Environment, Health, and Safety Office

During the past fiscal year, the focus of the Environment, Health, and Safety Office (EHS) was on a revaluation of the programs and services it offers. The office strives to ensure that all questions, needs, and requests are met, no matter how big or small. To ensure this is accomplished, EHS actively engages in process reviews and improvements. The office's hope is to enhance its programs to increase agility and be reflective of MIT's ever-changing environment.

To address the fast-paced setting of the Institute, EHS constantly identifies and rolls out new initiatives. It has developed, tested, and begun implementation of systems designed to increase efficiency in chemical inventory, in registering research involving biological materials or x-ray equipment, and in submitting blood-borne pathogen exposure control plans. In addition, EHS drafted, tested, and rolled out an incident system that features robust investigatory tools for the staff to identify contributing factors. This newly collected information gives EHS the ability to delve deeper into any incidents to ensure there are fewer reoccurrences.

With process improvements comes more data. EHS continues its evolution into the domain of data analytics. The office has revised and improved quarterly and annual reports to tell its story in new and engaging ways. As part of these efforts, EHS has developed vibrant new methods for visualizing data through the creation of EHS dashboards. These tools are readily available to relevant groups so data can be at researchers' fingertips.

The ongoing efforts have also bolstered the office's internal relationships. EHS works closely with many different departments, schools, laboratories, students, faculty, individuals, and so on, across many disciplines. For example, EHS staff worked side by side with the MIT.nano team to assist in the turnover of the new building and the start-up of EHS-related systems.

Community outreach has been successful, and EHS continues to collaborate frequently with external stakeholders. The office's relationship with the Cambridge Fire Department (CFD) has expanded to include additional joint training efforts, such as the fire safety day for students. In addition, EHS has provided training to both the CFD and the Cambridge Police Department (CPD).

EHS continued to address emerging challenges and issues arising from the research enterprise by supporting The Engine, the Whitehead Institute for Biomedical Research, Advanced Functional Fabrics of America, the Charles Stark Draper Laboratory, Inc., and the science community in Cambridge. These efforts also included improvements in makerspace training classes and the start of MIT's first biomaker space.

The office is proud of the strides it made over the course of the past year. All in EHS are very grateful for the support received from the institutional leadership and community partners.

EHS Management System by the Numbers

- 536 principal investigators (PIs) or supervisors
- 3,905 registered spaces
- 37,111 learning experiences
- 1,031 service tickets
- 756 research registrations or authorizations
- 97 laboratory cleanouts

Biosafety Program

EHS ensures the safe and responsible conduct of life sciences research. The office participates in, and supports, the MIT Institutional Biosafety Committee—known as the Committee on Assessment of Biohazards and Embryonic Stem Cell Research Oversight (CAB/ESCRO)—the Committee on Animal Care, and the Committee on the Use of Humans as Experimental Subjects.

Committee on Assessment of Biohazards and Embryonic Stem Cell Research Oversight

CAB/ESCRO ensures the safe and responsible conduct of biological research at MIT. The committee's scope has changed over time to provide a more consistent and cohesive oversight process that covers a range of biological research and new technologies.

CAB/ESCRO registers biological research involving the following:

- Recombinant or synthetic DNA and RNA
- Pathogens
- Human cells and tissues
- Use of biological agents at biosafety level 1 or greater
- Nanoparticle-based gene or drug delivery systems
- Biological toxins

The review and approval process is on the basis of the completion and submission of a biological research registration (BRR) form to the EHS Biosafety Program. Because of the large number of laboratories that use human materials, various viral vectors, bacteria, or viruses for researching ways to improve the human condition, the majority of BRRs (77%) are biosafety level 2 or biosafety level 2+, the highest approved containment level.

The committee reviewed 341 BRR submissions this fiscal year. They included:

- 65 rewrites
- 144 amendments
- 110 renewals
- 22 teaching laboratories

Biological Research Registration Process

The BRR forms were updated to simplify the registration process and to prepare for moving the process to an online system. The changes to the form were developed in conjunction with research personnel to best clarify the most pertinent information.

General Biosafety Training

The Biosafety Program developed an online training for the general biosafety course in collaboration with Information Systems and Technology. This training is required for everyone participating in biological research. Researchers now have more flexibility to complete their required training whenever it fits into their schedule. The training has also simplified the onboarding process for new PIs.

Outreach and Collaboration

The Biosafety Program supported the second annual Global Community Bio Summit, which was held at the MIT Media Lab on October 26–28, 2018. Program staff assisted event planners with the registration process for CAB/ESCRO. Staff also provided participants with biosafety training for the relevant safety hazards associated with the laboratory experiments portion of the summit.

Upcoming Initiatives

- Finalize and publish a new online blood-borne pathogen training.
- Pilot the use of an online registration system for biological research registrations.
- Continue to support the development of the new biomaker space on campus.
- Develop new web-based trainings for shipping biological materials.

Environmental Management Program

The Environmental Management Program (EMP) conducts services and activities to ensure that air, water, and hazardous waste discharge policies and procedures protect the environment and comply with all environmental regulations. Program staff provide environmental oversight, advice, consultation, training, and direct operational services for permitting, data reporting, and responses to the release or potential release of hazardous materials.

Central Utilities Plant Permitting

The Central Utilities Plant (CUP) expansion project has required active monitoring, permitting, and advising to ensure ongoing compliance. The EMP has been assisting this regulatory and permitting process by gathering necessary information, researching solutions, and advising on the construction.

The Massachusetts Department of Environmental Protection (MassDEP) has determined that the CUP upgrade project complies with both state and federal air quality regulations and noise policies. An air emissions permit, which was incorporated into MIT's Main Campus Operating Permit, has been issued.

The CUP's underground storage tanks required updating and were brought into compliance. There are currently five tanks for storage of #2 diesel fuel and #6 heavy oil. EMP worked to clean and close the #6 heavy oil tanks that held greater than 200,000 gallons.

Massachusetts Water Resources Authority Permits

Laboratory wastewater pH neutralization systems were permitted and installed at Buildings NW13 and NW14. The Massachusetts Water Resources Authority (MWRA) annually conducts four compliance inspections for the two permitted locations (the CUP and the main campus). During the inspection, 10 wastewater sampling locations, 18 laboratories, and the CUP were visited. There are nine treatment systems and four low flow and low permit locations.

Massachusetts Department of Environmental Protection Permits

MIT's Haystack Observatory and the Lincoln Laboratory Millstone Hill radar facilities located in Westford, MA, provide drinking water to occupants and are classified as public water systems by MassDEP. In fiscal year 2019, EHS took over regulatory oversight and management of the drinking water systems. EMP surveyed the water systems and assisted the Haystack and Millstone facility managers in improving the protection of drinking water.

Chemical Reporting

Federal regulations, such as the Emergency Planning and Community Right-to-Know Act and the Department of Homeland Security's Chemical Facility Anti-Terrorism Standards, require MIT to maintain and submit chemical inventories. EHS submits chemical inventory reports annually for MIT's Cambridge campus, the Haystack Observatory, and the Bates Research and Engineering Center to the Massachusetts State Emergency Response Commission, to local and regional emergency planning committees, and to local fire departments. In FY2019, EHS provided information on 18 substances for the campus, five substances for the observatory, and two for the Bates center. The campus report combines data provided from hundreds of laboratories and numerous operational units at MIT into one report.

Sustainable Laboratories

EHS is working to ensure that every laboratory in the MIT community has the knowledge, resources, and support to enable a sustainable approach to world-class scientific research. The program was reinvigorated this past year. Highlights included:

- The Green Labs program restructured the certification process to reach more groups and to ensure that energy assessments are prioritized. This year brought 35 new laboratories to the program, increasing the total to 52 active participants.
- Undergraduate Research Opportunity Program students and graduate students in the Laboratory Energy Assessment Program designed a device for alerting researchers when fume hood sashes were left open. The device is called the motion and sash height alarm. A pilot project conducted with 17 fume hoods in Building 56 saw an overall average sash height reduction of 75%.

- An interdepartmental hood hibernation team, comprising members from EHS and the energy efficiency group in the Department of Facilities (Facilities), met to identify underused fume hoods and put them into hibernation to save energy.
- An educational series was introduced to inform laboratories of best practices regarding energy savings. This year's focus was ultra-low temperature freezers.
- With 18 departments, laboratories, and centers (DLCs) participating, the glove recycling pilot project continued to be a success. MIT recycled 2,130 pounds of nitrile and latex gloves.
- Because of global changes and local restrictions, laboratory plastics are no longer accepted in MIT single-stream recycling bins. According to results from a waste audit in Building 68, pipette-tip boxes, which are no longer collected in single-stream recycling, constitute more than 70% of laboratory plastic waste. To help minimize the impact of this change, EHS is partnering with a local start-up to launch a pilot collection for pipette-tip boxes.

Upcoming Initiatives

- Enhance collaboration with Facilities to ensure environmental program continuity
- Increase efficacy and efficiency of the hazardous waste program to mitigate cost
- Expand sustainable laboratories programs to align with the MIT 2030 framework

Industrial Hygiene Program

Industrial Hygiene Program (IHP) staff members anticipate, recognize, evaluate, and control workplace conditions by limiting personal exposures to chemicals and addressing the control of other potential stressors, such as noise, heat, repetitive motion, and indoor air quality. This is accomplished through a hazard assessment to identify the severity of the risk and implement appropriate controls including engineering controls, administrative controls, and personal protective equipment.

On the Nanoscale

Staff in the IHP collaborated with the MIT.nano project commissioning team to review the functionality of critical systems that affect safety. Issues with chemical fume hoods were identified. These deficiencies were quickly rectified by working with the local supplier and manufacturer to identify proper modifications.

To adapt to the increasing number of laboratories using nanomaterials, in addition to the newly commissioned MIT.nano building, program staff published a short training presentation to guide safe practices, "Nanomaterial Safety and Health." Staff also created a nanomaterials inventory by sending out a nanomaterial questionnaire to all DLCs where they are in use. The survey results revealed that 237 different nanomaterials are in use in the 72 laboratories reporting nanomaterial use.

Revamped Ergonomic Evaluation Application

The IHP facilitates ergonomic evaluations for both Lincoln Laboratory and main campus. To support these services, the EHS information technology (IT) team developed an online ergonomics evaluation application that guides users through an ergonomic selfassessment. Upon completion of the self-assessment, users are linked to training and to an in-person evaluation request. The application also provides links to additional ergonomic information resources, reports, and post-evaluation surveys. Having a user complete an online ergonomic self-assessment prior to scheduling an in-person evaluation improves the overall quality and efficiency of this service. Through the successful launch on this application, there was a 56% increase in the number of users who took the online self-assessment before requesting an in-person evaluation.

Workplace Health and Safety

- To make managing respirator use and hearing conservation easier, new QuickBase (QB) tools were created. The respirator QB is simple to navigate and is in use by various stakeholders, including students. It gives EHS the ability to track users within DLCs and buildings and to send follow-up test reminders to users. It integrates with MIT Medical and enhances compliance.
- Annual audiometric testing was done for 254 employees. A mobile unit came to campus and provided on-site tests. To keep better track of user data, a QB app was created.
- IHP staff conducted six noise assessment surveys to ensure employees are not subjected to hazardous sound pressure levels. For example, an emergency generator room was assessed during commissioning of the MIT.nano building. IHP staff placed a warning sign and ensured that hearing protection was provided.
- The long-term drinking water fountain initiative is an ongoing program, with sampling prioritized on the basis of building usage and age. With these priorities and some special requests, program staff collected 116 samples. From these, 12 delivery points with elevated lead levels were identified in Building 13 (four), Building 3 (two), and Haystack Observatory (seven). IHP worked with Facilities to shut down the water supply temporarily, to notify occupants, and to repair or replace the fountains. A QB application provided an overview of the program, facilitated the sampling plan, and secured the sampling results.

Outreach and Collaboration

IHP staff collaborates with numerous departments and individuals around campus. Some highlights from the past year included:

- Isoflurane exposure assessment was provided for an animal facility. Test results showed high potential exposure, depending on ventilation. Staff recommended corrective actions to decrease exposure and resampling showed safe levels.
- During MIT's Independent Activities Period (IAP), program staff offered the Introduction to Rifle Shooting class. Staff collected air and wipe samples to

analyze lead contamination levels. All personal air samples were below US Occupational Safety and Health Administration (OSHA) exposure levels; however, some surfaces did have detectable amounts of lead. This confirms the need to maintain good housekeeping and hand-washing practices.

- Staff conducted area sampling to determine levels of silica exposure when using tube furnaces. Particle counts were high, and staff recommended that furnaces be placed in fume hoods or enclosures with local exhaust.

Upcoming Initiatives

- Expand nanomaterial survey campus-wide to compile a comprehensive inventory and to secure data on quantity, number of laboratories, and controls
- Evaluate the Hearing Conservation Program, including examining the criteria levels
- Evaluate and monitor procedures, including exposure assessment, used to change and dispose of filters in the pistol and rifle range

Radiation Protection Program

Radiation Protection Program (RPP) staff provided a safe working area for radiation workers, the general public, and the environment while allowing creative and breakthrough research to continue.

Committee on Radiation Protection

The Committee on Radiation Protection is responsible for establishing, maintaining, and advancing a radiation protection program at MIT and the off-campus sites. The committee reviews and approves all uses of ionizing and non-ionizing radiation sources through a system of authorization and registration programs, risk assessments, and monitoring programs managed by the RPP. The committee is also responsible for Institute compliance with radiation protection regulations, with standards promulgated by local, state, and federal agencies, and with the conditions of approval noted in the Institute's government-issued licenses. Within these parameters, the Committee on Radiation Protection works with students, staff, and faculty to facilitate research projects using radiation sources of all types.

Ionizing and Non-Ionizing Registrations and Monitoring

The RPP staff continued their strong collaborative presence at the Institute with radiation protection service programs and interactions with faculty, postdoctoral associates, students, and staff. The program performed radiation hazard risk analysis for proposed and continuing uses of licensed radioactive material and machine-produced radiation. The broad-scope license for radioactive materials was successfully renewed in the past year.

RPP continues to implement regulations for the security and safety of a number of programs.

List of Registrations and Devices Monitored by the Radiation Protection Program

Program	Registrations	Amount
Radioactive material	116	-
X-ray	31	52 machines
Polonium-210 alpha ionizer	30	220 ionizers
Accelerator	7	10 machines
Class 3B/4 laser	185	1387 lasers
Irradiator	36	4 facilities
Radiofrequency (RF)	-	75 systems
Superconducting magnet	10	50 magnets

Cesium Irradiator Replacement Project

Working with the Office of the Vice President for Research, RPP staff agreed to remove one cesium-137 irradiator. This will be replaced with a new x-ray irradiator for a cost savings of $275,000 to $325,000. Staff are working with faculty and researchers from nine DLCs to determine the best location of the new x-ray irradiator.

Internal Outreach and Collaboration

The program continued its partnership with Department of Nuclear Science and Engineering faculty to help design and manage the nuclear makerspace. Program staff participated in Nancy Leveson's system-theoretic process analysis risk assessment course. Staff have also been working with a doctoral student from the Department of Aeronautics and Astronautics to apply this methodology to the upcoming student-managed makerspace.

Each year, the Department of Nuclear Science and Engineering's subject, 22.033 Nuclear Systems Design Project, holds a competition. RPP staff members help by acting as project judges and as advisors for two of the projects, and by providing access to resources that would normally be out of reach for the students. Staff make sure students use these resources responsibly and safely.

Working with Facilities, RPP reviews all radiography projects on campus to ensure controls are in place. There were approximately 40 radiography projects in the past year.

External Outreach and Collaboration

Staff continued to train Cambridge authorities in basic radiation safety. They accompanied the CPD and MIT Police to New York City to review that city's radiation monitoring and detection programs. Program staff also provided eight half-day sessions to the CFD, including classroom and scenario-based instruction. A total of 128 first responders attended the training.

RPP also responded to a request from the CFD when a radioactive source was discovered at a housing project. Staff removed and safely disposed of the source.

To reduce the number of improperly discarded hypodermic needles, RPP installed three collection receptacles at the Cambridge and Somerville Program for Alcoholism and Drug Abuse Rehabilitation facility. These have collected approximately 50 needles per month, which reduces the risk to grounds workers and the Cambridge, and MIT, communities.

Challenges

- Resource allocation, especially to the off-campus locations (Lincoln Laboratory and Haystack Observatory and Millstone Hill). The demand on RPP services for Lincoln Laboratory activities continues to increase.
- Continued cross-training of EHS technicians to accommodate new roles and responsibilities in coverage for the nuclear reactor, regulated medical waste management, and non-ionizing radiation field measurements.

Upcoming Initiatives

- Continue to work with the Nuclear Science and Engineering faculty on the planning for the SPARC project, a compact, high-field, net fusion energy experiment.
- Design a customized alarm response training for the MIT Police, the CPD, and the CFD.
- Hold a drill to demonstrate the effectiveness for an emergency response to an irradiator facility.
- Work with the EHS IT team to implement the on-site EHS Assistant (EHSA) program for BRR and RPP registration systems.
- Implement the online registration system for use by Department of Facilities for radiography projects.

Occupational and Construction Safety Program

The responsibility of the Occupational and Construction Safety Program is to provide oversight of programs for general safety, fire prevention and protection, and construction safety, while complying with all relevant regulations.

Electrical Safety for Laboratories

To enhance electrical safety within research laboratories, the program purchased a variety of lock-out and tag-out equipment that will be used for hands-on training. Program staff are actively collaborating with MIT.nano to develop a tiered approval process for equipment not certified by a nationally recognized testing laboratory.

Cranes and Hoists Program

Collaborating with MIT DLCs, Occupational and Construction Safety Program staff strengthened the cranes and hoists safety program to improve equipment reliability and operator safety. The goal is to implement a campus-wide program that will standardize requirements across campus. Staff also:

- sponsored 33 third-party hoist inspections (increased total of annual inspections to approximately 100);

- are developing an online inventory system; and
- are researching options for the MIT in-service operator training program.

Field Research Safety

After a thorough review of the Institute's field research, program staff convened a stakeholder meeting to ensure all parties were represented. As a result, the field research safety webpage was updated. Links were added links to campus partners in international travel and to resources that provide improved guidance for field research planning and preparation.

Makerspace and Machine Shop Initiatives

The Audit Division's makerspace audit was closed in March. Results from the audit included closer tracking of, and increased compliance with, shop supervisor training and the formation of a working group to advise on shop policy.

Student Projects and Events

- EHS, the Division of Student Life (DSL), and students from the East Campus dormitory collaborated with the CFD to organize the first East Campus Fire Safety Day.
- Program staff worked with the DSL's EHS manager to streamline the approval process for barbecues.
- There were 145 events requiring significant review—e.g., liquid nitrogen ice cream, car smashing, scientific demonstrations, and engineering builds.
- Five events required external officials to approve plans that spanned weeks and required additional training—e.g., a fort, haunted house, hackathon, maker break.

Collaborations with the Department of Facilities

This year the Occupational and Construction Safety Program continued to reach out and expand its relationship with Facilities. Program staff reviewed shared programs, defined roles and responsibilities, and implemented new initiatives. Major topics included confined space and fall protection surveys and improvements in incident follow-up, training, and inspections.

- Worked with Facilities to implement an inventory survey of confined spaces in 41 buildings.
- Improved collaboration with the quality assurance and quality control group and assets manager on survey efforts.
- Reviewed and updated training groups with EHS requirements.
- Worked with Facilities EHS manager to host a training for all MIT personnel involved in the Hot Work Program regarding new National Fire Protection Association requirements.
- Developed and presented a training, "Working on Contaminated Systems," with input from Facilities supervisors.

Upcoming Initiatives

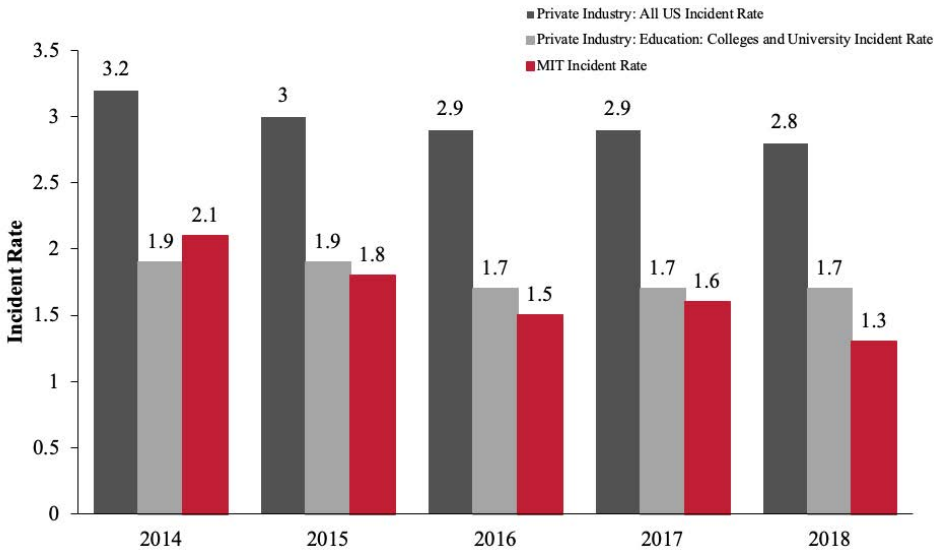
- Continue expansion of collaboration with Facilities into more programs with shared responsibilities.
- Complete fall protection roof and confined space surveys for more than 60 MIT buildings.
- Continue audit of current programs to reduce any potential gaps in service or compliance.
- Improve web presence for all major safety programs.
- Continue development of the Research Electrical Safety Program. The focus will be on the start-up of a training course for researchers and the development of tools for auditing researcher-built electrical equipment.

Incident Investigation and Reporting

To enhance incident investigations, the EHS online QB form was updated. Understanding all the factors that contributed to an incident can give EHS staff the knowledge needed to help ensure there are few or no reoccurrences. This year, program staff created a list of contributing factors and aspects associated with each factor, and a tool to collect investigatory details and follow-up actions. The tool guides the user through an investigation to collect information in a uniform manner. The update was launched in November 2018 and 311 full investigations have been completed since.

The OSHA incident rate of total recordable injury and illness cases for calendar year 2018 (1.3) is shown below, along with the data for the previous four years. Please note this is a lagging key risk indicator.

Occupational Safety and Health Administration (OSHA) Recordable Incident Rates of Injuries and Illnesses



Note: The 2018 US Private Industry Rates for Universities are the 2017 rates (the most recent data). The incidence rate of injuries and illnesses was computed from the following formula: number of injuries and illnesses × 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.

Injury and Illness Recordkeeping Incident Rate Initiative

In an ongoing effort to increase the precision of the campus incident rate, the Occupational and Construction Safety Program continued its work with the Office of the Vice President of Finance. Program staff revisited the data collection methodology and made it more repeatable, efficient, and accurate. In future, the process of getting this information will be more convenient than it is now.

Making Data Accessible and Enhancing Incident Dashboards

EHS staff and stakeholders require a comprehensive view of the incidents occurring around campus. Program staff updated the reporting tools and added features leading to a more visual experience. To make the complexities of the data more approachable, staff have improved the dashboard experience. The overhaul included additional data, descriptions, and visuals. The goal is to give users access to the data they need in a digestible format.

Campus Design and Construction Support

Campus Design and Construction Support provides mitigation, design review, and assistance to Facilities project managers for construction and renovation projects on the MIT campus. In addition, staff advised on 12 laboratory design projects for incoming faculty. These projects require careful EHS oversight to meet increasingly complex research needs. Staff reviewed and monitored 149 projects covering 165 unique areas or locations this past year—a 20% increase from the previous year.

Project Highlights

- Many projects require the incident investigation and reporting staff to advise project managers and contractors on the development of traffic plans to keep walkways open and mitigate congestion. These include Kendall Square (site 4), the Vassar Street dormitory, CUP and its co-generation plant expansion.
- Staff assisted the management of relationships with the Massachusetts Bay Transportation Authority and Keolis Commuter Services as work spanned the tracks above and below the Central Utilities Plant and co-generation plant expansion. In addition, staff worked with the City of Cambridge to ensure all permits were obtained to fill the three above-ground storage tanks.
- Staff worked closely with Facilities during x-ray equipment upgrades in two radiology laboratories in Building E23 (MIT Medical), ensuring that medical needs were not interrupted during construction and that the new equipment and space met all required regulatory testing standards.
- In preparation for the Stephen A. Schwarzman College of Computing, program staff have facilitated and performed hazardous materials testing in Building 44. Staff played a key role in the discussion of the enabling of utilities required before demolition of the building, slated for late in 2019.
- Distribution of the Construction Connect Newsletter continued in 2019, with articles on a variety of topics including eyewashes, protecting excavations, and laser safety. The newsletter was distributed to 364 and viewed by 262 individuals. The most recent issue of the newsletter was shared at a meeting of environment, health, and safety colleagues from other universities.

Service Teams

The service teams conducted a wide variety of initiatives and programs that involved cross-program monitoring and measurements to sustain regulatory compliance, proactively assess risk to the MIT community, and support a culture of safety. Below are some key highlights from each of the service teams.

Communications

The communications team works to promote effective and timely communication among all the EHS stakeholders across the Institute and the MIT community; the goal is to improve EHS performance. Team members supported the following outreach events, which required coordinating volunteers, providing materials, and communicating about programs and services.

- During the Student Orientation Fair, team members provided guidance for living in the dormitories, working in the laboratories, and enjoying extracurricular activities involving hazards, while incorporating the theme of the event: The Incredibles. The team showcased various forms of proper and improper personal protective equipment required for working in a laboratory or shop.
- The dean of student life hosted incoming first-year students and their families. During the brunch, DLCs across campus gathered to provide information to families about services available to the students. Communications team members provided parents with a postcard on student safety for where their children will work, play, and live.
- The Careers Across MIT event provided MIT employees the opportunity to explore and network with other DLCs on campus. Team members engaged with employees on campus to tell them about the jobs and career opportunities there are in EHS.
- Other events included a poster session sponsored by the Office of the Executive Vice President and Treasurer, at which staff showcased the following posters: EHS Metrics and Measures, Green Labs and Injury Incident Follow-up Process, Photon1 Van, Fire Safety Event, and Chemistry Department Fair.

Along with organizing six EHS NewsBolt newsletters, communications team members coordinated the process for updating print materials, including new PI (laboratory and non-laboratory) checklists, a new DLC head checklist, and a strategic plan poster.

Training

The training service team provides oversight for all EHS training needs and assists in the development of EHS training courses. The training courses are driven by regulation as well as by a general awareness of need. In FY2019, 37,111 learning experiences were delivered, of which 57% were delivered in the classroom, 31% were delivered through the web, and 12% through other means such as medical and signature forms. In total, 9,986 individuals completed an EHS training.

Below are highlights of major initiatives the team completed.

- Team members collaborated with Information Systems and Technology to present a "Train the Trainer" session. A true use case was presented to demonstrate the process for updating a classroom-based training into a web-based course.
- The team introduced an additional blended learning opportunity for researchers who work with radiological materials. During the practicum, the researchers receive hands-on training with safety practices. The environment of the practicum is set as it would be in a real radiation laboratory to reinforce good, safety-centric habits.
- Other course developments and improvements were made. These include instruction in the gammacell irradiator and in chemical hygiene, basic electrical safety, cryogen safety, fire safety for residences, and shop safety. Instruction was also given in safety in a static magnetic field and how to handle hydrofluoric acid.

Inspection

EHS coordinators conduct Level II inspections twice a year in research laboratory spaces and annually in facility spaces. During calendar year 2018, 2,435 findings across 1,405 reports were submitted on inspections of 51 DLCs and 2,916 rooms. There was a 7.4% increase in findings because of the previous year's modifications to the checklist; these allow a more detailed analysis.

Emergency Preparedness and Response

The emergency preparedness and response team provides oversight for the 24-hour emergency response services and is responsible for the follow-up processes provided by EHS. The team works in partnership with the Institute's Emergency Response Group.

The team focused on the following projects this year:

- Collaborated with original equipment manufacturers and other stakeholders (DLC EHS coordinators, MIT Medical, Facilities, and MIT Police) to revise the Emergency Response Guide.
- Updated the EHS on-call refresher training.
- Participated in after-action reviews.

Integrative Programming

Information Technology

Information managed by the EHS management system and used by the EHS organization is secured on a variety of software platform and tools. The IT team in EHS coordinates all services required to support the EHS management system infrastructure and operations. Team members also developed and now support several custom applications. Key areas of focus for the team were around regulated hazards management, ergonomic evaluation, communication, and outreach.

After a successful pilot program in FY2018, the team began Phase I of the full implementation of the EHSA chemical inventory platform. Team members built a data-cleaning utility to ensure data quality and to improve efficiency in data preparation. Current numbers of the laboratories, laboratory users, and chemicals being managed through EHSA are shown in the table below.

Chemical Inventory Usage

	Numbers in EHSA
Total number of PI inventories (6/30/19)	142
PI inventories added during FY2019	119
Number of system users (new unique user logins)	575
Number of DLCs with inventories	22
New EHSA laboratory containers uploaded FY2019	67,347
Containers disposed from inventories	3,050
Total containers (6/30/19)	**94,700**

Note: Six 6 PIs with chemical inventory left the Institute during 2019; these inventories were removed once the laboratories were decommissioned.

In addition, IT worked closely with staff to create comprehensive and convenient registration forms within EHSA for BRRs, exposure control plans, and x-ray research registrations.

Continuing Process Improvement through Technology

The RPP RADIO database, which contains data and reports on ionizing and non-ionizing radiation research registrations, required upgrading. The database had been managed using Microsoft Access 97. However, using an unsupported, old version of the software meant that only one Radiation Protection Program staff member could log in to the database at a time. IT staff updated and moved the database to Microsoft Access 2013 to provide stability, enhance efficiency, and support simultaneous users.

IT also built a custom application to help manage the outreach, assignments, results, and follow-up from ergonomic evaluation requests. The application was built to be used on campus and at Lincoln Laboratory.

Hazardous Shipping Program

The team continued to focus on rolling out eShipGlobal to additional DLCs. There was a total of 1,071 research material shipments, which consisted of 614 regulated and 457 nonregulated shipments.

Regulated Medical Waste

The amount of waste picked up increased 7% and the total number of boxes was up 16% across 237 PIs. The team estimated that 35,100 autoclave cycles were eliminated. In turn, this saved 6.6 million gallons of water, 877,000 kilowatts of energy, and 5,847 hours of laboratory time.

To keep up with the increasing number of waste pickups, the team worked with IT staff to enhance the user interface for the application. This upgrade makes it easier for technicians to claim and close out waste pickup requests.

Radioactive Waste

RPP continued to collect and process low-level radioactive waste collected from the radiation laboratories. All waste is segregated by half-life and held for radiological decay, or is shipped offsite for processing and disposal. Approximately 99% of the waste sent offsite for thermal processing resulted in no offsite disposal volume for the Institute. There were two shipments of low-level radioactive waste resulting from 190 waste pickups during the reporting period, a 17% increase from the previous year.

Hazardous Chemical Waste

The hazardous chemical waste team increased safety and reduced the environmental burden for MIT by disposing of expired or dangerous chemicals while reducing operational costs. The amount of chemical waste picked up increased over the past year by 13%, to 273,144 pounds, and costs have increased by 23%, to $504,437. Costs were up because of increased volume, contract changes, and management factors. To reduce the cost increase, the EHS IT group developed two applications to manage regulated chemical waste. The first application is for laboratory members to use in submitting detailed waste pickup requests and the second is for staff to assign, document, and close out waste requests more efficiently.

Team members cleaned out 97 laboratories, which resulted in more than 12,500 bottles of unwanted or leftover chemicals to manage. In addition, the team handled an average of 115 chemical pickups, and collected and consolidated 135 waste bottles, per week.

Awards

DLC Performance Awards

At the end of the year, EHS recognizes DLCs that have performances above 90% for training and inspections overall. There are three categories, based on the number of trainees in a DLC: small (1–50 trainees), medium (51–250 trainees), and large (equal to or greater than 251 trainees). The recipients were the Biotechnology Process Engineering Center, the Department of Material Science and Engineering, and the Department of Biology.

Infinite Mile Awards

The Infinite Mile Awards are intended to acknowledge an exceptional effort by service, support, and administrative staff. The recipients for the awards were:

- Distinguished Service Team Award: EHS IT Team—Michael Dunn, Hao Nguyen, Patrick O'Donnell, Jessica Van, and Lu Zhong
- Innovation Team Award: Tim Beaulieu, Brendan Ettridge, and Wei Lee Leong, Organization and Professional Development

EHS hired 12 highly qualified staff members who will enable the office to continue to provide excellent service to the MIT community. Staff also continued to engage in professional development opportunities and to obtain or maintain certifications. Overall, staff attended 52 conferences, workshops, seminars, and classes.

EHS Regulatory Compliance Calendar FY2019

July 2018:

- Bacterial testing at MIT pools
- Discharge monitoring report (DMR) for National Pollution Discharge Elimination System (NPDES) permit
- Department of Transportation hazardous materials registration
- MassDEP/US Environmental Protection Agency (EPA) nitrogen oxides excess emissions report
- MassDEP Title V compliance certifications
- NPDES DMRs for NPDES cooling waste discharge

August 2018:

- Accelerator registrations renewal
- Analytical x-ray registration renewal
- CAB/ESCRO meeting
- DMR for NPDES permit
- Low-level radioactive waste (LLRW) renewal
- Massachusetts Radiation Control Program (MRCP) license renewal

September 2018:

- CAB/ESCRO meeting
- City of Cambridge Inspectional Services–certificates of occupancy inspection
- Cambridge Public Health Department—ice skating rink certificate
- DMR for NPDES permit
- Functionality testing of accelerator and irradiator interlock and security systems
- Radiation Protection Committee meeting

October 2018:

- Bacterial testing at MIT pools
- CAB/ESCRO meeting
- DMR for NPDES permit
- MassDEP/EPA nitrogen oxides (NO_x) excess emissions report

- National Institutes of Health Office of Science Policy report
- NPDES DMRs for NPDES cooling waste discharge

November 2018:

- Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) explosives user certificate
- DMR for NPDES permit
- Nuclear Materials Management and Safeguards Systems (NMMSS) reconciliation report for special nuclear material receipt and transfer

December 2018:

- Accelerator registration renewal
- Analytical x-ray registration renewal
- CAB/ESCRO Meeting
- DMR for NPDES Permit
- Functionality testing of accelerator and irradiator interlock/security systems
- MassDEP rideshare submittal
- Nuclear Regulatory Commission inspections
- Radiation Protection Committee meeting
- Reactor Safeguards Committee meeting
- Site accelerator registration renewal

January 2019:

- Bacterial testing at MIT pools
- CAB/ESCRO meeting
- DMR for NPDES permit
- Human embryonic stem cell research report to Massachusetts Department of Public Health
- MassDEP/EPA NOx excess emissions report
- MassDEP Title V compliance certifications
- NPDES DMRs for NPDES cooling waste discharge
- Review of MIT security plan for irradiator facilities
- Review of memorandum of agreement with Cambridge Police Department and Cambridge Fire Department for irradiator emergency response plans

February 2019:

- Cambridge biosafety permit renewal

- DMR for NPDES permit
- Factual Mutual Global Insurance inspection
- LLRW report
- MRCP inspection of Increased Control Security Program
- OSHA 300 and 300A log
- Report from CAB/ESCRO to the City of Cambridge

March 2019:

- Bates Center audit
- CAB/ESCRO meeting
- Cambridge stormwater best management practice operation and maintenance report
- DMR for NPDES permit
- EPA greenhouse gas report
- Flammable liquid permits and licenses renewals
- Functionality testing of accelerator and irradiator interlock and security systems.
- Laser inventory
- NRC—calendar year report and review of Radiation Protection Program
- Radiation Protection Committee meeting
- RCRA: Resource Conservation and Recovery Act report

April 2019:

- Bacterial testing at MIT pools
- CAB/ESCRO meeting
- DMR for NPDES permit
- LLRW report
- MassDEP/EPA NO_x excess emissions report
- MassDEP greenhouse gas report
- MassDEP source registration and emission statements
- NPDES DMRs for NPDES cooling waste discharge
- NRC inspections
- RPP audit

May 2019:

- Audit of Whitehead Institute for Biomedical Research radiation protection programs

- DMR for NPDES permit

June 2019:

- CAB/ESCRO meeting
- DMR for NPDES permit
- Functionality testing of accelerator and irradiator interlock and security systems
- MassDEP underground storage tank compliance certification
- Radiation Protection Committee meeting

Intermittent:

- ATF explosives inspection (every three years; expected in December 2019)
- MDPH human embryonic stem cell research permit renewal (every three years; expected 2020)
- MRCP inspection of Irradiator Security Program (every two years: expected December 2019)
- MRCP inspection of broad-scope license activities (every three years: expected 2020)
- NRC special nuclear materials inspection (every five years: expected 2022)
- NRC special nuclear materials license renewal: SNM-986 (every 10 years; expected 2027)

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