Indoor Air Quality Program

DARTMOUTH

Contents

Section 1 – Scope

The Indoor Air Quality (IAQ) Program has been established to offer guidance on identifying various air quality concerns that may impact spaces within Dartmouth College (Dartmouth). It outlines how Environmental Health and Safety (EHS) assesses and, when necessary, takes corrective actions in collaboration with Facilities Operation and Management (FO&M), Facility Managers, Project Managers, Residential Operations, Work Control or other relevant departments for each issue.

Several environmental factors, among others, have the potential to influence indoor air quality:

- Unusual or atypical odors
- Presence of dust and particulate matter
- Temperature variations
- Relative humidity levels
- Malfunctioning or imbalanced Heating, Ventilation, and Air Conditioning (HVAC) systems
- Presence of chemicals and other gases
- Noise levels
- Lighting problems
- Presence of microbial contamination

These factors can cause mild to severe discomfort in indoor environments. The IAQ Program aims to address these issues proactively and provide a healthier indoor environment for the Dartmouth community.

Employees and/or students who are experiencing discomfort in a Dartmouth College owned or occupied building should report it immediately to their Supervisor, Facility Manager, Residential Operations, Project Managers, or Work Control (as appropriate). Students who have health concerns should contact Student Health Services. Employees with health concerns should consult their primary care physician.

Questions about this program should be directed to Environmental Health and Safety at 603-646-1762 or at ehs@dartmouth.edu.

Section 2 – Purpose

The IAQ Program provides a comprehensive approach to address potential indoor air quality issues that could arise on campus and the standard response to those issues. This IAQ Program is applicable to all members of the Dartmouth community, including faculty, staff, and students, who have any issues or inquiries regarding IAQ in their workspaces, offices, residence halls, or classrooms. The concerns raised by individuals may vary, ranging from mild discomfort to issues that impact health or hinder work performance.

Section 3 – Definitions

Air Handling Units (AHU) - Equipment including a blower or fan, heating and/or cooling coils, and related equipment such as controls, condensate drain pans, and air filters. Does not include ductwork, registers or grilles, or boilers and chillers.

Building Envelope - Elements of the building, including all external building materials, windows, and walls, that enclose the internal space.

Dampness - Any visible, measurable, or perceived outcome of excess moisture that could cause problems such as microbial growth in buildings.

EHS - **Dartmouth's** Environmental Health and Safety department.

Excess Moisture - Moisture that is higher than a design criterion, usually represented as moisture content or relative humidity in building material or the air.

Fungi - A separate kingdom comprising living things that are neither animals nor plants. The kingdom Fungi includes microbial growths, yeasts, mushrooms, and puffballs. In this document, the terms fungi and microbial growth are often used interchangeably.

HVAC - Heating Ventilation and Air Conditioning equipment.

Microbial Growth - The growth of a population or an increase in the number of cells. This term refers to a family of fungi that is commonly found both indoors and outdoors.

Mildew - A certain kind of microbial growth or fungus. The term mildew is often used generically to refer to microbial growth, usually with a flat growth habit.

Moisture - Water vapor or water in a medium, such as soil or insulation. This is not free-standing water or flowing water.

Relative Humidity - The amount of water vapor present in air expressed as a percentage of the amount needed for saturation at the same temperature.

SOP - Standard Operating Procedure.

Ventilation - The process of supplying or removing air by natural or mechanical means to or from any space; the air may or may not have been conditioned.

Section 4 – Responsibilities

There are several stakeholders at the College, along with external consultants, that play important roles in the IAQ Program:

4.1 Environmental Health and Safety (EHS)

1) Annually maintain and review the Indoor Air Quality Program.
2) Promptly respond to and investigate IAQ incidents.
3) Conduct relevant air monitoring to assess air quality conditions.
4) Offer recommendations to occupants and coordinate with FO&M, professional schools, real estate, athletics, project management etc. for IAQ remediation, if necessary.
5) Collaborate with FO&M so they may carry out any required repairs or improvements.
6) Keep occupants of affected spaces informed about the progress of air quality assessments and related investigations.
7) Maintain inspection and complaint records and documents.
8) Distribute written final reports to affected parties, as needed.

4.2 Facility Operations & Management (FO&M), and Facility Managers

1) Utilize a preventative maintenance program on equipment and assets.
2) Provide assistance to EHS during the investigation of IAQ assessments arising from plumbing, HVAC systems, and other building maintenance systems.
3) Undertake necessary repairs to address items identified by EHS or contractor as the cause or contributor to an IAQ incident.
4) Maintain open communication with EHS regarding the progress and resolution of IAQ issues.
5) Notification to building occupants of work tasks that could affect indoor air quality.
6) Properly shutting down the HVAC and protecting the supply and return locations during work tasks.
7) Communicate IAQ management plan to contractors.
8) Mitigate equipment emissions from entering building air intakes.
9) Ensure contractors have a dust mitigation plan within scope of work for activities.

4.3 Stakeholders – Faculty, Staff, and Students who work or live in spaces owned or operated by Dartmouth College

1) Promptly notify EHS of any IAQ issues or persistent malodors using the Complaint Form.
2) Be available to communicate with EHS IAQ investigators at the time of the incident.
3) Be responsive to any inquiries made by EHS concerning the air quality of their workspace.

4.4 Office of Communications

1) Manage communication to internal or external audiences when requested by EHS or others.

4.5 Consultants

1) Conduct inspections, sampling and testing as requested by EHS, Project Managers, FO&M, and other Facility Managers.
2) Prepare reports documenting inspection findings and recommendations for mitigation.
3) Prepare work plans detailing engineering controls and work practices to be utilized.
4) Work with EHS to determine project completion criteria.

4.6 Project Managers

1) Communicate IAQ management plan to contractors.
2) Mitigate equipment emissions from entering building air intakes.
3) Ensure contractors have a dust mitigation plan within scope of work for activities.

Section 5 – Types of IAQ Issues

Section 5.1 Atypical Odors

Odors can be a result of various sources and may vary in intensity and duration. Some common sources of atypical odors include:

- Outdoor or indoor sources introduced through the HVAC system, such as pollutants from the surrounding environment.
- Natural gas leaks
- Plumbing issues, including dry traps in unused sinks or floor drains, or worn seals in overhead plumbing lines or sumps that allow odors to escape.
- Activities in construction areas or routine maintenance that may release odors.
- Problems with HVAC systems, leading to the distribution of odors throughout the building.
- Improper use of chemicals outside of chemical hoods, leading to the release of noxious odors.
- Inadequate housekeeping practices that contribute to the accumulation of odorous substances.
- Presence of plants that emit distinct odors.
- Improperly stored or disposed waste, causing unpleasant smells in the indoor environment.
- Improper moisture management in spaces, leading to microbial growth.

Section 5.2 Indoor Air Discomfort or "Sick Building Syndrome"

Indoor air discomfort or "Sick Building Syndrome" is often characterized by complaints such as a feeling of stale air, frequent reports of feeling unwell, or experiencing discomfort during or at the end of the workday. Individuals affected by this syndrome typically feel better when they leave the building or go home at the end of their shift.

Several factors can contribute to air quality issues, including:

- Area temperature variations that lead to discomfort among occupants.
- Insufficient supply and/or exhaust of air, which can result in poor air circulation.
- Low humidity levels, particularly during the heating season, causing discomfort.
- High levels of dust in the air, which can be irritating to the respiratory system.
- Presence of various contaminants in the indoor environment.
- Combustion byproducts from certain activities or equipment.
- Elevated levels of carbon dioxide, indicating inadequate air circulation.
- Undetected microbial contamination that can lead to health issues.

Section 6 – Investigation and Remediation Procedures

To resolve an IAQ incident effectively, the collaboration of area occupants, EHS and FO&M is essential. Below are the procedures for reporting IAQ incidents to EHS and the steps to remediate the three main types of IAQ incidents, categorized by group.

Section 6.1 Procedures for Reporting an IAQ Issue

To report an IAQ complaint to EHS, please fill out the Complaint Form.

It is important that the person who reports the IAQ issue to EHS, or a designated individual who is aware of the issue, must be available when EHS personnel respond to the incident. This person should be able to describe the symptoms and observations related to the IAQ issue. This information is crucial for conducting a proper assessment and initiating appropriate remediation measures.

Section 6.2 Signs of Illness

If there is an odor causing occupants to display signs of illness, those affected should promptly vacate the premises, seek medical attention, contact their supervisor and EHS at 603-646-1762, and file and Incident Report with Risk Management.

It's important for someone knowledgeable about the situation to be ready to meet EHS at a different location to provide details about the odor and whereabouts.

Section 6.3 Atypical Odor Procedures

Section 6.3.1 Occupant Procedures

If atypical odors are detected in the area, and occupants are not experiencing symptoms, they should follow these steps:

1) If you smell natural gas, immediately evacuate the premise, taking everyone with you, and go to a safe distance (muster point). Do not use any electrical devices, light switches, or phones as these can create sparks that could ignite the gas. Once at a safe distance, call 911.
2) Check the area for any rubbish or waste material that has not been properly disposed of or removed.
3) Check household plants are healthy and the soil is not emitting any unpleasant smell or has visible microbial growth.
4) Run all sinks and eyewashes that haven't been used recently for 2-3 minutes to flush out any stagnant water. Do not let water spill onto floor when flushing sinks and eyewashes.
5) Fill floor drains with approximately half-gallon of water to prevent odors from coming up from the drainage system.
6) Make sure that no other area occupant is working with a strong-smelling material outside of a functioning chemical hood.
7) Verify that all chemical or biological waste is placed in proper waste containers.

If the above measures are taken and the odor persists after 10 minutes, occupants should promptly contact EHS for further evaluation. The person who reports the complaint should be available when EHS arrives to describe the conditions or odors they are detecting.

If the odor is overpowering and creates discomfort, arrangements should be made to meet with EHS at an alternative location to assess the situation and address the issue effectively.

Section 6.3.2 EHS Procedures
EHS, with the assistance of Facility Manager, will conduct a comprehensive investigation to identify the source of the odor. They will review the steps already taken by occupants (as listed above) and also investigate the following items to determine if they are causing the odor:

1) Inspect plumbing connections to check for any leaks, faulty seals, or other issues that could be contributing to the odor.
2) Examine the supply air intakes of the HVAC system to verify that outdoor air is not bringing in any odors from external sources.
3) Inspect lighting fixtures to rule out any electrical or other mechanical issues that could be generating the odor.
4) Examine other equipment in the vicinity to see if any of it is emitting odors.
5) Consider if any activities or processes in adjacent areas could be causing the odor.
6) If there are adjacent construction activities, EHS will evaluate if they could be contributing to the odor.
7) Explore other possibilities, such as outdoor sources or nearby environmental factors, that could be influencing indoor air quality.

If EHS identifies any of these items as the cause of the IAQ issue and they can be corrected, they will initiate a Service Request through PlanOn and submit it for remediation.

Section 6.3.3 Facilities, Operations & Management and Facility Managers Procedures
FO&M will check on the following and remediate, if necessary:

- All nearby plumbing.
- HVAC system.
- Light bulbs and ballasts.
- All other building systems equipment and building areas.

Section 6.4 Building Discomfort Procedures
Investigations involving building discomfort are typically more intricate and multifaceted compared to issues like odors and microbial contamination. While odors and microbial contamination can be identifiable and may contribute to discomfort, building discomfort often arises from a combination of factors that interact with one another. These factors can vary widely and may involve multiple parameters that need to be thoroughly examined.

Section 6.4.1 Occupant Procedures
Occupants play an active role in alleviating symptoms of building discomfort if the source of the issue can be controlled by them. Here are some proactive steps that occupants can take to improve Indoor Air Quality and enhance their overall comfort:

1) Minimize clutter and maintain a clean work area to reduce dust and allergens.
2) Avoid leaving food out or storing it in work areas to prevent attracting pests and vermin.
3) Communicate with colleagues to find a temperature that is comfortable for all occupants.

4) Have carpets professionally cleaned and vacuumed regularly to reduce dust and allergens.
5) Take care of indoor plants to prevent microbial growth and allergens. Avoid keeping flowering plants indoors as they may release pollen.
6) Clean up water and food spills immediately to prevent mold and bacterial growth.
7) Notify EHS, FO&M or Facility Managers immediately if leaks or floods occur from plumbing, roofing, or any other sources.

Section 6.4.2 EHS Procedures
EHS will conduct a thorough investigation to identify the source(s) of building discomfort by following these steps:

1) Interview area occupants and ask questions related to the procedures outlined in section Atypical Odor Procedures – Occupant Procedures of this program.
2) Walk through the affected area(s) and visually inspect the environment. They may use appropriate air quality measurement instruments based on the reported complaints, which may include those for monitoring temperature, humidity, particulate matter, chemical gases, or other relevant parameters.
3) Investigate adjacent areas, including floors above and below, to determine if any activities or conditions in these spaces are contributing to the discomfort in the affected area.
4) If there are any construction sites in close proximity to the affected area, EHS will inspect these sites to check if construction-related activities, materials, or ventilation systems are affecting Indoor Air Quality.

Section 6.4.3 FO&M Procedures
In case of building discomfort issues, FO&M will work with EHS in the following ways:

1) Collaborate with EHS by providing information and answering questions related to the building discomfort issues as described in the Occupant Procedures.
2) Communicate with EHS and other relevant personnel to address the identified problems. The response time for remediation will depend on the severity of the issue, and in some cases, external contractors may be required to address and correct the problems effectively.

Section 6.4.4 Common Types of Measurements
EHS will perform the following measurements in an attempt to determine cause of complaint(s):

- Supply and exhaust air flow rates (room air changes per hour – FO&M may provide this information)
- Temperature and relative humidity levels
- Carbon dioxide and carbon monoxide concentrations
- Total volatile organic compounds concentration
- Airborne particulate concentrations

Section 6.4.5 Some Common IAQ Issues
Building discomfort issues are often attributed to one or more of the following factors:

1) Temperature Variation: Malfunction of thermostats, resetting of variable air control dampers (VAV), or heat loads in an area exceeding the cooling capacity, leading to discomfort.
2) Insufficient Supply and Exhaust: Design flaws, closed dampers, or malfunctioning fan units affecting proper ventilation and air circulation.
3) Low Humidity: Lack of building humidification during the heating season, resulting in dry indoor air.
4) Higher Dust Concentrations: Poor housekeeping practices, especially in areas with carpeting that may require more frequent vacuuming and shampooing. Particulates may also originate from supply vents or inadequate filtration of outside air.
5) Presence of Contaminants: Sources of organic vapors, such as improper chemical storage or preservatives on carpeting and furniture, contributing to discomfort.
6) Higher Concentrations of Carbon Dioxide: Insufficient supply and/or exhaust leading to poor air mixing and elevated carbon dioxide concentrations.
7) Insidious Microbial Contamination: Areas affected by leaks or flooding that have not been adequately dried, leading to microbial growth and other microbial issues.

Section 7 – Water Intrusion and Microbial Contamination Procedures

There are no federal or New Hampshire state regulations governing microbial growth remediation. Dartmouth College has designed a Microbial Growth Management Program based on relevant standards and guidance from the American National Standards Institute (ANSI) and United States Environmental Protection Agency (USEPA). Appendix A contains the Microbial Growth Management Program.

Section 8 – Annual Review of the IAQ Program

EHS will review the Indoor Air Quality Program annually. As part of the review, EHS and FO&M will look for trends and lessons learned from prior years to incorporate into the Indoor Air Quality Program or SOPs. The lessons can help improve the overall program and may affect the design of future building renovations and new construction on campus.

Section 9 – Documentation and Recordkeeping

In addition to inspection records, EHS and FO&M maintain an incident response log. Information is organized by building with reports being retained for 10 years.

Risk Management may be involved for insurance and liability purposes. When Risk Management is involved, Dartmouth will designate a recordkeeper who will manage and centrally store all relevant documentation.

Appendices:

Appendix A: Microbial Growth Management Program
Appendix B: Indoor Air Quality Complaint Form
Appendix C: IAQ Walkthrough Inspection Checklist

Appendix A: Microbial Growth Management Program

Microbial Growth Management Program

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Document Contents

Executive Summary

The Dartmouth College Microbial Growth Management Program (MGMP) provides a comprehensive, proactive approach to managing the prevention and remediation of microbial growth and moisture intrusions in facilities on the Dartmouth College campus. The Program also includes measures designed to protect the health of building occupants, Dartmouth employees, Dartmouth students, and remediation workers and contractors or any other persons within a Dartmouth owned facility or building.

There are standard operating procedures outlined for all stakeholders within the program. *Identifying and Reporting Water Damage or Suspected Microbial Growth (EHS SOP #29A)* details how the process for determining what is a reportable incident of a water intrusion or microbial growth.

Conducting a Water Damage or Microbial Growth Inspection (EHS SOP #29B) details the process used to assess and evaluate spaces with a water intrusion, or when microbial growth is suspected or likely. *Form 1* is the *Microbial Growth Assessment Tool*, adapted from the NIOSH Moisture and Dampness tool to better suit Dartmouth College's specific needs around microbial growth assessments. The NIOSH guidelines for assessment area(s) are sized based on three metrics: "smaller than a piece of paper," "larger than a piece of paper, but smaller than a standard door," and "larger than a standard door." These are considered common objects and can quickly have their size identified with the naked eye during an assessment.

Water Damage Response and Microbial Growth Remediation (EHS SOP # 29C) overviews the steps needed to perform remediation, or cleaning, of microbial growth in Dartmouth owned and operated spaces. *Table 1* houses information regarding what to do when a water intrusion is noted, and *Table 2* describes the actions to be taken if microbial growth is found. *Figures 1, 2 and 3,* are all flow charts, to aid the process in determining who needs to clean what and when. The process for when the scope of work is large enough to merit hiring a remediation contractor or consultant is also outlined here. In most cases, areas less than or equal to 25 square feet (sqft) (which is the approximate size of a "standard door," and aligns with the NIOSH guidelines above), will be cleaned and remediated by Dartmouth College Employees.

Surface Sampling Using the Tape Lift Method for Microbial Growth (EHS SOP # 29D) is the analytical sampling method that may be used by EHS staff to test for microbial growth in areas when required. This method is typically only taken into consideration when there are health concerns noted by the population in or around the space requiring assessment.

In an effort to communicate this program's policies and procedures as effectively as possible, three fact sheets have been developed by EHS to be distributed to stakeholders, when appropriate. Students, Employees (faculty and staff), the departments within Facilities, Operations, and Management, the Office of Real Estate, and building managers for the professional schools, all have a relevant fact sheet with information pertaining to their specific role on Campus within the MGMP.

Purpose

The purpose of the Dartmouth College Microbial Growth Management Program (MGMP) is to provide a comprehensive and proactive approach for the prevention and remediation of microbial growth and moisture problems in facilities at Dartmouth. The Program also includes measures designed to protect the health of building occupants, Dartmouth employees, and remediation workers.

Background

Microbial growth, often referred to as mold or mildew, is a family of fungi commonly found both indoors and outdoors. Microbial spores are found almost everywhere in the environment and can grow on most organic substances (the growth medium) when moisture, oxygen, and ideal temperature ranges are present. Microbial growth can occur when excessive moisture accumulates in buildings or on building materials, especially if the moisture problem remains undiscovered or unmitigated for 48 hours or longer.

While it is impossible to eliminate microbial spores from most indoor environments, the number of spores present in space directly depends on the type of area or space in question. The prevention of microbial growth can be as simple as cleaning or wiping down an area, removing sources of moisture, or swapping out organic materials with non-organic/anti-microbial materials.

Once microbial growth is established in a building material or building component, the response can vary from a thorough cleaning of impacted surfaces with a chemical product which eliminates microbial growth, to a complex response conducted by a specialized microbial growth remediation company.

There are no federal or New Hampshire state regulations governing microbial growth remediation. Dartmouth College has designed this MGMP based on relevant standards and guidance from the American National Standards Institute (ANSI), the National Institute for Occupational Safety and Health (NIOSH), and United States Environmental Protection Agency (EPA). Appendices A through D contain the following Standard Operating Procedures (SOPs):

- EHS SOP # 29A: Identifying and Reporting Water Damage or Suspected Microbial Growth
- EHS SOP # 29B: Conducting a Water Damage or Microbial Growth Inspection
- EHS SOP # 29C: Water Damage Response and Microbial Growth Remediation
- EHS SOP # 29D: Surface Sampling Using the Tape Lift Method for Microbial Growth

Some people can experience health problems when exposed to microbial growth (such as spores) in the indoor environment. Dartmouth College takes microbial growth management seriously and is committed to the health and safety of everyone in our community. Employees and/or students who encounter suspected microbial growth in a Dartmouth College owned or occupied building should report it immediately to their Facility Manager, Residential Operations, or Work Control (as appropriate). Students who have health concerns should contact Student Health Services. Employees with health concerns should consult their primary care physician.

Questions about this program should be directed to Environmental Health and Safety at 603-646-1762 or via ehs@dartmouth.edu

Responsibilities

Several stakeholders at Dartmouth College, along with external consultants, play important roles in the MGMP.

Environmental Health and Safety (EHS)

- Maintain and annually review the MGMP.
- Conduct water damage/intrusion and microbial growth inspections.
- Conduct training and prepare educational information regarding microbial growth.
- Coordinate sampling and testing of suspected microbial growth, when needed.
- Provide oversight of microbial growth consultants and contractors, when needed.
- Review and approve scope of work for remediation of microbial growth.
- Maintain inspection and complaint records and documents.
- Distribute written final reports to affected parties, as appropriate.
- Provide oversight and guidance to other stakeholders as needed.

Facility Operations & Management (FO&M), Facility Managers, and Residential Operations

- Utilize a preventative maintenance program on equipment and assets.
- Receive suspect microbial growth work orders or phone calls.
- Notify EHS of employee or student health concerns or questions pertaining to microbial content, general air quality, or microbial growth-based health impacts.
- Notify EHS of areas with suspected microbial growth or excessive moisture which cannot be immediately remediated.
- Provide escorts and support to EHS or consultants for inspections.
- Coordinate with EHS for staff training and education. Direct appropriate staff to attend annual microbial growth training provided by EHS.
- Assign staff to investigate water damage and microbial growth.
- Assign staff to clean up microbial growth.
- Maintain reports and records pertaining to microbial growth remediation projects.
- Retain engineers / building envelop specialist to identify sources of unwanted moisture and to design remediation strategies.

Staff Assigned for Microbial Growth Cleanup

- Comply with the MGMP, including all microbial growth clean-up methods.
- Annually, attend microbial growth training provided by EHS.
- Clean-up less than 25 square feet (sqft) of microbial growth, or larger amounts based on the professional opinion of EHS and Facility Manager discretion.

Project Managers

- Consider moisture management and microbial growth resistant building materials as part of construction/renovation activities.

- Retain engineers / building envelop specialist to identify sources of unwanted moisture and to design remediation strategies.

Employees (Faculty and Staff) and Students who work, live, or otherwise inhabit in any space owned or operated by Dartmouth College

- Report suspected microbial growth or water damage to Work Control, Residential Operations or Facility Manager.
- Comply with the MGMP.
- When feasible, take steps to prevent microbial growth from occurring, such as promptly drying wet areas and ensuring dry areas are kept dry.

Office of Communications

- Manage communication to internal or external audiences.
- Update Dartmouth College's Mold Remediation projects website, when necessary.

Consultants

- Conduct inspections, sampling and testing as requested by EHS, Project Managers, FO&M, and other Facility Managers.
- Prepare reports documenting inspection findings, provide reports to EHS.
- Prepare work plans detailing engineering controls and work practices to be utilized during remediation projects.
- Work with EHS to determine project completion criteria.

Remediation Contractors

- Conduct microbial growth remediation projects in accordance with EHS approved work plans and College SOPs.
- Abide by Dartmouth College's contractor safety requirements.

Prevention and Response

Preventive Maintenance – Preventive maintenance is a proactive strategy for building maintenance which includes inspections and selective service and repairs to building equipment and envelope components on a regular basis.

Preventive maintenance is the first line of defense for microbial growth problems and primarily involves the control of moisture. Dartmouth's preventative maintenance program involves noticing areas where moisture is present, determining the cause of the moisture, taking steps to mitigate the moisture impacts, and stopping the source of the moisture before microbial growth develops.

This could include (but is not limited to):

- Within 48 hours, cleaning or drying wet areas, determining the source of the moisture, and taking steps to prevent future issues.

- Inspections of chilled water piping for condensation and wet spots, removing wet pipe wrap, and replacing it with a non-organic pipe wrap.
- Maintaining low indoor humidity, including locations with showers.
- Identifying and fixing leaks in plumbing and in the building envelope as soon as discovered.
- Identifying areas where foundations are wet and taking steps to address the moisture. This could include adding waterproofing materials, sloping the ground surface away from the foundation, and/or adding monitored dehumidification to the space.

Training and Outreach – Microbial growth training is provided annually by the EHS office for Custodians and Maintenance Workers (and their supervisors), Project Managers, Facility Managers, who routinely perform work in Dartmouth College buildings. The training may be delivered in-person with the support of short videos, or online; and will focus on how to identify and promptly report suspected microbial growth or moisture problems. This training will also include descriptions of proper procedures for small-scale microbial growth remediation, required personal protective equipment, and disposal considerations.

During the training, EHS will review the Standard Operating Procedure (SOP) entitled "*Identifying and Reporting Suspected Microbial Growth, EHS SOP #29A,"* which is provided in Appendix A.

EHS also provides educational material including brochures, posters and fact sheets for students, faculty, and staff.

Inspections – Walkthrough inspections are conducted in campus buildings by EHS, Residential Operations, FO&M, Facility Managers, and/or consultants. The purpose of these inspections is to support the early identification of potential microbial growth or water-damaged building materials. A visual inspection of residential buildings typically includes common spaces such as corridors, lounges, laundry facilities and bathrooms, as well as a subset of bedroom spaces. HVAC equipment, if present, is assessed including air intakes, condensate drip pans, internal insulation, and filters. Inspections also include mechanical spaces, storage areas, attics, custodial closets, and the building envelope. The frequency of inspection varies depending on the building classification. All residential buildings, affinity houses, and Greek houses are inspected on an ongoing basis throughout the year. Other buildings are inspected periodically. For more details about documentation requirements, see *Conducting a Microbial Growth Inspection,* EHS SOP #29B.

Response to Identified Concerns – When an area with suspected microbial growth or a moisture/moisture intrusion problem is identified, the concern should be immediately reported to Work Control, Residential Operations, or the Facility Manager. They will assess the issue, and follow the steps discussed in Section 4. If they are unable to immediately identify the root cause of the problem and fix it, EHS will inspect the area and assist in determining next steps. EHS will follow the process described in *Conducting a Microbial Growth Inspection,* EHS SOP #29B.

Sampling and Testing – In some cases, additional steps may be necessary to further assess a concern, such as performing moisture assessment surveys to document moisture content. ANSI and EPA guidance typically do not recommend air sampling for microbial content because microbial growth is ubiquitous in the environment, and sample results can be misleading. EHS is responsible for determining when tape-lift sampling should be conducted. EHS will follow the process described in *Surface Sampling using Tape Lift Method for Microbial Growth,* EHS SOP #29D. For more details, including documentation requirements, see *Conducting a Microbial Growth Inspection,* EHS SOP #29B.

Communication

A successful remediation strategy must include continuous communications with the stakeholders. For small microbial growth response actions, Residential Operations, FO&M, or other Facility Managers will notify impacted stakeholders directly of the findings and the planned response.

Dartmouth may elect to disclose the results of inspections and large remediation projects. Notification may be made by the Office of Communications, Residential Operations, FO&M, or Facility Managers to stakeholders prior to the start of any remediation project. Updates will frequently be provided to stakeholders. For particularly large or complicated remediation projects, a face-to-face forum may be held to brief stakeholders and to answer questions.

Water Damage Response and Microbial Growth Remediation Prevention and Response

Water damage should be promptly reported to Work Control, Residential Operations, and/or the Facility Manager. The source of the water should be identified and controlled. Water-damaged areas and items should be dried within 24 to 48 hours to prevent microbial growth. For more details, see *Water Damage Response and Microbial Growth Remediation,* EHS SOP #29C.

Some microbial growth impacted building materials less than 25 square feet (sqft) in size can be managed by trained custodians or maintenance personnel. *Water Damage Response and Microbial Growth Remediation,* EHS SOP #29C, has additional detail for decision making regarding whether a microbial growth remediation contractor is needed for the microbial growth response and whether the response should be overseen by a microbial growth consultant.

Annual Review of the Program Prevention and Response

EHS will review the MGMP annually. As part of the review, EHS and FO&M will look for trends and lessons learned from prior years to incorporate into the MGMP or SOPs. The lessons can help improve the overall program and may affect the design of future building renovations and new construction on campus.

Documentation and Recordkeeping Prevention and Response

In addition to inspection records, EHS and FO&M maintain an incident response log. Microbial growth information is organized by building with reports being retained for 10 years.

Risk and Internal Control Services (RICS) may be involved for insurance and liability purposes. When RICS is involved, Dartmouth will designate a recordkeeper who will manage and centrally store all relevant documentation.

Appendix A: Identifying and Reporting Water Damage or Suspected Microbial Growth (EHS SOP # 29A)

1.0 Purpose

This Standard Operating Procedure (SOP) provides information on identifying and reporting water damage or suspected microbial growth.

2.0 Scope

This SOP applies to all Dartmouth buildings and employees, contractors and consultants who find suspected microbial growth in Dartmouth owned or operated buildings.

3.0 Responsibilities

Environmental Health and Safety (EHS)

- Conduct training and prepare educational information regarding microbial growth.
- Conduct microbial growth inspections.
- Maintain inspection and complaint records and documents.

Facilities Operation and Management (FO&M), Facility Managers and Residential Operations

- Receive suspect microbial growth work orders or phone calls.
- Notify EHS of any employee or student health concerns or questions pertaining to microbial content, general air quality, or microbial growth-based health impacts.
- Follow and comply with the Work Order Flow Chart for Microbial Growth, EHS SOP #29A FC 1, notifying EHS of microbial growth or moisture concerns, when applicable.
- Provide escorts and support to EHS or consultants for inspections.
- Coordinate with EHS for staff training and education.
- Maintain reports and records pertaining to microbial growth remediation projects.

Stakeholders - Employees and Students who work or live in spaces owned or operated by Dartmouth College

- Report suspected microbial growth to Work Control, Facility Manager, or Residential Operations.
- Comply with the MGMP.

4.0 Procedures

4.1: Identifying water damage or suspect microbial growth

Water damage can come from many sources, including leaking pipes, rainwater, groundwater, or other sources of unmanaged moisture. Water damage appears differently in various building materials; paint can appear to be peeling, bubbling, or flaking; flooring can appear warped or discolored; and plaster can be discolored, swell, or sag. Active water damage is usually wet to the touch.

Microbial growth (also known as mold or mildew) grows on moist surfaces and can appear as a slightly fuzzy, discolored, or slimy patch, increasing in size as it grows. A musty odor can accompany some types of microbial growth or mildew growth.

4.2: Reporting suspect microbial growth or water damage

Reports of any suspected microbial growth should be sent directly to Work Control, either via a phone call, email, or by submitting a work order through Planon. Work Control should follow the steps outlined in EHS SOP # 29A Figure 1, to route concerns appropriately.

4.3: Concerns about health and safety

Exposure to microbial growth may cause allergies and irritation. Although symptoms can vary, the most common symptoms seen in people exposed to microbial growth include nasal and sinus congestion, eye irritation, wheezing, coughing, throat irritation, skin irritation, and headache. Students who have health concerns should contact Student Health Services. Employees with health concerns should consult their primary care physician. Employees should fill out an incident report if they believe they were harmed, regardless of if the employee actually receives medical care.

4.4 Preparing for next steps

FO&M, the Facility Manager, or Residential Operations will respond to the area with the suspected microbial growth or moisture problem and will collect the information described in *Conducting a Microbial Growth Inspection,* EHS SOP #29B. Depending on the reported location or scope of problem, EHS may also respond to the area. Stakeholders may be asked to be present to move belongings or to answer questions.

If FO&M, the Facility Manager, or Residential Operations is unable to immediately fix the problem, EHS will dispatch personnel to inspect the area. EHS will follow the process described in *Conducting a Microbial Growth Inspection, EHS SOP #29B.*

4.5 Results

Results of the inspection and relevant next steps will be provided verbally or in writing to the stakeholders.

*** End ***

Appendix B: Conducting a Water Damage or Microbial Growth Inspection (EHS SOP # 29B)

1.0 Purpose

This Standard Operating Procedure (SOP) describes the process for performing a water damage or microbial growth inspection.

2.0 Scope

This SOP applies to all Dartmouth personnel and consultants who perform water damage or microbial growth inspections.

3.0 Responsibilities

Environmental Health & Safety (EHS)

- Conduct water damage and microbial growth inspections using the Microbial Growth Assessment Tool (MGAT), provided in EHS SOP # 29B Form 1.
- Maintain inspection and complaint records and documents.
- Make recommendations for the next steps.

Facilities Operation and Management (FO&M), Facility Managers, and Residential Operations

- Receive suspect microbial growth work orders or phone calls.
- Assign staff to investigate water damage and microbial growth.
- Conduct water damage and microbial growth inspections.
- Provide escorts and support to EHS or consultants during inspections.

Employees and Students who work or live in spaces owned or operated by Dartmouth College

- Report suspected microbial growth to Work Control, Facility Managers, or Residential Operations.
- Comply with the MGMP.

Consultants

- Perform water damage and microbial growth inspections at the request of Dartmouth.

4.0 Procedures

The following sections describe the steps to be taken by FO&M, Facility Managers, Residential Operations, EHS, and consultants should they be asked to conduct a water damage or microbial growth inspection. The steps below describe a path for escalation for water damage and microbial growth once it is reported.

4.1: FO&M, Facility Managers or Residential Operations

- Respond to the location and document the current conditions. Record the following information at a minimum:
    - Location
    - Observed conditions
    - Suspected source
    - Estimated size of condition
- Consider the possibility of hidden sources of microbial growth, and, if warranted and safe to do so, look behind wallboards, cabinets, above ceiling tiles, and/or in ductwork. ***Note:*** depending on the type of building material, it may be necessary to check for asbestos or lead paint before these materials.
- If FO&M, the Facility Manager or Residential Operations cannot immediately address the issue, they will ask EHS to respond.
- If EHS is not asked to respond, FO&M, the Facility Managers or Residential Operations will follow the procedures outlined *in SOP 29C: Water Damage Response and Microbial Growth Remediation* to determine the next steps.

4.2: EHS

- Respond to the location and document the current conditions using the form provided in Appendix A. Take photos of existing conditions. Include information about:
    - Location
    - Observed conditions
    - Suspected source
    - Relative humidity
    - Water moisture content
    - Estimated size of condition
- Consider the possibility of hidden sources of microbial growth, and, if warranted and safe to do so, look behind wallboards, cabinets, above ceiling tiles, and/or in ductwork. ***Note:*** depending on the type of building material, it may be necessary to check for asbestos or lead paint before disturbing these materials.
- If warranted by professional judgement, EHS may recommend a consultant be hired to document conditions.
- EHS will retain documentation of the inspection and will share the inspection results with the FO&M, the Facility Manager, or Residential Operations. For sufficiently complex or large projects, EHS will provide a cover letter with additional detail.
- EHS will follow the procedures outlined in *SOP 29C: Water Damage Response and Microbial Growth Remediation* to determine the next steps.

4.3: Consultants

- Respond to the location and document the current conditions. Consultant microbial growth inspections should include:
    - Photographs
    - Floorplans
    - Description of quantity and type of building material and impacted area
    - Description of potential cause of issue
    - Water moisture contents

    - Microbial growth sampling, if warranted
    - Limitations of the inspection
    - Hazardous building material assessment (if applicable)
    - Recommended next steps (if applicable)
- Consultants water damage or microbial growth inspections may be used to support insurance claims and should be sufficiently detailed.
- Consultants will provide the results of their inspection to FO&M, the Facility Manager or Residential Operations (as appropriate) and to EHS.

5.0 Considerations for Complex Projects

In some cases, it is readily apparent when a complex remediation project or significant building repair may be needed to address microbial growth. For these projects, it may be helpful for inspectors to gather additional relevant information about the building. Inspectors should consider the following questions as they start to make recommendations about microbial growth response or remediation.

- Are there existing moisture problems in the building?
- Are there hidden sources of water or is the humidity too high (high enough to cause condensation)?
- Are building occupants reporting musty or microbial growthy odors?
- Are building occupants reporting health problems?
- Are building materials or furnishings visibly damaged?
- Has maintenance been delayed or has the maintenance plan been altered?
- Has the building been recently remodeled or has the building use changed?
- What role might the HVAC system play in the issue?

Once the inspection is complete, follow the procedures outlined in *SOP 29C: Water Damage Response and Microbial Growth Remediation* to determine the next steps.

*** End ***

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1 (Rev. 4/1/24)

Date:	Amended Date:
Observer:	
Building:	
Floor/Room/Area:	
Relative Humidity:	%RH

Room/Area Type: Describe below the type of room/area you are assessing.

Mold Odor: Fill in the bubble for mold odor. Be sure to smell for mold odor when you first walk into the room/area.

⓪None ①Mild ②Moderate ③Strong Describe source of mold odor: _____ ○Source Unknown

Scoring:

⓪= none ①< or = the size of a sheet of paper ②> than paper to a standard door ③> than the size of a standard door

✓	Check if area was assessed	✓ if nothing found	✓ if samples taken	Damage or Stains	✓ if near exterior wall*	Visible Mold	✓ if near exterior wall*	Wet or Damp	✓ if near exterior wall*	Component Notes: Check the bubbles for type of material that is affected.	Assessment Notes: Check the bubbles for additional detail. Describe if "Other"
✓	Ceiling			⓪①②③	☐	⓪①②③	☐	⓪①②③	☐	○Ceilling tile ○Plaster ○Concrete ○Sheet rock ○Metal ○Wood	○Peeling paint ○Rust Other:
✓	Walls			⓪①②③	☐	⓪①②③	☐	⓪①②③	☐	○Sheet rock ○Plaster ○Concrete ○Block ○Brick ○Tile ○Wood	○Peeling paint ○Efflorescence Other:
✓	Floor			⓪①②③	☐	⓪①②③	☐	⓪①②③	☐	○Wood ○Carpet ○Vinyl ○Ceramic ○Concrete	○Buckling Other:
☐	Windows			⓪①②③		⓪①②③		⓪①②③		○Exterior ○Interior ○Skylight	○Peeling paint ○Condensation Other:
☐	Furnishings			⓪①②③		⓪①②③		⓪①②③		○Furniture ○Mechanical ○Sink ○Toilet ○Copier	○Peeling paint ○Rust Other:
☐	HVAC Sys.			⓪①②③		⓪①②③		⓪①②③		○Radiator ○Forced-air ○Fan ○Unit ventilator ○Windowunit	○Peeling paint ○Rust Other:
☐	Materials			⓪①②③		⓪①②③		⓪①②③		○Books ○Boxes ○Equipment	○Wrinkled pages ○Crumpled boxes Other:
☐	Pipes			⓪①②③		⓪①②③		⓪①②③		○Plumbing ○Gas	○Peeling paint ○Rust Other:

*Within 3 feet of exterior wall.

Work Orders Placed:

(*Section only used if needed/merited)

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1

General Assessment Notes

Work Orders Placed:

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General Buildings Form

EHS SOP #29B Form 1

Photo Log

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1

Sample Results

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1

Moisture Probe Results

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1

Floor Plan

KEY:

BLUE - Locations surveyed by EHS.
GREEN - Photo specific locations.
PINK - Moisture probe/sample locations.

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1

Remediation/Work Plan

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1 (Rev. 4/1/24)

Date:	1/1/2024	Amended Date:	
Observer:	First M. Last		
Building:	1 Testfield Road		
Floor/Room/Area:	Room 122 - First Floor office		
Relative Humidity:	61.1 %RH		

Room/Area Type: Describe below the type of room/area you are assessing.

1 Testfield Road is a 4-floor office building with a flat room. The first floor is all office space, and room 101 is an office. There is a window in the office. The first floor is partly built into the hillside.

Mold Odor: Fill in the bubble for mold odor. Be sure to smell for mold odor when you first walk into the room/area.

⓪None ①Mild ■Moderate ③Strong Describe source of mold odor: Dampness from water intrusion ○Source Unknown

Scoring:

⓪= none ①< or = the size of a sheet of paper ②> than paper to a standard door ③> than the size of a standard door

✓	Check if area was assessed	✓ if nothing found	✓ if samples taken	Damage or Stains	✓ if near exterior wall*	Visible Mold	✓ if near exterior wall*	Wet or Damp	✓ if near exterior wall*	Component Notes: Check the bubbles for type of material that is affected.	Assessment Notes: Check the bubbles for additional detail. Describe if "Other"
✓	Ceiling	✓		■①②③	☐	■①②③	☐	■①②③	☐	●Ceilling tile ○Plaster ○Concrete ○Sheet rock ○Metal ○Wood	○Peeling paint ○Rust Other:
✓	Walls			■①②③	✓	⓪①■③	✓	⓪①■③	✓	●Sheet rock ○Plaster ○Concrete ○Block ○Brick ○Tile ○Wood	○Peeling paint ●Efflorescence Other:
✓	Floor			■①②③	☐	■①②③	☐	⓪■②③	✓	○Wood ●Carpet ○Vinyl ○Ceramic ○Concrete	○Buckling Other:
✓	Windows			■①②③	☐	⓪①■③	☐	⓪■②③	✓	●Exterior ○Interior ○Skylight	○Peeling paint ●Condensation Other:
✓	Furnishings			⓪①■③	☐	⓪①■③	☐	⓪■②③	✓	●Furniture ○Mechanical ○Sink ○Toilet ○Copier	○Peeling paint ○Rust Other:
✓	HVAC Sys.	✓		■①②③	☐	■①②③	☐	■①②③	☐	●Radiator ○Forced-air ○Fan ○Unit ventilator ●Window unit	○Peeling paint ○Rust Other:
✓	Materials			⓪①②③	☐	⓪①②③	☐	⓪①②③	✓	○Books ○Boxes ○Equipment	●Wrinkled pages ●Crumpled boxes Other:
☐	Pipes			⓪①②③		⓪①②③		⓪①②③		○Plumbing ○Gas	○Peeling paint ○Rust Other:

*Within 3 feet of exterior wall.

Work Orders Placed:

EHS Placed x1 work order (WO#: 00.123456) as a result of this assessment:
• To have the microbial growth seen on the window and wall to be cleaned, and for moldy chair to be replaced.

(*Section only used if needed/merited)

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1

General Assessment Notes

The relative humidity in the space was measured at 61.1% which indicates moderate-to-high humidity. The carpet was damp to the touch, and probed to be wet. The walls and window both had visible mold seen (Pic 1. and 2.). There was also mold seen on an office chair (Pic 3.). Efflorescence was seen on the window wall and condensation was seen on the window interior. Boxes of books on the floor nearest the window were damaged and damp.

EHS recommends the following:

- Have the space cleaned and remediated of all microbial growth seen in the space.
- Launder, clean, and disinfect all items in the space, discarding affected items where necessary.
- Conduct a building envelope assessment to determine the cause of the water intrusion.

Work Orders Placed:

EHS Placed x1 work order (WO#: 00.123456) as a result of this assessment:

- To have the microbial growth seen on the window and wall to be cleaned, and for moldy chair to be replaced.

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General Buildings Form

EHS SOP #29B Form 1

Photo Log

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1

Sample Results

No Tape-Lift Samples Taken!

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Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1

Moisture Probe Results

Moisture Probe Results

#	DATA	UNIT
1.	19.3	WME
2.	22.1	WME
3.	25.8	WME
4.	13.1	WME
5.	9.9	WME

WME = Wood Moisture Equivalent
(Values over 16.0 indicate a substance is wet/damp/moist)

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Microbial Growth Assessment Tool

General Buildings Form

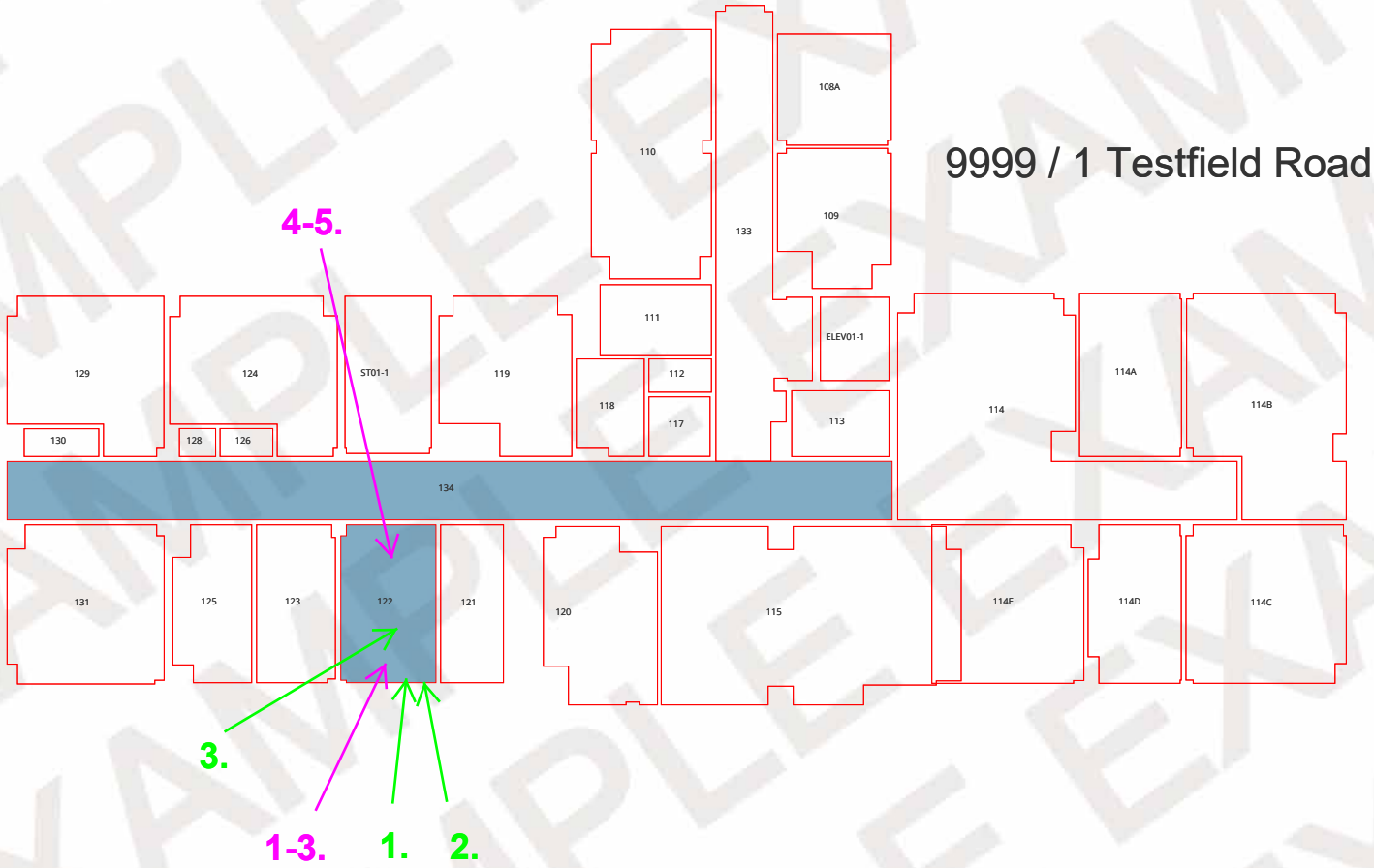
EHS SOP #29B Form 1

Floor Plan

KEY:

BLUE - Locations surveyed by EHS.
GREEN - Photo specific locations.
PINK - Moisture probe/sample locations.
HIGHLIGHT - Extent of microbial growth seen.

9999 / 1 Testfield Road / 01 First Floor



DARTMOUTH

Microbial Growth Assessment Tool

General Buildings Form

EHS SOP #29B Form 1

Remediation/Work Plan

- Place work orders to have have the space cleaned by internal staff.
- Have building envelope specialist evaluate the space and building.
- No further action required.

Appendix C: Water Damage Response and Microbial Growth Remediation (EHS SOP # 29C)

1.0 Purpose

This Standard Operating Procedure (SOP) describes the process for performing a water damage or microbial growth remediation response.

2.0 Scope

This SOP applies to all Dartmouth personnel and consultants who perform water damage, microbial growth response, or microbial growth remediation.

3.0 Responsibilities

Environmental Health and Safety (EHS)

- Make recommendations about the next steps and communicate next steps appropriately.
- Provide oversight and guidance as needed.
- Provide training to staff assigned for microbial growth clean-up.
- Provide oversight of microbial growth consultants and contractors, when needed.
- Create or review work plans related to microbial growth remediation, when needed.
- Maintain inspection and complaint records and documents.
- Distribute written final reports to affected parties as needed.

Facilities Operation and Management (FO&M), Facility Managers, and Residential Operations

- Follow the Work Order Flow Chart for Microbial Growth (Figure 1).
- Clean-up less than 25 square feet (sqft) of microbial growth, or larger amounts based on EHS and Facility Manager discretion (Figure 2 and Figure 3).
- Maintain reports and records pertaining to microbial growth remediation projects.
- Retain engineers / building envelop specialist to identify sources of unwanted moisture and to design remediation strategies.

Staff Assigned for Microbial Growth Cleanup

- Follow SOP describing microbial growth cleanup methods.
- Attend annual microbial growth training provided by EHS.
- Clean-up less than 25 square feet (sqft) of microbial growth, or up to 100 square feet (sqft) when work practices will not result in the release of microbial spores.
- Wear the required personal protective equipment.
- Notify EHS upon completion of work.
- Comply with the MGMP.

Consultants

- Conduct inspections, sampling and testing as requested by EHS, Project Managers, FO&M, and other Facility Managers.
- Prepare reports to document inspection findings.
- Prepare work plans detailing engineering controls and work practices to be utilized during remediation projects.
- Work with EHS to determine project completion criteria.

Remediation Contractors

- Conduct microbial growth remediation projects in accordance with approved Work Plans, EPA guidance, OSHA regulation, and College SOPs.

4.0 Work Order Intake Response

Work orders submitted to Work Control should be routed according to the Work Order Flow Chart for Microbial Growth. Figure 1 details this process and how the flow of work orders submitted should flow. In this case, a work order refers to any work request submitted to Work Control either via phone, email, or Planon.

5.0 Water Damage Response

A quick response to a water damage event (such as a flood or a burst pipe) is necessary to reduce the potential for microbial growth. The cause of the water damage should be determined quickly, and steps should be taken immediately to fix the problem. Knowing when the water damage occurred is a key; microbial growth can start to develop within 48 hours after a release of water. Table 1 provides a list of common materials and the recommended approach for managing water damage when materials have been wet for less than 48 hours. Depending on the size of the water damaged area, professional assistance may be needed to dry an area quickly and thoroughly. Figure 2 provides a flow chart showing the Water Damage Cleanup and Microbial growth Prevention process.

Dartmouth's water damage response program is based on EPA's Microbial growth Remediation in Schools and Commercial Buildings Guide.

Building materials not previously sampled and may contain asbestos and/or lead paint and must be tested prior to starting any demolition work. If asbestos is present a licensed abatement contractor will need to be contracted to perform the work. Consult EHS for existing hazardous building materials surveys.

6.0 Microbial Growth Response and Remediation

If microbial growth is identified in a material, Table 2 provides a list of actions to be taken depending on the size of the impacted area and the type of the impacted material. In some cases, a judgement call should be made to determine the correct action for a specific material. Figure 3 provides a flow chart showing the microbial growth cleanup response. The flow chart is provided for guidance purposes and is not inclusive of every situation; EHS can provide additional guidance for specific cases.

Dartmouth defines a microbial growth response as the cleanup or removal of less than 100 square feet (sqft) of visible microbial growth when there are no actions taken which may increase the risk of building occupant or response worker respiratory exposure microbial growth spores. Microbial growth remediation is the term used for more complicated projects which may involve containment or consultant/contractor response, as determined by EHS. Microbial growth remediation is not typically performed by Dartmouth personnel.

6.1 Communication

Communication is an important part of Dartmouth's MGMP. Once the response actions to address microbial growth have been determined, the plan will need to be communicated to stakeholders.

If the scope of work is being developed and executed by FO&M, the Facility Manager, or Residential Operations, they will determine the best way to communicate the proposed response actions to relevant building occupants and/or staff.

If the scope of work is being developed by EHS, they will take the following steps:

- For microbial growth responses not requiring any deviation from the recommended options in Table 2, EHS will place work order to have work be done. EHS will communicate the work order to the relevant stakeholder.

- For microbial growth responses requiring a deviation from the recommended options in Table 2, EHS will provide a summary to FO&M, the Facility Manager, and/or Residential Operations with the reasoning behind the recommendation. Once all relevant parties have agreed on the path forward, EHS will place a work order and will communicate the work order to the relevant stakeholder.

- For microbial growth remediation projects, EHS will provide a memo to FO&M, the Facility Manager, and/or Residential Operations describing a recommended path forward, with the reasoning behind the recommendation. The memo will include stakeholders if the recommendation requires action on part of the stakeholders (i.e., limiting access to the space prior to remediation).

One person should be designated to field for questions and comments about remediation projects. Depending on the project, this could be the Facility Manager or the Office of Communications. This individual should have a clear understanding of the recommendations, and should be given support from EHS, FO&M, the Facility Manager, and/or Residential Operations. Notification is made by the Office of Communications or by the Facility Manager to stakeholders prior to any remediation project, and regular updates are sent to stakeholders and are posted on the Microbial growth Remediation website. For particularly large or complicated remediation projects, a face-to-face forum may be held to brief stakeholders and answer questions.

6.2 Personal Protective Equipment (PPE)

Remediation work can disturb microbial growth, and microbial growth spores may become airborne, increasing the risk of respiratory exposure.

Actions likely to stir up microbial growth include but are not limited to:

- Breakup of microbial growthy porous materials such as wallboard.
- Invasive procedures are used to examine or remediate microbial growth in a wall cavity.

- Actively stripping or peeling wallpaper to remove it.
- Using fans to dry items.

The primary function of Personal Protective Equipment (PPE) is to prevent inhalation of microbial growth spores and to prevent microbial growth contact with the skin or eyes. For small quantities of microbial growth (less than 25 square feet (sqft) in size), Dartmouth encourages individuals performing the microbial growth response to wear a minimum of a KN-95 face mask, goggles, and gloves. Larger responses and microbial growth remediation require the use of respiratory protection, such as N95 respirators, half-face respirators, full-face respirators, or powered air purifying respirators (PAPRs). Staff wearing respirators must be trained to use the respirator they are using, be medically cleared to wear a respirator, successfully complete a fit test by a trained professional, and be enrolled in an OSHA compliant respiratory protection program. Depending on the scale of the response or remediation activity, disposal coveralls or Tyvek suits may be required. Table 2 describes required and recommended PPE.

Contractors performing microbial growth response or remediation activities must have their own OSHA compliant Respiratory Protection Program.

6.3 Containment Structures

The purpose of containment during remediation activities is to limit release of microbial growth into the air and the surrounding areas, minimizing the exposure of remediators and building occupants to microbial growth.

Microbial growth and microbial growth debris should not be allowed to spread to areas in the building beyond the contaminated site.

The larger the area of microbial growthy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment, along with the work practices employed within the area.

Certain work practices may require the use of containment. EHS can assist in evaluating the need for containment for a particular situation. Dartmouth staff do not typically work in containment.

6.4 Staffing and Work Plan Guidance

Microbial growth response can be handled by Dartmouth College employees who have been trained and who are using appropriate personal protective equipment. Microbial growth remediation projects may involve an outside contractor following a Work Plan. A Work Plan is a document specifying the cleanup methods, the required PPE, and the appropriate containment equipment. These measures are designed to protect both the remediation workers and the building occupants. Typically, this level of response and documentation would be done for larger, complex projects involving many sensitive occupants. Depending on the needs of the project, a qualified consultant may be engaged to write the Work Plan and/or oversee consultant work.

Table 2 also presents guidance on staffing for specific microbial growth abatement projects, the requirements for containment and a work plan, and a summary of the level of EHS involvement. Please note: professional judgement may be used to select the appropriate personnel for a project, and as such, the structure in Table 2 may not apply to every project.

For certain remediation projects, selection and supervision of a qualified microbial growth remediation contractor is required. Dartmouth EHS maintains a list of approved abatement consultants and contractors who are qualified and hold the appropriate licenses, certificates, and insurance. In the state of NH, there is no license or certification required for the cleanup of microbial growth.

6.5 Interim Remediation

There may be situations where a full remediation project needs to be delayed until building occupancy can be reduced, or until required equipment, supplies or contractor services can be procured or scheduled. In these circumstances, an intermediate fix might be put into place, stabilizing the situation until the full remediation project starts.

6.6 Monitoring and Clearance

When an outside remediation contactor is used, completion of work should be verified by an independent consultant, EHS personnel, or a trained individual.

6.7 Disposal

Microbial growth contaminated material is not regulated and can be disposed of as regular waste. To prevent the spread of microbial growth to non-affected areas in a building, contaminated material must be removed from the work area in a sealed disposal bag or wrapped in plastic.

*** End ***

Table 1: Dartmouth Water Damage - Cleanup and Microbial Growth Prevention

The information in this table is based on EPA's Mold Remediation in Schools and Commercial Buildings Guide.

Water-Damaged Material †	Actions
Books and papers	For non-valuable items, discard books and papers. Photocopy valuable/important items, discard originals. Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours (see note 4)	Remove water with water extraction vacuum. Reduce ambient humidity levels with dehumidifier. Accelerate drying process with fans.
Ceiling tiles	Discard and replace.
Cellulose insulation	Discard and replace.
Concrete or cinder block surfaces	Remove water with water extraction vacuum. Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	Discard and replace.
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl) (see note 4)	Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. Check to make sure underflooring is dry; dry underflooring if necessary.
Non-porous, hard surfaces	Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	Remove water with water extraction vacuum. Accelerate drying process with dehumidifiers, fans, and/or heaters. May be difficult to completely dry within 48 hours. If the piece is valuable, consult a restoration/water damage professional who specializes in furniture.
Wallboard	May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. Ventilate the wall cavity, if possible. Consider treating wall spaces with additional microbial growth inhibiting products.
Window drapes	Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. Wet paneling should be pried away from wall for drying.

Notes:

1. Consult Table 2 if microbial growth has occurred or materials have been wet for more than 48 hours. Even if materials are dried within 48 hours, microbial growth may occur. Items may be assessed or tested by professionals if there is doubt. Note that microbial growth will not always occur after 48 hours; this is only a guideline.

2. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage (i.e.: is blackwater), or has other chemical or biological pollutants, then Personal Protective Equipment and containment are required by OSHA. An experienced professional should be consulted for cleanup and impacted material removal. Do not use fans before determining that the water is clean or sanitary.

3. If a particular item(s) has high monetary or sentimental value, a restoration/water damage specialist may need to be consulted.

4. The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

Dated: May 1, 2023

Table 2: Dartmouth Visible Microbial Growth Response and Remediation Guidelines

The information in this table is based on EPA's microbial growth Remediation in Schools and Commercial Buildings Guide, and Dartmouth best practice.

Material or Furnishing Affected	Cleanup Methods	Containment (see note 2)	Staffing	Personal Protective Equipment (see note 1)	Response Level	Work Plan	EHS Involvement
SMALL - Total Surface Area Affected Less Than 25 square feet (sqft)							
Books and papers	HEPA vacuum, or discard.	Not typically required.	Qualified and trained Dartmouth staff can perform work.	Required PPE: Nitrile gloves and eye protection. Recommended PPE: KN-95 face covering.	Mold Response	Verbal Work Plan	When requested
Carpet and backing	Extraction, deep clean, dry immediately. May need to be discarded and replaced.						
Ceiling Tiles	Discard and replace.						
Cellulose insulation	Discard and replace.						
Concrete or cinder block	Clean with antifungal biocide, and dry.						
Fiberglass Insulation	Discard and replace.						
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	Clean with antifungal biocide, and dry.						
Non-porous, hard surfaces (plastics, metals)	Clean with antifungal biocide, and dry.						
Upholstered furniture & drapes	Drapes may be laundered, furniture may need replacing.						
Wallboard (drywall and gypsum board)	HEPA vacuum, and paint over impacted area with anti-microbial paint. May need to cut and remove.						
Wood surfaces	Clean with antifungal biocide, and dry.						
MEDIUM - Total Surface Area Affected Between 25 and 100 sqft							
Books and papers	HEPA vacuum, or discard.	Not required if work will be conducted in a manner that minimizes the release of microbial growth spores. Required if work practice has the ability to release microbial growth spores. Containment should consist of a minimum of a single layer of fire retardant polyethylene sheeting with negative pressure exhausting through a HEPA filter or outside. Use professional judgment, EHS to consider potential for remediator/occupant exposure and size of contaminated area.	If no containment required: Qualified and trained Dartmouth staff can perform work. If containment is required: Qualified mold remediation contractor.	If no containment required: Required PPE: Nitrile gloves and eye protection. Recommended PPE: KN-95 face covering. If containment is required: Required PPE: Nitrile gloves, eye protection, N95 respirator.	If no containment required: Mold Response If containment is required: Mold Remediation	If no containment required: Verbal Work Plan If containment is required: Contractor supplied Work Plan	If no containment required: When requested If containment is required: EHS drafts recommendations for work; reviews contractor scope of work; keeps records of remediation.
Carpet and backing	Extraction, deep clean, dry immediately. May need to be discarded and replaced.						
Ceiling Tiles	Discard and replace.						
Cellulose insulation	Discard and replace.						
Concrete or cinder block	Clean with antifungal biocide, and dry.						
Fiberglass Insulation	Discard and replace.						
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	Clean with antifungal biocide, and dry.						
Non-porous, hard surfaces (plastics, metals)	Clean with antifungal biocide, and dry.						
Upholstered furniture & drapes	Drapes may be laundered, furniture may need replacing. May need to be discarded and replaced.						
Wallboard (drywall and gypsum board)	HEPA vacuum, and paint over impacted area with anti-microbial paint, or cut and remove.						
Wood surfaces	Clean with antifungal biocide, and dry.						

Table 2: Dartmouth Visible Microbial Growth Response and Remediation Guidelines

The information in this table is based on EPA's microbial growth Remediation in Schools and Commercial Buildings Guide, and Dartmouth best practice.

Material or Furnishing Affected	Cleanup Methods	Containment (see note 2)	Staffing	Personal Protective Equipment (see note 1)	Response Level	Work Plan	EHS Involvement
LARGE - Total Surface Area Affected Greater Than 100 sqft or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant							
Books and papers	HEPA vacuum, or discard.	Full Containment: Double layer of fire retardant polyethylene sheeting, with negative pressure in remediation area and a decontamination airlock entrance/exit. Use professional judgment, EHS to consider potential for remediator exposure and size of contaminated area.	Qualified mold remediation contractor, potential oversight by a qualified consultant.	Required Minimum PPE: Minimum of a half-face respirator with a HEPA cartridge. microbial growth-impervious disposable head, hand, and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).	Mold Remediation	Contractor or consultant supplied Work Plan.	EHS or consultant drafts recommendations for work; reviews contractor scope; keeps records of remediation.
Carpet and backing	Extraction, deep clean, dry immediately. May need to be discarded and replaced.						
Ceiling Tiles	Discard and replace.						
Cellulose insulation	Discard and replace.						
Concrete or cinder block	Clean with antifungal biocide, and dry.						
Fiberglass Insulation	Discard and replace.						
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	Clean with antifungal biocide, and dry. May need to be discarded and replaced.						
Non-porous, hard surfaces (plastics, metals)	Clean with antifungal biocide, and dry.						
Upholstered furniture & drapes	Drapes may be laundered or replaced, furniture may be discarded and replaced.						
Wallboard (drywall and gypsum board)	HEPA vacuum and paint over impacted area with anti-microbial paint, or cut and remove.						
Wood surfaces	Clean with antifungal biocide, and dry. May need to be discarded and replaced.						

Notes:

1. Use professional judgment to determine prudent levels of Personal Protective Equipment (PPE) and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment and containment, if, during the remediation, more extensive contamination is encountered than was expected. In general, a KN95 is recommended when work practices are unlikely to release microbial growth spores, and an N95 or higher protection is required when work practices are likely to release microbial growth spores.
2. Tasks that are known to release microbial growth spores include, but are not limited to, the following tasks: breakup of moldy porous materials such as wallboard, invasive procedures used to examine or remediate microbial growth in a wall cavity, actively stripping or peeling wallpaper to remove it, or drying microbial growth items with fans.
3. Some or all of these scenarios may need to be documented and send to Risk and Internal Control Services (RICS) for liability and insurance purposes. Significantly impacted areas should be inspected by EHS or a consultant. Photographs and lists of impacted items will be needed for future insurance claims. Dartmouth will designate a record keeper who will centrally store all relevant documentation.
4. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment, and immediate disposal of impacted materials. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.
5. Mold response can be performed by Dartmouth staff for the cleanup or removal of less than 25 to 100 square feet of visible microbial growth when there are no actions taken that may increase the risk of respiratory exposure.
6. Mold remediation is the term used for more complicated projects that may involve containment or consultant/contractor response, as determined by EHS. Mold remediation is not performed by Dartmouth personnel.
7. A work plan is a document that describes cleanup methods, the required PPE, and the appropriate containment equipment for microbial growth remediation or response.

Dated: May 1, 2023

Work Order Flow Chart for Microbial Growth

EHS SOP # 29A Figure 1 | EHS@Dartmouth.edu

This flow chart is to act specifically as a work order routing system for microbial growth concerns. Concerns related to **SOILED CEILING TILES** should be routed directly to building repair shop and **SHOWER/BATH PANS** directly to custodial, per the flow chart.
The flow chart is an addendum to **EHS SOP # 29 C Table 1 and Table 2**.

NOTE: Any moisture issue MUST be brought-to and addressed-by the building manager.

Acronym Key

- EHS - Dartmouth College Environmental Health and Safety
- SOP - Standard Operating Procedure
- WO - Work Order
- SMG - Suspected Microbial Growth
- ACM - Asbestos Containing Material

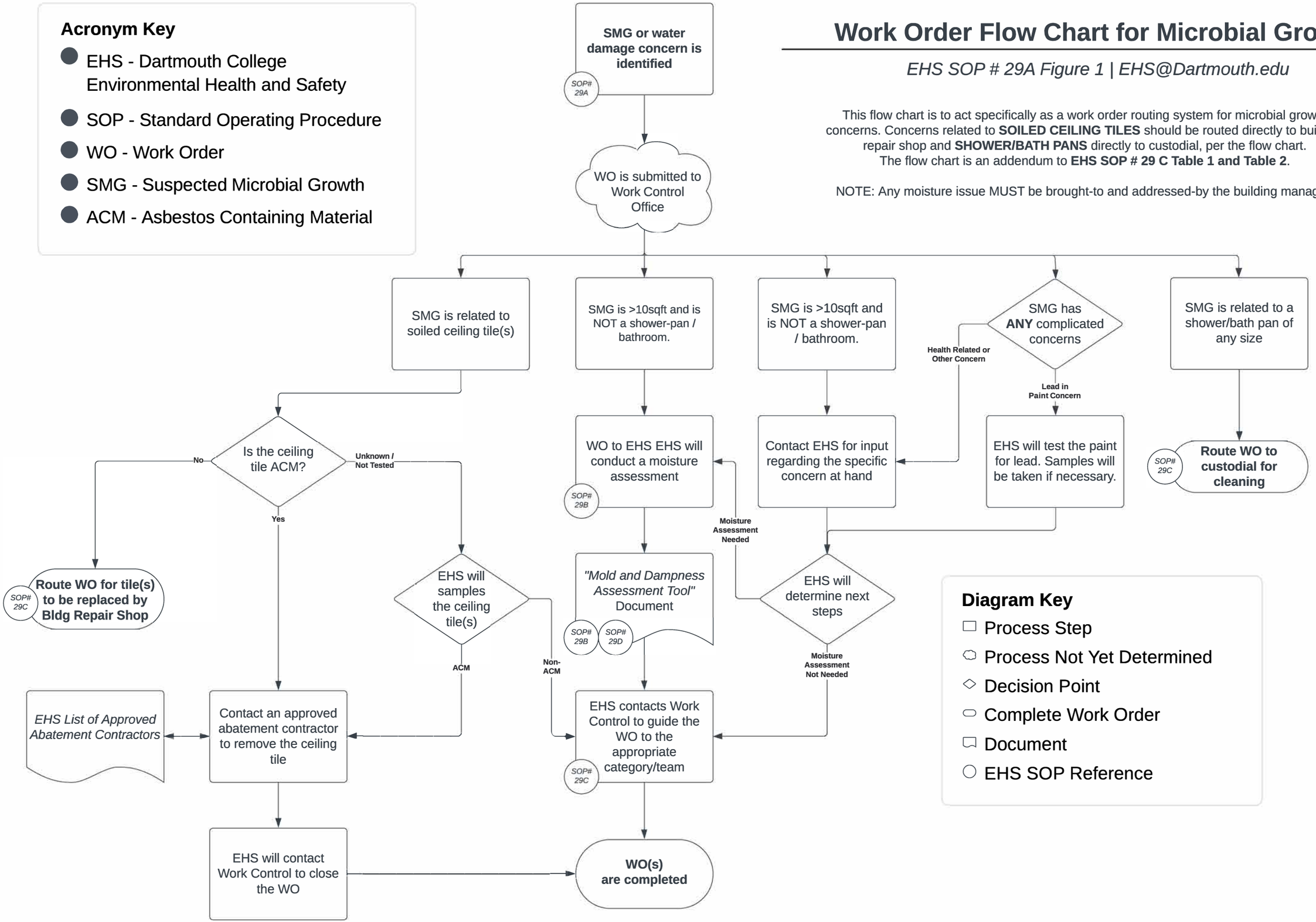
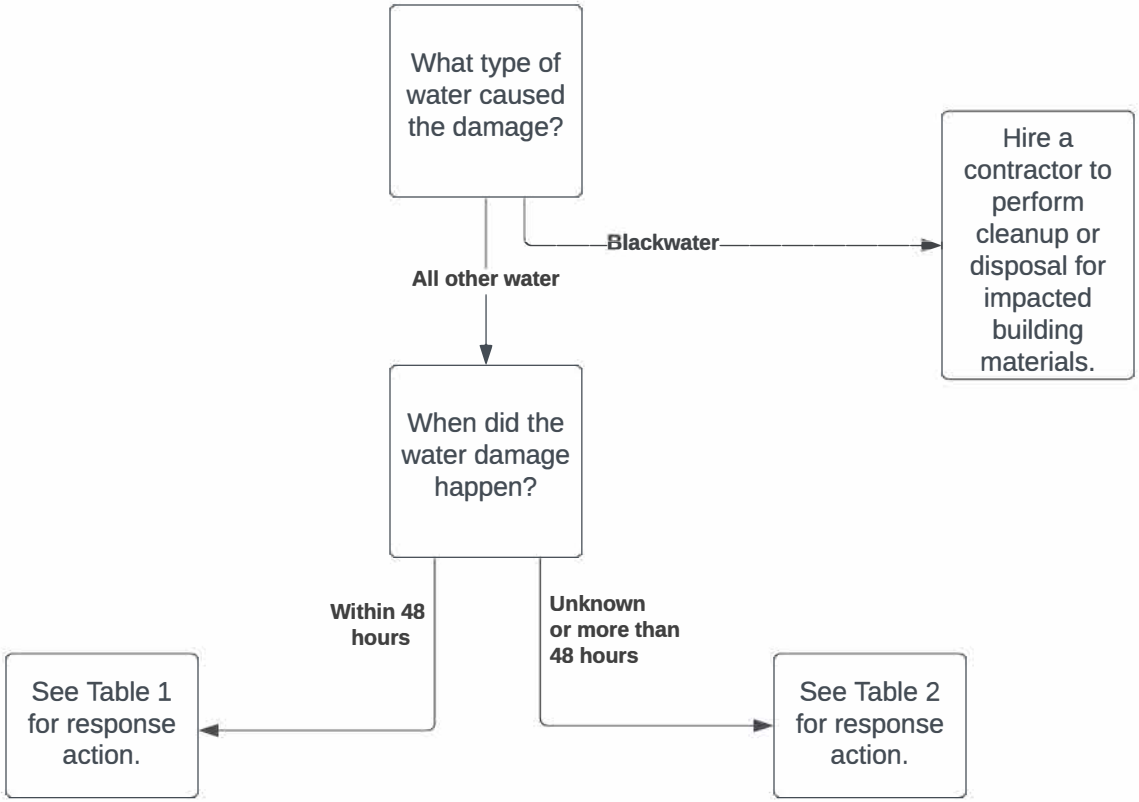


Diagram Key

- Process Step
- Process Not Yet Determined
- Decision Point
- Complete Work Order
- Document
- EHS SOP Reference

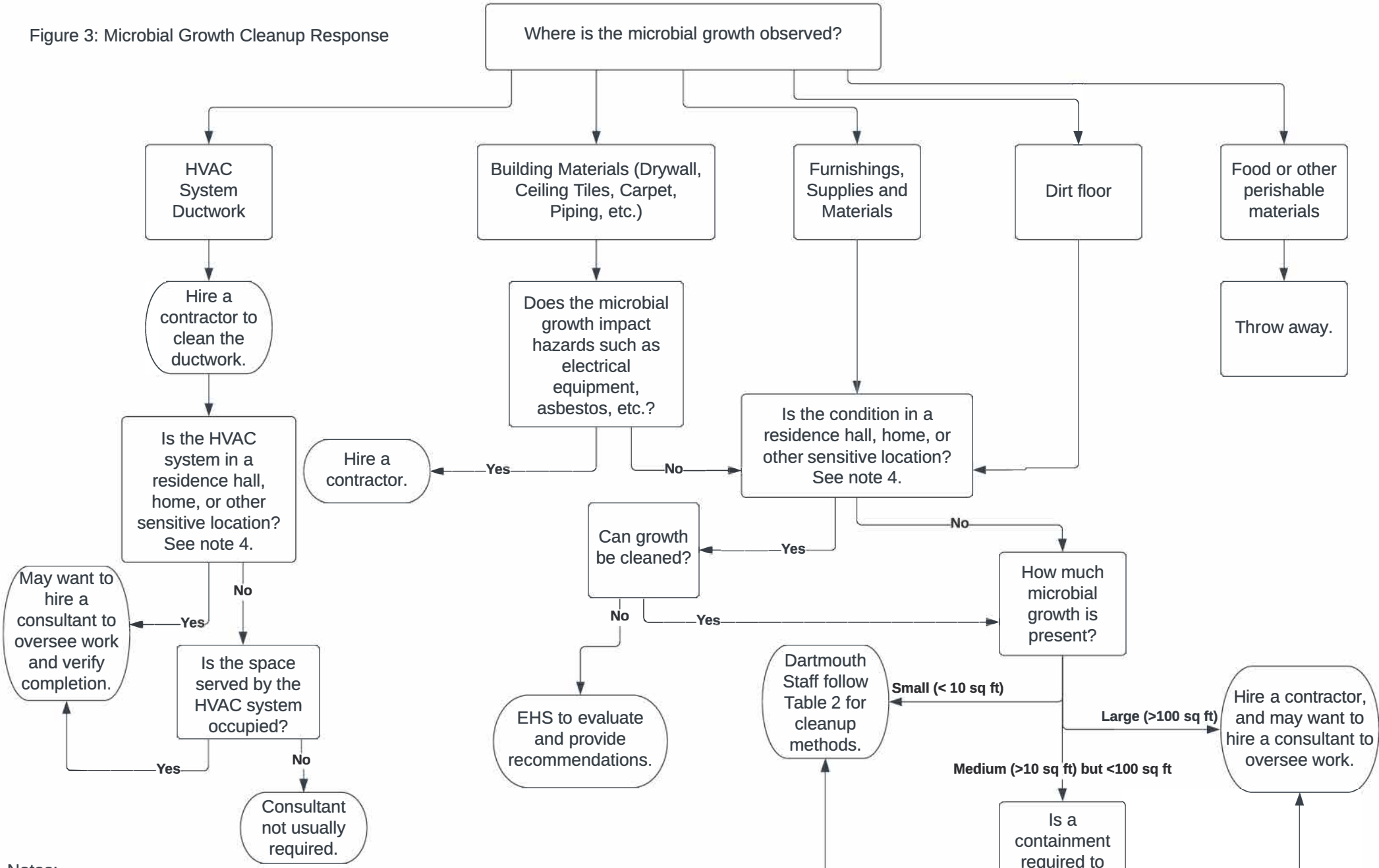
Figure 2: Water Damage Cleanup Process



Notes:

1. Address the cause of the water damage before starting cleanup.
2. Blackwater (or sewage) should be cleaned up by a contractor as soon as possible. Impacted materials such as carpet or drywall should be removed.
3. Microbial growth can start if impacted materials are not dried within 48 hours.

Figure 3: Microbial Growth Cleanup Response



Notes:

1. Address the cause of microbial growth before starting cleanup.
2. Dartmouth EHS will use professional judgment about the use of containment for cleanup activities.
3. Respiratory protection (N95 or better) is required whenever a containment is required, and users must be enrolled in the Respiratory Protection Program. KN95 face masks are recommend for other microbial growth cleanup activities.
4. Sensitive locations are spaces on campus where people live, or spaces that have other requirements, such as health care facilities.

Appendix D: Surface Sampling Using the Tape Lift Method for Microbial Growth (EHS SOP # 29D)

1.0 Purpose

This Standard Operating Procedure (SOP) describes the process for collecting a tape lift sample for determination of microbial growth.

2.0 Scope

This SOP applies to all Dartmouth personnel and consultants who collect tape lift samples for microbial growth. Depending on the situation, the objective(s) for collecting a tape lift may include:

1. Determining if the visible stain, discoloration, or other signs indicate the presence of microbial growth at the sampled location. Surface sampling helps confirm whether the observed signs are indeed caused by microbial growth.

2. To identify the specific microbial growth which are viable, non-viable and/or dormant on the sampled surface. This allows for a more accurate assessment of the types of microbial growth present and their potential health implications.

3. To assess the spore population on the surface and determine if it represents a normal distribution or a skewed population. Unusual or elevated levels of certain spore types may indicate indoor microbial growth or specific microbial growth-related issues.

4. Set a baseline for remediation of microbial growth.

5. Determining the effectiveness of completed remediation.

3.0 Responsibilities

Environmental Health & Safety (EHS)

- Collect surface samples using tape lift method and document in field notebook.
- Maintain records and documents.
- Make recommendations for the next steps.

Facilities Operation and Management (FO&M), Facility Managers, and Residential Operations

- Provide escorts and support to EHS or consultants during sampling.

Consultants

- Perform surface sampling using tape lift method at the request of Dartmouth College.
- Provide a report/data to EHS.

4.0 Procedures

The following sections describe the steps to be taken by EHS or consultants, should tape lifts for microbial growth be warranted.

4.1: Conducting Surface Sampling using Tape Lift Method for Microbial Growth:

Respond to the location and meet with FO&M, Facility Manager, and/or Residential Operations for escort. Collect surface samples using the tape lift method.

Materials:

- Clear/transparent Scotch tape.
    - DO NOT use thick packing tape, opaque/frosted tapes.
- Microscope slides and microscope slide holder.
- Gloves.
- Sample bag with label.
- Sharpie.
- Floorplans.

Procedure for collecting a tape-lift sample:

- Collect surface samples on various surfaces to determine a representative characterization of microbial growth using the tape lift method:
    - Discard the first inch or two of tape from the roll to prevent sample contamination. Obtain a piece of clear tape, approximately one or two inches in length. Tape must only be handled by the ends to avoid contamination.
    - Position the adhesive side of the tape over the suspected microbial growth area or with visible signs. Press the tape firmly onto the surface to ensure good contact and adhesion.
        - DO NOT press more than once per location, per piece of tape or it may overload the sample.
    - Carefully remove the tape from the surface, making sure not to fold or crumple it. Handle the tape by the ends to maintain its integrity.
    - Place the tape onto a clean microscope slide, adhesive side down. Identify sample respectively and note the location on the floorplan. It's essential to properly label the sample with relevant information, such as the location and date of sampling, to ensure accurate identification and analysis.
        - Take photo(s) of all sample locations with respective tape lift.
        - DO NOT fold the tape on itself or under the microscope slide.
        - Place the microscope slide into a slide box or another protective container to prevent damage or contamination during transportation.
        - Complete the chain-of-custody form:
            - Analysis method should be by direct microscopic examination.
            - Send via overnight mail to a laboratory accredited by the American Industrial Hygienist Association (AIHA), Environmental Microbiology Laboratory Accreditation Program (EMLAP).

Consider the possibility of hidden sources of microbial growth: If warranted and safe to do so, look behind wallboards, cabinets, above ceiling tiles, and/or in ductwork. ***Note:*** depending on the type of building material, it may be necessary to check for asbestos or lead paint before disturbing certain building materials.

Sample Substrates: Ideal sample locations are organic, permeable, smooth substrates. While these are preferred mediums for microbial growth, it's also a preferred surface to collect a tape lift sample because the tape more easily adheres to the suspected microbial growth without adhering and collecting the growth medium:

- Preferable: If a tape lift sample were to be collected from a wooden chair with suspect microbial growth, the tape would adhere to the spores and leave the wood fibers behind, allowing for good contact and adhesion primarily to the suspect microbial growth. This provides very low to no background debris on the sample, making it an ideal sample for analysis by direct microscopic examination.

- Suboptimal: If you were to collect a tape lift sample from a carpet, the tape would adhere to the carpet fibers which obscures the lab analyst's ability to "read" the microscope slide for microbial spores. This is an example of a sample with likely very heavy background debris.

Sample Locations: Take samples in each area of concern or area where there is visible microbial growth or visible signs. If there are different types of microbial growth present, indicated by different colors or appearances, it is advisable to sample each type separately. Additionally, if there is visible microbial growth on different substrates or building materials, it is best to take separate tape lift samples from each material. This approach allows for a more comprehensive analysis and identification of the specific microbial growths present on different surfaces.

Number of Samples: More data is better and helps understand the situation. For example, if there's a microbial growth concern in a custodial closet, a total of three samples may be appropriate. However, fi there are several floors in a commercial building, then many more than three samples should be collected.

- Bare Minimum Number of Samples: Collect one tape lift sample per substrate, per color or appearance, per area of concern.

Clearance Sampling: Occasionally it will be necessary to demonstrate the effectiveness of remediation. In this case, a higher number of tape lift samples will be collected to ensure surfaces within the remediation area have been decontaminated and thoroughly cleaned. It's important to note tape lift samples analyzed by direct microscopic examination do not differentiate between viable, non-viable (alive and dead), and dormant spores. Non-viable microbial spores have the potential to cause an allergic reaction, so it is necessary to remove the microbial growth from the indoor environment.

Documentation: EHS will retain documentation of the sampling and will share the laboratory results with the FO&M, the Facility Manager, or Residential Operations. For sufficiently complex or large projects, EHS may provide a cover letter or memo with additional detail.

5.0 Limitations

Although a tape lift can show hyphae fragments and reproductive structures, surface sampling for microbial growth is not a direct indication of microbial spore concentration in the air. Microbial spores may become airborne via natural and mechanical air movements, and from disturbances caused by humans, pets, and rodents. Additionally, some smaller microbial spores do not settle on surfaces at the same settling velocity as

some larger microbial spores. The particle size of the microbial spore can under- or over-represent population concentrations.

Some microbial growth groups produce similar spore types which are non-distinguishable by direct microscopic examination alone together (e.g., Aspergillus or Penicillium).

Some microbial growth lacks distinguishing features and are grouped together (e.g., Ascospores or Basidiospores).

If the sampling material is wet, the tape adhesive may not collect a viable sample.

6.0 References:

Direct Microscopic Examination. (n.d.). https://www.emlab.com/media/resources/direct.pdf

EMSL Analytical, Inc. (2019). Expanded Fungal Report [Review of *Expanded Fungal Report*]. In *emsl.com* (pp. 1–37). EMSL. https://www.emsl.com/PDFDocuments/SampleReports/ExpandedAsessmentReportV2.pdf

US EPA. (2014, August 4). *Mold Remediation in Schools and Commercial Buildings Guide: Chapter 1*. Www.epa.gov. https://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide-chapter-1

US EPA. (2014, August 13). *A Brief Guide to Mold, Moisture and Your Home | US EPA*. US EPA. https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home

US EPA. (2015, May 13). *Mold Testing or Sampling*. Www.epa.gov. https://www.epa.gov/mold/mold-testing-or-sampling

Surface Sampling for Mold. (n.d.). Www.emlab.com. https://www.emlab.com/resources/sampling-guides/mold-surface-sampling/

*** End ***

Microbial Growth Management Program Fact Sheet for Students

DARTMOUTH COLLEGE
ENVIRONMENTAL HEALTH AND SAFETY

(603) 646-1762
WWW.DARTMOUTH.EDU/EHS

What is *microbial growth?*

- Microbial growth, often referred to as mold or mildew, is a family of fungi commonly found both indoors and outdoors.
- Microbial spores are found almost everywhere in the environment and can grow on most organic substances when moisture, oxygen, and ideal temperature ranges are present.
- The health effects of mold can vary vastly and are dependent on an individual person's susceptibility to the contaminant.

What do I do if I suspect *microbial growth* in a Residence Hall, dorm room, or Dartmouth owned residence?

- Option A: Bring your concern to the Area Director of your Residence Hall, who will forward the concern to the appropriate party.
- Option B: Submit a work order yourself (via Planon, the College's work order request system). Someone from EHS, Facilities, or Res. Ops. will evaluate the work order and determine next steps. Work Control: 603-646-2508

How to help prevent *microbial growth* from occurring:

- Promptly report any leaks or water intrusions you notice in your area.
- Keep areas that are meant to be dry, as dry as possible.
- Dispose of food waste, promptly and properly.

Dartmouth College has a number of historic buildings. Over decades and centuries of use, these buildings may begin to show signs of wear, which may include water or moisture intrusions and may lead to microbial growth .

Sanborn House, pictured right, was built in 1929.
Dartmouth's oldest building is Webster Cottage, built in 1780

Important Resources:
https://www.dartmouth.edu/ehs/
https://facilities.dartmouth.edu/
https://www.cdc.gov/mold/

Microbial Growth Management Program Fact Sheet for Employees

DARTMOUTH COLLEGE
ENVIRONMENTAL HEALTH AND SAFETY

(603) 646-1762
WWW.DARTMOUTH.EDU/EHS

What is *microbial growth?*

- Microbial growth, often referred to as mold or mildew, is a family of fungi commonly found both indoors and outdoors.
- Microbial spores are found almost everywhere in the environment and can grow on most organic substances when moisture, oxygen, and ideal temperature ranges are present.
- The health effects of mold can vary vastly and are dependent on an individual person's susceptibility to the contaminant.

What do I do if I suspect *microbial growth* in an office, workspace, or other space on Dartmouth College property?

- If you SEE microbial growth, water damage, or any leaks, promptly REPORT them to Work Control ASAP!
- Submit a work order yourself (via Planon, the College's work order request system).
  - Someone from EHS and/or Facilities will evaluate the work request and determine next steps.

How to help prevent *microbial growth* from occurring:

- Promptly report any leaks or water intrusions noticed in or near your area.
- Keep areas that are meant to be dry as dry as possible.
- Do not store items in unfinished basements; especially items that are likely to become wet or damp.

Important Resources:
Work Control: 603-646-2508
https://www.dartmouth.edu/ehs/
https://facilities.dartmouth.edu/
https://www.cdc.gov/mold/

Microbial Growth Management Program Fact Sheet for FO&M, ResOps, & REO

DARTMOUTH COLLEGE
ENVIRONMENTAL HEALTH AND SAFETY

(603) 646-1762
WWW.DARTMOUTH.EDU/EHS

When does *microbial growth (MG)* occur?

- Often referred to as mold or mildew, MG is more likely to appear in spaces with an abundance of moisture or high humidity, especially places like basements with fieldstone foundations, wood framing, French drains, or dirt floors/walls.

The following options may be appropriate to prevent *microbial growth:*

- Locate and stop the source of the water intrusion causing the MG.
  - Inform building/facilities managers immediately of any water intrusions.
- Lower the humidity in the space, using either dehumidifiers or air handlers.

Who is expected to clean *microbial growth?*

- Dartmouth College custodial staff are expected to clean areas less than or equal to 25 square feet of microbial growth. Some instances may require the cleaning of larger areas. EHS will help to determine the scope of work necessary. (MG training will be offered to employees on an annual basis)
- EHS typically does not evaluate every area found to have suspected MG.
  - *For Example:* EHS does not need to assess shower/bath pans or soiled ceiling tiles.
- EHS typically is involved when a concern is wide spread, recurring, or otherwise deemed complex.

How can I protect myself when working around *microbial growth*?

- Promptly report any health concerns regarding cleaning microbial growth to your supervisor.
  - Follow the steps for Personal Protective Equipment when working with MG, as outlined in EHS SOP # 29C Table 2; this may include KN95s, N95 respirators, gloves, etc.

Important Resources:
Work Control: 603-646-2508
https://www.dartmouth.edu/ehs/
https://facilities.dartmouth.edu/
https://www.cdc.gov/mold/

Appendix F: Websites and Resources

Websites

- Dartmouth College Microbial growth Remediation Website
- National Institute of Environmental Health Sciences
- U.S. Centers for Disease Control and Prevention
- U.S. Environmental Protection Agency
- World Health Organization Guidelines

Standards and Guidelines

- American Conference of Governmental Industrial Hygienists (ACGIH), Bioaerosols: Assessment and Control, Chapter 15: Remediation of Microbial Contamination.
- American Industrial Hygiene Association (AIHA), "Report of Microbial Growth Task Force."
- Institute of Inspection, Cleaning and Restoration Certification (IICRC), "IICRC S520: Standard and
- ANSI/ASHRAE/ACCA Standard 180-2018: "Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems."
- ANSI/IICRC, "IICRC S500-2021: Standard for Professional Water Damage Restoration Fifth Edition."
- Health Canada, Federal Provincial Committee on Environmental and Occupational Health, "Fungal Contamination in Public Buildings: A Guide to Recognition and Management."
- United States Environmental Protection Agency, Office of Air and Radiation, Indoor Environments Division, "Microbial Growth Remediation in Schools and Commercial Buildings."
- United States Department of Labor, Occupational Safety and Health Administration (OSHA), Safety and Health Information Bulletins, "A Brief Guide to Microbial growth in the Workplace."

Appendix G: Glossary of Terms

Air Handling Units (AHU): Equipment including a blower or fan, heating and/or cooling coils, and related equipment such as controls, condensate drain pans, and air filters. Does not include ductwork, registers or grilles, or boilers and chillers.

Building Envelope: Elements of the building, including all external building materials, windows, and walls, which enclose the internal space.

Dampness: Any visible, measurable, or perceived outcome of excess moisture which causes problems such as microbial growth in buildings.

EHS: Dartmouth's Environmental Health and Safety department.

Excess Moisture: Moisture when it is higher than a design criterion, usually represented as moisture content or relative humidity in building material or the air.

Fact Sheet: A training/informational document provided to specific stakeholders of the MGMP. The document contains relevant information points about the MGMP as it pertains to the specific role(s) mentioned within the fact sheet.

FO&M: Dartmouth's Facilities Operation and Management department.

Fungi: A separate kingdom comprising living things, neither animals nor plants. The kingdom Fungi includes microbial growths, yeasts, mushrooms, and puffballs. In this document, the terms fungi and microbial growth are often used interchangeably.

HVAC: Heating Ventilation and Air Conditioning equipment.

Microbial Growth: The growth of a population or an increase in the number of cells. This term refers to a family of fungi commonly found both indoors and outdoors.

MGAT: Microbial Growth Assessment Tool (EHS SOP # 29B Form 1)

MGMP: Dartmouth College's Microbial Growth Management Program. This document.

Mildew: A certain kind of microbial growth or fungus. The term mildew is often used generically to refer to microbial growth, usually with a flat growth habit.

Moisture: Water vapor or water in a medium, such as soil or insulation. This is not free-standing water or flowing water.

NIOSH: The National Institute for Occupational Safety & Health.

Relative Humidity: The amount of water vapor present in air expressed as a percentage of the amount needed for saturation at the same temperature.

Remediation: The process of removing all identified suspected or confirmed microbial growth (mold/mildew) in a space and fully repairing any damage within scope.

SOP: Standard Operating Procedure.

Ventilation: The process of supplying or removing air by natural or mechanical means to or from any space; the air may or may not have been conditioned.

Appendix B: Indoor Air Quality Complaint Form

Appendix C: IAQ Walkthrough Inspection Checklist