Laboratory and Facility Design and Construction Review Services

1. Purpose / Background

The purpose of this SOP is to establish standard operating procedures for Laboratory and Facility Design and Construction Review Services (LFDCRS) per the MIT Environmental, Health and Safety Policy "achieving and maintaining compliance with federal, state and local environmental, health and safety laws and good practices in all of our departments, laboratories, research centers, facilities and operations" and the Guiding Principles, in particular, #11 "standard operating procedures" and #14 "primary responsibility for EHS compliance". These procedures are designed to ensure that EHS issues are addressed in a timely manner and applicable EHS regulations and codes are followed as changes are made to Institute laboratories, facilities and operations.

Services include review of EHS issues in MIT Capital projects (new buildings), Committee for Review of Space Planning (CRSP) projects (renovations and space changes), Repair / Maintenance and other DLC Projects, and the EHS Construction Safety Program services. Input on EHS issues is provided for all phases of the project.

2. Scope

The review services cover all new construction, renovations and space changes for all MIT DLCs.

3. Prerequisites

No prerequisites are needed.

4. Procedures

4.1 Establishing an EHS Project Review Team

The Laboratory and Facility Design and Construction Review Services (LFDCRS) Team Leader in consultation with the Service Team members (see Appendix B: EHS Team Expertise) coordinates with the DOF and the DLCs to actively identify new projects at the Concept / Planning building stage working with the assigned DOF Project Manager/responsible DOF Senior Management / DLC Project Manager (Capital, Renovation, Repair/Maintenance, and Space Change projects). DOF and DLC senior management will notify the Service Team Leader of all new projects. See Appendix F for Design ReviewProcess Flow Chart.

The DoF project initiation team leader (renovation) or program manager (capital) will contact the Service Team Leader and send Memorandum of Understanding on the project and EHS Scoping Sheet. See Appendix G for Scoping Sheet Process Flow and Scope Sheet.

For Capital Projects (new buildings), the Service Team Leader assigns an EHS Project Liaison and Construction Liaison and assembles the EHS Project Review Team (in conjunction with the EHS Director/Deputy Directors) with needed disciplines for project review and input. For renovations and space changes, Repair / Maintenance, and other DLC Projects, the Service Team Leader in conjunction with the Project Manager, will determine the scope of the review services and assign an EHS Project

Liaison, Construction Liaison and EHS Project Review Team as needed.

The EHS Project Liaison and EHS Project Review Team will be chosen based on the necessary expertise areas listed in Appendix B: EHS Team Expertise and Criteria for the Selection of EHS Project Liaison and EHS Project Review Team.

The EHS Project Liaison completes the EHS Scope sheet (Appendix G) and requests and obtains EHS Laboratory Assessment form from PI (https://ehs.mit.edu/site/content/laf) and includes appropriate EHS Lead Contact and DLC EHS Coordinator in review.

The EHS Project Liaison completes the EHS Capital Projects Design Review Form (see Appendix C: EHS Capital Projects Design Review Form (Example)) and submits copy to Service Team Leader and Project Manager.

The Service Team Leader and EHS Project Liaison meet with the DOF Project Manager/responsible DOF Senior Management /DLC Project Manager to determine scope and time line of the project and gather additional information.

The EHS Project Review Team participates as reviewers in the appropriate Concept /Planning and Design stages of the project and participates as needed for follow up review during the Construction and Building Commissioning stages of the project. Refer to Appendix E: Laboratory and Facility Design and Construction Review Services Process Flow Diagram, New Buildings and Renovations

The EHS Project Review Team reviews project design/construction plans, notes, and specifications and attends appropriate Project Planning and Design Review meetings.

The EHS Project Liaison and EHS Project Review Team identify potential EHS issues and report these to the Service Team Leader and Project Manager.

The EHS Project Liaison and DOF Project Manager/responsible DOF Senior Management/DLC Project Manager resolve outstanding EHS issues with the Service Team Leader facilitating resolution of potential issues. In the event of an impasse of differing or unresolved requirements or views, the DoF Project Manager, EHS Project Liaison, or both shall escalate their concern or issue to the relevant EHS Deputy Director and DoF Program Manager for resolution in a timely manner. Impasse resolutions shall be documented and communicated to both organizations. See Appendix H for Massachusetts Institute of Technology Department of Facilities and Environment, Health and Safety Office Project Review and Comment Process Memorandum of Understanding.
The Service Team Leader reports all EHS issues with significant impacts to the EHS Director and DOF/DLC senior management.

4.2 Transfer to EHS MS Partnership Team

The Service Team Leader coordinates the transfer concerning the handling of EHS issues from the Construction Safety Officer and EHS Project Review Team to the EHS MS Partnership Team (EHS Lead Contact / Team and DLC EHS Coordinator) during the Commission Building and Building in Use stages of the project.

4.2.1 For Laboratories

The City of Cambridge Local Emergency Planning Commission (LEPC) conducts inspections of all new laboratory installations that use hazardous materials. New laboratories and existing laboratories that undergo renovation or relocation where additional hazardous materials or processes are introduced must meet the requirements of the LEPC prior to receiving the Certificate of Occupancy and before research or teaching activities can begin. Refer to *City of Cambridge Local Emergency Planning Commission (LEPC) Laboratory Inspection Guideline*. The guideline provides a quick reference for DLCs, MIT Project Managers and EHS in order to prepare for an LEPC inspection which covers Emergency Preparedness Planning, Hazardous Materials Management and Laboratory features and the parties responsible for providing the documentation and ensuring laboratory features are in place.

The EHS Construction Safety Program covers all other inspections prior to Certificate of Occupancy.

Once the building or renovated area is ready for use, the EHS MS Partnership Team takes over the coordination of EHS issues and the Construction Safety Officer and EHS Project Review Team assist with any follow up issues that are design or construction related. This is necessary since there are occasions when the building or area will receive a temporary Certificate of Occupancy while construction activities are completed.

4.2.2 For all other facilities

For other facilities, an LEPC inspection is not required but prior to receiving the Certificate of Occupancy certain documents and features must be in place. The DLC with assistance from EHS is responsible for providing the written Emergency Preparedness Plan. The MIT Project Manager will provide all other documents, permits and features with assistance from the Construction Safety Program.

The EHS Construction Safety Program covers all other inspections prior to Certificate of Occupancy.

Once the building or renovated area is ready for use, the EHS MS Partnership Team takes over the coordination of EHS issues and the Construction Safety Officer and EHS Project Review Team assist with any follow up issues that are design or construction related. This is necessary since there are occasions when the building or area will receive a temporary Certificate of Occupancy while construction activities are completed.

4.3 Post Occupancy Review of EHS Issues

The Service Team, EHS Project Review Team, Construction Safety Officer, DLCs and DOF jointly conduct a post Occupancy review of EHS issues and add resolution of issues to *Lessons Learned* documentation which is on file at the EHS Office. See *Post Occupancy Review and Lessons Learned Procedure*.

5. Roles & Responsibilities

5.1 Service Team Leader

Actively identifies new projects

Once project (Capital, Renovation, Repair/Maintenance, Space Change) is identified, coordinates with DOF Project Manager /responsible DOF Senior Management/DLC Project Manager to determine scope and time line of project

Assembles Project Review Team with needed disciplines for project review and input – coordinating with EHS Director and Deputy Directors

- Assigns EHS Project Liaison in conjunction with Director and Deputy Directors
- Prepares EHS Project Liaison duties

Leads and coordinates review process. Tracks project assignments and verify completion.

Adds EHS Project Liaison and Construction Liaison to DoF PICS Database List of Projects. Update completed by assigned EHS Staff Assistant.

Reviews R-CRSP meeting Community Minutes.

Develops dispute resolution process coordinating with MIT Ombudsperson and EHS Ombudsperson/Customer Relations

Attends Project Planning and Design Review meetings when necessary

Acts as facilitator

Identifies and facilitates resolution of potential EHS issues

Works with DOF Project Manager/responsible DOF Senior Management /DLC Project Manager to resolve issues and report significant impacts to MIT senior management. Assists in conflict resolution.

Provides oversight and chairs monthly service team meetings

Coordinates transfer of EHS Project Review Team to EHS MS Partnership Team (EHS Lead Contact / Team and DLC EHS Coordinator) during Design, Commission and Use stages of capital project / renovation

Conducts post occupancy review of EHS issues and adds resolution of issues to *Lessons Learned* documentation

Reviews periodic *Construction Impact Reports*

Maintains *Laboratory and Facility Design and Construction Review Services SOP*

Directs and provides oversight to the Construction Safety Program

Provides oversight of Laboratory and Facility Decommissioning Procedures including recycling opportunities for demolition materials

Coordinates review of EHS issues with MIT Green Building Initiative

Provides oversight of EHS review and updating of *EHS Guidelines for Building Design* and MIT Department of Facilities *Building Systems Design Handbook*

Routinely reports to EHS staff on progress of projects and renovations

Keeps EHS Director and Deputy Directors informed of relevant issues on quarterly basis.

5.2 Service Team Deputy Leader

Assists Service Team Leader and assumes Service Team Leader roles and responsibilities during Service Team Leader's absence

5.3 Service Team

Assists Service Team Leader with implementation of service

Assists with document and process development and maintenance

Assists with resolution of potential EHS issues

Participates in post occupancy review of EHS issues

Attends monthly service team meetings

5.4 EHS Project Liaison

Assigned by the EHS LFDCRS Team Leader to a specific Department of Facilities (DOF) project

Serves as an EHS point of contact for Department of Facility

Leads and coordinates reviews of EHS Project Review Team. See Design ReviewProcess Flow Chart in Appendix_F.

Provides input to EHS issues rather than oversight of project.

Adheres to project timeline.

Ensures that Project Review Team provides clear and concise comments on EHS issues. See *EHS Laboratory Design Guideline*.

Attends monthly service team meetings if necessary for specific EHS program issues.

Acts as a subject matter expert (SME) for their discipline

Participates in process with Department of Facilities, e.g. receives project schedules, attends project meetings, reviews meeting minutes for EHS action items, and is copied on key correspondence between EHS and DOF Project Manager(s).

Coordinates participation by discipline, i.e. radiation protection, biosafety, industrial hygiene, safety, environmental management as project scope requires

Meets with assigned EHS Team to discuss the project and deadline dates throughout the design process.

Provides EHS comments as they are generated; interpreter of code and regulation, consultant, information

resource, and other. Comments could be generated based on any of these roles and should be qualified as described below when provided as part of the project record

Develop staged project acceptance process where meeting minutes and email would suffice for advisory and commentary phases and a formal sign off would be required at confirmatory phases, e.g. Construction release

EHS Project Liaison is integrated into the design process

- EHS Project Liaison and the EHS team will assume the roles indicated in the following table as they correspond to the specified project phase.

- The table displays a generic project thus phasing and roles could vary slightly from project-to-project; however, the intent is that EHS Project Liaison will be involved in projects through the design and construction phases

Project Phase	EHS Role
Programming	Advisory
Conceptual design	Advisory
Schematic design	Review and commentary
Design development	Review and commentary
Construction documents	Confirmatory
Submittals	Review and commentary
Shop drawings	Review
Requests for information during construction	Advisory
Changes during construction	Review and commentary
Commissioning	Review

- Elicits clear guidelines regarding the project review comments, such as:

  - Uses the established due
  - Explains the need for completeness and consistency in comments
  - Will standardize comments to DoF and ensure comments are categorized and substantiated. The following form is provided as an example that the EHS Project Liaison and/or their Team members can use.

Check All That Apply		Source	Reason
	Code Requirement		
	MIT Design Standard		
	Better Practice		
	MIT EHS SOP		

	Insurer Recommendation		
	Sustainability (e.g. LEED, reduced water or energy usage)		
	Reliability		
	Future / Spare Capacity		
	Cost Implications (e.g. initial or life-cycle)		
	Other (Specify:_____)		

EHS Project Liaison will be involved in the Impasse Resolution Process

- EHS Project Liaison, The DoF project manager or both shall escalate concern or issue to a higher level of authority such as their EHS Deputy Director and DoF Program Manager for resolution

Meets the skills and competencies of a project reviewer as described in Appendix D: EHS Project Reviewer Skills/Competencies and Acquisition of Skills.

5.5 EHS Project Review Team

Reads design / construction plans, notes and specification documents carefully and provides clear and concise comments on EHS issues. See *EHS Laboratory Design Guideline*.

Attends appropriate project planning and design review meetings.

Understands relevant regulations and codes and MIT internal programs, procedures and policies as applied to the review process.

Assists DOF or DLC Project Manager in ensuring that codes and MIT requirements, insurer recommendations, prior municipal building inspector and fire prevention inspector findings and EHS MS Inspection corrective actions to improve fire protection and life safety are incorporated into the design.

Attends monthly service team meetings if necessary for specific EHS program issues.

5.6 EHS Construction Liaison

Advises/supports DOF Project Managers/responsible DOF Senior Management and DLC Project Managers by assisting with the implementation of MIT's oversight of field related construction activities with special emphasis on the implementation of NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations

Assists DOF Project Managers/responsible DOF Senior Management and DLC Project Managers in ensuring the safety of MIT personnel during a construction project

Assists DOF Project Managers/responsible DOF Senior Management and DLC Project Managers in

providing oversight of the building and occupancy permit process

In coordination with the DOF and DLCs, conducts site safety tours and inspections and makes recommendations to DOF and DLC Management and Project Managers with respect to MIT safety issues

Provides EHS Awareness training for Project Managers

Serves as the Cambridge Fire Department contact person for Construction Safety coordinating with the DOF Systems Engineering Group (SEG)

Provides oversight for the MIT Hot Work Program

Interfaces with MIT Property Insurance Field Engineers

Reports on construction site safety

Leads discussion on Construction Review portion of service team meetings

Advises and develops / presents safety education and awareness classes to the management and staff responsible for construction, alteration and demolition operations. Assists with the development of MIT specific practices and procedures/ manuals/checklists associated with implementation of programs

In concert with project managers assures that construction, alteration, and demolition work in occupied buildings is conducted in accordance to MIT practices, Cambridge Fire Department mandates, property insurance requirements and all other applicable codes and standards

Reports the status of construction safety with recommendations to the DOF Customer Council

Participates in construction related incident investigations in the interests of MIT

5.7 EHS Deputy Directors

Reviews workload balance for Project Team or Project Liaison (PL)

Assist in conflict resolution – Technical/ Communicate to PL/ PM

Acts as final SME if necessary

Acknowledges assignment of PL to LFDCRS Team Leader

5.8 EHS Director

Conflict resolution if necessary

Inform PL of issues that arise and are reported to Director

Communicate new design review process to EHS

With LFDCRS Team Leader communicate current projects at all staff meetings

5.9 Lead Contact

Provide input when requested

Function as SME

Communicate with EHS Coordinator and EHS Project Liaison on project issues

Provide DLC specific "issue confirmation"

5.10 DLC EHS Coordinator and DLC Management

During all stages of the project, keep active role in providing input. See EHS *Laboratory Design Guideline*.

Participates as a project team member for their DLC.

Works with the designated EHS Project Liaison and a designated DLC point person, i.e. Administrative Officer.

Provides input to design and to partner with the MIT EHS Office during the course of the project.

Provides laboratory-specific and/or DLC-specific information:

- by familiarity with the proposed space
- knowledge of the research activities
- the hazards involved
- proposed hazardous material usage, and storage quantities, and
- any department-specific EHS protocols.

Assists PIs/DLCs with determination of anticipated hazards involved, types of equipment, hazardous materials inventory, anticipated chemical waste generation including type and quantities, etc.

Is sent a copy of completed Laboratory Assessment Form (LAF) and EHS Scope Sheet.

Maintains communication with EHS Lead Contact; as often there are informal discussions between the EHS Lead Contact and EHS Coordinator.

Works with the Service Team Leader, EHS Project Liaison, EHS Construction Liaison and EHS Project Review Team to ensure the transfer of information concerning the handling of EHS issues during the Commission Building and Building in Use stages of the project.

Provides DLC specific documentation requested during the Local Emergency Planning Committee (LEPC) inspection.

Assists in conducting post occupancy review of EHS issues.

5.11 DOF Project Manager/responsible DOF Senior Management and DLC Project Manager

During all stages of the project, be aware of EHS issues. See Appendix A: EHS Best Practices for Project

Designers and Managers and *EHS Laboratory Design Guideline*.

Call upon EHS resources as needed.

Involve EHS expertise as early as possible in all stages of the project.

Communicate with the Service Team Leader, EHS Project Liaison or Construction Safety Officer as appropriate early and often during the project and express any doubts or disagreements.

Ensure that codes and MIT requirements, insurer recommendations, prior municipal building inspector and fire prevention inspector findings and EHS MS Audit corrective actions to improve fire protection and life safety are incorporated into the design.

Ensure the safety of MIT personnel during a construction project.

Provide oversight of the building and occupancy permit process.

6. Training

The Laboratory and Facility Design and Construction Review Services Team and EHS Safety Program will develop and maintain a Laboratory and Facility Design and Construction Review training module to cover general knowledge of MIT plan review and construction review process; reading design and construction review plans; understanding design and construction review notes; understanding municipal building and fire department review process; and understanding process for certificate of occupancy. See Appendix D: EHS Project Reviewers Skills / Competencies and Acquisition of Skills.

7. Monitoring Requirements

There are no monitoring requirements for this program.

8. Record Management

Plans, drawings, blueprints, shop drawings, construction notes and specifications, EHS notes, documents and meeting minutes will be kept for minimum of one year after the end of the project (occupancy of the building), located on EHS M drive, Project Design Review folder and hard copy files in EHS Office. *Lessons Learned* documentation from Post Occupancy review will be kept indefinitely in appropriate Project Design Review folder and updated as needed. The DoF PICS Database List of Projects will be updated as needed. The *Laboratory and Facility Design and Construction Review Services SOP* and all supporting documentation will be kept indefinitely and updated as needed. EHS Lead Contacts and DLC EHS Coordinators should be copied on EHS Project Liaison and EHS Project Review Team project correspondence as appropriate.

9. References

9.1 Appendices

Appendix A: EHS Best Practices for Project Designers and Managers

Appendix B: EHS Team Expertise

Appendix C: EHS Capital Projects Design Review Form (Example)

Appendix D: EHS Project Reviewers Skills / Competencies and Acquisition of Skills

Appendix E: Laboratory and Facility Design and Construction Review Services Process Flow Diagram: New Buildings and Renovations

Appendix F: Design Review Process Flow Chart

Appendix G: Scoping Sheet Process Flow and EHS Scope Sheet

Appendix H: Project Review and Comment Process Memorandum of Understanding

9.2 Standards

NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations

Massachusetts State Building Code, 780 CMR, 8th Edition

Massachusetts Fire Prevention Regulations, 527 CMR 1.00 – 50.00, Fire Code

Chapter 148 of the Massachusetts General Laws, Fire Prevention

29 CFR, Part 1910 Occupational Safety and Health Standards

29 CFR, Part 1926 Safety and Health Regulations for Construction

MIT Building Systems Design Handbook

EHS Guidelines for Building Design

9.3 Other SOP/ SOGs

EHS Office Records Retention

Moving a Laboratory: Preparation and Decontamination

Laboratory Start-Up

Hot Work Permit

Leaving MIT: Closing Out a Laboratory

MIT's Environment, Health and Safety Guidelines for Construction, Service and Maintenance Contractors

EHS Laboratory Design Guideline

Post Occupancy Review and Lessons Learned Procedure

9.4 Supplementary Documents

City of Cambridge Local Emergency Planning Commission (LEPC) Laboratory Inspection Guideline

DoF PICS Database

City of Cambridge Step-by-Step Guide to Building Permits with Certificate of Occupancy Procedure

10. Definitions

Capital Project – Project which covers construction of new building.

Committee for Review of Space Planning (CRSP) Project - Project which covers renovations of existing buildings and space changes within existing buildings.

Repair and Maintenance Project – Project, which covers repair and maintenance of building infrastructure.

Space Change – When existing use of space within building is changed, e.g., office space to lab space.

Certificate of Occupancy – The certificate issued by the building inspector which permits the use of a building in accordance with the approved plans and specifications and which certifies compliance with provisions of law for the use and occupancy of the building in its several parts together with any special stipulations or conditions of the building permit.

Temporary Certificate of Occupancy - The certificate issued by the building inspector before the completion of the entire work covered by the permit, provided that such portion or portions shall be occupied safely prior to full completion of the building or structure without endangering life or public welfare. Any occupancy permitted to continue during the work shall be discontinued within 30 days after completion of the work unless the building inspector issues a certificate of occupancy.

Appendix A
EHS Best Practices for Project Designers and Managers

Ten Top Tips for Project Managers

1. Evaluate Occupancy during Renovation
2. Evaluate Potential Site Contamination
3. Evaluate the Need for a Storm Water and Dewatering permits
4. Incorporate Sustainable Concepts in the Design
5. Evaluate Code Compliance Options from an Institutional Perspective
6. Incorporate Laboratory Specific Issues
7. Incorporate Construction Mitigation
8. Evaluate Safety Record of Contractors; Pre-Qualify Contractors and Evaluate Contractor Performance on the Job
9. Obtain All Appropriate In-house and Legally Required Permits
10. Allow Sufficient Time for Building Commissioning

Introduction

Project Designers and Managers at the start of new projects and periodically during the various project stages should review the following EHS Best Practices. The intent is to alert the reader about significant EHS issues that may arise. More details on each issue may be project specific and are available from the EHS Project Review Team (EHS Team). The EHS Team is available to provide advice, obtain appropriate regulations and guidance documents and assist in their interpretation. The issues below are presented in the project stage (i.e., planning, design, or construction) where the impact of the issues is most significant.

See Appendix B: EHS Team Expertise for a more detailed list of resources.

Planning Phase

1. Evaluate Occupancy during Renovation

Buildings undergoing renovations are often filled with potential physical and chemical hazards and nuisance issues (e.g., odor, noise, vibration). The scope of construction and how it really impacts any occupants that are adjacent to the renovations can be underestimated. It is important that occupants do not become surprised and sometimes alarmed when the project gets into full swing. In addition to nuisance issues, there could potentially be code compliance problems if fire exits, fire alarms, fire protection sprinklers, or egress are compromised. See Construction Mitigation Issues at the end of this appendix.

Moving people into swing space if feasible may save money and time and construction can be done more effectively. People will be more productive, comfortable and safe in swing space without disruptions to their classes, work and research.

Except for small projects, all renovation projects should put together a study that evaluates the cost and feasibility of swing space versus keeping occupants in place. The study should answer the following questions:

Can the construction activity be reasonably isolated from the occupied space?

Can all code related systems remain on line during the life of the project? If not, what is the impact of taking them off line?

What is the relative cost of moving occupants versus keeping them in place? Any phasing issues should be discussed as well as any temporary measures: for example, egress pathways, temporary lighting, or alternate sources of ventilation.

How are the occupants' activities affected if they remain in place and if they are relocated?

2. Evaluate Potential Site Contamination

Potential contamination in the soil and/or groundwater is an important consideration for almost every MIT Capital Project. The presence of contamination can affect both the cost and schedule of the construction project and the future use or design of the building.

For projects that involve the off-site transportation of excavated soil, pre-characterization of the soil to determine its chemical quality is often warranted. This step is helpful in identifying the presence of contaminants at the site that would affect the cost of soil removal and disposal and/or require "response actions" under the Massachusetts Contingency Plan (MCP). If contamination is present and the site falls under the MCP, future site uses could be restricted depending on the types and levels of contaminants and how they are addressed. Thus, the project design may have to be modified to respond to MCP requirements.

3. Evaluate the Need for Storm Water and Dewatering Permits

The Clean Water Act, through the National Pollutant Discharge Elimination System (NPDES), sets requirements for point-source discharges (e.g., via a storm drain) into the Charles River or other bodies of water. These would apply to MIT construction projects that disturb more than 1 acre or dewater into a storm drain. The operator must submit a Notice of Intent at least prior to starting the project; develop and implement a Storm Pollution Prevention Plan (SWPPP) that incorporates Best Management Practices (BMPs); and submit a Notice of Termination when the project is completed.

BMPs may include non-structural (minimizing disturbances, preserving natural vegetation, good housekeeping) or structural (silt fence, sediment traps, etc.) methods. If discharging contaminated water, treatment will likely be required.

4. Incorporate Sustainable Concepts in the Design

MIT is committed to incorporating "green" or "sustainable" materials, designs, or concepts into any renovations or new buildings to the greatest extent feasible. Such features can save significant energy costs over their useful lives as well as improve the indoor environmental quality (IEQ) of the building, leading to increased productivity and comfort for all building occupants. Enhanced day lighting, increased acoustical barriers, occupant-controlled windows, and similar features have been proven to lead to happier and more productive workers.

MIT has developed sustainable building guidelines that may be consulted during the design phase.

Design Phase

5. Evaluate Code Compliance Options from an Institutional Perspective

Strict Code Interpretations versus Opportunities for Wider Scoped Code Upgrades

Often during renovation and new construction projects there are opportunities to extend fire protection or detection, improve exits, enhance fire rating of walls, increase fire stopping, upgrade electrical distribution systems, etc. In addition, insurer recommendations, prior municipal building inspector and fire prevention inspector findings and EHS MS Audit corrective actions to improve fire protection and life safety should be incorporated into the design. Possible barriers to taking these steps are, "it is not in the scope of the work" or "it is not required by the code". Before rejecting these possibilities, the long-term benefits to the Institute should be considered and alternate work scopes prepared that show the cost, schedule and scope impact.

Code Compliance versus other Non-Code Needs

Buildings that are built "to code" do not necessarily meet operational needs required to meet OSHA regulations, emergency response, ease of

maintenance, quality of equipment in terms of compatibility and longevity, etc. Users and service-oriented personnel at MIT may ask for something that "is not required by code" but is required for safe, efficient operation of the building. Project Managers should consider the long-term Institutional-use issues when deciding how to apply what the code allows. Remember that most regulations are minimum requirements.

The Institute's Long Range Planning

The Institute has been doing long range planning for years. Designers should be made aware of these planning studies and incorporate their goals as part of the design. These studies include campus wide utilities, emergency preparedness and response, flood protection, storm water management, hazardous operations, master planning for the physical campus, security, signage and location of special use facilities such as child care centers and hazardous materials storage.

6. Incorporate Laboratory Specific Issues

Lab Cleanouts for Demolition or Renovations

Prior to conducting demolition or renovations in any MIT laboratory, clearance is necessary from the EHS Team to assure the work is conducted safely and in compliance with government and MIT standards. The EHS Team reviews the work scope and indicates practices necessary to conduct safe work and/or comply with the government regulations. Some issues normally encountered are asbestos, ventilation, chemical, radiation, and biological hazards, lead paint, sharps, and physical hazards. Refer to *Laboratory Decontamination SOP*.

The EHS Team coordinates with an outside contractor when necessary to handle any such hazard, and will re-open the space upon verification that the hazard has been addressed. The project manager should not determine how the laboratory should be cleaned out without the advice of the EHS Team.

Floor Drains versus No Floor Drains

Whenever possible floor drains should be avoided in areas using chemicals, i.e. laboratories, due to the potential for a release to the environment. In addition, continual maintenance is required to prevent

traps from drying and releasing foul odors. However, floor drains can be an aid to preventing significant damage during uncontrolled releases of water. A compromise is to carefully locate floor drains away from areas where chemicals are used or stored provided a good maintenance program is developed. They should not be located next to laboratory hoods or chemical storage cabinets. The installation of floor drains should be carefully considered on a case-by-case basis.

Waste Water Treatment

Local regulations require a careful evaluation of options to handle wastewater effluent. One option is to have a building treatment system. Another option is to consider local treatment (e.g., limestone chip tanks) at each sink, but this option may require on-going time-consuming maintenance and is not preferred by Cambridge authorities. The choice depends on the extent of the building renovation and existing building systems. As part of the evaluation of system choices, the project manager should compare the two options for life cycle cost and acceptance by the Cambridge authorities.

Existing Ventilation System Cannot Accommodate New Program Requirements / Insufficient Outside Air for Intended Use of Space

There are a few different ventilation issues that project managers should be aware of in laboratory renovations. The scope of work may call for new fume hoods to be installed but no additional capacity to the air-handling unit. Or conversely, the program may call for new research activity but no new exhaust (and therefore supply) brought into the new space. In all cases of renovation work where there is a change of activity and/or the hood capacity, a review of the building systems will need to occur. There may be underutilized capacity somewhere else to reroute to the new space or perhaps the research activity itself has to be relocated; or it may be that the system can in fact handle the activity. In all cases, it is a question to be asked and answered.

Air Intakes near Loading Docks or other Contaminant Sources

To ensure that air intakes are not close to fume hood discharges, they are frequently located at or near ground level. This may result in ground level contamination of supply air from diesel or automobile exhaust with resulting poor indoor air quality. Costs of rerouting of the traffic adjacent to the intake or some protection from the contamination may need to be figured into the budget.

Inadequate Separation of Supply and Exhaust Stacks

Buildings with very few lab hoods often have air-handling units located on the roof and these sometimes end up near fume hood exhaust stacks. Re-entrainment of the contaminants from the exhaust stack to the supply air may occur. Computer modeling or wind tunnel tests may need to be done and the fume hood exhaust stacks may need to be extended if the studies show a problem.

Location of Lab Hood

The lab hood is assumed to be the most hazardous area at the lab. Its location should not impede egress in the event of an incident in the hood. The hood should also be located as far away as possible from sources of cross drafts that may compromise the hood's ability to contain hazardous materials. These sources include supply air grilles, doors, and heavy traffic areas. All these issues must be evaluated with respect to the location of the hood.

7. Incorporate Construction Mitigation

Construction activities around a dense campus like MIT often create issues to some part of the population, most often those in the general area. During the early phases of project design there is a

need to evaluate the adverse effects of the project on adjacent structures, research and/or operations. Consideration of the impact construction may have on delivery of services, daily operations, research, and mitigation of such issues as dust, noise, scheduling, access, odors, vibration, interference with emergency response and safe passage of pedestrians, require good overall communications with users, service providers, emergency responders, abutters and points of contact for questions and other similar concerns. Once this evaluation is complete, a construction mitigation plan should be developed. This mitigation plan should address the methods that will be employed to minimize (or eliminate) the adverse impact on the respective operations and procedures and to respond to and resolve construction related complaints. See Construction Mitigation Issues at the end of this appendix.

8. Evaluate Safety Record of Contractors; Pre-Qualify Contractors and Evaluate Contractor Performance on the Job

Because MIT expects contractors to exercise a standard of care, work, and workmanship related to safety, the safety history of those contractors should be reviewed before they are hired. Further, their safety performance on the site needs to be continuously evaluated, and corrective actions taken if/when necessary. Preliminary inspection of contractors' records with OSHA and EPA can be quite revealing. These materials can be obtained from the contractors and also from OSHA and EPA web sites.

Contractors must have written safety and emergency action plans and qualified individuals responsible for their implementation. For certain regulated work, a "competent person" must be used.

Strong EHS programs will prevent injuries, control losses, and minimize environmental impact. MIT expects contractors to cooperate in providing a safe workplace and healthy environment for the MIT community and its visitors, as well as Contractor's employees and subcontractors, by following industry standards and best practices, to address potential hazards.

One of the goals of MIT's *Environment, Health and Safety Guidelines for Construction, Service and Maintenance Contractors* is to communicate MIT's EHS philosophy and expectations to all construction, service and maintenance contractors. The reach of this document is intended to focus on Contractors working in occupied buildings (or on grounds) on renovations and operations projects as opposed to stand-alone capital construction projects. While MIT shall communicate known hazards, from our operations, Contractors are expected to manage Environment, Health and Safety hazards, risks and programs for their employees and subcontractors.

MIT EHS guidelines may be more comprehensive than government regulations. Regulatory compliance is a minimal expectation. Contractors are required to evaluate the contents of the guidelines document as it pertains to the work to be performed at MIT and shall ensure their employees and subcontractors understand the guidelines.

Before starting work at MIT, contractors are required to contact the appropriate MIT project manager or supervisor. Contractors are asked to review any applicable MIT EHS guidelines and standard operating procedures (SOPs).

Various OSHA standards require that a program be developed and implemented by the employer. These programs include written employer-specific programs (including

documentation and record keeping) employee training and program assessment. The OSHA standards requiring such programs include Fall Protection, Confined Spaces, Control of Hazardous Energy (Lock Out/Tag Out), Hazard Communication, Bloodborne Pathogens, electrical safety (particularly higher-voltage work), and certain contaminant-specific exposures such as lead, asbestos, beryllium, and benzene. Wherever applicable, the contractor may be requested to produce evidence of these programs and its implementation with its on-site employees as well as those potentially working at MIT.

Contractor Qualification Statement:

A Contractor Qualification Statement is available from MIT Department of Facilities. This statement requests information on: organization, categories of work, experience, financial, safety and insurance, and signature. The safety and insurance section includes: corporate safety plan/program, Workmens' Compensation Rating Bureau Experience Modification Worksheet, five year OSHA or other safety agencies compliance history, and insurance and can be used to pre-qualify contractors.

Contract for Construction:

General conditions for the Contract for Construction include:

Safety precautions and programs:

- Contactor/subcontractor responsibility
- Written safety program
- Insurance
- Hazardous material
- Environmental conditions

Safety of persons and property:

- Precautions for safety
- Compliance with applicable laws
- Provide safeguards for safety
- Use of hazardous materials
- Designate responsible person for prevention of accidents
- Police details for traffic control and safety
- Compliance with MIT's permits and programs: electrical, hot work, confined space entry, control of hazardous energy and electrical safety-related work practices, hazard communication, shutdown requests, and work near sprinkler, water, or drain lines.

Emergencies:

- Emergencies affecting safety of persons and property

Construction Phase

9. Obtain All Appropriate In-house and Legally Required Permits

In-house permits for hot work and confined space entries need to be obtained by the contractor before going to the fire department and building inspectional services. It is important that the City of

Cambridge regulatory authority have confidence in MIT's ability to control hazardous operations. This can prevent unnecessary delays.

10. Allow Sufficient Time for Building Commissioning

Advanced notice of a building nearing completion and the planning for when the certificate of occupancy will be sought is necessary to provide an opportunity for pre-inspections and "shake downs" before the fire department or inspection services are called in to issue certificates of occupancy.

The project scheduling and timetables are often challenging with little or no flexibility and little opportunity for dealing with unplanned events that arise. The promise to deliver a finished project by the time the semester begins sets up expectations of users who can be disappointed if the fire department or building inspectional service decides the building isn't ready for occupancy and no certificate of occupancy is issued. This can be avoided with good communication between the EHS Team, Project Manager and Contractor.

The MIT EHS Construction Safety Program through its Construction Safety Officers is actively involved with the Department of Facilities Project Management Division on capital and renovation construction activities. Working closely with project managers and other MIT groups, as well as with Cambridge Fire Department and Building Inspectional Services, we continue to facilitate a mutual means for communicating and resolving construction and safety concerns without interfering with or delaying the progress of the work. The team has provided specific guidelines to help project managers in the conduct of their work, participate in project kick-off meetings, and conduct field surveys of active construction sites. Construction Safety program includes: inspections, tours, interaction with Project Management Division staff, training, construction metrics, and occupancy permits / building commissioning.

Construction Mitigation Issues

MIT Community Affected

Type of Complaint	Possible Cause	Possible Solution
Odor or indoor air quality	1) Vehicle exhaust from air intakes	1) Proper maintenance of equipment Filtration of exhaust from equipment Keep vehicles away from air intakes Relocate air intakes temporarily Filtration of air intakes Conduct work off hours Shut off air intakes if possible during work Conduct air monitoring to verify success
	2) Vehicle exhaust from open windows	2) Close windows and provide other source of air
	3) Vapors from construction materials, i.e. paints, tar, glues Odors associated with excavation work	3) Substitute odorless materials Work off hours Isolate areas via barriers and HVAC systems Filtration of air intakes
Dust	Construction vehicle movements, demolition of structures	Work wet Provide frequent cleaning of area Proper filtration on air intake On/off management of HVAC system
Noise and vibration	Vehicles, Equipment	Use quieter equipment Install mufflers or other noise abatement techniques Carefully schedule work activities Conduct monitoring to verify success
Lab safety issues	1) Compromising fire protection systems	1) Establish procedures in advance
	2) Blocking Egress Routes	2) Maintain proper egress Evaluate effects of construction activities in advance
	3) Safety hazards, i.e. falling objects, tripping hazards	3) Keep areas isolated from community Provide adequate signage

Construction Personnel Affected

Type of Complaint	Possible Cause	Possible Solution
Chemical exposures caused by MIT	Fume hood exhausts	Control time of roof work Control time of hood use Relocate hood stacks Increase hood stack height
	Laboratory work	Keep workers away from laboratories
Concern about use of radiation or biological materials	Laboratory work	Keep workers away from laboratories Careful control of work schedules Information or training

Appendix B
EHS Team Expertise

Criteria for the Selection of EHS Project Liaison and EHS Project Review Team

Attributes of a design review team and project liaison-assumptions

Consistency
Technical knowledge
Team members should represent all relevant EHS disciplines
Familiarity with the MIT design and construction process
Working relationship with DOF
Working relationship with DLC and the EHS Coordinator
Flexibility
Communication is key

Assignment of the EHS P**roject Liaison and EHS Project Review Team members.**

A. EHS Project Liaison-in this role, the liaison acts as the EHS point of contact for the project team (DoF Project Manager, PI, etc.) and attends project meetings as required. Currently Service Team Leader assigns this individual from the LFDCRS team or from within EHS based on the project scope and anticipated expertise required. Other factors may include the DLC affiliation.

Options- EHS Lab Design Team member, Lead Contact, EHS Coordinator

1. EHS Laboratory Design Team member (current process)
   Pros-familiarity with the design and construction process
   - Working relationship with DOF and most A&E firms.
   - Experience in the role.
   - Fosters consistent input from project to project.
   - Workload balance accounted for.
   - Ability to understand other stakeholder concerns (DOF, DLC, consultants etc.)
   - Has ready access to DLC team members.

   Cons-in most cases, may not have authority to speak on behalf of the DLC

2. Lead contact
   Pros- familiarity with the DLC
   - Has a vested interest in the outcome of the project
   - Has an established relationship with the EHS Coordinator.
   - May have authority to speak on behalf of the DLC

   Cons- may or may not be familiar with the design and construction process
   - May not be a member of the EHS Laboratory Design Team

Workload balance issues
potential lack of consistency from project to project

3. EHS Coordinator (large DLC's only)
   Pros- familiarity with the DLC
   Has a vested interest in the project
   Can speak on behalf of the DLC
   Cons-workload balance issues
   EHS process would be dependent on individuals outside the EHS organization
   Potential lack of consistency from project to project
   May not have an appreciation for DOF limitations, may be biased to the DLC

B. **EHS Project Review Team membership selection/assignment-** in this role, the team members support the EHS Project Liaison by providing technical input to the design review, representing their respective disciplines and attending project meetings as required.

Options-EHS Project Liaison selects his or her own team members at random, or the team members are drawn from the EHS-MS Team for the DLC or from the LFDCRS Team members.

1. EHS-MS Team
   Pros- have a vested interest in the DLC
   Familiarity with the DLC
   All EHS disciplines are represented
   Ability to engage the EHS Coordinator for input or conflict resolution

   Cons- may or may not be familiar with the design and construction process
   Possible lack of consistent design review input from project to project

2. LFDCRS Team members (current process)
   Pros-currently performing the work
   Opportunity for consistency of design review input from project to project
   Familiarity with the design and construction process
   All EHS disciplines are represented
   Members may also be the lead contact or EHS-MS team member for the DLC
   Can engage the EHS Coordinator for input or conflict resolution on an as needed basis.

   Cons- inconsistent DLC (EHS) representation
   Members may not have a working relationship with the DLC.

Laboratory and Facility Design and Construction Review

Service Team

Service Team Leader

Service Team Deputy Leader

Construction Safety Officer

Safety Program member

Industrial Hygiene Program member

Radiation Protection Program member

Biosafety Program member

Environmental Management Program member

EHS Team Expertise Areas by Building Stages

Concept / Planning

A. Environmental Considerations
Environmental Impact Review
Ground Water Contamination
Hazardous Waste
Wastewater, storm water and construction water

B. Loss Prevention & Personal Safety
Chemical Storage & Handling
Fire Detection Alarm and Suppression Systems
Interface with Factory Mutual
Underground Utilities

C. Ventilation and Chemical Storage
Heat Recovery

D. Performance and Acceptance Criteria
Air Balance Conventional
Air Balance VAV Systems
As built drawings
Duct Tests
Emergency Electrical Testing
Emergency Eyewash
Emergency Showers
Fire and Smoke Alarms
Fume Hood and Biosafety Cabinet Tests
Other Alarms
Pre-Occupancy Safety Review Checklist

E. Construction Phase Issues
Construction Safety Review Checklist

Decontamination/Decommissioning
- Asbestos
- Lead Paint
- Radiation
- Chemical
- Safety
- Biological

Excavation
Indoor Air Quality

Design

A. Environmental Considerations

Air Pollutants and Emissions
Permits and Submissions
Spill Conditions
Spill Containment
Storm Water Runoff/Surface Water Protections/Land Use Restrictions

B. Loss Prevention & Personal Safety

Alarm & Control Systems for Experimental Equipment
Building & Laboratory Signs
Chemical Storage & Handling
Compressed Gas Storage and Piping
Deluge Showers
Emergency Preparedness Planning
Emergency Cabinets
Emergency Electrical Considerations
Emergency Fuel Gas Shut-Off
Eye Wash
Fire Detection Alarm and Suppression Systems
Flammable Liquid Storage Cabinets
Fuel Gases
Ground Fault Circuit Interrupters
Interface with Factory Mutual
Life Safety/Public Safety
Master Electrical Disconnects
Safety Control Systems for Laboratory Experiments
Underground Utilities

C. Ventilation and Chemical Storage

Air Distribution
Duct Issues
Exhaust Ventilation for Lab Modules
General Ventilation
Pressure Relationship
Recirculation of Lab Air
Supply Air Velocity and Entry Location
Ventilation Air Rate
- Air Changes per Hour
- Recirculation of Exhaust Air

Toxic Gas Cylinder Storage
Directional Air Flow in Laboratories
Emergency Ventilation Needs
Heat Recovery

D. Performance and Acceptance Criteria
Air Balance Conventional
Air Balance VAV Systems
As built drawings
Duct Tests
Emergency Electrical Testing
Emergency Eyewash
Emergency Showers
Fire and Smoke Alarms
Fume Hood and Biosafety Cabinet Tests
Other Alarms
Pre-Occupancy Safety Review Checklist
Building/Project Commissioning
Building/Project Certificate of Occupancy

E. Construction Phase Issues
Construction Safety
Construction Safety Review Checklist
Decontamination/Decommissioning
- Asbestos
- Lead Paint
- Radiation
- Chemical
- Safety
- Biological

Excavation
Demolition Safety
Indoor Air Quality
Prequalification of Contractors with respect to EPA and OSHA

F. Specialty Considerations
Biosafety Laboratory
Radiation Safety
Laser Safety

Construction

A. Environmental Considerations
Environmental Release
Spill Containment
Storm Water Runoff/Surface Water Protections/Land Use Restrictions

B. Loss Prevention & Personal Safety
Interface With Factory Mutual
Underground Utilities

C. Performance and Acceptance Criteria
Air Balance Conventional
Air Balance VAV Systems

As built drawings
Duct Tests
Emergency Electrical Testing
Emergency Eyewash
Emergency Showers
Fire and Smoke Alarms
Fume Hood Tests
Other Alarms
Pre-Occupancy Safety Review Checklist
Testing Prior to Occupancy
Building/Project Commissioning
Building/Project Certificate of Occupancy

D. Construction Phase Issues

Construction Safety
Construction Safety Review Checklist
Cranes
Decontamination/Decommissioning
- Asbestos
- Lead Paint
- Radiation
- Chemical
- Safety
- Biological

Excavation
Demolition Safety
Indoor Air Quality
Prequalification of Contractors with respect to EPA and OSHA

Other Issues

Interaction with Regulatory Agencies
MWRA
Building Department
Fire Department
EPA
MA DEP
OSHA
Plumbing Department
Environmental Permits

Sources of EHS Help

For general assistance and direction call 452-EHSS (3477)

Biosafety Program

Use of Biological Materials
Bloodborne Pathogens
Recombinant DNA
Viruses, bacteria, fungi research
FDA, CDC, NIH regulations
Sharps Waste
Biological Decontamination

Environmental Management Program

Sustainable Concepts
Lab Cleanouts
Hazardous Waste Disposal
Pollution Prevention Plan
Air Permits
NPDES Permit Campus
Waste water and storm water

Industrial Hygiene Program

Chemical Decontamination
Asbestos
Lead, Mercury
Indoor Air Quality
Laboratory Ventilation
Supply Air Intakes
Exhaust Stack Design
Noise
Ergonomics
Odor Complaints
Protective Clothing
Toxic Gases
Exposure To Chemicals

Campus Radiation Protection Program

Radioactive Material Authorization
Ionizing Radiation
Non ionizing Radiation
Radioactive material usage, security, and storage
Lasers, x-ray machines
Accelerators
Radioactive Waste Collection
Radioactive Decontamination

Safety Program

Construction Safety
Occupancy Issues
Code Compliance
Fire Protection Systems
Confined Space Entry
Cutting Welding
Electrical Safety
OSHA Regulations
Emergency Response
Hot Work

Facilities Environmental Team

MWRA
Wastewater Treatment
Storm Water Management
NPDES Permits - Construction
Potential Site Contamination*
Environmental Releases*
Refrigerants
Environmental Initiatives*

* The Environmental Management Program provides support to Department of Facilities for these issues.

Appendix C
EHS Capital Projects Design Review Form (Example)

EHS CAPITAL PROJECTS DESIGN REVIEW

Project _____ **EHS Project Liaison** _____ **Date** _____

EHS Team:

Name: **Review Discipline:**

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

Project Status: **Concept / Planning Phase** _____

Design Phase _____

Construction Phase _____

Commission Phase _____

Main EHS Issues:

_____
_____
_____
_____

Potential Issues:

_____
_____
_____
_____

Appendix D
EHS Project Reviewers
Skills / Competencies and Acquisition of Skills

General knowledge of MIT plan review and construction review process

- Knows that Laboratory and Facility Design and Construction Review Services Service Team Leader and Team are responsible for leading efforts to provide review of EHS issues in new building and laboratory construction (capital projects) and renovations at MIT and to direct the EHS Construction Safety Program

- Knows the members of the service team:

  See Appendix B: EHS Team Expertise.

- Knows the duties and process associated with this service:

  See Laboratory and Facility Design and Construction Review Services SOP

  Knows the process and can explain in detail to DLC personnel and EHS Office staff

Acquisition of Skills

- Discussion with Service Team Leader

- In-house training

- On-the-job training / participation on team

Read design / construction plans

- Ability to read and interpret plans, drawings and blueprints

- Knows difference between Plan (plan can include calculations, specifications, manufacturer's product literature, and other engineering design data; includes sketches, site plans, floor plans, shop drawings, and blueprints comprising the design and construction documents for a project) and Shop Drawing (scaled working drawings, equipment cut sheets, and design calculations)

- Understand abbreviations and symbols

- Ability to locate EHS features

- Use plan legend to find appropriate page

- Relate plan specifics back to regulatory and MIT requirements

- Ability to interpret and use plan scale

- Ability to identify construction methods and materials that have EHS issues

- Ability to identify EHS requirements, given a set of plans, so that deficiencies / issues are identified and documented

- Ability to evaluate an EHS related design concept, given preliminary design presentation, so that agreed upon concept meets intent of regulations and MIT requirements
- Ability to evaluate plans for process or operation, given plans and specifications, so that the process or operation is reviewed for regulatory and MIT requirements and all deficiencies / issues are identified and documented
- Ability to evaluate alternative methods for compliance with regulations and MIT requirements
- Ability to evaluate the integration of EHS systems with building service systems
- Ability to evaluate a performance-based EHS design concept so that the agreed upon concept meets intent of regulatory and MIT requirements

Acquisition of Skills

- Discussion with Service Team Leader
- In-house training
- On-the-job training / participation on team

Understand design and construction notes / specifications

- Ability to read and interpret notes / specifications
- Understand abbreviations and symbols
- Ability to locate EHS features
- Relate notes / specifications specifics back to regulatory and MIT requirements
- Ability to identify construction methods and materials that have EHS issues
- Ability to identify EHS requirements, given a set of notes / specifications, so that deficiencies / issues are identified and documented
- Ability to evaluate an EHS related design concept, given preliminary design presentation, so that agreed upon concept meets intent of regulations and MIT requirements
- Ability to evaluate notes / specifications for process or operation, given plans and specifications, so that the process or operation is reviewed for regulatory and MIT requirements and all deficiencies / issues are identified and documented
- Ability to evaluate alternative methods for compliance with regulations and MIT requirements
- Ability to evaluate the integration of EHS systems with building service systems
- Ability to evaluate a performance-based EHS design concept so that the agreed upon concept meets intent of regulatory and MIT requirements

Acquisition of Skills

- Discussion with Service Team Leader

- In-house training
- On-the-job training / participation on team

Understand municipal building and fire department review process

- Know and use *MIT EHS Construction Safety Program City of Cambridge Construction Permitting and Certificate of Occupancy* procedures
- Know and use the regulations / procedures for the local municipal review process (for Cambridge—*Step by Step Guide to Building Permits with Certificate of Occupancy Procedure*
- Know and use the Cambridge Fire Department permitting process schedule
- Know and use applicable sections of Massachusetts Building Code

Acquisition of Skills

- Review municipal web site
- Discussion with Service Team Leader
- In-house training
- On-the-job training / participation on team

Understand process for certificate of occupancy

- Know and use *MIT EHS Construction Safety Program City of Cambridge Construction Permitting and Certificate of Occupancy* procedures
- Know and use the regulations / procedures for the local municipal review process (for Cambridge—*Step by Step Guide to Building Permits with Certificate of Occupancy Procedure*)
- Know and use the Cambridge Fire Department permitting process schedule
- Know and use the MIT EHS *Construction Safety Guideline, Occupancy Permit Readiness Process Flow Chart*
- Know and use the MIT EHS *Building Commissioning Checklist for Pre-Certificate of Occupancy Inspection*
- Know and use applicable sections of Massachusetts Building Code

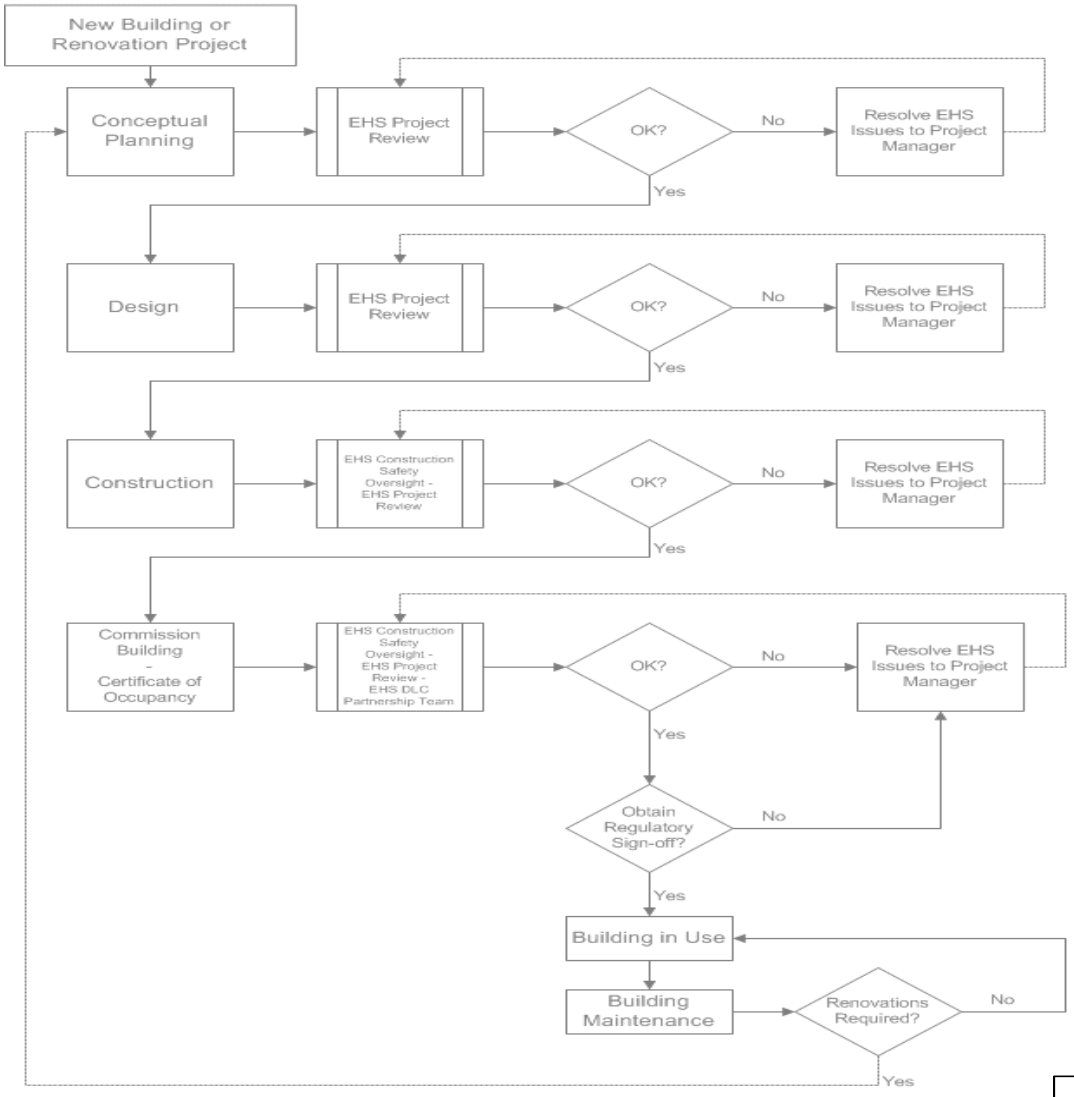
Acquisition of Skills

- Review municipal web site
- Discussion with Service Team Leader
- In-house training
- On-the-job training / participation on team

Appendix E

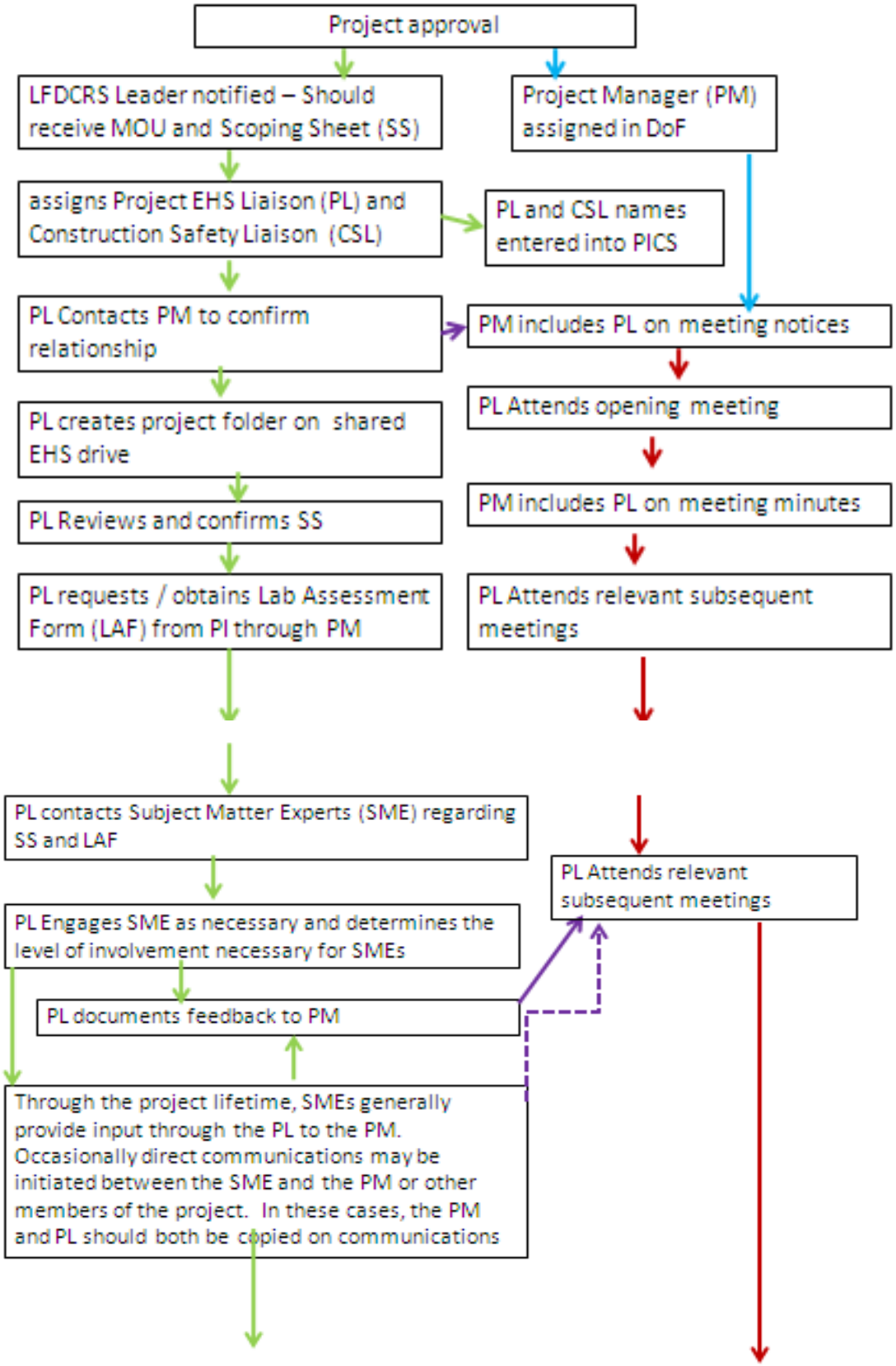
Laboratory and Facility Design and Construction Review Services Process Flow Diagram:

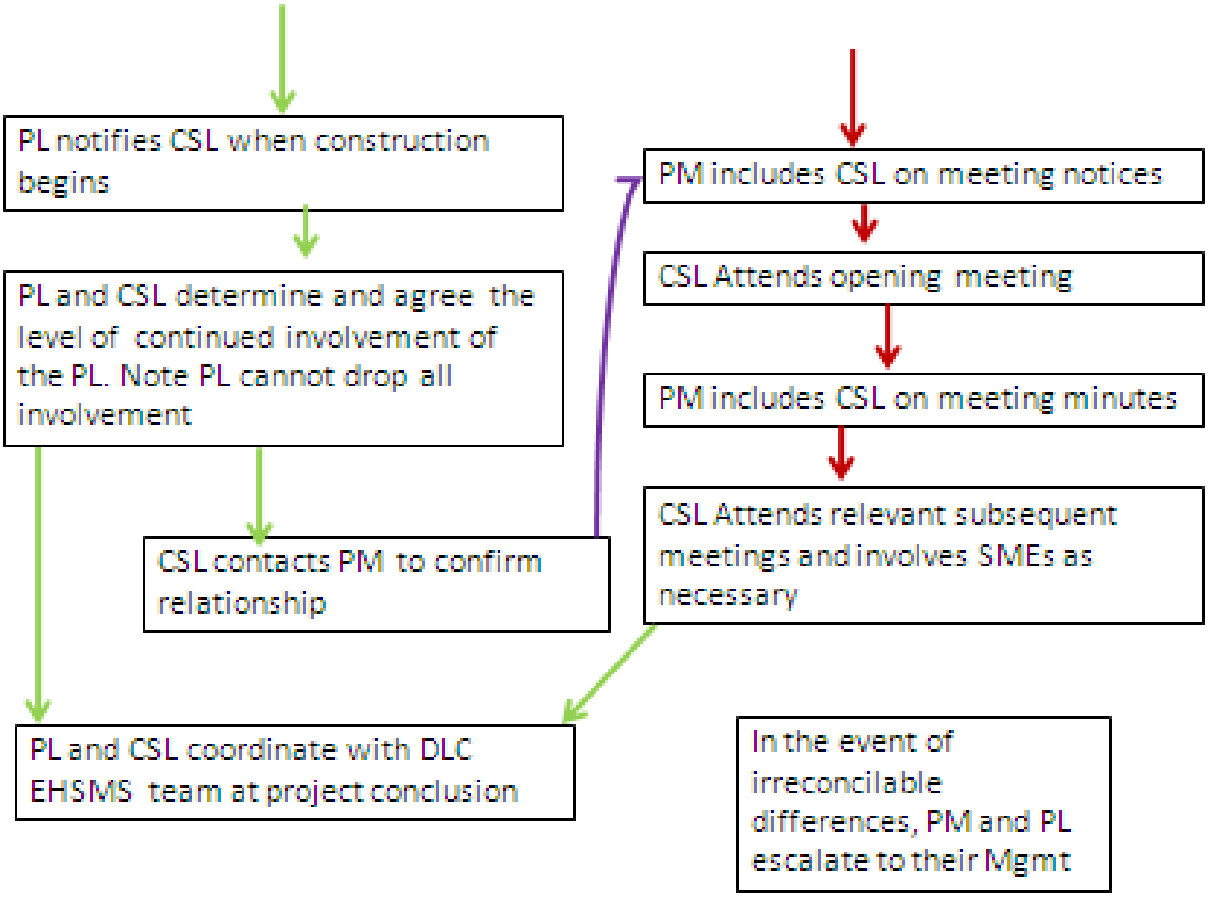
New Buildings and Renovations



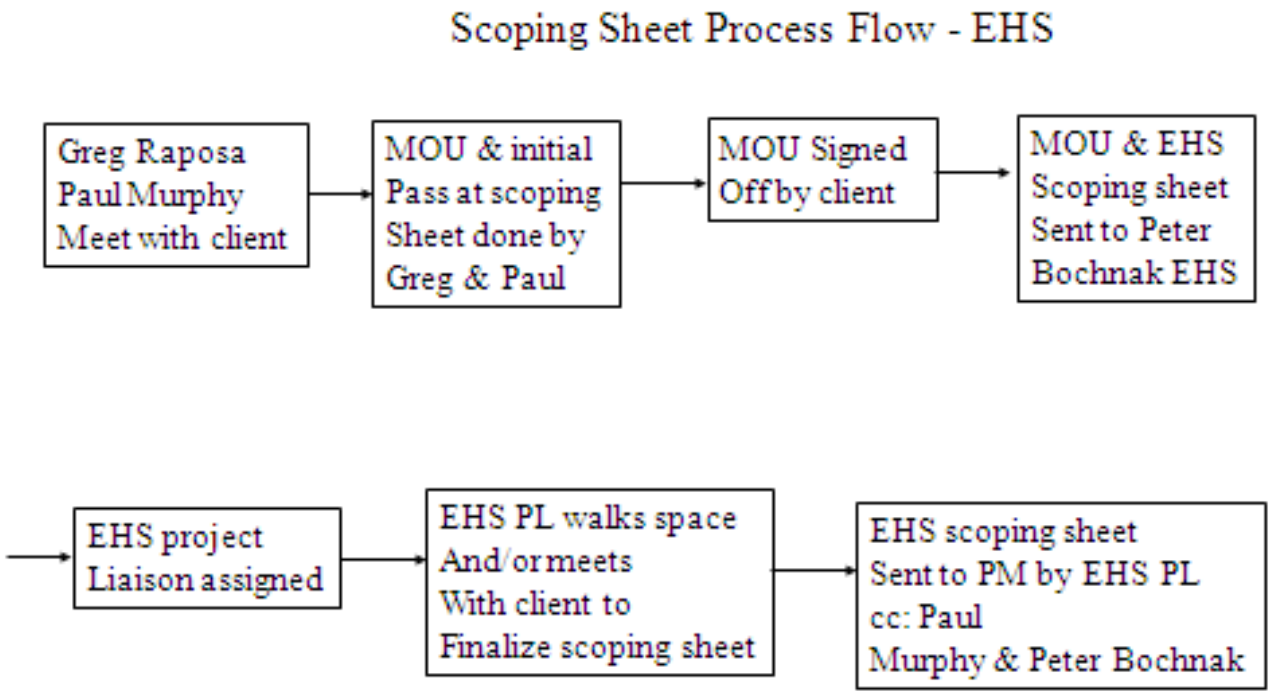
Appendix F

Design Review Process Flow Chart




PL notifies CSL when construction begins
PL and CSL determine and agree the level of continued involvement of the PL. Note PL cannot drop all involvement
CSL contacts PM to confirm relationship
PM includes CSL on meeting notices
CSL Attends opening meeting
PM includes CSL on meeting minutes
CSL Attends relevant subsequent meetings and involves SMEs as necessary
PL and CSL coordinate with DLC EHSMS team at project conclusion
In the event of irreconcilable differences, PM and PL escalate to their Mgmt

Appendix G


Scoping Sheet Process Flow - EHS
Greg Raposa
Paul Murphy
Meet with client
MOU & initial
Pass at scoping
Sheet done by
Greg & Paul
MOU Signed
Off by client
MOU & EHS
Scoping sheet
Sent to Peter
Bochnak EHS
EHS project
Liaison assigned
EHS PL walks space
And/or meets
With client to
Finalize scoping sheet
EHS scoping sheet
Sent to PM by EHS PL
cc: Paul
Murphy & Peter Bochnak

EHS Scope Sheet - This form will be used by EHS to communicate to PM's the EHS Issues that are relevant to the project at project initiation. Once EHS receives this from Facilities, we will review it and if necessary contact the PI to get more information. The completed form will be sent back to Michael Kearns, Facilities Program Manager.

Project: (input data)
Project #: (input data)
Client: (input data)
Contact Name: (input data)
Phone: (input data)
Email: (input data)

Space Location: (input data)

Funding Source: (input data)

USF: (input data)

Space Type:

0	Office	0	Classroom	0	Conference
0	Study Space	0	Library	0	Lab
0	Other				

Zero (0) Designates That The Field Has Not Been Selected From The Input Sheet

Construction Type:

0	Finishes Only	0	Full Gut/Renovation

Scope of Work:

General

	Animal Research		Nano-materials
	Glove boxes		Occupied Renovation
	Lab Decontamination/Decomissioning		Office in lab
	Laboratory equipment - special electrical connections, emergency power		Photo processing
			Warm / Cold / Environmental rooms

Safety

	Acoustical materials		Fall hazards
	Compressed gas cylinder use/storage		Special Fire protection/life safety features
	Confined spaces		Flammable storage cabinets
	Cryogenic Use		Flammable storage refrigerators
	Special egress issues		Fuels
	Emergency eyewash		Hazardous material use/storage/inventory/permits

- [ ] Emergency evacuation maps
- [ ] Emergency shower
- [ ] Explosives
- [ ] Machine tools
- [ ] Portable fire extinguishers

Industrial Hygiene

- [ ] Acid digestion/aquaregia
- [ ] Animal perfusion sinks & local ventilation
- [ ] Biosafety cabinet
- [ ] Clean room
- [ ] Chemical storage cabinets
- [ ] Fume hoods
- [ ] Heated perchloric
- [ ] Hydrofluoric Acid use
- [ ] LEL monitoring
- [ ] Local exhaust ventilation
- [ ] Oxygen depletion monitoring
- [ ] Toxic gas monitoring

Environmental

- [ ] Air emission sources
- [ ] Containment soils management
- [ ] Hazardous waste generated
- [ ] Storm water management
- [ ] Wastewater management
- [ ] Water supply

Radiation Protection

- [ ] Accelerators: shielding
- [ ] Cell phone antenna
- [ ] Irradiator: security /floor loading
- [ ] Lasers: Class 3b & 4
- [ ] Magnets: shielding/isolation
- [ ] Radioactive materials
- [ ] Radioactive waste storage
- [ ] RF/Microwave
- [ ] Specialty ventilation: Carbon/HEPA
- [ ] Tritium exit signs
- [ ] UV light sources
- [ ] X-ray Machine: shielding/floor loading

Biosafety

- [ ] Aerosol generation equipment, i.e. sonicator
- [ ] Madison Aerosol Chamber, FACs
- [ ] Autoclaves - special ventilations & steam lines
- [ ] Biological agents - BL1
- [ ] Biological agents - pathogens (BL2 or greater)
- [ ] Incubators (CO_2 gas lines and piping)
- [ ] Large scale bio research (≥ 5 liters)
- [ ] Security Issues for DEA materials/select agents
- [ ] Sink, i.e. hands-free
- [ ] Tissue Culture suite
- [ ] Use Non-NIH Designated human embryonic stem cells
- [ ] Use of primates
- [ ] UV lights in room

Construction Safety

☐	Access control	☐	disturb/remove lab plumbing
☐	Asbestos	☐	Fire stopping
☐	Construction mitigation plan	☐	Pest Management
☐	Construction waste management	☐	Window caulking 1960's/70's
☐	Disturb painted surface (lead paint survey)		

Additional Comments: (Please identify code or potential code triggers)

The following items are considered part of building code or MIT design guidelines and it is expected the architect and engineer will be responsible for them. However, EHS can be contacted for advice on e.g. fire protection, detection and suppression systems, automatic sprinkler design and egress design.

Scope Review By: _____

_____

Date

Appendix H

Massachusetts Institute of Technology
Department of Facilities and Environment, Health and Safety Office
Project Review and Comment Process Memorandum of Understanding

Agreed by

Richard Amster, Director of Campus Planning, Engineering and Construction

Louis DiBerardinis, Director of Environment, Health and Safety Office

The parties agree to the following principles in an effort to facilitate an efficient and effective process for the review of Environment, Health and Safety aspects and impacts related to the design of projects involving new construction and the renovation of spaces at the Institute.

1. Ensure Environment, Health and Safety Office (EHS) representation to Department of Facilities (DoF) capital and renovation projects at the screening / initiation phase.

    a. DoF project initiation team leader (renovation) or program manager (capital) will contact the EHS lab design team leader who will assign an EHS staff member as an EHS Project Liaison who is responsible to coordinate and be a front contact for EHS participation by discipline as project scope requires.
    b. It is recognized that most Capital Renewal projects and projects in the "Minor Alterations" category may not require EHS involvement. However, EHS will participate upon request and as the need arises for these types of projects.

2. The Project Manager and EHS Project Liaison will participate diligently in the process.

    a. Timely communication of project schedules and correspondence is expected of all parties.
    b. The EHS Project Liaison will attend and participate in project meetings.
        i. It is recognized that EHS may not need to attend all meetings, but will be expected to be invited to key meetings and if unable to attend provide sufficient follow up to be confident that EHS issues will be addressed.

3. The EHS Project Liaison will be integrated into all phases of the project and will typically assume the roles indicated in the following table as they correspond to the specified project phase.

    a. The table displays a generic project thus phasing and roles could vary slightly from project-to-project; however, the intent is that EHS be involved in projects through the design and construction phases.

Project Phase	**EHS Role**

Programming	Advisory
Conceptual design	Advisory
Schematic design	Review and commentary
Design development	Review and commentary
Construction documents	Confirmatory
Submittals	Review and commentary
Shop drawings	Review
Requests for information during construction	Advisory
Commissioning	Review

4. Clear guidelines will be developed to the extent necessary to ensure timely and clear solicitation and elicitation of project review comments from each organization.

    a. Due dates will be developed that take into consideration DoF and EHS project and staffing requirements.
    b. Comments will strive to be complete, accurate and consistent.
    c. The EHS Project Liaison is responsible for ensuring all potentially effected EHS program areas are consulted and provided opportunity for comment.
    d. Comments from each organization (EHS and DoF) will be documented and qualified to indicate their basis. This will include, but is not limited to, whether they are a code or regulatory requirement, a program requirement, MIT design standard, best practice, insurer recommendation, will improve reliability, provide future or spare capacity, maintainability, sustainability (such as reduced water usage or reduced energy usage) or life-cycle-cost advantage.

5. Comments from the identified Project Manager and the EHS Project Liaison will be considered valid and will be incorporated to the extent agreed between these individuals.

    a. Relevant comments from other interested parties must include the EHS Project Liaison and DoF Project Manager in their distribution.

6. In the event of an impasse of differing or unresolved requirements or views, the DoF Project Manager, EHS Project Liaison, or both shall escalate their concern or issue to the relevant EHS Deputy Director and DoF Program Manager for resolution in a timely manner.

    a. Impasse resolutions shall be documented and communicated to both organizations.

7. It is recognized that there are many other parties interested in the design, including DLCs and other elements of the DoF, and other phases of projects with EHS implications, including construction activities and commissioning. This agreement is intended to address and facilitate EHS and DoF communication and cooperation in the review of design plans. This agreement is not intended to address all interested parties

or phases of projects. It is recognized that the principles and information can and should be used to facilitate communication with other parties and throughout the project.

Date: _____

Signature: _____ Department of Facilities

Signature: _____ EHS Office