per year, weighing 234 pounds. Hazardous ingredients comprise about 25% of the total, or 58 pounds. The Santa Clara team focused its efforts upon chemicals appearing in 19 key products that are used for care of hard floors, carpets, restrooms, windows, and miscellaneous tasks. The cost for these products is estimated as $250 per worker, which is only about 1% of the annual salary of $20,000 typically earned by that same worker.

4.1 Janitorial Work Performed and Products Used

Janitors use a wide variety of chemicals in their work, including products for floor care, restroom maintenance, and general cleaning. Suppliers furnish these items ready to use ("RTU") in trigger bottles and aerosol cans, or as liquid and solid concentrates that are to be mixed with water.

Extrapolating from the diversity of chemicals found in use at the sites it reviewed, the Santa Clara team estimates that something on the order of 5,000 products are manufactured and sold for janitorial work in the United States.

A single site or janitorial contractor typically uses up to 50 different products, although this total can include a variety of seldom-used chemicals kept on hand "just in case" a special cleaning job requires them. Exhibit 4-1 summarizes how these products are used.

Exhibit 4-1
Janitorial Chemical Use

Tasks	How Often	Examples of Products Used:
Vacuum / dust mop floors	Daily	Dust Mop Spray
Wet mop floors	Daily to Weekly	Water or Cleaner
Strip & refinish floors	Quarterly to Yearly	Stripper, Rinse, & New Finish
Remove carpet spots	Daily to Weekly	Spot Remover
Wet-clean or shampoo carpets	Monthly to Yearly	Pre-spray, Shampoo, etc.
Clean restrooms	Daily	General Cleaner, Disinfectant, Toilet Bowl Cleaner
Clean windows	Quarterly to Infrequent	Glass Cleaner; Blind Cleaner
Clean furniture, display cabinets, etc.	Daily to Never	Upholstery Cleaner; Furniture Polish; Glass Cleaner
Other cleaning jobs	Upon Request	Metal Polish

4.2 Product Purchasing

The typical janitorial contractor buys its chemical products from a number of sources, and keeps an inventory sufficient to cover about a month's consumption. Custodians working for a site also buy from a variety of sources, but may keep more supplies on hand. For example, some school districts purchase each fall enough supplies for an entire year.

The amounts of each chemical product that a janitor uses vary according to the specific types of buildings the firm maintains. For example, hotels and airports often have extensive carpeted areas and busy public restrooms. Such high-traffic buildings require more products for carpet and restroom maintenance than do offices or manufacturing plants.

4.2.1 Product Sources

Custodians and large janitorial contractors working in Santa Clara County report that they purchase most of their chemical supplies from local distributors. Some sites purchase supplies directly from manufacturers, particularly hotels and other wide-spread organizations that have national accounts. In the case of hotel and restaurant chains, janitorial chemicals are often obtained from the same general catering service that furnishes the site with all of its operating supplies (i.e., including linens, flatware, and food). Combined together these sources account for an estimated 90% of the janitorial chemicals purchased by large users in Santa Clara County.

Janitorial contractors and custodians occasionally purchase supplies from grocery stores, discount warehouses, and other local outlets. Based upon its user interviews, the Santa Clara team estimates that large sites purchase ten percent or less of their supplies in this manner.

The project team also found that many facilities have an inventory of no longer used "orphaned" products, including items that were retired when a new manager or a new janitorial contractor was retained. An early change many new managers make upon taking responsibility for a site is to introduce the chemical products that they are familiar with.

In addition, the project team found that most sites it interviewed had a variety of sample products obtained through the years from sales representatives. Usually these samples were only partly used, and then were kept on hand "in case of need."

4.2.2 Product Quantities and Costs

The amount of chemicals that a janitorial firm purchases depends upon a number of factors, including the:

- Number, size, and diversity of sites it maintains;
- Types of buildings and their traffic levels;
- Length of services contract with the facility;

- Floor covering, wall types, and other architectural details;
- Chemical distribution & storage within the company; and
- Mixing and use instructions given to employees.

The Santa Clara team discovered that contractors with widespread and diverse maintenance responsibilities will generally use more products in greater quantifies than those engaged in one type of work, or responsible for just a few buildings. However, in almost any situation close management of chemical inventories and thorough staff training greatly reduce the amounts of janitorial products consumed.

Exhibit 4-2 summarizes the amounts of 19 key maintenance products that are used at four facilities interviewed in depth for the project. These chemicals include items for:

- Hard floors;
- Carpets;
- Restrooms; and
- Miscellaneous (e.g., graffiti & furniture).

Exhibit 4-2
Annual Use of 19 Janitorial Products at Four Surveyed Sites

Site:	1	2	3	4	Averages
Sq. Ft. Maintained:	1,000,000	800,000	4,600,000	426,000	1,706,500
Building Types:	General	Offices	University	General	
Janitors:	50	48	126	67	73
Sq.Ft./Person:	20,000	16,667	36,508	6,358	19,883
Total Quantity (gal)	1,510	1,330	2,182	1,189	1,553
Gallons/1,000 Sq. Ft.	1.51	1.66	0.47	2.79	1.61
Gallons/Person	30	28	17	18	23
Total Chemical Cost	$12,450	$13,350	$38,350	$10,721	$18,718
Cost/1,000 Sq. Ft.	$12.45	$16.69	$8.34	$25.17	$15.66
Cost/Person	$249	$278	$304	$160	$247

Details of these estimates appear in Appendix D.

Together these 19 types of products represent a large fraction of the total chemical use at most full service janitorial contractors. The annual cost of the example 19 janitorial chemicals averages about $250 per worker, which is only about 1% of the annual salary of $20,000 typically earned by that same worker. [4-1]

Window washers, carpet cleaners, and other specialty contractors have different chemical use patterns unique to the kinds of work that they perform. In addition, the mix of products varies according to the types of buildings being maintained, along with the relative amounts of hard floor, carpets, and glass in them. [4-2]

Exhibit 4-3 shows that the 26,800 janitors working in Santa Clara County use a total of about 620,000 gallons of chemical products each year. The annual cost of these chemicals is about $7 million, while the salaries paid to the janitors using them is about $540 million.

Exhibit 4-3
Estimate of Annual Janitorial Chemical Use in Santa Clara County

		Annual Chemical Use		
		Per Person (gal)	Total (gal)	Cost
Contractors	7,953	23	184,843	$2,043,921
Employees	18,878	23	438,760	$4,851,646
Total	26,831		623,603	$6,895,567

Chemical use is evaluated further in Section 7, and in Appendix G.

4.3 Highest Risks Products

As shown in Exhibit 4-4, the highest risk janitorial products are generally ones that:

- are corrosive to the eyes and skin;
- are flammable;
- give off toxic fumes; or
- are poisonous.

4.4 Highest Risk Ingredients

Exhibit 4-5 provides examples of common ingredients in janitorial products that pose the greatest health hazards to the user, building occupants, and the environment in general.

The best sources for more information about these ingredients are Material Safety Data Sheets (MSDSs) for the janitorial products, or MSDSs for the toxic ingredients themselves. The Santa Clara team published on the project website a safety summary for each of 100 common ingredients found in many janitorial products. These summaries appear in the Appendices.

Exhibit 4-4
Highest Risk Janitorial Products

Product	Hazards Often Seen?	How Frequently Used?
Acid Toilet Bowl Cleaner With Hydrochloric Acid	Corrosive to eyes and skin; Can cause blindness	Very
Metal Cleaner With Perchloroethylene	Poisonous; Causes Cancer; Flammable	Somewhat
Carpet Spotter With Perchloroethylene	Poisonous; Causes Cancer; Flammable	Very
General Purpose Cleaner With Butoxyethanol, Sodium Hydroxide, & Ethanolamine	Corrosive to eyes and skin; Poisonous; Flammable	Very
Floor Finish Stripper With Butoxyethanol, Sodium Hydroxide, & Ethanolamine	Corrosive to eyes and skin; Poisonous	Very
Baseboard Stripper With Butoxyethanol, Sodium Hydroxide, & Ethanolamine	Corrosive to eyes and skin; Poisonous	Somewhat
Graffiti Remover With Methylene Chloride or Perchloroethylene	Poisonous; Causes Cancer; Flammable	Somewhat
Glass Cleaner With Butoxyethanol	Flammable; Poisonous	Very
Disinfectant With Bleach, Phenol, Quats., or Hydrogen Peroxide	Corrosive to eyes and skin; Poisonous	Very

Exhibit 4-5
Highest Risk Ingredients

Type	Examples	Problems
Acids	Hydrochloric Acid; Phosphoric Acid; Hydroxyacetic Acid	Corrosive - May cause blindness Damages skin Sewer discharge pH too low
Caustic	Sodium Hydroxide; Sodium Metasilicate; Potassium Hydroxide	Corrosive - May cause blindness Damages skin Sewer discharge pH too low
Solvents	Perchloroethylene	Causes cancer
	Butoxyethanol; Ethanolamine; Toluene	Poison - Absorbs through skin & poisons liver, kidneys, and a pregnant woman's fetus
	HCFC-141	Environmental - Destroys the ozone layer; causes global warming
Surfactants	Alkyl Phenol Ethoxylates	Environmental - Persists in the environment; bioaccumulates; affects animal hormone systems
Disinfectants	Bleach (Sodium Hypochlorite)	Corrosive - Can burn eyes & skin
		Reacts - Bleach mixed with acid or ammonia causes poison gas
	Paradichlorobenzene (Urinal Blocks)	Causes cancer
	Quaternary Ammonium Chloride (concentrated)	Corrosive - Can burn eyes & skin

4.5 Footnotes To Section 4

[4-1] This rough estimate of $20,000 is based upon a salary of $10 per hour and 2,000 work hours per year. The team did not try to refine upon these numbers, as the point was only to show that chemical costs are relatively small compared to labor costs.

[4-2] The subjective estimate that 19 key products comprise two-thirds or more of the average firm's total annual chemical purchase is based upon interviews that the project team conducted with about three dozen sites and contractors. Forecasts that appear elsewhere in the report are conservatively based upon just these 19 products.

5. Pollution Prevention Opportunities

This section of the report provides examples of successful pollution prevention strategies for reducing the use of nineteen key janitorial chemicals. These examples are detailed further in a series of fact sheets which are published on the project's website and in the Appendices. Section 6 describes how this information was used in the outreach efforts that the project team undertook.

As mentioned in Section 4, the average janitor who is involved with chemicals uses an estimated 28 gallons of products per year, weighing 234 lbs. in their concentrated form. Hazardous ingredients comprise about 25% of this total, or 58 pounds. Water added on-site to dilute the products for use is not included in these estimates.

If that same average janitor employed all of the chemical substitutions and other pollution prevention measures described here for the nineteen key products, it is likely that his or her hazardous materials usage would decrease by 23 lbs. per year.

5.1 Chemical Substitutions

Chemical substitution involves changing from products with highly-toxic ingredients to ones that are less hazardous. A number of effective, easy-to-use, and low-toxicity janitorial products are now becoming available. Specific examples include switching from:

- Carpet shampoo with nitrilotriacetic acid or carpet spotter with tetrachloroethylene to ones made with ingredients that are not carcinogenic (Potential annual hazardous materials use reduction: 0.3 lbs per user); [5-1]

- Glass cleaner containing butoxyethanol to those formulated with isopropanol or other less-hazardous ingredients (Potential annual hazardous materials use reduction: 0.75 lbs per user);

- General purpose cleaners with alkyl phenyl ethoxylates, ethanolamine, or butoxyethanol to those formulated with linear alcohol ethoxylates, citric acid, or other less-hazardous ingredients (Potential annual hazardous materials use reduction: 0.3 lbs per user); and

- Metal polishes with tetrachloroethylene or volatile organic compounds. to ones with low-volatility hydrocarbons or non-toxic ingredients (Potential annual hazardous materials use reduction: 0.2 lbs per user).

The potential hazardous materials use reduction, resulting from these and similar changes toward less toxic products, is conservatively estimated as 11 lbs per year for each janitor, or about half of the total amount of reduction that is believed feasible.

5.2 Chemical Use Reduction

Some cleaning tasks must use hazardous products because there are no effective substitutes. In such instances the pollution prevention strategy is to have the janitor dilute each product as much as possible, and to use it only when absolutely necessary.

Examples of chemical use reduction include starting a program of tracking product quantities, changing floor stripping techniques, and using two products instead of one to clean toilet bowls. The potential hazardous materials use reduction from decreasing product consumption is conservatively estimated as 10 lbs per year for each janitor. Examples amounting to about 85% of this estimate are described below.

5.2.1 Monitoring Chemical Use

The simple act of monitoring a product usually leads to less consumption. Firms that begin to track floor stripper or toilet cleaner quantities report reductions of 10% to 20%. However, this monitoring should be continuous for the change to be permanent. The potential hazardous materials use reduction from such administrative procedural changes is conservatively estimated as 1.0 lbs per year for each janitor.

5.2.2 Reducing Floor Finish Stripper Use

Floor strippers often contain ammonium hydroxide, ethanolamine, and butoxyethanol, making this product one of the most dangerous handled by janitors. However, these hazardous ingredients are needed to dissolve and remove the modern, highly resistant, polymer floor finishes. Minimizing floor stripper usage by 50% or more may be achieved by:

- Scheduling floor renewal work according to wear patterns rather than simply following a calendar;
- Diluting the stripper with as much water as possible (but not so much that the floor finish is removed unevenly);
- Carefully and thoroughly applying the diluted stripper;
- Using a rotating pad scrubber wherever possible; and
- Thoroughly rinsing the stripped floor so as to neutralize the surface prior to applying the new floor finish.

The potential hazardous materials use reduction from these changes is 40 lbs per year for each janitor actively involved with floor finish work, or 4.0 lbs per year spread across all of the janitorial workers in the typical contracting firm. [5-1]

5.2.3 Reducing Acid Toilet Bowl Cleaner Use

Porcelain cleaners are another of the most hazardous janitorial products. Formulated with hydrochloric, phosphoric, or hydroxyacetic acid, these cleaners are very effective in removing hard water deposits and stubborn stains.

However, such potent cleaning power is not normally needed every day. Therefore, a good pollution prevention strategy is to use two cleaners - a mild product for daily cleaning, and an acid cleaner that is only used when absolutely necessary. Adopting this strategy will potentially decrease hazardous material usage by 1.8 lbs per user per year.

5.2.4 Reducing Carpet Cleaner Use

Carpet maintenance products often contain ethanolamine, butoxyethanol, or alkyl phenol ethoxylates. Minimizing the use of these chemicals by up to 50% is possible by:

- Stain Removal - Reacting immediately to spills and spots before they have time to become semi-permanent stains. However, thorough training in spill clean-up is very important because using the wrong techniques or chemicals can smear the spilled substance or set the spot permanently. It is usually best to start with clear, cold water and blotting cloths, and then switch to stronger chemicals only if necessary.

- Maintenance Cleaning - Rotary bonnet cleaners and carpet shampoos usually are fairly mild products. However, it's easy to misuse or over-apply these maintenance cleaners, which may make it necessary to do hot water extraction more often or more extensively. Either way, the use of excess or inappropriate chemicals leads to more effort and expense.

- Deep Cleaning - With some exceptions, presprays used with hot water extraction systems are also fairly mild products. Careful application, thorough agitation, sufficient contact time, and extraction before drying all serve to help these products do their job, and reduce the amounts of chemicals that would otherwise have to be used in reworking a poorly cleaned carpet. Training and experience are needed to prepare the janitor for using these products effectively.

- Hazardous ingredients used in hot water extraction products include acid rinses (e.g., hydroxyacetic acid), solvents (e.g., butoxyethanol), and detergents (e.g., alkyl phenol ethoxylates). The best strategy is to choose products without these problem ingredients, use products with the least amounts, or dilute the cleaners to the highest level suggested by the manufacturers.

- A few restoration products contain tributyl tin, formaldehyde, and other ingredients that are meant to kill microorganisms, but at the same time are highly toxic to humans. Some of these ingredients, such as tributyl tin, are banned from use in the San Francisco Bay Area because of their potential to cause harm in the environment. [5-2]

The potential hazardous materials use reduction from these changes is forecast as 17 lbs per year for each janitor actively involved with carpet maintenance work (or 1.7 lbs per year spread across janitors of all types in the typical contracting firm).

5.3 Indirect Pollution Prevention Strategies

The pollution prevention measures presented so far have been ones with a direct impact on chemical use. In other words, change this product for that one, and the amount of hazardous materials used by janitors will go down. Several “indirect” methods can significantly reduce chemical use as well.

5.3.1 Building Perimeter Controls

Managing the entry of dirt into the building is another way of accomplishing source reduction. Cleanable floor mats, double-door entry chambers, and positive air pressure are all very effective in preventing foot-borne dirt from entering the building in the first place. Less soil in the building means less frequent cleaning, which in turn requires less chemical use.

5.3.2 Vacuuming

Daily vacuuming with strong suction, tight filter, rotating brush machines removes up to half or more of the soil that accumulates on the carpets. How much effort does it take to attain this level of cleaning? Routine vacuuming, with up to four back and forth strokes of the wand across the carpet, is sufficient for low traffic areas. Up to ten wand strokes may be needed at outside doorways and other high traffic areas. Supplemental vacuuming will be needed along walls and carpet edges where soil tends to accumulate.

5.3.3 Storage and Mixing

The project team discovered that janitors can use the following techniques to make their chemical storage and mixing safer, and at the same time reduce the amounts of hazardous materials lost through discards and spills.

> ***Incompatible Products*** - Products with incompatible ingredients should be stored separately. For example, it is important to keep glass cleaner with ammonia away from tub & tile cleaner containing bleach. “Away from” means in a separate room, in a separate cabinet, or on separate shelves (but not one over the other).
>
> ***Strong Ingredients*** - If space is available, the site should store products with acids or other strong ingredients in plastic tubs or containers so that any leaks will not harm the storage rack or janitorial closet, or result in a discharge to the sewer system.

Stock Rotation - It is useful to rotate the stock of stored products so that the oldest ones are used first. Some janitorial products (for example, bleach) have a shelf life. The idea is to use all such products before their expiration date.

Spill Kits - Janitorial crews should keep spill clean-up kits in each building or work vehicle, and should know how to use them.

Dispensers - Automatic dispensers might make sense if a janitorial crew uses lots of chemicals, and is working in a building with custodial closets. A well-designed dispensing system may save money, and can make chemical mixing safer for employees. However, mixing units sometimes have problems, particularly when filled with seldom used chemicals, so it is important evaluate the site's needs carefully before selecting a dispenser. Because of its simplicity and ease of maintenance, a manual dispensing system is usually best.

Safe Mixing - Floor strippers and other products with strong chemicals pose the greatest risks when workers handle them in concentrated form. To reduce these risks during mixing a janitorial contractor should:

- Train its employees in safe work procedures;
- Have a supervisor do all mixing;
- Insist that protective gloves and goggles are worn when an employee is handling concentrated products;
- Be aware of Cal/OSHA regulations that require a well-maintained, 15-minute, full-flow eye wash station be provided in any area where workers are exposed to corrosive chemicals; and
- Teach all employees about safe lifting methods, since many chemical accidents occur when workers lift full containers to pour the contents into a work bucket.

Avoid Aerosol Products – Aerosol containers include up to 20% of propane or another pressurized hydrocarbon that acts as a propellant. In addition, something on the order of 5% of the active ingredients must be abandoned in the container if the nozzle plugs or breaks off.

5.3.4 Other Prevention Techniques

Some building managers prohibit colored soft drinks, coffee, and other items that will easily stain carpets. Such a tight policy makes the building occupants unhappy at best. A compromise is to either have hard floors instead of carpets in food service rooms, or to place sacrificial carpet mats in these areas.

It helps to think of carpets as large, flat air filters. Most large particles and airborne soil will eventually end up attached to carpets. Unless something is done, significant amounts of carpet soil will come from kitchen fumes and other forms of building use. Properly maintained vents that exhaust outdoors can capture most materials that will otherwise fall out onto the carpets.

5.3.5 Forecast Impact of Indirect Measures

Estimating chemical use reductions for floor mats, vacuuming procedures, and other indirect strategies is difficult at best. The project team judges that something on the order of a 2% to 4% reduction in the use of floor, glass, and general purpose cleaners might reasonably be expected. Factoring in typical chemical ingredients found in these products, the team estimates that installing indirect dust and soil control measures can decrease annual hazardous materials use by 0.5 lbs. per janitor. Having good inventory control, practicing safe product mixing, and converting from aerosol cans to trigger spray bottles would reduce the average janitor's hazardous materials use by about 1.5 lbs. per year.

5.4 Changing The Cleaning Process

Modifying the techniques janitors use for applying their cleaning products can accomplish source reduction. In fact, many environmentally preferable cleaning products work best when they are applied to the surface with some force, and are left in place long enough to loosen and lift the soil that is present.

Work sequencing therefore is important for the product to be used successfully. For example, the first thing a janitor should do in daily cleaning of a restroom is to apply mild cleaners to the sinks and toilet bowls. These cleaners should be left in place while the trash containers are emptied and paper dispensers are refilled. Then the janitor can quickly scrub and rinse the fixtures once the cleaners have been in place for a few minutes. This sequence takes no more time than cleaning the fixtures separately before removing trash and stocking paper supplies.

Other, longer-term pollution prevention strategies include designing buildings with easy-to-clean architectural features (e.g., keep carpets out of locker rooms), taking care that features with incompatible cleaning needs are kept apart from each other (e.g., not situating carpets and vinyl tiles together), and operating building air conditioning systems so as to minimize the movement of dust.

5.5 Footnotes to Section 5

[5-1] These potential amounts of hazardous materials use reduction are based upon MSDSs for representative products that the project team encountered during on-site assistance visits.

For example, consider a carpet shampoo containing 20% nitrilo triacetic acid (NTA), an ingredient which causes cancer:

Total product amount per user (gal)	1.62
(lbs)	13.5
Est. Composition (% NTA)	20%
(lbs NTA/user)	2.7
Annual Hazmat Reduction (%)	100%
(lbs/user/yr)	2.7

However, NTA only appears in about 10% to 15% of carpet shampoo products. To account for this situation, the team discounted the potential impact expected from this kind of change to an estimated 0.34 lbs per user per year (i.e., 12.5% of 2.7 lbs.).

This estimate and all of the others prepared by the Santa Clara team, are stated in terms of lbs. of hazardous material usage reduction per average janitor, which in the case of carpet shampoo is 0.34 lbs. per year per average worker.

Janitorial contractors frequently told the Santa Clara team that they had dedicated “utility crews” that handled floor finish and carpet shampoo work. Each such crew of 2 or 3 people moved to various sites each day to do their work. The team estimates that janitors on these special crews comprise 10% of the total number of janitors. Therefore, the amount of hazmat reduction per dedicated carpet cleaning worker is 3.4 lbs. per year, or ten times that which is stated above for the average janitor. These statistics exclude secretaries, warehouse people, and other workers who do not actually use any chemicals.

[5-2] Information about tributyl tin appears on the web at: <http://ace.ace.orst.edu/info/extoxnet/pips/tributyl.htm>.

6. Outreach Activities

This section of the report describes the fact sheets, tools, workshops, on-site assistance, and other methods that the Santa Clara project used to send its pollution prevention messages to janitors and facility managers.

Janitors participating in the needs assessment convinced the team to concentrate its local outreach efforts in five key areas. Samples of items produced for each area appear in the Appendices.

1. ***Fact Sheets*** with information about safer ways to clean with hazardous chemicals.

2. ***Tools*** for people to use in evaluating the chemical products they use, including forms, checklists, ingredient hazard tables, and guidance on how to find internet sites that feature chemical data.

3. ***Commentaries*** about how to successfully change from strong chemicals to environmentally preferable ones. This category includes success stories and articles written by the project team, as well as materials furnished by other agencies.

4. ***Workshops*** for training janitorial professionals about product health, safety, and environmental issues.

5. ***Free On-site Assistance*** in reviewing janitorial chemicals, recommending alternatives, and providing samples of environmentally preferable products.

In addition, the team wrote trade press articles, made public presentations, and created a project website to share its findings with others located outside of Santa Clara County.

6.1 Fact Sheets

As work progressed, the team learned that janitors desire specific information that helps them perform their work more safely. Shifting to safer products usually (but not always) has the added benefit of moving toward environmentally preferable chemicals as well. Exhibit 6-1 lists the fact sheets that the project team published to address this need.

Exhibit 6-1
Fact Sheet Topics

Topics	Fact Sheets Produced	Rationale
High Risk Ingredients	Ingredients to • Avoid • Avoid if Possible • Use w/ Extreme Care • Use w/ Care	Chemicals were grouped according to their hazards and likelihood of a janitor or building occupant being exposed during normal use.
Specific Ingredient Hazards	Butoxyethanol Dibutyl Phthalate Diethanolamine Hydrochloric Acid Monoethanolamine Nitrilotriacetic Acid Nonyl Phenol Ethoxylate Octyl Phenol Ethoxylate Tetrachloroethylene Triethanolamine	These are fairly high risk ingredients that the Santa Clara team wanted to emphasize.
Highest Risk Cleaning Activities	Toilet Cleaning Hard Floor Care Carpet Care Restroom Cleaning Glass Cleaning Metal Cleaning Disinfectants	These tasks expose users to the highest risk of chemical injury.
Translations	Limpieza Segura Y Efectiva Para Los Inodoros (Safe and Effective Toilet Cleaning)	This translation was done by Montoya Communications for the Environmental Justice project in Richmond, CA.

These fact sheets appear in the Appendices.

6.2 Hazard Evaluation Tools

The Santa Clara team produced a number of tools for its own use in evaluating the health, safety, and environmental hazards posed by janitorial products. In addition, the team has written several commentaries on how to go about evaluating and reducing product hazards, and has searched for similar items published by other projects. Many of these items appear on the project website and in the Appendices.

6.2.1 MSDS Collection

The team collected and analyzed about 1,500 MSDSs for janitorial products used by sites in the San Francisco area. About 10 percent of these data sheets were obtained from product manufacturer's web sites on the internet. Others were obtained by FAX or mail. Most of the latter arrived within a few days, although some suppliers took significantly longer to fulfill requests. [5-1] In addition, a few distributors and suppliers refused to furnish a MSDS at all unless it was with a product shipment. In other words, these firms would not provide an advance MSDS to someone wanting to evaluate a product for potential use.

Collecting several MSDSs for each of the janitorial work categories allowed the Santa Clara team to compare hazard evaluations offered by different suppliers for similar products. In that way it was possible to identify suppliers that seemed to over- or under-state hazards, or whose MSDSs routinely did not provide information that the project needed.

The team contacted several of these latter firms to discuss the policy that each used in compiling their MSDSs, finding that some chemical manufacturers:

- Tried to write MSDSs that covered various different ways in which their products might be formulated (because such changes were expected to occur frequently whenever feedstock chemicals from different suppliers were used);
- Had a policy of supplementing the rather general hazard warnings on their MSDSs with additional information on labels and use instructions; or
- Believed that detailed hazard communication was best done through on-site training designed to accommodated language needs, reading difficulties, and other barriers to understanding the complexities of chemical risks.

6.2.2 Ingredients Database

The Santa Clara team thought it important to more fully understand the health, safety, and environmental impacts of those chemical ingredients that appear most often in the janitorial products that it encountered. Therefore, the team collected MSDSs, toxicology studies, and general literature on a selection of these chemicals, and created an ingredients database as an aid to evaluating alternative products. This supplementary information was secured from a number of sources, including those listed in Exhibit 6-2.

As shown in Exhibit 6-3 , the team believes that about a dozen of these common ingredients should be avoided altogether because of their potential to cause cancer or other serious harm to the user, building occupants, or the environment in general. Other ingredients should only be used by fully-trained workers who are extremely careful to wear protective gear such as gloves and goggles. Refer to Appendix for more details.

Exhibit 6-2
Sources of Chemical Ingredient Data

Information	Sources	How Obtained
MSDSs	Ingredient Manufacturer	Call a firm that makes basic chemical ingredients, or check their web site. [1]
Risk Ratings	US EPA	http://www.epa.gov/ngispgm3/iris/ http://www.epa.gov/epahome/search.html
	Environmental Defense Fund	http://www.scorecard.org/chemical-profiles/
	Purdue University	http://www.ecn.purdue.edu/CMTI/
Health Studies	US Gov't.	http://mail.odsnet.com/TRIFacts/ http://www.cdc.gov/niosh/homepage.html
	New Jersey Right-to-Know	ftp://alternatives.com/library/envchemh/

[1] The following web sites are examples of chemical ingredient data sources:
http://chemfinder.camsoft.com/
http://hazard.com/msds/
http://www.jtbaker.com/msds/
http://ccshst08.cs.uoguelph.ca/cntc/

6.2.3 Evaluation Guides and Worksheets

In addition to the ingredients database, the project team also created several checklists and worksheets to help in its reviews of chemicals being used by janitorial contractors. Exhibit 6-4 lists the six guides and worksheets that proved to be of the greatest help to the team, and that were therefore published on the project website for general use. Copies of each form are in the Appendices.

6.3 Commentaries

In preparing for its outreach workshops, the Santa Clara team collaborated with the project advisors to write a series of discussions about health and safety issues that janitors face. In addition, the team prepared case studies of three sites that are changing to environmentally preferable cleaning products. These commentaries are listed in Exhibit 6-5 , and are available on the project website. Examples are included in Appendix F.

Exhibit 6-3
Ingredients To Be Avoided

CAS Number	Ingredient Name	Problems [1]
00100-51-6	Benzyl Alcohol	Cancer / Corrosive / Skin Poison
00075-45-6	CFC-22; Chloro difluoro methane	Illegal
68603-42-9	Coconut Oil Diethanolamine	Cancer
00111-42-2	Diethanolamine	Cancer
00075-68-3	HCFC-141	Illegal
00120-40-1	Lauric Acid Diethanolamine	Cancer
00078-93-3	Methyl Ethyl Ketone	Skin Poison
00091-20-3	Naphthalene	Cancer / Corrosive / Skin Poison
18662-53-8	Nitrilotriacetic Acid	Cancer
00106-46-7	Para dichloro benzene	Cancer / Inhale Poison
00127-18-4	Tetrachloroethylene; or Perchloroethylene “PERC”	Cancer / Skin & Inhale Poison
00108-88-3	Toluene	Skin Poison
00688-73-3	Tributyl Tin	Illegal / Poison

[1] A “Skin Poison” can absorb through intact skin and poison the janitor’s liver, kidneys, and other internal organs. An “Inhale Poison” causes harms when a worker breathes the fumes. “Corrosive” means that the chemical can permanently destroy eyes and skin. “Illegal” means that this ingredient cannot be used for janitorial products in the San Francisco area. See Appendix E for more information.

Exhibit 6-4
Worksheets That Were Prepared

Tools	Why Prepared	How Prepared
Finding Chemical Data	Health & safety staff asked how the team found chemical data.	Summary of major internet sites and other resources that provide data.
High Risk Products List	Site staff often asked what products were the most dangerous to them.	This list features the most common hazardous products, emphasizing ones with a likelihood of exposure during use.
Product Risk Evaluation Form	Site managers needed a summary of the evaluation made of each product, and a clear set of recommendations.	After several editions it was decided to use a simple, open-space form to identify each product, its major issues, and the team’s specific recommendations.
Product Test Evaluation Form	Site managers needed feedback on trials of alternative products.	Editions used by Massachusetts and other agencies were adapted.
Risk Evaluation Criteria	Health & safety staff asked for a list of the most important product issues.	Product evaluation criteria used by MA, MN, Phoenix, and Santa Monica were adapted.
Site Survey Form	Project team needed a checklist for recording product use, work techniques, and key issues.	A 5-page survey form evolved from simpler editions.

Exhibit 6-5
Commentaries That Were Prepared

Topic	Why Prepared	How Prepared
Adding Labels to Your Containers	Health & safety staff request	By the project team, with input from project advisors
Buying Environmentally Preferable Products	Health & safety staff request	By the project team, with input from project advisors
City of San Jose Case Study	To show how product trials can be organized	By the project team
Conducting Effective Product Trials	To show how product trials can be organized	By the project team
How Often Are Janitors Injured?	To relate how serious janitorial injuries are	Based upon data from the State of Washington
Minimizing Use of Janitorial Products	To provide useful P2 advice for specific products	By the project team, with input from project advisors
Polaris Building Maintenance, Inc.	To highlight a contractor that worked with its chemical supplier	By the project team
Safe Storage and Mixing	Because of storage problems observed at some sites	By the project team with input from the City of Phoenix
Selecting Protective Equipment	A message that always bears repeating	By the project team
Stanford University Housing Case Study	To show how product trials can be organized	By the project team
Environmental Criteria & Vendor Certification Form	To show how product criteria can be expressed in a bid package	Written by the Washington State Department of Ecology EPP Project
What's Needed Next	To highlight need for better MSDSs and labels	By the project team

6.4 Training Workshops

The Santa Clara team held three major workshops to share project results with about 130 janitors, facility managers, and agency staff. These sessions comprised:

- July 1999 Industry Workshop - Attendance: ±60 Time: 4 hours.

  Emphasis upon evaluating product risks, finding environmentally preferable products, trying out sample products, and safely managing chemicals. The 125-page workbook for this session was published in a 3-ring binder with tabs, and also as a downloadable document on the project website. This session was sponsored by the County of Santa Clara and the University of California, Santa Cruz, Extension Service.

- September 1999 Industry Workshop - Attendance: ±25 Time: 90 minutes.

  Same topics as the July 1999 session, except that product trials were left out because the time was too short. For this event the earlier workbook was re-published with plastic comb binding. This session was sponsored by the Pacific Association of Building Services Contractors.

- October 1999 Agency Workshop - Attendance ±45 Time: 2 hours.

  Emphasis upon how a regulatory agency can organize its own P2 outreach effort for janitorial chemicals. The workshop was based upon a dramatization of a 10-page case study about Contra Costa County Health Department. Participant comments were incorporated into the final edition of this study that appears on the project website and in Appendix F. This session was sponsored by the Western Regional Pollution Prevention Network.

Workshop evaluation forms and other feedback were universally positive, saying that the materials presented were both informative and important to the attendees. From lessons learned here, the Santa Clara team suggests that other agencies that organize workshops in the janitorial industry should:

- Be sure that the audience includes a well-rounded mix of janitors, facility managers, health & safety specialists, and agency staff.

- Include in the audience several representatives of vendors who offer environmentally preferable products.

- Have as much of the presentation be interactive as possible, emphasizing small group problem solving and “hands-on” work with product samples.

- The materials included in the Santa Clara workbook take 8 hours to cover fully. If the available time is shorter, some of the materials will have to be skipped.

6.5 Articles

Two articles were prepared for publication in Pollution Prevention Review, and one extensive interview was held for an article written by the editors of Cleaning & Maintenance Management Magazine. The P2 Review articles were done in collaboration with Ms. Debbie Raphael and Ms. Lara Sutherland, project advisors from the City of Santa Monica and the Commonwealth of Massachusetts, respectively. [6-2]

6.6 Conference Presentations

The Santa Clara team made presentations about the project and janitorial product safety at five conferences. Handouts published for several of the sessions appear on the project website.

- October 98 - Western Regional Pollution Prevention Network conference in San Diego. Presented in conjunction with Mr. Brad Norton and Ms. Debbie Raphael.
- January 99 - California Association of Public Purchasing Officials conference in Sacramento.
- February 99 - California Water Environment Association conference in Berkeley.
- May 99 - California Household Waste Conference held at the Granlibakken Center, Tahoe City.
- September 99 - US EPA Region 9 Pollution Prevention Week Seminar Series, San Francisco.

6.7 Sample Kits

Based upon repeated requests from sites and contractors, the Santa Clara team decided to find, test, and distribute samples of environmentally preferable products. This effort took four months, and resulted in the identification of about 20 products for use as samples. These samples were packaged in plastic buckets with pre-printed safety messages, and then distributed via workshops, mailings, and in-person deliveries to about three dozen firms in Santa Clara County.

6.7.1 Identifying Alternative Products

The team first contacted purchasing agents and technical staff of the City of Santa Monica, the State of Minnesota, and the Commonwealth of Massachusetts. These agencies provided the names of several suppliers from whom they purchase janitorial chemicals. Before placing these purchase orders, each of these agencies had reviewed product MSDSs and other technical information received from bidders, and then field-tested several different products from each supplier.

Next, the team surveyed janitorial firms in the San Francisco Bay Area, and also contacted internet discussion groups to learn of other chemical suppliers that might offer environmentally preferable products. In making follow-up calls to each of these firms, the team obtained information on various cleaning products, and then evaluated each for health and safety issues.

6.7.2 Screening Alternative Products

First, the team reviewed product literature and eliminated products based on toxicology information. It is important to note that many suppliers market "green" products that did not meet the team's working standards. For example, one vendor submitted an entire line of products that did not pass this first step. As shown by Exhibit 6-6, this evaluation involved reviewing MSDSs, and also contacting the suppliers with questions about any unlisted ingredients that they use in formulating their products. A detailed discussion of these product evaluation criteria appears in Appendix E.

Exhibit 6-6
Product Evaluation Criteria

Health & Safety Impacts	Question used?
Carcinogenic / Prop. 65	Yes
Reproductive Hazard - Mutagen	Yes
Reproductive Hazard - Teratogen	Yes
Endocrine Modifier	Yes
Corrosivity / pH	Yes
Flammability / Flash Point	Yes
Reactivity	Yes
Eye Irritant	Yes
Skin Irritant	Yes
Inhalation Irritant	Yes
Ease of Skin Absorption	Yes
Ease Of Inhalation / Vapor Pressure	Yes
Overall Toxicity (LD50)	Yes
Environmental Impacts	
Ozone Depleting Substance	Yes
Global Warming Substance	Yes
Hazardous Waste	Yes
Stormwater Pollutant	No
Sanitary Sewer Pollutant	Yes
Persistence / Biodegradability / Bioaccum.	Yes
Indoor Air Quality	Yes
Phosphates	No
Volatile Organic Compounds	Yes
Other Impacts	
Has Added Fragrance	No
Has Added Dye	No
Bulk Concentrate / Mixing System	No
Safe Container	No
Refillable Container	No
Container Made Of Recycled Material	No
Non-Aerosol Container	No

6.7.3 Organizing The Product Trials

As a next step, the Santa Clara team simplified its field trials by limiting tests to the following seven product types:

- General purpose cleaner
- Toilet bowl cleaner
- Bath and tile cleaner
- Window / glass cleaner
- Graffiti remover
- Metal polish; and
- Disinfectant.

The team contacted suppliers whose products passed the first screening, and invited each to submit its environmentally preferable products which they offer for these seven cleaning functions. Specifically, they were asked to submit product samples, product MSDSs, product instruction sheets, and bottle labels for each product.

Upon receiving the samples, the team gave the products to professional janitorial crews to evaluate its cleaning effectiveness. Three groups volunteered to do the hands-on product evaluations:

- City of San José - Main Library crew (5 members)
- City of San José - Maintenance Yard crew (2 members); and
- County of Santa Clara - Hall of Justice crew (4 members).

6.7.4 Lessons Learned From Product Trials

Five key lessons were learned about conducting successful trials of environmentally preferable janitorial products.

1. Select the Right Test Crew - When selecting where to test new products it is important to chose a crew with consistent work attendance record, with experienced/senior employees, and one which has focused cleaning responsibilities. The San Jose City Main Library Crew was helpful because one of their regular job functions was to be the test crew for all new products for the City. The County Hall of Justice team was helpful because they had a well respected senior staff member.

2. Establish Crew Buy-In and Involvement - Before testing any products, have a team meeting with the test crew and emphasize why you are testing alternative products. Our testing was successful in large part because each test crew knew that their

upper management was looking for safer alternatives to current products. They also knew they were being asked to participate in a way that would directly influence the decision.

The following are examples of questions one must ask to help find ways to effectively involve the crew in the test process. Some of these questions are simple, but their answers can provide valuable information.

What products are you currently using? Answering this early on will help determine exactly what sample replacement products to offer for trial.

How much product are you using on average? Cleaning crews vary in the amount of product used, so you need to know how much product you need to give your test crew.

Example: Each member of the County of Santa Clara Hall of Justice cleaning crew uses a 32 oz bottle of glass cleaner each day, where it takes a month for the entire San Jose City Main Library crew to empty a 32 oz bottle of glass cleaner. This information will determine how much product to give the tester so they may conduct a fair evaluation. The County crew received a 32-oz bottle per product / per person while the 5-person City crew shared a 32-oz bottle.

- What is your daily cleaning routine? Answering this question will be helpful in establishing when a change to the routine is needed to successfully adopt a new product.

  Example: One crew member was understandably resistant to testing any products that would take more time for cleaning. This custodian complained that she hardly had enough time to complete her current cleaning tasks.

  Upon verbally walking through her daily routine it was discovered that she could spray the new surface cleaner in the bathroom, spend 10 minutes emptying trash cans on her floor, and then return to wipe up the cleaner (rather than spraying and waiting idly while the product worked).

- What are your toughest cleaning challenges? These are the people who will be using the products you change to, so their buy-in is essential. If you can find a safer product to tackle their toughest problem, then that buy in will be accelerated.

  Example: One crew member complained about the oily residue left on metal from their current metal cleaner. His evaluation for one of the alternatives read "This is the best product I've ever used on stainless. It works super in the elevators." He was sure to share that experience with the rest of his crew and his buy-in was affirmed.

3. Introduce Your Test Phase Timeline & Hold Regular Meetings - Share with the test crew your suggested timeline for the hands-on test phase. Include plans for reviewing their test evaluations and discussing problems/questions that arise.

The San José testing process included a weekly meeting where new products were given to the test crew and a discussion was held about the previous weeks' successes and failures. This discussion sometimes consisted of identifying barriers to the test process, and other times consisted of sharing mutual support of successful products.

Establishing the timeline provides a necessary structure for you and the test crew to work within, and can reinforce the spirit of a team collaborating on a project.

4. Give the Test Crew Products and Instructions - Because our test phase involved numerous products for one cleaning function, it was easier to test products according to cleaning function rather than according to vendor. For example, the cleaning crew first tested all glass cleaners, then all general purpose cleaners, etc.

   Along with the product samples themselves, the crews were given a copy of each product MSDS and instruction sheet for reference. In addition each member of the crew received an evaluation form to give feedback on each product tested. A sample evaluation form is in Appendix .

5. Do Hands-On Testing Yourself - Whenever possible, join the test crew for some of their cleaning. Nothing emphasizes the importance of the project more than “getting in the dirt” yourself and testing the products with the janitors that you expect to begin using the products.

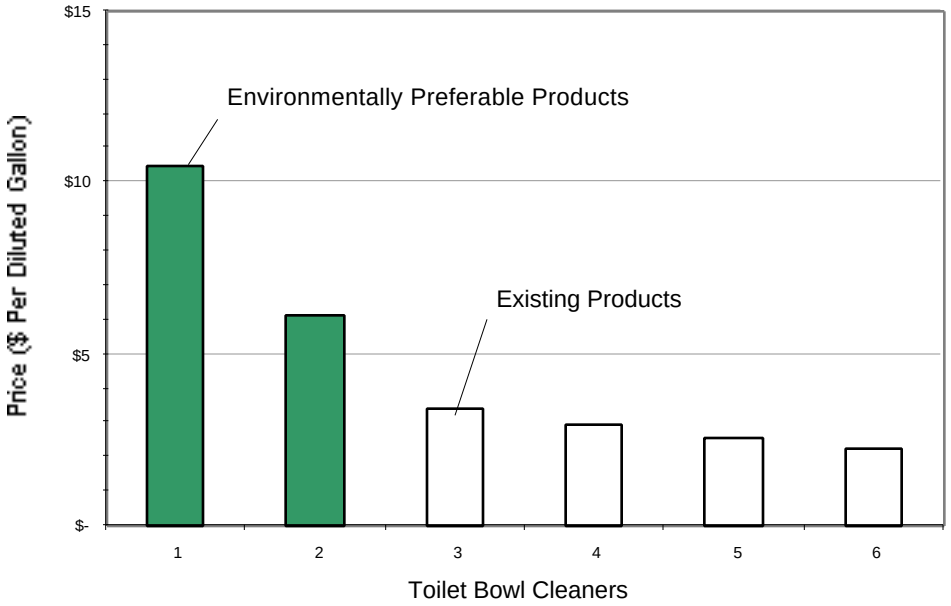
6.7.5 Sample Kit Distribution

Following the initial trials, the project team delivered samples as pre-packaged kits consisting of three or more alternative products, a 2-quart plastic bucket featuring a safety message in both English and Spanish, MSDSs and other product literature, gloves and goggles, and product evaluation forms. Samples were distributed to about three dozen end users.

6.7.6 Product Costs

The project team compared prices of products that sites were already purchasing with those of the environmentally preferable alternatives used in the field trials. Exhibit 6-7 shows that, with some exceptions, prices for both kinds of products are similar. In other words, many environmentally preferable janitorial products cost no more than the standard chemicals that a site is already using. These comparisons are based upon a one-gallon quantity of product that either comes ready-to-use, or that the site has diluted for use.

Exhibit 6-7
Comparison of Product Prices



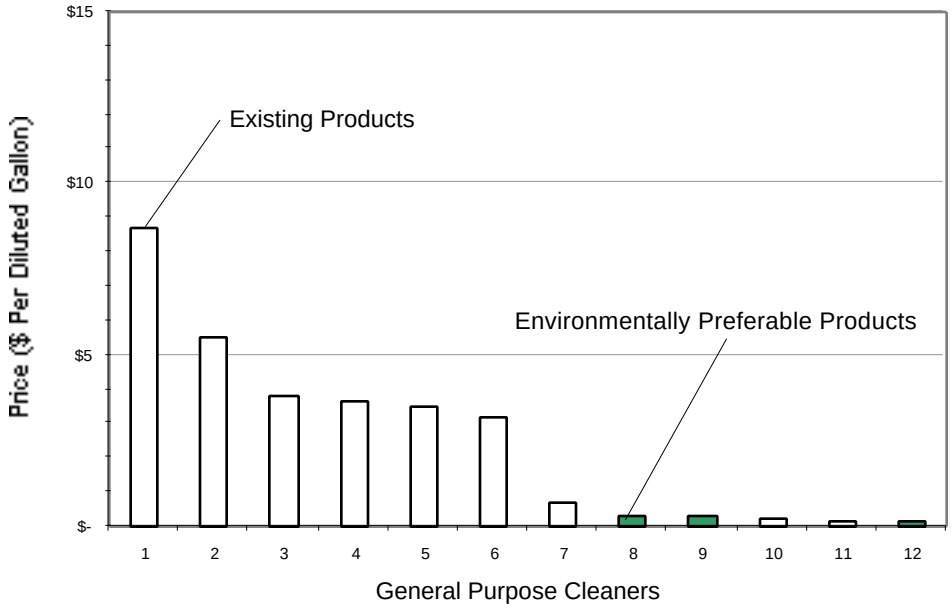
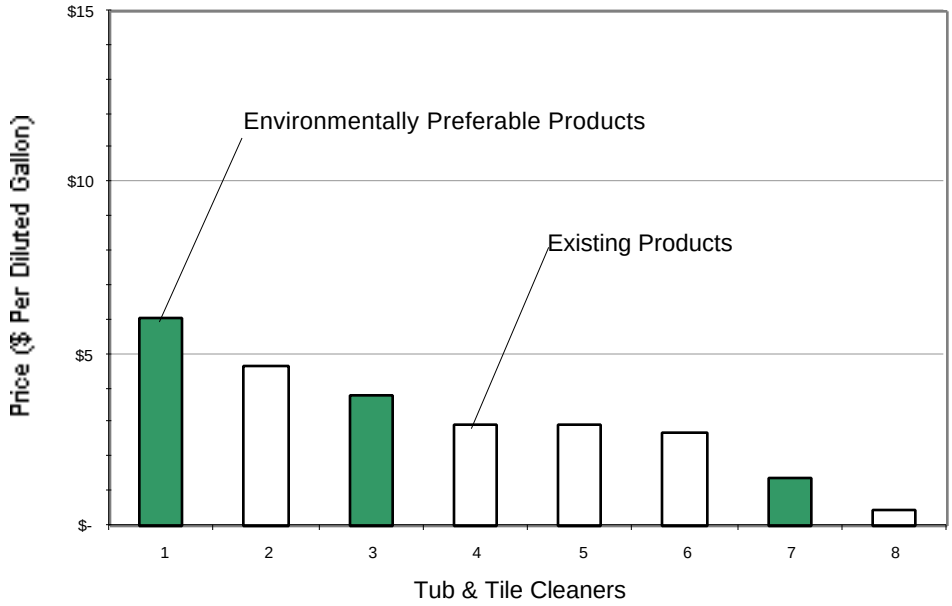
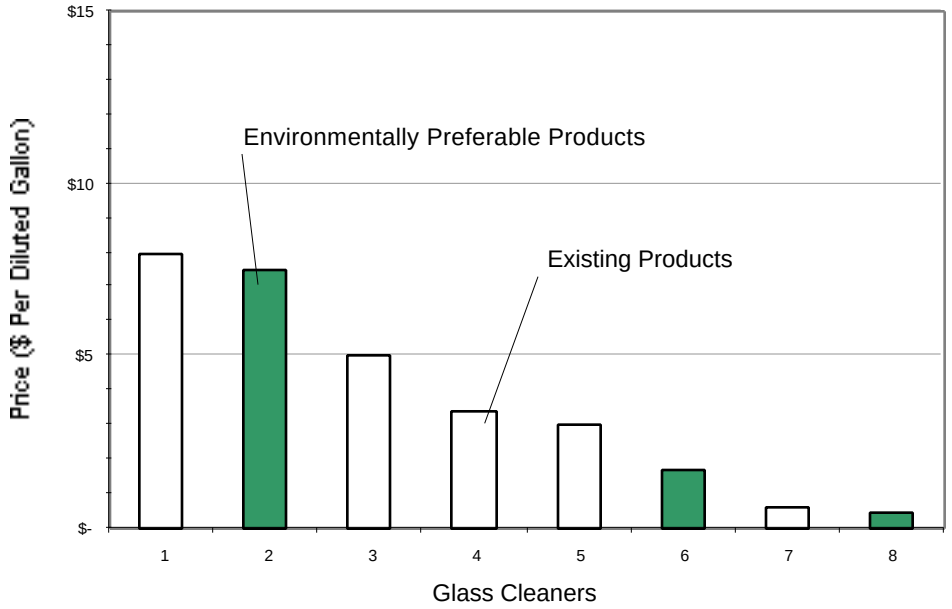


Exhibit 6-7 (Continued)
Comparison of Product Prices





6.8 Product Reviews

During the project the Santa Clara team reviewed health, safety, and environmental aspects of janitorial chemicals being used by 47 agencies, businesses, and contractors. As shown by Exhibit 6-8, a total of 1,137 products were evaluated in this process, of which about 20% were duplicates which were reviewed previously at another site.

Exhibit 6-8
Product Reviews

Types	No. of Sites	No. of Products
Schools & Colleges	7	158
Janitorial Contractors	13	324
Industrial Facilities	19	633
Other – Cal/EPA Offices	2	22
Totals:	47	1,137

As summarized below, the janitorial product reviews were adapted to meet the needs of each site.

- Usually each site copied and mailed its product MSDSs for the team to review in advance. The site visit, when it finally occurred, focused on discussing the review and identifying alternative products for the site to consider.
- About 30% of the reviews were accomplished with a single, 1-hour site visit.
- About 60% of the reviews involved two site visits – one to pick up the MSDSs and the second to discuss results.
- About 10% of the reviews were done remotely without ever visiting the site. A phone meeting served to explain the team's review to the site staff.

In addition, these reviews took varying amounts of time depending upon the effort needed to obtain updated MSDSs, research details with manufacturers, and prepare a summary report. Later reviews were much shorter if they involved a product that had already been encountered.

- Average Review: 15 minutes per new product to screen ingredients and properties, draft brief report to summarize results;
- Lengthy Review: 2 hours (research impacts of new ingredients, update MSDS, call manufacturer to obtain complete info); or
- Previously Seen: 5 minutes to find & copy the earlier report.

Exhibit 6-9 shows that more products with higher hazards were encountered as the work progressed. Most of this shift in hazard levels is circumstantial, although the team did begin using the "Extreme Care" category somewhat more readily as the work progressed. [6-3]

Exhibit 6-9
Product Review Results

Hazard Level	Needs Assessment [1]	All Reviews Combined [2]
"Stop Using"	6%	15%
"Use Extreme Care"	35%	44%
"Use Routine Care"	46%	41%

[1] Percentages of 250 products reviewed at first 12 sites.
[2] Percentages of 1,137 products reviewed at 47 sites, including the first 12.

The Santa Clara team offers the following lessons learned to any other agency that wishes to offer on-site assistance to local businesses:

- Plan to spend a significant amount of time advertising the importance of janitorial product safety, both in general and to specific sites whom you approach.
- Obtain and use introduction letters from both local government officials and local industry trade associations.
- Announce the availability of your on-site assistance via trade association, POTW, and utility bill newsletters.
- Because business people usually listen to their customers, deliver your message to building owners and managers who employ janitorial contractors.
- Emphasize issues that janitors care about, i.e., the personal health and safety benefits from changing to environmentally preferable products.
- Encourage sites to take their time, making small step-by-step changes in the products that they use. Also, advise sites to get thorough technical training from the new product suppliers.
- Lead by example by having your own agency change to environmentally preferable products for its janitorial work.

6.9 Project Website

Very early in the project it had been decided to use the internet as the primary way of both publishing the team's outreach materials, and providing visitors with links to similar sites operated by other projects. Initially the team had thought to use the County of Santa Clara's internet

server. However, it proved easier as the work proceeded to instead use space that became available on the EPA-sponsored Western Regional P2 Network website.

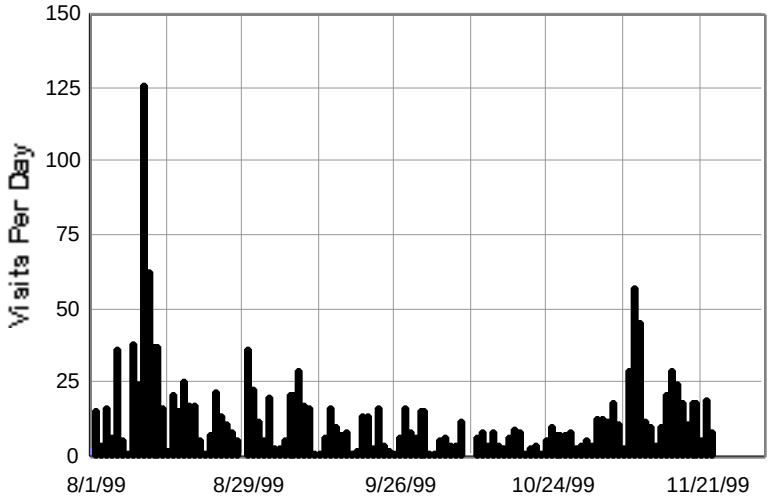
Construction of the project's web pages began in early-1999 with creation of a home page and five directory pages, each of which provided links to fact sheets, tools, and other specific items that the project team published. At this writing the overall website has expanded to eleven directories that together contain about 50 subsidiary pages, as well as links to about 25 sites sponsored by other agencies and projects.

The team also used the project web site to announce each of its workshops and the availability of both free product reviews and samples. As each event occurred, its page on the website changed from an announcement to a record. For example, the announcement of the July 1999 workshop was replaced by a copy of the workbook published for that session.

Exhibit 6-10 shows that an average of about 15 new users per day visit the website. A total of over 1,500 people visited the website during August through November 1999, the fourth through seventh months of its operation. The peak visits occurred in mid-August following announcement of the site on the P2Tech, EPPNET, and Facility Maintenance e-mail discussion groups.

The website activity tally in Exhibit 6-10 only counts the first visit by each person; repeat visits are not recorded. Also, the web counter statistics show that about 20% of the visitors are government agency staff. The balance are assumed to be janitors, facility managers, and others with an interest in workplace safety. [6-4]

Exhibit 6-10
Daily Project Website Visits (August – November 1999)



Through November 1999, the project team responded to about 50 e-mail and telephone inquiries from janitorial contractors custodians, and agency staff who wanted to know more about environmentally preferable products.

Feedback from site visitors has been generally very positive, with a number of industry people saying that they intend to download and use the project's fact sheets and other materials in the health and safety training given to their janitorial staff. For example:

- "Thank you so much for sending the packet on janitorial chemicals/products. As I mentioned I am currently researching all available information on the subject for a Guide to Custodial Products in Schools which will be used as an education/advocacy tool. The articles, etc. you sent will be quite useful to my work. Thanks again for your help." - MW

- "I am very interested in your samples of bath and tile cleaner. You see, I own a ceramic tile store and I am always looking for new products to suggest to my customers." - ME

- "I am always looking for something to make our job easier and safe at the same time. If this is as good as you say I can't wait to try it. Cleaning houses is a tuff job and I want what cleans the best. I look forward to trying your products." - RM, Laurinburg, N.C.

Similar comments have been made by agency staff who plan to use the site's technical materials to promote environmentally preferable purchasing at their organizations. For example: [6-5]

- "I very much appreciate your website. Good information and easy to navigate. I would love to get more information on the green product samples you distributed and how users responded to the survey. Thank you very much!" – MS, Springfield, MO

- "We are a research site for the US Dept. of Energy. We are interested in substituting safer and greener cleaning chemicals for the harsh ones we are currently using. Would you be willing to share product information about the cleaning products that worked for you? We need to find substitutes for:
  toilet bowl cleaner
  floor stripper
  glass and hard surface cleaner
  all purpose cleaner
  metal cleaner
  carpet cleaner.
  Thank you for any suggestions you can offer! We really appreciate your web-site." – BT, Morgantown, WV

6.10 Agency Outreach

The Santa Clara team was tasked by the project scope to share its findings, tools, and other outreach materials with other governmental agencies. This goal was accomplished by e-mail announcements, direct mailings, technical articles, professional conferences, and workshops.

- E-mail Announcements - The team posted e-mail messages about the project to several regional and national list servers to which agency P2 staff subscribe. In addition, e-mail was used to tell local agencies in the San Francisco area about workshops and other events. Finally, the project arranged for links to its website to be added to websites maintained by the National Association of Counties and other organizations with an interest in environmentally preferable purchasing.

- Direct Mailings - Project events, publications, and other resources were announced in a number of postal mailings. For example, newsletters were sent locally via the County of Santa Clara's P2 mailing list, and the project website was announced through-out the state to members of the California Association of Public Purchasing Officials.

- Pollution Prevention Conferences - The project's approach to janitorial pollution prevention was featured at a number of conferences and presentations, such as the 1999 Western Regional Pollution Prevention Conference in Monterey. This event focused upon ways for an agency to incorporate janitorial P2 into its industry outreach program. The case study used for this session appears on the project website.

It is estimated that the project reached a total of about 1,500 agency staff people via these various routes. About 250 individuals attended workshops and technical presentations that the Santa Clara team made. Three hundred others received announcements mailed directly to them. The balance received e-mail messages, read articles published about the project, or learned of the project through personal referrals.

Feedback received to date indicates that most agency information needs are being satisfied by the fact sheets, tools, and other materials posted on project website. Publication of this completion report will provide the overview and summary that some agency staff have requested.

6.11 Footnotes To Section 6

[6-1] The longest that a requested MSDS took to arrive was just over six months.

[6-2] The first article is: Barron, Thomas, and L. Sutherland, "Environmentally Preferable Janitorial Products: Issues and Opportunities", Pollution Prevention Review, Fall 1999. The second article, which will appear in the Winter 2000 edition of P2 Review, is by T. Barron, D. Raphael, and L. Sutherland. The interview article appearing in Cleaning and Maintenance Management is available on the internet at <http://www.cmmonline.com/GetArticle.asp?Article=360901>.

[6-3] Completing the previously mentioned survey of actual injury data and eventually finding safer alternative products led the team to rate glass, metal, and general purpose cleaners containing 2-butoxyethanol and isopropanol more strictly than had been done initially.

[6-4] Anyone visiting the project website from an internet service provider with a ".gov" suffix is assumed to be connected with an agency.

[6-5} One example of an agency using the project's outreach materials is King County, Washington. This agency shared the Santa Clara project website with its stakeholders via the internet: <http://www.metrokc.gov/procure/green/bul42.htm>.

7. Results Forecast

This section of the report estimates the amount of hazardous chemicals that janitors in Santa Clara County use, and forecasts the amount by which this use will decrease if recommendations from the project are implemented.

The project team worked with 47 organizations, two-thirds of which were janitorial contractors. These organizations employ about 6,800 people, representing about 25% of the janitors working in Santa Clara County. Each year the employees of the 47 firms use 1,140 chemical products that contain an estimated 400,000 lbs. of hazardous materials.

It is estimated that the use of hazardous janitorial chemicals at these 47 organizations could decrease by about 130,000 lbs. per year if all of the recommendations the team made during site visits, workshops, and other local outreach efforts were to be followed. About 25%, or 30,000 lbs. of this potential annual reduction are actually expected to occur.

If the other contractors and individuals doing janitorial work in Santa Clara County were to make similar changes, the total use of hazardous janitorial chemicals throughout the county could decrease by about 620,000 lbs. per year. Motivated by a continuing outreach effort, about 70,000 lbs. of this potential reduction might actually occur.

7.1 Hazardous Materials Use Before Project

The project team estimates that the 26,800 janitors in Santa Clara County use about 750,000 gallons of concentrated and ready-to-use chemical products every year. At an average of 8.34 lbs. per gallon, these chemicals weigh a total of just under 6,270,000 pounds.

As shown by Exhibit 7-1, the amount of hazardous materials in this annual total is estimated to be about 1,284,000 pounds, or 48 lbs. per person per year. [7-1]

Exhibit 7-1
Estimate of Janitorial Chemical Use In Santa Clara County

	Janitors	Total Product (lbs per year)	Hazardous Materials (lbs per year)
47 Reviewed Firms	6,857	1,601,880	328,266
Other Sites	19,974	4,665,841	956,148
Total	26,831	6,267,721	1,284,414
			(47.8 lbs per person)

7.2 Potential Impact Of The Project's Suggestions – Example Sites

Three examples are presented here to illustrate typical sites that are changing their chemical use as a result of product reviews the Santa Clara project conducted. A summary of chemical changes expected at all 47 reviewed sites follows these examples. [7-2]

- Site No. 1 is a manufacturing firm that occupies a campus of several buildings, which have a total area of 725,000 square feet.

  A janitorial contractor with a staff of 30 people maintains these facilities. The contractor uses 26 different chemical products in this work. It is estimated that 5,815 lbs per year of chemicals are consumed at the site, excluding water added for dilution. The amount of hazardous materials in these products is 1,436 lbs per year.

  Exhibit 7-2 highlights five product changes that the review team suggested be made. A potential 574 lb per year decrease in hazardous materials use could result if the site made all five changes.

  In a follow-up contact, the site indicated that the two product changes marked with an asterisk have been made so far, resulting in an actual hazardous materials decrease of 134 lbs. per year. The other changes are being considered, but will probably not be made soon.

Exhibit 7-2
Hazardous Materials Reduction Forecast – Site 1

	Number of Products	Change/Keep	Hazmat Decr. (lb/yr)
Stop Using	0	0/0	0
Avoid if Possible	7	5/2	574 lbs. Potential
Carpet Cleaner		Change	0 lbs. Actual
Floor Stripper		Keep	0 lbs. Actual
Glass Cleaner*		Change	22 lbs. Actual
Carpet Shampoo		Change	0 lbs. Actual
GP Cleaner*		Change	112 lbs. Actual
Acid Tile Cleaner		Change	0 lbs. Actual
Floor Cleaner		Keep	0 lbs. Actual
Use With Care	12	0/12	0
OK	1	0/1	0

As used here, the phrase "Change/Keep" refers to the number of products that the team suggested the site change versus those that the team thought the site should continue to use. This distinction is made because some janitorial tasks, most notably floor finish stripping, cannot as yet be accomplished with mild products.

- Site No. 4 is a school district with a staff of 31 custodians who maintain 1,100,000 square feet of school and administrative buildings. The district uses 33 chemical products, which weigh a total of 6,000 lbs per year excluding dilution water. An estimated 1,484 lbs of this annual total are hazardous materials.

  The review team recommended a number of product changes, which if implemented would potentially decrease the district's hazardous materials use by 594 lbs per year. As shown by Exhibit 7-3, about 10% of this amount, or 58 lbs per year, have actually been accomplished to date (i.e., products marked with an asterisk).

Exhibit 7-3
Hazardous Materials Reduction Forecast – Site 4

	Number of Products	Change/Keep	Hazmat Decr. (lb/yr)
Stop Using	2	2/0	58 lbs. Potential
Graffiti Remover*		Stop	20 lbs. Actual
Gum Remover*		Stop	38 lbs. Actual
Avoid if Possible	9	4/5	536 lbs. Potential
Acid Bowl Cleaner		Change	0 lbs. Actual
Carpet Spotter		Change	0 lbs. Actual
Graffiti Remover		Change	0 lbs. Actual
5 Dispenser Chem.		Keep	0 lbs. Actual
Glass Cleaner		Change	0 lbs. Actual
Use With Care	9	0/9	0
Various Floor Care & GP Cleaners			
OK	9	0/9	0
Various Soaps & Mild GP Cleaners			

Because this school district happens to purchase a full year's supplies at one time, additional hazardous materials decreases will occur next fall when a change is made to different toilet and glass cleaners.

- Firm No. 37 is a full service maintenance contractor that employs 32 janitorial workers at sites in Santa Clara County (i.e., additional company employees work elsewhere). These 32 janitors use 6,200 lbs per year of chemicals, which include 1,530 lbs per year of hazardous materials.

  In its review, highlighted in Exhibit 7-4, the project team recommended changes that would decrease hazardous materials use by 613 lbs. per year. As of December 1999, an estimated 125 lbs. per year of this reduction are believed to have occurred.

These totals do not include lubricants, paints, pesticides, and similar chemicals that other contractor employees at the site use for building and landscape maintenance.

Exhibit 7-4
Hazardous Materials Reduction Forecast – Firm 37

	Number of Products	Change/Keep	Hazmat Decr. (lb/yr)
Stop Using	5	5/0	200 lbs. Potential
Bleach		Stop	0 lbs. Actual
2 Stain Removers		Stop	50 lbs. Actual
Acid Toilet Cleaner		Stop	0 lbs. Actual
Spot Remover		Stop	25 lbs. Actual
Avoid if Possible	18	5/13	413 lbs. Potential
2 Gum Removers			0 lbs. Actual
Glass Cleaner			50 lbs. Actual
GP Cleaner			0 lbs. Actual
14 Other Products			0 lbs. Actual
Use With Care	9	0/9	0
OK	6	0/6	0

7.3 Potential Impact Of The Project's Suggestions – All Sites

Overall, the project team recommended that the 47 reviewed organizations stop using 160 products, and continue using 470 additional chemicals only if extreme care could be assured. In about half of the former cases the sites have already stopped using the product in question. However, only 6% of the latter changes have been made to date.

Predominantly, the products that the team recommended sites to stop using included:

- Carpet shampoo containing nitrilotriacetic acid (5 sites);
- Urinal blocks containing paradichlorobenzene (10 sites);
- Carpet spotter spray containing tetrachloroethylene (15 sites);
- Aerosol spray baseboard stripper (5 sites); and
- Graffiti remover containing methylene chloride (10 sites).

Products that the team recommended that sites avoid if possible (or continue to use only with extreme care) included:

- Acidic toilet bowl cleaner containing hydrochloric acid (25 sites);
- Glass cleaner with butoxyethanol (15 sites); and
- Aerosol furniture polish with flammable propellants (20 sites).

Exhibit 7-5 shows that these changes, if fully implemented, would reduce hazardous materials use at the 47 firms by 131,300 lbs. per year. Based upon follow-up interviews, it is expected that the 47 organizations will actually follow only about 30% of these suggestions in the short term.

Factoring in the specific on-site situations involved, the expected total reduction in hazardous materials usage is estimated as 29,260 lbs. per year. The team estimates further that about half of this decrease has already been accomplished.

Exhibit 7-5
Hazardous Materials Reduction Forecast – 47 Reviewed Sites

Recommendation	Total Potential Changes	Expected Changes	Actual Changes
"Stop Using Product"	160 Products	100 Products	80 Products
"Avoid If Possible, Otherwise Use Extreme Care"	470 Products	90 Products	30 Products
Forecast Hazardous Materials Reduction	131,300 lbs per year (19 lbs per janitor per year)	29,260 lbs per year (4.3 lbs per janitor per year)	±15,000 lbs per year (±2 lbs per janitor per year)

The project team also believes that persistent follow-up would increase the expected amount of reduction that each of the 47 firms accomplishes, attaining perhaps 65,000 lbs per year or 50% of the potential total in the long term.

7.4 Forecast Of County-Wide Hazardous Materials Reductions

Were future pollution prevention outreach efforts to reach all 26,831 of the janitors working in Santa Clara County, the potential amount of hazardous materials reduction would be 513,800 lbs. per year, as shown in Exhibit 7-6. The amount of reduction that would be expected to actually occur is believed to be about 82,500 lbs. per year, which is equivalent to 3.1 lbs. per janitor per year.

This hypothetical estimate assumes that organizations who didn't participate in the project would have the same potential hazardous materials use reduction as the reviewed firms did, but that these other sites would actually implement only half of the relative number of changes suggested

to them. In other words, the firms that didn't participate in the project are assumed to have the same numbers of potential chemical changes, but are less prone to making them.

Exhibit 7-6
Hazardous Materials Reduction Forecast – Santa Clara County

	Potential Changes	Expected Changes
47 Reviewed Organizations (6,857 Employees)	131,300 lbs per year (19 lbs per janitor per year)	29,300 lbs per year (4.3 lbs per janitor per year)
Other Organizations (19,974 Employees)	382,500 lbs per year (19 lbs per janitor per year)	53,200 lbs per year (2.7 lbs per janitor per year)
Total (26,831 Employees)	513,800 lbs per year (19 lbs per janitor per year)	82,500 lbs per year (3.1 lbs per janitor per year)

7.5 Footnotes To Section 7

[7-1] Details of these estimates appear in Appendix G. Briefly, the team made its extrapolations in three steps:

1. The ratio of 25% hazardous materials weight to total product weight was based upon the 19 janitorial products that the team studied in detail.

2. This ratio was used to estimate the amount of hazardous ingredients encountered in 1,137 products used by 47 organizations that were reviewed.

3. The reviewed organizations employ about 25% of all janitors employed in Santa Clara County. The estimate of annual County-wide hazardous materials use is an extrapolation based upon this ratio.

[7-2] Refer to Appendix G for similar information about changes expected at other sites that the Santa Clara team visited.

How To Select And Use Safe Janitorial Chemicals

Completion Report Appendices

Pollution Prevention
Incentives For States

U.S. EPA Region IX
California EPA
County of Santa Clara

December 1999

Preface

This report is an account of a pilot project to evaluate pollution prevention opportunities in the janitorial industry. The project was a collaboration of many individuals, businesses, and agencies whom the authors wish to acknowledge for their valuable contribution. The project would not have been a success without their support.

"Although the work described in this report has been funded in part by the United States Environmental Protection Agency through Grant Number NP-999-729-01-0 to the State of California, it has not been subjected to the Agency's required peer and policy review and therefore does not necessarily reflect the views of the Agency, and no official endorsement should be inferred."

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Appendices

Appendix A References

The following publications and websites are suggested as general references for learning more about the janitorial industry and the chemicals that it uses.

1. Barron, Thomas, C. Berg, and L. Bookman, Janitorial Products Pollution Prevention Project (JP4) Website, < http://www.westp2net.org/Janitorial/jp4.htm>.

2. Berry, Michael, Protecting The Built Environment: Cleaning For Health, Cleaning Management Institute, 1994. Call (518) 783-1281.

3. Bishop, Jeff, et al., More Answers Than You Have Questions About Carpet Cleaning, Volume II, Clean Care Seminars, 1997. Call (334) 983-8730.

4. Cleaning & Maintenance Email Forum, which may be subscribed to by contacting the list manager at: ELam@ntpinc.com.

5. Daugherty, Jack, Assessment of Chemical Exposures, Lewis Publishers, 1997. Call (800) 272-7737.

Appendix B Project Organization

The project team included staff from several government agencies, consultants, and industry representatives. Questions about the project and its findings may be addressed to:

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Appendix C Needs Assessment

The following questionnaire was used to interview site managers, custodians, and janitorial contractors. Not all questions were asked of every site.

Janitorial Products Survey

Thank you for taking part in this survey. It is being conducted for a project in the San Francisco area sponsored by the U.S. Environmental Protection Agency.

The purposes of the project are to learn what needs janitors have for health, safety, and environmental information, and to identify the best ways to provide the needed information.

Please respond by _____ if at all possible. Send your opinions by e-mail to tsbarron@ibm.net or FAX them to (925) 283-6746

Questions? Call (925) 283-8121

A few general questions about the janitorial work that you do:

How many buildings do you service?

What is the total building area that you maintain (Square Feet)?

How many people are employed by you as janitors/custodians?

In a typical building how often do you do the following tasks?

Vacuum / dust mop floors?	
Wet mop floors?	
Strip & refinish floors?	
Vacuum carpets?	
Wet-clean or shampoo carpets?	
Clean restrooms?	
Clean interior windows?	
Clean exterior windows?	
Clean furniture, displays, etc.?	

Next, a few questions about the janitorial products that you use:

How many different janitorial products	
How many different suppliers do you	
How many days worth of supplies do	
What vendor literature do you get	

Please circle the ways you personally learn about product safety and environmental issues?

Trade shows?
Trade magazines?
Vendors?
Professional training courses?
Technical staff person?
Technical consultants?
Internet discussions?
Other?

How important are the following for the various janitorial products that you use?	Very Important	Somewhat Important	Not Important
Low Purchase Price			
Safe To Use			
Effective			
Easy To Mix & Use			
Clearly Labeled Products			
Good Vendor Technical Support			
Good Vendor Training			
Minimize Environmental Impact			
Other Issues?			

How much of these janitorial products do you use each year?
(A rough estimate is fine if you do not have detailed information handy.)

	Estimated Amounts You Use Per Year	
	Gallons/Yr	Cost/Yr
Hard Floor Care		
Sealer		
Floor Finish		
Stripper		
Baseboard Stripper		
General Purpose Floor Cleaner		
Carpet Care		
Pre-Spotter		
Traffic Lane Cleaner		
Shampoo		
Chewing Gum Remover		
Restroom Cleaning		
Acid Bowl Cleaner		
Non-acid Bowl Cleaner		
Disinfectant Cleaner		
Metal Cleaner		
Glass Cleaner		
Spray Deodorizer		
Other Products		
Graffiti Remover		
Wood Furniture Polish		

Overall, do you think chemical dispensers save money compared to concentrated products mixed by hand?

Who do you think are the most frequent purchasers of dispensing systems - sites with employees doing janitorial work or outside janitorial contractors?

Overall, do you think dispensers are safer to use than mixing by hand?

Now we would like to ask your opinions about several health, safety, and environmental issues related to janitorial chemicals.

How aware are you personally of the following issues?	Very Aware	Somewhat Aware	Not Aware
OSHA requirements for safe chemical handling?			
Sanitary sewer discharge requirements?			
Stormwater protection requirements?			
Indoor air quality issues?			
Workers' compensation costs for janitors?			
Health issues for ingredients such as Glycol Ethers?			
Perchloroethylene?			
Alkyl Phenol Ethoxylates?			

How do you think we could best help janitors learn more about safe cleaning chemicals and practices?

	Very Useful	Somewhat Useful	Not Useful
Host Technical Workshops			
Publish Chemical Safety Fact Sheets			
Publish Safety Success Stories			
Make Training Videos			
Certify Cleaning Products			
Organize Business Mentoring Program			
Provide On-Site Assistance			
Operate a Technical Hot Line			
Promote Better Product Labels			
Provide Spanish Language Items			
Conduct Product Demos			
Provide Product Samples			
Other			

Are there any other comments that you would like to make?

Appendix D Product Use Estimates

The following tables summarize estimates made of nineteen common chemicals used by janitorial firms. These estimates are based upon the four complete and several partial surveys that the Santa Clara team conducted during the project. Partial results from other surveyed firms generally fit within the range of product use shown here.

These results are used in the calculations shown in Appendix G.

Table D1
Summary of Annual Janitorial Product Use

Firm:	1	2	3	4	Weighted Averages
Sq. Ft. Maintained:	1,000,000	800,000	4,600,000	426,000	1,706,500
Building Types:	General	Offices	University	General	
Janitors:	50	48	126	67	73
Sq.Ft./Person:	20,000	16,667	36,508	6,358	19,883
Total Quantity (gal)	1,510	1,330	2,182	1,189	1,553
Gallons/1,000 Sq. Ft.	1.51	1.66	0.47	2.79	1.61
Gallons/Person	30	28	17	18	23.2
Total Cost	$12,450	$13,350	$38,350	$10,721	$18,718
Cost/1,000 Sq. Ft.	$12.45	$16.69	$8.34	$25.17	$15.66
Cost/Person	$249	$278	$304	$160	$248

Table D2
Total Amounts Of Janitorial Products Used (Gal Per Year)

	1	2	3	4	Wtd. Avg.
Hard Floor Care					
Sealer	50	200	832		271
Finish	350	300	523	175	337
Stripper	75	200	125	75	119
Baseboard Stripper	10		96		27
General Purpose Floor Cleaner	100	50	96	60	77
Dust Mop Spray	15				4
Carpet Care					
Pre-Spotter	15	50		5	18
Traffic Lane Cleaner	50		100	500	163
Shampoo	150	80	114	60	101
Chewing Gum Remover	15	30	34		20
Mildew Treatment	15				4
Restroom Cleaning					
Acid Bowl Cleaner	75		107	60	60
Non-acid Bowl Cleaner	75				19
Disinfectant Cleaner	250	300	112	184	212
Metal Cleaner	50		4		14
Glass Cleaner	100		30	30	40
Spray Deodorizer	50	40		5	24
Other Products					
Graffiti Remover	15	24	3		10
Wood Furniture Polish	50	56	7	35	37
Total (Gallons):	1,510	1,330	2,183	1,189	1,557

These amounts are for differing amounts of floor space handled by each contractor.

Table D3
Amounts Of Janitorial Products Used (Gal Per 1,000 Square Feet)

	1	2	3	4	Average
Hard Floor Care					
Sealer	0.0500	0.2500	0.1809		0.1202
Finish	0.3500	0.3750	0.1137	0.4108	0.3124
Stripper	0.0750	0.2500	0.0272	0.1761	0.1321
Baseboard Stripper	0.0100		0.0209		0.0077
General Purpose Floor Cleaner	0.1000	0.0625	0.0209	0.1408	0.0811
Dust Mop Spray	0.0150				0.0038
Carpet Care					
Pre-Spotter	0.0150	0.0625		0.0117	0.0223
Traffic Lane Cleaner	0.0500		0.0217	1.1737	0.3114
Shampoo	0.1500	0.1000	0.0248	0.1408	0.1039
Chewing Gum Remover	0.0150	0.0375	0.0073		0.0149
Mildew Treatment	0.0150				0.0038
Restroom Cleaning					
Acid Bowl Cleaner	0.0750		0.0232	0.1408	0.0597
Non-acid Bowl Cleaner	0.0750				0.0188
Disinfectant Cleaner	0.2500	0.3750	0.0243	0.4319	0.2703
Metal Cleaner	0.0500		0.0009		0.0127
Glass Cleaner	0.1000		0.0065	0.0704	0.0442
Spray Deodorizer	0.0500	0.0500		0.0106	0.0276
Other Products					
Graffiti Remover	0.0150	0.0300	0.0005		0.0114
Wood Furniture Polish	0.0500	0.0703	0.0015	0.0822	0.0510
Total (Gallons/1,000 Sq. Ft.):	1.5100	1.6628	0.4743	2.7898	1.6093

Table D4
Costs Of Janitorial Products Used Per Year

	1	2	3	4	Average
Hard Floor Care					
Sealer	$500	$1,800	$10,974		$3,319
Finish	$4,000	$3,500	$7,314	$2,019	$4,208
Stripper	$750	$1,500	$6,371	$807	$2,357
Baseboard Stripper	$100		$309		$102
General Purpose Floor Cleaner	$1,000	$600	$3,200	$360	$1,290
Dust Mop Spray	$100				$25
Carpet Care					
Pre-Spotter	$200	$600		$45	$211
Traffic Lane Cleaner	$750		$1,300	$3,400	$1,363
Shampoo / Extractant	$2,000	$800	$1,219	$540	$1,140
Chewing Gum Remover	$150	$250	$385		$196
Mildew Treatment	$250				$63
Restroom Cleaning					
Acid Bowl Cleaner	$200		$1,190	$720	$528
Non-acid Bowl Cleaner	$200				$50
Disinfectant Cleaner	$1,000	$3,500	$4,120	$1,513	$2,533
Metal Cleaner	$300		$69		$92
Glass Cleaner	$300		$1,597	$325	$556
Spray Deodorizer	$275	$300		$96	$168
Other Products					
Graffiti Remover	$175	$300	$39		$129
Wood Furniture Polish	$200	$200	$263	$896	$390
Total Cost:	$12,450	$13,350	$38,350	$10,721	$18,718

Table D5
Costs Of Janitorial Products Used Per 1,000 Square Feet

	1	2	3	4	Average
Hard Floor Care					
Sealer	$0.50	$2.25	$2.39		$1.28
Finish	$4.00	$4.38	$1.59	$4.74	$3.68
Stripper	$0.75	$1.88	$1.39	$1.89	$1.48
Baseboard Stripper	$0.10		$0.07		$0.04
General Purpose Floor Cleaner	$1.00	$0.75	$0.70	$0.85	$0.82
Dust Mop Spray	$0.10				$0.03
Carpet Care					
Pre-Spotter	$0.20	$0.75		$0.11	$0.26
Traffic Lane Cleaner	$0.75		$0.28	$7.98	$2.25
Shampoo	$2.00	$1.00	$0.27	$1.27	$1.13
Chewing Gum Remover	$0.15	$0.31	$0.08		$0.14
Mildew Treatment	$0.25				$0.06
Restroom Cleaning					
Acid Bowl Cleaner	$0.20		$0.26	$1.69	$0.54
Non-acid Bowl Cleaner	$0.20				$0.05
Disinfectant Cleaner	$1.00	$4.38	$0.90	$3.55	$2.46
Metal Cleaner	$0.30		$0.02		$0.08
Glass Cleaner	$0.30		$0.35	$0.76	$0.35
Spray Deodorizer	$0.28	$0.38	$0.00	$0.23	$0.22
Other Products					
Graffiti Remover	$0.18	$0.38	$0.01		$0.14
Wood Furniture Polish	$0.20	$0.25	$0.06	$2.10	$0.65
Total Cost / 1,000 Sq. Ft.:	$12.46	$16.71	$8.37	$25.17	$15.66

These costs are per 1,000 square feet of building that is 50% carpeted and 50% hard floor.

Table D6
Amounts Of Janitorial Products Used Per Worker (Gal Per Year)

	1	2	3	4	Average
Hard Floor Care					
Sealer	1.00	4.17	6.60		2.94
Finish	7.00	6.25	4.15	2.61	5.00
Stripper	1.50	4.17	0.99	1.12	1.94
Baseboard Stripper	0.20		0.76		0.24
General Purpose Floor Cleaner	2.00	1.04	0.76	0.90	1.17
Dust Mop Spray	0.30				0.08
Carpet Care					
Pre-Spotter	0.30	1.04		0.07	0.35
Traffic Lane Cleaner	1.00		0.79	7.46	2.31
Shampoo	3.00	1.67	0.90	0.90	1.62
Chewing Gum Remover	0.30	0.63	0.27		0.30
Mildew Treatment	0.30				0.08
Restroom Cleaning					
Acid Bowl Cleaner	1.50		0.85	0.90	0.81
Non-acid Bowl Cleaner	1.50				0.38
Disinfectant Cleaner	5.00	6.25	0.89	2.75	3.72
Metal Cleaner	1.00		0.03		0.26
Glass Cleaner	2.00		0.24	0.45	0.67
Spray Deodorizer	1.00	0.83		0.07	0.48
Other Products					
Graffiti Remover	0.30	0.50	0.02		0.21
Wood Furniture Polish	1.00	1.17	0.06	0.52	0.69
Total (Gallons/Person):	30.20	27.72	17.31	17.75	23.25

These amounts are per total number of workers doing janitorial tasks. Amounts of specialized chemicals, like floor finish stripper, are also stated per total number of workers (and not per specialty worker assigned to utility crews).

Table D7
Annual Costs Of Janitorial Products Used Per Worker

	1	2	3	4	Average
Hard Floor Care					
Sealer	$10.00	$37.50	$87.10		$33.65
Finish	$80.00	$72.92	$58.05	$30.13	$60.27
Stripper	$15.00	$31.25	$50.56	$12.04	$27.21
Baseboard Stripper	$2.00		$2.45		$1.11
General Purpose Floor Cleaner	$20.00	$12.50	$25.40	$5.37	$15.82
Dust Mop Spray	$2.00				$0.50
Carpet Care					
Pre-Spotter	$4.00	$12.50		$0.67	$4.29
Traffic Lane Cleaner	$15.00		$10.32	$50.75	$19.02
Shampoo	$40.00	$16.67	$9.67	$8.06	$18.60
Chewing Gum Remover	$3.00	$5.21	$3.06		$2.82
Mildew Treatment	$5.00				$1.25
Restroom Cleaning					
Acid Bowl Cleaner	$4.00		$9.44	$10.75	$6.05
Non-acid Bowl Cleaner	$4.00				$1.00
Disinfectant Cleaner	$20.00	$72.92	$32.70	$22.58	$37.05
Metal Cleaner	$6.00		$0.55	$0.00	$1.64
Glass Cleaner	$6.00		$12.67	$4.85	$5.88
Spray Deodorizer	$5.50	$6.25		$1.43	$3.30
Other Products					
Graffiti Remover	$3.50	$6.25	$0.31		$2.51
Wood Furniture Polish	$4.00	$4.17	$2.09	$13.37	$5.91
Total (Cost/Person):	$249.00	$278.14	$304.37	$160.00	$247.88

Appendix E Product and Ingredient Risk Data

E.1 High Risk Products

This checklist can be used to identify a janitor's highest risk products, which are generally ones that:

- Are corrosive to the eyes and skin;
- Are flammable;
- Give off toxic fumes; or
- Are poisonous.

Product	Hazards Often Seen In This Kind Of Product	Do You Use This Product?
Acid Toilet Bowl Cleaner With Hydrochloric Acid	Corrosive to eyes and skin; Can cause blindness	
Metal Cleaner With Perchloroethylene	Poisonous, Causes Cancer, or Flammable	
Carpet Spotter With Perchloroethylene	Poisonous, Causes Cancer, or Flammable	
General Purpose Cleaner With Butoxyethanol, Sodium Hydroxide, & Ethanolamine	Corrosive to eyes and skin, Poisonous, or Flammable	
Floor Finish Stripper With Butoxyethanol, Sodium Hydroxide, & Ethanolamine	Corrosive to eyes and skin & Poisonous	
Baseboard Stripper With Butoxyethanol, Sodium Hydroxide, & Ethanolamine	Corrosive to eyes and skin & Poisonous	
Graffiti Remover With Methylene Chloride or Perchloroethylene	Poisonous, Causes Cancer, or Flammable	
Glass Cleaner With Butoxyethanol	Flammable, or Poisonous	
Disinfectant With Bleach, Phenol, Quats., or Hydrogen Peroxide	Corrosive to eyes and skin & Poisonous	

E.2 High Risk Ingredients

The following are examples of ingredients in janitorial products that pose the greatest health hazards to the user, building occupants, and the environment in general.

Type	Examples	Problems
Acids	Hydrochloric Acid, Phosphoric Acid	Corrosive - Causes blindness Damages skin Sewer discharge pH too low
Caustic	Sodium Hydroxide; Sodium Metasilicate; Potassium Hydroxide	Corrosive - Causes blindness Damages skin Sewer pH too high
Solvents	Perchloroethylene Butoxyethanol; Ethanolamine Toluene HCFC-141	Causes cancer Poison - Absorbs through skin & poisons liver, kidneys, and a pregnant woman's fetus Environmental - Destroys the ozone layer; causes global warming
Surfactants	Alkyl Phenol Ethoxylates	Environmental - Persists in the environment; bioaccumulates; affects animal hormone systems
Disinfectants	Bleach (Sodium Hypochlorite) Paradichlorobenzene (Urinal Blocks) Quaternary Ammonium Chloride	Corrosive - Can burn eyes & skin Reacts - Bleach mixed with acid or ammonia causes poison gas Causes cancer Corrosive - Can burn eyes & skin

Where can you get more information about these ingredients? The best sources are Material Safety Data Sheets (MSDSs) for your janitorial products, or MSDSs for the toxic ingredients themselves. In addition, our project has published a safety summary of 100 common ingredients found in many janitorial products. Visit our web site for details.

<http://www.westp2net.org/Janitorial/jp4.htm>

E.2.1 Do Not Use The Following Ingredients

Janitorial products with these ingredients pose unacceptable risks to the janitor, to building occupants, or to the environment. Gloves and goggles, may not be enough to fully protect the user from harm. In some instances the ingredients are illegal for janitorial products.

A “Skin Poison” can absorb through your skin and poison your liver, kidneys, and other internal organs. An “Inhale Poison” harms you when you breath the fumes. “Corrosive” means that the chemical can permanently destroy your eyes and skin.

CAS Number	Ingredient Name	Problems
00100-51-6	Benzyl Alcohol	Cancer / Corrosive / Skin Poison
00075-45-6	CFC-22; Chloro difluoro methane	Illegal
68603-42-9	Coconut Oil Diethanolamine	Cancer
00111-42-2	Diethanolamine	Cancer
00075-68-3	HCFC-141	Illegal
00120-40-1	Lauric Acid Diethanolamine	Cancer
00071-55-6	Methyl Chloroform; 1,1,1-TCE	Skin Poison
00078-93-3	Methyl Ethyl Ketone	Skin Poison
00091-20-3	Naphthalene	Cancer / Corrosive / Skin Poison
18662-53-8	Nitrilotriacetic Acid	Cancer
00106-46-7	Para dichloro benzene	Cancer / Inhale Poison
00127-18-4	Tetrachloroethylene; Perchloroethylene “PERC”	Cancer / Skin & Inhale Poison
00108-88-3	Toluene	Skin Poison
00688-73-3	Tributyl Tin	Illegal
00079-01-6	Trichloroethylene	Inhale Poison

E.2.2 Use Extreme Care (Avoid if Possible)

If at all possible, avoid janitorial products with these ingredients. They pose very high risks to the janitor using the product, to the building occupants, or to the environment. If there are no substitutes available, then assure that the workers are fully trained in safe handling and use of this product, and assure that protective gloves and goggles are worn at all times.

CAS Number	Ingredient Name	Problems
00111-76-2	2-Butoxy Ethanol	Skin Poison
00090-43-7	2-Phenyl Phenol	Eye & Skin Burns
00067-64-1	Acetone	Skin/Inhale Poison
07664-41-7	Ammonia	Corrosive
01341-49-7	Ammonium Bifluoride	Corrosive
01336-21-6	Ammonium Hydroxide	Corrosive
00628-63-7	Amyl Acetate	Poison
00124-07-2	Caprylic Acid	Corrosive / Skin Poison
00084-74-2	Dibutyl Phthalate	Hormone Modifier
00112-34-5	Diethylene Glycol Monobutyl Ether	Skin Poison
07647-01-1	Hydrochloric Acid	Corrosive
07722-84-1	Hydrogen Peroxide	Corrosive
00079-14-1	Hydroxyacetic Acid	Corrosive
00141-43-5	Monoethanolamine	Burns / Skin Poison
09016-45-9	Nonyl Phenol Ethoxylate	Hormone Modifier
09036-19-5	Octyl Phenol Ethoxylate	Hormone Modifier
07664-38-2	Phosphoric Acid	Corrosive
26027-38-3	Polyethylene Monophenyl Ether	Hormone Modifier / Burns
07681-51-9	Sodium Hypochlorite; Bleach	Corrosive
00102-71-6	Triethanolamine	Skin Poison
01330-20-7	Xylene	Burns / Skin & Inhale Poison

E.2.3 Use Extreme Care With These Ingredients

These ingredients are dangerous, but may have to be used because safer substitutes are not readily available. Assure that the workers are fully trained in safe handling and use, and assure that protective gloves and goggles are worn at all times (particularly when handling concentrated solutions). Also take care when disposing of left over product, wastewater, and empty containers.

CAS Number	Ingredient Name	Problems
00872-50-4	1-Methyl 2-Pyrolidinone	Burns
08001-54-5	Alkyl Dimethyl Benzyl Ammonium Chloride	Burns
00334-48-5	Capric Acid	Skin Poison
00111-46-6	Diethylene Glycol	Skin Poison
00115-10-6	Dimethyl Ether	Burns
29911-28-2	Dipropylene Glycol Butoxy Ether	Skin Poison Burns
25155-30-0	Dodecyl Benzene Sulfonate	Burns
27176-87-0	Dodecylbenzne Sulfonic Acid	Burns
00064-17-5	Ethanol	Skin/Inhale Poison
00122-99-6	Ethylene Glycol Phenyl Ether	Burns
00067-63-0	Isopropanol	Skin & Inhale Poison / Burns
08008-20-6	Kerosene	Inhale Poison / Burns
00067-56-1	Methanol	Inhale Poison
02809-21-4	Phosphonic Acid	Corrosive
07320-34-5	Potassium Diphosphate	Burns
01310-58-3	Potassium Hydroxide	Burns
07681-38-1	Sodium Bisulfate	Corrosive
00497-19-8	Sodium Carbonate	Corrosive
01310-73-2	Sodium Hydroxide	Corrosive
06834-92-0	Sodium Metasilicate	Corrosive
05329-14-6	Sulfamic Acid	Burns
08052-41-3	Stoddard Solvent	Poison

E.2.4 Use Routine Care With These Ingredients

Some of these ingredients are dangerous, but risks of them getting into the body to do harm are relatively low. For example, several of these ingredients have to be eaten in order for toxic effects to be felt. Others are toxic only at concentrations and quantities that are much higher than those in janitorial products.

As with any chemical, assure that the workers are fully trained in safe handling and use, and assure that protective gloves and goggles are worn at all times (particularly when handling concentrated solutions). Also take care when disposing of left over product, wastewaters, and empty containers.

CAS Number	Ingredient Name	Problems
00770-35-4	1-Phenoxy-2-Propanol	Inhale Irritant
00064-19-7	Acetic Acid	Irritant / Burns
00120-32-1	Chlorophene	Poison
05989-27-5	d-Limonene	Inhale Irritant
00111-90-0	Diethylene Glycol Monoethyl Ether	Inhale Poison (Slight)
00111-77-3	Diethylene Glycol Monomethyl Ether	Poison
02809-21-4	Diphosphonic Acid	Poison
34590-94-8	Dipropylene Glycol Methyl Ether	Skin Poison (Slight)
17572-97-3	EDTA Tetrapotassium Salt	Irritant
00064-02-8	Ethylene Diamine Tetraacetic Acid	Irritant
00097-86-9	Isobutyl Methacrylate	Irritant
67741-65-7	Mineral Spirits	Irritant
08030-30-6	Naphtha	Inhale Poison
05324-84-5	Octane Sulfonic Acid	Skin Poison (Slight)
68441-17-8	Oxidized Polyethylene	Irritant
63148-62-9	Poly Dimethyl Siloxane	Irritant
07757-82-6	Sodium Sulfate	Irritant
07758-29-4	Sodium Tripoly Phosphate	Irritant
01300-72-7	Sodium Xylene Sulfonate	Skin Poison (Slight)

E.3 Criteria For Evaluating Products

Here are about 30 questions that you can use to evaluate the risks of janitorial products. It takes quite a bit of effort to answer all of the questions, so it's best to focus on product characteristics that pose a higher hazard to you. For details see the following pages.

Health & Safety Impacts	How easy is it to use this question?	Do you want to use this question?
Carcinogenic / Prop. 65	Easy	
Reproductive Hazard - Mutagen	Hard	
Reproductive Hazard - Teratogen	Hard	
Endocrine Modifier	Medium	
Corrosivity / pH	Easy	
Flammability / Flash Point	Easy	
Reactivity	Easy	
Eye Irritant	Medium	
Skin Irritant	Medium	
Inhalation Irritant	Medium	
Ease of Skin Absorption	Hard	
Ease Of Inhalation / Vapor Pressure	Hard	
Overall Toxicity (LD50)	Medium	
Environmental Impacts		
Ozone Depleting Substance	Easy	
Global Warming Substance	Easy	
Hazardous Waste	Medium	
Stormwater Pollutant	Hard	
Sanitary Sewer Pollutant	Hard	
Persistence / Biodegradability / Bioaccum.	Hard	
Indoor Air Quality	Hard	
Phosphates	Medium	
Volatile Organic Compounds	Medium	
Other Impacts		
Has Added Fragrance	Hard	
Has Added Dye	Hard	
Packaged As Concentrate / Mixing System	Medium	
Safe Container	Medium	
Refillable Container	Medium	
Container Made Of Recycled Material	Medium	
Non-Aerosol Container	Medium	

Source: http://www.westp2net.org/Janitorial/jp4.htm

Product Risk Evaluation Criteria

Impacts	Description Of Criteria	Where To Get Information
Carcinogenic / Prop. 65 List	Does the product contain ingredients that are known or suspected of causing cancer, either in animals or humans? Example: Tetrachloroethylene Nitrilo Triacetic Acid Recommendation: Avoid products that have even trace amounts of cancer causing ingredients.	Material Safety Data Sheet (MSDS) for the product, or MSDSs for each ingredient, or published cancer studies. Cancer studies are available for only a few of the many hundreds of ingredients used in janitorial products. California's Proposition 65 chemical list is available on the internet.
Reproductive Hazard - Mutagen	Known or suspected of interfering with conception, either in animals or humans? Example: Tetrachloroethylene Recommendation: Avoid even trace amounts of such ingredients.	MSDS for the product, or separate MSDSs for its ingredients, or published toxicology studies.
Reproductive Hazard - Teratogen	Known or suspected of interfering with fetal development, either in animals or humans? Example: Tetrachloroethylene Recommendation: Avoid even trace amounts of such ingredients.	MSDS for the product or its ingredients, or published toxicology studies.
Endocrine Modifier	Known or suspected of interfering with hormone systems, either in animals or humans? Example: Alkylphenol Ethoxylate Dibutyl Phthalate Recommendation: Avoid even trace amounts of such ingredients. Although in normal use these ingredients do not affect the janitor, they do persist in the environment and affect fish and other animals, and can contaminate drinking water used by humans.	Contact product supplier for information - these ingredients are not yet required by OSHA to be listed on the MSDS. Refer to our project web site for links to internet sites with information about endocrine modifiers.

Corrosivity / pH	Will the product cause burns, or destroy skin, or cause blindness? Is the pH below 4 or above 11.5? Examples: Hydrochloric Acid Sodium Hydroxide Recommendation: Avoid corrosive ingredients (high or low pH) where possible. If no alternatives are available, then use product with extreme care.	MSDS for the product or its ingredients. Older MSDSs may not include pH.
Flammability / Flash Point	Is the product flammable or extremely flammable? Is the flash point below 140 F? Is the NFPA or HMIS fire rating 2 or higher? Examples: Propane (Aerosol Propellant) Isopropanol Toluene Recommendation: Avoid flammable (low flash point) ingredients where possible. Change to non-aerosol products if it is the propellant that causes the fire rating to exceed 2..	MSDS for the product or its ingredients.
Reactivity	Does the product contain ingredients that combine violently with other chemicals? Is the NFPA or HMIS reactivity rating 2 or higher? Examples: Bleach & Ammonia Bleach & Acid Recommendation: Avoid reactive ingredients where possible. Keep incompatible products away from each other.	MSDS for the product or its ingredients.

Eye Irritant	Does the product contain ingredients that irritate the eyes “moderately” or “severely”, or cause eye burns, or cause blindness? Examples: Hydrochloric Acid Ammonium Hydroxide Recommendation: Where possible, avoid ingredients that cause moderate eye irritation or worse. Otherwise use such products with extreme care.	MSDS for the product or its ingredients. Ask the supplier for eye irritation test data. Once scarce, these data are now becoming available for more products.
Skin Irritant	Does the product contain ingredients that irritate the skin “moderately” or “severely”, or cause skin burns, or damage/scar the skin? Examples: Hydrochloric Acid Sodium Hydroxide Recommendation: Where possible, avoid ingredients that cause moderate skin irritation or worse. Otherwise use such products with extreme care.	MSDS for the product or its ingredients. Ask the supplier for skin irritation test data. Once scarce, these data are now becoming available for more products.
Inhalation Irritant	Does the product contain ingredients that irritate the nose, throat, or lungs “moderately” or “severely”, or cause burns, or damage/scar the air passage? Examples: Hydrochloric Acid Sodium Hydroxide Recommendation: Where possible, avoid ingredients that cause moderate irritation or worse. Otherwise use such products with extreme care.	MSDS for the product or its ingredients.
Ease of Skin Absorbtion	Does the product contain ingredients that readily absorb through the skin, and that then damage or poison the kidneys, liver, or other internal organs? Examples: 2-Butoxyethanol Ethanolamine Acetone Recommendation: Where possible, avoid ingredients that can be absorbed through skin. Otherwise use such products with extreme care.	MSDS for the product or its ingredients. Ask the supplier for skin absorbtion test data. These data are available for only a few products and ingredients.

Ease of Inhalation / Vapor Pressure	Does the product contain ingredients that evaporate readily, and therefore are easy to inhale, and that then damage or poison the kidneys, liver, or other internal organs? Is the vapor pressure of the product or its most toxic ingredients more than 18 millimeters of mercury measured at 20 C? Examples: Isopropanol Tetrachloroethylene Recommendation: Where possible, avoid toxic ingredients that evaporate faster than water. Otherwise use such products with extreme care, provide good ventilation, and wear a breathing mask.	MSDS for the product or its ingredients.
Overall Toxicity (LD50)	Is the product or any of its ingredients highly toxic? Is the LD50 (oral - rat) for any ingredient less than 500 mg/kg? Examples: Naphthalene Quaternary Ammonium Chloride Recommendation: Where possible avoid ingredients that are highly toxic. Otherwise use such products with extreme care.	MSDS for the product or its ingredients.
Ozone Depleting Substance	Does the product contain any ingredient that evaporates readily and affects the earth's ozone layer? Examples: CFC-12 HCFC - 141 Recommendation: Do not use any product with ingredients that harm the earth's ozone layer.	MSDS for the product or its ingredients.
Global Warming Substance	Does the product contain any ingredient that evaporates readily and affects the earth's ozone layer? Examples: CFC-12 HCFC - 141 Recommendation: Do not use any products with ingredients that have a global warming potential.	MSDS for the product or its ingredients.

Hazardous Waste	Does the product contain any ingredient regulated under SARA Title III? Examples: Glycol Ethers Methylene Chloride Recommendation: Where possible avoid ingredients that are listed by SARA Title III. Otherwise use such products with extreme care.	MSDS for the product or its ingredients.
Stormwater Pollutant	If the product is to be used outdoors, does it contain any ingredients that are considered stormwater pollutants. Examples: Most Chemicals Recommendation: Do not use products containing stormwater pollutants outdoors, unless steps are taken to collect wastes before they can reach stormwater system.	Newer MSDSs (with 16-part format) might describe stormwater requirements. Otherwise ask local stormwater management agency for guidance.
Sanitary Sewer Pollutant	Will any unused product or any wastes be put into the sewer? If yes, does the product contain any ingredients regulated by the local sewer agency? Examples: High or low pH Toxic Organics Zinc & other metals Recommendation: Do not use products containing sanitary sewer pollutants, unless steps are taken to ship wastes off-site rather than putting them into the sewer system.	A few MSDSs mention specific ingredients of concern to local sewer agencies. Ask your local agency for guidance.
Persistence / Biodegradability / Bioaccumulation	Does the product contain any toxic ingredients that persist in the environment and bioaccumulate? Examples: Dibutyl Phthalate Alkylphenol Ethoxylate Recommendation: Do not use products containing ingredients that are not readily and fully biodegraded in the sanitary sewer system.	A few MSDSs mention specific ingredients of concern in this area. Contact product supplier and ask for their ecological fate assessment of the product. Ask your local county health agency for guidance.

Indoor Air Quality	Does the product contain any ingredient that evaporates easily, has an odor, is flammable, or is toxic? Examples: Isopropanol d-Limonene Recommendation: Where possible avoid ingredients that affect indoor air quality. Otherwise use such products with extreme care, with good outside ventilation, and at times when the building is empty.	MSDS for the product or its ingredients. Look for added unnecessary fragrances, flammables, and other volatile ingredients.
Phosphates	Does the product contain phosphates? Example: Trisodium Phosphate Recommendation: Where possible use products with no phosphates, or very low phosphate levels. In any case, be sure phosphate levels are less than required by local sewer agency.	MSDS for product.
Volatile Organic Compounds	Does the product have higher VOC levels than are allowed by California air quality rules? Example: General purpose cleaners must have less than 10% VOC content. Recommendation: Where possible do not use products containing any VOCs. If VOC ingredients are needed, assure that the VOC % is as low as possible.	MSDS for the product or its ingredients. Look for unnecessary added fragrances, flammables, and other volatile ingredients.
Has Added Fragrance	Does the product have a separate fragrance in addition to the natural odors of its other ingredients. Example: Lemon Oil Recommendation: Do not use products with unnecessary fragrances.	Product MSDS. Ask supplier for unscented products.
Has Added Dye	Does the product have a separate dye in addition to the natural colors of its other ingredients. Example: F&D Red Recommendation: Do not use products with unnecessary dyes.	Product MSDS. Ask supplier for uncolored products, or for ones where the color serves to identify different products.

Packaged As Bulk Concentrate / Mixing System	Is the product available as a concentrate? Example: Disinfectant Recommendation: If you have trained people responsible for mixing, and have safe mixing systems, then purchase concentrates. Otherwise buy only ready-to-use (RTU) products.	Ask supplier for mixing systems, dispensers, and mixing guides.
Safe Container	Is the product container spill resistant? Are product containers shipped in spill resistant packaging? Are the container and trigger strong enough to survive routine use? Example: Trigger assembly shipped separate with product in containers having tightly closed screw tops. Recommendation: Consider container safety when selecting products.	Ask supplier about spill resistant containers and packaging.
Refillable Container	Is the product container refillable? Example: Trigger bottles that can be refilled at a dispensing station. Recommendation: Use products that come in refillable containers.	Ask supplier about refillable containers and dispensing systems.
Container Made Of Recycled Material	Is the product container made of recycled plastic? Are shipping packages made of recycled cardboard? Example: Trigger bottles Recommendation: Use products whose shipping containers and trigger bottles are made of recycled materials.	Ask supplier about recycled content of containers and packaging.
Non-Aerosol Container	Is the product sold as an aerosol? Example: Baseboard stripper Furniture polish Glass Cleaner Graffiti Remover Recommendation: Where possible buy non-aerosol products.	Ask supplier for non-aerosol version of products.

E.4 How To Evaluate Product Ingredients

"Stop Using" or "Do Not Use"

Janitorial products with these ingredients pose unacceptable risks to the janitor, to building occupants, or to the environment. Gloves and goggles, may not be enough to fully protect the user from harm. In some instances the ingredients are illegal for janitorial products.

A "Skin Poison" can absorb through your skin and poison your liver, kidneys, and other internal organs. An "Inhale Poison" harms you when you breath the fumes. "Corrosive" means that the chemical will permanently destroy your eyes and skin.

"Avoid If Possible"

If at all possible, avoid janitorial products with these ingredients. They pose very high risks to the janitor using the product, to building occupants, or to the environment. If there are no substitutes available, then use with extreme care and assure that workers are fully trained in safe handling and use, and assure that protective gloves and goggles are worn at all times.

"Use With Extreme Care"

Ingredients of this kind are dangerous, but may have to be used because safer substitutes are not readily available. Assure that workers are fully trained in safe handling and use, and assure that protective gloves and goggles are worn at all times (particularly when handling concentrated solutions). Also take care when disposing of left over product, wastewaters, and empty containers.

"Use With Routine Care"

Some of these ingredients are dangerous, but risks of them entering into the body and causing harm are relatively low. For example, several of these ingredients have to be ingested in order for toxic effects to be felt. Others are toxic only at concentrations and quantities that are much higher than occur in janitorial products.

As with any chemical, assure that workers are fully trained in safe handling and use, and assure that protective gloves and goggles are worn at all times (particularly when handling concentrated solutions). Also take care when disposing of left over product, wastewaters, and empty containers.

E.5 Selecting Protective Equipment

The material safety data sheet should tell you what kinds of protection to wear for safe handling of the product. For most janitorial products the MSDS will tell you to wear gloves and goggles, and perhaps a plastic apron.

Gloves

Heavy duty chemical resistant gloves are the best. Buy various sizes so that your people can find a pair that fits.

If anyone has a problem with their hands sweating too much, then give them cloth glove liners. These absorb sweat and make the gloves more comfortable. Another thing to do to make gloves more comfortable is to use a hand cream before putting the gloves on. One choice is antibacterial hand cream similar to what is used in hospitals and doctors' offices. Such creams are available in drug stores.

Goggles

Plastic wrap-around soft-shell goggles are best for preventing chemical splashes from hitting your eyes. The soft edges fit closely to your face and prevent liquids from reaching your eyes. However, these goggles are uncomfortable, and can fog up. To deal with these problems, buy the softest rubber goggles you can find. Also get cleaning sprays that keep the lenses from fogging as badly (although nothing can keep lenses totally clear).

Impact goggles are meant primarily for protecting your eyes from flying objects. They provide some protection from splashed chemicals, but not as much as the wrap-around type. Because they are more comfortable and do not fog as badly, many people like these goggles better than the splash-proof kind. In deciding which goggles to buy you have to make a trade off between protection and comfort.

Apron

Using a plastic apron can be important when opening and mixing products. This is particularly true for when you are handling concentrated chemicals that you are diluting with water.

Eyewash and Shower

California OSHA requires that an eyewash and a shower be provided within a 10 second reach of any employee handling corrosive chemicals (like floor finish stripper or acid toilet bowl cleaner).

Appendix F Sample Outreach Materials

Based upon the needs assessment results, the Santa Clara team concentrated its local outreach efforts in four key areas. All of these items appear on the project website.

1. Information about cleaning work that uses the most hazardous chemicals, comprising seven fact sheets in English and one in Spanish.

2. Tools for people to use in evaluating their own chemical products, including forms, checklists, and guidance on how to find internet sites that feature chemical data.

3. Commentaries about the process of changing from strong chemicals to environmentally preferable ones. This category includes success stories, articles, and other items written by the project team, as well as materials furnished by other agencies.

4. Workbooks for use in training janitorial professionals about product health, safety, and environmental issues.

In addition, the team contributed to trade press articles, made public presentations, and furnished samples of environmentally preferable products to janitors and sites in Santa Clara County.

Example Fact Sheets included in this Appendix::

Toilet Cleaning / Highlights of Typical Fact Sheet

Highest Risk Cleaning Activities
- Toilet Cleaning
- Hard Floor Care
- Carpet Care
- Restroom Cleaning
- Glass Cleaning
- Metal Cleaning
- Disinfectants
- Limpieza Segura Y Efectiva Para Los Inodoros

Specific Ingredient Hazards
- Butoxyethanol
- Dibutyl Phthalate
- Ethanolamine (Mono-, Di-, Tri-)
- Hydrochloric Acid
- Monoethanolamine
- Nitrilotriacetic Acid
- Nonyl Phenol Ethoxylate / Octyl Phenol Ethoxylate
- Tetrachloroethylene

Example Tools included in this Appendix are marked *.

Finding Chemical Data (Exhibit 6-2)
High Risk Products List (Exhibit 4-4)
Product Risk Evaluation Form *
Product Test Evaluation Form *
Risk Evaluation Criteria (Appendix E)
Site Survey Form (Appendix C)

Example Commentaries included in this Appendix:

Safe & Effective Toilet Cleaning

Many toilet bowl cleaners contain acids and other chemicals that are harmful. Use the mildest product you can find, and always wear gloves and goggles to protect yourself.

Most non-acid toilet cleaners are relatively safe to use, and have only a small impact on the environment. Disinfectants require a bit more care, but are still fairly safe. Acid cleaners are the most dangerous of all.

Use a mild cleaner for daily toilet maintenance.

Unless the toilets are already in good shape, clean them first and then use a separate disinfectant.

Use acid cleaners only when you have really stubborn stains to remove.

Acid cleaners are very dangerous - always protect yourself by wearing gloves and goggles.

Regular Cleaning - Use a strong non-acid cleaning product for your daily toilet maintenance. Also use a disinfectant product that contains Alkyl Ammonium Chloride to kill germs.

Some suppliers combine the cleaner and disinfectant into one product. You can use a combined cleaner-disinfectant only if the toilet fixtures are not too dirty to start with.

Otherwise you should clean the toilets first, and then use a separate disinfectant. Leave the disinfectant in place for 10 minutes to get good results.

Stain Removal - Sometimes lime stains, rust, or other stubborn deposits will form in the toilet bowl. Your regular daily cleaner might not remove these materials.

You have two choices: use a powdered cleaner and scrub pad to scour the bowl, or use an acid cleaner.

Acids corrode metal. Use acid cleaners only on porcelain toilet bowls.

Don't mix acids with bleach. This creates chlorine gas that can kill you.

Acids can cause harm very quickly, so always protect yourself with gloves and goggles. Pour the acid cleaner from low down so it won't splash. Use your scrub brush carefully to avoid splashes as well. Flush the toilet twice to remove excess cleaner when you are done.

Fact sheets focus upon safety messages

Ideas included for using less toxic products

Boxes & Red Type used to highlight major safety points

Safety advice given on what to do if a strong product must be used

Highlights of A Typical Fact Sheet

Toilet Cleaning

Many toilet bowl cleaners contain acids and other chemicals that are harmful. Use the mildest product you can find, and always wear gloves and goggles to protect yourself.

Most non-acid toilet cleaners are relatively safe to use, and have only a small impact on the environment. Disinfectants require a bit more care, but are still fairly safe. Acid cleaners are the most dangerous of all.

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Don't mix acids with bleach. This creates chlorine gas that can kill you.

Acids can cause harm very quickly, so always protect yourself with gloves and goggles. Pour the acid cleaner from low down so it won't splash. Use your scrub brush carefully to avoid splashes as well. Flush the toilet twice to remove excess cleaner when you are done.

Hard Floor Care

Hard floor care involves one of the most dangerous chemical products that janitors use - floor finish stripper. Stripper usually comes in two forms: a liquid concentrate for stripping large floor areas, and a ready-to-use aerosol for taking floor finish off of baseboards. Both of these strippers contain chemicals that can seriously harm the user, and may also affect building occupants and the environment.

FLOOR STRIPPER INGREDIENTS

This table lists chemicals that are found in most floor stripper products.

Floor Stripper Ingredients and Risks

	To The User	To Building Occupants	To The Environment
Butoxyethanol	Absorbs through skin; damages blood, liver, kidneys, & developing baby.	Usually no contact, so fairly low risk. However, some people are sensitive to its vapors or residues.	Usually none unless disposed of outdoors (which is illegal).
Monoethanolamine	Can damage eyes and skin. Absorbs through skin; damages blood, liver, kidneys, & developing baby.	Usually no contact, so fairly low risk. However, some people are sensitive to its vapors or residues.	Usually none unless disposed of outdoors (which is illegal).
Sodium Hydroxide or Sodium Metasilicate	Can cause blindness and severely damage skin.	Usually no contact, so fairly low risk. However, some people are sensitive to its vapors or residues.	High amounts usually prohibited by sewer agency (pH too high).
Zinc (from the floor finish removed)	None.	None.	High amounts usually prohibited by sewer agency.

Because of these risks it makes sense to limit the amount of stripper that you use, and to do everything possible to reduce the exposure of your workers to these harmful ingredients. How can that be done?

REDUCE THE AMOUNT OF FLOOR STRIPPER YOU USE

Reducing stripper use is a good idea for safety reasons and for saving money. Floor stripping takes lots of time and so it is expensive. Stripping should be done only when needed, and then done right so that no time or chemicals are wasted.

Prevention: You can cut back on the stripping that you have to do by keeping abrasive dirt particles from reaching the floor in the first place.

- Keep dirt outdoors. Use walk-in mats at each entrance to the building. Clean these mats frequently.
- Use dust mops and vacuums to sweep up dirt frequently.
- Wet mop the floor with a liquid cleaner or surface buffing product.

Monitoring: The next step for reducing stripper use is to carefully monitor the floor refinishing work that you do.

- Strip floor finish only when needed. Keep track of your floors - check them out monthly, or more often if they get a lot of traffic. Refinish only those areas where the surface is wearing out.
- With good records, you will easily spot patterns in the way that floors are wearing. Draw a sketch map of each building you maintain, and record your inspections of the hard floor areas. If you use a computer, make these sketches with your spreadsheet program and record your results each time you do an inspection.
- Keep track of the amounts of floor stripper that each crew uses. Your people will respond to what you measure, and so will use less floor stripper when they know that you will be checking.

STRIPPING FLOORS ON A FIXED TIME SCHEDULE CAN WASTE MONEY.

IF DONE TOO SOON YOU'LL REFINISH THE FLOOR BEFORE IT'S NEEDED, AND THAT WILL WASTE LABOR AND CHEMICALS.

IF YOU WAIT TOO LONG. TRAFFIC WILL WEAR THROUGH THE FINISH AND DAMAGE THE UNDERLAYING FLOOR MATERIAL. WHEN THIS FOUNDATION BECOMES WORN, YOU'LL EITHER HAVE TO REPLACE FLOOR TILES OR SPEND LOTS OF EXTRA TIME TRYING TO GET A SATISFACTORY NEW FINISH.

Training: Additional reduction in floor stripper use comes from training your staff on how to refinish floors correctly.

- Train your people to mix the stripper with as much water as they can while still getting the job done. Most stripper products are meant to be mixed with something like 10 or 20 parts of water to one part of concentrate.

  Try working at the high end of the dilution range suggested by the supplier. If that works, then try adding a bit more water - but not too much. If you add too much water the stripper will work too slowly, and extra time will be needed to get the job done.

- Help your employees to minimize mistakes, spills, and waste. For example, mistakenly using the same mop to apply stripper and floor finish can cause problems. One good idea is to use different colored buckets or colored heavy-duty trash can liners in the stripper, rinse water, and

floor finish buckets. Buy mop heads or handles that are the same three colors as the buckets or liners.

- Also train your people on how to apply stripper to the floor and then rinse it off. Be sure that a machine or hand scrubber is used to help lift the floor finish - simple agitation makes the stripper work more quickly and more uniformly.

  Follow set procedures to assure that the stripper will work properly, and thereby reduce the amount of rework that your people have to do.

One final thing to consider is product mixing stations. Automatic dispensers might make sense if you use lots of chemicals, and are working in a building with custodial closets. A well-designed dispensing system can save you money, and also can make chemical mixing safer for your employees. However, mixing units can have problems, particularly when filled with seldom used chemicals, so it is important evaluate your needs carefully before selecting a dispenser.

PERMANENT VISION LOSS STARTS WITHIN 10 SECONDS AFTER A WORKER SPLASHES STRIPPER CONCENTRATE INTO HIS EYES.

IMMEDIATELY FLUSHING THE EYES WITH WATER IS ESSENTIAL TO STOP THE DAMAGE FROM GETTING WORSE.

SKIN BURNS START TO DEVELOP IN SECONDS AS WELL. QUICKLY WASHING THE BURNED AREA WITH WATER USUALLY AVOIDS PERMANENT DAMAGE.

HARMFUL CHEMICALS IN STRIPPERS CAN BE ABSORBED THROUGH SKIN TO POISON THE USER.

REDUCE WORKER EXPOSURE TO HARMFUL INGREDIENTS

Floor strippers are most dangerous to eyes and skin. These risks are greatest when a worker is handling the concentrate, but the diluted product is still strong enough to cause harm.

- Train your employees in safe work procedures.
- Insist that protective gloves and goggles are worn, particularly when your employee is handling concentrated stripper products.
- Be aware of Cal/OSHA regulations that require a 15-minute full-flow eye wash station be provided in any area where workers are exposed to corrosive chemicals.
- Many accidents occur when a worker lifts a full mop bucket to pour its contents into a janitorial sink. Teach your employees safe lifting methods.

REDUCE IMPACT ON THE ENVIRONMENT

Some floor stripping products affect indoor air quality. However, strippers usually have their biggest potential impact if they are improperly disposed of outdoors.

- Use Ventilation: Some building occupants may be sensitive to the vapors or residues from floor stripping products. If that is the case, do your stripping work at night, on weekends, or during holidays. Also, open windows if possible and use fans to increase the amount of outside air flowing into the area where you are working. Take care that these fans don't make the new floor finish dry unevenly.

- Avoid Outdoor Disposal: Floor stripper products should never be disposed of outdoors. It is illegal to pour strippers or any other chemicals on the ground, in a parking lot, or any other outdoor area.

- Control Outdoor Use: If the floor you are refinishing is outdoors, be sure to keep the stripper and rinse water in the work area. Put up absorbent pads or other barriers. Have your janitors use a shop vacuum and wet mops to pick up all excess stripper. Also, have them wash their equipment and dispose of any left over product or rinse water at an indoor sink.

- Be Aware of Zinc Problems: Most modern floor finishes have zinc in them. Zinc is only about 1% of the total product, but it is an important ingredient that makes the floor finish harder. When your janitors strip the floor, this zinc is picked up by the stripper and rinse water.

  Some local sewer agencies have strict limits on the amounts of metals like zinc that you can put into the sewer. Why? Because their treatment plant cannot take these metals out of the sewage very well. Enough zinc gets through the treatment plant to harm shellfish and other animals living in the river or bay where the treated sewage is discharged.

  Check with your sewer agency to see what level of zinc they allow, and have some samples tested to see how much zinc is in your stripper and rinse water. You have three choices if your zinc levels are too high:

  1. Change to a floor finish that does not have any zinc. Although less durable, non-zinc finishes work well for low traffic floor areas.

  2. Dilute your floor stripper as much as possible when you mix it. Doing so will reduce the amount of finish that you pick up each time, and at therefore will reduce the amount of zinc that you put into the sewer.

  3. If using a dilute stripper doesn't get you beneath the limit that the sewer agency requires, then you will have to dispose of used stripper and rinse water as a hazardous waste rather than putting them into the sewer.

Carpet Care

Most carpet care products are relatively safe to use, and have only a small impact on the environment. However, some of these products do contain toxic chemicals that are harmful both to the janitor who uses them and to people who occupy the building.

It is best to select the mildest products you can find that work effectively.

Also, carpets that are cleaned less often require more and stronger chemicals that do carpets that are regularly maintained. It is a good strategy to set up a maintenance program that takes care of carpet needs throughout their useful life.

Using the wrong products or excess amounts of chemicals can easily damage carpets. Therefore, a successful maintenance program will feature the products suited to the work, and will thoroughly train janitors in proper cleaning methods.

Use mild products for regular cleaning.

Use stronger products only for deep cleaning.

Avoid ingredients that are poisonous or that harm the environment.

Wear protective gloves and goggles when mixing or using any cleaning products.

A successful carpet care program begins before installation, and then continues with routine vacuuming, maintenance cleaning, and periodic restoration efforts.

Carpet Design & Installation

Carpets are both functional and visually appealing. However, the wrong kind of carpet, or one that is poorly installed will require extra maintenance.

Generally you should match the carpet type, texture, and underlayment to its working environment. It is also important to keep carpets away from situations where water, chemicals, or other hard-to-clean materials are used. For example, locker rooms, kitchens, and copy centers are not good places to install carpet.

In addition, it's essential to consider how nearby, non-carpeted floors or walls will be cleaned. Chemicals used for that kind of maintenance can easily spill over and damage carpets.

Dust Prevention

Preventing soil from entering a building in the first place means carpet cleaning can be less frequent, thereby reducing the amounts of chemicals used.

Large, frequently cleaned walk-on mats should be placed at each high-traffic building entrance. These mats should be large enough to capture several footsteps. Experiment with different sizes and textures to see what

works best at each doorway. Every few days these mats will become “full” of soil. Therefore, it’s important to vacuum all doorway mats frequently so that they will continue to capture soil before it is carried into the building.

Some modern buildings are totally enclosed. If possible, the heating, ventilating, and air conditioning system in such a building should be operated so that the air pressure just inside each doorway is higher than that of the natural air outdoors. Doing so will push airborne dust back outside.

Vacuuming

Daily vacuuming with strong suction, tight filter, rotating brush machines removes up to half or more of the soil that falls onto carpets. How much effort does it take to attain this level of cleaning? Routine vacuuming, with up to four back and forth strokes of the wand across the carpet, is sufficient for low traffic areas. Up to ten wand strokes may be needed at outside doorways and other high traffic areas. Supplemental vacuuming will be needed along walls and carpet edges where soil tends to accumulate.

Other Prevention Techniques

Some building managers prohibit colored soft drinks, coffee, and other items that will easily stain carpets. Such a tight policy make building occupants unhappy at best. A compromise is to either to have hard floors instead of carpets in food service rooms, or to place sacrificial carpet mats in those areas.

It helps to think of carpets as large, flat air filters. Most light particles and airborne soil will eventually end up attaching to carpets. Unless something is done, significant amounts of carpet soil will come from kitchen fumes and other forms of building use. Properly maintained vents that exhaust outdoors can capture most materials that will otherwise fall out onto the carpets.

Carpet Spotters

Another form of prevention comes from reacting immediately to spills and spots before they have time to become semi-permanent stains. However, thorough training in spill clean-up is very important because using the wrong techniques or chemicals can smear the spilled substance or set the spot permanently. It is usually best to start with clear, cold water and blotting cloths, and then try stronger chemicals only if needed.

A special word of caution - carpet spot removal products contain some of the most dangerous chemicals found in carpet care products. Use these products sparingly, and only when wearing gloves and goggles. Provide extra ventilation, and if possible do the work when building occupants are elsewhere. In any case, avoid products that have highly dangerous ingredients such as hydrofluoric acid (rust remover), or tetrachloroethylene (Type 4 spot remover).

Maintenance Cleaners

Rotary bonnet cleaners and carpet shampoos usually are fairly mild products. However, it’s easy to misuse or over-apply these maintenance cleaners. Such improper use may make it necessary to do hot water extraction more often or more extensively. Use of excess chemicals or the wrong ones leads to more effort and expense.

The toxic ingredients that are in maintenance cleaners pose their greatest risks through inhalation (e.g., isopropanol) or skin contact (e.g., butoxyethanol or ethanolamine). Therefore, providing good ventilation and wearing gloves are very important to protect the janitor doing the work. It is also important to keep building occupants away from wet, freshly cleaned carpets so as to reduce their exposure to these chemicals.

Extractants

With some exceptions, presprays used with hot water extraction systems are also fairly mild products. Careful application, thorough agitation, sufficient contact time, and extraction before drying help these products do their job, and reduce the amounts of chemicals that would otherwise have to be used in reworking the carpet. Training and experience are needed to prepare the janitor for using these products effectively.

Hazardous ingredients used in hot water extraction products include acid rinses (e.g., hydroxyacetic acid), solvents (e.g., butoxyethanol), and detergents (e.g., alkyl phenol ethoxylates). The best strategy is to choose products without these problem ingredients. If that is not possible, than it is essential that the janitor wear gloves and goggles, and that building occupants are kept away from the area until the work is complete.

Mildewcides & Disinfectants

A few restoration products contain tributyl tin, formaldehyde, and other ingredients that are meant to kill microorganisms, but at the same time are highly toxic to humans. Some of these ingredients, such as tributyl tin, are banned from use in the San Francisco Bay Area because of their potential to cause harm in the environment.

Important Safety Tips

Use stronger chemicals sparingly and carefully so as to avoid harming the user or building occupants. Be sure that each janitor is well trained, and if possible, have your people work in buddy teams when using stronger chemicals. That way someone can get immediate help if an accident occurs.

Corrosive chemicals (acids or caustics) can blind you in seconds.
Always wear goggles to protect your eyes.

Corrosives can also damage your skin and leave scars.
Wear gloves to protect your hands.

Some poisonous chemicals absorb through your skin.
Always wear gloves when using products containing glycol ethers or ethanolamines.

Some poisonous chemicals are easily inhaled.
Be sure that your work area has enough ventilation.

Mixing different products together can create poisonous chemicals.
Avoid mixing products, and be sure to rinse out work buckets after each use.

Carpet Cleaning Ingredients

Manufacturers make several products for carpet cleaning. These products range from mild to strong, and have many different ingredients. Some of these cleaning products have acids and other chemicals that can harm you.

The following table lists chemical ingredients commonly found in strong carpet cleaners. Some are relatively safe if you wear gloves and goggles, while others are so risky that you should not use them. In addition, there are some chemicals that may be relatively safe to a janitor wearing gloves and goggles, but that can harm the environment.

Do Not Use - Severe Health Risk

Hydrofluoric Acid
Nitrilotriacetate
Nitrilotriacetic acid
Perchloroethylene / Tetrachloroethylene
Tributyl Tin

Use Extreme Care or Avoid - Health Risk To Janitor

Butane, Isobutane, or Propane (aerosol propellants)
Ethanolamines
Glycol Ethers (such as butoxyethanol)
Quaternary Ammonium Chloride
Sodium Bisulfate
Sodium Carbonate
Sodium Hydroxide

Avoid if Possible - Will Harm The Environment

Dibutyl Phthalate
CFC-22 (Now illegal for janitorial use)
HCFC-141 (Now illegal for janitorial use)
Nonyl Phenol Ethoxylate
Octyl Phenol Ethoxylate

Sewer districts prohibit discharges of some of these chemicals, such as phenol, tetrachloroethylene, and tributyl tin, as well as acids or bases that are corrosive (having a pH less than 4-5 or greater than 11-12). Avoid products that make your sewer discharge illegal. In the San Francisco Bay Area it is illegal to discharge any cleaning materials or wastewaters onto the ground or street.

Where to get more information

Here are four ideas for obtaining more information about the health and safety risks of the cleaning products that you use:

1. Read the product label and product data sheets. Carefully follow the directions these give for safe use.

2. Get a material safety data sheet for each product you use. Look for a phone number on the container label and contact customer service at the manufacturer. Or ask the store where you got the product.

   Read each material safety data sheet when you get it - don't wait for an accident. Focus on the risks the product presents to the user. Look for and use the personal protective gear that the supplier recommends.

3. Contact either your county health department or local sewer agency. Staff of these organizations can answer health, safety, and environmental questions that you have.

4. Search the Internet. You can find general information about chemicals and janitorial products on the Internet. One web site to visit is www.chemfiners.com. Another is www.Cleanlink.com. Many chemical companies also have web sites at which they provide product safety information.

This fact sheet was prepared for the Janitorial Products Pollution Prevention Project. Call (408) 441-1195 or (925) 283-8121 if you have any questions or comments. Acknowledgment is given to Jeff Bishop of Clean Care Seminars for carpet care ideas provided by his many articles and books.

Restroom Cleaning

Clean restrooms reflect positively on your employees, customers, and visitors. To reach this goal you need to use the right chemicals in the right way. Look for restroom cleaning products that:

- Easily remove soil from counters, floors, walls, and fixtures.
- Eliminate bacteria, germs, and viruses.
- Make the restroom appear and smell clean.
- Are safe to both the user and building occupants.
- Have minimal environmental impact.

Use mild products for regular daily cleaning.

Use stronger products only for weekly deep cleaning.

Avoid ingredients that are poisonous or that harm the environment.

Wear protective gloves and goggles when mixing or using any cleaning products.

You can maintain clean and sanitary restrooms by following a two-level cleaning schedule - a combination of regular daily cleaning and weekly deep cleaning.

Regular Daily Cleaning

Trash removal, surface cleaning, disinfection, and restocking supplies needs to be done daily for most commercial or office restrooms.

Facilities in airports, restaurants, and other high traffic sites may need more frequent touch-up cleaning and restocking of soap and paper supplies.

Routine cleaning involves the following tasks:

- Removing trash & replacing can liners;
- Refilling dispensers;
- Dusting high surfaces;
- Cleaning toilets & urinals with a non-acid bowl cleaner;
- Cleaning showers with a non-acid soap remover;
- Cleaning mirrors and other class surfaces;
- Cleaning walls, ceiling, partitions, doors, & light switches;
- Disinfecting all surfaces and fixtures; and
- Vacuuming floor and wet mopping with a cleaner/disinfectant.

Some products combine cleaning and disinfecting ingredients into one container. These combined products work well only on surfaces that are already relatively clean. For dirty surfaces it is important to clean first, and then apply a separate disinfectant. To work well, this disinfectant must remain in place for at least 10 minutes.

Fairly mild products are available for daily restroom cleaning. Such products are reasonably safe to use, and have little environmental impact. Check the supplier's directions, and mix the cleaning product with as much water as you can. A dilute product is usually safer to use than a concentrated one.

Deep Cleaning

Deep restroom cleaning needs to be done weekly in most cases. However, a deep cleaning may also be required when you do a restroom for the first time, or when you encounter particularly dirty situations. High traffic restrooms may need a deep cleaning once a day, even if routine cleaning is done more frequently.

Most deep cleaning can be done with your regular chemicals, perhaps mixed with less water so that they are stronger. In addition, it may be necessary to spend more time removing soils with brushes and scrub pads.

However, some deep cleaning tasks require stronger chemical products to remove stubborn deposits or stains. Examples include:

- Removing graffiti;
- Cleaning stained toilet bowls; or
- Removing shower tile deposits.

Important Safety Tips

Use stronger chemicals sparingly and carefully to avoid harming the user or building occupants. Be sure that each janitor is well trained, and if possible, have your people work in buddy teams when using stronger chemicals.

Corrosive chemicals (acids or caustics) can blind you in seconds.
Always wear goggles to protect your eyes.

Corrosives can also damage your skin and leave scars.
Wear gloves to protect your hands.

Some poisonous chemicals absorb through your skin.
Always wear gloves when using products containing glycol ethers or ethanolamines.

Some poisonous chemicals are easily inhaled.
Be sure that your work area has enough ventilation.

Mixing different products together can create poisonous chemicals.
Avoid mixing products, and be sure to rinse out work buckets after each use.

Restroom Cleaning Ingredients

Manufacturers make several products for restroom cleaning. These products range from mild to strong, and have many different ingredients. Some of these cleaning products have acids and other chemicals that can harm you.

The following table lists chemical ingredients commonly found in strong restroom cleaners. Some are relatively safe if you wear gloves and goggles, while others you should not use. In addition, there are some chemicals that may be safe to a janitor wearing gloves and goggles, but that can harm the environment.

Use Extreme Care or Avoid - Health Risk To Janitor

Butane or Isobutane (aerosol propellants)
Diphosphonic Acid
Ethanolamines
Glycol Ethers (such as butoxyethanol)
Hydroxyacetic Acid
Phosphoric Acid
Propane
Quaternary Ammonium Chloride
Sodium Bisulfate
Sodium Carbonate
Sodium Hydroxide

Do Not Use - Severe Health Risk To Janitor & Building Occupants

Bleach (Sodium Hypochlorite)
Hydrochloric Acid
Nitrilotriacetate
Nitrilotriacetic acid
Paradichlorobenzene
Perchloroethylene
Phenol
Tetrachloroethylene

Avoid if Possible - Will Harm The Environmental

DiButyl Phthalate
Nonyl Phenyl Ethoxylate
Octyl Phenyl Ethoxylate

In addition, sewer districts prohibit discharges of some of these chemicals, such as paradichlorobenzene, phenol, and tetrachloroethylene, as well as acids or bases that are corrosive (having a pH less than 4-5 or greater than 11-12). Avoid products that make your sewer discharge illegal.

Glass Cleaning

Most window and mirror cleaners are relatively safe to use, and have only a small impact on the environment. However, some cleaners contain glycol ethers and other chemicals that are harmful.

Use the mildest product you can find, and always wear gloves and goggles to protect yourself.

Use a mild cleaner with alcohol or ammonia for daily glass maintenance.

Avoid glass cleaning pro ducts that are flammable.

Use products that are packaged in a trigger bottle rather than an aerosol can.

Some degreasers contain butoxyethanol or similar toxic ingredients - always protect yourself by wearing gloves and goggles.

Regular Glass Cleaning - Use a mild alcohol or ammonia cleaning product for your daily glass maintenance.

Disinfection - If you need to disinfect the surface, use a product that contains Alkyl Ammonium Chloride to kill germs.

Grease Removal - Sometimes grease, fingerprints, or other oily deposits are found on the glass you are cleaning. Your regular daily cleaner might not remove these materials.

In that case, use a stronger degreasing cleaner with butoxyethanol. Apply the cleaner with a scrub pad if a rag or squeegee doesn't work. Afterwards, you may need to finish the job by using your regular cleaner to remove streaks left by the degreaser.

Degreasers with butoxyethanol and other strong ingredients can harm you, so always protect yourself with gloves and goggles.

Spray the degreaser onto your rag or brush, and then wipe the glass surface. If that doesn't work, then carefully spray the degreaser directly onto the glass. Hold your rag nearby to prevent overspray.

Do not use any degreasers made for auto repair work. These often contain flammable ingredients such as naphtha or hexane, or a dangerous cancer-causing chemical called tetrachloroethylene.

Metal Cleaning

Most metal cleaners are relatively safe to use, and have only a small impact on the environment. However, some cleaners contain chemicals that are harmful.

Use the mildest product you can find, and always wear gloves and goggles to protect yourself.

Use a mild cleaner for daily metal polishing.

Avoid metal cleaning products that are flammable.

Use products that are packaged in a trigger bottle rather than an aerosol can.

Some degreasing cleaners contain toxic ingredients - always protect yourself by wearing gloves and goggles.

Regular Metal Cleaning - Use a mild cleaning product for daily maintenance.

Disinfection - If you need to disinfect the surface, use a product that contains Alkyl Ammonium Chloride to kill germs.

Grease Removal - Sometimes grease, fingerprints, or other oily deposits are found on the metal you are cleaning. Your regular daily cleaner might not remove these materials.

In that case, use a stronger degreasing cleaner with butoxyethanol or a similar ingredient. Spray this degreaser onto your rag or brush, and then wipe the metal surface. If that doesn't work, then carefully spray the degreaser directly onto the metal, while holding your rag nearby to prevent overspray. Let the degreaser sit on the metal briefly, and then wipe it up. Afterwards, you may need to finish the job by using your regular cleaner to remove streaks left by the degreaser.

Degreasers with butoxyethanol and other toxic ingredients can harm you, so always protect yourself with gloves and goggles. In addition, take care to keep metal degreaser liquids out of the sewer system (for example, when cleaning sinks or drinking fountains.

Do not use degreasers that contain flammable ingredients such as naphtha or hexane, or cancer-causing chemicals such as tetrachloroethylene.

Disinfectants

According to the Federal Center for Disease Control, a thorough cleaning of sinks, toilets, doorknobs, and other hard surfaces that people frequently touch is the first and most important step in preventing the spread of disease.

Even though a good cleaning removes many of the germs living on these surfaces, the ones left behind soon begin to grow and reaccumulate. Therefore, to be safe most janitors also use a disinfectant product to kill the bacteria and viruses that are present. It usually isn't possible to kill everything, including spores. Doing so would require the use of a sterilizer (such as hospitals use for medical equipment).

Disinfectant products work by oxidizing the germs, breaking down their cell walls, or otherwise deactivating them. Different ingredients or combinations of ingredients kill different germs. Therefore you either need to select a disinfectant that works on the specific germs you are trying to get rid of, or select a broad-spectrum product that works on all of the germs that you might encounter.

Disinfectants can harm you - always protect yourself by wearing gloves and goggles.

Use a disinfectant that kills the specific germs in your building.

Follow product mixing instructions, and make up only as much as you need.

Leave the disinfectant in place long enough for it to do its job - up to 10 minutes or so for best results

Use an ultraviolet light to see how well you are disinfecting.

How can you tell what germs a disinfectant product will kill? Check the container label or product fact sheets for an EPA Number. Most commercially available disinfectants register their effectiveness claims with the EPA.

In order to kill germs your disinfectant must stay wet on the surface for about 10 minutes. Because this time is longer than what most janitorial situations allow, a thorough pre-cleaning of the surface is very important.

Regular Disinfection - So what should you do? Clean thoroughly. Use a mild but effective disinfectant product, and use as little of it as possible. Always wear gloves and goggles to protect yourself.

It is usually enough to use an institutional grade disinfectant product for daily hard surface maintenance. In addition, milder sanitization grade products may be used on carpets or in toilet tanks where the goal is to reduce germs to a safe level (typically 0.1%), rather than completely eliminate them.

Deep Disinfection - In some cases you may need to deeply disinfect a part of your building (for example, to clean up where someone has been injured). In that situation, or if you are working in a health care setting, it is important to use a hospital grade disinfectant product. Such products accomplish a more thorough

job and kill a broader range of pathogens; however, they are generally more hazardous than institutional grade disinfectants.

Combined Cleaning & Disinfection - Some products, primarily those containing quaternary ammonium chlorides, may be used for both cleaning and disinfecting. These products work best upon surfaces that are already fairly clean, or when they are used twice in a row - once to clean, then to disinfect.

Pollution Prevention Ideas - Because of the potential health risks and impacts on the environment it makes sense to minimize the amount of disinfectant that you use. There are four ways to accomplish this goal:

1. Select the right product. It is best to use a product that contains the specific EPA-registered ingredients needed to kill the germs found in your building. Using the wrong disinfectant wastes your time and money, and doesn't remove the germs.

2. Plan how often to disinfect. Evaluate the amount of traffic your building gets and identify the surfaces that people touch most often. Use an ultraviolet light to reveal how soon germs reappear after cleaning, and then schedule your disinfection work accordingly. Also check disinfection guidelines published for your situation by EPA, Center for Disease Control, and other agencies.

3. Control product mixing. Using full strength disinfectants may be reassuring, but this practice is seldom warranted so it just wastes chemicals. In addition, using the full strength product is more dangerous to the user. Therefore, make sure that your janitors dilute their disinfectants according to the manufacturer's directions. Typical dilutions are 1 part concentrated product to something in the range of 125 to 500 parts water.

4. Use correct methods. Disinfectants need to be in contact with the germs they are intended to kill. That means the surface must first be cleaned to the point where it is free of dirt, grease, and oil. Then the disinfectant must be thoroughly applied, and left in place for 10 minutes. It may be necessary to do the work in a new sequence so as to allow this longer contact time. For example, consider doing a pre-cleaning the surfaces and applying the disinfectant throughout a restroom, and then go on to empty the trash and refill paper dispensers.

Chemical of Concern - Six ingredients are commonly used as disinfectants in today's janitorial products, with the choice depending upon both the type of building being maintained and the specific pathogens present.

Each of these ingredients can impact the janitorial user, building occupant, and the environment in general. Careful storage, mixing, and use of disinfectant products can reduce these impacts.

	Potential Impacts			
Ingredient	User	Surfaces	Occupants	Environment
Quaternary Ammonium Chlorides	Eye & skin burns	Stains floor tile	Usually none	Medium
Phenols	Eye & skin burns	Corrodes plastic surfaces	Usually none	High
Sodium Hypochlorite (Bleach)	Eye & skin burns; Vapors harmful	Corrodes metal surfaces	Affects indoor air quality	Medium to High
Hydrogen Peroxide	Eye & skin burns; Vapors harmful	Corrodes metal surfaces	Affects indoor air quality	Medium to High
Alcohols	Absorb thru skin; Vapors harmful	Usually none	Affects indoor air quality	Low to Medium
Iodine	Eye & skin burns	Stains many surfaces	Usually none	High

Source: H. Temkin, Disinfectant Overkill Tempts Managers, <http://www.cmmonline.com>

Take care to review each product's material safety data sheet for other ingredients that may harm the user. For example, be wary of combined cleaner-disinfectants that contain butoxyethanol or ethanolamine.

Where To Get More Information - For information on a specific product, refer to supplier instructions and material safety data sheets.

In addition, read "Cleaning & Maintenance Management" , "Services", and other trade magazines that contain general information about disinfectant products and their ingredients. Some of these publications also list their articles on the internet. For example, refer to <http://www.cmmonline.com>.

You should also consider contacting your health department, county hospital, or local sewer agency. If you do a lot of disinfection work it might also make sense to retain the services of an industrial hygiene professional.

LIMPIEZA SEGURA Y EFECTIVA PARA LOS INODOROS

Muchos limpiadores para los inodoros o tazas del baño tienen ácido y otros químicos que son dañinos. Use el producto más suave que encuentre y siempre use guantes para protegerse.

La mayoría de los limpiadores que no tienen ácido son relativamente seguros para usar y sólo tienen un impacto pequeño en el medio ambiente. Los desinfectantes requieren un poco más de atención pero son bastante seguros. Los limpiadores que tienen ácido son los más peligrosos.

Use un limpiador suave para el mantenimiento diario de los inodoros.

A menos que los inodoros ya esten en buenas condiciones, límpielos primero y luego use otro desinfectante.

Utilice limpiadores ácidos sólo cuando haya manchas muy difíciles de sacar.

Los limpiadores ácidos son muy peligrosos, prtotéjase siempre con guantes y gafas (lentes que le cubran los ojos).

Los ácidos corroen el metal. Use limpiadores ácidos solo en inodoros de porcelana.

No combine ácidos con decolorantes. Esto crea un gas que le puede matar.

***La limpieza regular*-** use un producto de limpieza fuerte sin ácido para el mantenimiento diario de los inodoros. No use decolorante o cloro. En vez de eso, use un desinfectante que contenga cloruro de amonia para matar los gérmenes.

Algunos suministradores combinan un limpiador y desinfectante en un solo producto. Sólo se debería usar esta combinación si el dispositivo del inodoro no esta demasiado sucio.

De otra manera, se debería limpiar los inodoros primero y después utilizar un desinfectante por diez minutos para obtener buenos resultados.

***Sacando manchas*-** A veces, las manchas de cal, moho, u otros depósitos fuertes se pueden formar en el inodoro. Es posible que su limpiador regular no pueda quitar estos materiales.

Usted tiene dos opciones: Usar un limpiador de polvo y un cepillo para restregar la taza o usar un limpiador ácido.

Ya que los ácidos pueden hacer daño muy rápido, siempre se debe proteger utilizando guantes y gafas. Derrame el limpiador ácido en una manera que no salpique. Use su cepillo con cuidado para evitar las salpicaduras. Cuando usted haya terminado, bájele a la taza del inodoro dos veces para eliminar el exceso de limpiador.

Fact Sheets - Specific Ingredient Hazards

2-Butoxy Ethanol

Glycol alkyl ethers are commonly used as solvents. 2-Butoxy Ethanol is one of the most toxic of the glycol ethers. You should use products containing butoxyethanol with extreme care. It is a poison that can easily absorb through your skin to harm you. When working with it, always wear gloves and goggles and be sure that you have enough ventilation.

HAZARD SUMMARY [1]

* 2-Butoxy Ethanol can affect you when breathed in and by passing through your skin.

* Exposure can irritate or burn the eyes, nose, and throat. Higher exposures may cause you to become dizzy, lightheaded, and to pass out.

* High or repeated exposure can break down red blood cells, and cause anemia. It can also damage the liver and kidneys.

*Breathing the vapor can irritate the lungs and cause a build-up of fluid (pulmonary edema). This can cause death.

Acute Health Effects - The following acute (short-term) health effects may occur immediately or shortly after exposure to 2-Butoxy Ethanol:

* High exposures may cause you to become dizzy, lightheaded, and to pass out.

* 2-Butoxy Ethanol can break down red blood cells. This can cause a low blood count (anemia). It may also damage the liver and kidneys.

* Breathing the vapor may irritate the lungs, causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema). This can cause death.

* The liquid can cause eye burns and may cause temporary blurred vision. It may also irritate the skin, causing a rash or burning feeling on contact.

* Exposure to the vapor can irritate the eyes, nose, mouth, and throat.

Chronic Health Effects - The following chronic (long-term) health effects can occur at some time after exposure to 2-Butoxy Ethanol and can last for months or years:

Cancer Hazard According to the information presently available to the New Jersey Department of Health, 2-Butoxy Ethanol has not been tested for its ability to cause cancer in animals.

Reproductive Hazard According to the information presently available to the New Jersey Department of Health, 2-Butoxy Ethanol has not been tested for its ability to adversely affect reproduction.

Other Long-Term Effects Long-term exposure can cause the breakdown of red blood cells, resulting in anemia. 2-Butoxy Ethanol may damage the liver and kidneys. Very irritating substances may affect the lungs. It is not known whether 2-Butoxy Ethanol causes lung damage.

[1] New Jersey Workers' Right-to-Know Fact Sheet

Dibutyl Phthalate

Dibutyl Phthalate is used as a solvent in many janitorial products. Its harm to the user is limited because it usually must be eaten in order for the effects to be felt. However, dibutyl phthalate persists in the environment, and damages the hormone systems of animals. It is strongly suspected that humans eating these animals will be harmed as well.

HAZARD SUMMARY [1]

Dibutyl Phthalate can affect you when breathed in.

Dibutyl Phthalate may damage the developing fetus and may also damage the testes (male reproductive glands).

Contact may irritate the eyes and skin.

Exposure may irritate the nose and throat.

Acute Health Effects - The following acute (short-term) health effects may occur immediately or shortly after exposure to Dibutyl Phthalate:

Contact can irritate the skin, and the eyes. Exposure to the vapor or aerosol can irritate the eyes, nose, mouth, and throat.

Chronic Health Effects - The following chronic (long-term) health effects can occur at some time after exposure to Dibutyl Phthalate and can last for months or years:

Cancer Hazard - According to the information presently available to the New Jersey Department of Health, Dibutyl Phthalate has not been tested for its ability to cause cancer in animals.

Reproductive Hazard - Dibutyl Phthalate may damage the developing fetus in humans since it has been shown to be fetotoxic in animals. It may also damage the testes (male reproductive glands).

Other Long-Term Effects - Dibutyl Phthalate has not been tested for other chronic (long-term) health effects.

[1] This information is quoted from: New Jersey Workers' Right-to-Know Fact Sheet, which is on the internet at <http://www.state.nj.us/health/eoh/rtkweb/0773.pdf>.

Additional information regarding phthalates appears on the internet at:

http://www.greenpeace.org.uk/science/hdc/maff2.html
http://www2.ec.gc.ca/cceb1/eng/bbp_summary.htm
http://www.cooper.edu/~ahmed/intro.html#ToC
http://www.maff.gov.uk/food/infsheet/

Ethanolamine

Mono-, Di-, and Tri-ethanolamine are compounds that appear as surfactants in floor finish strippers, degreasers, and other janitorial products.

The following is quoted from the Fisher MSDS for Monoethanolamine, which may be obtained on the internet at <http://www.fisher.com>.

Danger! Causes eye burns.
Causes digestive tract burns.
Causes respiratory tract irritation.
Causes skin irritation.
Corrosive.
Combustible liquid.
May cause central nervous system depression.
May be absorbed through the skin.
May cause liver damage.
May cause kidney damage.

Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye: Causes severe eye irritation.
Causes eye burns.

Skin: Causes moderate skin irritation.

May be absorbed through the skin in harmful amounts.

Ingestion: Causes gastrointestinal tract burns.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation.

Chronic: May cause liver and kidney damage. Diethanolamine and related compounds are in the process of being declared to be carcinogenic.

Hydrochloric Acid

Strong acids are used in toilet bowl cleaners and in some specialty products such as rust removers. These acids are corrosive, and can cause instant and permanent blindness and skin injury to the unprotected user. Wearing goggles and gloves buys critically needed time to reach an eye wash or shower.

Nitrilotriacetic Acid

Nitrilotriacetic acid trisodium salt monohydrate is used in synthetic detergents - primarily in carpet shampoo. According to the NIEHS:

> “Nitrilotriacetic acid (NTA) is a synthetic amino-polycarboxylic acid chelating agent used chiefly as a replacement for phosphates in detergents. NTA sequesters magnesium and calcium ions present in hard water, which would normally inhibit the activity of detergent surfactants.” *

This ingredient is suspected of causing cancer. It is listed as such by California's Proposition 65 (Workers' Right-to-Know legislation), and by RTECS# AJ1070000.

* Source: US EPA
<http://ntp-db.niehs.nih.gov/NTP_Reports/NTP_Chem_H&S/NTP_Chem1/Radian18662-53-8.txt>

Octyl Phenol Ethoxylate / Nonyl Phenol Ethoxylate

These two members of the Alkyl Phenol Ethoxylate family of surfactants (APEs) appear in a number of janitorial products. The ability of APEs to harm to the user is limited because they usually must be eaten in order for their effects to be felt.

However, all of the APEs persist in the environment and even in very small amounts can damage the hormone systems of animals. It is strongly suspected that humans eating these animals, or drinking from supply systems that draw river water downstream of sewage treatment plants, will be harmed as well.

OSHA Regulations do not yet require that APEs be listed on material safety data sheets. Therefore, to find out about the presence of APEs in your products you must ask the technical service people at the manufacturer.

There is a great deal of emerging information on the impact of APEs on the internet:

http://www.epa.gov/endocrine
http://www.sdahq.org/sdalatest/html/techform1.htm
http://www.ciit.org/INSIGHTS/endomys.html
http://www.tmc.tulane.edu/ecme/EEHome/default.html

The Washington Toxics Coalition has issued a report regarding APEs. Copies may be ordered by contacting WTC at (206) 632-1545.

Canadian efforts to evaluate APEs are available in a report from:

Susan Sang, Ph.D.
Wildlife Toxicology Program
245 Eglinton Avenue East, Suite 410
Toronto, ON M4P 3J1
Tel: 416-489-4567 Ext. 260 • Fax: 416-489-3611
e-mail: ssang@wwfcanada.org

Other information is available from European sources:

http://www.foe.co.uk/camps/indpoll/suschem.htm

Tetrachloroethylene; Perchloroethylene; "Perc"; Dry Cleaning Fluid

Tetrachloroethylene is a chlorinated solvent found in metal cleaners and carpet spot removal products. It evaporates readily, is very easy to inhale, and causes cancer.

You should not use any product containing tetrachloroethylene.

Risks from Exposure *

- Tetrachloroethylene can affect you when breathed in and by passing through your skin.
- Tetrachloroethylene should be handled as a CARCINOGEN.
- It may damage the developing fetus.
- High exposure can cause you to become dizzy and lightheaded and to pass out.
- It can cause the heart to beat irregularly or stop. This can cause death.
- Severe liver and kidney damage can occur.
- High exposure may cause a build-up of fluid in the lungs (pulmonary edema).
- Contact can cause eye and skin burns.

Acute Health Effects - The following acute (short-term) health effects may occur immediately or shortly after exposure to Tetrachloroethylene:

High exposure can cause you to become dizzy, lightheaded, and to pass out. Overexposure can cause the heart to beat irregularly or stop. It can also damage the liver and kidneys enough to cause death.

Breathing the vapor may irritate the lungs, causing coughing and/or shortness of breath. Higher exposure can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency. The start of these effects can be delayed for many hours.

Contact can cause severe skin burns, and can cause eye burns.

Exposure to the vapor can irritate the eyes, nose, mouth and throat.

Chronic Health Effects - The following chronic (long-term) health effects can occur at some time after exposure to Tetrachloroethylene and can last for months or years:

Cancer Hazard

Tetrachloroethylene may be a CARCINOGEN in humans since it causes liver cancer in animals.

Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

Tetrachloroethylene may damage the developing fetus.

Other Long-Term Effects

Tetrachloroethylene may damage the liver and kidneys with high single exposures or lower repeated exposures.

Long-term exposure can cause drying and cracking of the skin.

* Source: USEPA, as reported by the New Jersey Workers' Right-to-Know series of chemical safety data sheets.

Example Tools

Example Commentaries

Adding Labels To Your Containers

Labels are essential to identify hazardous and non-hazardous materials. They identify what's inside. If the material is a waste, a label tells us how long it has been there. Labels are required for used material or waste collection containers.

If a container loses its label, or if you feel that the original label does not provide all the information you want, prepare a replacement. An example of such a label is provided below:

ABC Glass Cleaner

HAZARD - Moderate Eye Irritant
Flammable

Contains Isopropanol

CAUTION!
MAY CAUSE EYE IRRITATION
Avoid contact with eyes.
Wash thoroughly after handling
FIRST AID: In case of contact, immediately flush eyes with plenty of water.
Call a physician if irritation persists.

Use Instructions
Apply to surface with a sponge. Wait 5 minutes. Wipe off.

For additional information, see Material Safety Data Sheet for this chemical

ABC CHEMICAL COMPANY
One Industrial Drive
Anytown, NJ 08010

This page was adapted from the City of Phoenix training program for Hazardous Materials Inventory Management.

Buying Environmentally Preferable Janitorial Products

Purchasing of environmentally preferable (EP) products inevitably involves a process of behavior change. End users such as mechanics, custodians, and office staff have been using traditional products for many years, and are often satisfied with their results. When environmental managers suggest a switch to EP products, they are usually met with resistance simply because any change is difficult, and it is human nature to resist change. Yet behaviors can be changed, and attitudes towards new products and systems improved. Behavior change involves much more than just issuing a carefully-worded policy statement or telling janitors to switch product "A" for product "B".

A careful review of EP purchasing efforts across the country reveals a common approach in programs that have successfully changed purchasing behaviors. Listed below are the four common elements in these programs:

Management Support
Purchasing Agents
Environmental Staff
Training of End Users

We call this the "Sandwich Approach" to environmental purchasing. All elements must be in place or the "sandwich" will fall apart.

Obtain Management Support

Support from decision-level management is important if the program is to be successful. For small pilot projects, support from the facility manager of a single building may be adequate. For larger programs support from city administrators or elected officials may be required. Support at this level is imperative if busy managers and staff are to give sufficient time to implement the change.

Train End Users

No matter how well worded the policy or how effective the product, if the people implementing the change do not believe in the program, all efforts are doomed to fail. Attitudes like "if it doesn't smell like bleach it won't clean" or "if its got Environmental on the label it must be weak, and will result in more effort on my part to get the job done" must be addressed head on. These attitudes can also result in overuse of product, a practice which is potentially harmful to the user and is not good for the environment.

End users must be trained by a credible source, not by the environmental staff at their agency, who probably have never cleaned a public restroom. In addition, including these end-users early on in product selection and testing will turn skeptics into stake-holders. End users often become the best trainers, and should be used as models of success when approaching new departments.

Involve Purchasing Agents

In all large institutions, purchasing is done according to a complex and detailed set of regulations and policies. Bid processes are accountable to public scrutiny, and budgets are carefully guarded by elected officials and civil servants. Purchasing agents are skilled in locating almost any commodity, and are well trained in the evaluation of lowest cost bids.

Purchasing agents are usually not trained to develop environmental criteria or to read a material safety data sheet to evaluate the human health impacts of various product ingredients. However, these agents are critical to the success of any institutional purchasing program. They assure that the bid process goes smoothly, and can help with the enforcement of EP purchasing policies by rejecting requests for products that do not have the required approval of an environmental office.

Involve Environmental Staff

One of the most challenging and time-consuming aspects of EP Purchasing is defining what is meant by Environmentally Preferable. Unfortunately no universal definition exists for any product category, and each locality may find it has a unique set of priorities regarding human health and environmental protection. The environmental staff must provide the technical expertise and work with end users to determine product specifications. Purchasing agents and end-users do not have the time to develop technical specifications, and such details are rarely spelled out in the policy issued by top management. The environmental staff must become the accountable member of the team whose job it is to facilitate all elements of the “sandwich”.

Set Up The Purchasing System

Once the “sandwich” is set in place, the purchasing process is ready to begin. There are five key steps in this process of procuring EP products and services:

Step 1: Establish Desired Goals
Step 2: Design an Effective Bid Process
Step 3: Review and Score Vendor Responses
Step 4: Test Product Effectiveness
Step 5: Award Purchase Order(s)

Adopted from a forthcoming article in Pollution Prevention Review by Thomas Barron, Debbie Raphael, and Lara Sutherland.

City of San Jose Case Study

The Search For Safer Cleaning Products

Steve Lopez, Building Services Supervisor for the City of San Jose, has been involved for over 25 years in the building maintenance field, both with hands-on experience and in management. He has always stressed the importance of worker safety, and wanted to take a fresh look at products used in his department. As a result he asked the Janitorial Pollution Prevention Project team to review products that were being used by his custodians. This review led Mr. Lopez to decide that some of these products exposed his staff to unacceptable health risks. In hopes of finding alternatives for the City, he offered to assist the JP4 team in their search to find effective environmentally preferable cleaning products.

IDEAL TEST CREW Mr. Lopez had already established a test crew to evaluate all new products considered for City use. With plenty of prior experience assessing new products, the five member Main Library cleaning crew made an ideal test group. In three months they worked with project members and tested over 30 products for a range of cleaning functions including: General Purpose, Toilet Bowl, Tile/Bath, Glass, Disinfectant, Metal Polish, and Graffiti Remover.

WHAT MADE TESTING A SUCCESS Weekly meetings were a necessity for the crew to discuss successes and failures throughout the test process. Although the cleaning staff was accustomed to evaluating products, there were new things to consider when testing "green" cleaners. For example, green products sometimes need more surface exposure time to be effective. Test crew members were at first reluctant to use products that could negatively impact their productivity. However, the weekly crew meeting offered a forum to discuss this issue, and the crew members soon established a change in their daily cleaning routine to make the products work better. The crew decided that when using toilet cleaners, for example, each employee should apply the cleaner in the toilet bowl at the beginning of a restroom routine. The custodian would then proceed to empty trash cans and restock paper products before returning to scrub the toilets. After three months of similar routine changes and evaluations, the test crew established a list of 19 environmentally preferable cleaning products that work effectively.

EXPECTED RESULTS As a result of these tests, the City of San Jose is considering a number of safer cleaning products. Switching to these alternative cleaners would primarily reduce the use of: - Butoxy Ethanol (poisons blood, liver, and kidneys); - Sodium Hydroxide (corrosive to eyes and skin); - Alkyl Phenol Ethoxylates (affect hormone systems); and - Hydrochloric Acid (corrosive to eyes and skin). The project team estimates that changing away from products with these ingredients will decrease the Main Library's hazardous chemical use by at least 1300 pounds per year.

Conducting Effective Product Trials

We simplified our trials by limiting tests to the following 7 product types.

You might want to do the same at your facility. Start with a few products, and then work your way through the others after you have organized your test program and you have worked the bugs out of it.

- General Purpose Cleaner
- Toilet Bowl Cleaner
- Bath and Tile Cleaner
- Window / Glass Cleaner
- Graffiti Remover
- Metal Polish
- Disinfectant

We contacted our list of suppliers and invited them to submit any safer and environmentally preferable products that they offer for the above cleaning functions. Specifically, they were asked to submit a product sample, product MSDS, product instruction sheet and a bottle label for each product.

First, we reviewed product literature and eliminated products based on toxicology information. Our product screening questions are listed on another part of our web site.

It is important to note that many suppliers have "green" products that will not meet our suggested standards. For example, one vendor submitted an entire line of products that did not pass this first step.

Then we gave the products to professional cleaning crews to evaluate cleaning effectiveness. Three cleaning crews volunteered to assist us with our hands-on product evaluations:

- City of San José Main Library crew (5 members)
- City of San José Maintenance Yard crew (2 members); and
- County of Santa Clara Hall of Justice crew (4 members).

The product evaluation form we used is available as a PDF file.

The following are some additional lessons we learned while conducting our product trials.

Select the Right Test Crew - When selecting where to test new products it is important to chose a crew with consistent work attendance, with experienced senior employees, and with focused cleaning responsibilities. The San Jose City Main Library Crew was helpful because one of their regular job functions was to be the test crew for all new products for the City. The County Hall of Justice team was helpful because they had a well respected senior staff member.

Establish Crew Buy-In and Involvement - Before testing any products, have a team meeting with the test crew and emphasize why you are testing alternative products. Our testing was successful in large part because each

test crew knew that their upper management was looking for safer alternatives to current products. They also knew they were being asked to participate in a way that would directly influence the decision.

The following are examples of questions you can ask to help find ways to effectively involve the crew in the test process. Some of these questions are simple, but their answers can provide you with a lot of valuable information. You can use our survey form, or make one of your own.

- What products are you currently using? Answering this early on will help determine exactly what sample replacement products to offer for trial.

- How much product are you using on average? Cleaning crews vary in the amount of product used, so you need to know how much product you need to give your test crew.

  Example: Each member of the County of Santa Clara Hall of Justice cleaning crew uses a 32 oz bottle of glass cleaner each day, where it takes a month for the entire San Jose City Main Library crew to empty a 32 oz bottle of glass cleaner. This information will determine how much product to give the tester so they may conduct a fair evaluation. The County crew received a 32-oz bottle per product / per person while the 5-person City crew shared a 32-oz bottle.

- What is your daily cleaning routine? Answering this question will be helpful in establishing when a change to the routine is needed to adopt a product.

  Example: One crew member was understandably resistant to testing any products that would take more time for cleaning. She complained that she hardly had time to complete her current cleaning tasks.

  We verbally walked through her daily routine and discovered that she could spray the surface cleaner in the bathroom, spend 10 minutes emptying trash cans on her floor, and then return to wipe up the cleaner (rather than spraying and waiting idly while the product worked).

- What are your toughest cleaning challenges? These are the people who will be using the products you change to, so their buy-in is essential. If you can find a safer product to tackle their toughest problem that buy in will be accelerated.

  Example: One crew member complained about the oily residue left on metal from their current metal cleaner. His evaluation for one of the alternatives read "This is the best product I've ever used on stainless. It works super in the elevators." He was sure to share that experience with the rest of his crew and his buy-in was affirmed.

Introduce Your Test Phase Timeline & Hold Regular Meetings - Share with the test crew your suggested timeline for the hands-on test phase. Include plans for reviewing their test evaluations and discussing problems/questions that arise.

Our testing process included a weekly meeting where new products were given to the test crew and a discussion was held about the previous weeks' successes and failures. This discussion sometimes consisted of identifying barriers to the test process, and other times consisted of sharing mutual support of successful products.

Establishing the timeline provides a necessary structure for you and the test crew to work within, and can reinforce the spirit of a team collaborating on a project.

Give the Test Crew Products and Instructions - We determined that because our test phase involved numerous products for one cleaning function it was easier to test products according to cleaning function rather than according to vendor. For example, the cleaning crew first tested all glass cleaners, then all general purpose cleaners, etc.

Along with the product samples themselves, the crews were given a copy of each product MSDS and instruction sheet for reference. In addition each member of the crew received an evaluation form to give feedback on each product tested. A sample evaluation form is on the following page.

Do Hands-On Testing Yourself - Whenever possible, join the test crew for some of their cleaning. Nothing emphasizes the importance of the project more than getting in the dirt yourself and testing the products with them.

How Often Are Janitors Injured?

What injuries do your janitors actually experience, and how much do these injuries cost you?

Recent workers' compensation data from the < Site > show that six out of every hundred janitors have lost-time injuries every year. Some of these injuries are reported; most are not.

- 40% of these injuries involve eye irritation or burns;
- 36% involve skin irritation or burns; and
- 12% involve breathing chemical fumes.

How significant are these injuries? We found that each reported workers' compensation incident requiring medical treatment took the worker off of the job for an average of 18 hours. Medical costs averaged $375 per claim, while lost time for the worker and his or her supervisor are estimated as $240 per claim. That makes the total cost equal to $615 for each workers' compensation claim.

How Do Your Injuries Compare?

	Typical Contractor	Your Experience?
Number of Janitors	100	
Accidents Per Year	Up to 6 Accidents With Lost Time	
For Each Accident Lost Time	18 hours per accident	
Cost For Janitor's Lost Time	18 hours $180	
Supervisor Lost Time	4 hours $60	
Medical Cost	$375	
Cost Per Accident	$615	
Cost Per Year For 6 Injured Janitors	$3,690	

In addition, if your people have lots of accidents your workers' comp. premiums will go up.

How Accidents Happen

This is a fictionalized account of a typical eye injury.

Thomas anxiously stood with his fellow workers as the foreman explained what tonight's work would be. The small basement room was unfamiliar to him and captured his attention. He found himself looking at the pipes overhead and at the shelves covering the wall next to him.

Thomas wondered at the confusing collection of bottles and cans filling these shelves. Why does anyone need so many chemicals? After all, we are only cleaning this place. He heard his name, and again paid attention to the foreman.

"You three new people will be cleaning the restrooms tonight", the foreman said. "Julio will be your lead and will show you what to do. We are short handed because some of our regular staff didn't show up. So you will have to hurry."

Julio gathered his crew and helped them select chemicals and equipment they would need from the shelves. He explained each item as he picked it up and placed it on the work cart. "Eye goggles and Rubber gloves", Julio said. "Wear them all the time when you are working. Here. Try the goggles on, and adjust the fit."

Thomas unwrapped the glasses and put them on his face. He didn't like the way they pinched his ears and kept sliding down his nose, so he took them off and put them in his pocket.

Next Julio placed several bottles onto the cart. "This blue one is for cleaning the mirrors. This yellow one is for the sinks. And this white one is for the toilets. Be careful - it can burn your skin. If you splash any on yourself, wash it off!"

An hour later, Thomas was worrying that he would never figure out this job. His team members seemed to finish their share of the work much faster than he. They were always ready to move on while he still had more toilets to clean. I'll have to cut out some steps, do things quicker, he thought. These glasses are getting in my way and are slowing me down. I can move faster if I leave them off.

In the next restroom he put his plan into action. Taking the white bottle, he hurried from one stall to the next. He quickly poured some of the cleaner into each toilet, swirled his cleaning brush around the bowl, and moved on.

Thomas made it through four more restrooms before his luck ran out. The white bottle of bowl cleaner was almost empty, so he hurriedly poured all of what was left into the first toilet. Some of it splashed up into his face.

The next thirty seconds permanently changed his life.

What Happens During An Eye Injury?

Elapsed Time	What Thomas Feels	What His Eyes Suffer
1 second	The first thing he feels is the wetness on his face.	The toilet bowl cleaner was 23% hydrochloric acid.
3 seconds	Then his eyes begin to sting.	The acid spreads over the eye surface.
5 seconds	He stands up blinking away the tears that are flowing from his eyes.	Corrosive burns begin on the eye surface, including underneath the lid.
7 seconds	The stinging quickly becomes pain. It seems that his eyes are on fire.	Permanent eye damage has begun.
10 seconds	Acting on reflex he hurrys to the nearby sink, thrusts his face under the tap, and turns the water on full.	The eye surface is being corroded away.
15 seconds	He quickly switches the water from side to side washing each eye in turn.	The water begins to wash away some of the acid, but the pH in the eye is still less than 1. The under side of the eyelid starts to burn.
20 seconds	But the pain continues to increase.	Nerve cells in the eyelid begin to die.
1 minute	His coworkers join him at that point drawn by Thomas' painful cries.	One third to one half of the acid has been washed out of the eyes.
20 minutes	They help Thomas wash out his eyes for 20 minutes, at which point his pain becomes almost bearable.	All of the acid has been washed out of Thomas' eyes. Pain still prevents him from opening his eyes.
1 hour	The crew then take him to the emergency room at a nearby hospital.	Thomas discovers that he has permanently lost 15% of his vision. He can no longer drive at night, and has trouble reading.

Minimizing Use of Janitorial Products

The following are examples of successful pollution prevention strategies for reducing the use of janitorial chemicals. These examples are from a series of fact sheets published on the internet by the Janitorial Products Pollution Prevention Project. Two of these fact sheets are included at the back this section of the workbook.

- Chemical Substitutions - Changing from highly-toxic to less-toxic ingredients. A number of effective, easy-to-use, and low-toxicity janitorial products are now becoming available. Because earlier "green" products did not always meet janitors' expectations, extensive product trials are usually necessary to convince skeptical users to make a change.

  Specific examples include changing from:

  Carpet shampoo with nitrilotriacetic acid to one made with ingredients that are not carcinogenic;

  Glass cleaner containing butoxyethanol to one formulated with isopropanol or non-hazardous ingredients;

  General purpose cleaner with alkyl phenyl ethoxylates, ethanolamine, or butoxyethanol to one formulated with linear alcohol ethoxylates, citric acid, or non-hazardous ingredients.

- Chemical Use Reduction - Decreasing the amounts of products with toxic ingredients that janitors use. Some cleaning tasks must use hazardous products because there are no effective substitutes. In these instances the pollution prevention message is to ask the janitor to dilute the product as much as possible, and to use it only when absolutely necessary.

  Floor finish strippers often contain ammonium hydroxide, ethanolamine, and butoxyethanol, making this product one of the most dangerous handled by janitors. Minimizing floor stripper use by 50% or more is possible by:

  Scheduling floor renewal work according to wear patterns rather than simply following a calendar;

  Diluting the stripper with as much water as possible (but not so much that the floor finish is removed unevenly);

  Carefully and thoroughly applying the diluted stripper;

  Using a rotating pad scrubber wherever possible; and

  Thoroughly rinsing the stripped floor so as to neutralize the surface prior to applying the new floor finish.

  Acid toilet bowl cleaners are another of the most hazardous janitorial products. Formulated with hydrochloric, phosphoric, or hydroxyacetic acid, these cleaners are very effective in removing hard water deposits and stubborn stains. However, this much cleaning power is not normally needed every day. Therefore a good pollution prevention strategy is to use two cleaners - a mild product for daily cleaning, and an acid cleaner that is only used when absolutely necessary. Adopting this strategy will usually decrease hazardous material use by over 80%.

- Building Perimeter Strategies - Managing the entry of dirt into the building is another way of accomplishing source reduction. Cleanable floor mats, double-door entry chambers, and positive air pressure are all very effective in preventing foot-borne dirt from entering the building in the first place. Less soil in the building means less frequent cleaning, which in turn requires less chemical use.

- Change Cleaning Process - Modifying the techniques janitors use for applying their cleaning products can accomplish source reduction. Many environmentally preferable cleaning products work best when they are applied to the surface with some force, and are left in place long enough to loosen and lift the soil that is present.

  Work sequencing therefore is important for the product to be used successfully. For example, the first thing a janitor should do in daily cleaning of a restroom is to apply mild cleaners to the sinks and toilet bowls. These cleaners should be left in place while the trash containers are emptied and paper dispensers are refilled. Then the janitor can quickly scrub and rinse the fixtures once the cleaners have been in place for a few minutes. This sequence takes no more time than cleaning the fixtures separately before removing trash and stocking paper supplies.

Other, longer-term pollution prevention strategies include designing buildings with easy-to-clean architectural features (e.g., keep carpets out of locker rooms), taking care that features with incompatible cleaning needs are kept apart from each other (e.g., not situating carpets and vinyl tiles together), and operating building air conditioning systems so as to minimize the movement of dust.

Adopted from a forthcoming article in Pollution Prevention Review by Thomas Barron and Lara Sutherland.

Polaris Building Maintenance

Clean Up Your Janitorial Products

In 1994, Frank Schwarb, President and Roger Gomez VP, Operations at Polaris Building Maintenance, Inc. worked together with their vendor to reformulate more than half of their janitorial products to be safer to use. Polaris was at that time working from an inventory of over 30 cleaning products, most of them petroleum based. Today, Polaris has 10 water based cleaning products that it uses for all of its cleaning needs.

"I sleep better at night knowing I've made a good decision affecting the safety of my employees and the quality of the environment."

Frank Schwarb, President, Polaris Building Maintenance, Inc.

Polaris simplified the burden of inventory control with requiring so few products, and it now strictly manages the amount of product used by each cleaning crew. Today, the purchasing department orders each product as a concentrate, and then a trained crew foreman dilutes and bottles the solutions needed for his crew.

Polaris retrained their entire janitorial crew to work with the reformulated products. Initially not all employees wanted to change the products they used. However, company management maintained a strong commitment to the purpose of the changeover, and in time the new products were adopted by the entire janitorial crew.

Polaris' cleaning crews learned that with a little extra time and some better cleaning tools the job could be done just as well as with the old products. Mr. Schwarb advises that his new products can take a little more effort to do an effective cleaning job, but proper training can minimize the extra time needed.

Reformulating cleaning products should be a joint venture between vendor and customer.

The key to a successful product changeover is total management commitment.

Reformulating can reduce the number of products used, saving time and money in inventory and training new employees.

Safe Storage & Mixing

The following are ideas you can use to make your chemical storage and mixing safer.

Incompatible Products - Products with incompatible ingredients should be stored separately. For example keep glass cleaner with ammonia away from tub & tile cleaner containing bleach. “Away from” means in a separate room, in a separate cabinet, or on separate shelves (but not one over the other).

Strong Ingredients - If you have space, consider storing products with acids or other strong ingredients in plastic tubs so that any leaks will not harm the storage rack or janitorial closet.

Stock Rotation - Rotate your stock of stored products so that the oldest ones are used first. Some janitorial products (for example, bleach) have a shelf life. Be sure all such products are used before this time expires.

Spill Kits - Keep spill clean-up kits in each building, and train your workers in their use.

Dispensers - Automatic dispensers might make sense if you use lots of chemicals, and are working in a building with custodial closets. A well-designed dispensing system can save you money, and also can make chemical mixing safer for your employees. However, mixing units can have problems, particularly when filled with seldom used chemicals, so it is important evaluate your needs carefully before selecting a dispenser. Because of its simplicity and ease of maintenance, a manual dispensing system is usually best.

Safe Mixing - Floor strippers and other products with strong chemicals pose the greatest risks when your worker is handling the concentrate. To reduce these risks during mixing:

- Train your employees in safe work procedures.
- Have a supervisor do all mixing.
- Insist that protective gloves and goggles are worn when your employee is handling concentrated products.
- Be aware of Cal/OSHA regulations that require a 15-minute full-flow eye wash station be provided in any area where workers are exposed to corrosive chemicals.
- Many accidents occur when a worker lifts a full mop bucket to pour its contents into a janitorial sink. Teach your employees safe lifting methods.

Selecting Protective Equipment

The material safety data sheet should tell you what kinds of protection to wear for safe handling of the product. For most janitorial products the MSDS will tell you to wear gloves and goggles, and perhaps a plastic apron.

Gloves

Heavy duty chemical resistant gloves are the best. Buy various sizes so that your people can find a pair that fits.

If anyone has a problem with their hands sweating too much, then give them cloth glove liners. These absorb sweat and make the gloves more comfortable. Another thing to do to make gloves more comfortable is to use a hand cream before putting the gloves on. One choice is antibacterial hand cream like what is used in hospitals and doctors' offices. Such creams are available in drug stores.

Goggles

Plastic wrap-around soft-shell goggles are best for preventing chemical splashes from hitting your eyes. The soft edges fit closely to your face and prevent liquids from reaching your eyes. However, these goggles are uncomfortable, and can fog up. To deal with these problems, buy the softest rubber goggles you can find. Also get cleaning sprays that keep the lenses from fogging as badly (although nothing can keep lenses totally clear).

Impact goggles are meant primarily for protecting your eyes from flying objects. They provide some protection from splashed chemicals, but not as much as the wrap-around type. Because they are more comfortable and do not fog as badly, many people like these goggles better than the splash-proof kind. In deciding which goggles to buy you have to make a trade off between protection and comfort.

Apron

Using a plastic apron can be important when opening and mixing products. This is particularly true for when you are handling concentrated chemicals that you are diluting with water.

Eyewash and Shower

California OSHA requires that an eyewash and shower be provided within 10 seconds reach of any employee who is handling corrosive chemicals (like floor finish stripper or acid toilet bowl cleaner).

Stanford University Housing Case Study
Quest for Safer Residential Cleaning

Stanford University is committed to strong programs of accident and injury prevention and to complying with all environmental and health and safety laws. The first three guiding principles in their Injury and Illness Prevention Plan commit to protecting the health and safety of Stanford University faculty, staff and students; providing safe workplaces for faculty, staff and students; and providing information to faculty, staff, and students about health and safety hazards. In line with that commitment, Heather Perry, Environmental Health and Safety Coordinator for Student Housing Services contacted the Janitorial Products Pollution Prevention Project to learn more about safety and health related risks regarding products used by the janitors in her department.

THE HOUSING LAYOUT Student Housing Services has a staff of nearly 70 full-time janitors that clean and maintain 3.2 million square feet of residential living space for over 9,000 students. There are 11 cleaning crews comprised of a crew lead and 4-7 janitors, each with their own challenges. One crew of 6 works with the row houses and struggle with the inconvenience of lugging supplies from house to house daily, not to mention the challenges of cleaning fixtures over 50 years old. Another crew maintains the common living areas for graduate housing, leaving it up to the student to clean their own room.

It isn't until a student vacates a room that the cleaning crew comes in and does a thorough cleaning. With such variances in cleaning needs it is difficult to have everyone use a simple list of cleaning products. At the beginning of the year Ms. Perry worked with Tom Barron of the project team to review 80% of the products used by the 11 cleaning crews. Of the 50+ products reviewed Ms. Perry arranged for the cleaning crews to completely stop using a dozen products with serious health and/or environmental risks. Among those eliminated were products with ozone depleting substances, cancer causing ingredients and reproductive hazards. Although it was easy to make these initial changes, further product adjustments would prove to be more challenging.

ONE CREW AT A TIME With no formal central purchasing policy in place for the Student Housing Services staff, it is difficult to make changes across the board in products used by the cleaning crews. To work around this issue Ms. Perry focused on working with one group at a time. She asked for volunteer crews to test an array of environmentally preferable products in hopes that initial group successes would serve as example to those who would follow later. Initially, two crews of 6 janitors tested products for restroom, window and general purpose cleaning. As other crews learned about the testing process two more volunteered for the process.

SAFETY AWARENESS TRAINING In addition to looking for safer products Ms. Perry and other management staff continually look for ways to increase safety awareness for and with the employees. Regular informal training sessions are held twice a month with nearly half of the meetings directly related to product safety issues. Pocket sized bilingual cheat sheets with dilution ratios, mixing instructions and safety precautions are provided to staff trained to mix from concentrate. On July 29th, Ms. Perry attended a half-day workshop where she learned how to conduct her own technical product reviews among other things. Since then, Ms. Perry has

advised against the use of a few new products based on safety risks and is searching for possible alternatives. The project team estimates that each cleaning crew that decides to switch to the suggested alternative products will reduce their handling of hazardous ingredients by about 4,200 pounds per year.

What's Needed Next?

Environmentally preferable purchasing is an important step toward reducing the impacts of building maintenance products upon the janitorial user, building occupant, and the environment in general.

There are three major problem areas that need to be addressed jointly by environmental professionals, janitorial product suppliers, and the specialty chemicals manufacturing industry.

We invite you to become involved. Tell your suppliers, associates, and anyone else who will listen what your opinions are.

We Need Better MSDSs

To be at all useful for making health and environmental decisions, material safety data sheets need to voluntarily list all ingredients in the product, not just those mandated by regulations. The relative quantity of each ingredient also needs to be stated, although providing a range such as "15% to 20%" is sufficient for most purposes.

In addition, printed MSDSs need to be clearly written, well organized, and legible. About a tenth of all MSDSs we have evaluated either cannot be read because of small or distorted type, or are hard to use because some of the information is in non-standard locations.

Finally, we encourage all product suppliers to publish their MSDSs on the internet. Direct and instant access is far better than waiting weeks or months to receive a requested data sheet.

We Need Better Technical Information

We suggest that vendors begin providing more information to janitors who wish to use their products. For example, we think that product literature should emphasize:

- How to store, mix, and use products;
- How to avoid incompatibilities with other products;
- How to easily access the supplier's customer service system with health, safety, and environmental questions; and
- How to properly dispose of unused product, wastes, and containers.

We Need Better Product Labels

We encourage nation-wide development of standard janitorial product labels like those now being used for food packaging. Key information to display includes explicit identification of dangers that the product poses, a list of toxic ingredients, recommended personal protective equipment, and guidance for proper emergency response. Containers should also explain where to get more information.

Adopted from a forthcoming article in Pollution Prevention Review by Thomas Barron, Debbie Raphael, and Lara Sutherland.

Appendix G Results Forecast Calculations

The following tables summarize the amounts of hazardous materials that janitors use today and the reduced amounts that may result from the project's outreach efforts. The team made its extrapolations in the following steps:

1. The ratio of 25% hazardous materials weight to total product weight was based upon the 19 janitorial products that the team studied in detail.

2. This ratio was used to estimate the amount of hazardous ingredients encountered in 1,137 products used by 47 organizations that were reviewed. The amount of reduction the sites can potentially accomplish is also shown.

3. The reviewed organizations employ about 25% of all janitors who work in Santa Clara County. The estimate of County-wide hazardous materials use is based upon this ratio, as is the amount of potential reduction that could occur.

G.1 Estimate Of 25% Hazardous Materials Content

Table G1 - Annual Use Of 19 Key Janitorial Products

	Estimates per person at one typical janitorial contractor							
	Use/person/yr [1]		Hazmat/person/yr [2]		Total Product Reduction/pers		Potential Hazmat Reduction/pers	
	gal/pers/yr	lb	%	lb	%	lb	%	lb
Hard Floor Care								
Sealer	2.94	24.54	20%	4.91	50%	12.27	50%	2.45
Finish	5.00	41.73	20%	8.35	50%	20.86	50%	4.17
Stripper	1.94	16.22	50%	8.11	50%	8.11	50%	4.05
Baseboard Stripper	0.24	2.01	75%	1.50	50%	1.00	50%	0.75
General Purpose Floor Cleaner	1.17	9.80	33%	3.23	20%	1.96	20%	0.65
Dust Mop Spray	0.08	0.63	75%	0.47	10%	0.06	10%	0.05
Carpet Care								
Pre-Spotter	0.35	2.95	20%	0.59	50%	1.48	50%	0.30
Traffic Lane Cleaner	2.31	19.30	20%	3.86	50%	9.65	50%	1.93
Shampoo	1.62	13.48	25%	3.37	10%	1.35	10%	0.34
Chewing Gum Remover	0.30	2.48	50%	1.24	10%	0.25	10%	0.12
Mildew Treatment	0.08	0.63	20%	0.13	10%	0.06	10%	0.01
Restroom Cleaning								
Acid Bowl Cleaner	0.81	6.76	25%	1.69	80%	5.41	80%	1.35
Non-acid Bowl Cleaner	0.38	3.13	10%	0.31	10%	0.31	25%	0.08
Disinfectant Cleaner	3.72	31.04	10%	3.10	10%	3.10	10%	0.31
Metal Cleaner	0.26	2.15	20%	0.43	10%	0.22	25%	0.11
Glass Cleaner	0.67	5.60	20%	1.12	10%	0.56	50%	0.56
Spray Deodorizer	0.48	3.96	33%	1.31	50%	1.98	50%	0.65
Other Products								
Graffiti Remover	0.21	1.71	75%	1.28	50%	0.85	50%	0.64
Wood Furniture Polish	0.69	5.74	50%	2.87	25%	1.43	25%	0.72
Total (gal or lb/Person):	23.25	193.86		47.87		70.91		19.24
Est. Hazardous Materials Content:				**25%**				

[1] Amount of product used per total person in company, not just utility crew workers.
[2] This % is for a single representative product, not yet discounted for how frequently that product might be in use.

G.2 Hazardous Materials Use At 47 Reviewed Sites

Table G2 - Annual Use Of Janitorial Products (47 Reviewed Sites)

Site/Firm Data				Existing Chemical Use (Est.)		
No.	Type	Workers	Sq. Ft.	No.	Total (lb/yr)	Haz Mat (lb/yr)
1	Contr.	30	725,825	26	5,815	1,436
2	C	30	725,825	20	5,815	1,436
3	C	620	11,000,000	37	120,179	29,680
4	Staff	31	1,100,000	33	6,009	1,484
5	C	5	125,000	16	969	239
6	C	25	604,854	24	4,846	1,197
7	S	6	225,000	18	1,163	287
8	C	16	387,107	18	3,101	766
9	C	21	692,000	10	4,071	1,005
10	C	1,179	28,340,993	10	228,534	56,439
11	S	33	421,000	37	6,397	1,580
12	C	70	2,000,000	43	13,569	3,351
13	C	40	967,766	11	7,753	1,915
14	C	52	1,258,096	38	10,080	2,489
15	C	4	75,000	19	775	191
16	C	1	5,000	11	194	48
17	C	4	96,777	15	775	191
18	S	16	387,107	18	3,101	766
19	S	12	300,000	57	2,326	574
20	S	15	375,000	22	3,004	742
21	S	17	250,000	13	3,295	814
22	C	32	2,100,000	38	6,203	1,532
23	C	52	1,258,096	27	10,080	2,489
24	C	843	10,516,079	27	163,405	40,355
25	S	72	1,800,000	24	13,956	3,447
26	C	10	240,000	17	1,923	475
27	C	900	31,260,000	17	174,469	43,087
28	S	2	48,388	19	388	96
29	S	14	200,000	15	2,714	670
30	S	54	19,883	27	10,467	2,585
31	C	349	3,274,175	56	67,649	16,707
32	C	695	12,000,000	56	134,717	33,270
33	C	6	145,165	21	1,163	287
34	S	3	72,582	12	582	144
35	S & C	10	240,000	24	1,923	475
36	C	41	1,000,000	21	8,012	1,979
37	C	32	2,100,000	38	6,203	1,532
38	S	35	846,796	25	6,784	1,675
39	C	80	3,000,000	12	15,507	3,830
40	S	70	3,200,000	40	13,569	3,351
41	C	115	2,782,329	24	22,291	5,505
42	C	7	160,000	47	1,282	317
43	C	1	6,358	9	194	48
44	S	4	96,777	14	775	191
45	S	1,200	29,032,993	9	232,605	57,445
46	C	2	50,000	8	388	96
47	C	1	24,194	14	194	48
	Totals	6,857	155,536,165	1,137	1,329,213	328,266 (25%)

Table G3 - Reduced Use Of Janitorial Products (47 Reviewed Sites)

No.	Site Data		Forecast Changes (lb/yr)	
	Haz Mat (lb/yr)	Potential (lb/yr)	Will Probably Do (lb/yr)	(%)
1	1,436	574	62	11%
2	1,436	574	80	14%
3	29,680	11,872	562	5%
4	1,484	594	58	10%
5	239	96	26	28%
6	1,197	479	112	23%
7	287	115	41	36%
8	766	306	34	11%
9	1,005	402	193	48%
10	56,439	22,576	3,386	15%
11	1,580	632	219	35%
12	3,351	1,340	349	26%
13	1,915	766	446	58%
14	2,489	996	144	14%
15	191	77	18	24%
16	48	19	3	14%
17	191	77	10	13%
18	766	306	26	8%
19	574	230	63	28%
20	742	297	43	15%
21	814	326	120	37%
22	1,532	613	181	29%
23	2,489	996	280	28%
24	40,355	16,142	4,260	26%
25	3,447	1,379	230	17%
26	475	190	50	26%
27	43,087	17,235	1,521	9%
28	96	38	3	7%
29	670	268	101	38%
30	2,585	1,034	144	14%
31	16,707	6,683	2,238	33%
32	33,270	13,308	4,456	33%
33	287	115	21	18%
34	144	57	13	22%
35	475	190	24	13%
36	1,979	791	52	7%
37	1,532	613	181	29%
38	1,675	670	139	21%
39	3,830	1,532	357	23%
40	3,351	1,340	456	34%
41	5,505	2,202	321	15%
42	317	127	34	27%
43	48	19	4	22%
44	191	77	14	18%
45	57,445	22,978	3,511	15%
46	96	38	11	28%
47	48	19	6	32%
	328,266	131,306	24,599	19%

G.3 Extrapolation To Other Janitors In Santa Clara County

The project team estimates that the 26,831 janitors in Santa Clara County use about 750,000 gallons of concentrated and ready-to-use chemical products every year. At an average of 8.34 pounds per gallon, these chemicals weigh a total of just under 6,300,000 pounds.

As shown by Table G4, the amount of hazardous materials in this annual total is estimated to be just over 1,284,000 pounds, or about 48 pounds per person per year. Were future pollution prevention outreach efforts to reach all 26,831 of the janitors working in Santa Clara County, the potential amount of hazardous materials reduction would be 513,765 pounds per year. Based upon site interviews, the team expects that 82,497 pounds per year of this reduction will occur.

Table G4 - Reduced Use Of Janitorial Products (Santa Clara County)

		Hazardous Materials (lb per year)		
		Amounts	Forecast Reduction	
	Janitors	Used Before	Possible	Expected
Contractors				
47 Sites	4,629	221,593	88,637	16,606
Others	3,324	159,122	63,649	5,962
Total	7,953	380,714	152,286	22,568
Site Employees				
47 Sites	2,228	106,673	42,669	12,654
Others	16,650	797,026	318,811	47,275
Total	18,878	903,699	361,480	59,930
Combined Totals				
47 Sites	6,857	328,266	131,306	29,260
Others	19,974	956,148	382,459	53,237
Total	26,831	1,284,414	513,765	82,497

This hypothetical extrapolation assumes that organizations who didn't participate in the project would have the same potential hazardous materials use reduction as the 47 reviewed firms did, but that these other sites would actually implement only half of the relative number of changes suggested to them. In other words, the firms that didn't participate in the project are assumed to have the same numbers of potential changes, but are less likely to actually make them.