

Environmental Health and Safety 9th Annual Report 2006

Environmental Health & Safety Office
www.dal.ca/safety

MARCH 2007



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1 INTRODUCTION

1.1 Environmental Health and Safety Office

The Dalhousie Safety Office operates to:

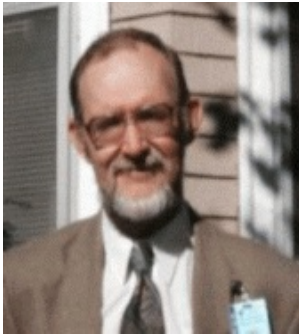
- Offer advice to the University's Senior Management on ways in which the University can strengthen its efforts to provide a healthy and safe environment in support of the entire range of University activities.
- Support the activities of the Dalhousie Environmental Health and Safety Committee.
- Support the Deans, Directors and Chairs of Departments as they discharge their responsibilities for health and safety within their units.
- Liaise with regulatory agencies and other organizations to keep the University informed of developments that could impact Dalhousie's Environmental Health and Safety Program.
- Ensure that inspections, testing and training are carried-out as needed to ensure that the University is operating in accord with legislation.
- In accord with regulations, coordinate the disposal of hazardous waste created by teaching and research programs and by the University's operations.

In January 2006, the Safety Office welcomed a fourth member. Mr. Stephen Ellis joined the Office as a Health and Safety Officer. Mr. Ellis brought with him a background in safety and first aid training and fire safety, having served as a volunteer fireman with Halifax Fire and Emergency Services for three years. Mr. Ellis has assumed responsibility for much of the University's fire safety program as well as implementing a very successful CPR program.

Long term members of the Department include Ms. Pauline Jones who deals with radiation safety, and increasingly with related issues such as biosafety. Ms. Jan Taylor McIntyre, the Office Administrator, and Dr. William Louch, the Director.

The Office shares space with several other offices in one of the "University houses" at 1391 Seymour Street.

In carrying out its work, the Safety Office is assisted by a network of individuals in virtually every Department across all three campus who serve as first aiders, fire wardens, safety committee members, and laboratory safety coordinators.



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2 HIGHLIGHTS OF 2006

2.1 Staffing

Early in 2006, the Safety Office successfully recruited a new member bringing to 4, the staff complement. The newly recruited Health and Safety Officer has already made a substantial contribution to fire safety and health training.

2.2 Involvement with University-wide Programs

Although Safety Office programs often involve staff in co-operative efforts, 2006 was remarkable in this regard. The Safety Office was represented on ad hoc committees which developed a draft International Travel Policy, provided advice on the preparation of an Influenza Pandemic Response Plan, and prepared for a possible Norwalk virus epidemic. The Safety Office is included among the units which has begun what will likely be a multi-year project to decommission the University's Slowpoke Reactor. The Safety Office is also represented on the committee providing over-sight on the project to build an addition on the Chemistry Building, and the renovation of the former Management Building.

The Safety Office contributed to Senate's review of the Faculty of Engineering and the Canadian Council on Animal Care's review of the University experimental animal programs. Working with staff from Facilities Management and Earth Sciences, the Safety Office also contributed ergonomic input to the design to a new geographical information systems laboratory which opened in late 2006. The laboratory is already seeing heavy use by undergraduate students.

2.3 Health and Safety Committee Initiatives

The Environmental Health and Safety Committee recognized the hundreds of individuals who volunteer as fire wardens in dozens of buildings across all three Dalhousie campuses by naming the fire wardens as recipients of the 2006 Environmental Health and Safety Committee Award. At the Committee's suggestion, the official presentation was coupled with the fire safety training event that was very well received by the attending wardens.

The Committee also took the major step of updating the institution's Health and Safety Policy as well as the Committee's terms of reference. The work updates a policy which has been little changed since 1988 and the update more closely aligns the University policy with the Province's legislation.

3 PROGRAM ADMINISTRATION

3.1 Environmental Health and Safety Committee

Throughout 2006, the Dalhousie Environmental Health and Safety Committee continued to operate as a forum for discussion of health and safety policy and procedural matters. The Committee also plays an important role in assisting in the development and updating of programs offered by the Safety Office.

Although the Committee responds to the requirements of Nova Scotia's Occupational Health and Safety Act, it was actually created in 1980, some years before Nova Scotia law required organizations to establish such committees.

Committee membership for the year is shown below:

Chair Person

2005 – 2006	A. Weeden
2006 – 2007	Z. Hildebrant
	M. Yorke - Deputy Chair

2006-2007 ENVIRONMENTAL HEALTH & SAFETY COMMITTEE MEMBERSHIP			
<u>Employee and Student Group Appointees</u>			
Heather Ann Walker	DUAG	Anatomy & Neurobio.	Heather.Ann.Walker@dal.ca
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Zita Hildebrandt	NSGEU	Learning & Teaching	ZHildebr@dal.ca
<u>University Appointees</u>			
Greg McNutt		Medicine	Greg.McNutt@dal.ca
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Mateo Yorke		Housing & Conference Svs.	Mateo.Yorke@dal.ca
Patrick McGrath		Athletics & Recreational Svs.	Pat.McGrath@dal.ca
Paul Amyotte		Chemical Engineering	Paul.Amyotte@dal.ca
Ruth Murray		Faculty of Engineering	Ruth.Murray@dal.ca
<u>Ex-officio Members</u>			
William J. Louch		Director	William.Louch@dal.ca
Jan Taylor McIntyre		Recording Secretary	Jan.Taylor.McIntyre@dal.ca

3.2 Committee Activities

During the year, the Committee took an active role in reviewing and providing comment on the University's response to an outbreak of mumps among students and the University's influenza immunization efforts. The Committee selected University Fire Wardens as recipients of the 2006 Annual Award and assisted in the preparation for the first annual Fire Warden's Day, and

participated in the re-launch of the University's indoor air quality initiative. The Committee also reviewed the results of monitoring programs and equipment audits and maintained communications with local safety committees across the University.

But perhaps the Committee's most significant contribution was a redrafting of the University's Health and Safety Policy. The Nova Scotia Health and Safety Act requires that joint health and safety committees annually review their organizations' health and safety policies. During the 2006 review, the Committee concluded that the University's policy was in need of updating. Over a series of meetings, the Committee reviewed drafts prepared by the staff, eventually agreeing on a revised policy statement, a set of guiding principals and description of roles and responsibilities, and in doing so, created a document which the Committee hopes will support continued development of the University's program.

With the agreement of Dr. Traves, the new policy was formally adopted in April 2006. Appendix 1 presents the new policy.

3.3 Local Safety Committees

In response to the University Policy which encourages Deans, Directors and Departmental Chairs to engage staff and faculty in safety matters, 17 local safety committees operate on a faculty, departmental, building or functional level.

To the extent possible, the Safety Office Director attends meetings of these committees.

3.4 Communications

During 2006, the Safety Office continued to expand its website: www.dal.ca/safety. The site has become both the Environmental Health and Safety Committee and Safety Office's most important means of communicating with the University and the broader community.

The site is heavily used both by members of the University and outsiders interested in health, safety and environmental protection. A tracking program, managed by University Computing and Information Services, reports that almost 70,500 users visited the Safety Office website during 2006. Visitors viewed about 166,000 pages. Among the most popular where pages dealing with the University's smoking, scent and radiation safety programs, and information on trades and custodial safety.

Again, during 2006, the Safety Office authorized a number of organizations, including other universities and colleges, hospitals and schools, to reproduce materials from the website. Among the materials duplicated were our scent pages, our Fire Warden's Handbook and the newly updated Asbestos Management Plan.

4 SAFETY AND ACCIDENT PREVENTION

4.1 Accident Reporting

Dalhousie policy requires staff, faculty and students to report work or study related accidents and injuries. Such reporting is an important component of the University's Safety Program in that these reports provide a means to:

- document the incident,
- ensure that the accident victim receives appropriate care, and
- initiate a review which aims to prevent similar accidents.

When accidents occur, those involved are required to report the accident to their supervisors. In turn, the supervisors direct those involved in the incident to complete the section on the Accident/Incident form which describes the sequence of events that led to the accident and the nature of the injuries. The supervisor then completes the section of the form describing the steps which the supervisor believes are necessary to prevent similar accidents. Copies of the report are provided to the:

- individual involved in the accident,
- local safety committee (acting on behalf of the Dean, Director or Chair),
- supervisor, and
- Director of Environmental Health and Safety.

When the accident is serious, the Director of Environmental Health and Safety, in cooperation with the Dalhousie Environmental Health and Safety Committee, conducts a formal accident investigation.

4.2 2006 Accident Experience

As **Figure I** shows, employees suffered 237 accidental injuries during 2006. The number of injury producing accidents has remained relatively stable over the past 5 years.



Figure I

Table I breaks down the distribution of staff and faculty reporting injuries.

Table I

2006 ACCIDENTAL INJURIES BY EMPLOYEE GROUP	
Employee Group	Number of Accidental Injuries
Faculty	3
Trades	54
Custodial	126
Mail, Grounds and Trucking	10
Security Services	11
Other Staff	33
Total Employees	237

As is always the case, the largest fraction of accidental injuries is reported by employees of Facilities Management. Included amongst these employees are the trades persons -plumbers, electricians, the custodians, and grounds keepers and the security officers. Other universities across the country report similar accidental injury patterns.

Although all accidents are of concern, clearly some are more serious than others. One measure of accident severity is time lost from work. The Dalhousie Safety Office counts as a lost time accident, one which prevents the injured person from returning to work on the next scheduled work day. During 2006, 46 accidents caused injuries serious enough to keep staff from reporting to work on their next scheduled work day. **Figure II** shows that the 2006 experience was much improved over the 2005 experience and much more in line with the experience of the last five years.

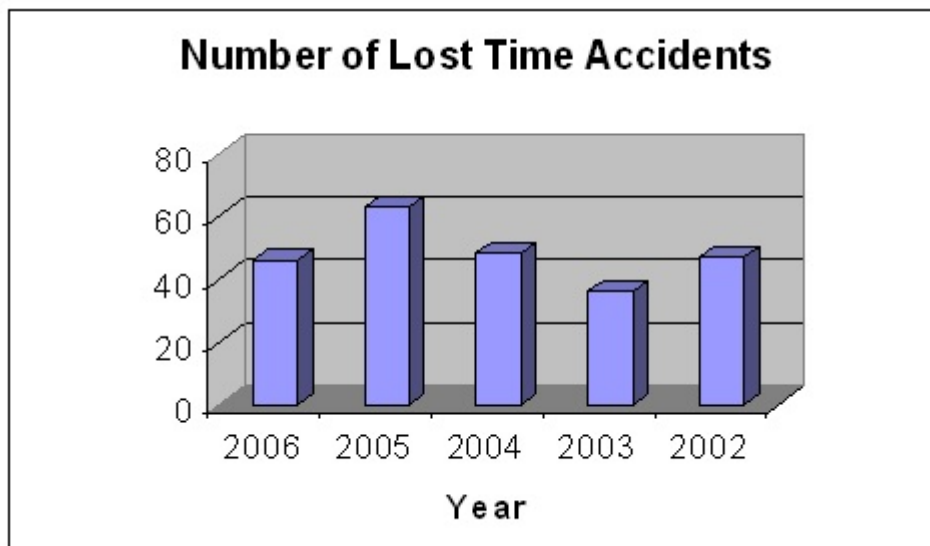


Figure II

The picture also improves when we look at accident severity as measured by the number of days lost. In total, the 46 time loss accidents recorded during 2006 resulted in 454 lost work days. Although still considerable, this total represents a dramatic improvement over the 945 work days lost as a consequence of 2005 accidents.

Workplace accidents can have lasting impact on both the victim and the employer. During 2006, Dalhousie trades, custodial and grounds staff recorded an additional 397 lost days as a result of accidents which occurred in past years. Some of these days thus arose as a consequence of accidents which occurred in late 2005. But others were caused by recurring difficulties arising from older accidents - in one case dating back as far as 1999. Adding the lost from previous year accidents, raises the total 2006 lost day count to 851. While still far from desirable, the 2006 lost day total is well below the total 1001 days lost in 2005.

As **Figure III** shows, the 2006 lost work day total is much more in line with the experience of the last five years.

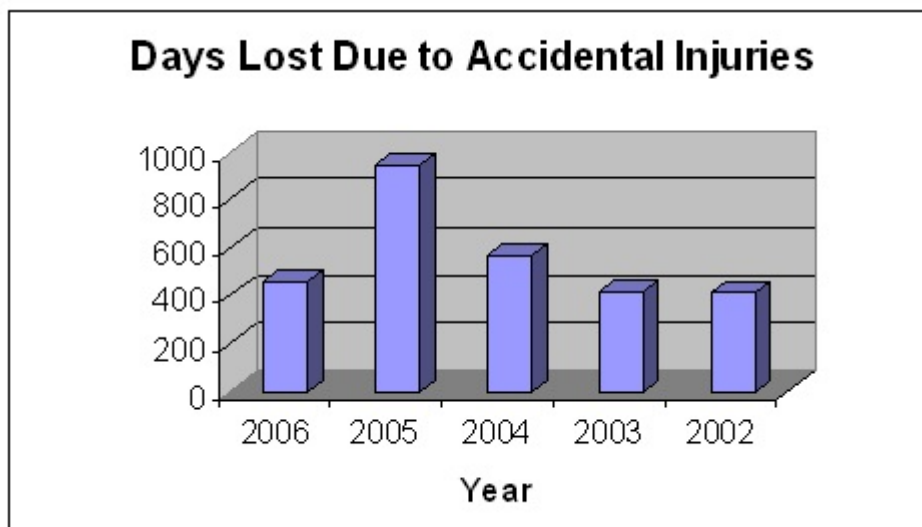


Figure III

As **Table II** shows by far the majority of those involved in lost time accidents are trades and custodial workers and grounds keepers in Facilities Management.

Table II

Distribution of Lost Time Accidents Among Employee Groups

	NUMBER OF TIME LOSS ACCIDENTS	DAYS LOST
Trades	13	125
Custodians	23	286
Mail, Grounds and Trucking	4	13
Other Staff	6	25
Faculty	1	15
Total	47	454

As is usually the case, a small number of accidental injuries accounted for the bulk of the loss time. In early 2006, while trying to stop a stack of examination tables from falling over, a custodian suffered a shoulder injury which caused a loss of 101 work days. The three most serious accidents together accounted for a time loss of 243 days or 53% of the 2006 days lost as a result of workplace accidents.

The 2006 improvement in lost time experience is probably due to several factors. The number of custodial lost time accidents was more than a third lower than recorded in 2005. And in 2006, custodians recorded only about 1/3 of the total days they lost due to workplace accidents in 2005.

Table III shows that although the losses were reduced during 2006, the types of accidents which cause time loss were the same as in past years. As the data shows, over-exertion, falls (including falls from a height as well as falls on the level) and striking something or being struck by something, were the causes of loss time accidents.

Table III

	Over-Exertion	Falls	Struck/Being Struck
Number of Accidents	24	14	8
Total Days Lost	366	68	21

The data presented in **Table III** sheds some additional light factors behind the 2006 improvement. Although fewer days were lost in each category, the most dramatic reduction in the number of days lost as a consequence of falls and a less dramatic, but still significant, reduction in the toll taken by over-exertion injuries.

During 2006, falls which occurred on wet or icy floors, stairs or sidewalks, were relatively infrequent. Our experience is that, on average, falls which occur on slippery surfaces, lead to absences which are twice as long as absences caused by slips and trips on dry surfaces. So dryer weather, along with efforts by Custodial Services to keep floors drier and to work more carefully around wet floors, were likely both factors in the improvement.

Accidents and injuries involve not only staff. Faculty, students, contractors and visitors, are also occasionally injured. Further, the Safety Office receives reports of other campus events, some of which relate to injuries.

Figure IV shows that the Safety Office received a total of 354 such reports during 2006, generally in-line with the experience of recent years.



Figure IV

Included among these reports were:

-	Accidents causing injuries to staff and faculty	237
-	Other work or study accidents (1)	42
-	Sport accidents involving:	
	faculty	1
	students	15
	visitors	15
-	Medical emergencies	17
-	Incidents (2)	27

(1) *Other work or study accidents include:*

- *cuts and punctures suffered by students in laboratory or clinic programs, and*
- *other miscellaneous injuries suffered by students in the course of attending classes or working on campus.*

(2) *Incidents included fires and chemical spills and several indoor air quality episodes.*

5 FIRE SAFETY

5.1 The Fire Safety Program

During 2006, Dalhousie continued to operate the aggressive fire safety program which has been developed over the years. The University makes ongoing efforts to install and maintain detection, suppression and alarm systems, and to upgrade equipment and facilities to keep pace with changes in the National Building and Fire Codes of Canada. During the year, the Safety Office continued to work with fire warden teams across the University. These fire warden teams are a cornerstone of our program and serve each of the University's major buildings. As described elsewhere, the University Environmental Health and Safety Committee recognized the contributions made to campus safety by fire wardens by recognizing them collectively with the 2006 Health and Safety Award.

To ensure that both wardens and building occupants are familiar with the building's emergency evacuation plan, evacuation drills are conducted annually. In most cases, the drill is conducted during the first few weeks of the Fall term. The evacuation systems are now so well established that we are able to evacuate most Dalhousie buildings in less than 5 minutes.

Working with Facilities Management and building fire wardens, the Safety Office has begun to upgrade the emergency evacuation information which the Fire Code requires to be posted in major buildings. During 2006, updated signs were placed in about a third of Dalhousie buildings. We plan to complete the work early in 2007.

To meet the requirements of Nova Scotia's new Fire Safety Act the Safety Office has begun to prepare formal fire safety plans for each building. We began by preparing plans for the University's student residences and the Sir Charles Tupper Medical Building. Although it is an ambitious goal, we hope to prepare a plan for each of the University's major buildings during 2007.

5.2 The 2006 Fire Experience

Dalhousie's 2006 fire experience was again exceptional. During the year, only four fires were recorded. As the table shows, the 2006 experience is the best in at least a decade. None of the 2006 fires caused any injuries and fire damage was negligible.

5.2.1 Indoor Fires

Two of the four 2006 fires broke out within Dalhousie buildings. Both occurred in electrical panels, one in the Computer Sciences and the second in Shirreff hall.

An electrical fault in the Computer Science Building created a small amount of smoke which attracted the attention of a staff member who initiated an alarm. The evacuation and response by the Fire Department were uneventful. Supervised by the fire crew, repairs were made by a Dalhousie electrician.

During the fall a fire broke out in an electrical panel in the electrical vault in Shirreff Hall. The smoke detector activated the alarm. Residents and staff evacuated without incident. The responding fire crew experienced some difficulty in de-energizing the circuit. Once the electricity was disconnected, the Fire crew were easily able to deal with the fire. In the days that followed the fire, staff from the Safety Office, Facilities Management and Housing, met with representatives of the Fire department to resolve the access difficulties. As a further follow up, Dalhousie staff and a fire prevention officer have begun to conduct detailed inspections of each of the University's residences.

5.2.2 Outdoor Fires

Two outdoor fires occurred in 2006. The first was simply a fire in a mulched flower bed outside of the Killam Library. Security and grounds keeping staff responded and easily doused the fire with water. The cause was almost certainly a carelessly discarded cigarette.

The second outdoor fire was potentially more serious. A contractor was using a torch to heat tar and roofing as part of the roof renewal project on one wing of the Chemistry Building. It was not

clear whether the work ignited some roofing materials or whether smoke and fumes from the work were simply drawn into the building. Upon entering a laboratory, a researcher noticed the fumes and initiated the alarm. The building was evacuated and the fire department responded. The responding fire crew determined that the problem was confined to the immediate area of the roofing work. They then supervised the removal of materials to ensure that underlying materials were not smouldering. Building occupants were permitted to return to the building within an hour or so and the roofing contractor returned to complete the job.

Year	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
# of Fires	4	6	5	11	5	7	8	10	7	12

5.3 2006 Fire Safety Upgrades

2006 was another productive year in facility fire safety. Kitchen range fire suppression systems were replaced in Howe and Shirreff Halls and the University Club. These upgrades address changing standards and fire suppression technologies as well changes in food preparation practices.

The final stages of a three year project to update the fire alarm system in the Life Sciences complex was also completed. The 450,000 square foot complex now has a completely renewed, state of the art, fire alarm system. Finally, work has begun on the installation of a modern fire alarm system in the Dunn Building. This project is slated for completion early in 2007.

Smaller projects involving such things as improving emergency lighting, improving fire separations and adding detection capacity in ventilation systems, took place on all three campuses.

6 MANAGEMENT OF HAZARDOUS MATERIALS

6.1 Highly Regulated Materials

Dalhousie has had years of experience dealing with materials such as asbestos, freons and PCB's. During 2005, we continued the programs which are designed to ensure that we manage these materials safely and in full compliance with Federal and Provincial regulations. Given the extent of the University's use of these highly regulated materials, their management will challenge the Faculties and Facilities Management for many years to come.

6.1.1 Asbestos

Because asbestos is so prevalent in Dalhousie buildings, in 1998 the University adopted an Asbestos Management Plan. Late in 2005, the Safety Office and Facilities Management co-operated to update the Plan. The revised Plan more closely aligns the training components with the types of asbestos work undertaken by Dalhousie staff and contractors, adopts some new action levels used elsewhere in Canada, and adds some new procedures to provide supervisors with guidance as they conduct some types of renovation work. During the first half of 2006, the Safety Office offered a series of seminars for all the staff of Facilities Management and other units whose employees might have also have occasion to work in areas where asbestos is located. These seminars were designed to ensure that all potentially exposed staff understood the properties and hazards of asbestos, where staff might expect to encounter asbestos-containing materials and the basic precautions that must be taken. This training corresponds to the Level 1 program as described in the revised Asbestos Management Plan.

Once all the appropriate staff had completed the Level 1 program, the Safety Office, staff of Facilities Management and an external consultant, worked together to create a Level 2 course which was delivered during the fall to members of the trades group.

6.1.2 PCBs

As permitted by federal regulations, Dalhousie continues to operate several large transformers filled with PCB-containing transformer oils. Several months before it was slated for replacement, the PCB transformer located in the Central Services Building failed. The Safety Office worked with electrical staff at Facilities Management to address the health and safety issues which arose with the installation of a portable transformer (required to meet the on-going electric power demands), examination of the failed unit, and ultimately the removal and replacement of the failed unit with a non-PCB transformer.

The project required several hundred gallons of PCB oils to be drained from the failed unit and transferred to drums and removal of portions of the wall to the electrical vault to permit the empty, several thousand pound carcass to be removed and the replacement unit to be installed. The Safety Office arranged for inspectors from Environment Canada to be on-site to oversee the work and to ensure that they were satisfied with the precautions that were being taken.

The project proceeded without incident and the contaminated oil, as well as the drained carcass, were transported without incident by truck to a licensed PCB handling facility in Ontario.

6.1.3 Propane

During 2006, Dalhousie continued to work on propane systems in co-operation with inspectors from the Fuel Safety section of the Department of Environment and Labour. The focus of the work was to address compliance issues created by recent code changes, including some introduced by the new Fuel Safety Regulations.

Following the 2005 propane inspection, the Safety Office and the inspector agreed upon a standard tubing for use in connection with portable burners. The change over was made early in 2006 when the Safety Office visited every laboratory, explained the rationale for the change and replaced tubing on hundreds of burners. Arrangements have been made with stores in Medicine, Dentistry, Chemistry and Biology, to stock the 'approved' tubing.

We believe that work completed over the past year or so on the Sexton campus appropriately deals with the propane safety issues raised by the inspectors. Similarly, upgrades in the Dental Building and the University Club have addressed propane safety issues in a fashion that addresses the concerns of both the Fire Department and the gas inspector.

In the Chemistry Building, new procedures have been put in place to ensure that valves which control the flow of propane into laboratories are closed and locked when the propane is not in use. Changes have been made in the propane handling system in one of the large, ground floor student laboratories as well as the glass blowing shop. Further modification of the glass blowing propane supply system will be completed as part of the renovations which will accompany the building of the addition scheduled to start this spring. Testing to ensure that individual propane gas outlets are gas tight is being carried out in each laboratory as time permits. This testing is expected to be completed during 2007.

Staff from the University and the Fuel Gas Safety section have met on several occasions to review the status of the propane systems in the Sir Charles Tupper Building. Among the changes which have resulted are an educational initiative aimed at increasing awareness among laboratory staff and students of propane safety matters and, where practical, increasing control over the supply of propane to individual laboratories. Facilities Management has reviewed the propane distribution system and identified a series of upgrades which will, when completed, bring the distribution system into compliance with current code requirements. Facilities Management has also examined the delivery system in each of the dozens of laboratories in the complex. Some of these laboratories have been recently renovated and are already in compliance while considerable work would be required to bring others up to date. Given the relatively small volumes of propane used in the Building and the cost that would be incurred in upgrading non-compliant laboratories, the University is exploring removing the propane supply in these laboratories. Some researchers will, of course, continue to need open flames to, for example, sterilize instruments used in microbiological procedures. Researchers are presently testing the practicality of using small, portable butane fueled burners as an alternative to piped in gas supplies.

Compliance with fuel gas safety code in the Life Sciences Centre also presents some challenges. Some redundant older systems have been removed in recent years and some work has been carried out on the distribution system. But it is likely that significant additional changes – along the lines of those being made in Tupper – will also be needed in the Life Sciences Centre.

As reported in the 2005 Annual Report, a long standing propane problem in Shirreff Hall had been linked to the presence of water in the tank which supplies propane to the residence kitchen. At

night, ranges are, of course, not in use and only very low flows of propane are needed to supply pilot lights. It appeared that on cold nights, small ice crystals could briefly block the flow of propane through the tank valve and the pilot light would then be extinguished. Subsequent dislodging of the blockage would permit the propane to begin flowing. But with the pilot light extinguished, the propane could escape unburned into the kitchen. As unburned propane began to accumulate, staff and students began to detect the odourant used in propane systems. Fearing a major leak, the building was often evacuated.

Early in 2006, the propane supplier replaced the tank. The tank replacement appears to have solved the problem.

6.2 Hazardous Waste

Since 1988, the Safety Office has coordinated the University's chemical waste disposal effort. With the assistance of a crew from Trucking, the Safety Office collects waste solvents and related wastes on a monthly schedule. The fluid wastes are generally bulked into 45 gallon drums with other compatible wastes and shipped for disposal to a fully-licensed waste site by a licensed hazardous waste disposal firm. In recent years, the range of wastes collected in this program has been expanded to include some radioactive waste as well some biohazardous wastes. These wastes are also bulked and sent for destruction by incineration (again at licensed sites) or are handled in the system which accommodates the biohazardous materials generated by the Province's network of hospitals.

During 2006, the Province closed the pathological waste incinerator which had previously dealt with the biohazardous waste created by the Province's hospitals and universities. The replacement systems primarily relies upon treating these wastes in an industrial scale autoclave, then shredding them prior to depositing them in a secure landfill. While this system adequately destroys most potentially harmful organisms which might be present, it is not an appropriate disposal system for some of the wastes created in some of Dalhousie's medical or biological laboratories. Some of the University's wastes contain volatile contaminants which could be driven off by the heating which takes place in an autoclave with a resulting worker exposure risk. Other wastes contain dangerous contaminants which are not destroyed by autoclaving and which could create environmental problems if they were deposited in a landfill site.

When the new system was introduced, staff of the Safety Office and Facilities Management met with the new contractor to devise a system which adequately handles the various classes of biohazardous waste created by University research and teaching programs. Following those meetings, the University introduced the revised waste storage and handling procedures required to accommodate the new system.

Again, during the summer of 2006, we accepted the full range of waste chemicals including those which we are unable to deal with during the academic year. Many of the wastes created by University laboratories require some degree of pretreatment and cannot simply be bulked into drums for shipment and disposal. Lacking year round access to facilities which support such pretreatment work, we are unable to accept such wastes except during the summer months when we have access to a vacant undergraduate Chemistry laboratory. As in the past, we were assisted in this phase of the disposal effort by two senior students.

Work is scheduled to begin in the spring of 2007 on an addition to the Chemistry Building. This new facility will more appropriately accommodate the storage of the substantial volumes of

chemicals required by the Chemistry Department. It will also will create a facility designed to support the University waste and surplus chemical handling program. Once operational, we will be able to accept the full range of wastes as they are created, thus reducing the volumes of waste chemicals that are present in research and teaching laboratories.

6.3 The 2006 Experience

During 2006, the disposal program handled almost 9500 individual wastes, ranging in size from a few milligrams to a few kilograms. In total, the program handled almost 17,000 kg. of waste and surplus chemicals. Changes in the way we handled some biohazardous waste meant that the item count cannot be directly compared with 2005 data. But the program handled about 2500 kg. more waste in 2006 than in 2005.

Of the 17,000 kg. total, almost half consisted of laboratory solvents and the associated dissolved solids. A breakdown of the type of wastes handled during 2006 is shown below.

Waste Disposal

Toxic inorganic compounds	460 kg.
Scintillation waste	400 kg.
Toxic organic chemicals	130 kg.
Contaminated acids	290 kg.
Laboratory and clinic solvents and oil	7950 kg.
Non-hazardous chemical wastes	230 kg.
Sharps and other potentially infectious waste *	4300 kg.
Dangerously reactive compounds	500 kg.
Contaminated solid and sediments	275 kg.
Other wastes	200 kg.

* This quantity represents a fraction of the 28,250 kg. Of sharps and potentially infectious waste created by Dalhousie research and teaching laboratories and clinics in Medicine, Dentistry and Science. The disposal of this waste is coordinated by Facilities Management's Environmental Services. Dalhousie's sharps and potentially infectious waste disposal program is fully integrated into the province-wide system with several hospitals and similar facilities.

In addition to this disposal activity, we are increasingly able to reuse or recycle some of these surplus and waste materials. The 2006 totals for materials diverted from disposal are shown below.

Metals including mercury, lead and chromium	120 kg.
Batteries	1392 kg.
Paint	80 kg.
Gas Cylinders	440 kg.
Glass	3665 kg.
ChemEx	190 kg.

Chemical disposal costs can be significant. Since 1992, when much of the chemical waste handling was taken over by the Safety Office, annual disposal costs have run between \$10,000 - \$20,000. As **Table I** shows, disposal costs have increased, reflecting increases in the unit disposal fees and the increased volumes.

Table I
Disposal Costs

Year	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Annual Chemical Disposal Cost	\$21,000	\$21,300	\$20,675	\$14,800	\$14,600	\$16,200	\$14,250	\$16,000	\$13,500	\$10,800

6.4 ChemEx

During 2006, The Safety Office continued to operate ChemEx, the University's surplus chemical exchange program. During the year, ChemEx placed 482 items with a catalogue value of just over \$22,300.

As **Table II** shows, 2006 activity brings the value of chemicals placed since 1992 to over \$380,000. The value of the exchanged chemicals under-estimates the avoided costs as it does not include shipping or brokerage costs associated with new purchases nor the disposal costs which otherwise would have been incurred.

Table II

Year	2006	1992-2006
Number of chemicals exchanged	482	7600
Value of chemicals exchanged	\$22,300	\$385,725

7 LEGAL MATTERS

7.1 Ongoing Regulatory Matters

During 2006, the Nova Scotia Department Environment and Labour did not issue any orders with respect to Dalhousie operations.

On behalf of the University, the Safety Office filed the reports required annually under the National Pollutant Release Inventory by Environment Canada and under Chemical Weapons Convention Regulations by Foreign Affairs Canada.

7.2 Regulatory Changes

Federal Legislative Matters:

2006 did not see significant changes in the Federal statutes under which the University health and safety program operates. Interest remains high in the potential for prosecutions under the "Westray Bill" which amended the Criminal Code of Canada. Ontario laid the first charges under the amendment in connection with a fatality which occurred when a worker was killed when a trench collapsed at a metro Toronto construction site. The charges were later dropped in favour of a prosecution under Ontario's Occupational Health and Safety Act. More recently, criminal charges were laid in Quebec in connection with a serious workplace accident which took place early in 2006. That case has yet to reach the courts.

There were no important changes in regulations at the federal level although Environment Canada has formally announced its intention to amend the PCB regulations. If adopted, these changes could require the University to move forward its plans to replace the University's 4 remaining PCB-containing electrical transformers.

Provincial Legislative Matters:

At the Provincial level, there were minor changes to statutes which impact Dalhousie's health and safety program.

Amendments to the Smoke-free Places Regulation, the Building Code Regulations, the Fire Safety Regulations and the Fuel Safety Regulations all came into effect during 2006.

The amended Smoke-free Places Regulations have no impact on Dalhousie as the University's Smoking Policy, adopted in 2001, anticipated the changes introduced during the past year.

The Building Code and Fire Safety regulation, in large measure, adopt the National Building and National Fire Code, making them legally enforceable in Nova Scotia. These actions have relatively little impact on Dalhousie as the University tends to design and operate buildings in accord with the national codes as they are published. The Fire Safety Regulation does, however, introduce some new reporting and documentation requirements. Facilities Management and the Safety Office are co-operating in the preparation of written materials required to bring the University into full compliance with the new regulations.

The 2006 efforts to address propane compliance issues are described in the Hazardous materials section of this report.

8 TRAINING

Although a number of units and departments across campus provide safety training, the Safety Office is one of the focal points for safety training. During 2006, the Safety Office delivered, or participated in, sessions which provided instruction and information to well over 1200 staff and students.

8.1 Workplace Hazardous Materials Information System (WHMIS)

WHMIS is a set of interlocking Provincial and Federal regulations, created to give employers and employees information upon which they can develop procedures to work safely with chemicals. WHMIS regulation requires employees to be trained in WHMIS, and in how the employee is to apply this information to daily work with chemicals. The Safety Office provides much of the WHMIS training for those whose exposure to chemicals arises in laboratories or clinics. Although the WHMIS regulation technically only applies to employees, many of those participating in these training sessions are students. During 2006, the Safety Office conducted 9 training sessions for staff and students in Biology, Chemistry, Dental Hygiene, Dentistry, Facilities Management, Housing and Conference Services, Medicine, Science Co-op and Engineering. In total, over 300 people participated in these programs.

Use of the Safety Office on-line WHMIS test is gaining in popularity, particularly among those who have previously attended a WHMIS course and among student employees of University residences.

8.2 Student Security

As has been the practice over the past decade, the Safety Office provided two, half-day safety orientation sessions for members of Tiger Patrol and the Student Building Security Service. One session was offered in January as part of the orientation for students recruited during the course of the year. The second session was held in September as part of the orientation provided to 100 students recruited to work during the 06-07 academic year.

8.3 Radiation Safety Training

The Radiation Safety Office also conducts training for all staff and students working with radioactivity. The training meets the terms set in the consolidated license issued to the University by the Canadian Nuclear Safety Commission. The Radiation Safety Office also introduced an on-line training module which provides refresher training for those who have attended previous training workshops. More information of these training programs is presented in the Radiation Safety Annual Report which is appended to this report.

8.4 CPR and Related Training

With the recruitment of the new Health and Safety Officer who has previous experience in first aid training, the Safety Office has begun to develop a first aid training program. It is hoped that such internal training capabilities will permit us to develop and deliver training that is more focused on the needs of particular University work or study situations than is available from external trainers.

To launch the program, we first developed CPR study guide and - with special assistance from senior administration - purchased the mannequins and supplies required to train groups of 10 people. We began courses in April by offering to provide the two hour sessions to units

requesting training and by advertising "open" registration courses for which any interested member of the University could register. The program has proved very popular. Since early April, we have delivered 35 programs, training over 260 people.

Late in the year, the University again provided special funding for the purchase of 4 automatic external defibrillators. In 2000, Dalhousie purchased three AEDs, one of which was placed in the Dalplex (where, over the years, there have been a number of cardiac emergencies), and one in each of the two Security vehicles able to respond to medical emergencies across the University. At that time, Dalhousie was the first organization outside of health care/EHS to purchase AEDs. But as early as 2000, we recognized that the provision of AEDs would become widespread and that the Dalhousie network would inevitably grow. The decision taken in 2006 represents the initial step in expanding the AED network with the goal of eventually placing an AED in each Dalhousie building. It is hoped that additional units will be purchased in future years as funds become available.

The plan is to place the four new AEDs in the University Club, MacDonald Building (primarily to serve University Hall), the Arts Centre (primarily to serve the Cohen and the other large performance venues), and centrally on the Sexton campus. Although modern AEDs are designed to be used by people without extensive training, the Safety Office is currently organizing training sessions for volunteers in each of these areas. We anticipate that there will be a good deal of overlap between the network of CPR/AED trainees and our fire warden network.

8.5 Custodial and Trades Training

During 2006, the Safety Office provided 7 training sessions involving about 200 trades and custodial staff. The majority of these people, of course, work in Facilities Management, but a few do similar work in other campus units or work for firms that routinely provide services to the University. Among the topics covered were:

- an orientation to the hazards present in University labs and clinics,
- back injury prevention,
- asbestos orientation (level 1 training), and
- lock-out tag-out programs

8.6 Fire Warden Training

In connection with the awarding of the 2006 Environmental Health and Safety Annual Award, the Safety Office organized a day long Fire Warden's Day attended by over 100 wardens from across all three campuses. Dr. Traves and B. Mason were both able to attend and Dr. Traves officially presented the Award, expressing the University's appreciation for the important volunteer contribution which fire wardens make to campus safety.

A training component was provided by a representative of the Fire Prevention Division of HRM Regional Fire and Emergency Services.

Particularly welcomed by the participants was the opportunity to discuss together the challenges they face in ensuring fire safety in their buildings and to consider the new demands that will emerge as regulations change.

The day ended with very clear calls from those attending to make the gathering an annual event.

8.7 Biosafety Training

Several years ago, the Safety Office recognized the need to expand our biosafety efforts. With teachers and researchers in Dentistry, Engineering, Medicine and Science regularly dealing with materials which could - if not handled properly - present an infection risk to animals or humans, we felt that area needed added attention. The basics of a biosafety program had been in place from many years, based mostly on the efforts of the University Veterinarian and the University Biosafety Officer. There has been a long standing tradition that the position of Biosafety officer has been held by a faculty member, often by a faculty member from the Faculty of Medicine's Microbiology Department.

The early steps in creating a more formal program involved creating a Biosafety Handbook which was intended to support the training efforts of laboratory supervisors. Later, we introduced a quarterly audit of autoclaves. Autoclaves are essentially industrial scale pressure cookers which use high pressure steam to kill pathogens. Under our audit, we furnish indicator strips to each autoclave supervisor. These strips are included randomly with materials being treated in the autoclave. The strips are then retrieved and cultured. If the autoclave has performed properly, the organisms present on the indicator strip will not grow.

Discussions with Dr. W. Currie, the current Biosafety Officer, and the Faculty of Medicine Safety Committee, suggested the need for a more formal biosafety training effort and accordingly, the Safety Office organized a Biosafety Training day which was held in early December. The session was presented by the biosafety officer from Canada's level 4 facility in Winnipeg and a biosafety specialist from Health Canada's Ottawa head quarters.

The session attracted almost 170 participants, including a few from other Maritime universities and bioresearch institutions. Several Dalhousie researchers closed their laboratories for the day so that they, along with all their students and employees, could attend.

We plan to follow up on the session in early 2007 by creating a small committee that will be asked to help chart a course for further biosafety developments at Dalhousie.

9 OUTLOOK FOR 2007

9.1 Health Training

In 2007, we expect to build on the CPR training initiative of 2006 with the introduction of programs which will create the beginnings of a network of staff trained in the operation of automatic external defibrillators. We also anticipate introduction of the first of a series of first aid training programs which are tailored to the risks in particular Dalhousie work and study situations.

9.2 Radiation Safety

Difficulties in scheduling prevented us from putting in place the planned audit of University X-ray generators. We now expect to see that program put in place in early 2007. The Safety Office, in co-operation with the Radiation Safety Committee, expects to put in place additional elements of a laser safety program. Among the elements which the Committee is exploring are the introduction of a permit system which would formalize the conditions under which high powered lasers would be operated at Dalhousie and a training program for employees and students working with such lasers.

9.3 Biosafety

We expect to continue development of the Biosafety Program. The Dalhousie Biosafety Officer has suggested that the Safety Office form an interim biosafety committee which would be asked assist in charting the next steps in the development of the program.

9.4 Facilities Management Safety Plan

The Safety Office has been working for some months with senior staff in Facilities Management to formally document Facilities Management's safety program. During the early months of 2007, the Safety Office expects to work with Facilities Management's Safety Committee to complete the review and adoption of the document.

9.5 SLOWPOKE Decommissioning

For over 28 years, Dalhousie has operated a SLOWPOKE-2 (Safe Low Power Critical Experiment) nuclear reactor in connection with University research and teaching programs. The reactor operates under the terms set down in an operating license issued by the Canadian Nuclear Safety Commission. The unit is a pool type reactor capable of producing 20 kilowatts of power employing a light water moderated enriched uranium fuel core. In light of the age of the unit and changing research directions, Dalhousie has decided to decommission the facility. During the past year, the University has held a series of exploratory meetings with officials representing the Canadian Nuclear Safety Commission, Natural Resources Canada, Atomic Energy of Canada Ltd., and other Canadian universities which have decommissioned similar units or which may decommission in the next few years.

Early in 2007, the University plans to retain a contractor who would head up the project. The project will involve initially, conducting an environmental assessment which would be followed up before the preparation of detailed defuelling and decommissioning plans. At this point, a timeline for completion has not been finally determined. The Safety Office is represented on the internal committee providing over-sight for the project.

APPENDICES

MILESTONES IN HEALTH AND SAFETY AT DALHOUSIE

- 1976** Appointment of Dr. GFO Langstroth, a faculty member in the Department of Physics, as Radiation Safety Officer and Chair of the Radiation Safety Committee.
- 1977** Appointment of A. Chisholm as Director of Safety (in addition to duties as an engineer within Physical Plant and Planning).
- 1980** Establishment of the Dalhousie Environmental Health and Safety Committee composed of both University and Employee Group representatives charged with providing policy advice and presenting an opportunity for the resolution of health and safety concerns.
- 1982** Establishment of a Radiation Safety Program in cooperation with the Nova Scotia Cancer Centre. Appointment of P. Jones as Assistant Radiation Safety Officer. Atomic Energy Control Board of Canada issues Dalhousie University its first consolidated radioisotope licence.
- 1983** Appointment of Dr. J. Johnson as Director of Safety. Dr. Johnson, a physician with years of service at Dalhousie brought to the Program a professional stature and an important skill set.
- 1984** Appointment of Ms. J. Taylor McIntyre, Administrative Secretary.
- 1985** Enactment of the Nova Scotia Occupational Health and Safety Act. This Act mandated the creation of committees and introduced important new workplace rights and responsibilities.
- 1990** Appointment of Dr. Wm. Louch, Director of Environmental Health and Safety.
- 1995** Adoption of the Scent Reduction Program. In an effort to support sensitive members of the University community, the program encourages people to avoid using scented personal care products. The Program also encourages Facilities Management to avoid unnecessary chemical exposure which may arise from maintenance and operations of Dalhousie buildings.
- 1996** Enactment of an amended Occupational Health and Safety Act.
- 1997** Amalgamation of Dalhousie University and Technical University of Nova Scotia. The Dalhousie Safety Office assumed responsibilities for environmental health and safety at the Sexton Campus.
- 2000** Amalgamation of Environmental Health and Safety and Radiation Safety Offices. Appointment of Ms. P. Jones as Radiation Safety Officer.
- 2001** Dalhousie becomes the first University to be issued a consolidated licence by the new Canadian Nuclear Safety Commission.
- 2003** Dalhousie becomes the first Canadian University to adopt a smoke-free campus policy.
- 2004** An amendment to the Criminal Code of Canada created a new legal obligation in matters of safety for those who direct or who have the authority to direct work.
- 2005** Appointment of Mr. S. Ellis, Health and Safety Officer.

DALHOUSIE ENVIRONMENTAL HEALTH AND SAFETY POLICY

Updated: President's Office

April 2006

Reviewed by: Environmental Health and Safety Committee

April 2006

POLICY

With the full support of the President and Board of Governors, the University is fully committed to providing an environment which appropriately supports work, study and campus life by conducting all aspects of its operations in accord with appropriate standards of health, safety and environmental protection.

GUIDING PRINCIPLES

The University understands that achieving high standards of health, safety and environmental protection requires active support and participation of all employees, students and visitors. Accordingly, the University will continue to develop its environmental health and safety program by working openly and in co-operation with members of the University community and, in particular, with the Dalhousie University Environmental Health and Safety Committee, and with external individuals and agencies which share its environmental health and safety goals.

In a rapidly changing world, Dalhousie University further understands that providing an appropriately healthy and safe environment, requires an ongoing and iterative process of program development, implementation, and performance audit, leading to program improvement.

ROLES and RESPONSIBILITIES

Individuals

Individuals are responsible for:

- acting safely to protect their own well being and that of others who might be impacted by their actions,
- complying with government regulations and University and departmental safety policies and procedures, and
- promptly reporting hazardous situations.

Faculty, Instructors, Managers and Supervisors

Faculty, instructors, managers, and supervisors are responsible for ensuring:

- tasks undertaken under their supervision, are structured in such a fashion as to minimize the likelihood of harm, and
- those whom they supervise are appropriately trained, equipped and supervised.

Deans, Chairs, Directors and Heads of Units

Deans, Chairs, Directors and Heads of Units are responsible for:

- providing safety leadership within their units, and
- ensuring that their units operate effective health and safety programs.

Director Environmental Health and Safety

The Director Environmental Health and Safety is responsible for:

- supporting the health and safety efforts of Faculties and Departments by providing expert information and advice,
- providing such health and safety services and training as is appropriate,
- supporting the work of the Dalhousie Environmental Health and Safety Committee, and
- liaising with external agencies to ensure that the University is fully aware of matters which might impact its environmental health and safety program.

Dalhousie University, Radiation Safety Annual Report

This annual report summarizes the progress of the Radiation Safety Program for the period January 1, 2006 to December 31, 2006.

1. SUMMARY

During 2006 the Radiation Safety Program has continued successfully with the supervision of the policies and procedures developed thus far. The matter of improvement of these policies and procedures is a continuing agenda item for each meeting of the Radiation Safety Committee.

New initiatives this year include:

- a) A worker re-training session in the form of a Power Point presentation was completed and posted to the Environmental Health & Safety web site in June 2006. The topic of this years re-training module was "**Receiving Radioactive Shipments**". All workers trained prior to 2004 were required to complete the module and accompanying quiz.
- b) A significant change was approved by the Radiation Safety Committee for the handling of aqueous radioactive waste. The revised policy would require that all such waste, as defined as radioactive by the Canadian Nuclear Safety Commission, must be collected in containers provided by the Radiation Safety Office then transferred to a storage facility under direct supervision of the Radiation Safety Officer. The waste would be held for decay then transferred out for subsequent incineration. Renovations were undertaken to a room in the Tupper building. Implementation of the new procedures is expected to take place in January 2007. Revised policy is appended to this report.
- c) A computerized inventory control program is being developed which would replace the current system in place for tracking the use of nuclear substances in individual laboratories. Currently researchers maintain a hard copy record sheet for each stock solution on hand. An inventory report is required to be submitted to the Radiation Safety Office on an annual basis. The computerized program will enable the Radiation Safety Officer to have a "live" record of all radioactive material on campus at any given time. Currently a number of research groups are evaluating the program.
- d) A Gammacell irradiator was acquired by a research group in the Microbiology & Immunology department in the Faculty of Medicine.
- e) A laser safety training DVD was acquired from Rockwell Laser Institute. This program consists of nine modules. All laser users will be required to complete the nine modules and pass an exam to become an Authorized User. The program will be available on the EH&S web site and will be password protected.
- f) The Terms of Reference for the Radiation Safety Committee were revised and a Quality Assurance policy was developed. Both documents are appended to this report.
- g) The Radiation Safety Training Manual was revised in July of 2006.

- h) An awareness session for Facilities Management personnel was developed to address chemical, radiological, biological and other hazards which staff might encounter when entering laboratories.
- i) A Radiation Safety Awareness session was developed and presented to fire crews at the University Avenue station, who would respond to calls at the university.

2. **RADIATION SAFETY COMMITTEE**

Members for 2006

Dr. A. Chatt, Director, SLOWPOKE-2 facility, Trace Analysis Research Centre,
Dr. S. Cameron, Chemistry
Dr. M. Dobson, (Chair), Biochemistry & Molecular Biology
Dr. R. Dunlap, Physics & Atmospheric Science
Dr. K. Hall, Physics & Atmospheric Science
Dr. K. Hewitt, Physics & Atmospheric Science
Dr. D. Hoskin, Microbiology & Immunology, Pathology
Ms. P. Jones, (Secretary), Radiation Safety Officer
Dr. W. Louch, Director, Environmental Health & Safety
Mr. G. McNutt, Building Services Manager, Tupper
Ms. K. Murphy, Pharmacology
Dr. N. Ridgway, Atlantic Research Centre
Dr. M. Zentilli, Earth Sciences

Dates of Committee Meetings

March 7, 2006
 June 6, 2006
 September 5, 2006
 December 5, 2006

3. **RADIATION USE** (*ionizing and non-ionizing*)

- a) Nuclear substances find application in the following experimental techniques, where the majority of use is conducted in the Faculty of Medicine.

- i) activation analysis
- ii) gas chromatography
- iii) geochronological research
- iv) imaging studies
- v) metal assays
- vi) Mossbauer spectroscopy
- vii) positron annihilation studies
- viii) radiation biology
- ix) radioimmunoassay
- x) teaching, laboratory technique
- xi) tracer studies

b)	Number of active Nuclear Substance permits in 2006	58
	Number of new permits issued in 2006	5
	Number of "Storage Only" permits	4

	Number of "Inactive " permits	2
	Number of permits utilizing open source material	54
	Number of staff/students who use/handle nuclear substances	300
c)	Number of analytical x-ray permits issued in 2006	1
	Number of staff/students authorized to use x-ray equipment	35
d)	Number of Class 3B and Class 4 lasers identified	21
	Number of laser users identified	47

e) **Nuclear Substance Purchases - 2006**

¹⁴ C	106.56 MBq*
³ H	1.20 GBq
³² P	1.77 GBq
³³ P	203.5 MBq
³⁵ S	7.61 GBq
⁵¹ Cr	2.07 GBq
¹²⁵ I	177.7 MBq
Others	0

TOTAL 13.14 GBq

** The **becquerel (Bq)** is the derived unit of radioactivity, defined as the activity of a quantity of radioactive material in which one nucleus decays per second. This is an extremely small amount of radioactivity, research labs generally work with activities in the **megabecquerel (MBq)** - 10^6 and **gigabecquerel (Gq)** - 10^9 range.

- f) Currently only one research group is conducting experiments at an off campus location. The principal investigator is conducting field studies for body composition and water influx measurements on seals using ³H. Field use is during winter months on Sable Island.
- g) During this reporting period there were no significant changes to nuclear substance facilities.
- h) There has been no significant change in nuclear substance use at Dalhousie University during this reporting year.

4. **CONTAMINATION AND RADIATION SURVEYS**

Nuclear substance users are required to comply with the requirements set out in the **Radiation Safety Manual**, section **E.6**, condition 10 of Dalhousie University's **Nuclear Substance and Radiation Devices Licence 07154-2-07.9**, Dalhousie University's **Nuclear Substance User Permit - Schedule of Conditions** (item 14), Dalhousie University's **Basic/Intermediate Level Laboratory- Nuclear Substance Safety** posters and Dalhousie University's **Record Keeping Requirements** policy. Radiation Safety personnel visit each research group a minimum annually or as required.

Each research group is required to perform self-audits twice yearly, in May and November.

5. **INCIDENTS**

During this reporting year there were no incidents where personal exposures exceeding Dalhousie University action limits occurred. Action limits are set at one third of regulatory limits. No incidents which required reporting to the Canadian Nuclear Safety Commission occurred during the reporting year.

6. **DOSIMETRY**

a) In the following table dosimetry results are reported on the basis of the past year to date, as shown in returns from the Radiation Protection Bureau.

Department	# of badges	Whole Body Exposure (mSv)	Skin Exposure (mSv)
Animal Care	14	0.00	0.00
Biochemistry	70	0.15	0.15
Biochemistry (extremity)	25	-----	0.00
Biology	2	0.00	0.00
Dentistry	16	0.13	0.13
Chemistry	1	0.00	0.00
Earth Sciences	17	0.00	0.00
Microbiology	34	0.00	0.00
Microbiology (extremity)	6	-----	0.00
Pediatrics	31	0.00	0.00
Pharmacology	63	0.18	0.18
Pharmacology (extremity)	21	-----	1.10
Physics	8	0.35	0.35
Physiology	17	0.00	0.00
Physiology (extremity)	15	-----	0.00
SLOWPOKE	8	0.16	0.16

Exposures listed are the maximum for any individual in each departmental group.

There are no designated Nuclear Energy Workers (NEW's) at Dalhousie University.

b) A program is in place for routine bioassay screening as required by CNSC regulatory guide **R-58 "Bioassay for Iodine-125 and Iodine-131 in Medical, Teaching and Research"**. One worker participated in this screening program. No thyroid burden was detected.

- c) No tritiations are performed at Dalhousie University, thus a tritium bioassay program has not been necessary.

7. **WASTE MANAGEMENT**

Solids to municipal garbage

No solid waste is sent to the municipal garbage system. All shipping containers are collected in designated metal containers, transferred to one of two radioisotope storage facilities on campus for monitoring, trefoil defacement and prepared for recycling or disposal.

Liquids to sewer

Labs continue to dispose of water soluble radioactive waste to the sewer. High level waste is held for decay in individual labs prior to disposing via this route to ensure that discharge limits for sewer disposal do not exceed those limits set out in condition 20 of Dalhousie University's ***Nuclear Substances and Radiation Devices Licence***. Individual labs maintain disposal records.

Solvent based liquid waste is collected monthly by the Environmental Health & Safety Office. The waste is shipped for incineration.

Incineration

Solid waste containing nuclear substances with a half life of less than ninety days is packaged by laboratory personnel and transferred to one of two decay rooms located in the Tupper Building and the Life Sciences Centre. The material is held for ten half lives, then monitored and transferred as biomedical waste for incineration. Tritium waste is also packaged for incineration.

Transfer to other agencies

During this reporting year no radioactive waste was shipped to another agency for disposal.

8. **RADIATION SAFETY TRAINING**

There were four formalized one day ***Radiation Safety Training*** sessions held in 2006. A total of 58 workers participated in these sessions.

A total of 58 workers received ***Receipt of Radioactive Shipments*** training.

Workers who trained prior to 2004 were required to participate in an on-line training module. The topic of this years training was ***Receipt of Radioactive Shipments***. A total of 31 workers were re-trained.

A total of six ***Hazard Awareness*** sessions were held for Facilities Management personnel. Two hundred forty eight participants took part.

A ***Radiation Safety Awareness*** session was held for crew from the University Avenue fire station. A total of fourteen firefighters participated.

Total number of individuals trained - 351

10. **INSTALLATIONS**

_____ A Gammabeam irradiator was installed in the Faculty of Medicine.

11. **OUTLOOK**

Five ***Radiation Safety Training*** sessions have been scheduled for 2007. A retraining module reviewing the principles and procedures of contamination monitoring is being developed for the workers trained prior to 2004.

Revised radioactive waste disposal procedures will be implemented in early 2007.

Computerized inventory tracking and management is expected to be launched by mid-February 2007.

Respectfully submitted,

Pauline Jones

Title:	Management of Radioactive Waste
Number:	RSP - 10
Revision Date:	1991, revised September 8, 2006

Introduction:

Dalhousie University uses nuclear substances under conditions set down by a licence issued by the Canadian Nuclear Safety Commission. Waste disposal is among the many facets of nuclear substance use governed by this licence. Failure to observe the disposal procedures set out below risks harming people or the environment, licence cancellation and even prosecution.

Categories of Radioactive Waste:

1. Dry Waste

Includes dry solid materials, dehydrated biological materials, and **contaminated** papers, glassware, gloves or apparel.

2. Liquid Waste

Includes liquid nuclear substances, solutions, contaminated rinses, and liquid scintillation cocktail. Liquid wastes are further categorized as **aqueous** and **non-aqueous**.

Aqueous wastes are those considered readily soluble in water.

Non-aqueous wastes are those liquids which are not readily soluble in water. These liquids include organic based liquid scintillation fluids.

3. Biological Waste

Includes animal carcasses, bedding, solid excreta, tissue, organs, blood, etc..

4. Sharps

Includes contaminated broken glass, needles, razor blades, scalpels, etc..

Disposal and Packaging Procedures:

Dry (solid) Waste

Solid waste containing nuclear substances **shall** be packaged in the radioactive waste storage boxes available through Tupper stores. These boxes are provided with a two part transfer form which must be completed. Copy 1 remains as the laboratory record of disposal. Copy 2 accompanies the box to storage. Boxes must be lined with a **orange** garbage bag. Arrangements must be made with the Radiation Safety Officer to transport

the waste to the appropriate decay room in either Tupper or the Life Sciences Centre. Transfer form accompanying the box must contain the following information:

- i) lab of origin
- ii) permit #
- iii) date of transfer
- iv) nuclear substance(s) contained
- v) approximate activity
- vi) name of individual who packaged box

Every effort should be made to segregate wastes by nuclear substance, though provisions may be made to mix short lived waste ($T_{1/2}$ of less than 90 days). Tritium (^3H) and Carbon-14 (^{14}C) **must** be packaged separately. Boxes found to be packaged incorrectly will be returned to the lab of origin for re-packaging.

Arrangements may also be made to transfer empty "pigs" to the storage rooms.

Liquid Waste

I. Aqueous Liquid Waste

Aqueous liquid waste containing nuclear substances must be decanted to the colour-coded 1 gallon bottles provided by the Radiation Safety Office if the amount of radioactivity per litre is in excess of the release limits outlined in Table I. Bottles will be colour coded as such:

Short lived nuclear substances	$T_{1/2} < 30$ days - MAGENTA
Medium lived nuclear substances	$T_{1/2}$ 30 days to 90 days - GREEN
Long lived nuclear substances	$T_{1/2} > 90$ days - YELLOW

When full, arrangements must be made with the Radiation Safety Officer to transport the aqueous liquid waste to the appropriate decay room. The outside of the bottle must be clean and free of wet or dried liquids.

All information must be included on the bottle tag provided.

Table I

Dalhousie University Release Limits For Radioactive Materials In Aqueous Liquids (lower activities are classified as non-radioactive by the CNSC)	
Column 1	Column 2
Carbon -14	37kBq (1 μCi)/litre of wash
Chromium – 51	37 kBq (1 μCi)/litre of wash
Tritium	370 kBq (10 μCi)/litre of wash
Iodine – 125	0.37 kBq (0.01 μCi)/litre of wash
Phosphorus – 32	3.7 kBq (0.1 μCi)/litre of wash
Phosphorus – 33	11.1 kBq (0.27 μCi)/litre of wash
Sulphur -35	3.7 kBq (0.1 μCi)/litre of wash

Any aqueous liquid waste below the criteria set out in the above table may be disposed of to the regular drain, followed by several litres of running water.

II Non-aqueous Liquid Waste

Liquid scintillation cocktails need not be drained from their counting vials, but rather placed intact in a plastic bag lined cardboard box. The box must be appropriately labeled as to contents including the following information:

- a) lab of origin
- b) nuclear substance
- c) solvent
- d) estimated activity
- e) name of person packaging waste

Arrangements should be made with either the Radiation Safety Office or the Environmental Health and Safety Office for collection. Boxes found to contain materials other than counting vials and their contents will be returned to the lab of origin for repackaging.

Biological Waste

Arrangements for disposal of radioactive contaminated biological waste should be made through the Radiation Safety Office and the Animal Care Facility. As all biological waste must be shipped for incineration, provisions should be made for refrigerator or freezer storage until arrangements can be made for shipment. Prior to shipment it must be demonstrated that the activity present meets regulatory requirements.

Sharps

Sharps as defined earlier must be packaged in an approved sharps container for collection and subsequent disposal.

RESPONSIBILITIES:

Principal Investigators

In accordance with this procedure and permit conditions the principal investigators are responsible for the collection of all radioactive waste arising from activities under their direction:

- a) Determining the waste activity and for separating waste by category
- b) Assuring that the radioactive contents do not exceed the indicated quantity.
- c) Ensuring that all packaging and disposal procedures are accurately followed. Waste found inappropriately packaged will be the responsibility of the lab of origin to re-package.
- d) Maintaining accurate records of disposal routes for all nuclear substances purchased against their Nuclear Substance User Permit.

Radiation Safety Officer

The Radiation Safety Officer is responsible for:

- a) Developing policy and procedures for the safe storage, collection, and processing of radioactive waste.
- b) Managing waste disposal program in accordance with the terms and conditions of the university's Nuclear Substances and Radiation Devices Licence as issued by the CNSC.

Radiation Safety Committee Policy

Policy Statement:

The Radiation Safety Officer is responsible for the day to day operations of the radiation safety program. He/she reports to the Radiation Safety Committee which has the authority to implement and enforce the radiation safety program encompassing the use, handling, storage and disposal of sources of ionizing and non-ionizing radiation in accordance with regulatory requirements of the Canadian Nuclear Safety Commission and provincial and federal standards for the safe use of x-ray emitting devices and lasers.

The Radiation Safety Committee is appointed by and accountable to the Vice -President, Academic and Research

All faculty, staff and students are expected to take individual responsibility for safe work practices and procedures so as to safeguard their own individual health and well being as well as that of their colleagues.

Committee Membership:

The Committee **shall** consist of a minimum of four voting members drawn from those engaged in work involving the use of nuclear substances or radiation emitting devices and a minimum of one voting member engaged in work involving the use of Class 3B or Class 4 lasers. Facilities Management and Security will be invited to each appoint a member. In addition, the following **shall** be non-voting members:

Radiation Safety Officer (Secretary)
Director of Environmental Health & Safety
Radiation Safety Officer, Capital Health
Building Services Manager, Sir Charles Tupper Medical Building

Committee members are appointed by the Vice-President – Research.

Terms of Reference:

1. Establish and regularly review policies and procedures for the safe use and control of nuclear substances, radiation emitting devices, lasers, and other sources of non-ionizing radiation throughout the university.
2. Assist the Radiation Safety Officer, where necessary, with the preparation and submission of CNSC applications and Annual Compliance Reports.
3. Establish and review worker training programs on an annual basis.
4. Advise the Radiation Safety Officer, if necessary, on the processing of internal permit applications and approval of space and facilities to be used for projects involving those items listed in item (1).
5. Receive reports of any incidents or accidents involving sources of ionizing or non-ionizing radiation, arrange for investigations where warranted and assist the Radiation Safety Officer with the required reporting to appropriate bodies.
6. Monitor necessary action on any **action item** or **directive** from regulatory agencies.

7. Order appropriate corrective action in accordance with the university's **Compliance Enforcement Policy**.
8. Advise senior management of the need for additional resources to improve the Radiation, X-ray and Laser Safety programs.
9. Conduct an annual audit of the university **ALARA** program.
10. Maintain written records of meetings, actions, incidents and unusual occurrences along with recommendations.

Reporting Structure:

The Radiation Safety Committee is accountable to the Vice-President. Dalhousie University's Environmental Health and Safety Committee shall be advised of the Radiation Safety Committee's proceedings, and in turn may refer matters to the Radiation Safety Committee for consideration or action.

Membership Term:

Committee members will normally be appointed for a three year term. Members may be reappointed to serve subsequent terms.

Chairperson:

The Chairperson **shall** serve a three year term. The Chairperson will be elected by the voting members.

Meetings:

The Radiation Safety Committee **shall** meet four times yearly – September, December, March and June. Special meetings, however, may be called at any time. The schedule for the year will be established at the September meeting.

Agenda:

Any member may place items on the agenda for discussion. Items for inclusion on the agenda should be received by the Radiation Safety Office at least one week prior to the scheduled meeting to allow time for distribution of relevant documents to committee members.

Conduct of Meetings:

Meetings will be conducted by the Chairperson. In the absence of the Chairperson, voting members in attendance will select a member as acting Chairperson.

Quorum:

At all meetings, a quorum will be one half of the voting Committee membership.

Voting:

The Committee will normally seek to operate by consensus without the need for formal votes. When a member requests a formal vote, a motion will be carried when supported by a simple majority of the voting members.

RADIATION SAFETY POLICY & PROCEDURE

Title:	Quality Assurance Program
Number:	RSP - 016
Date:	October 16, 2006

Each research group will be required to conduct a nuclear substance laboratory self-audit (attached) on a twice yearly basis, in May and November. These audits will be reviewed by the RSO and appropriate corrective action taken within one week of receipt of the audit.

Twice yearly to correspond with research group self-audits, the RSO will verify the results of a minimum of 10% of the audits. Research groups to be audited will be selected randomly.

NUCLEAR SUBSTANCE LABORATORY SELF-AUDIT CHECKLIST

Principal Investigator: _____ **Permit #:** _____

Location(s): _____ **Audited by:** _____

Date: _____

Posting:

	YES	NO	N/A
Caution - Radioactive Materials sign clearly posted			
Dalhousie " <i>Hazard Identification</i> " sign clearly posted at laboratory entrance			
Dalhousie University " <i>Lab Rules</i> " posted			
CNSC's " <i>Spill Procedures</i> " and " <i>Guidelines for Handling Packages Containing Nuclear Substances</i> " posters posted.			
Storage area signed, included 24 hour contact information			
Disposal sink signed			
Nuclear Substance User Permit and <i>all</i> attachments posted, including a list of authorized workers			
" <i>No Eating, Drinking ...</i> " sign posted			
Radiation Safety Manual (2005 version) available			
Radiation Safety Policies available (manual or web)			
Radiation Safety Training Manual (2001 version) available and distributed for reading to all new personnel			

Facility:

	YES	NO	N/A
General housekeeping satisfactory			
Isotope work areas well marked			
All equipment used for isotope work clearly labeled			
<u>No food or drink consumption in laboratory</u>			
Work area covered with absorbent liner			
Survey instrument available and operational			
Survey meter calibrated annually if required			
Fume hood operational with flow rate > 150 lfm			
Laboratory listed as an approved location on permit			
Radiation exposure levels maintained below 2.5 µSv/hr			
Contamination levels below ALARA criteria			

Personnel:

	YES	NO	N/A
Lab coats worn			
Personal dosimeters worn if required by permit			
Extremity dosimeters worn if required by permit			
Participation in ¹²⁵ I Bioassay Program if required			
Personnel perform a direct monitoring check prior to exiting Intermediate Level laboratories			
Personnel registered with Radiation Safety Office			
Staff have completed Dalhousie University - "Radiation Safety Training Course" or equivalent			
Staff trained prior to 2004 have completed required retraining module and passed test			
Workers awaiting next training session have read and signed " <i>Radiation Safety Training Manual</i> "			
Female workers familiar with " <i>Fetal Exposure Policy</i> "			

Security:

	YES	NO	N/A
Laboratory door locked when room is unoccupied			
Storage unit equipped with an approved padlock and hasp			
Non-radiation workers and visitors supervised at all times when radioactive materials are not secured			
Inventory records up-to-date to detect any loss or theft			
All issued keys accounted for			

Waste Disposal and Storage:

	YES	NO	N/A
Percentage of each aliquot used, logged for appropriate waste stream used			
Solid waste properly stored, labeled and shielded to ensure exposure levels are < 2.5 μ Sv/hr			
Water soluble waste double contained and shielded			
Solvent waste stored properly prior to monthly pick-up by EH&S			
Rad warning labels removed on surplus "pigs"			

Record Keeping:

	YES	NO	N/A
Personnel using nuclear substances approved by RSO			
Appendix "A" of User Permit lists all nuclear substance workers and is up to date			
Daily direct contamination surveys performed and results documented if applicable			
Weekly wipe tests performed and results documented			
<u>"Non-use" weeks recorded"</u>			
Packages received as per proper procedures			
Laboratory has at least one person trained to receive radioactive packages			
Receipt of shipment is recorded			
Usage of inventory is documented			

	YES	NO	N/A
Disposal of inventory is documented			
Transfer of radioactive material is documented			
Staff are familiar with " <i>Record Keeping Requirements</i> " policy			
Procedure deviations approved by RSO			
Record book up-to-date			

Nuclear Substance Use In The Laboratory:

Basic Level Laboratory: _____ **Intermediate Level Laboratory:** _____

During this past audit period the following nuclear substances were used:

¹⁴C _____ ³H _____ ³²P _____ ³³P _____ ³⁵S _____ ⁵¹Cr _____
¹²⁵I _____ **Others (specify)** _____

Principal Investigator signature: _____

Auditor's signature: _____

RSO use only:

Date received: _____

RSO signature: _____

Remedial action required:

