



# Nail Salons, Schools, and COVID, Oh My!

## Indoor Air Quality in 3 Contexts

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# Where We're Going

What is IAQ and Why do We Care?



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graph TD; A[What is IAQ and Why do We Care?] --> B[History of School Environmental Assessments in Boston]; B --> C[Safe Shops and Nail Salon Regulations]; C --> D[COVID Response and IAQ in a Post-COVID World]; D --> E[Challenges and Lessons Learned];
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History of School Environmental Assessments in Boston

Safe Shops and Nail Salon Regulations

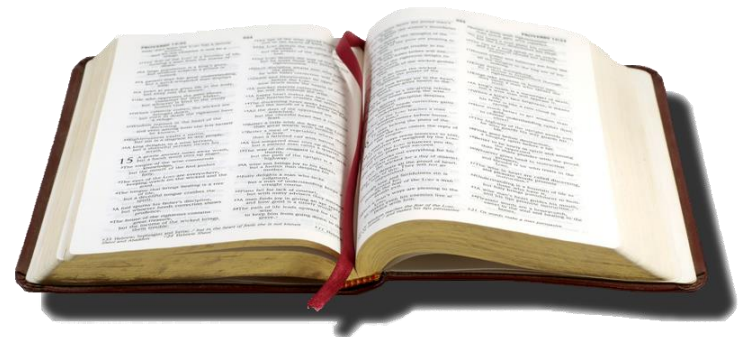
COVID Response and IAQ in a Post-COVID World

Challenges and Lessons Learned

## Indoor environmental quality has been a concern for humans as long as humans have been living indoors:

*<sup>33</sup> The LORD said to Moses and Aaron, <sup>34</sup> “When you enter the land of Canaan, which I am giving you as your possession, and I put a spreading mold in a house in that land, <sup>35</sup> the owner of the house must go and tell the priest, ‘I have seen something that looks like a defiling mold in my house.’ <sup>36</sup> The priest is to order the house to be emptied before he goes in to examine the mold, so that nothing in the house will be pronounced unclean. After this the priest is to go in and inspect the house. <sup>37</sup> He is to examine the mold on the walls, and if it has greenish or reddish depressions that appear to be deeper than the surface of the wall, <sup>38</sup> the priest shall go out the doorway of the house and close it up for seven days. <sup>39</sup> On the seventh day the priest shall return to inspect the house. If the mold has spread on the walls, <sup>40</sup> he is to order that the contaminated stones be torn out and thrown into an unclean place outside the town. <sup>41</sup> He must have all the inside walls of the house scraped and the material that is scraped off dumped into an unclean place outside the town. <sup>42</sup> Then they are to take other stones to replace these and take new clay and plaster the house.”*

- Bible (NIV) Leviticus 14: 33-42





<https://www.epa.gov/indoor-air-quality-iaq/interactive-tour-indoor-air-quality-demo-house>

# Indoor Air Quality (IAQ)

## **Commonly Measured/Tested**

- Ventilation presence/rate
- Carbon dioxide
- Temperature
- Relative humidity
- Carbon monoxide
- Volatile organic compounds
- Chronic dampness/mold

## **Less Frequently Measured/Tested**

- Allergens
  - Pet dander
  - Insect parts/infestation
  - Pollen
  - Dust mites
- Specific chemical contaminants
  - Secondhand smoke
  - Hydrogen sulfide/'sewer gas'
  - Pesticides
  - Formaldehyde
  - Asbestos
  - Mercury

# Health Concerns of IAQ

- Asthma and other chronic respiratory illnesses
- Allergies, respiratory irritants, and sick building syndrome
- Chemical exposure – acute impacts
- Chemical exposure – chronic impacts
- Infectious diseases



# Regulatory Basis

## 1. MGLc111 s122 REGULATIONS RELATIVE TO NUISANCES, EXAMINATIONS

The board of health shall examine into all nuisances, sources of filth and causes of sickness within its town, on board of vessels within the harbor of such town, which may, in its opinions, be injurious to the public health, shall destroy, remove or prevent the same as the case may require, and shall make regulations for the public health and safety relative thereto and to articles capable of containing or conveying infection or contagion or of creating sickness brought into or conveyed from the town or into or from any vessel...

## 2. 105 CMR 410.000 “Excess Moisture”

Multiple references, but in particular:

- **410.010** – Excess Moisture means the unwanted presence of moisture or water on permeable surfaces in a residence that occurs on a periodic, chronic or acute basis and presents a risk of mold growth.
- **410.420(A)** – No room or area in a residence may be used for habitation if it is subject to excess moisture.
- **410.500** – Every owner of a residence shall maintain all buildings and structural elements in compliance with accepted standards so they are in good repair and in every way fit for the intended use, including: (1) Protected from wind, rain and snow, and are watertight, free from excess moisture or the appearance of mold, and pest resistant; and (2) Free from holes, cracks, loose plaster, or defects that render the area difficult to keep clean, create an injury risk, or provide an entry or harborage for pests.

# Regulatory Basis

## **3. City of Boston Municipal Code 7-14.1**

There is hereby established within the Environmental Health Office of the Department of Health and Hospitals or its successors an Indoor Air Quality Unit which is charged with monitoring the quality of air (a) in buildings to which the public has access which are not subject to monitoring by the U.S. Occupational Safety and Health Administration (OSHA) for air quality standards substantially as contemplated by its Proposed Indoor Air Quality Rule (59FR15968), (b) in all public school buildings within the City, (c) in all other buildings owned or leased by the City or any agency or instrumentality thereof (except foreclosed real estate,) and, (d) in any other structure in Boston where there is an apparent risk to health likely to be caused or aggravated by poor air quality. (Ord. 1996 c. 10)

## **4. Boston Public Health Commission Nail Salon Regulation (amended 10/17/2013) section 4.7**

Any new salon, or salon that has applied for a permit under this regulation after October 17, 2013 shall, attain compliance with the minimum ventilation rate specifications set forth in the version of the International Mechanical Code incorporated into the State Building Code at 780 CMR 28 and 271 CMR 6, as amended. This ventilation system shall be in operation any time the salon is open for business.....

## **5. Executive Orders of Governor Charles Baker related to the COVID-19 State of Emergency**

Beginning March 2020 and following through 2022 as well as related orders and guidance from Massachusetts Department of Public Health, Boston Public Health Commission, and City of Boston

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History of School Environmental Assessments  
in Boston

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Challenges and Lessons Learned

# Local History


1980s “Sick  
Building  
Syndrome”

1990s  
advocacy

1996 city  
ordinance on  
IAQ

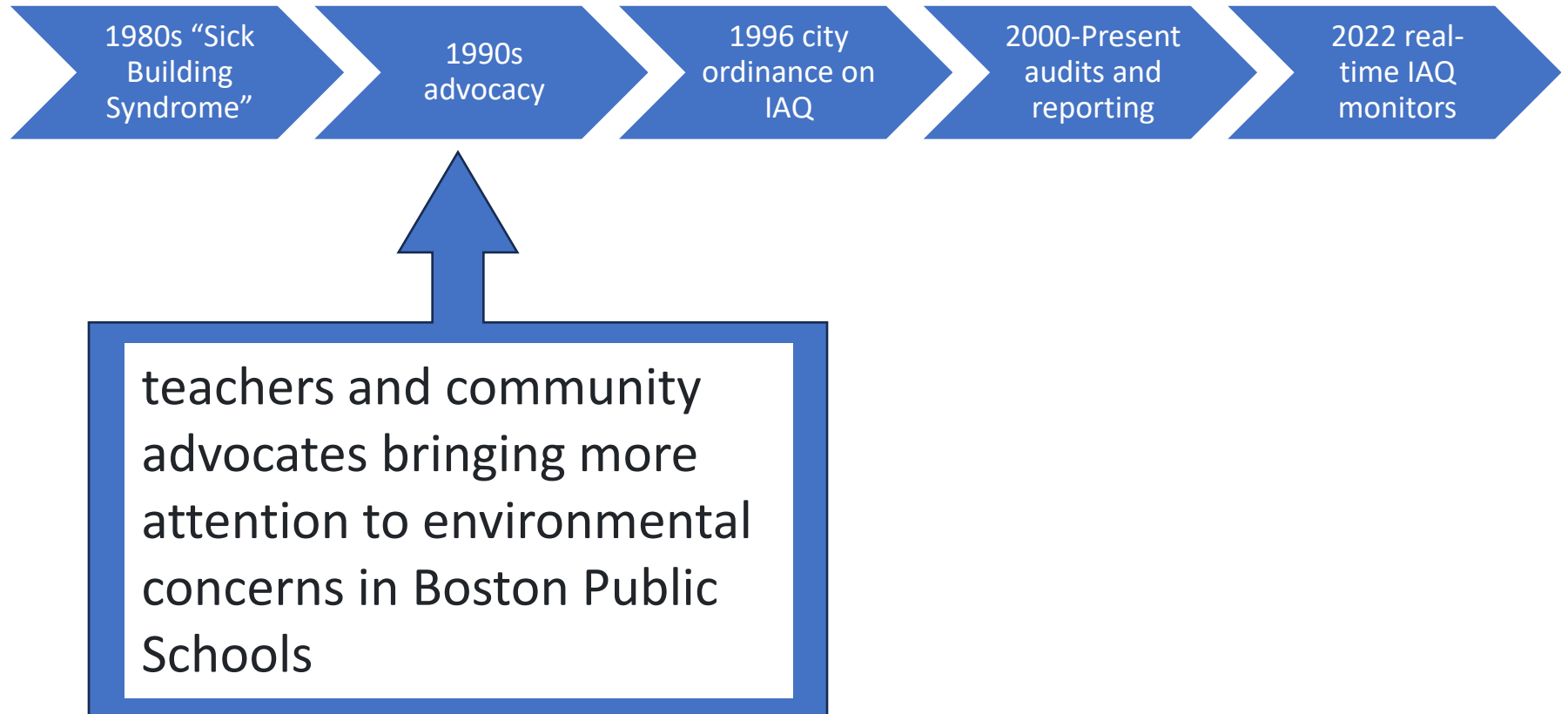
2000-Present  
audits and  
reporting

2022 real-  
time IAQ  
monitors



WHO coins the term “sick building syndrome” to name to a problem that had been receiving more attention and becoming more common. Multiple examples in Boston in the 1980s and 90s.

# Local History



# Local History

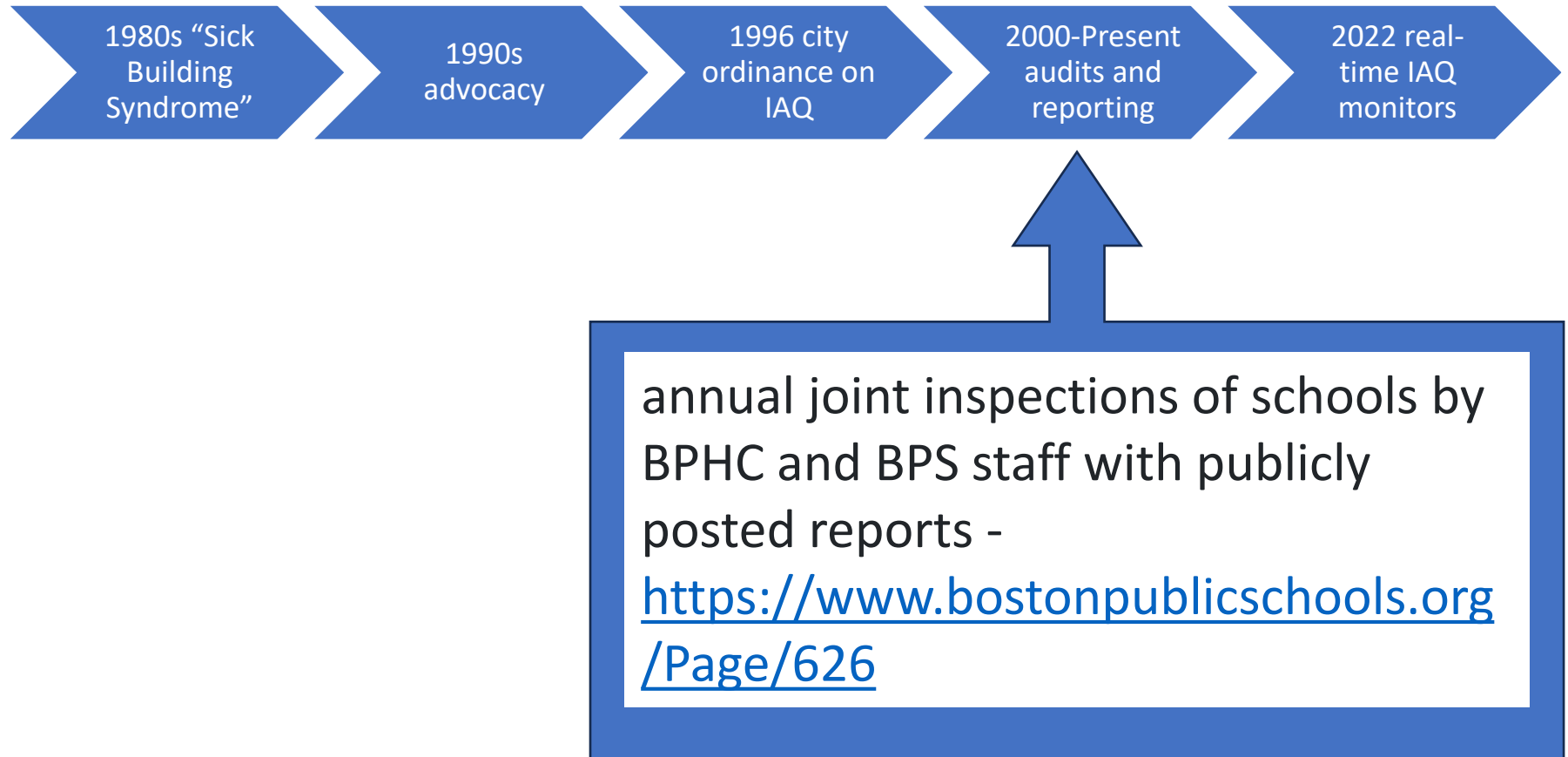


## **7-14.2 Air Quality in School Buildings.**


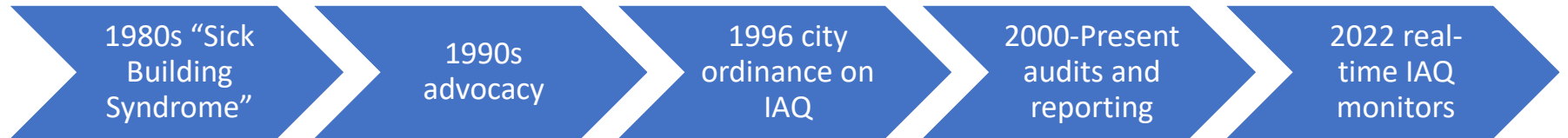
No less than twice each year the Indoor Air Quality Unit shall inspect each school building, and, using as guidelines the then current recommendations and standards of OSHA and the Environmental Protection Agency, shall ensure that the air quality in each such building is appropriate to the maintenance of good health, with special regard to airborne pollutants in concentrations harmful to children. Each inspection shall include (a) electronic environmental air quality monitoring, (b) visual inspection, (c) review of health complaint surveys, heating, ventilation and air conditioning evaluations, building inspection records, and, (d) such other procedures as building history and inspection of similar structures suggest. In the event an inspection shall detect a situation likely to cause ill health, the Unit shall forthwith make written record thereof and report the same to the person in charge of the building, to the Superintendent of Schools, and to the School Committee. The Unit shall cooperate with City and school officials and employees to take appropriate action to cure the situation and minimize adverse effect on the public health. In the event subsequent inspection, or other facts known to the Unit, indicate a failure to act with expedience toward correction of the situation, the Unit shall give immediate report to the Board of Health and Hospitals or its successors and to the Mayor.

(Ord. 1996 c. 10)

# Local History



# Local History



installation of real-time continuous air quality monitors in all classrooms and offices of BPS buildings -  
<https://www.bostonpublicschools.org/Page/8810>  
or  
<https://bostonschoolsiaq.terrabase.com/>

Address: 78 Avenue Louis Pasteur,  
Boston, MA 02115

Date of Inspection: 3/1/2017

Inspector: Maria Carvalho

Source of Drinking Water: Bottled Water

Integrated Pest Management  
Plan available at time of inspection: Yes

Year Built: 1922

Number of areas inspected: 218

Square Feet: 336,545

**Environmental  
Issue**

**% of Areas  
with Concern**

**Leak or Water Stain**

School Year 2017 0.00%

School Year 2016 1.00%

BPS Average (2017 only) 9.87%

**Repairs**

School Year 2017 8.14%

School Year 2016 13.50%

BPS Average (2017 only) 34.45%

**Dust**

School Year 2017 4.59%

School Year 2016 6.20%

BPS Average (2017 only) 4.11%

**IPM Index**

School Year 2017 2.60%

School Year 2016 1.07%

BPS Average (2017 only) 4.43 %

The IPM Index is a total average percentage of clutter, sanitation and signs of overt pest activity

# SY2023 Inspections

- 128 school buildings
- 8,330 rooms
- ~380,000 data points collected

## General Information

School Name:	Boston Latin School
Year Built:	1922
Assessment Date:	6/29/2022
Ventilation Type:	Mechanical
Inspector:	EOH 1
Drinking Water:	City Water
Integrated Pest Management Log last entry date:	

## COVID-19 Control Measures

Mask Use signs present:	No
Physical Distance signs present:	Yes
Number of occupants observed NOT wearing a mask:	2 of 136
Bathrooms with cleaning log present:	11 of 16
Cleaning Logs with recent entry:	9 of 11
Bathrooms with hand sanitizer present:	1 of 16



	Percentage of rooms with condition present			
	School year 2021/22 all rooms	School year 2021/22 classrooms only	School year 2019/20 all rooms	School year 2021/22 district average all rooms
Non-approved cleaners	0.00%	0.00%	0.00%	0.00%
Leaks or water stains (minor/moderate)	0.00%	0.00%	1.00%	1.33%
Leaks or water stains (significant)	0.00%	0.00%	0.00%	0.38%
Mold (minor/moderate)	0.00%	0.00%	1.00%	0.10%
Mold (significant)	0.10%	0.00%	0.00%	0.01%
Pests (minor/moderate)	6.00%	0.00%	0.00%	0.38%
Pests (significant)	0.00%	0.00%	0.00%	0.00%
Dust (minor/moderate)	0.00%	0.00%	0.00%	0.79%
Dust (significant)	0.00%	0.00%	0.00%	0.13%
Clutter (minor/moderate)	0.00%	0.00%	0.00%	0.79%
Clutter (significant)	0.00%	0.00%	0.00%	0.40%
Repairs needed	0.00%	0.00%	1.00%	0.00%
Ceiling tiles missing or damaged	1.00%	0.00%	1.00%	1.40%

### Indoor Air Quality Measurements

Number of areas measured: 235

	Building Average	Building Minimum	Building Maximum	Average outside reading	Reference Range
Carbon Dioxide (ppm)	383.26	323.00	721.00	342.00	375 - 1,000ppm
Carbon Monoxide (ppm)	0.26	0.10	0.70	0.20	0-9ppm
Temperature (°F)	83.06	73.60	83.10	81.50	68 – 78 F
Particulate Matter / Dust (mg/M3)	0.36	0.00	43.50	0.23	0.00 – 0.050 mg/m3

# Continual IAQ Monitoring

In 2022 BPS installed IAQ sensors in all BPS classrooms, Nurse's Offices, and Main Offices, with a roof-top unit installed in every school building to measure outdoor air as a baseline per location.

Each sensor records the following IAQ measures:

- Carbon Dioxide (CO<sub>2</sub>)
- Carbon Monoxide (CO)
- Airborne particulates - Total (PM<sub>10</sub>)
- Airborne Particulates - Respirable (PM<sub>2.5</sub>)
- Temperature (T)
- Relative Humidity (RH%)



<https://www.bostonpublicschools.org/Page/8810>

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# Nail Salons in Boston: A Quick Timeline

- 2010 and before:
  - Licensed by MA Board of Cosmetology, no annual inspections
  - Voluntary Safe Shops Program was making little headway in outreach/education
- 1/13/2011 – BOH regulations passed
- 7/12/2011 – Regulations go into effect
- 8/2/2011 – First permit issued
- 7/1/2012 – 173 identified salons (67% permitted/in process)
- 10/17/2013 – regulations amended to require source capture ventilation and dry heat sterilizers, among other updates
- Today – 199 known salons (190 permitted/in process)

# IAQ Health Concerns in Salons

## **Exposure by workers, customers, neighbors, and children**

- Methacrylates
- Acetone
- Toluene
- Methyl ethyl ketone
- Xylene
- Formaldehyde
- Cyanoacrylates
- Dibutyl phthalate
- Particulates

## **Symptoms and Health Impacts**

- Respiratory irritation
- Asthma and difficulty breathing
- Headaches
- Drowsiness
- Dizziness/lightheaded
- Eye irritation
- Nervous system damage
- Cognitive impairment
- Reproductive impacts
- Cancer

Boston 2012: <https://pubmed.ncbi.nlm.nih.gov/23765035/> and <https://www.hindawi.com/journals/isrn/2012/962014/>

Colorado 2019: <https://www.safetyandhealthmagazine.com/articles/18527-dangerous-for-workers-study-looks-at-air-quality-in-colorado-nail-salons>

NY 2022: <https://www.mdpi.com/1660-4601/19/19/12411>

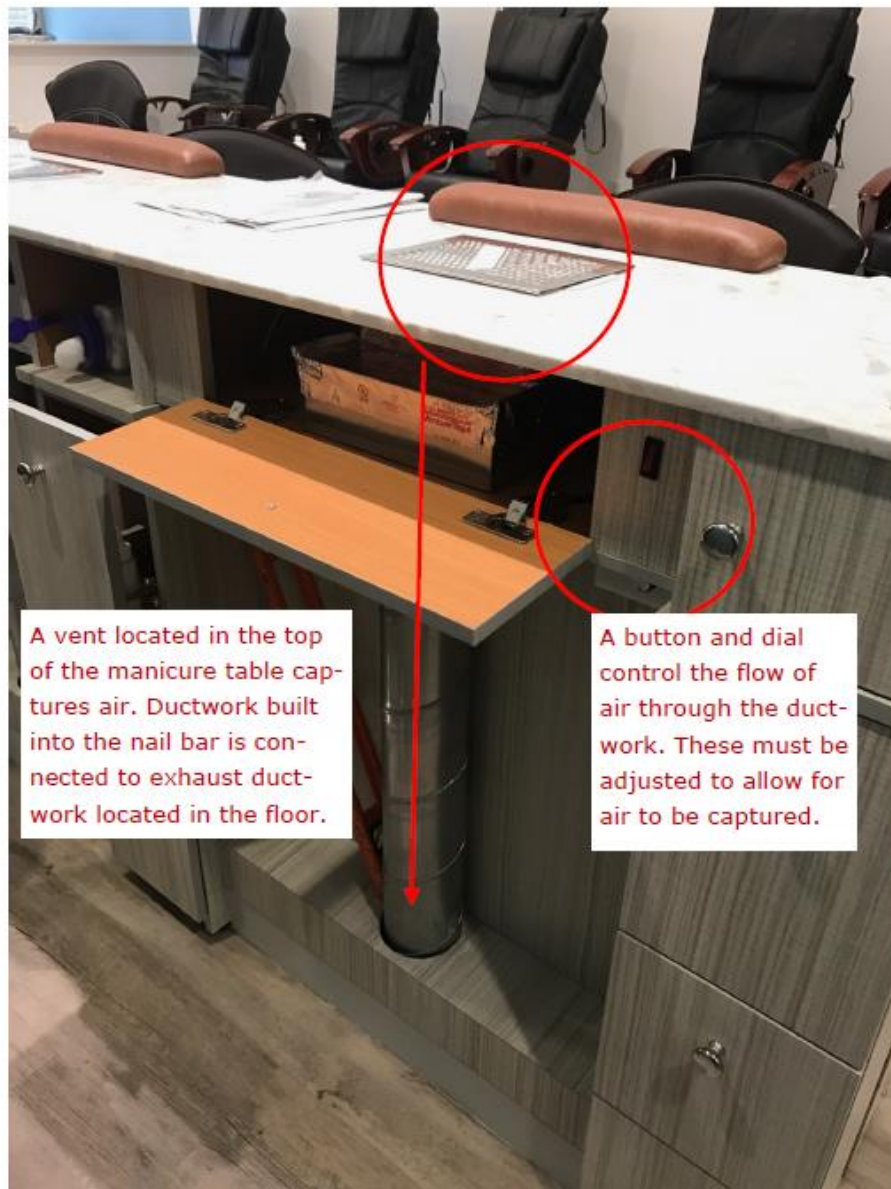
LA 2016: <https://escholarship.org/uc/item/0rv805bd>

# 2013 Regulation Amendments

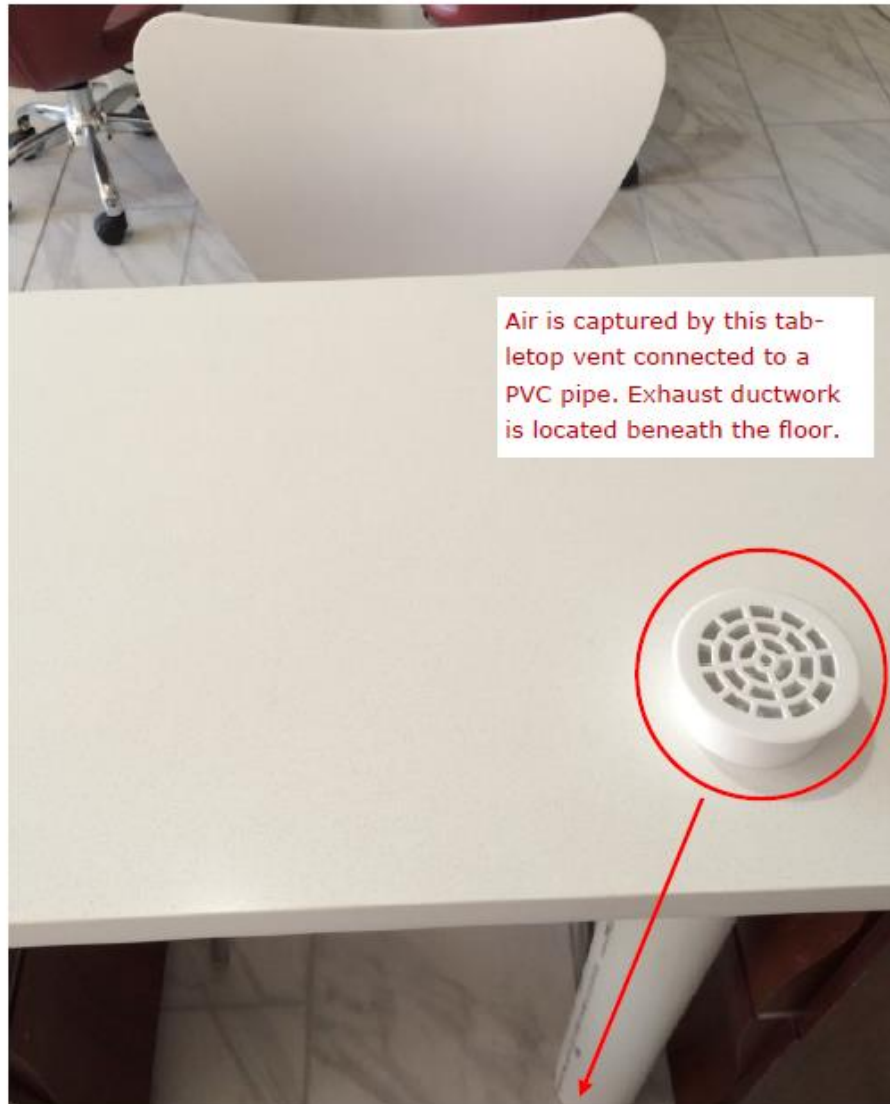
- Added requirement for dry heat sterilizer or autoclave for sterilizing re-usable tools
- Prohibited use of UV 'sterilizer' boxes
- Added requirement for dedicated source capture ventilation based on the International Mechanical Code as referenced in the Building Code
  - 0.6 CFM/ft<sup>2</sup> mechanical general room exhaust
  - 50 CFM source capture direct exhaust at each nail station
  - 0.12 CFM/ft<sup>2</sup> makeup outdoor air supply
- Immediate compliance for all new shops
- 5 years (by October 2018) to come into compliance for existing shops



## Salon Example 2: Mauralinh Spa



## Salon Example 3: Geneva Nails



## **Salon Example 4: Bellissimo Nail & Spa**

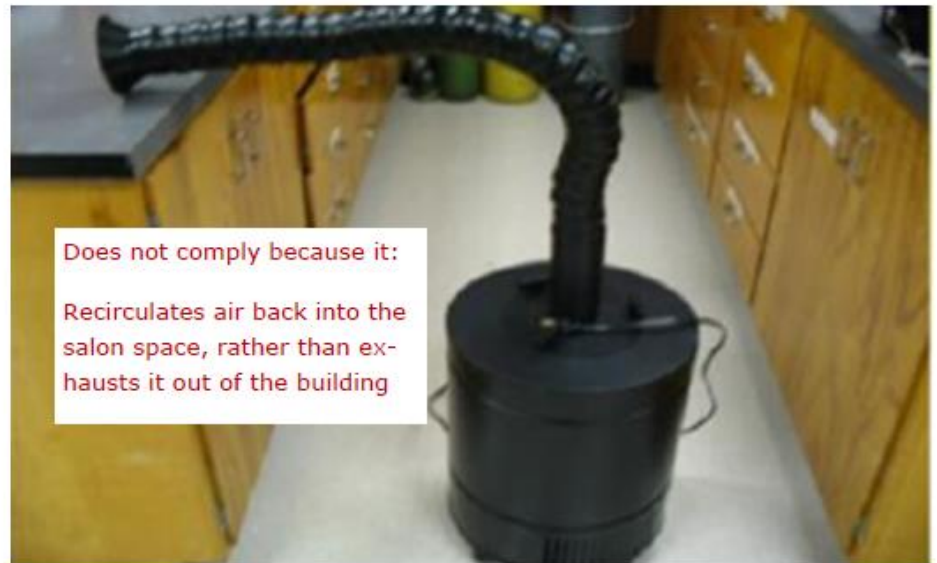
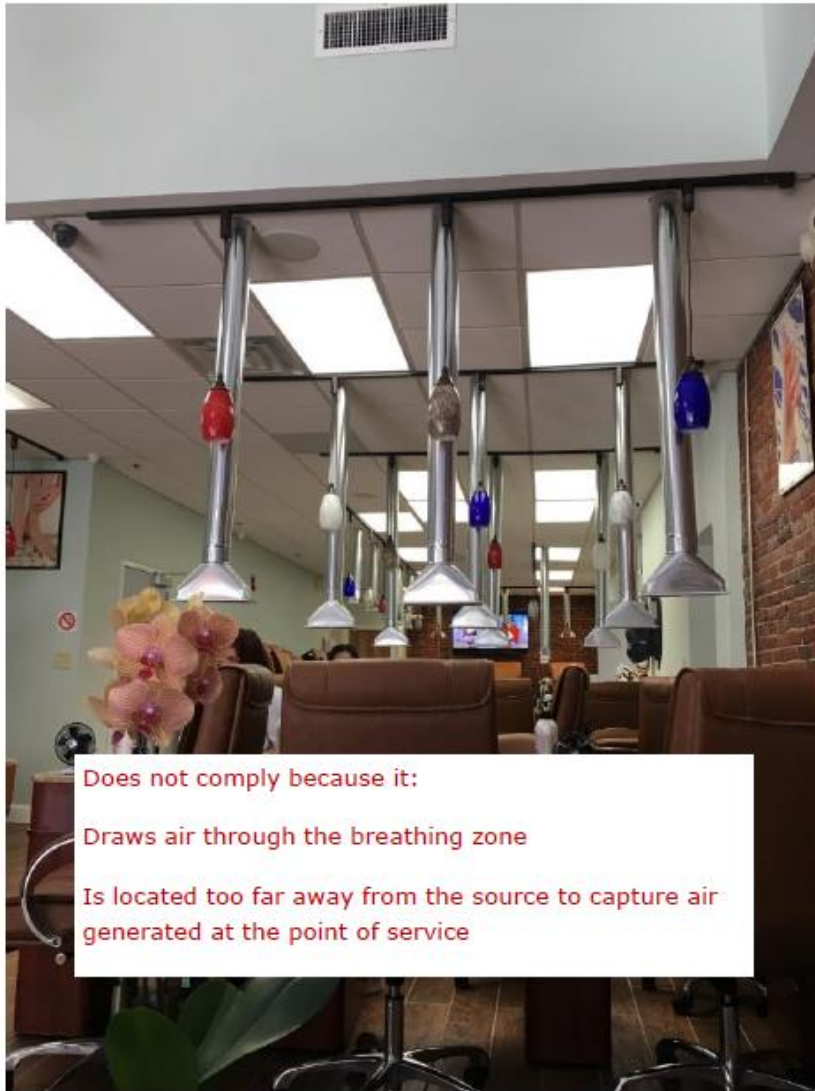
Air is captured by this PVC pipe with inlets towards each work station. NOTE: The inlets could be located closer to the table to be more effective.



Air is captured through a duct running next to the pedicure chair.



# What does non-compliance look like?



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# COVID Turned Everything Up

- Business closure or limitation orders
- Outdoor vs. indoor activities
- Remote classrooms vs. enhanced ventilation
- Graduations and special events
- Air “purifiers”
- Policy development efforts
- Sanitizing products



# ASHRAE 241 Standard for Control of Infectious Aerosols – July 2023

- ASHRAE = American Society of Heating Refrigeration and Air Conditioning Engineers
- Standard 421 addresses IAQ through “Equivalent Clean Airflow Rate” calculations
- Explicitly addresses IAQ concerns as balanced against infection control and cost considerations
- Provides room for options instead of “one size fits all”
- Barriers to review and adoption:
  - Must be purchased (\$100+) from ASHRAE
  - Currently voluntary unless/until incorporated into building codes
  - “Grandfathering” of existing buildings if adopted into the code
  - Unsure how it will be reconciled with the International Mechanical Code already referenced in the Building Code
  - Engineering and logistical hurdles





# Questions? Discussion?

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