

Environment, Health, and Safety Office

The [Environment, Health, and Safety Office](#) (EHS) is an institutional compliance office as well as a service and operations department. It supports the Institute's environment, health, and safety mission associated with education, research, and the operation of MIT's endeavors in Cambridge, at Lincoln Laboratory, and worldwide.

During the past year, there continued to be a national focus on environment, health, and safety issues at academic institutions. This resulted from several tragedies that had occurred at universities in the previous four years: the death of a laboratory researcher at the *University of California, Los Angeles*, with subsequent criminal charges filed against the university and principal investigator (PI); the death of an undergraduate student in a departmental machine shop at Yale University; and a laboratory explosion and injury to a graduate student at Texas Tech University. The US Chemical Safety Board released a report and video identifying some of the root causes behind these tragedies and asking universities to review and strengthen their EHS programs. In 2014, the National Academy of Sciences published a study, *Safe Science: Promoting a Culture of Safety in Academic Chemical Research*, that emphasizes the responsibility of all university community members for the safety and health of their colleagues as well as themselves. In view of these events, EHS has continued its efforts to review and strengthen the Institute's EHS Management System (EHS-MS).

To reduce the risks that are inherent to new and innovative research, EHS must be able to guide the Institute in early risk assessments in order to embed mitigation designs and practices in research proposals. EHS programs have helped to identify predictive indicators that mean the Institute could be put at risk if the research being assessed is not done carefully, with safety considered in the planning stages.

EHS has a history of planning for safety by following the scientific literature, tracking where the funding is coming from and where the research is going, and interacting with leading faculty members. For example, 10 years ago, EHS recognized that nanotechnology was a growing area; eight years ago, that synthetic biology was a growing area. In both cases, EHS developed the necessary safeguards before regulatory agencies promulgated rules. More recent trends have seen engineering moving into the biological sciences. This requires EHS to reevaluate the design requirements for engineering facilities and the training needs of engineers. And over the past few years, there have been significant increases in battery research, which typically uses highly reactive materials, and in the conversion of traditional machine shops to digital fabrication studios, which present new types of hazards to users.

Enabling MIT's Mission

Faculty and Principal Investigator Responsibilities

In FY2011, EHS undertook a new EHS orientation for faculty members and PIs, expanding it to include an overall presentation and discussion for all faculty. This is an effort to help faculty members understand their EHS responsibilities and to become aware of the resources that are available to assist them. This orientation has been

completed by 164 out of the 432 PIs who are listed as working with hazardous materials in the EHS Space Registration database (38%). This outreach will continue in FY2015.

Emergency Preparedness Planning

In FY2014, EHS made significant strides in rolling out a new model for all-hazards emergency preparedness plans (EPP) to be used by departments, laboratories, and centers (DLCs) across MIT in collaboration with the Security and Emergency Management Office. EHS developed an all-hazards [emergency preparedness plan](#) template that consolidates evacuation procedures, communications protocols, shelter-in-place measures, and the US Occupational Safety and Health Administration (OSHA) fire prevention requirements, into a five-worksheet Excel document. This is an improvement over conventional EPPs, which tend to be Word documents that are 25 to 30 pages long. The new template has been designed to be eventually imported into a database or web-enabled platform. EPP modernization accomplishments in FY2014 included updating the inventory of existing EPPs from more than 140 reporting units across MIT, approximately 50% of which are currently enrolled in EHS-MS. The EHS Safety Program successfully worked with DLCs that are entered in the EHS-MS to raise the initial inventory from 10% – 15% to more than 90% by June 2014.

Machine Shop Program

The Yale incident also spurred EHS to do a complete review of MIT's machine shop program. EHS has assessed approximately 70 individual machine shops at the Institute, convened a Machine Shop Safety Forum of machine shop supervisors or representatives to share and review practices and "working alone" policies, and successfully conducted a shop safety video contest to engage the community about shop safety. EHS documented approximately 573 machine tools, assessed their safety features, and identified where improvements were needed (in approximately 80% of them). Upgrades have been completed in 32 shops (288 tools) and are in process in nine shops (approximately 78 tools) for a total of 366 tools (upgrades approximately 75% complete). EHS expects to complete assessments in the remaining shops (many are small) in FY2015. The Office of the Executive Vice President and Treasurer and the affected departments have co-funded these upgrades.

Comprehensive Laboratory Hazard Assessments

A causal factor of the tragic incidents that have occurred in universities over the past four years has been the lack of a comprehensive hazard assessment before a procedure is started. There are currently several programs that can assess a specific hazard in a laboratory or register or document conditions in the laboratory. However, there is no comprehensive assessment of each laboratory on the basis of all the information available, and review of specific activities performed in the laboratory typically is limited to required reviews (i.e., biosafety protocol reviews and radiation authorizations). The laboratory hazard assessment (LHA) pilot program conducted in FY2013 was well received and was expanded in FY2014. EHS has conducted LHAs in more than 52 PI groups in 11 DLCs to date.

EHS has also reviewed hazards in six undergraduate courses. In the coming year, EHS hopes to expand the program with more LHAs in laboratories, including new DLCs, and EHS hopes that additional DLCs sign on for reviews of all of their laboratories. EHS is also working with more undergraduate courses to perform hazard assessments and develop tools for faculty.

Establish an Accident and Injury Reporting System for Students

In collaboration with MIT Medical, EHS expanded the current accident and injury reporting system, required by OSHA to document and track employees' injuries, to include students. This has allowed EHS to follow up more thoroughly on incidents involving students, to identify trends in activities, and to find opportunities to intervene in activities to eliminate or minimize the risk of accidents and injuries. In FY2013, there were 41 reported incidents; in FY2014, there were 22 reported incidents.

International Agreements

Major efforts for EHS this year were to support the Singapore–MIT Alliance for Research and Technology (SMART) and the MIT–Skolkovo Institute of Science and Technology Initiative (Skoltech) agreements. Support for SMART focused on designing, and completing the move into, a new facility in Singapore in the first half of FY2014, and assisting in customizing and implementing MIT's EHS-MS for adoption by SMART. Support for Skoltech has taken the form of advising on the design of a new campus, and developing both a strategy for identifying and assembling the components of an environment, health, and safety management system and a strategy for building such a system. This phase of involvement with Skoltech has been completed.

EHS has assisted other collaborators, including the Masdar Institute Cooperative Program, the Singapore University of Technology and Design, and King Fahd University of Petroleum and Materials. EHS has also provided advice to international colleagues in Brazil and Turkey who look to MIT as having a world-class EHS program.

Laying the Foundation for the Future

Significant Laboratory Design Reviews

EHS has been an active design team member during the programming and schematic design phases of the Nano-materials, Structures, and Systems Laboratory (nMaSS). EHS considerations are significant for this clean-room building that will have a significant impact on campus during construction and significant use of hazardous materials when opened. EHS has been advocating the consolidation of similar research equipment that uses highly toxic gases in the nMaSS facility so that the expensive engineering controls required for these systems can be shared. Laboratory ventilation, hazardous gas monitoring, chemical storage, hazardous waste handling, and wastewater treatment are just some of the areas addressed. EHS will also focus on minimizing community impact during construction.

Overall, 97 design and construction projects were reviewed. This effort is expected to increase fourfold in FY2015 with increased renovations and infrastructure renewal.

Updating the Master Plan for Campus Waste Water

EHS has worked with Campus Planning, Campus Engineering and Construction (CPEC) and Utilities Operation on the FY2012 Notice of Violation for mercury and the FY2013 Notice of Noncompliance for copper issued to Utilities Operations from the Massachusetts Water Resources Authority (MWRA). Combined with foreseeable future needs for the nMaSS facility, these notices have brought agreement that a study of how to update the campus waste-water master plan is necessary – as, probably, is the expansion of the system.

New Central Hazardous Waste Accumulation Facility

A new hazardous-waste accumulation facility is planned for the ground floor of Building 24 that will replace the existing Building 12A facility. The improved layout of the facility will ensure a more efficient and effective operation and provide some redundancy in critical campus waste-handling facilities that currently do not exist. EHS expects to occupy this facility in the last half of FY2015.

Transforming Experiences through Collaboration

eShipGlobal Software Project Pilot

After careful evaluation, EHS believes that the eShipGlobal software can simplify the shipping process for the MIT community, reduce overall costs, and enhance compliance with regulations covering shipping of hazardous materials and export controls. This is a collaboration between Sourcing and Procurement, Information Services & Technology (IS&T), the Office of Sponsored Programs (OSP), several DLCs, and EHS. Implementation is scheduled for the coming fiscal year. Goals include increased compliance with US Department of Commerce export rules and US Department of Transportation hazardous materials regulations. This reduces MIT's risk. Added benefits are a simplified shipping process and reduced shipping costs.

Laboratory Coat Program

The Committee on Toxic Chemicals mandated the use of laboratory coats for all work with hazardous chemicals at its June 2012 meeting, in part as a response to the national concern about safety in laboratories. EHS established a task force consisting of representatives from Sourcing and Procurement, the user community, and the EHS office to ensure that information and options were available to the MIT community for selecting appropriate laboratory coats and for engaging cost-effective services to clean and maintain the laboratory coats. The work of the committee has resulted in an extensive compilation of information about laboratory coat options and the selection of two companies as preferred vendors.. An outreach campaign was conducted in FY2014 to ensure that DLCs know about the preferred options and vendors and options so their students can have easy access to the correct laboratory coats.

Chemical Inventory

During fall 2012, the EHS Inventory Team spearheaded the process of identifying a new chemical inventory vendor to replace the current centrally provided platform (ChemTracker). The goal for the new platform was to offer a solution that better

supports laboratories' need to manage inventories effectively while giving EHS staff the ability to meet MIT's chemical regulatory reporting and oversight requirements.

Working closely with MIT Sourcing and Procurement, EHS developed the detailed specifications grid, project goals, and platform requirements that were issued to the seven vendors who were invited to respond to the request for proposal. Stakeholder laboratory personnel from seven key DLCs participated in the vendor review and selection process. The effort secured faculty endorsement and FY2015 funding. The inventory project is now in the contract negotiation phase with the chosen vendor. The goal is to provide a new inventory solution for use by laboratories and EHS during FY2015.

Compliance Related Activities

The Massachusetts Department of Environmental Protection (MassDEP) conducted a Title V air permit audit during the spring of 2012. This inspection resulted in a consent order, with fines, to the central utility plant (CUP) for stack emission exceedances and to the MIT campus for boiler and emergency generator noncompliant stack heights. EHS and CPEC have completed corrective actions to meet MassDEP requirements. Federal and state reporting of greenhouse gas emissions indicated that 2013 greenhouse gas emissions were reduced by 5% compared with 2012 (in metric tons carbon dioxide equivalence).

During the past year, MIT was under an Administrative Consent Order with Penalty from MassDEP that was closed on March 31, 2014. Some of the items in the consent order included modifications to exhaust stack designs on existing natural gas boilers and diesel generators, installations of particulate matter filters on two existing diesel generators, and replacement of one diesel generator.

MWRA issued two Notices of Violation to the CUP for exceedance of copper limits for wastewater discharge. The CUP wastewater system services the Building 42 operations and 100 laboratories in five buildings on campus. Testing copper levels for each notice of violation was closed out when additional testing revealed that the CUP's discharge met the permit discharge requirements for copper.

MassDEP audited several Activity Use Limitation sites on and off campus. These sites are regulated by the Commonwealth in managing low-risk contamination left in place on properties. Findings from the audit were resolved by the EHS Office, the Office of the General Counsel, and the City of Cambridge. No violations or penalties were proposed by MassDEP.

OSHA inspected the Building 13 mechanical spaces because of a complaint concerning potential exposure to toxic chemicals. OSHA issued three citations. All conditions have been abated.

MassDEP conducted a comprehensive multimedia inspection of Lincoln Laboratory. The final report has not yet come in.

The Office of Biohazard Assessment of the National Institutes of Health (NIH) conducted an inspection of the Biosafety Program.

In preparation for upcoming stricter stormwater regulations, EHS has reviewed the current stormwater system and operations to ensure that the needs of the nMaSS building will be met.

The Massachusetts Radiation Control Program conducted an unannounced inspection of the activities included under the Institute’s broad-scope radioactive materials license. The inspection was conducted over four days and included site visits to the Lincoln Laboratory and the Bates Linear Accelerator Center campus. There were no findings of noncompliance.

Accomplishments

During the past year, the EHS Office continued its service to the Institute through its interactions with faculty, post-doctoral associates, graduate and undergraduate students, and staff. EHS also collaborated closely with other administrative offices, particularly the Department of Facilities (DOF), the Division of Student Life, the Office of Sponsored Research, Sourcing and Procurement, the Office of General Counsel, the Office of Risk Management, the Office of International Agreements, and IS&T.

Waste Management Program

Regulated Medical Waste: The regulated medical waste management program that began in FY2013 and was implemented by the end of FY2014 improves the collection and processing of biosharps containers and biowaste from MIT laboratories. The number of biosharps containers collected was reduced by 59%; the number of bio-burn boxes increased by almost 300%. The new management practices save the Institute money, reduce the potential for noncompliance, and, by eliminating the need for 10,000 to 11,000 autoclave cycles per year, also reduce the risk of injuries and eliminate researchers’ need to spend time on autoclaving waste. The program has met with great acceptance.

Radioactive Waste Disposal 2008-2013

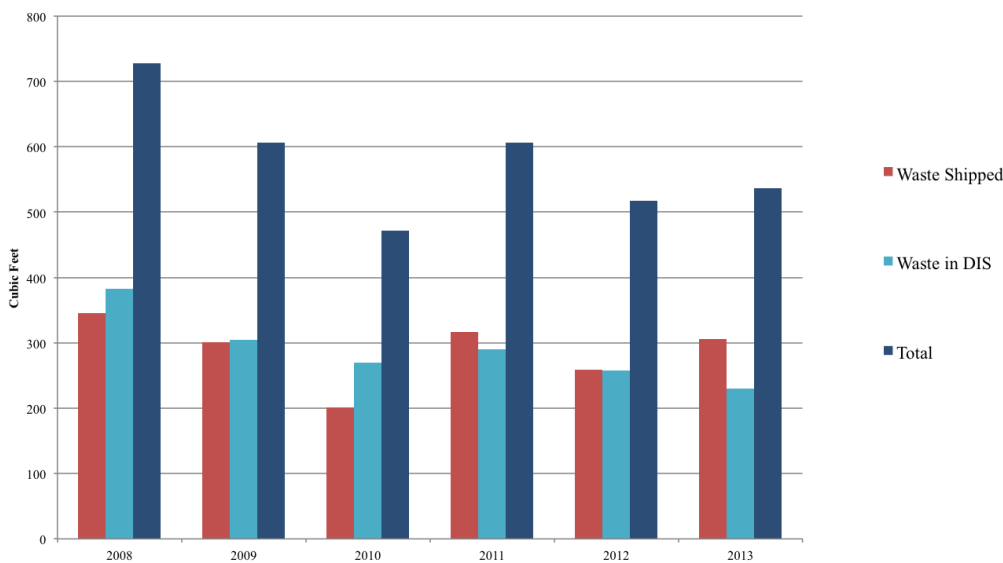


Figure 1. Radioactive Waste Disposal, 2008–2013

Radioactive Waste: The Radiation Protection Program continued to collect and process low-level radioactive waste collected from radiation laboratories. Figure 1 shows the total low-level radioactive waste (LLRW) volumes collected and disposed of over the past six years. LLRW shipped waste represents dry active waste and liquid scintillation waste contaminated by radionuclides with long half lives. Decay-in-storage (DIS) waste represents dry active waste and radioactive sharps that were contaminated by radionuclides with short half lives and were managed in-house. The total amount of waste managed remained constant this past year.

Hazardous Chemical Waste: Hazardous waste volumes stayed relatively constant over the past five years, even with the increases in research and chemical use. The cost of waste (expressed in dollars per pound of waste disposed) was reduced from \$1.72 in FY2004 to \$1.20 in FY2014. EHS continues to seek operational changes that will reduce costs and noncompliance issues.

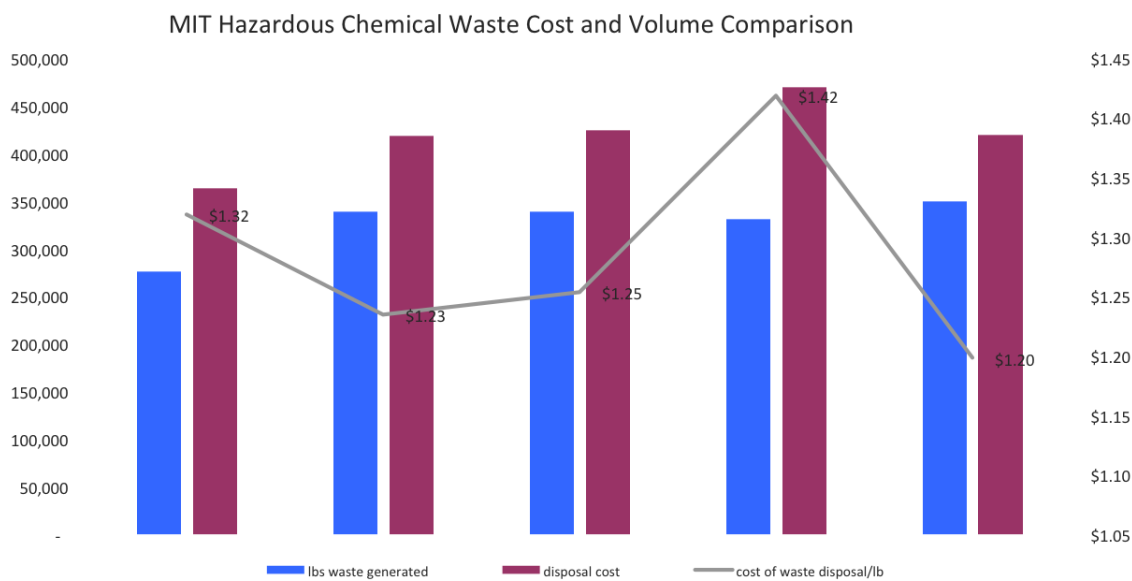


Figure 2. Hazardous Chemical Waste Disposal Spending and Waste Generated

Training: Development and delivery of EHS training is a major effort for the Office. Such training is a regulatory requirement and, more important, it is a leading indicator of risk reduction.

Core Courses Training Completion Metrics: Some DLCs have a lab-specific training that is DLC-wide. EHS added this as a metric in FY2011. As expected, there are better completion rates for this than for the classroom version, which is more difficult to administer. All other metrics remained steady compared with last year.

Table 1. Training Completion Rate for Common EHS Courses Over the Past Five Years

| | Completion Rate FY2010 | Completion Rate FY2011 | Completion Rate FY2012 | Completion Rate FY2013 | Completion Rate FY2014 |
|---|------------------------|------------------------|------------------------|------------------------|------------------------|
| Course | (Total trainees) | (Total trainees) | (Total trainees) | (Total trainees) | (Total trainees) |
| General Chemical Hygiene and Hazard Communication | 98% (4,760) | 97% (4,541) | 97% (4,994) | 97% (5,741) | 97% (5,243) |
| Lab-Specific Chemical Hygiene and Hazard Communication | 87% (3,847) | 85% (2,843) | 88% (3,794) | 84% (3,236) | 85% (3,592) |
| DLC Lab-Specific Training | N/A | 93% (980) | 94% (1,393) | 87% (1,825) | 88% (1,508) |
| Bloodborne Pathogens | 92% (1,329) | 91% (1,401) | 92% (1,461) | 92% (1,298) | 93% (1,220) |
| General Biosafety | 96% (2,357) | 97% (2,358) | 97% (2,626) | 99% (2,806) | 97% (3,111) |
| Radiation Safety | 94% (783) | 94% (706) | 96% (706) | 95% (767) | 95% (765) |
| Laser Safety | 95% (1,181) | 93% (934) | 94% (1,091) | 96% (1,651) | 94% (1,364) |
| Managing Hazardous Waste | 90% (4,878) | 90% (4,221) | 91% (5,621) | 87% (5,219) | 89% (5,210) |
| Total EHS Web and Classroom (Includes Lincoln Laboratory) | 24,039 | 25,197 | 26,796 | 25,553 | 29,050 |

Note: All those who need specific training prior to work with hazardous materials and equipment have completed training. The data does not reflect those who have left MIT and whose records have not been archived, or those who signed up to take a course out of interest or future need but have not taken it yet.

Overall EHS Training Metrics

Some trends in EHS training are:

- Average EHS classroom attendance for 2014 was 21 students, up from 19 in 2013.
- The number of total training seats for core courses has remained relatively stable, but the number of overall training seats has increased by 15% because of some new courses and outreach to potential users of some of the more narrowly focused courses.
- Some 29.7% percent of EHS sessions were web-delivered in FY2014, compared with 32.4% in FY2013.
- There are no external costs for web course hosting; everything is hosted internally.
- Total time spent by EHS trainers (EHS Office only) was 2,961 hours, or 1.5 full-time equivalent (FTE) in FY2014, compared with 1.4 FTE in FY2013.

Injury and Illness Report

Incident Reporting and Investigations

The EHS Office continues to work with DLCs on using 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 DOF management, EHS Office staff, and DLCs' coordinators. This allows more effective follow-up and initiation of corrective actions. A new program was established using an updated reporting form to record undergraduate student injuries and provide reports.

The incidence rate of total recordable injury and illness cases for calendar year (CY) 2013, 1.8, is shown in Figure 3, along with data for the previous 10 years. This rate is the same as for CY2012, but it is well below the CY2011 (latest available data) incidence rate for private industry (3.4) and for Massachusetts (2.5). It is the same as the incidence rate for colleges and universities (1.8).

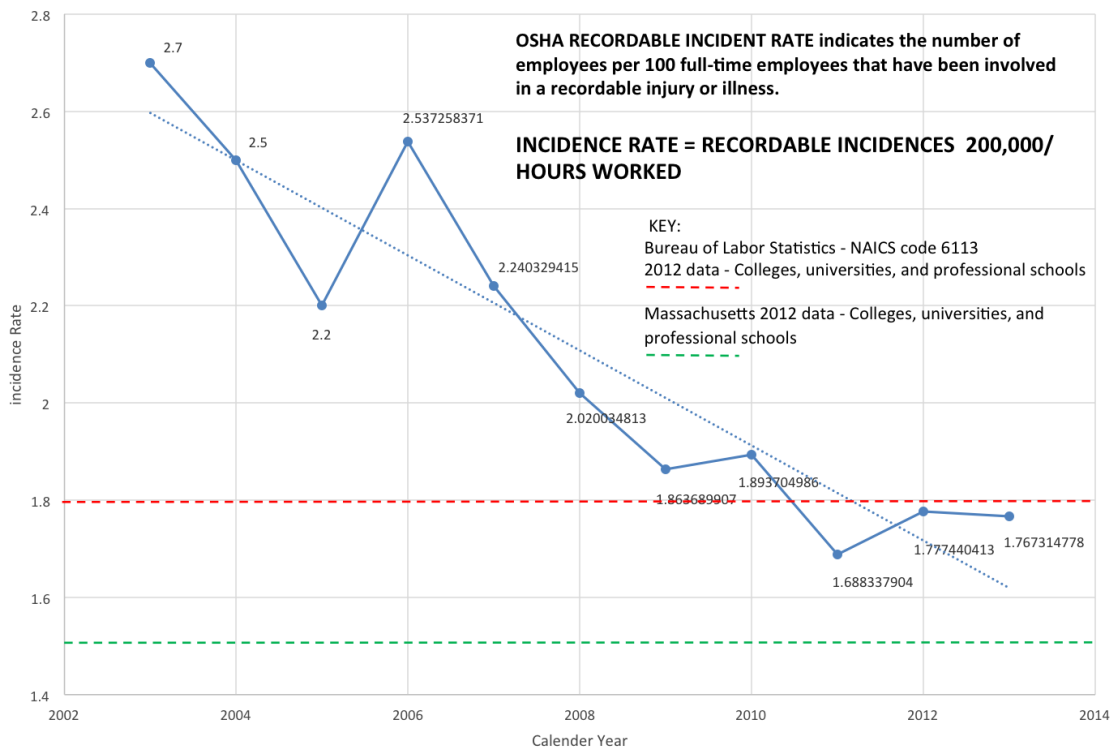


Figure 3. MIT Recordable Incident Rates of Recordable Injuries and Illnesses

Table 2 shows a comparison of MIT's 2012 injury and illness data compared with the latest Bureau of Labor Statistics data (2011).

Table 2. MIT 2012 Injury and Illness Data Compared with 2011 Bureau of Labor Statistics Data

| Case Type | MIT | All US Universities |
|--|-----|---------------------|
| Total Rate (Total recordable injury and illness cases) | 1.8 | 1.8 |
| Days Away Rate (Cases involving days away from work) | 1.0 | 0.5 |
| Job Transfer and Restriction Rate (Cases involving job transfer or restricted work activity) | 0.2 | 0.2 |
| Days Away, Restricted, and/ or Transferred Rate (Total cases involving days away from work, days of restricted work activity, and/or job transfer) | 1.3 | 0.8 |

Note: The incidence rate of injuries and illnesses is computed from the following formula: Number of injuries and illnesses X 200,000/ employee hours worked = incidence rate. The 200,000 hours in the formula represents the equivalent of 100 employees working 40 hours per week, 50 weeks per year, and provides the standard base for the incidence rates.

Following is a breakdown of the five most commonly recorded incidents at MIT in 2013:

- 22% — Overexertion in carrying, lifting, or pulling objects (42)
- 18% — Falls (35)
- 14% — Injury from improper handling of object (including foreign objects in the eye) (27)
- 13% — Struck by stationary or falling objects (26)
- 7% — Bending, climbing, crawling, reaching, twisting (13)

Table 3 shows an estimated \$2.5 million in savings over the past 10 years, relative to the cost of lost productivity, if the number of days away from work at MIT had remained the same as in CY2003.

Table 3. Cost Savings from Reduction in Lost Time from Injuries and Illnesses

| Year | Number of Days Away Due to Injury / Illness | Number of FTEs | Cost of FTEs | Cost if Days Away Equal to 2003 | Cost Savings |
|--------------|---|----------------|--------------------|---------------------------------|--------------------|
| 2003 | 2721 | 13.61 | \$816,300 | \$816,300 | \$0 |
| 2004 | 2295 | 11.48 | \$705,713 | \$836,708 | \$130,995 |
| 2005 | 2079 | 10.40 | \$654,885 | \$857,115 | \$202,230 |
| 2006 | 1385 | 6.93 | \$448,740 | \$881,604 | \$432,864 |
| 2007 | 2124 | 10.62 | \$705,380 | \$903,644 | \$198,264 |
| 2008 | 1375 | 6.88 | \$468,053 | \$926,235 | \$458,182 |
| 2009 | 1948 | 9.74 | \$679,682 | \$949,391 | \$269,709 |
| 2010 | 1522 | 7.61 | \$544,321 | \$973,126 | \$428,805 |
| 2011 | 1901 | 9.51 | \$696,861 | \$997,454 | \$300,593 |
| 2012 | 2816 | 14.08 | \$1,058,086 | \$1,022,390 | -\$35,695 |
| 2013 | 2371 | 11.86 | \$908,699 | \$1,042,838 | \$134,139 |
| Total | 22537 | 112.69 | \$7,686,720 | \$10,206,805 | \$2,520,085 |

Note: Cost calculation uses the following estimated compensation: 2013—\$76,651; 2012—\$75,148; 2011—\$73,315; 2010—\$71,527; 2009—\$69,782; 2008—\$68,080; 2007—\$66,420; 2006—\$63,000; 2005—\$63,000; 2004—\$61,500; 2003—\$60,000.

Biological Research

Increase in Biological Research at MIT

Over the past 13 years, there has been continued growth in the number of faculty members engaged in biological research and participating in the Biosafety Program and the Committee on Assessment Biohazards/Embryonic Stem Cell Research Oversight (CAB/ESCRO) program at MIT. This growth is a reflection of the increased funding in biological research, the fundamental applicability of ongoing MIT bioresearch, and the use of new technologies in life science research at MIT.

Much of the EHS oversight program is built on the relationship between EHS staff, PIs, and the PIs' laboratory groups. EHS meets with PIs to discuss their research and the risks inherent in the work and procedures, to assist with registrations, to conduct live trainings at laboratory group meetings, and to inspect—and just visit—the laboratories. Its intent is to remain a highly visible and easily approachable resource for researchers.

Another indication of the shift in biological research is the shift in the containment level of the biological research at MIT. The number of biological research registrations considered to be research requiring biosafety level 1 containment measures has dropped as a percentage of the reviewed and approved registrations over the past 13 years. Most biological research conducted at MIT required biosafety level 2 or 2+, which are higher containment levels. This is probably because of the large number of laboratories that use human materials and the increase in laboratories that use various viral vectors, bacterial and or viruses.

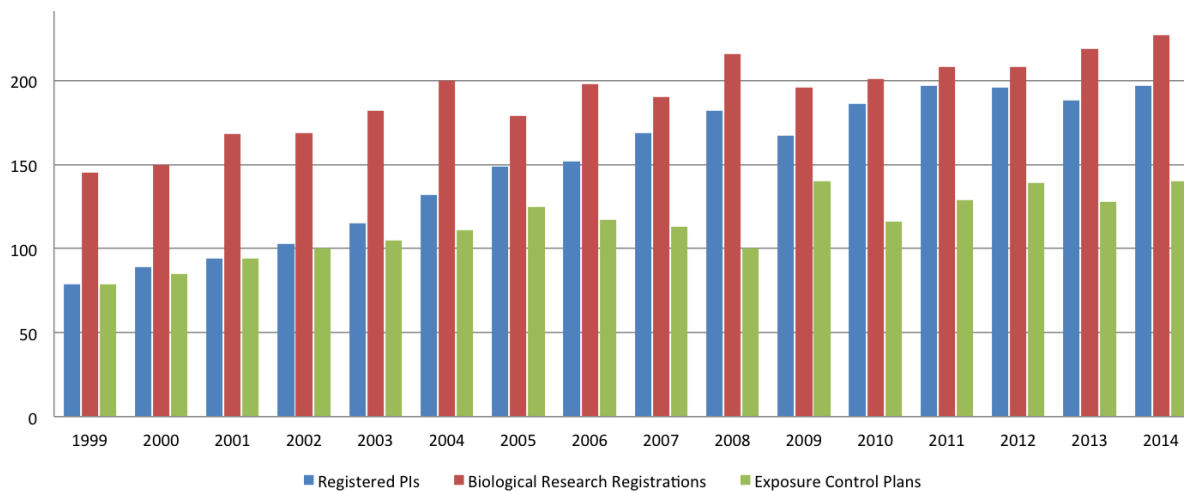


Figure 4. Volume of Biological Research Registered with CAB/ESCRO by Year

CAB/ESCRO Oversight Program

As of April 2013, the NIH Guidelines were amended to extend the purview of all institutional biosafety committees to include responsibility for oversight of research involving synthetic nucleic acids. This is because of the fast-growing nature of the research involving synthetic nucleic acids, the high dual-use potential of this particular area of research, and the fact that this research had not been within the scope of any federally mandated committee. MIT has been in compliance with this requirement for quite some time—the Biosafety Office brought synthetic nucleic acid research into the CAB/ESCRO review and approval process some seven years ago. The change in the regulations did not necessitate any changes in the EHS oversight program.

Office of Sponsored Programs Collaboration on Human Embryonic Stem and Induced Pluripotent Stem Cell Research

The Biosafety Program has effectively collaborated with OSP to ensure that copies of all CAB/ESCRO approval letters for use of human embryonic stem cells are sent to OSP as needed. The Biosafety Program also includes OSP on state and federal assurance letters. EHS is examining ways to give OSP viewing access to its central biological research registration database so that OSP can cross-check CAB/ESCRO approval dates for all biological research registrations. Beyond the need to ensure appropriate funding for human embryonic stem cell and induced pluripotent stem cell research, access to the OSP grants database is helpful in understanding future areas of research growth.

Coordination of Research Compliance

Three committees—CAB/ESCRO, the Institutional Animal Care and Use Committee, and the Committee on the Use of Humans as Experimental Subjects—carry federal oversight and documentation responsibilities; they provide assurances to different agencies and must be registered with those agencies. Their compliance programs require approvals that involve various levels of review, depending on risk. In several instances, there is overlap in committee responsibilities.

The deputy director of the Biosafety Program is the only person who is a voting member of all three committees, and, as a voting member, reviews all research protocols for all three committees. This amounts to review of several thousand protocols a year. It has allowed the deputy director to identify areas of overlapping responsibilities and to work with the various committees to have one take primary responsibility for oversight, with the other committees developing mutually supporting policies.

Research Using Radiation-Producing Materials and Equipment

During the past year, the campus, Bates, and Reactor Radiation Protection Programs (RPPs) continued their strong presence in the Institute with the continued implementation of numerous service programs and interactions with faculty, post-doctoral associates, students, and staff. RPP staff performed radiation hazard risk analysis for proposed and continuing uses of licensed material and machine-produced radiation for radioactive materials authorization, analytical x-ray machine registration, accelerator registration, experimental use and operations of the MIT research reactor, laser registration and safety, and radio frequency (RF) source registration and safety. The demand for RPP services remained strong, with an increase need for experimental reviews involving higher-powered laser and RF sources at Lincoln Laboratory and the Haystack/Millstone Hill Observatory, and routine and nonroutine outages at the nuclear reactor. RPP professionals met with faculty members and senior research scientists on approximately 100 different occasions and continued to serve the Institute in leadership positions within the EHS-MS.

RPP assumed responsibility for the quarterly security and alarm testing program for the gamma irradiator facilities. The testing had been performed by a federally sponsored contractor during the previous three years. RPP works in collaboration with the MIT Police, the Security and Emergency Management Office, and the DOF Operations Center to manage these secure facilities.

Under the non-ionizing radiation protection programs, there were two significant efforts conducted by RPP. The Haystack Ultrawideband Satellite Imaging Radar project was accepted by the US Air Force and commissioned in December 2013. The Air Force's acceptance criteria included a comprehensive RF hazard assessment of the facility and surrounding landscape. RPP completed the RF hazard assessment report and submitted it to the Air Force. RPP personnel also met with the Air Force representative to perform confirmatory measurements as part of this acceptance. This project was a multiyear program that won a 2014 research and development award.

In addition, some concerns had arisen regarding potential RF exposure of individuals from the installation of wifi and cellular data systems in buildings throughout campus, including residence halls. RPP met with the concerned parties and devised an evaluation process. Working with IS&T, RPP conducted a comprehensive analysis and evaluation of these systems; the concerns were alleviated and the projects went forward.

The safety culture at the MIT Nuclear Reactor Laboratory (NRL) continues to be strong. Two training courses were developed and delivered to the NRL staff and users of the facility. The trainings covered the basics of safety culture and examples of good and bad safety culture, both at MIT and across the industry. During two separate inspections by the Nuclear Regulatory Commission in the past year, NRL was recognized for having a good safety culture.

As part of its agreement with the Department of Energy, the Bates Linear Accelerator Center continued its clean-up of those accelerator systems not required for the Bates mission in the future. The accelerator gallery, south hall ring, and beam switchyard were specifically targeted for clean-up in 2013–2014. The Bates RPP staff assisted in the planning, monitoring, removing, and segregating for future disposal approximately 200 tons of surplus hardware from these areas. In addition, the staff managed the planning and oversight of the disposal of approximately 5,000 gallons of secondary coolant. These efforts resulted in an estimated savings of \$200,000. RPP continues to provide radiation safety and emergency response training to the City of Cambridge police and fire departments.

Table 4. Summary of Authorizations and Reviews for All Radiation Sources, FY2014

| Total | Radiation Materials | Analytical X-Rays | Accelerators | Class 3B + 4 Lasers | RF Sources |
|---------------------------------|----------------------------|--------------------------|---------------------|----------------------------|-------------------|
| Authorizations or Approvals | 110 | 40 | 7 | 1,300 | — |
| New in FY2013 | 1 | 4 | 2 | 55 | — |
| Renewed or Amended or Processed | 45 | — | — | 39 | 25 |

Note: Authorizations and approvals require a risk assessment, experimental review, completion of radiation safety training, and routine inspections by RPP

Major EHS Initiatives for FY2015

1. Perform a review and organizational assessment of the EHS-MS.
2. Support the dramatic increase in design and construction projects.
3. Roll out the e-Ship Global Program. The initial portion of the roll-out of the software (starting in fall 2014) will be to DLCs that represent the full cross-section of the community at MIT: chemical- and biological-intensive shippers, international and US research collaborators, and mail-intensive and every-day shippers. The next phase, in 2015, will be to the remaining DLCs, organized in groups to facilitate implementation.

3. Roll out the Chemical Inventory Program.
4. Increase support to Lincoln Laboratory and other offsite facilities.
5. Develop new, and update existing, EHS training courses.
6. Explore the formation of focused working groups, such as the Shop Managers and Supervisors Group, that will allow targeted communications and initiatives. For FY2015, the two proposed new work groups are laboratory managers and DLC facility managers, in collaboration with DOF and the Office of Sustainability.
7. Develop and communicate standard operating procedures; this includes streamlining existing documents and developing new laboratory safety procedures.
8. Support funding agencies' increased requirements for EHS review and input into funding proposals.

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