

Environment, Health, and Safety Office

Enhanced Delivery of Services

Reorganization

The Environment, Health, and Safety Office (EHS) initiated a reorganization after careful planning and with input from Human Resources, EHS staff, and our clients. The purpose was to realign and leverage our resources for increased efficiency, enhance succession planning, create opportunities for staff development and advancement, and position EHS to absorb future increases in research and regulatory activity within budget constraints. Two associate director positions were created and two EHS deputy directors, Pam Greenley and Mitch Galanek, were promoted to fill these positions while retaining their current duties. Each will coordinate the efforts of three EHS program offices to allow for better leverage of resources. The three radiation protection programs (Campus, Bates, and Reactor) will be led by Mitch Galanek, while the Industrial Hygiene, Environmental Management, and Safety Program will be led by Pam Greenley. A cross-training program will be initiated to allow for better delivery of our services and to provide staff development opportunities. We anticipate that these changes will allow us to continue to improve and even expand our services in spite of a reduction of two full-time equivalents in the FY2011 budget.

Process Reviews

We conducted a detailed review of 12 key EHS processes to better understand how we deliver these services and to identify areas to improve efficiency. Process flow diagrams were developed for each process; time-consuming or limiting steps were identified and measures for improvement initiated. We plan to review additional processes in FY2011.

Design Guidelines

The EHS Office is actively involved with the Department of Facilities' Campus Planning, Engineering, and Construction group on capital and renovation design review activities. In FY2010, we participated in three capital projects (Koch Institute for Integrated Cancer Research, Sloan School of Management building, and Media Lab); 91 renovation projects are in the planning/design stage, and 117 are in the construction stage. To facilitate a better understanding of EHS requirements in design and construction, we have been preparing building design guidelines that will become part of the updated MIT building system design handbook maintained by Facilities. In FY2010 we prepared 22 new modules; 40 modules are now available to Facilities on various design topics such as biosafety, ventilation, fire protection, environmental protection, and construction safety. We will continue developing these modules based on priorities established with Facilities and our clients.

Strategic Collaborations

Facilities/EHS Work Groups

In FY2009, we initiated the formation of small work groups made up of a facilitator and two to three people each from Facilities Operations and EHS to evaluate specific processes where we had joint responsibilities and overlap. The people directly involved in these processes reviewed the program requirements, current delivery methods, and any areas of confusion and identified procedures in need of improvement. In FY2010, we began implementation of several of these recommendations and formed four new groups to evaluate the asbestos, air permits, contractor safety, and injury and illness programs. In addition, a fifth group was formed informally by members of EHS and Facilities concerned about compliance with new electrical safety standards; this group will continue into FY2011. All five groups will report out in FY2011. We plan to revisit the status of implementation of recommendations and effectiveness for all 12 groups in FY2011.

Integrated Pest Management

In FY2009, we developed and implemented an Integrated Pest Management program for the day care center in collaboration with Human Resources and Facilities. In FY2010, we expanded the program campus-wide in collaboration with Human Resources, Facilities, Housing, and Food Services. We combined three separate pest control vendor contracts into one for the entire Institute and now have one vendor providing services in coordination with Housing, Food Services, and Facilities.

Controlled Substances Program

We developed and implemented an Institute-wide controlled substance program to allow better oversight of compliance and exchange of best practices among users across the Institute. We have identified 11 faculty with Drug Enforcement Administration (DEA) licenses. We obtained permission from DEA to deactivate and destroy unused or unneeded controlled substances, allowing better control and significant cost savings on disposal. DEA has approved three EHS staff members to conduct on-site destruction of out-of-date or unwanted drugs.

Energy Conservation/Sustainability

We continue to work with Facilities and the MIT Energy Initiative (MITEI) to identify ways to conserve energy. The EHS deputy director for sustainability now splits his time between EHS and Facilities Engineering. Efforts continue to focus on laboratory ventilation and voluntary recruitment of “green ambassadors” to facilitate good energy choices daily at MIT.

Support for Off-Campus and Special Projects

Singapore-MIT Alliance for Research and Technology

The Singapore-MIT Alliance for Research and Technology (SMART) has resulted in over 100 MIT employees and students conducting research activities in facilities at the National University of Singapore (NUS). This has presented unique EHS challenges

due to different and sometimes conflicting regulations, policies, and facilities between Singapore and MIT's Cambridge campus. In an effort to understand and reconcile these differences and to be in a better position to respond to future international programs, we developed and implemented a joint EHS peer review program with the NUS Office of Safety, Health and Environment (OSHE). Seven representatives of OSHE visited MIT for a week and reviewed our EHS management system. Three EHS Office personnel visited NUS for a week and reviewed their safety and health management system and met with SMART personnel at NUS to hear about their experiences and difficulties adjusting to different policies and practices. This has led to an effort to harmonize the NUS and MIT EHS policies and procedures to minimize duplication and the burden on MIT researchers at NUS while still maintaining confidence that they are working in a safe environment and are being provided services similar to those they have come to expect at MIT.

In FY2011, we intend to streamline the procedures at both MIT and NUS to provide effective and efficient EHS services needed by personnel from each institution who may be conducting research at the other's facility. We expect this to become a template for other research universities that can be used in similar international endeavors. We are collaborating with other institutions in the United States and United Kingdom to develop international guidelines to address these types of alliances.

Bates Linear Accelerator

EHS provided oversight and support of several initiatives at Bates, including neutron cargo screening, proton accelerator development for medical therapy, mobile detector system development, and accelerator research projects conducted within the research and engineering center supported by the Department of Energy (DOE).

Nuclear Reactor Laboratory

The replacement of the heat exchanger required a major effort to monitor radiation exposures and ensure that they were well below regulatory requirements, as well as to make certain that the work was done in a safe manner. We continue to enhance the ALARA (As Low As Reasonably Achievable) radiation exposure control program. This year the dose was higher (by 20%) due to the heat exchanger replacement but still much lower (50%) than the historical average (since 1995).

Regulatory Issues

Regulatory Inspections

MIT was inspected by federal (Occupational Safety and Health Administration, Nuclear Regulatory Commission, Federal Aviation Administration), state (Massachusetts Department of Public Health), and local (Cambridge Fire Department and Inspectional Services) agencies in FY2010. No fines or citations were issued.

Emerging Regulatory Issues

- PCBs in building materials and new federal rulemaking
- Campus fire safety and security reporting requirements
- Upgrades in emergency eyewash requirements for laboratories
- Environmental compliance requirements by funding agencies
- Security regulations for hazardous materials in laboratories

Sustainability Program

MIT's approach to environment, health and safety performance integrates important voluntary environmental stewardship initiatives—which are managed by the deputy director of the Sustainability Program within the EHS Headquarters Office—with compliance programs to reflect a holistic and high standard of stewardship. Going well beyond regulatory requirements, these initiatives are intended to develop sustainable ways to safeguard the environment and the health and safety of the MIT and larger community.

Sustainability Program Overview

The Sustainability Program was established to collaboratively develop, strengthen, and realize MIT's institutional commitments to integrate principles of sustainability and environmental stewardship into all aspects of MIT's facilities, activities, and operations in a manner that enhances the Institute's core education and research mission. The Sustainability Program advances its mission by providing leadership in visioning, planning, facilitating, coordinating, and executing programs and projects that bring best practices into our campus operations while offering rich educational opportunities to the MIT community.

FY2010 saw the continued progress of the Sustainability Program—and sustainability improvements across campus—with a deepening of existing stewardship initiatives and the initiation of new ones focused on energy and an expansion of our partnerships with faculty, students, and staff alike.

Overall Sustainability Program Highlights

Enhancing Campus Operations

In 2010, MIT was again recognized as a national “Campus Sustainability Leader” by the Sustainable Endowments Institute in its annual College Sustainability Report Card, which ranked hundreds of US colleges and universities. The Sustainability Program coordinates and submits campus-wide surveys, develops outreach material, and communicates institutional commitments, approaches, and progress to the community.

From 2005 through 2009, MIT committed \$3 million to new energy conservation measures. The Sustainability Program worked collaboratively with key stakeholders, such as the Department of Facilities and the Office of the Executive Vice President, to understand and build a robust energy conservation and efficiency program.

MIT Efficiency Forward, an industry-leading energy conservation and efficiency program designed to save 34 million kWh over three years and \$50 million over the lifetime of the program-supported projects, was established in May in collaboration with NSTAR. This program creates a new model for enhanced utility efficiency initiatives supporting the Massachusetts Green Communities Act and the state's desire to make efficiency competitive with new source generation. The Sustainability Program was a member of the program development team and played a catalytic role in bringing the necessary faculty, research, and staff resources together for this collaboration.

MIT's commitment to sustainable campus development was reinforced by engaging with the Global University Leaders Forum's Sustainable Campus Charter in early 2010. The charter commits MIT to integrating a series of sustainable development principles that guide campus operations toward a more energy-efficient and sustainable future. The deputy director of the Sustainability Program has been asked by the Office of the President to take the lead in developing and coordinating MIT's activities related to the charter commitment.

The Sustainability Program deepened its collaborations with the Department of Facilities on energy-related issues and focused on increasing support and programming for energy conservation (as outlined above). Additional collaborations to introduce more environmentally friendly practices on campus have resulted in the adoption of biodiesel fuel for our MIT shuttle fleet, improved recycling rates, addition of postconsumer food composting programs, and integration of sustainability into campus-wide planning efforts.

The Institute was commended for excellence by the city of Cambridge through a city council resolution for its work in launching the MIT-NSTAR Efficiency Forward Program. The Sustainability Program represents MIT at numerous governmental and nongovernmental organization meetings and activities in the areas of campus sustainability and stewardship, and worked with the city council to create this resolution.

MIT was awarded two City of Cambridge Go Green awards for campus environmental management excellence for its alternative transportation programs and innovative storm water management system. MIT's campus transportation demand management program reduced the rate at which people drove to work alone from 26% to 22%.

Supporting Student Educational Opportunities

In FY2010, the Sustainability Program and the EHS Office provided significantly increased technical and educational support to student research projects that focused on campus energy and environmental issues, including individual theses, class and student projects, and projects undertaken by student organizations. The Sustainability Program and the EHS Office worked with students to provide data, operational information, UROP (Undergraduate Research Opportunities Program) supervision, and access to key operational personnel, enabling them to conduct research that in return better informs us on aspects of our operations.

The Sustainability Program, in partnership with the MITEI Energy Education Office, expanded its innovative campus sustainability UROP and intern program. The program is designed to facilitate the educational involvement of MIT undergraduates in practical research issues of interest and concern to campus sustainability initiatives at MIT. In the past two years, over 20 UROP projects and internships focusing on campus energy issues were supported by the Sustainability Program in partnerships between academic and administrative units.

The EHS Office also formed a team to support and enable a student-led biodiesel processor that converts spent frying oil from MIT food vendors into diesel fuel for MIT's fleet.

In FY2010, the Sustainability Program continued to manage, administer, and grow the MITEI Student Campus Energy Project Grant Fund, which awards grants to support innovative student projects on campus that advance our campus energy and environmental stewardship goals. Since 2007, 44 grants totaling over \$40,000 have been awarded.

The Sustainability Program and the Department of Facilities partnered with the MITEI Energy Education Office to develop campus-focused research projects that addressed campus sustainability issues for the 5.92 Projects in Energy class, as well as an innovative, campus-focused freshman pre-orientation program and a Sloan School of Management executive education practicum.

Building Community Awareness and Engagement

Recognizing that reducing an organization's energy footprint requires both engineered solutions as well as individual behavior-focused action, the Sustainability Program has taken the lead in partnering with several departments and student organizations to design and implement several behavior change programs that will reduce energy use on campus. These include programs focused on improving chemical fume hood practices, turning off unused lights, promoting revolving door use, enabling computer power management features, reducing paper use in Athena clusters, and supporting the Dorm Electricity Competition.

The Green Ambassador program—a voluntary faculty, student, and staff network of individuals promoting sustainable practices in their offices, labs, and dorms—has grown to more than 185 people. The Green Ambassador network has created an infrastructure rapidly and effectively driving energy efficiency and resource use reduction across campus. The Sustainability Program is responsible for managing and developing the work program that supports the Green Ambassadors.

Supporting and participating in local and regional environmental initiatives is an important role of EHS Headquarters and the EHS Office. Together, the Sustainability Program and the EHS Office represent MIT in a number of off-campus community initiatives and programs to share information, learn best practices, and enable others to take action. Examples include participation in the Northeast Campus Sustainability Consortium, the Ivy Plus Sustainability Working Group, Greater Boston Breathes

Better, the Campus Consortium for Environmental Excellence, Cambridge Public School Volunteers, the Boston Consortium, the Clean Charles Coalition, the Campus Safety Health and Environmental Management Association, the Cambridge Energy Alliance, the US Environmental Protection Agency, the Massachusetts Department of Environmental Protection, Recyclemania, and many more.

Upcoming Sustainability Program Goals

- Work collaboratively with the Department of Facilities and other key departments and academic units to develop energy conservation and efficiency measures to support the MIT Efficiency Forward commitments. This includes a focus on approaches for measuring behavior change project impacts, engaging faculty and staff in joint collaborations, and expanding outreach and education on program implementation.
- Develop and implement a collaborative approach for setting Institute-wide sustainability goals and performance metrics to support activities related to the Global University Leaders Forum Sustainable Campus Charter and other Institute-wide programs.
- Deepen collaboration, engagement, and integration of the EHS Office to enable adoption of energy-efficient practices and behaviors across our laboratories and other areas of MIT.
- Strengthen the Institute-wide presence and community awareness of the Sustainability Program and its resources to maximize the program's impact and contributions to the entire MIT community.

EHS Services

Training

Training-related accomplishments include the development and delivery of a new training module to the MIT Police to cover EHS on call procedures and Security and Emergency Management Office (SEMO) information. Also, two new web courses were launched: Dry Ice Certification (for shipping biological materials) and Controlled Substances Program Review. Integrated Pest Management training for EHS coordinators and day care providers was completed.

EHS Performance Awards were given to the following departments, labs, and centers (DLCs) for outstanding training and inspection performance:

- Plasma Science and Fusion Center (large DLC)
- Center for Environmental Health Sciences (small DLC)
- Koch Institute for Integrated Cancer Research (special recognition)

EHS training continues to be a major emphasis of our office. Such training not only helps the Institute to meet regulatory requirements, but it allows us to reach over 5,000 members of the MIT community annually to help them work in a productive and safe manner.

Some highlights of our training metrics are as follows:

- Average EHS classroom attendance in 2010 was 18 students.
- 31% of EHS sessions were web delivered in FY2010.
- A total of 2,013 individuals took EHS training for the first time this year. Almost 5,000 individuals completed at least one EHS course during the year, with an average of four or five courses.
- The completion rate for our core courses has remained high (between 90% and 95% as of May 2010).
- Overall EHS training enrollment in FY2010 was 24,039 class seats.

There was a 5.8% decrease in EHS training participants in FY2010 (compared to a 4% decrease in FY2009 and a 13% increase in FY2008), mostly due to removal of the Broad Institute from our system.

Hazardous Waste Management

FY2010 was another unprecedented year of growth in research and infrastructure at MIT. Waste pickup requests and the amount of waste generated increased by 17% in comparison to FY2009. Despite the increase in the volume of waste generated on campus, the Hazardous Waste Management Program was able to provide significant savings to the Institute through increased program efficiencies and waste consolidation and minimization efforts.

Previously implemented waste minimization and cost avoidance protocols, in addition to a reduction in on-site support from our contractor, assisted in producing substantial savings in FY2010. These protocols include waste consolidation on a larger scale, reductions in shipments, and increased efficiencies of the overall program. In addition to these practices, the program revisited the characterization and disposal methods of two common waste streams from research labs: ethidium bromide waste and nonregulated chemical sharps. The Institute will realize combined savings each year based on these changes.

Efforts to reduce the unit cost of hazardous waste disposal have also contributed to EHS controlling the costs of the program while retaining a high level of safety, quality, and customer service. The cost of hazardous chemical waste disposal has remained relatively constant for the past four years at \$1.32 per pound of waste (a 40% reduction compared to the cost of \$2.20 per pound in FY2006).

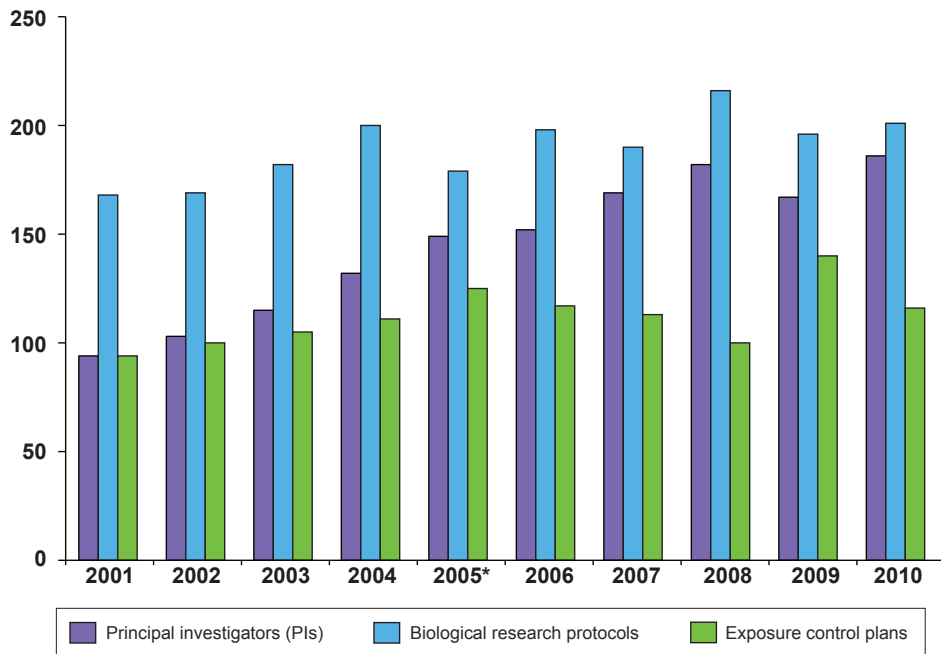
Inspections

We continue to inspect all laboratories at least twice per year and all other spaces with potential hazards at least once per year. This allows us to have routine contact with the MIT community to be available to answer questions or address concerns and provide the Institute with oversight of its operations. We track inspection findings to verify that appropriate corrective actions have been taken and, as necessary, documented in our inspection system.

Support of Research and Education

Biological protocols and research continue to grow at a rapid pace, as demonstrated in Figure 1. Even with the removal of the Broad Institute from our system, researchers' activity increased in FY2010. In addition, the complexity of research and regulatory requirements is increasing, demanding closer attention from our biosafety staff.

Figure 1. Number of biological research registrations and principal investigators in Science, Engineering and VP for Research, FY2001 to FY2010.



*Prior to 2005 the Whitehead Institute's Biosafety Program was administered through MIT's EHS. In 2004, the Whitehead Institute implemented its own biosafety program, removing 13 PIs and 20 protocols that had been reviewed in 2004.

Autoclave Validation Program

The MIT Biosafety Program continues to manage the Autoclave Validation Program. Recent Massachusetts regulatory changes have increased our institutional responsibilities in this area. The regulations, to be implemented by July 2009, now require that each autoclave be certified as functioning appropriately on an annual basis. EHS has devised an inexpensive means of doing this within MIT. We expect to be able to meet or exceed the regulatory requirements through this internal process and save the Institute over \$100,000.

Radiation Authorizations

The radioactive materials authorization program serves as a strong link among the MIT Radiation Protection Committee (RPC), the Radiation Protection Program (RPP), and the licensed material user community within the academy. The MIT broad scope license (Massachusetts Radiation Control Program license 60-0095), the principal governing mechanism of this program, remains in effect with an expiration date of April 2012. The special nuclear material (SNM) license (SNM-986), issued by the Nuclear Regulatory

Commission, is currently being amended to reflect the proposed use of some new SNM sources. Much of our work with new radiation sources will be done at our Bates facility in Middleton.

All uses of radioactive material and radiation-producing equipment are reviewed and approved by the MIT Committee on Radiation Protection on a continual basis. RPC fulfilled its required quarterly meeting frequency for the past year. There are currently 137 authorizations, of which 61 were renewed or amended during the past year. There were six new applications for radioactive material use over the past year. Staff members conducted biennial audits of research projects during the authorization renewal process, along with the annual audit (in May 2010) of all operational programs. They also performed a security audit of all licensed material storage locations and conducted the annual program audits for the Whitehead Institute for Biomedical Research and Draper Lab during the past year.

Service programs are implemented to support the authorization and registration processes and ensure the safe handling of radiation sources at MIT. Programs include control/security of licensed materials received at the Institute; radioactive material order approval; receipt, monitoring, and delivery of radioactive samples; collection and management of low-level radioactive waste; radiation worker dosimetry and the ALARA radiation exposure control program; environmental radiation monitoring; laboratory radiation surveys and sample analysis; radiation worker training/retraining; radiation survey instrument calibration; packaging/transport of radioactive samples; and emergency response.

A particularly challenging program involved detection of radiation tested at speeds of 5 to 35 miles per hour with the radioactive sources a minimum distance of 100 meters from the moving vehicle. During the discussion of proposed experiments and potential risk analyses, RPP determined that the Briggs athletic fields would be a suitable location for the experiments, as the detection vehicle could be driven at the various required speeds on Vassar Street and the fields allowed for the varying distances of the radioactive material from the vehicle. The experimental and safety plans were presented to and accepted by RPC. RPP staff facilitated the experiments, which took place from 5 am to 2 pm on consecutive weekends in August. RPP arranged for MIT Police details and the use of the Briggs fields and facilitated all measurements and radioactive source locations. Those involved in the project were extremely appreciative of our efforts and accommodations, knowing that MIT was one of only a few licensed facilities that could have accommodated their experiments.

Increased Control and Security of Radioactive Sources

We continued the implementation of the “increased control” requirements for source irradiator facilities. A grant secured from the National Nuclear Security Administration (NNSA) was used last fall to upgrade the security system for our irradiator facilities. Upgrades included installation of a biometrics component (iris scanner) for user access identification, a radio frequency ID seal interconnected to the irradiators with remote monitoring capabilities, and “hardening” of the irradiators to make removal of the source more difficult. In addition, alarm monitoring equipment was installed in the

MIT Operations Center to serve as a complement to the equipment at the MIT Police headquarters. We assist in the quarterly testing of the irradiator security systems and reports the results to NNSA.

A total of 108 trained irradiator users were fingerprinted during the past year. Once deemed acceptable for unescorted access by the trustworthiness and reliability official and the FBI, individuals are trained by RPP on the new security system.

RPP professionals, along with representatives from the MIT Police and the Cambridge Police and Fire departments, participated in a response force training exercise at DOE's Y-12 facilities in Oak Ridge, TN, during May 2010.

Construction Safety

Construction activities on campus remain a significant risk that must be closely monitored. While contractors have day-to-day responsibilities, EHS provides preplanning guidance and Institute oversight.

Injury and Illness Reporting and Investigations

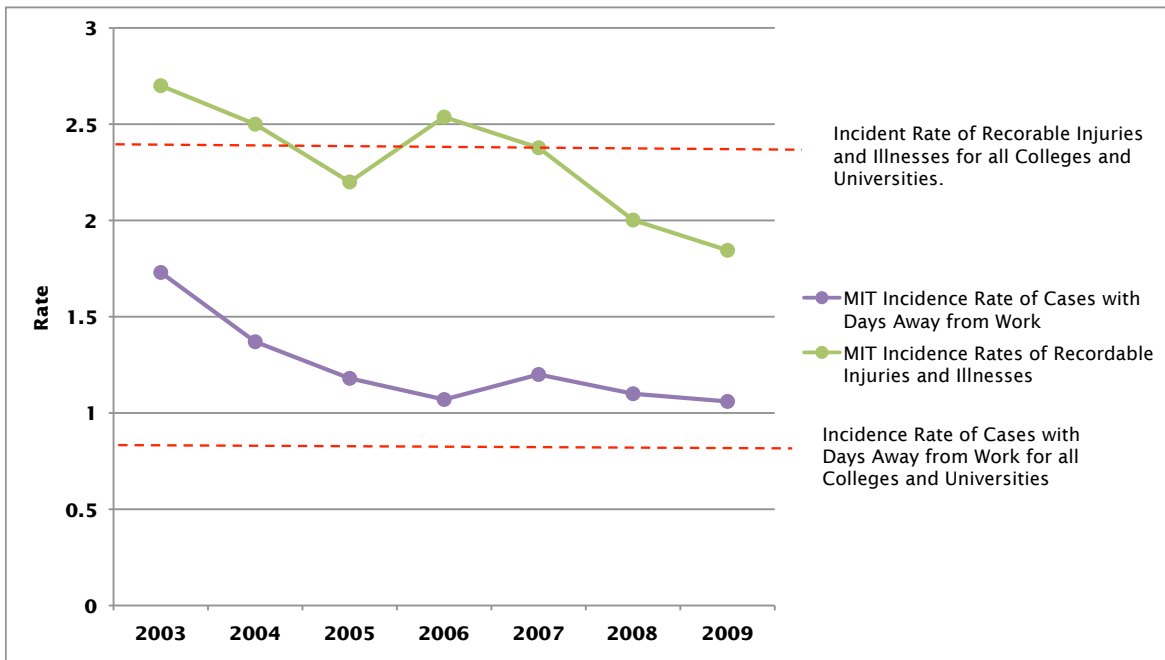
The EHS Office continues to work with DLCs to use the incident reporting and investigation system, which centralizes and electronically links all information related to an incident, facilitates data handling, and provides online access to reports on injuries to Department of Facilities management, EHS Office staff, and DLC EHS coordinators.

The incidence rate of total recordable injury and illness cases for calendar year 2009 was 1.8. This rate continued the downward trend from the previous year and was well below the calendar year 2008 (latest available data) incidence rate for private industry (3.9), the Massachusetts rate for private industry (3.6), and the rate for colleges and universities overall (2.4).

Trends in MIT's incidence rate of total recordable injuries and days away from work are shown in Figure 2. MIT's days away from work rate edged slightly down from last year and was near the national rate of 0.7 for colleges and universities. If MIT were at that 0.7 rate instead of the current 1.06 rate, estimated annual savings would be approximately \$204,000.

MIT trends for the last six years in number of days of restriction/job transfer, number of days away, and total number of injuries are also shown in Figure 2. These decreases saved MIT \$269,000 in calendar year 2009 relative to the costs of lost productivity if the number of days away had remained the same as in calendar year 2003. This has translated to an estimated savings of \$1.6 million over the past six years.

Figure 2. MIT Incidence Rates of Recordable Injuries and Illnesses, and Rate of Cases with Days Away from Work, 2003 to 2009.



FY2011 Goals

- Perform at least five EHS process reviews
- Conduct follow-ups and implement the 12 EHS/Facilities work group recommendations
- Continue the EHS Office reorganization
- Implement the EHS cross-training program
- Bring the new Koch Institute and Sloan School buildings online safely and efficiently
- Implement a contractor safety program
- Influence proposed EHS regulations that may affect MIT
- Implement an Institute-wide commercial vehicle program to allow for better compliance oversight and identify opportunities for efficiency gains
- Implement an Institute-wide explosives/reactive chemicals control program
- Implement several new hazardous waste minimization initiatives to continue to reduce the quantity of hazardous materials generated by MIT and improve cost effectiveness
- Collaborate with Procurement to develop a more effective and less costly way to track the purchase of chemicals heavily regulated by the Department of Homeland Security and the Environmental Protection Agency

- Collaborate with the UROP Office to develop a method to ensure that students are properly trained and supervised to perform their research safely
- Collaborate with the Office of Sponsored Programs on several regulatory issues, including import/export rules, research involving human embryonic stem cells and induced pluripotent stem cells, and dual-use issues
- Develop a template for addressing EHS issues in MIT's international collaborations

Challenges

- Determine who should ship regulated chemicals and how they will do so
- Provide oversight of UROP activities that may present a risk to students
- Closely monitor activities and address the increase in biological research
- Monitor, influence, and quickly react to new regulations
- Develop a mechanism to respond to the increase in requests for Certification of Environmental Compliance in research grant applications in a timely manner

MIT will be hosting a DOE-sponsored table-top exercise in August 2010 to measure the capabilities of our first responders during an attack on our nuclear facilities. RPP is hosting the event along with the Nuclear Reactor Laboratory, SEMO, and the MIT Police. We anticipate participation from 150 to 175 people at the exercise representing first responders from local, city, state, and federal agencies.

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More information about the Environment, Health, and Safety Office can be found at <http://ehs.mit.edu/>.