Ergonomics Study of
Custodial, Housekeeping, and Environmental Service Positions
At the University of California

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Prepared By:
The UC System-wide Ergonomics Project Team

Be Smart About Safety

Contents

Executive Summary

At the University of California, custodians, housekeepers and environmental service workers play a critical role in keeping building interiors well-maintained. To perform these physical tasks, these workers are exposed to ergonomic risk factors such as repetitive motions and awkward postures. In fiscal year 2010, custodial injuries accounted for 761 workers' compensation claims, with an actuarial estimated ultimate direct cost of $7.1 million. Loss data was valued as of June 30, 2010.

UCOP Risk Services tasked the UC System-wide Ergonomics Work Group with conducting an ergonomic study of this group to identify problem areas and develop strategies to address those problems. A project team comprised of ergonomists from various UC locations was formed.

Various approaches were used to meet the project objectives. Workers' Compensation data and task analysis were used to identify high risk tasks. The high risk tasks include: trash, recycle and linen handling, mopping, bathroom cleaning, vacuuming, lifting and moving furniture. A literature review was conducted and the ergonomists drew upon front line experiences at their individual locations.

From the compiled data, a set of reference documents was developed including *Best Practices Bulletins, Recommended Product Sheets* and *Ergonomic Design Guidelines for New Construction and Existing Buildings*. The Best Practices Bulletins provide recommendations to reduce ergonomic risk factors. Each Best Practice Bulletin also includes information on equipment selection, training concepts, and work and staffing guidelines. The Recommended Product Sheets offer equipment recommendations that have proven successful at various UC locations. The Ergonomic Design Guidelines for New Construction and Existing Buildings offer important criteria to implement at the beginning of construction projects.

In addition to these reference documents, a few specific strategies were initiated by this project:

- A newly designed tool was developed through the collaboration of Ira Janowitz (LBNL) and Howard Silverberg (Flexible Scientific) to hold dumpster lids open. These will be piloted at each location to determine their effectiveness.
- UCOP is developing a streamlined purchasing program to obtain effective pricing for the recommended tools and equipment.
- UCOP is creating a website to post the documents for easy access and implementation. Content will be updated bi-annually.

Lastly, the project team created a project application and brief evaluation tool to develop and implement location-specific interventions to address one of the high at-risk tasks. UCOP Risk Services will provide funding, up to $5,000 per location, to facilitate implementation.

Project Sponsors

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Introduction and Project Overview

At the request of UCOP Risk Services, the UC System-wide Ergonomics Work Group was requested to perform an ergonomic study of the five occupations within UC that have the highest incurred workers' compensation cost with the purpose of developing system-wide strategies that reduce ergonomic risks. In reviewing actuarial data, UCOP Risk Services determined that custodians, food service workers, lab technicians (animal health), grounds and building maintenance workers have the highest incurred costs. At the 2010 Risk Summit, it was agreed upon that the first ergonomic study would focus on custodial/housekeeping/environmental service positions.

After a Project Charter (Appendices) was developed, a Project Team was established to lead this study. The objectives of the project were to help reduce ergonomic risk factors and injuries by developing:

1. *Best Practices Bulletins* so each location can use the resources and guidelines to make improvements
2. *Recommended Product Sheets* for equipment that has proven successful
3. *Ergonomic design guidelines* for new construction and existing buildings (remodels)
4. *An evaluation process* for effectively engaging staff in the purchase and evaluation of new equipment
5. *Pilot project proposal guidelines* to assist each location in developing and implementing location-specific interventions to address one of the high risk tasks. For these interventions, UCOP Risk Services will provide funding, up to $5,000 per location.
6. *Evaluation tool and metrics for effectiveness*

To begin the process, a questionnaire was developed to help identify the most common at risk job tasks. This questionnaire was sent to ergonomists at each location. To complete the questionnaire, the ergonomists used workers' compensation data, previous job analyses, recorded injury history, and interviews and feedback from managers, supervisors and employees. The results showed the most common at risk job tasks were 1) trash and recycle handling, 2) mopping, 3) vacuuming, 4) lifting and moving furniture, and 5) cleaning bathrooms. In addition, linen handling was added to the list as a special task unique to the medical centers. During the data collection phase, the project team split up into three subgroups 1) Trash, Recycle and Linen Handling, 2) Bathroom Cleaning and Mopping and 3) Vacuuming and Lifting/Moving Furniture to conduct further research and analysis.

A second questionnaire was developed to determine the types of equipment and products being used, maintenance and storage issues, training protocols, and design guidelines. The questionnaire also inquired as to the effectiveness of those factors in reducing injuries, increasing productivity, and improving cleanliness. Ergonomists from each location were charged with administering this questionnaire with their respective cleaning units.

From the data results, literature review and front line experiences, *Best Practices Bulletins*, *Recommended Product Sheets* and *Custodial Design Guidelines for New Construction and Existing Buildings* were created for the at-risk job tasks. These documents will be posted at http://ucanr.org/sites/ucehs/Workgroups/Ergonomics/ and should be utilized as part of the system-wide strategies to reduce risk and decrease workers' compensation injuries and costs.

Findings and Recommendations

Literature Review and Background Data

For the University of California, custodians, housekeepers and environmental service workers (herein referred to as cleaners) play a critical role in keeping building interiors clean. They perform manual labor and their physical tasks expose them to a variety of ergonomic risk factors. Research studies highlight a number of risk factors that are strongly associated with the development of muscular skeletal disorders: (1) working in awkward postures, (2) high static postures, (3) repetitive work, (4) using high forces, (5) working with vibration and (6) a combination of all these factors (Village et al 2009, Balogh et al 2004, Norman et al 2003, Andrew et al 1998, Gunn et al 2002). Cleaners are exposed to all of these risk factors; therefore, their risk to injury is heightened.

Psychosocial issues, such as staffing levels, availability of equipment, work schedules, recovery time, work pace, work procedures, and task variety play an underlying role in the exposure to risk factors and the development of injuries (NOHSC, 2004). The types of equipment being purchased, maintenance issues, training protocols, and overall safe operating procedures should also be taken into consideration. Therefore, it will be important to incorporate all of these factors into system-wide strategies.

Data Analysis and Recommendations

In order to determine the most common five at-risk job tasks throughout the UC system, the Project Team developed a questionnaire (Appendices) that was sent to all locations for completion. Of the 16 locations, 15 responses were received. A summary of the results can be seen below, while detailed results are in the appendices (Appendices).

Summary of Results

Top At Risk Tasks **1= Highest Risk**	***Number of Locations with this concern***
1. Trash/Recycle Handling	14
2. Mopping	10
3. Vacuuming	6
4. Lifting and Moving Furniture	6
5. Cleaning Restrooms (includes cleaning showers)	6

6. Linen Handling (to include medical centers)	3

From the data results, 3 subgroups were established to address the 6 top at risk job tasks. Two tasks were assigned to each group as follows:

Group 1: Trash/Recycle and Linen Handling
Group 2: Mopping and Bathroom Cleaning
Group 3: Vacuuming and Lifting/Moving Furniture

Each group compiled and reviewed questionnaire responses in order to evaluate interventions and subsequent outcomes (Appendices).

Trash/recycle and linen handling interventions include:

- Collection containers with receptacles for both trash and recycle on one cart are helpful
- Dumpster heights placed at 36 inches reduce lifting bags above shoulder height
- Propping a dumpster lid open with a pole allows the cleaner to use both arms to throw the filled bag, linen or recycled material
- Transporting a full dumpster with a mechanical assistive device, such as an Ergo Tug, eliminates pushing and pulling the dumpster by hand
- Training to limit the weight of the bags to 25 pounds has not proven successful

Mopping/bathroom cleaning interventions include:

- Self-propelled walk behind auto scrubbers have reduced repetitive mopping for larger areas
- Lightweight mopping systems, such as microfiber, clean more efficiently than traditional mopping
- Mop buckets designed to dump dirty water into toilets or floor drains eliminates higher level lifting to sink-height
- No touch cleaning systems have reduced repetitive motions, awkward, forceful postures and reduced injuries
- Utilizing shower head hose adaptors is a simple improvement that decreases forceful awkward postures while rinsing showers
- An adjustable smart handle, with a doodle bug tool, helps clean higher areas
- A long angled brush improves toilet bowl cleaning and reduces bending forward at the waist

Vacuuming and moving/lifting furniture interventions include:

- Light weight upright vacuums with hose attachments and powerful suction reduces using forceful postures
- Back pack vacuums are best for stairs and hard-to-reach areas
- Large area vacuums are useful in bigger areas
- Lightweight tables and chairs reduces risk when frequently set-up, moved and taken down
- Wheeled storage carts with lockable casters makes it safer and easier to transport lightweight tables and chairs

Based on the above data results, the Project Team developed additional questionnaires in order to gather more information about products and equipment, work flow, training, maintenance, and storage and design issues. The information received was consolidated and reviewed and helped create the *Best Practices Bulletins,*

Recommended Product Sheets and Design Guidelines for New Construction and Existing Buildings (Appendices).

Best Practice Bulletins

The bulletins are designed for supervisors and offer strategies to reduce ergonomic risk factors. The literature review suggests an increase in ergonomic risk is partially due to a lack of assessment and trial of equipment prior to purchase, a lack of consultation with users, unsuitable or non-existent maintenance/replacement schedules, and confusion over roles/responsibilities regarding equipment purchase, maintenance, and storage (Woods et al 1999; Woods & Buckle in press 2004; Gaudry 1998; Aickin & Carasco 1998; Paver et al 1997). Therefore, some of the strategies focus on the type of equipment, the equipment selection process, and the importance of having maintenance schedules.

The bulletins also focus on training strategies. The questionnaire data showed that when training was provided it was in a very inconsistent manner. It was difficult to determine what was being taught and by whom. These bulletins recommend new hires be trained within the first 30 days of hire with annual refreshers. In addition, training must include safe equipment use and proper body mechanics. Training is most successful in small groups with the active involvement of supervisors, leads, ergonomists, and vendors.

Work and staffing guidelines also play a critical role. Due to budget constraints and cut backs, many locations are understaffed. In addition, there are no temporary pools of staff available to help with vacations, illnesses or other staff shortages. The level of cleanliness deteriorates and cleaners are asked to do more in the same time frame. They are under time constraints which add to the challenge. This increases exposure and the risk of injury. It is important to develop a back up staffing plan for the UC locations.

Unfortunately, there is also a lack of standard operating procedures. Developing procedures that look at the whole task process allows for improved cleanliness, increased productivity and a way to incorporate a maintenance and replacement schedule for the equipment. This in turn can decrease the ergonomic risk factors and reduce injuries.

Recommended Product Sheets

The product sheets offer equipment recommendations that have proven successful at various UC locations. Carefully selecting appropriate equipment is an important step in reducing ergonomic risk factors. As a starting point, it is important to try a demonstration model from the recommended product sheets prior to purchasing new equipment.

The Best Practices Bulletins and Recommended Product Sheets are posted at http://ucanr.org/sites/ucehs/Workgroups/Ergonomics/ and will be updated on a bi-annual basis. As equipment and products change and improve, so will these documents.

Custodial Design Guidelines for New Construction and Existing Buildings

The design guidelines (Appendices) were developed from first hand experiences, best practices and the literature review. They provide risk information to share with campus partners, such as architects and project

managers, whose designs directly impact the work of cleaners. These guidelines offer recommendations for reducing risk exposures by designing buildings from an ergonomics-perspective from the beginning.

Conclusion

This project has confirmed that the custodial/housekeeper/environmental service workers are exposed to a variety of ergonomic risk factors and have a high risk of injury. In order to reduce injuries, both physical and psychosocial risk factors must be considered when developing system-wide strategies. These strategies should focus on trash/recycle and linen handling, mopping and bathroom cleaning and vacuuming and lifting/moving furniture.

The Campus ergonomists are pleased to contribute to what will be an ongoing process in developing and implementing these strategies at each location. Through the creation of the *Best Practice Bulletins*, *Recommended Product Sheets* and *Design Guidelines for New Construction and Existing Buildings* and the $5,000 per location funding by UCOP Risk Services, a solid foundation has been formed on which to build in the future.

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Appendices

Project Charter

Project Title

Ergonomics Study of High-Injury Occupations at the University of California

Project Objective

At the request of UCOP Risk Services, the UC-Wide Ergonomics Work Group will conduct ergonomic studies of the five occupations within UC that have the highest incurred workers' compensation cost with the purpose of developing system wide strategies that address current issues. UCOP Risk Services looked at actuary data that indicate custodians, food service workers, lab technicians (animal health), grounds and building maintenance workers have the highest incurred costs. At the 2010 Risk Summit, it was agreed upon that the first ergonomic study would focus on custodial/housekeeping/environmental service positions because all of the locations have one of these positions.

Project Scope

The scope of the project is to identify the top five at-risk tasks within these positions and develop strategies to reduce injuries and decrease workers' compensation costs. This will be achieved by developing:

- *Best practices* so each location can use the resources and guidelines to make improvements
- *Product information sheets* for equipment that has proven successful. Sheets will include specifications, features, and appropriate applications.
- *An evaluation process* for effectively engaging staff in the purchase and evaluation of new equipment.
- *Ergonomic design standards* for new construction and existing buildings (remodels).
- *Pilot project proposal guidelines* to assist each location to develop and implement location-specific interventions to address one of the high risk tasks. For these interventions, UCOP Risk Services will provide funding, up to $5,000 per location.
- *Evaluation tool and metrics for effectiveness*

Project Methodology

Data will be collected from each location by asking the following three questions:

- What are the top five at risk tasks within your custodial/housekeeping/environmental services departments? (this information will be gathered from resources such as: recorded injury history; interviewing management of departments; feedback from employees; IVOS system and injury statistics; ergo coordinators and accident investigators)
- What interventions has your location already implemented to address these high at risk tasks and what has been the outcome?
- What other things might your campus need to reduce these risks?

The data will be analyzed by the Project Team via conference calls and work group meetings. If needed, each location may be contacted for further information/data.

The data collected will help the group design and develop best practices, product evaluation processes, product information sheets, design standards and a pilot project proposal guideline.

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Project Milestones

Milestones	Deliverables	Estimated Date
Confirm project charter	Approved project charter document	9/2/2010
Identify top five at-risk tasks	Results ready for analysis	9/2/2010
Project Team meeting in Oakland (Facilitated by Mallory et al.)	• Develop questions to ask work group members • Develop template for best practices (think about design	9/24/2010

	standards) • Develop template for product information sheets • Project Team members assigned to top risk job tasks to gather more information from locations	
Development of documents	Documents finalized	10/6/10
Send email to entire work group to have them gather further information from their locations		10/6/10
Project Team members begin contacting locations for additional information	Collect data	11/6/10
Complete data collection	Data analysis	11/12/10
Conference call	Data analysis and next steps	11/12/10
Project Team meeting in Oakland (Facilitated by Mallory et al.)	• Develop and review best practices for top five high at-risk tasks • Develop and review product information sheets for successful equipment being used at locations • Develop an evaluation process for equipment review and purchase • Project Team members assigned to top risk job tasks to develop design standards	12/10/10
Conference call	Analyze results and review action items from 12/10/10 Project Team meeting; next steps	1/20/10
Project Team meeting in Oakland (Facilitated by Mallory et al.)	• Develop design standards for top five risk job tasks • Develop pilot project proposal guideline • Develop evaluation tool and metrics for effectiveness	2/11/11
Document development	Send documents out for review	2/25/11

Conference call	• Review documents • Project Team members divided into teams to work on assigned section of final report; next steps	3/11/11
Report development	Draft report	4/15/11
Conference call	Review final report and make necessary changes	4/29/11
Final report due	Final project report	5/20/11
Presentation to Erike Young and others at UCOP (1-2 team members)	Presentation summarizing research, analysis, and recommendations	5/27/11

Project Success Measurements

This project will be a success if it culminates in specific actionable steps for each location to implement that will result in the reduction in the frequency and severity of injuries related to these top five at-risk job tasks. Since the field of ergonomics is dynamic, our goal is to continuously improve and incorporate lessons learned into the work practices. Therefore, this report is intended to be a living document and updated with new information as available.

Success measurements include:

- Develop best practices so each location can use the resources and guidelines to make improvements
- Recommend equipment to reduce the risk of injury and provide product information sheets as a resource
- Develop design standards for new construction and existing buildings (remodels)
- Obtain UCOP support to implement recommended design standards
- All locations implement a one-year pilot project that also includes training and evaluation
- Develop tracking tool and incorporate lessons learned and work practices into living document

Questionnaire: Identify Top At-Risk Custodial Tasks

The following form was sent to the ergonomist at each location to help determine the top 5 at-risk tasks for the Custodial/Housekeeping/Environmental Service Positions.

What are the top five at risk tasks within your Custodial/Housekeeping/EVS department?
What interventions have you implemented for these at risk tasks and what was the outcome?
What other things does your campus need to reduce the risk?

CAMPUS	RANK ACCORDING TO RISK	CUSTODIAL HOUSING KEEPING EVS TASK	PREVIOUS INTERVENTION	APPROX. COST OF INTERVENTION	OUTCOME	NEW OR ALTERNATE IMPLEMENTATION
Example: UCB	*1*	*THROWING TRASH/RECYCLE*	*TRAINING TO LIMIT WEIGHT TO 25 LBS*	*$0*	*DIFFICULT TO MEASURE*	*TRIAL OF PROTOTYPE TOOL FROM LBNL*
			TYING OFF BAGS TO REDUCE SUCTION	*$0*		*TRIAL OF TIPPER*
	2	*CLEANING SHOWERS*				

Questionnaire Results: Identify Top At Risk Custodial Tasks

UC LOCATIONS

At Risk Tasks 1=Highest	**B**	**D**	**DMC**	**SF**	**SC**	**M**	**I**	**IMC**	**SB**	**R**	**LA**	**LAMC**	**SD**	**SDMC**	**LBNL**	**ANR**
Placing trash/recycle into large dumpsters	1		1	1		5	4	1	1	1	1		2		1	
Picking up and throwing trash/recycle		1								4		2	1	2	2	
Cleaning above shoulders and below knees						4			6		2					
Lifting heavy items above shoulder height													3			
Cleaning showers	2					1				3						
Restroom cleaning					1		2								4	
Dusting						2										
Vacuuming	4				2	6			5		3		5			
Mopping	3		4	3		3		2	3	2	4		4		3	
Waxing											5					
Burnishing	5															
Scrubbing									2							
Lifting/moving furniture				2		7	3		4					1		2
Slip/trip/fall					4		1	3								1
Carrying equipment																3
General fatigue and leg pain					3											
Lifting soiled linen from hampers			2									1				
Lifting/carrying pharmaceutical waste			3													
Changing bed sheets												3				
Pushing laundry carts												4		3		
Transporting full laundry carts to loading dock												5				
Stress					5											
Lack of education					6											

Summary of Results

***Top At Risk Tasks (*1= Highest Risk)**	***Number of Locations with this concern***
1. Trash/Recycle Handling	14
2. Mopping	10
3. Vacuuming	6
4.Lifting/Moving Furniture	6
5. Cleaning Restrooms (includes cleaning showers)	6
6. Linen Handling (to include medical centers)	3

Questionnaire: Intervention, Outcome and Next Steps At UC locations

Trash/Recycle	INTERVENTION	OUTCOME	NEXT STEPS
UCB	Tandem Brute dolly (Rubbermaid) - 2 separate containers for trash and recycle on one cart.	Eliminated pushing and pulling two separate containers; easy to maneuver in and outside building and over thresholds	New buildings: Design standards for clear short access to large containers and ways to dump so height of large container is no more than 36 inches in height. Existing buildings: Trial of lid lifter and research into portable ramp to place in front of containers as needed.
UCD	Trial of foot pedal operated dumpster lid lifter design	Created problem with dumpster pick up by trucks (abandoned concept)	
	Gradually replacing dumpsters with new lower heights from 55" to 39" - Consolidated Fabricators Corporation, 901 Simmerhorn Road, Galt, CA 95632	Custodian satisfaction/ need more time to see if injuries go down	
	Dumpster lid change from metal to plastic to reduce force required to open		
	Dumpster lid holding rod to reduce reach (design from UCSB)		
UCD MC	Training to limit weight to 25 lbs.; tying off bags to reduce suction	Not successful as this is now our # 1 risk /cause of injury in Env. Svs. this past fiscal year	Use of alternate trash can, side opening
UCSF	Brute Receptacles	Involved MB Campus only, none measured	
UCI	Throwing trash into small trucks – training		Hydraulic lift for the trucks - In Housing they have a small truck that goes around to dump the contents into the truck - they would like a lifter to empty into the truck and also into the larger dumpsters
UCI MC	Trash removal: most common injury associated with this task has been "needlestick" or "sharps" injury (8 of 17); meetings with nurse manager - attempt to identify cause of improper sharps disposal; some	Short term improvements followed by periods of increased incidence	Initiate study to determine primary causes of improper sharps disposal; focused training or procedural -policy changes as indicated by study.

	training on how to handle trash safely		
	Implementation of accident investigation		
UCSB	Facilities- Megabrute Toters (Rubbermaid) Cart	Yes	In process of installing below the ground dumpsters for green waste and some trash - working with local garbage company
	Facilities - Vestal T Auto Dumpster	Starting a pilot	
	Facilities - Dumpster Lid Brace	Yes	
	Facilities - Gloves - Protection of Hands	Yes	
	Dining - Auto Lift Dumpster	Yes	Re-design of custodial closets
UCR	Pushing full trash dumpsters - Administrative controls: require 2 persons for task	Department implemented the procedure; reduced risk but prefer to provide mechanical assistance for transportation of dumpsters	Ergo Tug or similar powered mover (waiting for funding)
	Lifting trash - Training to limit weight of trash bag to 20-25 pounds	Poor compliance	Recommended porta safe racks to reduce the suction: http://www.sibleylabs.com/pdf/coreless.pdf
UCLA	Throwing trash/recycle training to recognize and limit weight to <30 pounds	Increased awareness but unable to determine if effective in reducing injuries	Design standards to lower height of dumpsters to <36" or place dumpsters adjacent to loading docks at ground level
	Developed ergonomics training course for supervisors to include awareness of high risk tasks and providing positive feedback	Basic awareness developed; needed more consistent follow-up and reinforcement	
UCSD	Conducted department wide back safety and safe lifting training in English and Spanish to re-emphasize proper lifting techniques	Recently completed in select departments- monitoring outcome	Behavior and awareness training
	In tailgate meetings reinforced safe practices including: limiting the size of the load, dividing loads in 2 and using the buddy system	Recently completed- not yet able to measure	Create an added component of safety training to include additional stress relief techniques. Develop or enhance safety incentive program with positive reinforcement and recognition.
	Placing trash into large dumpsters: limited location- provided Queen Mary receptacles and a dumpster with an electric lift	Successfully working in one area. Need to investigate cost of smaller units or quantity discount	Research alternative dumpsters-compactors (possible smaller sizes) with lifts; where possible, reposition dumpster for easier access and off-loading of trash
LBNL	Training fill bags only ½ way	Custodians will still hold lid open with one hand or improvised	Working on prototype of dumpster lid brace

		dumpster sticks using various implements to hold open lids	
	Carrying heavy bags of trash/recycle paper and books. Training to fill bags only ½ way.	Some custodians minimized # of trips by filling bags with heavy loads	

Mopping	INTERVENTION	OUTCOME	NEXT STEPS
UCB	Unger Mopping System for small areas www.ungerglobal.com	Reduced weight - Successful mostly with Housing - supervisors buy in helped to make it successful. In Dining, these mops were unsuccessful mainly because the buckets did not roll very well. Staff continue to use the string mops but love the auto scrubber for the large areas	Research how all main depts (PPCS, RSSP, and Intercollegiate Athletics) are cleaning their bldgs.
	Walk behind Auto scubbers for larger areas, Tennant T1/T3 http://www.tennantco.com	Reduced repetition	
	Walk behind burnisher, no torque burnishers, Tennant 2550 http://www.tennantco.com	Reduced vibration/torque	
UCD MC	General housekeeping, i.e. mopping, high dusting, filling dispensers- training, purchase of some ergonomic equipment	Changing to mostly microfiber mops has had a significant impact on the decrease of severity and frequency of these types of claims (back, shoulder injuries).	Continue to purchase quality ergonomic equipment as new items come on the market.
UCSF	Unger Mopping System	Involved all campus custodians ($27,000), none measured	
UCSC	Ergonomic microfiber mops: Upper body injuries from restroom cleaning- training to use mop closer to body and or limit mopping time due to injury	Microfiber mops decrease dust particles, reduced upper body injuries due to lighter weight equipment. The microfiber mops seem to be best on smooth floors best. Main down side is having to clean mop head. This was solved with purchasing mini washing machines placed in each custodial locker. Problem with singular purchases of washing machines, cost, limited closet space, staff time lost to cleaning mop heads and maintenance repairs for washing machines. Hallways, use longer fiber dry mop heads best for transition from old type mop to microfiber instead of the smaller looped mop	
UCI MC	Mopping or use of floor	little impact	

	scrubber: most common injury with this task has been "slip and fall" - Daily "huddle meetings"; repeaters view video specific to slip & fall issues; recommendation to workers to use "slip-resistant" shoes		
	implementation of accident investigation		
UCSB	Housing - using Smart Handle and some microfiber mops		
	FM - using some microfiber mops		
UCR	Lifting full mop buckets into waist-height sinks - Implemented Unger Systems	Eliminate lifting mop buckets. Employees use either floor drains or toilets to empty water	
UCLA	Floor scrubber in large corridors. Textured Floors.	Improved efficiency and reduced injuries ROI 3 months	Expanding program to purchasing 7 additional scrubbers
			Need to provide improved storage areas for scrubbers; need to plan for washers and dryers in building design; need to provide for floor level custodial sinks to reduce lifting associated with mop buckets.
UCSD	Investigated alternative mopping system	Currently being used in some areas and not in others	Conduct survey on current usage. If needed, investigate alternatives
			Look at plausible solutions for mop sinks that are too high
LBNL	Promote use of microfiber mops	Mixed, many custodians kept cotton string mops partly due to inadequate training and availability of microfiber mop equipment	

Vacuuming	**INTERVENTION**	**OUTCOME**	**NEXT STEPS**
UCB	Backpack Vacuums, Proteam http://www.pro-team.com/pt/vacuums/default.aspx backpacks and hip style models	Reduced repetition	
	Light weight vacuums (10lbs) Rubbermaid	Reduced weight	
UCSC	Ergonomic Backpack Proteam vacuums for Day custodial staff: Wrist pain due to general work duties, old vacuums and equipment	Possibly reduction in wrist injuries due to lighter weight vacuums. Opens up need for large (walk behind) industrial vacuums needed for larger surface areas. Thorough training must be done before	

		handing out vacuums otherwise staff won't use and refuse to use.	
UCSB	FM - ORECK XL20 Commercial Vacuum Cleaner		
UCLA	Replaced heavy vacuum with Javelin vacuum with lighter weight handle and more powerful suction	Too slow to evaluate effectiveness	Currently purchasing 50 vacuums to speed up replacement process
	Purchased backpack vacuums for appropriate areas	Very effective in high traffic areas, stairs, areas with large amounts of furniture and equipment (dining, halls, gyms) females more resistive due to perceived weight and discomfort	
UCSD	Demonstration of 2 types of backpack vacuums	To be determined- currently in trial demonstration phase	Complete trial phase. Investigate alternative styles and provide pre-use training

Lift/Move Furniture	**INTERVENTION**	**OUTCOME**	**NEXT STEPS**
UCB	Mity Lite tables/chairs and carts http://www.mitylite.com	Reduced weight being lifted; not reaching up for stacked chairs; easier to transport	Incorporating more of the lightweight furniture where needed on campus
	Testing of a permanent glide showed a 30% reduction in initial force; however, the Housing department has not yet implemented. http://www.ezmoves.com		Matching funds to implement the glides
UCD	Plastic sliders that attach to the bottom of the dorm room furniture, (desks, chest of drawers, closets) **to reduce friction and force required to move** them so staff can adequately clean. 1-2 inches purchased from Ace Hardware		
UCI	Training		Teflon gliders and purchase lighter furniture to replace old ones
UCSB	Housing - installed some furniture sliders		Purchasing Mattress Dollies
	Housing - Lighter furniture		Replacing wheels on move-in carts

Cleaning Bathrooms	**INTERVENTION**	**OUTCOME**	**NEXT STEPS**

UCB	CLEANING SHOWERS: Shower head hose adaptor for area that do not have water, Rinse Ace - 6 foot hose sprayer and power sprayer valve, http://www.rinseace.com/shower-products/power-sprayer	Cost $15 - Reduced repetitive arm motions	
	C3 Cleaning Companion, http://www.cleanbetter.com/	Reduced repetitive squeezing of spray bottle/Improved process	Kaivac Cleaning Systems
UCD	Handle extenders for the window and shower washers (Doodlebugs is the name of the scrubber), Unger products		
UCSC	Upper body injuries from Restroom Cleaning - Training to use mop closer to body and or limit mopping time due to injury resulting in other coworkers picking up extra work.	Microfiber mops decrease dust particles, reduced upper body injuries due to lighter weight equipment. The microfiber mops seem to be best on smooth floors best. Main down side is having to clean mop head. This was solved with purchasing mini washing machines placed in each custodial locker. Problem with singular purchases of washing machines, cost, limited closet space, staff time lost to cleaning mop heads and maintenance repairs for washing machines. Hallways, use longer fiber dry mop heads best for transition from old type mop to microfiber instead of the smaller looped mop.	
UCI	Unger long brush for toilets	Too early to tell	Cleaning systems
	Stanley Steam Vacuum for the showers and the floors to reduce scrubbing	Too early to tell	
	Training		
UCSB	Housing - Steam vapor cleaning system	Unsuccessful; Budget constraints - critical periods of time that need extra staff	Behavior based program with positive reinforcement
	Housing - Battery operated scrubber	Unsuccessful	
	FM -Windsor COMPASS II cleaning system (compatible with Buckeye products)		
UCR	Cleaning showers (ladies are short and cannot reach) - Implemented Smart Handle Pro	Good. Telescoping handles allow employees to reach the top of the shower and then shorten the handle	

	handles with doodle bug - http://www.smarthandlepro.com/	to clean mid-height	
	Cleaning mirrors- Recommended squeegees with telescoping handles to reduce the extended reaches	Employees did not want to use a squeegee because they felt it didn't clean as well. Continue to reach too far to clean mirrors.	None
UCLA	Cleaning above shoulders and below knees (mirrors, toilets, chalkboards) Ergonomics training (posture, back safety, body mechanics); purchase telescoping hand tools, longer handled tools	Reduced injuries to staff using tools	Replace all tools for entire staff $20,000
LBNL	Wiping outside of toilet bowls (bending trunk)- trial of brush with handle to wipe	Minimal: Rejected as ineffective vs. hand-held cloth or paper towel	

Linen Handling	**INTERVENTION**	**OUTCOME**	**NEXT STEPS**
UCD MC	Handling Linen- training	Minimal success, this was the highest risk for frequency and severity of WC claims.	Created a Linen Crew with designated staff to handle linen- transports linen carts with tugs- and an auto lifter dumps into laundry vendor's carts.** However with the opening of a new building additional toters will likely be needed but were not part of original plans. Also new cleaning equipment will likely be needed to clean OR rooms based on new ceiling mounted equipment that was installed.
UCLA MC	Lifting soiled linen from hampers -Training to staff to reduce the amount of linen per bag	No reduction in injuries	Foot lever that assists lifting bags from hamper
	Pushing laundry carts - Training to staff to push one cart at a time and not push and pull two carts	None, employees feel pressured to perform at a faster pace	Purchase smaller carts
	Transporting full laundry carts to loading dock - purchased 2 Ergo tug devices	Slight reduction in claims	Purchase smaller carts

Be Smart About Safety

QUESTIONNAIRE
TRASH, RECYCLE, AND LINEN HANDLING

QUESTIONS	YES	NO	EXPLAIN
Products and Equipment			
What types of containers do you use to collect trash and recycle **inside** the buildings? (Please provide manufacturer and model #'s)			
What types of containers do you use to collect trash and recycle **outside** the buildings? (Please provide manufacturer and model #'s)			
How effective are they?			
Benefits			
Limitations			
Medical Centers only: Clarify what equipment is being used in patient rooms vs. office type or other setting for trash handling.			
How effective are they?			
Benefits			
Limitations			
Are **assistive devices** for lifting/transporting used to handle trash, recycle or linen?			
If yes, provide the manufacturer and model #'s			
How long has the equipment been in use?			
Any maintenance issues? Who maintains?			
Would you buy this particular type of equipment again? (specify model)			
Has the use of this equipment resulted in:			
Reduced injuries			
Increased productivity			
Improved cleanliness			
What product or process have you used to reduce injuries related to liner suction issues when pulling trash/recycle out of containers?			
How effective has this been?			
Pros and cons			
Limitations			
Please identify any other products or equipment that is being used to reduce the risk of employee injury when moving trash, linen, and recycle?			
Workflow and Processes			
What is your current collection system for:			
Trash inside buildings, room to room			
Trash between buildings and dumpsters			
Recycle inside buildings			
Recycle between buildings and dumpsters			
Patient room trash to dumpster			
Linen			

What changes to your current systems do you feel would reduce injuries and increase efficiency?			
Do you use trash/linen teams or other creative staff deployment strategies?			
If yes, how many are allocated to the team per shift?			
If teams aren't used how many staff are allocated to handle trash, linen, recycle?			
Does staff other than Environmental Services or Custodial Services handle trash?			

Training

What type of training is provided for staff who handle trash, recycle, and linen?			
Frequency; who provides?			
Has your training program resulted in reduced injuries?			

Design Issues

What are your biggest design challenges related to the following:			
Handling trash			
Handling recycle			
Handling linen			
Types of containers or carts used (i.e. product material, height, size)?			
What success has your location had related to improving design of equipment or space that reduced the risk of injury related to transporting/lifting trash, linen, recycle?			
How are the ergonomic needs of the custodial department considered when new buildings or spaces are being planned?			

General Questions

Have you implemented an injury reduction program for trash, recycle or linen?			
What type of program?			
Was it successful?			
Do you have best practices related to trash, recycle, or linen handling injury prevention developed at your location? (please list)			
To what extent is the custodial staff at your location involved in selecting new equipment or ideas for injury reduction?			
Do you involve other staff in preventing injuries related to custodial work? (i.e. end user training related to trash weight)			
Are there any additional products or systems related to trash, recycle, or linen that you are aware of that warrant investigation?			

Be Smart About Safety

QUESTIONNAIRE
MOPPING AND BATHROOM CLEANING

ACTIVITY	QUESTIONS	YES	NO	EXPLAIN
Cleaning Systems	Do you use no-touch cleaning systems?			
Cleaning Systems	If yes, where are they used and what types, brands and models (surfaces, square footage, size, type restroom)?			
Cleaning Systems	How effective are they?			
Cleaning Systems	Pro & Cons			
Cleaning Systems	Limitations			
Cleaning Systems	What type of training is required for users?			
Cleaning Systems	Length, who provides, frequency			
Cleaning Systems	How long has equipment been in use?			
Cleaning Systems	Any maintenance issues? Who maintains?			
Cleaning Systems	Would you buy this particular type of equipment? (and specify model again)			
Cleaning Systems	Has equipment resulted in:			
Cleaning Systems	Reduced injuries			
Cleaning Systems	Increased productivity			
Cleaning Systems	Improved Cleanliness			
Cleaning Systems	Have you had any storage issues?			
Cleaning Systems	Where do you keep it?			
Auto-Scrubbers	Do you use electric and/or battery operated floor scrubbers?			
Auto-Scrubbers	If yes, where (surfaces, square footage) and what types (brands, models)?			
Auto-Scrubbers	How effective are they?			
Auto-Scrubbers	Pro & Cons			
Auto-Scrubbers	Limitations			
Auto-Scrubbers	What type of training is required for users?			
Auto-Scrubbers	Length, who provides, frequency			
Auto-Scrubbers	How long has equipment been in use?			
Auto-Scrubbers	Any maintenance issues? Who maintains?			
Auto-Scrubbers	Would you buy this particular type of equipment? (and the specific model)			
Auto-Scrubbers	Has equipment resulted in:			
Auto-Scrubbers	Reduced injuries			
Auto-Scrubbers	Increased productivity			
Auto-Scrubbers	Improved Cleanliness			
Auto-Scrubbers	Have you had any storage issues?			
Auto-Scrubbers	Where do you keep it?			
Mopping	What type of mopping system(s) do you use? (Bucket, mop head, handle, ringer)			
Mopping	What types of surfaces is each system used on?			

Be Smart About Safety

QUESTIONNAIRE
MOPPING AND BATHROOM CLEANING

Mopping	What types of chemicals are used?			
Mopping	How are mop heads laundered?			
Mopping	What type of training is required?			
Mopping	How do custodians transport equipment?			
Mopping	Are guidelines used to assign square footage?			
Please answer the questions below for the following tasks: Cleaning bathroom mirrors, toilets-latrines, showers, walls, sinks, counters, and doors				
Bathroom Hand Cleaning	What equipment is used for cleaning?			
Bathroom Hand Cleaning	What cleaning products/chemicals are used?			
Bathroom Hand Cleaning	What type of training is provided?			
Bathroom Hand Cleaning	What style carts are used to organize and transport equipment/supplies?			
Bathroom Hand Cleaning	Do they work well? If not, what are limitations or problems?			
Bathroom Hand Cleaning	Where are the carts/supplies/equipment stored?			
Bathroom Hand Cleaning	Do you have hard water issues? If yes, are special products or equipment used?			
Bathroom Hand Cleaning	Do you use hoses? If so, what kind and how are they attached?			
Bathroom Hand Cleaning	Are standards established for:			
Bathroom Hand Cleaning	Cleaning processes (SOPs)			
Bathroom Hand Cleaning	Type of paper, soap, dispensers			
Bathroom Hand Cleaning	Do you have touch-less towel or soap dispensers, faucets or air hand dryers?			
Bathroom Hand Cleaning	Do they work well? If not, what are the limitations or problems?			
Design Issues	Are there guidelines established for custodian closets for specific issues such as:			
Design Issues	Floor sink availability			
Design Issues	Hoses, connectors			
Design Issues	Size			
Design Issues	Location + number per building			
Design Issues	Storage systems for supplies			
Design Issues	Cleaning product dispensers			
Design Issues	Elevators			
Design Issues	Storage for specialty equipment (i.e. scrubbers)			
Design Issues	Storage for supplies			
Design Issues	Are you willing to share your guidelines?			
Design issues	Do all buildings have service elevators? If not, how do custodians get equipment to other floors?			
General	Do you have ideas for improving your work area that you would like to share?			

Be Smart About Safety

QUESTIONNAIRE
Vacuuming and Furniture Moving

QUESTIONS	YES	NO	EXPLAIN
Back Pack Vacuums			
Do you use ***Back-Pack Vacuums*** at your facility?			
If so, in what areas of your facility?			
What make and model of this type of vacuum are you using?			
Has this make/model been identified as the "best tool for the job"?			
Pros and cons of using this type of vacuum?			
How long have you been using this model of vacuum?			
Are there any maintenance issues associated with this vacuum?			
What type of training, if any, is required for the users of this equipment?			
Length of training, who provides training, frequency of training			
Has use of this equipment resulted in:			
Reduced injuries?			
Increased productivity?			
Improved cleanliness?			
Where do you store them?			
Have you had any storage issues?			
Upright Vacuums			
Do you use standard, ***Upright Vacuums*** at your facility?			
If so, in what areas of your facility?			
What make and model of this type of vacuum are you using?			
Has this make/model been identified as the "best tool for the job"?			
Pros/ cons of using this type of vacuum?			
How long have you been using this model of vacuum?			
Are there any maintenance issues associated with this vacuum?			
What type of training, if any, is required for the users of this equipment?			
Length of training, who provides training, frequency of training			
Has use of this equipment resulted in:			
Reduced injuries?			
Increased productivity?			
Improved cleanliness?			
Where do you store them?			
Have you had any storage issues?			
Large Area Vacuums (Walk Behind)			
Do you use ***"Large Area" Vacuums*** at your facility?			
If so, in what areas of your facility?			
What make and model of this type of vacuum are you using?			

Be Smart About Safety

QUESTIONNAIRE
Vacuuming and Furniture Moving

Has this make/model been identified as the "best tool for the job"?			
Pros/ cons of using this type of vacuum?			
How long have you been using this model of vacuum?			
Are there any maintenance issues associated with this vacuum?			
What type of training, if any, is required for the users of this equipment?			
Length of training, who provides training, frequency of training			
Has use of this equipment resulted in:			
Reduced injuries?			
Increased productivity?			
Improved cleanliness?			
Where do you store it?			
Have you had any storage issues with this equipment?			

Event Set-Up and Tear-Down

Is furniture frequently moved for various events?			
If so, who is responsible?			
Do you use light-weight furniture for event set-up?			
What brand/type of furniture are you using?			
Has use of this equipment resulted in:			
Reduced injuries?			
Increased productivity?			
Have you had any storage issues with this type of furniture?			

General Furniture Moving

Is furniture frequently moved in your facility?			
Who does this type of furniture-moving at your facility?			
Is furniture frequently moved by cleaning crews?			
Do you use hand trucks (hand dollies)?			
If so, what type have you found to be most effective?			
Do you use shoulder dollies (moving straps)?			
If so, what type/ brand and model?			
Are they effective?			
Do you use flat bed dolly or cart?			
If so, which type/ specs are most efficient?			
Are employees who frequently move furniture trained in proper lifting?			
Length of training, who provides training, frequency of training			
Are you using furniture "gliders" or something similar?			
If so, which type/ specs are most efficient?			

Risk Services Best Practices Bulletin

Trash, Recycle, Linen Handling

Presented by Office of the President Risk Services – May 13, 2011

Throughout the UC system, custodians are among the highest occupational groups at-risk for injury. Their high frequency and severity of injury is due to the physical nature of their work that often involves awkward postures, repetition of motion, and forceful exertion.

The following Best Practices are offered to guide those responsible for supervising and/or ensuring the health and safety of these custodial workers.

Best Practices:

Reduce the frequency of manually handling trash, recycle and linen materials at all stages of collection, transportation and dumping. This can reduce the risk of injury and increase workers' productivity.

- Purchase receptacles that have venting channels to reduce force needed to overcome suction.
- Use wheeled containers to collect and transport materials. When the design of the trash enclosures or dumpster itself is such that the overall height of the dumpster is higher than 36 inches, or, if the trash is usually more than (25#), use an automated dumping device.[1,2] **Refer to Recommended Product Sheets**
- Use an extension device to push and hold the dumpster lid **o**pen. This will help eliminate holding the lid open with one arm and throwing the bag of material with the other. Train custodians to use both hands to place material in dumpster. **Refer to Recommended Product Sheets**
- When automated equipment is not available, the following considerations should be made:[3-5]
    - Provide side opening receptacles to reduce lifting above shoulder height. Empty containers more frequently to reduce weight of containers.

- Prepare to lift bag or empty receptacles. This includes testing the weight of the bag, checking for contents such as sharp objects and heavy items such as books, fluid-filled containers, or glass.
- In the wheeled container, tie off bags when they are half full (or no more than 25 pounds) and start a new bag on top of the first
- Where applicable, tip container over and pull bag out from the side to reduce force needed to overcome suction
- Consider ways to reduce the walking distance when transporting containers to dumpster. **Refer to Recommended Product Sheets**
- Avoid saving all lifting tasks to perform continuously or at the end of the shift. Physically-challenging tasks should rotate between less strenuous tasks in an effective work flow.

General Considerations

- Develop a system where the building occupants bring trash and recycled materials to a central location for custodian to transport to dumpster. This will reduce picking up materials.
- Leave a larger wheeled container in a closeable room for areas with a high volume of recycled materials. This will reduce the manual handling needed to discard and/or condense materials before transport to dumpster.
- Establish a dedicated team to reduce the number of staff exposed to trash/recycle linen handling injuries.

Equipment[5-7]

Selecting the most appropriate equipment is an important decision. Prior to purchasing:

- Contact the campus ergonomist to help with the selection process
- Include custodial staff in the selection process
- Arrange for demonstration of product by manufacturer or distributor
- Refer to the Recommended Product Sheets for applications and recommendations
- Pilot the preferred equipment for a minimum two–week trial period

During the pilot period, consider the following:

- Adjustability, size and weight of equipment to accommodate wide range of body types
- Appropriate sized casters and swivel design to allow for easy rolling and maneuverability
- Size, and type of surfaces to be cleaned
- Location of controls and ease of operation
- Noise and vibration levels
- Storage and transporting needs
- Equipment maintenance and replacement parts

- Battery life and charging time
- Need for back-up equipment

Training[5]

Initial training should be provided for new employees within the first 30 days and annually thereafter. Training is best provided in small groups with the involvement of supervisors, leads, ergonomists and vendors.

Training should include:

- Hands-on performance of job tasks and related activities
- Equipment use, maintenance, storage, safety procedures and use of personal protective equipment (PPE) as required
- Instruction in proper body mechanics
- Verbal, written and illustrative materials to accommodate non-English speaking workers

Work and Staffing Guidelines[5]

Work and staffing guidelines insure that employees are adequately trained and assigned reasonable workloads. Guidelines include:

- Staff levels that provide adequate coverage to complete assigned work tasks
- Cross-training to allow for job rotation as needed
- Staff levels to avoid overtime
- Backup staffing to accommodate unplanned absences
- Use of task and job rotation to limit repetition and fatigue
- Use of teams for heavy lifting and moving tasks
- Pre-shift exercises to warm up muscles to prepare for work
- Frequent rest breaks
- Implementation and support of a work hazard notification system to identify problems such as excessive weight in trash containers

References: (1) UC Berkeley Indoor/Outdoor Enclosure Design Criteria, September 2010. Contact mlynch@uhs.berkeley.edu; (2) Consolidated Fabricators Corporation 901 Simmerhorn Rd, Galt, Ca 95632; (3) British Columbia School Safety Association, WorkSafeBC, "A Clean Sweep, Safe Work Practices for Custodians", Available at http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/clean_sweep.pdf; (4) Industrial Accident Prevention Association, "A Health and Safety Guideline for Your Workplace", 2008, pp. 1-6. Available at www.iapa.ca/pdf/manmat.pdf; (5) Cal/OSHA Consultation Service, Department of Industrial Relations, *Working Safer and Easier for Janitors, Custodians, and Housekeepers,* 2005; (6) Hansen, Steve, "Understanding Ergonomics and How it Affects Your Cleaning Business", *Custodial Workers' Resource*. Available at http://custodian.info/ergonomics.html; (7) Eastman Kodak Company, "Ergonomic Design for People at Work", Vol. 2, pp. 374 (Hand Carts and Trucks), 1986

Recommended Product Sheet

Trash and Linen Transporting

Motorized Tug

	**Criteria:**	Motorized Tug fits multiple carts using "universal coupling hitch" Custom design attachments can link or "train" multiple carts
	Application:	Transporting trash and linen container

Make	**Model**	**Comments** (Pros and Cons)	
Ergo Tug	Motorized Tug Model 4000	**PROS:** • Universal hitch system or custom hitch built to user specifications • Easily attaches to cart • Can pull up to 2,000 lbs. • Can tow multiple carts • Easily maneuverable • Meets JACHO requirements	**CONS:** • Indoor use only • Works best on smooth and level surface
	Approximate cost	$7,000	
	For more information	**North:** Joyce Rhoades joyce.rhoades@ucsf.edu **South:** David Wilson dwilson@mednet.ucla.edu	
URL:	http://www.phswest.com		

Recommended Product Sheet

Trash /Recycle Handling

Dumpster Pole

Criteria:	Assists custodians and others who carry loads to dumpsters by holding the lid open
Application:	Loading trash and recyclables into dumpsters

Make	Model	Comments (Pros and Cons)	
Flexible Scientific	Dumpster Prop®	**PRO:** • Eliminates the need to twist body while one hand holds up the lid • Reduces strain on shoulders and back	**CON:** • Need to locate storage for it near dumpster or on cart
	Approximate cost	$50.00 per pole at UC discount	
	For more information	**North:** Ira Janowitz ILJanowitz@LBL.GOV **South:** Flexible Scientific 8451 Miralani Drive, Suite A San Diego, CA 92126 Phone: 888-538-8715 Fax: 888-538-8716	
URL:	http://www.flexiblescientific.com/dumpster-prop		

Recommended Product Sheet

Handling Clean Linen

Spring-lift platform carts

	**Criteria:**	Spring-lift platform raises load up to the worker as weight is reduced
	Application:	Handling clean linen Spring-lift reduces bending over to handle linen

Make	**Model**	**Comments** (Pros and Cons)	
Maxi-Movers	Model 2914 Model M2820	**PRO:** • Reduces bending over to handle linen • Easily maneuverable • Two cart sizes (25" wide x 36" long and size 36" wide x 67" long) • 4 class ratings from 250 to 420 lbs. • Powder coated base with replaceable casters	**CON:** • Indoor use only
	Approximate cost	$500-$725	
	For more information	Jill Evans-Grinbergs jill.evansgrinbergs@ucdmc.ucdavis.edu	
URL:	http://www.maxi-movers.com		

Recommended Product Sheet

Dumping Trash and Linen

Stationary Large Load Lifter

Criteria:	Lifts multiple container sizes Dump heights 48" -70" Load capacity 2500 lbs.
Application:	Dumping large trash or linen containers

Make	Model	Comments (Pros and Cons)	
Toter	Universal Lifter 3078-XX-6000	**PRO:** • Lifts multiple container sizes • Universal adapter available for caster and two-wheel carts • Load capacity 2500 lbs. • Power supply 208/230/460V three phase, 5HP • Adapter available for caster and two wheel carts	**CON:** • Requires compatible containers • Requires storage space
	Approximate cost	$9000-$10,000	
	For more information	Joyce Rhoades joyce.rhoades@ucsf.edu	
URL:	http://www.toter.com		
Toter	Universal Lifter Low Profile 3078-LP-5000	**PRO:** • Dump height 35" • Load capacity 3500 lbs. • Power supply 208/230/460V three phase, 5HP	**CON:** • Require compatible containers • Requires storage space
	Approximate cost	$8500-$9500	
	For more information	Joyce Rhoades joyce.rhoades@ucsf.edu	
URL:	http://www.toter.com		

Recommended Product Sheet

Trash/Recycling

Mobile Container Lifters

Criteria:	Mobile power lift unloads trash and recycling into large dumpsters at various locations
Application:	Lifts various container sizes with weight capacity up to 350lbs. with a dump height range between 34" – 74" depending on the size of the container

Make	Model	Comments (Pros and Cons)	
Toter	Atlas Mobile Lifter 3081-MT-1000	**PRO:** • Mobile lifter allows for staging dumpsters at various locations & closer to the facility • Two container sizes can be used, 32 and 44 gallon • Unloads into multiple style container systems; front load, side load, and roll-off open top • Compatible with vertical/horizontal balers, self-contained and stationary compactors • Uses two 6 volt batteries • Can dump 100 lbs. for 8 hours on fully charged battery • Battery charger included	**CON:** • Requires 42" x 42" footprint
	Approximate cost	$4500-$5000	
	For more information	Joyce Rhoades joyce.rhoades@ucsf.edu	
URL:	http://www.toter.com		
Toter	Saddle Mobile Lifter 3081-MT-5000	**PRO:** • Mobile lifter allows for staging dumpsters at various locations closer to facility • Various container size can be used; 32 and 64 and 96 gallon, 2 wheel containers, 35,60,90 gallon caster • Unloads into multiple style container systems; front load, side load, and roll-off open top.	**CON:** • Requires 42" x 42" footprint

		• Compatible with self-contained and stationary compactors and vertical/horizontal balers • Uses two 6 volt batteries • Can dump 100 lbs. for 8 hours on fully charged battery • Battery charger included	
	Approximate cost	$4500-$5000	
	For more information	Joyce Rhoades joyce.rhoades@ucsf.edu	
URL:	http://www.toter.com		

Recommended Product Sheet

Transporting Recycle Containers

Powered Hand Truck

Criteria:	Powered hand truck designed for indoor, outdoor, and ramp use for transporting heavy containers
Application:	Transport large, heavy containers

Make	Model	Comments (Pros and Cons)	
Wesco	Cobra Pro	**PRO:** • Drive can be disengaged to be used in manual mode • Power drive works in 2-wheel or 4-wheel drive • 1200-pound capacity in 4-wheel mode, 600-pound capacity in 2-wheel mode • Converts easily from dolly to hand truck • Can be used indoors and outdoors • Can be used on a ramp up to 17.5 degrees	**CON:** • Battery life 6 hours • Unit weighs over 100 pounds • Maximum capacity of 950 lbs in 4-wheel mode when used on ramps
	Approximate cost	$1300	
	For more information	Kristie Elton Kristie.elton@ucr.edu	
URL:	http://www.wescomfg.com/html/hand_trucks/aluminum_cobrapro_convertible.htm		

Recommended Product Sheet

Trash/Recycling

Stationary Container Lifters

Criteria:	Power lift unloads trash and recycling into large dumpsters Designed for permanent mounting in concrete or metal pad
Application:	Lifts various container sizes with weight capacity up to 350lbs. with a dump height range between 34" – 74" depending on the size of the container

Make	Model	Comments (Pros and Cons)	
Toter	Atlas Stationary Lifter 3081-ST-1000	**PRO:** • Eliminates manual lifting of containers when unloading materials • Two container sizes can be used, 32 and 44 gallon • 115/230V single phase battery supply • Unloads into multiple style container systems; front load, side load, and roll-off open top	**CON:** • Requires transporting containers to permanent dumpster locations vs. staging locations • Requires 42" x 42" footprint
	Approximate cost	$4000-$4500	
	For more information	**North:** Joyce Rhoades joyce.rhoades@ucsf.edu **South:** Cindy Burt burt@ehs.ucla.edu	
URL:	http://www.drum-handlers-dumpers.com/Drum-Lifters-Tilters-and-Dumpers.htm		
Toter	Saddle Stationary Lifter 3081-MT-5000	**PRO:** • Eliminates manual lifting of containers for unloading materials • Containers sizes include 30-60-90 gallon 2 wheel and caster carts • 115/230Vsingle phase power supply • Designed for dumping into multiple collection systems: front load, side load and roll-off open top containers • Can be used at self-contained	**CON:** • Requires transporting containers to permanent dumpster locations vs. staging locations • Requires dedicated space of 42" x 42"

		compactors	
	Approximate cost	$4500-$5000	
	For more information	**North:** Joyce Rhoades joyce.rhoades@ucsf.edu **South:** Cindy Burt burt@ehs.ucla.edu	
URL:	http://www.drum-handlers-dumpers.com/Drum-Lifters-Tilters-and-Dumpers.htm http://toter.com		

Risk Services Best Practices Bulletin
Mopping

Presented by Office of the President Risk Services – May 13, 2011


Throughout the UC system, custodians are among the highest occupational groups at risk for injury. Their high frequency and severity of injury is due to the physical nature of their work that often involves awkward postures, repetition of motion, and forceful exertion.

The following Best Practices are offered to guide those responsible for supervising and/or ensuring the health and safety of these custodial workers.

Best Practices:

- General equipment considerations:
  - Automated floor cleaning equipment can work in a variety of locations and will reduce physical risks associated with manual mopping
  - No-touch cleaning systems and automatic scrubbers can significantly reduce ergonomic risks and provide a higher level of cleaning, especially for larger areas.[1, 2] **Refer to Recommended Product Sheets** for specific model details.
  - For small, semi-private bathrooms with linoleum floors, consider using upright steam mops. **Refer to Recommended Product Sheets** for specific model details.
- When mopping by hand:
  - Provide an adjustable (telescoping) handle to accommodate different workers
  - Use light-weight mop heads, including microfiber flat, tube, and string mops. Traditional heavy cotton-loop mop heads are not recommended.
  - Consider adjustable mop handles with a curved & swiveling handle for larger areas that do not require automatic scrubbers. **Refer to Recommended Product Sheets** for specific model details.
- The following design issues should be considered with regard to bathroom mopping:
  - Adequate and functional floor drains

- The location of quick-connect hose fittings should be easily accessible to minimize bending and twisting
- Wall mounted trash receptacles with side access and light-weight liners reduce bending when floor cleaning. This design makes it easier to clean the floor than free standing trash barrels/receptacles.[2]
- Sanitary napkin disposal containers should be mounted to the stall wall to prevent rusting and reduce bending while cleaning

Equipment[3, 4]

Selecting the most appropriate equipment is an important decision. Prior to purchasing:

- Contact the campus ergonomist to help with the selection process
- Include custodial staff in the selection process
- Arrange for demonstration of product by manufacturer or distributor
- Refer to the Ergonomics Recommended Product Sheet for applications and recommendations
- Pilot the preferred equipment for a minimum two–week trial period

During the pilot period, consider the following:

- Adjustability, size and weight of equipment to accommodate wide range of body types
- Appropriate sized casters and swivel design to allow for easy rolling and maneuverability
- Size and type of surfaces to be cleaned
- Location of controls and ease of operation
- Noise and vibration levels
- Storage and transporting needs
- Equipment maintenance and replacement parts
- Battery life and charging time
- Need for back-up equipment

Training[3]

Initial training should be provided for new employees within the first 30 days and annually thereafter. Training is best provided in small groups with the involvement of supervisors, leads, ergonomists and vendors.

Training should include:

- Hands-on performance of job tasks and related activities
- Equipment use, maintenance, storage, safety procedures and use of personal protective equipment (PPE) as required
- Instruction on safe postures and body mechanics
- Verbal and/or written materials to accommodate non-English speaking workers

Work and Staffing Guidelines[3]

Work and staffing guidelines insure that employees are adequately trained and assigned reasonable workloads. Guidelines include:

- Staff levels that provide adequate coverage to complete assigned work tasks
- Staff levels to avoid overtime
- Backup staffing to accommodate unplanned absences
- Use of task and job rotation to limit repetition and fatigue
- Use of teams for heavy lifting and moving tasks
- Pre-shift exercises to warm up muscles to prepare for work
- Frequent rest breaks
- Implementation and support of a work hazard notification system to identify problems such as excessive weight in trash containers

References: (1) Kaivac, Inc., "Removing Soil: A Comparison of Cleaning Methods", *Cleaning & Maintenance Management Online*, Vol. 46, Issue 10, October 2009, www.cmmonline.com (2) Goggins, R., "Hazards of Cleaning – Strategies for Reducing Exposures to Ergonomic Risk Factors", *Professional Safety*, March 2007, pp 23-24, www.asse.org ,(3) Cal/OSHA Consultation Service, Department of Industrial Relations, *Working Safer and Easier for Janitors, Custodians, and Housekeepers*, 2005; (4) Hansen, Steve, "Understanding Ergonomics and How it Affects Your Cleaning Business", *Custodial Workers' Resource*. http://custodian.info/ergonomics.html

Recommended Product Sheet

Floor cleaning

Automatic Scrubbers

	**Criteria:**	Automatic (cylindrical walk behind, self propelled walk behind, stand on, or ride on) floor scrubber for chemical (or non chemical) cleaning
	Application:	Flat or tiled floor cleaning of small or larger areas

Make	**Model**	**Comments** (Pros and Cons)	
Tennant	Walk behind: T1	**PRO:** • An automated bucket and mop replacement • Has good maneuverability in smaller areas • Folds down to small footprint • Cylindrical brush cleans grout and tiled surfaces • Adjustable handle • Easy fill and dump tanks • Unlimited use time (corded)	**CON:** • Needs electric outlet; Cord presents a trip hazard and limited mobility • Increased noise compared to battery operated scrubbers (72dBA)
	Approximate cost	$2,000-3,000	
	For more information	Mallory Lynch mlynch@uhs.berkeley.edu	
URL:	http://www.tennantco.com/equipment/scrubber---walk-behind/t1--compact-low-profile-floor-scrubber/overview		
Advance	Walk behind: Micromatic 14E Scrubber	**PRO:** • An automated bucket and mop replacement • Good maneuverability in smaller areas • Cylindrical brush cleans grout and tiled surfaces • Adjustable handle	**CON:** • Needs electric outlet • Limited mobility and trip hazard due to cord and trip hazard

		• Easy fill and dump tanks • Unlimited use time (corded)	
	Approximate cost	$2,000-2,500	
	For more information	Greg Ryan gryan@uhs.berkeley.edu	
URL:	http://www.advance-us.com/products/scrubbers.aspx		
Tennant	Walk behind: T3, T5	**PRO:** • T3 is good for medium sized areas (20'' pad) • T5 is good for larger areas (24, 28, and 32'' pads) • EC-H2O chemical free option • Battery powered: less noise, no cord	**CON:** • If using chemicals, must use Tennant's • Limited run time and must be charged • Need storage space with electric outlet to charge battery • Changing pads requires kneeling to the ground
	Approximate cost	$2,000-3,000	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Cindy Burt burt@ehs.ucla.edu	
URL:	http://www.tennantco.com/equipment/scrubber---walk-behind		
Advance	Walk behind: SC750, SC800	**PRO:** • SC750 (26 and 2 inch pads) is good for medium to large sized flat surfaces • SC750 (28 inch cylindrical brush) good for larger tiled and grouted surfaces • Easy to remove pads and brushes • Eco-flex system for green cleaning and the flexibility of heavy scrubbing • Battery powered: less noise, no cord	**CON:** • Limited Run time and must be charged • Need storage space and electric outlet to charge battery operated models • Changing pads requires some effort
	Approximate cost	SC750 $9,000-9,500 SC800 $9,500-10,000	
	For more information	Greg Ryan gryan@uhs.berkeley.edu	
URL:	http://advance-us.com/products/scrubbers/sc750%20sc800/sc750%20sc800.aspx		

Windsor	Stand-on: Chariot iScrub 20, 24, 26	**PRO:** • Stand on models are good for large areas; saves time & effort • Chariot works very well, very good visibility; small footprint for storage • Comes in 26'' cylindrical brush for tiled and grouted surfaces	**CON:** • Limited Run time and must be charged • Need electric outlet to charge battery • Changing pads require some effort
	Approximate cost	$4,000-10,000	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Cindy Burt burt@ehs.ucla.edu	
URL:	http://www.windsorind.com/ViewCategories.aspx?Pid=54		
Advance	Adfinity 20ST	**PRO:** • 20-inch cleaning path with capability of cleaning next to the wall's edge • On-board charger results in cord-free operation which reduces trips • Pedal assist for removing and loading pads and brushes • Turns easily • Medium noise level at 65 dB	**CON:** • Not good for sloped surfaces • Pad assist drive system (requires more effort to push than self-propelled models)
	Approximate cost	$4,250	
	For more information	Mallory Lynch mlynch@uhs.berkeley.edu	
URL:	http://www.advance-us.com/products/scrubbers/adfinity/17st%2020st.aspx		

Recommended Product Sheet

Floor Care

Steam Mop

Criteria:	Steam mop for cleaning small, semi-private bathroom floors and small lobby areas
Application:	Sealed surface floor cleaning for small areas

Make	Model	Comments (Pros and Cons)	
Shark	Steam Pocket Mop	**PRO:** • Can be used on all sealed hard floor surfaces – including sealed hardwood, linoleum, ceramic tile, marble, and other stone floors • Uses steam for disinfecting-no chemicals • Light weight (less than 5 lbs) • Has telescopic handle on the pole to adjust the height of the unit • Eliminates need for mop bucket system	**CON:** • Should not be used on unsealed surfaces such as unfinished hardwood, unglazed ceramic floors, or unsealed stone floors • Should use only distilled water to prolong equipment life • May be hard to push the first few uses because of chemical buildup on the floor • 30-inch cord limits use to small areas
	Approximate cost	$100-175	
	For more information	Ginnie Thomas gthomas@housing.ucsb.edu	
URL:	http://www.sharkclean.com/Shark-S3505-Steam-Pocket-Mop/		

Recommended Product Sheet

Floor Care

Mopping Systems

Criteria:	Mopping systems (bucket, mop head, handle and wringer) for hand mopping of floors; includes traditional cotton, nylon and blended mops as well as micro-fiber mops.
Application:	Bathroom (and other) floor cleaning. Custodians assigned approximately 25,000 to 30,000 square feet to clean.

Make	Model	Comments (Pros and Cons)	
Rubbermaid	WaveBrake® Dual Water Mopping Combos (26, 35, and 44 quart). • 35 and 44 quart sizes available in Down Press or Side Press Combos	**PRO:** • Bucket design reduces splashing and limits cross contamination of clean and dirty water. Dirty water bucket is easily removed to empty • Durable bucket • Quiet caster design • 44 qt model has foot pedal water release system at bottom of bucket • Durable wringer • Color-coded options to reduce cross-contamination	**CON:** • Dual bucket system requires more frequent water changes • Requires floor drain to ensure no lifting of bucket to drain • Requires use of Rubbermaid carts • Down Press is recommended over Side Press wringer due to durability and ease of operation (26 quart size is available in Side Press only)
	Approximate cost	$72-130	
	For more information	Ginnie Thomas gthomas@housing.ucsb.edu	
URL:	http://www.rubbermaidcommercial.com/rcp/products/category.jsp?categoryCode=cleaning		
Unger System	SmartColor Combo 30L/15L System	**PRO:** • Bucket design reduces splashing and limits cross contamination of clean and dirty water. Dirty water bucket is easily removed to empty.	**CON:** • Good for smaller areas, not recommended for larger areas • Flat mop head press will not accommodate string mops

		• Can be used on sealed tile as well as grouted tile • Rear-mounted pour spout is at standard toilet height providing the option to dump water into the toilet rather than lift into a sink • Locking lower drain spigot allows draining into floor drains • Microfiber pads provide more hygienic cleaning . • High-profile side press promotes upright posture when pressing and requires less force to wring mop • Adjustable handle length • Fits on a standard custodial cart • Color-coded options to reduce cross-contamination.	• Must select appropriate mop head for each floor surface • Less durable than Rubbermaid and Continental systems (bucket, wringer) • Dual bucket system requires an additional wring • Flat head microfiber mopping requires significant training and cultural shift • Dual bucket system requires more frequent water changes • Wringer design requires employee to hold the mop to position and avoid breakage • Bucket is difficult to control due to caster design
	Approximate cost	$ 150 (Mop and bucket)	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Kristie Elton kristie.elton@ucr.edu	
URL:	• http://ungerglobal.com/pro/admin/files/pl2011-chapter/unger-2011-3.pdf • http://ungerglobal.com/pro/us/images/stories/UNGER/download2010/SmartColor-Cleaning-BROCHURE.pdf		
Continental	Unibody Mopping System-35 quart	**PRO:** • No need to lift wringer off bucket • Bottom-mounted spigot reduces need to lift to empty. Threaded spigot empties directly into floor drain or can accommodate a hose for floor sink. • Wringer handle design improves hand position and requires less force to use • Non-marking casters	**CON:** • Requires floor drain to ensure no lifting of bucket to drain • Continental wringer not as durable as Rubbermaid.

		• Color-coded options to reduce cross-contamination	
	Approximate cost	$118-130	
	For more information	Ginnie Thomas gthomas@housing.ucsb.edu	
URL:	http://www.continentalcommercialproducts.com/prodcat.php?ID=1		
Rubbermaid	Microfiber Mopping System	**PRO:** • Removable microfiber pads eliminate wringer and need to lift mop bucket • Bottom-mounted spigot allows emptying bucket without lifting • Microfiber pads provide more hygienic cleaning • Lightweight adjustable aluminum frames and handles • Angled handle improve wrist position • Good for medical centers (removable microfiber pads and color-coded options reduce cross contamination)	**CON:** • Flat head microfiber mopping requires significant training and cultural shift • Micro-fiber mopping only • Good for small areas, limited use in corridors and larger areas • Hook-and-loop backing on pads can wear out over time and will need to be replaced • Not as durable as traditional mops
	Approximate cost	$125-150	
	For more information	Jill Evans-Grinbergs jill.evans-grinbergs@ucdmc.ucdavis.edu	
URL:	http://www.rubbermaidcommercial.com/rcp/products/subcategory.jsp?categoryCode=cleaning&subCategoryCode=cleaning_microfiber		

Risk Services Best Practices Bulletin
Bathroom Hand Cleaning

Presented by Office of the President Risk Services - May 13, 2011



Throughout the UC system, custodians are among the highest occupational groups at risk for injury. Their high frequency and severity of injury is due to the physical nature of their work that often involves awkward postures, repetition of motion, and forceful exertion.

The following Best Practices are offered to guide those responsible for supervising and/or ensuring the health and safety of these custodial workers.

Best Practices:

- No-touch cleaning systems can significantly reduce ergonomic risks and provide a higher level of cleaning.[1, 2] **Refer to Recommended Product Sheets** for specific model details.
- Applying a sealer to the tile and grout in the bathrooms 1-2 times per year reduces the effort involved in daily cleaning
- General equipment considerations:
  - Toilet brushes (Johnny mops) with angled brushes and longer handles reduce bending and awkward wrist postures when cleaning toilets. **Refer to Recommended Product Sheets** for specific model details.
  - Telescoping or adjustable handles minimize extended reaches and awkward postures when cleaning shower walls, mirrors, and bathroom walls
  - Attach the hose connector to shower head to help wash down shower walls when a no touch cleaning system is not available. **Refer to Recommended Product Sheets** for specific model details.
- The following design issues should be considered with regard to bathroom cleaning:
  - Showers fabricated with grouted tile require additional scrubbing and increase the risk of ergonomic injuries
  - There should be adequate and functional floor drains
  - Water and sustainability issues are very important to consider; however, certain types of low water, high-efficiency, dual flush toilets may require additional cleaning and

may be more difficult to clean than standard toilets. Install toilet systems that have a high Waste Removal Performance Measure (MaP[3]) rating to the amount of daily cleaning required. Consult http://www.bewaterwise.com/pdf_rebates_toilets_01.pdf or http://www.map-testing.com/about/maximum-performance/map-search.html to see ratings.

- Provide quick-connect hose fittings. The location should be easily accessible to minimize bending and twisting.
- Sanitary napkin disposal containers should be mounted to the stall wall to prevent rusting and reduce bending while cleaning
- Towel dispensers should be installed at the ADA height of 48 inches, reducing the required reach when filling
- Wall mounted trash receptacles with light-weight liners reduce required bending when cleaning the floor. This design is also easier to empty than free-standing trash barrels/receptacles. The tops of these trash receptacles should measure 36" from the floor to reduce reaching or lifting above shoulder height.
- Touchless faucets reduce the amount of cleaning required. However, recent studies have shown that water from these faucets has more bacteria than traditional faucets.[3] Touchless faucets are therefore not recommended in dining facilities or medical centers.
- Coordination between construction and facilities should exist to standardize dispensers

Equipment[4, 5]

Selecting the most appropriate equipment is an important decision. Prior to purchasing:

- Contact the campus ergonomist to help with the selection process
- Include custodial staff in the selection process
- Arrange for demonstration of product by manufacturer or distributor
- Refer to the Ergonomics Recommended Product Sheet for applications and recommendations
- Pilot the preferred equipment for a minimum two–week trial period

During the pilot period, consider the following:

- Adjustability, size and weight of equipment to accommodate wide range of body types
- Appropriate sized casters and swivel design to allow for easy rolling and maneuverability
- Size and type of surfaces to be cleaned
- Location of controls and ease of operation
- Noise and vibration levels
- Storage and transporting needs
- Equipment maintenance and replacement parts
- Battery life and charging time

- Need for back-up equipment

Training[4]

Initial training should be provided for new employees within the first 30 days and annually thereafter. Training is best provided in small groups with the involvement of supervisors, leads, ergonomists and vendors.

Training should include:

- Hands-on performance of job tasks and related activities
- Equipment use, maintenance, storage, safety procedures and use of personal protective equipment (PPE) as required
- Instruction on safe postures and body mechanics
- Verbal and/or written materials to accommodate non-English speaking workers

Work and Staffing Guidelines[4]

Work and staffing guidelines insure that employees are adequately trained and assigned reasonable workloads. Guidelines include:

- Staff levels that provide adequate coverage to complete assigned work tasks
- Staff levels to avoid overtime
- Backup staffing to accommodate unplanned absences
- Use of task and job rotation to limit repetition and fatigue
- Use of teams for heavy lifting and moving tasks
- Pre-shift exercises to warm up muscles to prepare for work
- Frequent rest breaks
- Implementation and support of a work hazard notification system to identify problems such as excessive weight in trash containers

References: (1) Kaivac, Inc., "Removing Soil: A Comparison of Cleaning Methods", *Cleaning & Maintenance Management Online*, Vol. 46, Issue 10, October 2009, Available at www.cmmonline.com (2) Goggins, R., "Hazards of Cleaning – Strategies for Reducing Exposures to Ergonomic Risk Factors", *Professional Safety*, March 2007, pp 23-24, www.asse.org (3) *"Latest Hands-Free Electronic Water Faucets Found To Be Hindrance, Not Help, In Hospital Infection Control",* Johns Hopkins Medicine online, available at www.hopkinsmedicine.org.
(4) Cal/OSHA Consultation Service, Department of Industrial Relations, *Working Safer and Easier for Janitors, Custodians, and Housekeepers,* 2005; (5) Hansen, Steve, "Understanding Ergonomics and How it Affects Your Cleaning Business", *Custodial Workers' Resource*. Available at http://custodian.info/ergonomics.html

Recommended Product Sheet

Bathroom Cleaning

No-Touch Cleaning Systems

	**Criteria:**	1. Automatic spray pump for chemical application and rinse water 2. Adjustable handle for tools 3. Wet Vacuum 4. Green Chemicals
	Application:	Bathroom cleaning

Make	Model	Comments (Pros and Cons)	
Kaivac	Cleaning System models 1250, 1750, and 2150 (Models include accessories)	**PRO:** • High powered sprayer to remove dirt (good for sealed surfaces) • Hepa wet/dry vacuum for areas without floor drains, can be used for standard vacuuming • Used with power cord for unlimited duration • Comes in 3 sizes for cleaning large and small areas • Comes with cleaning accessories • Detachable motor for ease of maintenance; can continue to use cleaning system with extra motor • Can be used with alternative cleaning chemicals	**CON:** • Sprayer may cause increased water on floor and walls and may cause water damage • Cord presents potential trip hazard and user must have access to power supply • Corded unit is louder compared to battery-operated units (68dB) • Additional accessories will incur additional costs
	Approximate cost	$2,000-3,500	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Cindy Burt burt@ehs.ucla.edu	
URL:	http://www.kaivac.com/m_1-Restroom_Cleaning		
Kaivac	Cleaning System (1215, 1715 and 2115) (Models do NOT include	**PRO:** • High powered sprayer to remove dirt (good for sealed surfaces)	**CON:** • Sprayer may cause increased water on floor and walls- can cause water damage

	accessories)	• HEPA wet/dry vacuum for areas without floor drains, can be used for standard vacuuming • Comes in 3 sizes for cleaning large and small areas • Has detachable motor for ease of maintenance and can continue to use unit with extra motor • Can be used with alternative cleaning chemicals • Used with power cord for unlimited duration	• Cord is a trip hazard and must user have access to power supply • Limited cleaning accessories (however this does reduce the cost)
	Approximate cost	$1,500-3,000	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Cindy Burt burt@ehs.ucla.edu	
URL:	http://www.kaivac.com/m_1-Restroom_Cleaning		
Hillyard	C3 Cleaning Companion	**PRO:** • Low powered sprayer for even chemical distribution to kill bacteria • 13 different chemical choices • Fits onto custodial cart • Wet/Dry vacuum is optional (it should be purchased if there are no floor drains). Cost is reduced without it. • Battery Powered, can be used w/o power supply, no trip hazard; 3 hour run time, 6 hour charge time, quieter than system with power cords (62 dB) • 7.5 gallon tank for smaller areas (residential halls)	**CON:** • Not enough power to remove dirt • Must be used with Hillyard chemicals • No HEPA option • Vacuum component is corded (trip hazard) • Not recommended for larger areas • The hose length is 15 feet so

			the unit cannot be left on the cart outside of the bathroom during use. A 12-ft hose extension can be purchased separately. Up to 2 hoses can be added for 39 feet of hose.
	Approximate cost	$800-1,200 $69.80 (12-ft hose extension)	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Cindy Burt burt@ehs.ucla.edu	
URL:	http://www.hillyard.com/Nav.asp?x=5		

Recommended Product Sheet

Bathroom Cleaning

Hand Tools

Criteria:	Adjustable, customizable or increased length handles
Application:	Bathroom Hand Cleaning

Make	Model	Comments (Pros and Cons)	
Unger	Ergo Toilet Brush	**PRO:** • Longer Handle (26'') to reduce bending • Larger handle to decrease grip pressure • Angled handle assists with cleaning under the rim • Interchangeable nylon heads to increase friction and decrease dry time. Standard swab head also available • Bottom of holder is easy to remove	**CON:** • Removable bottom can cause contents to spill
	Approximate cost	$20	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Kristie Elton kristie.elton@ucr.edu	
URL:	http://www.ungerglobal.com/pro/landing-us/index.php?site=13		
Parsons	Long handled toilet brush with cup	**PRO:** Longer Handle (30'') to reduce bending	

	Approximate cost	$12	
	For more information	Ginnie Thomas gthomas@housing.ucsb.edu Kristie Elton kristie.elton@ucr.edu	
URL:	http://www.parsonsadl.com/details.php?prod=199		
Smart Handle Pro	Scrub-All Tools	**PRO:** • Bent handle design promotes neutral wrist postures and safe body mechanics • Adjustable length to fit a variety of users • Foam grip to reduce grip pressure • Range of the length can be customized (by vendor or in-house) to fit small spaces	
	Approximate cost	$20 for the handle $40 for the handle and swivel scrub brush	
	For more information	Ginnie Thomas gthomas@housing.ucsb.edu Kristie Elton kristie.elton@ucr.edu	
URL:	http://smarthandlepro.com/scruballtools.htm		
Unger	Adjustable pole for various tool	**PRO:** • Two-section pole for lighter-weight adjustability • Multipurpose tip can fit various tools • Various models (extended length from 4' to 13')	**CON:** • Heavier than non-extension aluminum poles
	Approximate cost	$30-50	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Kristie Elton kristie.elton@ucr.edu	
URL:	http://www.ungercleaning.com/p-1397-unger-2-section-extension-poles.aspx		
Rinse Ace	Shower connector and quick-connect 6-foot hose system	**PRO:** • One-time installation, easy to install • Water-saving trigger system • Eliminates using small buckets to rinse down shower walls	**CON:** • Connector is difficult to reach for shorter employees when attached to a shower/tub combo

	Approximate cost	$20-25
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Kristie Elton kristie.elton@ucr.edu
URL:	http://www.rinseace.com/commercial-applications	

Risk Services Best Practices Bulletin
Vacuuming

Presented by Office of the President Risk Services: May 13, 2011



Throughout the UC system, custodians are among the highest occupational groups at-risk for injury. Their high frequency and severity of injury is due to the physical nature of their work that often involves awkward postures, repetition of motion, and forceful exertion.

The following Best Practices are offered to guide those responsible for supervising and/or ensuring the health and safety of these custodial workers.

Best Practices:

Many buildings may need a combination of vacuums to safely clean all areas. It is best to identify the most efficient and practical vacuum for each area to be cleaned. Establish and enforce a regular maintenance program for all vacuums.

UPRIGHT VACUUMS – are best used in hallways, offices, residence halls and small to medium spaces. The bag inside the vacuums should be replaced regularly and the unit maintained often to keep it in good condition. These types of vacuums should:

- Provide good suction
- Be adjustable to the height of carpet pile
- Be easy to maneuver
- Be easy to service and maintain – bags are easy to replace and serviceable parts are minimal and easily accessed
- The handle component should be lightweight

- Have a magnet in front to catch paper clips or other metal objects, which may damage the vacuum and/or increase maintenance and servicing (**Refer to Recommended Product Sheets)**

BACKPACK VACUUMS – should be used to clean hard to reach areas or where upright vacuums are not practical for use, such as: stairs, chandeliers, windowsills, etc… Use of backpack vacuums in large areas should be avoided as this is inefficient and creates excessive physical load to the worker. Lighter weight models represent a trade off: less weight for less power with smaller bags and less capacity. In general, backpack vacuums should:

- Be lightweight (12 pounds or less) and provide good suction
- Use wall-mounted, "mounting-stations" where possible to facilitate getting the vacuum on and off the user
- Hose length and attachments should be appropriate for specific uses to maximize efficiency (**Refer to Recommended Product Sheets)**

LARGE AREA VACUUMS – should be used in any large, carpeted area where accessibility and maneuverability is practical. Large area vacuums significantly increase productivity and efficiency and reduce physical load to the worker.

- Use in large areas where maneuverability is practical
- Must provide adequate storage area for this equipment (**Refer to Recommended Product Sheets)**

Equipment[1, 2]

Selecting the most appropriate equipment is an important decision. Prior to purchasing:

- Contact the campus ergonomist to help with the selection process
- Include custodial staff in the selection process
- Arrange for demonstration of product by manufacturer or distributor
- Refer to the Ergonomics Recommended Product Sheet for applications and recommendations
- Pilot the preferred equipment for a minimum two–week trial period

During the pilot period, consider the following:

- Adjustability, size and weight of equipment to accommodate wide range of body types
- Appropriate sized casters and swivel design to allow for easy rolling and maneuverability
- Size and type of surfaces to be cleaned
- Location of controls and ease of operation
- Noise and vibration levels

- Storage and transporting needs
- Equipment maintenance and replacement parts
- Battery life and charging time
- Need for back-up equipment

Training[1]

Initial training should be provided for new employees within the first 30 days and annually thereafter. Training is best provided in small groups with the involvement of supervisors, leads, ergonomists and vendors.

Training should include:

- Hands-on performance of job tasks and related activities
- Equipment use, maintenance, storage, safety procedures and use of personal protective equipment (PPE) as required
- Instruction on safe postures and body mechanics
- Verbal and/or written materials to accommodate non-English speaking workers

Work and Staffing Guidelines[1]

Work and staffing guidelines insure that employees are adequately trained and assigned reasonable workloads. Guidelines include:

- Staff levels that provide adequate coverage to complete assigned work tasks
- Staff levels to avoid overtime
- Backup staffing to accommodate unplanned absences
- Use of task and job rotation to limit repetition and fatigue
- Use of teams for heavy lifting and moving tasks
- Pre-shift exercises to warm up muscles to prepare for work
- Frequent rest breaks
- Implementation and support of a work hazard notification system to identify problems such as excessive weight in trash containers

References: (1) Cal/OSHA Consultation Service, Department of Industrial Relations, *Working Safer and Easier for Janitors, Custodians, and Housekeepers,* 2005; (2) Hansen, Steve, "Understanding Ergonomics and How it Affects Your Cleaning Business," *Custodial Workers' Resource*. Available at http://custodian.info/ergonomics.html

Recommended Product Sheet

Vacuuming

Backpack Vacuums

Criteria:	• Lightweight • Easy to maneuver • Powerful suction
Application:	Use in hard to reach places such as staircases, nooks and crannies, chandeliers, bookcases etc…not for use in large areas

Make	Model	Comments (Pros and Cons)	
Pro-Team	Super Coach Backpack **10 quart capacity**	**PRO:** • Portable and lightweight (11 lbs); easy to maneuver and allows for overhead reach • Durable with low maintenance • Available accessory includes a wall-mounted, "mounting station" to facilitate getting the backpack on and off the user • Recommend an adjustable wand • Training required to learn how to put the backpack on and off, adjust for fit and move the wand	**CON:** • Although this is a lightweight backpack vacuum, the weight may be fatiguing for some employees
	Approximate cost	$350-400	
	For more information	**North:** Kitty Woldow kittyw@ucsc.edu **South:** Clyde Blackwelder cblackwe@uci.edu	
URL:	http://www.pro-team.com/pt/vacuums/default.aspx?style=1&id=100182		
Pro-Team	Super QuarterVac Backpack – **6 quart capacity**	**PRO:** • Lighter weight than the Super Coach Backpack • Portable and lightweight; easy to maneuver and allows for overhead reach • Durable with low maintenance • Available accessory includes a wall-mounted, "mounting station" to facilitate getting the backpack on and off the user • Recommend an adjustable wand	**CON:** • Although this is a lighter weight backpack vacuum, the weight may be fatiguing for some employees • Potentially less suction than the 10 quart model

		• Training required to learn how to take the backpack on and off, adjust for fit and move the wand	
	Approximate cost	$300	
	For more information	**North:** Kitty Woldow kittyw@ucsc.edu **South:** Clyde Blackwelder cblackwe@uci.edu	
URL:	http://www.pro-team.com/pt/vacuums/default.aspx?style=1&id=106070		

Recommended Product Sheet

Vacuuming

Large Area Vacuums

	**Criteria:**	• Designed for large carpeted areas • Controls are easily accessible • Built in hose and wand • Easy access to change or empty filter/collector bags
	Application:	Large Area Vacuuming

Make	**Model**	**Comments** (Pros and Cons)	
Advance	Carpetriever	**PRO:** • Easy to use • Covers a lot of space (efficient for larger areas) • Easy to maneuver • Low maintenance	**CON:** • Large and heavy; difficult to store (takes up a lot of space)
	Approximate cost	$1500 - 2500	
	For more information	**North:** Kitty Woldow kittyw@ucsc.edu **South:** Clyde Blackwelder cblackwe@uci.edu	
URL:	http://www.advance-us.com/products/vacuums/carpetriever/carpetriever.aspx		

Recommended Product Sheet

Vacuuming

Upright Vacuums

Criteria:	• Auto adjust for any surface • High performance motor • Onboard tools • High efficiency filtration • Easy to change filter bag
Application:	Upright Vacuuming

Make	**Model**	**Comments** (Pros and Cons)	
Windsor and Javelin	Sensor and Javelin Uprights (same vacuum but under different names)	**PRO:** • Lightweight and easy to maneuver • Powerful with good suction • Good maintenance record • Easy to change filter bags • Easy to change out frayed cord by removing handle	**CON:** • $150 charge to replace handle and cord
	Approximate cost	$465	
	For more information	**North:** Kitty Woldow kittyw@ucsc.edu **South:** Clyde Blackwelder cblackwe@uci.edu	
URL:	http://www.homeprovacuum.com/index.php?l=product_detail&p=87 - Windsor http://www.unisourcedirect.com/Javelin-12X-Upright-Vacuums - Javelin		

Risk Services Best Practices Bulletin
Furniture Moving

Presented by Office of the President Risk Services – May 13, 2011

Throughout the UC system, custodians are among the highest occupational groups at-risk for injury. Their high frequency and severity of injury is due to the physical nature of their work that often involves awkward postures, repetition of motion, and forceful exertion.

The following Best Practices are offered to guide those responsible for supervising and/or ensuring the health and safety of these custodial workers.

Best Practices: Moving and lifting heavy furniture represents a significant risk. Team lift policies should be established and proper moving equipment should be provided. The setting-up and tearing-down of furniture to accommodate various events demands frequent moving of furniture specifically designed for this use. This type of furniture should be lightweight, easy to move, easy to stack and store.

GENERAL FURNITURE MOVING

For general furniture moving, a variety of moving assists should be available. Consider usage of any and all of the options listed below:

- Strap-dollies, flat-bed dollies, gliders or carts
- Use appropriate moving equipment for the furniture involved; consider weight capacity, size of the load, straps to stabilize the load, lockable casters on the carts etc.
- For heavy furniture that needs to be moved, consider permanently installing casters or gliders to make it easier to maneuver the furniture
- Use mechanical assists and team-lifts with heavy, extra large or awkward loads

MOVING OF FURNITURE FOR EVENT SET-UP

Furniture in use for this purpose should be:

- Lightweight
- Easily and efficiently stackable
- It is best if furniture is accompanied by wheeled storage carts specifically designed for this use, for easy transport and efficient storage (**Refer to Recommended Product Sheets)**
- When event set-up demands moving heavy loads, greater than 50 lbs, "team lift" procedures should be standard policy

Equipment[1, 2]

Selecting the most appropriate equipment is an important decision. Prior to purchasing:

- Contact the campus ergonomist to help with the selection process
- Include custodial staff in the selection process
- Arrange for demonstration of product by manufacturer or distributor
- Refer to the Ergonomics Recommended Product Sheet for applications and recommendations
- Pilot the preferred equipment for a minimum two–week trial period

During the pilot period, consider the following:

- Adjustability, size and weight of equipment to accommodate wide range of body types
- Appropriate sized casters and swivel design to allow for easy rolling and maneuverability
- Size and type of surfaces to be cleaned
- Location of controls and ease of operation
- Noise and vibration levels
- Storage and transporting needs
- Equipment maintenance and replacement parts
- Battery life and charging time
- Need for back-up equipment

Training[1]

Initial training should be provided for new employees within the first 30 days and annually thereafter. Training is best provided in small groups with the involvement of supervisors, leads, ergonomists and vendors.

Training should include:

- Hands-on performance of job tasks and related activities

- Equipment use, maintenance, storage, safety procedures and use of personal protective equipment (PPE) as required
- Instruction on safe postures and body mechanics
- Verbal and/or written materials to accommodate non-English speaking workers

Work and Staffing Guidelines[1]

Work and staffing guidelines insure that employees are adequately trained and assigned reasonable workloads. Guidelines include:

- Staff levels that provide adequate coverage to complete assigned work tasks
- Staff levels to avoid overtime
- Backup staffing to accommodate unplanned absences
- Use of task and job rotation to limit repetition and fatigue
- Use of teams for heavy lifting and moving tasks
- Pre-shift exercises to warm up muscles to prepare for work
- Frequent rest breaks
- Implementation and support of a work hazard notification system to identify problems such as excessive weight in trash containers

References: (1) Cal/OSHA Consultation Service, Department of Industrial Relations, *Working Safer and Easier for Janitors, Custodians, and Housekeepers*, 2005; (2) Hansen, Steve, "Understanding Ergonomics and How it Affects Your Cleaning Business," *Custodial Workers' Resource*. Available at http://custodian.info/ergonomics.html

Recommended Product Sheet

Furniture Moving

Lightweight Tables & Chairs

Criteria:	• Lightweight • Easy to break down, transport and set-up • Stackable
Application:	Event Furniture Set-up

Make	Model	Comments (Pros and Cons)	
Mity Lite	Lightweight Tables	**PRO:** • Lightweight and easy to stack • Sturdy • Recommend only half-tree or single stackable carts • Recommend lockable casters on carts to help secure on slopes	**CON:** • Not aesthetically pleasing; best used with table cloths
	Approximate cost	Varies by model. Refer to Mity Lite website (see below)	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Clyde Blackwelder cblackwe@uci.edu	
URL:	http://www.mitylite.com/folding-tables.html		
Mity Lite	Lightweight Chairs	**PRO:** • Lightweight • Easy to stack • Sturdy (rated to support over 1000 lbs)	
	Approximate cost	Varies by model. Refer to Mity Lite website (see below)	
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Clyde Blackwelder cblackwe@uci.edu	
URL:	http://www.mitylite.com/chairs.html		
Mity Lite	Carts	**PRO:** • Carts provide efficient portability of furniture	CON: • Recommend not stacking chairs above 48 inches

	Approximate cost	Varies by model. Refer to Mity Lite website (see below)
	For more information	**North:** Greg Ryan gryan@uhs.berkeley.edu **South:** Clyde Blackwelder cblackwe@uci.edu
URL:	http://www.mitylite.com/carts.html	

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Custodial Ergonomic Design Guidelines
For New Construction and Existing Buildings

***1. General*:**

- There shall be accessible service elevators in every building large enough for custodial equipment, such as trash carts, floor scrubbers and large no-touch cleaning systems
- There shall be sufficient dedicated storage space for custodial equipment, such as floor scrubbers and large cleaning systems. Consult with custodial management to determine specific space requirements.
- There shall be a minimum of one dedicated custodial closet on each floor[1]
    - Shall be a minimum of 100 square feet (10' x 10')
    - Door shall swing into corridor to maximize useable space
    - Elevator controls, electrical panels, telephone equipment, etc., shall NOT be located in custodial closet[2]
- Each custodial closet shall have one floor drain sufficient in size for dumping 5-gallon buckets of liquid
- There shall be dedicated space for tools to be hung on the wall
- Each custodial closet and storage space shall have a floor sink with a 12- or 13-inch wide drop front[3]

2. Indoor/Outdoor Trash/Recycle/Linen Enclosures:

- There shall be trash and recycle chutes to the bottom level from each floor in high rise buildings
- The door to the collection room shall be large enough to accommodate collection equipment and accessible to the road to allow for automated collection
- Mechanically-assisted or automated systems which eliminate the need for manual lifting, pushing, and pulling are preferred
- The height of trash bin access shall not exceed 36 inches[4-6]
    - Provide loading dock with bins at or below the height of the dock. If there is a guard rail around the dock, a section should be removable for access.
    - Design a platform in the enclosure such that the distance from the top of the platform to the top lip of the bin is not greater than 36 inches for all bins in the enclosure. This platform shall allow access to all bins at all times without the need to move bins.
    - If this is not possible, provide dumpster bins that have been modified so the front height is no more than 36 inches[7]
- The distance from the service elevator to the indoor enclosure shall be a maximum linear distance of 50 feet within the building. The path from the service elevator to the indoor enclosure shall be within the

building. No impediments shall exist in this path of travel. Impediments include: stairs, textured surfaces, bumps, drains, slopes/grades greater than 2%.[4]

- Outside Lighting[4]
    - Provide adequate night lighting in and around the enclosure and to the pathway from the building to the enclosure.

3. Bathroom Cleaning and Mopping/Floor Care

- Water and sustainability issues are very important to consider; however, certain types of low water, high-efficiency, dual flush toilets may require additional cleaning and may be more difficult to clean than standard toilets. Install toilet systems that have a high Waste Removal Performance Measure (MaP[3]) rating to the amount of daily cleaning required. To see ratings, consult http://www.bewaterwise.com/pdf_rebates_toilets_01.pdf or http://www.map-testing.com/about/maximum-performance/map-search.html
- Provide a designated area for commercial washer and dryer (30 – 50 lb) to clean shower curtains, mop heads, rags, etc. Provide a concrete raised pad 5' x 5' with proper utility hook ups, drains and vents.
- Hard water issues shall be addressed in the design process. Reducing water hardness results in less mineral buildup, thus less physical force to clean. Where water is considered "hard," avoid installing grouted tile on shower walls.
- Select paint with higher sheen because it is easier to clean and maintain
- In the residence hall private bathrooms, install non-glass shower doors rather than shower curtains
- Ensure that materials used for walls and sub-floors support the moisture of no-touch cleaning systems. Provide water proof, seamless, non-grout, epoxy flooring where appropriate.
- Design plumbing to support wall-mount toilets instead of floor-mount toilets
- Bathroom electrical outlets shall be easily accessible for regular cleaning and maintenance
- For bathrooms with multiple sinks along a counter top, install under-mount sinks, which are easier to clean and have less water build-up around the perimeter

References: (1) Northern Arizona University, "Division 13: Special Construction," *Technical* Standards, pp. 2, 7/2010, https://www4.nau.edu/cas/Plan-Dev/Documents/TechStandards/Division13.pdf (2) NC State University Construction Guidelines, http://www.ncsu.edu/facilities/con_guidelines/index.htm
(3) Cal/OSHA Consultation Service, Department of Industrial Relations, *Working Safer and Easier for Janitors, Custodians, and Housekeepers,* pg. 25, 2005; (4) "UC Berkeley Indoor/Outdoor Enclosure Design Criteria," September 2010. Contact mlynch@uhs.berkeley.edu, (5) Porter, B., "Ergonomic Interventions to Reduce Risk Exposure for Lift Induced Occupational Shoulder Impingement and Rotator Cuff Tears," Dissertation, 2009, contact bfporter@ucdavis.edu, (6) Eastman Kodak Company, "Ergonomic Design for People at Work," Vol. 2, pp. 448-52, 1986; (7) Consolidated Fabricators Corporation 901 Simmerhorn Rd, Galt, Ca 95632

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Ergonomic Pilot Project Application

Custodians, Housekeepers and Environmental Service Workers

UCOP Risk Services would like your help in reducing the ergonomic risk factors and risk of injury for:

- Trash, recycle, and linen handling
- Vacuuming
- Moving and lifting furniture
- Mopping
- Bathroom cleaning

As the ergonomist, you can help reduce the risk of injury by working directly with this group of workers and applying for a grant from UCOP. Please email completed applications directly to Erike Young, Director of Environmental Health and Safety. There is a $5,000 limit per location. You should establish a trial period for your pilot and be prepared to have the employee participants fill out a survey tool (provided) to help establish the effectiveness of the product(s) you select.

Date:	
To:	Erike Young, Director of Environmental Health and Safety UC Office of the President Erike.Young@ucop.edu

APPLICANT INFORMATION	
University Location:	
Ergonomist Name:	
Address:	
Phone Number:	
E-mail Address:	

PILOT PROJECT	
Identify which at-risk task you wish to address (see list above):	
Name of the department piloting this project:	
Provide a brief history of ergonomic interventions for this task at your location:	
What recommended product would you like to test? (Please select from the Recommended Product Sheets):	
Approximate Cost of product(s):	
Quantity:	

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Ergonomic Equipment Satisfaction Survey

Your feedback is important to us. Please take a few moments to complete this form and return it to your supervisor.

Date: _____ Department: _____

Name of equipment being evaluated: _____

Using the scale: 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent

1. How would you rate your overall satisfaction with this equipment? 1 2 3 4 5
2. How well did the training prepare you to use this equipment? 1 2 3 4 5
3. To what extent will this equipment make it easier to do your job? 1 2 3 4 5

4. Please list the specific work activities where you used this equipment:

5. If your department purchased this equipment would you use it? **YES** **NO**

   If yes, how often would you use it?
   ☐ Daily ☐ Frequently ☐ Seldom

6. Please indicate the features you liked on this equipment:

7. Please indicate the features that need improvement on this equipment:

8. Additional comments: