

MAURA T. HEALEY
GOVERNOR

KIMBERLEY DRISCOLL
LIEUTENANT GOVERNOR

TERRENCE M. REIDY
SECRETARY

The Commonwealth of Massachusetts
Executive Office of Public Safety and Security
Fire Prevention Regulations Appeals Board
P.O. Box 1025 ~ State Road

Stow, Massachusetts 01775

(978) 567-3181 Fax: (978) 567-3121

ANTHONY P. CAPUTO
CHAIRMAN

Docket # 2023-04
815 Columbus Avenue
Boston, Massachusetts

FIRE PREVENTION REGULATIONS APPEALS BOARD DECISION

A) Statutory and Regulatory Framework

This matter is an administrative appeal filed in accordance with Massachusetts General Laws Chapter 22D, section 5. The Appellant is seeking the Fire Prevention Regulations Appeals Board's review of a decision of the Boston Fire Department to reject Northeastern University's ("the Appellant") use of ductless/filtered chemical fume hoods installed in eight (8) chemistry teaching laboratories at the EXP Teaching and Research Building located at 815 Columbus Ave, Boston, Massachusetts. The rejection/denial cites violations of 527 CMR 1.00 and NFPA 45 (2019).

B) Procedural History

By an undated notice issued by the Boston Fire Department and received by the Appellant on or about August 22, 2023, the Boston Fire Department issued a rejection on the use of ductless/filtered chemical fume hoods at the Northeastern University EXP Teaching and Research Building located at 815 Columbus Ave, Boston, Massachusetts.

On August 25, 2023, the Appellant filed a timely appeal of the Boston Fire Department's rejection. Following several requests by each party for continuances in this matter, the Board held a video conference hearing on December 13, 2023.

Appearing on behalf of the Appellant was: Jonathan Eisenberg PE, Associate Principal, Arup; Michael Glover, Vice President and Senior Counsel, Northeastern University; Marne Smith Associate Vice Provost – Education and Research Safety, Northeastern University; Robyn Goodner Executive Director – Makerspace, Northeastern University; Whitney Hess, Assistant Director and Chemical Hygiene Officer, Office of Academic Research Safety, Northeastern University; and Thomas C. Smith, President and CEO, 3Flow.

Appearing on behalf of the Boston Fire Department was: Deputy Chief Patrick Ellis, Fire Marshal; District Chief Joseph Walsh, Assistant Fire Marshal; Captain Mark Dunnigan, Lab Safety Officer; and Lt Mike Kates, Assistant Lab Safety Officer.

Present for the Board were: Larry S. Fisher, Presiding Panel Member; Dr. Paul Scheiner; John Cox; and Patricia Sheehan, Alternate. Glenn M. Rooney, Esq., was the Attorney for the Board.

C) Issue(s) to be Decided

Whether the Board should reverse, affirm, or modify the Boston Fire Department's rejection/denial of the usage of ductless filtered fume hoods at Northeastern University's EXP Teaching and Research Building located at 815 Columbus Ave, Boston, Massachusetts in accordance with 527 CMR 1.00, NFPA 45 (2019), Section 7.4?

D) Evidence Received

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| 1. | Application for Appeal filed by Appellant | 8/25/2023 |
| 2. | Statement in Support of Appeal from Mary Strother, Sr. Vice President and General Counsel, Northeastern University | 12/1/2023 |
| 3. | Memorandum of Appeal and Argument of Northeastern University with Appendices | 12/1/2023 |
| 3A. | DFH Boston Fire Department Communication History | |
| 3B. | Permit Set Drawings – Partial Set (pages 10-27) | |
| 3C. | Lab Layout | |
| 3D. | Permit Set – Laboratory Fume Hood Specifications (pages 30-48) | |
| 3E. | Boston Fire Department Rejection of Ductless/Filtered Chemical Fume Hoods at Northeastern University | Undated |
| 3F. | Filtered Fume Hood Hazard Assessment completed by Arup (pages 52-72) | |
| 3G. | Design Team Affidavit | |
| 3H. | Third Party Review of Risk Associated with Use of Ductless Fume Hoods in Teaching Laboratories at Northeastern University EXP | |
| 3I. | Ductless Filtered Fume Hood One Year Monitoring Plan | |
| 3J. | Ductless Filtered Fume Hood Case Studies from Massachusetts: Framingham State University and Bristol Community College | |
| 4. | Statement from Captain Dunnigan, Boston Fire Department, in Support of Order of Notice (undated) | |
| 4A. | Laboratory Inspection Report – Snell Engineering (dated 7/19/22) | |
| 4B. | Laboratory Inspection Report – Egan Building (dated 9/21/22 and 9/29/22) | |
| 4C. | Laboratory Inspection Report – Dana Research Center (dated 7/20/22) | |
| 4D. | Laboratory Inspection Report – EXP Building (dated 10/30/23) | |
| 5. | Supporting Document – Boston Fire Department Code Interpretation & Assessment | 11/30/23 |

E) Findings of Fact

- 1) The Appellant sought this Board's review of the rejection/denial of the Boston Fire Department on the use of ductless/filtered chemical fume hoods at the Northeastern University EXP Teaching and Research Building located at 815 Columbus Ave, Boston, Massachusetts.
- 2) The Appellant, Northeastern University, testified that the building in question is the EXP Building, which is a 350,000 square foot state-of-the-art research and teaching facility for science and engineering on Northeastern's Boston campus. The building includes 77 filtered hoods in eight (8) teaching labs located on the 3rd floor.
- 3) The Appellant testified that the construction drawings for the subject building were submitted to the City of Boston's Office of Inspectional Services and the City of Boston Fire Department in 2020 for review and approval. The plans included drawings and specifications clearly indicating that the building would include the 77 filtered hoods. The Appellant stated that the plans, including the portions relative to the filtered hoods, were reviewed and approved by Inspectional Services and the Fire Department, and a building permit for the construction of the building was issued on August 13, 2021.
- 4) The Appellant then proceeded to construct the building with the filtered hoods, based upon the approvals received from the City. Once the building was substantially completed, the Appellant requested a final certificate of occupancy for the building. After some discussion with the Boston Fire Department, the Appellant received a written notice from the Department in summer 2023 which rejected the filtered hoods in the building, despite the fact that the filter hoods had previously been approved in connection with the issuance of a building permit.
- 5) The Appellant testified that it is their position that filtered hoods are permitted under NFPA 45 (2011 Edition) and that the Boston Fire Department's prior approval of these particular filtered hoods, is evidence of a finding by the Boston Fire Department of a permitted equivalency under Section 1.5 of NFPA 45.
- 6) The Appellant testified that filtered hoods are not designed to and do not exhaust fumes, gases, vapors, mist, and particulate matter generated within the hood interior. Instead, the hoods capture these emissions in a series of filters. Accordingly, the Appellant argued that filtered hoods do not fit within the definition of chemical fume hoods under NFPA 45, 2011, nor are they special exhaust systems under NFPA 45, 2011. Further, Section 8.3.1 of NFPA 45 (2011) states "laboratory ventilation systems shall be designed to ensure that chemical fumes, vapors, or gases originating from the laboratory shall not be recirculated". The Appellant stated that the filtered hoods specifically prevent the recirculation of chemical fumes, vapors and gases.
- 7) The Appellant further indicated that the hoods being used within the EXP building are for student experiments, where instructors are present at all times and the experiments are highly controlled and based on accepted standards for education level and the intent and outcome is defined and controlled before it even starts. The Appellant further stated that chemical quantities for the experiments are highly controlled and that students are only given what they need for the experiment. Furthermore, to ensure safe and reasonable use

of these devices, the Appellant adjusted its curricula and performed a robust set of calculations specific to the chemicals and chemical reactions used in these courses and engaged the services of an occupational health and safety firm to undergo a comprehensive analysis of the intended uses of these devices.

- 8) The Appellant further testified that Boston Fire Department did not apply the correct version of NFPA 45 in issuing their decision. The Boston Fire Department's aforementioned decision stated that it was based upon the determination that the filtered hoods did not comply with the 2019 version of NFPA 45. However, when the Department submitted supplemental documentation to the Board prior to the hearing, the Appellant expressly acknowledged that the 2019 version of NFPA 45 was not the applicable standard for laboratories within the subject building.
- 9) Furthermore, it's the Appellant's position that Section 26 of the Massachusetts Comprehensive Fire Safety Code applies to this building, which requires that all laboratories comply with NFPA 45 (2011). The Appellant stated that Chapter 8 of NFPA 45 (2011) later became Chapter 7 of NFPA 45 (2019) and underwent material modifications between the 2011 and 2019 versions.
- 10) The Appellant briefly outlined the modifications between the 2011 and 2019 editions, including the requirement that air exhaust from chemical fume hoods and other special exhaust systems not be recirculated and be discharged above the roof. However, the Appellant stated NFPA 45 (2011) does not contain a definition for the term "special exhaust system".
- 11) The Appellant also outlined that filtered hoods are not designed to and do not exhaust fumes, gases, vapors, mist, and particulate matter generated within the hood interior but rather, capture these emissions, as defined in Section 8.3.1 of NFPA 45 (2011). Accordingly, the Appellant believes that filtered hoods do not fit within the definition of chemical fume hoods under NFPA 45 (2011), nor are they special exhaust systems under NFPA 45 (2011).
- 12) The Appellant argued that a number of other filtered hoods have been permitted in Massachusetts under NFPA 45 (2011), including filtered hoods within buildings constructed by the Commonwealth such as the ones at Framingham State University and Bristol Community College. The Appellant stated that if the Board were to find that filtered hoods at the EXP building are not allowable under NFPA 45, it would effectively be an invalidation of the permits that have been issued at Framingham State and at other locations in which filtered hoods are being used in the Commonwealth that were permitted under NFPA 45 (2011).
- 13) The Appellant expressed frustration, stating that if the Boston Fire Department felt that the filtered hoods in the building were not compliant with NFPA 45, it could have easily rejected Northeastern's plans as part of its initial review. By not rejecting the hoods within the plan, the Appellant believes that either the Boston Fire Department determined, at the time of the issuance of the building permit, that the filtered hoods complied with NFPA 45 or that the filtered hoods were otherwise sufficient to satisfy the equivalency standards under NFPA 45 under Section 1.5, which allows the authority having jurisdiction to approve of "systems, methods, or devices of equivalent or superior quality,

strength, fire resistance, effectiveness, durability, and safety over those prescribed by an NFPA 45.”

- 14) In closing, the Appellant requested that if the Board found that the Boston Fire Department erred in their determination to reject the implementation and use of these hoods, that a variance be granted to the Appellant for the use of these hoods. Furthermore, the Appellant expressed its willingness to consider any other conditions or controls as part of any decision issued by the Board.
- 15) In support of the Boston Fire Department’s position, Captain Mark Dunnigan, Lab Safety Officer, testified that the initial rejection decision was grounded in the 2011 Edition of NFPA 45, Section 8.4.1. Subsequently, the filtered hoods were ruled non-compliant in the rejection letter referencing Section 7.4.1 of the 2019 Edition of NFPA 45. Captain Dunnigan explained that both editions of NFPA 45 consistently mandate the same critical element – that air exhausted from chemical fume hoods and other special exhaust systems shall not be recirculated. Captain Dunnigan stated that based on the Appellant’s intended use for the ductless hoods and a Ductless Fume Hood assessment dated May 25, 2023, that the Department issued its rejection letter, citing the provision set forth in the 2019 Edition.
- 16) Captain Dunnigan stated that the decision to utilize the newly adopted edition of NFPA 45 was influenced by two key considerations. First, the applicable codes stated in Northeastern's Filtered Fume Assessment which explicitly address all fume hood installations, are required to comply with the 2019 edition of NFPA 45. Secondly, the Department conducted a comprehensive review of both the adopted edition and the newer edition. Further, Boston Fire Prevention Code gives the fire official the authority to apply subsequent additions of 527 CMR 1.00 to address or avert immediate hazards, which Boston Fire Department reports was done in this case.
- 17) Captain Dunnigan testified that many of the arguments put forth by the Appellant reference the 2024 Edition of NFPA 45, which the Board of Fire Prevention Regulations has not yet adopted into 527 CMR 1.00 and should not be considered.
- 18) Captain Dunnigan stated that both the 2011 and 2019 editions of NFPA 45 state the same requirements, that air from chemical fume hoods or other special exhaust systems cannot be recirculated and emphasizes that ductless fume hoods, which filter and release air back into the laboratory are only applicable for nuisance vapors or dust that pose no fire or toxicity hazard.
- 19) Lt. Michael Kates, also of the Boston Fire Department Lab Safety Unit, testified that as soon as the Department became aware of ductless hoods, they began conversations with Northeastern’s staff and expressed their concern. Lt. Kates clarified that the Department’s primary concern was the intended use of the equipment, not its installation or existence. Lt. Kates stated that the use of the hoods would be in violation of the Code, as the Appellant would be using chemicals that could cause either flammable fire vapors or toxic vapors, which is different than nuisance vapors or dust, as indicated in the Code.
- 20) Lt. Kates stated that the Lab Safety Unit specifically asks all hood owners to explain what the hoods will be used for and in cases involving chemicals, asks for copies of the Material Safety Data Sheets (SDS) to determine the dangers.

- 21) The Department also clarified that while the Boston Fire Department approved the building plans for the building in 2020, those approvals were on the life safety systems of the building and not an approval of systems being installed within the building, including the hoods. The Department stated that when a lab is preparing to obtain its certificate of occupancy, that is when the Lab Safety Unit goes out and begins to speak with lab owner to determine how the lab hoods are going to be used, to review any SDS sheets, and to review any specifications or other materials provided by the hood manufacturer.
- 22) In response to the concerns raised by the Department, the Appellant re-stated that the labs at the EXP building would be used as teaching labs, not research labs. The Appellant agreed that ductless filtered fume hoods would not be appropriate in a research lab environment due to the chemistry being too variable. However, the Appellant believes that these hoods are appropriate and safe to use in a teaching environment.

F) Ultimate Findings of Fact and Conclusions of Law

1. NFPA 45 (2011) states in pertinent part:

1.5 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

8.3.1 Laboratory ventilation systems shall be designed to ensure that chemical fumes, vapors, or gases originating from the laboratory shall not be recirculated.

8.4.1* Air exhausted from chemical fume hoods and other special local exhaust systems shall not be recirculated. *(See also 8.3.1.)*

A.8.4.1 Ductless chemical fume hoods that pass air from the hood interior through an adsorption filter and then discharge the air into the laboratory are only applicable for use with nuisance vapors and dusts that do not present a fire or toxicity hazard.

2. NFPA 45 (2019) states in pertinent part:

1.5 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

7.3.1* Laboratory ventilation systems shall be designed to ensure that chemical fumes, vapors, or gases originating from the laboratory shall not be recirculated. *(See also 7.4.2.)*

7.4 Exhaust Air Discharge.

7.4.1* Air exhausted from chemical fume hoods and other special local exhaust systems shall not be recirculated. (*See also 7.3.1.*)

A.7.4.1 Ductless chemical fume hoods that pass air from the hood interior through an adsorption filter and then discharge the air into the laboratory are only applicable for use with nuisance vapors and dusts that do not present a fire or toxicity hazard. See ANSI Z9.5, *Laboratory Ventilation*, and other applicable standards for additional information for the proper use and application.

3. The Board finds that based upon the documentation and testimony received by the Board, that the ductless/filtered chemical fume hoods installed at the Northeastern University EXP building are designed not to exhaust vapors or fumes and will be used for student experiments involving trace amounts of nuisance vapors and thus are permissible under either edition (2011 or 2019) of NFPA 45.

G) Decision and Order

Based upon the evidence received and testimony presented, the Board hereby **reverses** the Order of the Boston Fire Department and grants a variance to Northeastern University to allow for the use of ductless filtered fume hoods on the conditions that:

- A third-party reviewer be hired by Northeastern University, and approved by the Boston Fire Department, to conduct performance-based testing of the ductless filtered hoods to verify compliance with the standards and specifications of these hoods;
- Said third party reviewer shall be in place on or before March 1, 2024 and said performance reviews shall be done on a monthly basis and in conjunction with student activities and laboratory related experiments; and
- Said third party review reports shall be submitted to the Boston Fire Department for a term of eighteen (18) months from the date of testing commencement.

H) Vote of the Board

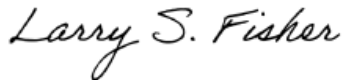
Larry S. Fisher, Presiding Panel Member
Dr. Paul Scheiner
John Cox

In Favor
In Favor
In Favor

I) Right of Appeal

You are hereby advised you have the right, pursuant to section 14 of chapter 30A of the General Laws, to appeal this decision, in whole or in part, within thirty (30) days from the date of receipt of this order.

SO ORDERED,



Larry S. Fisher, Presiding Panel Member
Fire Prevention Regulations Appeals Board

Dated: January 22, 2024

**A COPY OF THIS DECISION AND ORDER WAS FORWARDED BY E-MAIL AND
CERTIFIED MAIL, RETURN RECEIPT REQUESTED TO:**

Jonathan Eisenberg
ARUP
60 State Street
Boston, MA 02109
Jonathan.Eisenberg@arup.com

Michael A. Glover
Vice President and Senior Counsel, Real Estate and Strategic Operations
Northeastern University
360 Huntington Ave., Suite 301CP
Boston, MA 02115
m.glover@northeastern.edu

Deputy Chief Patrick Ellis, Fire Marshal
Boston Fire Department – Fire Prevention
1010 Massachusetts Ave, 4th Floor
Boston, Massachusetts 02118
Patrick.Ellis@boston.gov

Captain Mark Dunnigan, Lab Safety Officer
Boston Fire Department – Fire Prevention
1010 Massachusetts Ave, 4th Floor
Boston, Massachusetts 02118
Mark.Dunnigan@boston.gov