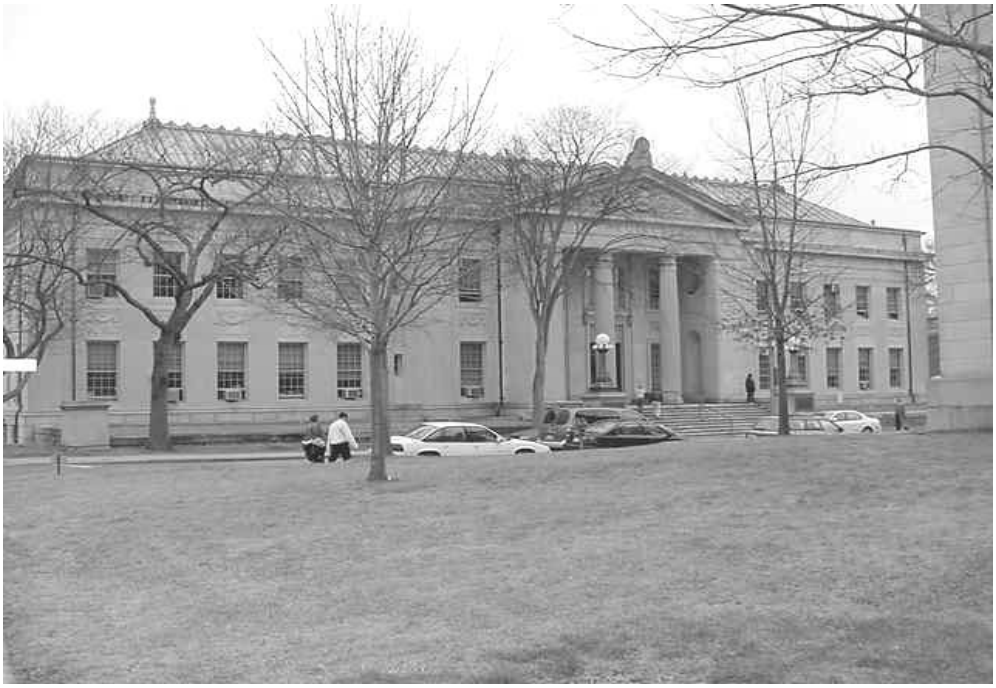
INDOOR AIR QUALITY REASSESSMENT

Norfolk Probate Court
649 High Street
Dedham, Massachusetts



Prepared by:
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Bureau of Environmental Health Assessment
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Background/Introduction

In response to a request from Elizabeth Minnis, Deputy Director of the Office of Planning, Design and Construction, Division of Capital Assets Management (DCAM), , the Bureau of Environmental Health Assessment (BEHA) was asked to conduct a reassessment of the indoor air quality issues and health concerns at the Norfolk Probate Court (NPC), 649 High Street, Dedham, Massachusetts. On February 20, 2002, a visit was made to this building by Michael Feeney, Chief of Emergency Response/Indoor Air Quality (ER/IAQ), BEHA, to conduct an indoor air quality assessment.

The NPC is a three-story marble block building, built in 1903. The original building has been renovated on several occasions. In 1952, the wing containing the basement county engineering office was added to the rear of the south side of the NPC. In 1958, the wing containing the 3rd session courtroom was added to the rear of the north side of the NPC, and in 1980, a third renovation added the 2nd session courtroom. The final renovation, reported to be in 1990, replaced the roof of the original building.

This building has been evaluated by a number of consultants and agencies over the course of the past ten years (A.L., Inc., 1994; A.L., Inc., 1996a; A.L., Inc., 1996b;

MDLWD, 1996). Each of these assessments indicated various problems related to lack of ventilation, poor building design, poor ventilation of print shop, bird infestation and lack of maintenance issues. Of note was a pigeon infestation of the

existing ventilation ductwork (DVCA, 1997a; DVCA, 1997b; NCC, 1997a; NCC, 1997b).

Actions on Recommendations Previously Made by MDPH

BEHA had previously made recommendations to improve indoor air quality in various sections of the courthouse (MDPH, 1999). The original assessment is included as Appendix 1 of this report.

Methods

Air tests for carbon dioxide, temperature and relative humidity were taken with the TSI, Q-Trak, IAQ Monitor, Model 8551.

Results

This courthouse has an employee population of over 300 and is used by several hundred patrons daily. Tests were taken under normal operating conditions and results appear in Tables 1-5.

Discussion

It can be seen from the tables that carbon dioxide levels were elevated above 800 ppm in 26 of the 43 areas surveyed. Of note are the 2nd session courtroom, room 4, the ACPO Office, the Registry of Deeds scanner area, first assistant registrar's office, Registry of Deeds room 15, Registry of Deeds room 12, and room

210, all of which had levels of carbon dioxide in excess of 800 ppm without occupancy during the air monitoring, indicating little or no air exchange.

Ventilation

The ventilation system that exists in the NPC is complex. The NPC has had four separate types of ventilation systems, some of which have been altered as a result of various renovations. The original building does not have a modern mechanic ventilation system, but uses a gravity/natural ventilation system to provide airflow to rooms in combination with openable windows.

Ventilation is provided by a series of louvered vents. Each room has an approximately 2' x 3' grated air vent in the center of an interior wall near the ceiling, which is connected by an airshaft to the building's boiler. A corresponding vent exists in each room below the supply vent that is connected to an exhaust ventilation shaft that runs through the roof to the basement. These ventilation shafts are connected into an air mixing room in the basement that is accessible through heavy iron doors in the two basement offices. The building has two of these shafts on the north and south sides of the building. Rooms were constructed around these shafts to provide ventilation. Each of these ventilation shafts exists on either side of the building, and terminates in a "hearth"-like opening in the basement.

Air movement is provided by the stack effect. The heating elements warm the air, which rises up the hot air ventilation shafts. As the heated air rises, negative pressure is created, which draws cold air from the basement area into the heating elements. This system is designed to draw air from three sources in the basement:

fresh air from a window system on the exterior wall of the building, fresh air through grates that are located below basement level windows, and return air from the exhaust ventilation shafts. These sources of air mix in the basement mixing room prior to being drawn into the heating elements. The percentage of fresh air to return air is controlled by the mixing room window system. The windows are open the desired distance to limit fresh air intake. Fresh air in winter is supplied throughout the building by the hot air vents.

Fresh air intakes also exist above a number of basement windows. Large metal ducts are connected to these fresh air intakes and appear to serve as adjuncts to the airshafts in the back of the original building, which appear to supply fresh air into basement rooms and the above floors.

The air vents near the floor provide exhaust ventilation. As the heating elements draw air into the hot air ducts, return air is drawn from the "hearths" at the bottom of the exhaust ventilation shafts. Negative pressure is created in these shafts, which in turn draw air into the floor level air vents of each room. The draw of air into these cool air vents is controlled by a louver system. A percentage of return air rises up the ventilation shaft to exhaust outdoors.

This ventilation system appears to be either renovated out of existence, adapted to other uses or abandoned. The fresh air intake for the north mixing room was blocked by the addition of storage sheds during the 1958 renovations (see Picture 6). The south mixing room appears to be abandoned. At this time, the only source in the original building for fresh air appears to be openable windows or doors.

The second ventilation system within this building seems to be an adaptation of the basement to roof air shafts into vents with mechanical exhaust ventilation motors. The south wing appears to have no mechanical fresh air supply or exhaust ventilation. The Family Court office on the second floor appears to have had additional ductwork installed in the main office. These ducts are attached to an inoperable fan with motor in the attic above the main office. This ductwork has been connected to the south basement to roof vent shaft and adapted as a vent for a mechanical ventilation system. While this airshaft appears to have been adapted for mechanical exhaust ventilation, the installation of the new roof in 1990 resulted in sealing this shaft (see Picture 7). If the mechanical ventilation system in this half of the old building is reactivated, air cannot be exhausted from the building because the airshaft is sealed.

Renovations to the north side of the building also adapted the basement to roof airshaft to a vent connected to a mechanical ventilation system. This fan motor was inoperable with the fan belt hanging loose from thevent. While airflow was noted in the 1st session courtroom vents, this air current could be attributed to natural ventilation (i.e., up the airshaft).

Many air diffusers and exhaust vents within rooms that appear to be attached to this system were sealed. Removing plywood from the floor level vent in the 3rd session courtroom resulted in this vent drawing air. It is probable that even with the mechanical exhaust motors inactive, this system is drawing air by the stack effect of heated air moving into this vent.

The third ventilation system exists in the 3rd session courtroom. Fresh air is supplied by a unit ventilator (univent) system. None of the univents in this room were operational. No exhaust vents could be identified in this room.

The fourth ventilation system exists in the 2nd session courtroom. An air handling unit (AHU) with ductwork was installed to provide ventilation. Ceiling-mounted air diffusers provide fresh air. Exhaust ventilation is provided by ducted, ceiling-mounted exhaust vents. This AHU was operating during this evaluation. The wing added to the south section of the old building has no identifiable ventilation system.

A number of areas are equipped with a window-mounted air conditioner. Some air conditioners have the capacity to introduce fresh air, however the majority of installed machines recycle indoor air only.

In order to have proper ventilation with a univent and exhaust system, all fresh air intakes and exhaust vents should remain unobstructed to allow for proper airflow; units must also be in working order and allowed to function as designed. In addition, the supply and exhaust ventilation systems should be balanced to provide an adequate amount of fresh air to the interior of a room while removing stale air from the room. It is recommended that existing ventilation systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994).

The Massachusetts Building Code requires a minimum ventilation rate of 15 cubic feet per minute (cfm) per occupant of fresh outside air or have openable windows in each room (SBBRS, 1997; BOCA, 1993). The ventilation must be on at all times that the room is occupied. Providing adequate fresh air ventilation with

open windows and maintaining the temperature in the comfort range during the cold weather season is impractical. Mechanical ventilation is usually required to provide adequate fresh air ventilation.

Carbon dioxide is not a problem in and of itself. It is used as an indicator of the adequacy of the fresh air ventilation. As carbon dioxide levels rise, it indicates that the ventilating system is malfunctioning or the design occupancy of the room is being exceeded. When this happens, a buildup of common indoor air pollutants can occur, leading to discomfort or health complaints. The Occupational Safety and Health Administration (OSHA) standard for carbon dioxide is 5,000 parts per million parts of air (ppm). Workers may be exposed to this level for 40 hours/week based on a time weighted average (OSHA, 1997).

The Department of Public Health uses a guideline of 800 ppm for publicly occupied buildings. A guideline of 600 ppm or less is preferred in schools due to the fact that the majority of occupants are young and considered to be a more sensitive population in the evaluation of environmental health status. Inadequate ventilation and/or elevated temperatures are major causes of complaints such as respiratory, eye, nose and throat irritation, lethargy and headaches.

Temperature readings were within a range of 70^{o} F to 77^{o} F. The BEHA recommends that indoor air temperatures be maintained in a range between 70^{o} F to 78^{o} F in order to provide for the comfort of building occupants. In many cases concerning indoor air quality, fluctuations of temperature in occupied spaces are typically experienced. Please note that many areas had open windows. The evaluation was done on a day with above freezing outdoor temperatures with

minimal wind conditions. BEHA staff received numerous complaints of cold temperatures during the winter with the windows open.

The relative humidity in the building was below the BEHA recommended comfort range in all areas surveyed. Relative humidity measurements ranged from 20 percent to 32 percent. The BEHA recommends that indoor air relative humidity is comfortable in a range of 40 percent to 60 percent. The sensation of dryness and irritation is common in a low relative humidity environment. Low relative humidity is a very common problem during the heating season in the northeast part of the United States.

Moisture/Microbial Concerns

The Family Court office on the second floor of the south wing addition has a significant number of water-damaged ceiling tiles, which are evidence of historical roof leaks. Ceiling tiles were replaced in this area, but other water-damaged ceiling tiles remain. Water-damaged ceiling tiles can provide a source of microbial growth and should be replaced after a water leak is discovered. In addition, several ceiling tiles of this interlocking system were removed, opening the ceiling plenum to occupied areas. Under certain conditions airflow can move from the ceiling plenum into the room below, which can result in materials, including mold spores, to penetrate into the occupied areas.

The windows of this building are wood framed and appear to be original equipment. The window frames are heavily water-damaged and are missing caulking. These conditions can lead to water penetration into walls and may lead to

potential mold growth. The 2nd session courtroom has wall paneling that is warped from exposure to roof water leaks. Water-damaged wall paneling can be a medium for mold growth.

Several areas in the building contain plants. Plant soil and drip pans can also provide a source of mold growth. Over watering of plants should be avoided and drip pans should be inspected periodically and cleaned to prevent mold growth.

Other Concerns

Several other conditions that can potentially affect indoor air quality were also identified. Reports of vehicle exhaust and noise were received from occupants in areas along the north and west exterior walls. The NPC is at the intersection of High and Ames Street. The operation of a traffic light at this intersection stops vehicles, causing them to idle at this intersection. Vehicle exhaust odors and noise complaints are exacerbated during rush hour. North, west and northwesterly winds will tend to direct vehicle exhaust towards the building. Since the sole supply of fresh air for many areas is openable windows, it would be expected that vehicle exhaust migration into the NPC would be a chronic problem until the ventilation system is rendered operable.

The microfilm department in the Family Court Office uses a number of developing chemicals without local exhaust ventilation. Photographic chemicals contain volatile organic compounds (VOCs), which can be irritating to the eyes, nose and throat. Appropriate local exhaust ventilation should be used to exhaust VOCs from the interior of the building.

A number of rooms contain photocopiers that do not have local exhaust ventilation. Volatile organic compounds (VOCs) and ozone can be produced by photocopiers, particularly if the equipment is older and in frequent use. Local exhaust ventilation may help to reduce odors in these rooms. The photostat room in the basement also contains a number of photocopier machines. Exhaust fans are located in windows that exhaust odors into the south courtyard. Under certain conditions, odors attributed to the Photostat room were noted in offices across the south courtyard. By exhausting into the south courtyard, strong odors from the photostat room can infiltrate adjacent offices through windows and doors.

Renovations

The installation of a ventilation system within the NPC may involve renovations that may effect all occupied areas of the building during occupancy. Demolition of walls, cutting of holes in wall plaster and installation of ductwork can generate gases, vapors, fumes and dusts that require containment and exhaust ventilation to prevent exposure to NPC building occupants. Several pathways exist for pollutants to migrate through the building: the elevator shaft that traverses all three floors, abandoned ductwork, stairwells and numerous pipe and utility holes (see Picture 8). The operation of the elevator can draw pollutants into the elevator shaft from each floor. This piston effect can serve to place the elevator shaft under positive or negative pressure, dependent on the position of the elevator. If pollutants (e.g., odors or particles) exist on one floor, the elevator may draw these materials into the shaft. Once in the shaft, pollutants could be distributed to other levels of the

building. Holes for pipes connected to the heating system exist between floors. In addition, the installation of computer network cables warranted drilling numerous holes in interior walls and floors. The drilling of these holes has created plaster dust as well as a means for pollutants from one room to penetrate into an adjacent room. Further, materials within the wall cavities now have a pathway to penetrate occupied space. Extensive efforts to provide containment and ventilation need be made prior to commencement of any renovation to occur in the NPC.

Conclusions/Recommendations

The opening of windows in the NPC has resulted in a marginal improvement of indoor air quality in the building. Since the building was originally designed to have an operating ventilation system to provide heat and fresh air, the study by DCAM is necessary to improve overall indoor air quality in this building. At this time, the following recommendations are made:

1. Continue to conduct the ventilation study to identify the best methods for restoring the ventilation system building-wide. Under current conditions, openable windows and doors are the only source of ventilation within the building. Continue to use openable windows to provide fresh air in the interim. This should be done in a manner to prevent damage to the heating system from freezing pipes.
2. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous

cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when relative humidity is low. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations). Continue to use dust control procedure that has been implemented. Consider using a vacuum cleaner equipped with a high efficiency particulate efficiency (HEPA) filter to reduce the aerosolization of respirable dusts.

3. Reduce excessive numbers of plants in offices.

4. Seal ceiling plenum in the Family Court office on the second floor of the south wing addition.

5. Repair and activate the univents in the 3rd session courtroom.

6. Continue to prohibit vehicles from idling in the courtyards.

7. If products containing hazardous materials must be used in the courthouse in the microfilm department, please consider following these recommendations to ensure the safe handling and application of these products:

   (a) Make sure that the directions that are listed on the product label are followed explicitly. Failure to follow directions may result in misuse, which can lead to exposures.

   (b) Ensure that all personnel in the building who use these products are properly trained. Training in handling these materials is mandated by the Massachusetts Right-To-Know Law, M.G.L. c. 111F (M.G.L., 1983).

8. Acquire current Material Safety Data Sheets for all products that contain hazardous materials and are used within the building, including office supplies, in conformance to the Massachusetts Right-To-Know Law, M.G.L. c. 111F (M.G.L., 1983).
9. Examine the feasibility of providing local exhaust ventilation for the photostat room that exits out the rear of the building instead of the south courtyard.
10. Consider consulting an industrial hygienist to advise of the feasibility of installing local exhaust ventilation in the microfilm area. Adequate, active local exhaust ventilation is necessary to remove VOCs from the work area.
11. Replace water-damaged ceiling tiles in the interlocking system in the Family Court second floor, south wing.

Renovations

In order to prevent further degradation of indoor air quality in the NPC during the proposed ventilation system rehabilitation/restoration, measures must be taken to prevent migration of renovation-generated pollutants from migrating into occupied areas. The following recommendations should be implemented in order to reduce the migration of renovation generated pollutants into occupied areas. We suggest that the majority of these steps be taken on any renovation project within a public building.

1. When possible, schedule projects which produce large amounts of dusts, odors and emissions during unoccupied periods or periods of low occupancy.

2. Establish communications between all parties involved with building renovations to prevent potential IAQ problems. Develop a forum for occupants to express concerns about renovations as well as a program to resolve IAQ issues.

3. Develop a notification system for building occupants immediately adjacent to construction activities to report construction/renovation related odors and/or dusts problems to the building administrator. Have these concerns relayed to the contractor in a manner to allow for a timely remediation of the problem.

4. Disseminate scheduling itinerary to all affected parties; this can be done in the form of meetings, newsletters or weekly bulletins.

5. Obtain Material Safety Data Sheets (MSDS) for all construction materials used during renovations and keep them in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act (MGL, 1983).

6. Consult MSDS' for any material applied to the effected area during renovation(s) including any sealant, carpet adhesive, tile mastic, flooring and/or roofing materials. Provide proper ventilation and allow sufficient curing time as per the manufacturer's instructions concerning these materials.

7. Use local exhaust ventilation and isolation techniques to control for renovation pollutants. Precautions should be taken to avoid the re-entrainment of these materials into the building's HVAC system. The design of each system must be assessed to determine how it may be impacted by renovation activities. Specific HVAC protection requirements pertain to the

return, central filtration and supply components of the ventilation system. This may entail shutting down systems (when possible) during periods of heavy construction and demolition, ensuring systems are isolated from contaminated environments, sealing ventilation openings with plastic and utilizing filters with a higher dust spot efficiency where needed (SMACNA, 1995).

8. Seal all doors that access renovations (including elevator doors) with polyethylene plastic and duct tape. Consider creating an air lock by installing a second sheet of polyethylene plastic on the interior of doorframes.

9. If possible, relocate susceptible persons and those with pre-existing medical conditions (e.g., hypersensitivity, asthma) away from areas of renovations.

10. Implement prudent housekeeping and work site practices to minimize exposure to renovation pollutants. This may include constructing barriers, sealing off areas and temporarily relocating furniture and supplies. To control for dusts, a high efficiency particulate air filter (HEPA) equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended.

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Picture 1

Plants Were Found In Offices

Picture 2

Spaces Continue to Exist in This Ceiling – Family Court Office, 2nd Floor

Picture 3

Formerly Cardboard

Cardboard Replaced With Plywood

Picture 4

Courtyard Used For Parking

Picture 5

Water-Damaged Ceiling Tiles in the Interlocking System in the Family Court Second Floor South Wing.

Picture 6

The Fresh Air Intake for the North Mixing Room Was Blocked by the Addition of Storage Sheds During the 1958 Renovations

Picture 7

Installation of the New Roof In 1990 Resulted in the Sealing of Original Ventilation Shaft; Arrow Denotes Approximate Location of this Shaft

Picture 8

Possible Pollutants Migration Path through Pipe and Utility Holes

TABLE 1

Indoor Air Test Results – Norfolk Family/Probate Court, Dedham, MA – February 20, 2002

Location	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
Outside (Background)	416	56	25					
1st Session Courtroom (12:20pm)	695	74	20	16	Yes			Exhaust blocked with plywood, windows open
Adoption/Equity Department	969	75	22	3	Yes	No	No	Window open
Microfilm Department	987	75	23	0	Yes	No	No	Efflorescence, 15+ water-damaged CT, plant
Marital Department	929	76	22	10+	Yes	No	No	
Registrar's Office	914	77	21	1	Yes	Yes	Yes	Hole in ceiling
Room 207	1066	75	24	3	Yes	No	No	Window-mounted air conditioner, window open, photocopier
Langlois	749	74	23	2	Yes	Yes	Yes	Supply and exhaust off-exhaust vent blocked by file cabinet, window open
201 – 3rd Session	789	72	21	8	Yes	No	No	2 window mounted air conditioners, 2 windows open
2nd Session	1012	73	22	9	No	Yes	Yes	2 water-damaged CT-wall veneer

*** ppm = parts per million parts of air**
CT = ceiling tiles

Comfort Guidelines

Carbon Dioxide - < 600 ppm = preferred
600 - 800 ppm = acceptable
> 800 ppm = indicative of ventilation problems
Temperature - 70 - 78 °F
Relative Humidity - 40 - 60%

TABLE 2

Indoor Air Test Results – Norfolk Family/Probate Court, Dedham, MA – February 20, 2002

Location	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
204 – 1st Session (10A-15 ft. from window)	745	72	20	26	Yes	Yes	Yes	6 windows open, supply sealed by boards, 3 water-damaged CT
4th Session	653	75	20	3	Yes	Yes	No	Window open, exhaust sealed, a/c in window
Hallway/Check-in Area	696	75	20	5	Yes	No	No	
Photostat Area	579	75	17	1	Yes	No	Yes	Exhaust off, 2 photocopiers
Bindery	847	74	20	6	Yes	Yes	Yes	
Record Books Vol. 3400-4799	683	75	20	2	No	No	No	
Registry of Deeds Main Room South	808	75	20	60+	Yes	Yes	Yes	9 a/c, windows open
Registry of Deeds Main Room East	969	74	21	60+	Yes	Yes	Yes	Windows open
Registry of Deeds Main Room North	960	74	20	60+	Yes	Yes	Yes	Windows open, repaired water damage
Registry of Deeds Main Room Center	997	74	21	60+	Yes	Yes	Yes	Windows open

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Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%

TABLE 3

Indoor Air Test Results – Norfolk Family/Probate Court, Dedham, MA – February 20, 2002

Location	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
Registry of Deeds Main Room West	1019	75	21	60+	Yes	Yes	Yes	Windows open, peeling paint
Record Books Vol. 11354-Present	1139	76	22	3	No	Yes	Yes	Supply and exhaust off
Land Court Lobby	1052	76	22	23	Yes	Yes	Yes	2 photocopiers, 3 computers
Land Court Office	943	75	21	16	Yes	No	No	2 window-mounted a/c, windows open
Room 210 Main Office	1061	77	23	20	Yes	Yes	Yes	Supply and exhaust off, 2 window-mounted a/c, photocopier, plant
2nd Floor Restroom						No	Yes	Door open
2nd Floor Stairwell Foyer	990	76	22	1	No	No	No	
Data Processing	837	73	21	0	No	No	No	Musty odor, drip pan
Maintenance Switchboard	837	74	21	0	No	No	No	
Room 1	630	74	20	2	Yes	No	Yes	Exhaust blocked, plants, photocopier odor

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Relative Humidity - 40 - 60%

TABLE 4

Indoor Air Test Results – Norfolk Family/Probate Court, Dedham, MA – February 20, 2002

Location	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
Maintenance Department-Main Office	824	76	20	2	Yes	No	No	Photocopier, door open
Room 4	716	75	20	2	Yes	Yes	Yes	Supply off, exhaust-natural airflow/no mechanical exhaust operating
Central Bull Pen	644	75	19	2	No	Yes	No	Exhaust blocked, hole on wall, door open
ACPO Office	564	75	19	1	Yes	No	No	Window and door open, plants
PO/Secretary's Office	673	75	20	0	No	Yes	Yes	Supply and exhaust off, exhaust blocked by box
Family Services Support Unit	761	76	20	4	No	Yes	Yes	Supply blocked, exhaust off, photocopier, door open
Engineering Department	962	75	21	3	Yes	No	No	2 window-mounted a/c, door open
Registry of Deeds Computer Area	856	76	21	2	No	No	No	No exhaust-a/c, 8 water damaged CT, photocopier
2nd Scanner Area	903	74	21	4	Yes	No	No	Computer, ceiling fan, door open
Data Entry	847	76	21	3	No	No	Yes	Exhaust blocked by wood, window-mounted a/c, door open

*** ppm = parts per million parts of air**
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Comfort Guidelines

Carbon Dioxide -	< 600 ppm = preferred
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	> 800 ppm = indicative of ventilation problems
Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%

TABLE 5

Indoor Air Test Results – Norfolk Family/Probate Court, Dedham, MA – February 20, 2002

Location	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
Room 6 – Paging Room	761	75	19	1	Yes	Yes	Yes	Supply and exhaust off, exhaust blocked by cabinet, windows and door open
Comparing Room	637	74	18	3	Yes	No	No	Windows open, plants
Room 15 Registry of Deeds	736	75	19	3	Yes	Yes	Yes	Supply and exhaust off, window-mounted a/c, window open
Computer Area	904	75	22	5	Yes	Yes	Yes	Supply and exhaust off, plants
Hallway Outside 201	955	72	22	2	No	Yes	Yes	Supply and exhaust off, 2 water-damaged CT, 1 missing CT

*** ppm = parts per million parts of air**
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Comfort Guidelines

Carbon Dioxide -	< 600 ppm = preferred
	600 - 800 ppm = acceptable
	> 800 ppm = indicative of ventilation problems
Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%

Appendix 1
Actions on Recommendations Previously Made by MDPH

The following is a status report of action(s) taken on previous BEHA recommendations (**in bold**) based on reports from building occupants and court staff, documents, photographs and BEHA staff observations:

1. **Use of openable windows to provide fresh air in the interim should be done in a manner to prevent damage to the heating system from freezing pipes.**

   Action Taken: Windows were opened in many areas tested. While carbon dioxide levels were decreased in comparison to the previous air sampling (see Tables), many remain above the BEHA comfort guideline of 800 ppm.

2. **For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when relative humidity is low. Continue to use dust control procedures that have been implemented. Consider using a vacuum cleaner equipped with a high efficiency particulate arrestance (HEPA) filter to reduce the aerosolization of respirable dusts.**

   Action Taken: The NPC appears to be clean in hallways and common areas.

3. **Do not use strong scented materials, such as air fresheners, in work areas.**

Appendix 1
Actions on Recommendations Previously Made by MDPH

Action Taken: No strongly scented materials were noted in evaluated areas, with the exception of the maintenance storage closet in the basement. Cleaning solution odor was not noted in the hallway when the closet door was closed.

4. **Reduce excessive numbers of plants in offices.**

   Action Taken: Plants were still observed in offices (see Picture 1).

5. **Seal ceiling plenum in the Family Court office on the second floor of the south wing addition.**

   Action Taken: Spaces continue to exist in this ceiling (see Picture 2). Of note is the condition of the ceiling tile system in this office and water damage (for further discussion, refer to the **Moisture/Microbial Concerns** of this report**.**

6. **Replace cardboard and other inappropriate materials sealing fresh air intakes with a water impermeable material.**

   Action Taken: Cardboard was removed and replaced (see Picture 3).

7. **Remove the carpet square sealing the exhaust vent and replace with a vent that will seal when this fan is not in use.**

   Action Taken: Carpet square was removed from the vent and a louver system was installed.

8. **Operate the 2nd session courtroom AHU during court hours. Consider consulting a ventilation engineer to balance this AHU.**

   Action Taken: This ventilation system was operating during the reassessment.

9. **Repair and activate the univents in the 3rd session courtroom.**

   Action Taken: Univents were deactivated. Windows were used to provide ventilation in this courtroom.

Appendix 1
Actions on Recommendations Previously Made by MDPH

10. Continue to prohibit vehicles from idling in the courtyards.

Action Taken: No idling vehicles were found in the courtyards. These areas are used for parking (see Picture 4).

11. Consult with a licensed pesticide applicator concerning the institution of IPM practices to limit termite harborages. Consider repackaging stored records in termite-proof containers to reduce cardboard stored in this area.

Action Taken: No information concerning this recommendation was available during this assessment.

12. A ventilation engineer should be consulted to resolve air supply/exhaust ventilation building-wide.

Action Taken: The Division of Capital Assets Management (DCAM) is in the process of conducting a study to examine the feasibility of reestablishing a functional ventilation system in the NPC.

13. Consultation with the Department of Labor and Workforce Development, Division of Occupational Safety, Lead and Asbestos Program and a licensed asbestos abatement contractor would be advisable to contain and remediate asbestos-containing pipe insulation within this building.

Action Taken: No information was available concerning asbestos removal or consultation with the Department of Labor and Workforce Development, Division of Occupational Safety, or the Lead and Asbestos Program.

14. The ductwork was cut in a number of places during the duct cleaning, therefore the integrity of this system has been breached. If these ducts are to be used to reestablish a functioning mechanical exhaust ventilation system, an evaluation of

the condition of this ductwork, both exterior and interior should be done by a ventilation engineer.

Action Taken: This evaluation of the ventilation system is part of the DCAM feasibility study concerning reestablishing a functional ventilation system in the NPC.

15. **If the ductwork is determined to be useable with repairs, the following activities should be done: Examine the feasibility of reopening the south airshaft through the roof. In order to restore the function of this system, restoration of the chimney top of this shaft may be necessary. Consult a structural engineer as to whether this is feasible. If this is an option, the contractor who installed the roof should be contacted in order to ascertain the appropriate procedure to render the roof watertight around this extension.**

    Action Taken: This evaluation of the ventilation system is part of the DCAM feasibility study concerning reestablishing a functional ventilation system in the NPC.

16. **Repair the exhaust vent motors in the old building attic.**

    Action Taken: The evaluation of the ventilation system is part of the DCAM feasibility study concerning reestablishing a functional ventilation system in the NPC.

17. **Once the mechanical exhaust ventilation is restored, remove plywood blocking exhaust vents in the 1st session courtroom.**

    Action Taken: This activity was not done and should remain in place until ventilation system renovations are complete.

18. **Determine whether a mechanical ventilation system can be installed in the 1952 addition. Determine whether ductwork in the Family Court area can be extended to provide exhaust ventilation in this wing.**

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Action Taken: This evaluation of the ventilation system is part of the DCAM feasibility study concerning reestablishing a functional ventilation system in the NPC.

19. **Examine the feasibility of providing local exhaust ventilation for the photostat room that exits out the rear of the building instead of the south courtyard.**

    Action Taken: No extension of the exhaust ventilation system was installed.

20. **Consider consulting an industrial hygienist to advise of the feasibility of installing local exhaust ventilation in the microfilm area. Adequate, active local exhaust ventilation is necessary to remove VOCs from the work area.**

    Action taken: No exhaust ventilation system was installed to remove chemical vapors during the use of this equipment.

21. **Replace water-damaged ceiling tiles in the interlocking system in the Family Court second floor south wing.**

    Action Taken: Some water-damaged tiles were removed (see Picture 5). Other water-damaged ceiling tiles remain in place. Employees report that a mold odor occurs in this area, particularly in spring months after rainstorms.

22. **Examine the feasibility of lowering the roof drain to prevent water pooling on the roof.**

    Action Taken: This drain was not examined.

23. **Consultation with the Department of Labor and Workforce Development (DLWD), Division of Occupational Safety, Lead and Asbestos Program and a licensed lead abatement contractor would be advisable to contain and remediate lead paint in restrooms.**

Appendix 1
Actions on Recommendations Previously Made by MDPH

1. **Action Taken:** No information was available concerning lead paint removal or consultation with the DLWD.