

***Fungal Evaluation of Paper Products
Within
State of Connecticut
Department of Revenue Service's Facilities
For the
State of Connecticut
Department of Public Works
Hartford, Connecticut***

***Submitted on
January 10, 2003***



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State of Connecticut-Department of Public Works

Fungal Evaluation of Paper Products within DRS facilities

Summary

EnviroMed Services, Inc. (EMS) was retained by the State of Connecticut Department of Public Works (DPW) to conduct a fungal evaluation of the paper products that are currently stored and in use for the Department of Revenue Services (DRS) at their facilities. These facilities are located at 25 Sigourney Street, 92 Farmington Avenue in Hartford, Connecticut and 38 Wolcott Hill Road in Wethersfield, Connecticut. The purpose of this evaluation was to determine the pathway of the use of paper products by personnel for DRS and to sample the paper products at various locations in the facility to determine the current fungal conditions on the surfaces of the papers. Mr. Stephen Arena and Ms. Marigrace Harkins performed the evaluation during October 2002.

Initial Assessment of Facilities

Personnel from DRS mainly reside in 25 Sigourney Street in Hartford. This building is a multi-story facility that not only services DRS but also the Department of Social Services (DSS). This brick façade structure has a multi-level parking garage attached to the building for personnel and visitors. The facility has recently been undergoing rehabilitation to eliminate water incursion from the brick façade and window systems associated to the building. During the course of the work being performed, personnel from DRS have indicated health concerns with respect to exposure during the work. Testing and oversight regarding this item have been addressed. Another item of concern that was brought to the attention of DPW by DRS personnel in the building is the transmission of fungal materials on paper products used and its movement throughout the building.

In order to determine the exposure and activity of use of paper products by DRS personnel, EnviroMed Services interviewed a number of personnel from DRS who could discuss the movement of paper products in the various departments or have experienced various symptoms when exposed to paper products from their offices. Initially, S. Arena met with Ms. Anne Alling from the Human Resources Department of DRS who indicated that employees from her area and other locations were exhibiting symptoms upon exposure to paper products in their work areas. As a result of health issues, several employees in Ms. Alling's area and other locations in 25 Sigourney Street were relocated to other buildings where DRS operations are also taking place. These locations are 92 Farmington Avenue in Hartford and 38 Wolcott Hill Road in Wethersfield. Ms. Alling indicated that it was noted to her that when these persons were exposed to their files and papers within, that they would exhibit various symptoms such as scratchy eyes, nasal congestion, and throat closure. Further discussion noted that paper products that are typically found in the files and on personnel desk might either be copied documents from copiers, printers or pre-printed documents made by printing operations located in the building. Some of the documents are multi-page books and forms. Documents that are either copied or printed use standard stock paper that are ordered in bulk quantity and stored in a stock room on the lower level of the parking garage. At the time of the evaluation, persons were using Domtar Paper (Stock #44004) for copying and printing operations in Ms. Alling's and other locations in DRS. Forms and other pre-printed paper products are either made in printing operations located on the 14th floor or are made by an outside vendor and stocked in the storage room as discussed above. Ms. Alling indicated that persons that relocated to the 2 outside facilities have had their personal belongings and other work related items transferred to their new work areas. It was noted to her that when these persons opened their paper-related items, they exhibited symptoms similar to those previously seen in their residing in 25 Sigourney Street.

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After interviewing Ms. Alling, EnviroMed Services proceeded to tour the workstations of persons affected. Workstations are typical modular type workstations with cloth dividers and laminated work surfaces. Chairs were typical cloths and areas contained low pile carpeting. There were no visible signs of fungal growth or moisture incursion in these areas at the time of the walkthrough. Files are typically stored in cabinets that are typically closed to the interior environment of the office spaces. Files in these cabinets are found to be usually tight with little space for material to enter the file folders.

Upon completing the workstation walkthrough, EnviroMed Services proceeded to the paper stock room. This room is located on the lowest level of the parking garage (P1). Prior to entering the room, it was observed that a number of pallets and rolls of paper products were being stored outside the room. In questioning DRS representatives, it was indicated that there is not enough room to store the paper materials and thus the items are stored in this location. The paper products stored outside the stockroom are noted to be stored in the direct environment to vehicular emissions and to other sources inside the parking garage. In walking through the pallets and rolls, it was observed that some of the paper products boxes were covered and sealed but a number of them were directly exposed to the garage environment. A fine layer of dirt and dust was observed on the surfaces of paper rolls and boxes in this area. It was also found that a number of boxes with forms and papers were found to be directly exposed to the indoor garage environment and appeared to have a layer of dust on the surface.

In entering the stockroom for paper products, it was noted that the area is comprised of concrete walls, floor and ceiling. There was no sign of mechanical ventilation or temperature control in this location at the time of the evaluation. It was noted in entering the room that a blue tarp was draped over pallets of paper materials. It was indicated that these items were not DRS and may be DSS documents. It appeared that the tarp was covering the materials due to water incursion from the ceiling of the room in this area. There were signs of efflorescence on the ceiling concrete indicating water have entered the area. In the eastern portion of the stockroom, a majority of the paper product for DRS is stored. The predominant paper product that was stored in this area was Domtar stock paper for printing and copying. These boxes of paper were stored on wooden pallets and shrink wrapped for shipment. Those pallets that were not shrink-wrapped were found to be those that are in use for stock. According to DRS representatives, the turnaround for paper use of this type is approximately 90 to 120 days. There were approximately 12 pallets of paper observed the day of the walkthrough. Directly across from the stock paper were boxes of DRS files that were archived and are not typically brought into the facility. Boxes of paper are brought to the various floors that DRS reside on a stock request basis. There is no central storage point inside the building for these papers. They are brought directly from the stockroom location to the floors and stored for personnel's immediate use.

Further evaluation of the room noted that the concrete floor showed signs of wear as a result of movement of material handling equipment in the area. The concrete was found to be in a worn state and a powdery layer was observed when a finger was rubbed across the surface. This powdery substance was not observed on the shrink-wrap surface or cardboard surfaces in the room at this time.

At the completion of the stockroom walkthrough, EnviroMed Services proceeded to the 14th floor to discuss the use of the various forms found in the stockroom and the use of the paper rolls in the printing operations.

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Fungal Evaluation of Paper Products within DRS facilities

Several types of forms used in the DRS process are stored in small bulk in a room noted as the exise room (Room 1404). These forms are brought from the lower level stock room to this location when the supply is low. The turnaround time for re-stock is variable depending on the type of form and need by personnel. Forms such as the Circular CT forms that were observed in the lower level stock area are also seen in this location. The room does contain environmental controls such as ventilation and temperature. Forms are stored on a standard shelving system off the floor.

In evaluation of the paper rolls that were seen in the lower level stock room, it was found these rolls are used by the printing operations for DRS to print mass memorandums, documents for taxpayers and other mass mailings. This paper may or may not enter into the work environment in this or other DRS facilities.

After completing the walkthrough of 25 Sigourney Street, EnviroMed Services proceeded to 92 Farmington Avenue to walkthrough the DRS facilities. It is noted that a majority of usage at this building is for storage of taxpayer files and other tax documents. In the rear of this facility and on the second level, there are two office locations where DRS personnel reside. It was noted that one of the employees from DRS was relocated from 25 Sigourney Street to this building and had a workstation on the first level rear portion of this building. In review of their work area it was noted the person had a typical workstation with cloth dividers and a laminated desk surface. There were papers on the desk and on the divider. The person residing at this station was not present due to illness; however, a co-worker in the area noted that some of the papers the person had over at 25 Sigourney St. were still present at the desk and showed one in particular hanging on the divider wall.

In walking to the second floor offices, it was observed that the space contained standard laminated desktops with a large amount of paperwork on each of the desks. There was some mechanical ventilation in the area with a total of 4 DRS employees present at this time. The floor of the office on the second floor was vinyl composite tile. There appeared to be no fungal growth visible in the area at the time of the walkthrough.

Lastly, a walkthrough of the DRS facility located at 38 Wolcott Hill Road in Wethersfield was conducted. EnviroMed Services met with two individuals who were previously assigned at 25 Sigourney Street. They were relocated to this location due to possible health concerns with regards to the building's air quality. In discussions with the two individuals, it was noted that paper products that were brought over from 25 Sigourney Street cause them to have various symptoms similar to those exhibited when they were in Sigourney Street. It was indicated that they couldn't open file boxes or file cabinets containing these documents without a reaction. Also, personnel noted that when documents were intra-mailed from 25 Sigourney Street to this location that they would react to the paper products when opening envelopes. A procedural change took place as a result of this to have documents directly sent to this location and not opened and intra-mailed from 25 Sigourney Street.

The offices were made up of standard laminated desktops with cloth back chairs and carpeting throughout. In the common work areas, cloth dividers divided employee's workstations. Areas did contain mechanical ventilation and were supplemented with ceiling fans. There was no sign of visible fungal growth in the space at the time of the walkthrough.

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Methods and Locations for Sampling

Based on the information ascertained from the walkthroughs of three locations that personnel reside for the DRS and the pathway which paper moves in the DRS system, the following sampling scheme was devised:

- **Sample for the presence of fungi at room temperature on the surfaces of various paper products and where paper may reside.** Sampling was performed using a sampling pump calibrated at 10 liters of air per minute with a 0.45-micron particle size polycarbonated filter cassette attached. The cassette face was opened and placed down on a surface and the paper or surface was vacuumed in a vertical manner. Once the surface was vacuumed, the cassette was then moved in a horizontal manner over the surface, perpendicular to the first pass. Once the second vacuum pass was completed, the cassette was then capped. Microbiological samples were sent to P & K Microbiology Services whereby they were weighed for total mass of dust, if present, then the filter and materials were placed onto two types of media for incubation (DG18 and MEA). A particle may contain at least one microorganism capable of growing on the appropriate microbiological media. The visible growth is called a colony; that which caused it to grow is termed a colony-forming unit (CFU). Colonies were counted and the microbial genera were identified, if present.

The above sampling scheme was employed during normal business hours at the three locations for DRS. The following areas were chosen based on the information ascertained from the walkthrough and the pathway by which paper products are transmitted in the DRS system:

- 1.) Human Resources, Room 1929 (Conference Room), Application in Tray
- 2.) Human Resources, Room 1929 (Conference Room), Top of Cabinet
- 3.) Human Resources, Room 1930, Paper from File Cabinet, Middle Drawer (Random)
- 4.) Exise Room, Room 1404, Circular CT Form
- 5.) Paper Stock Room, Parking Garage Level P1, Concrete Floor
- 6.) Paper Stock Room, Parking Garage Level P1, New Box of Domtar Paper (Stock #44004), Top Sheet
- 7.) Parking Garage Level P1, Outside Storage Area, Circular CT Form
- 8.) Parking Garage Level P1, Outside Storage Area, Paper Roll
- 9.) 92 Farmington Avenue, Room 107- E. Taylor's Workstation, Paper on Wall
- 10.) 92 Farmington Avenue, 2nd Floor, N. Rehman's Desk, Paperwork
- 11.) 38 Wolcott Hill Road-V. Chappelle's Office, Paper from File (4/12/00), Second Drawer
- 12.) 38 Wolcott Hill Road-V. Chappelle's Office, Paper from Banker's Box from 25 Sigourney St.

Results of Sampling and Analysis

In review of the data collected (Appendix A) from the twelve locations listed, the following results can be observed:

- 1.) Three out of the twelve samples obtained from the surfaces sampled had quantifiable levels of dust. These locations were the Stock Room floor, the CT Circular Form and paper roll from the outside storage on P1. The highest concentration of dust was from the concrete floor of the stock room. It has been suggested in studies that dust is a carrier of fungal materials and can

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transmit these components to other locations through natural and mechanical ventilation in an indoor environment.

- 2.) Three out of the twelve samples analyzed showed high concentrations of various fungal genera on their surfaces. These locations were Stock Room floor, the CT Circular Form and paper roll from the outside storage on P1. Fungal concentrations ranged from 417,600 CFU/g to 4,990,000 CFU/g. The genus prevalence in these locations varied from location to location but had common genera such as *Cladosporium* and *Penicillium*. These two genera of fungi are typical components found in the environment and can be related to outdoor decay from leaves, trees and soils. The concentrations of these two specific fungal species were the highest in these locations ranging from 120,000 to 4,100,00 CFU/g. It may be suggested from this data, in conjunction with the quantification of dust on these surfaces and moisture from ambient relative humidity, that the levels may be attributed to the dust carrying these fungal components onto the surface. Due to the storage of these items in proximity to vehicular traffic, dusts and debris from the parking garage surfaces may be contributing to the increase in concentration of these genera of fungi. Additionally, concrete is a porous substance that may allow moisture to absorb into the surface and be retained for a period of time. This may be a contributor to the increased growth observed on this surface in the stock room.

Additionally, other genera of fungi were found on these three samples including *Alternaria alternata*, *Epicoccum nigrum*, *Aspergillus niger*, *Aspergillus flavus*, and sterile fungi. These genera of fungi ranged in concentration from 13,000 to 240,000 CFU/g. Several of these genera of fungi have been found to contribute to various health symptoms and effects as noted in the literature. A number of these genera need increase levels of moisture on a feedstock such as paper to grow and amplify to concentrations as seen in this evaluation. Based on the location of the paper storage in the garage, it may be suggested that increased relative humidity and lack of proper ventilation may have contributed to the increased concentrations of the growth observed.

- 3.) Review of the data collected from the surface of the Domtar paper in the stock room noted low concentrations of fungi. Levels of fungi ranged from 10-30 CFU with *Cladosporium* being the sole genera of fungi found. This indicates that the paper products being brought into the facility in their original wrapping are not showing amplification of fungal material while being used in the printing and copying by DRS personnel in this facility at the present time.
- 4.) A comparison of fungal materials was noted on a form (CT Circular) that was stored in two different locations at 25 Sigourney Street. These were the storage area outside on Parking Level P1 and the exise room (Room 1404). As noted earlier, when these forms run low in stock in the exise room, personnel go to the lower level and obtain these forms from this location.

It was found that the forms located in the exise room did not contain quantifiable levels of dust while the lower level showed a level of dust at 0.003 grams. This difference may be from the movement of the forms by personnel from the lower level to the exise room with the surface dust becoming airborne during transport. Also, the exise room has environmental and temperature controls that may reduce the level of dust on this form and others in the room whereby the lower level storage had no controls.

In comparing the concentrations of fungal materials in these locations, it was observed that a significant reduction in concentration and genera of fungus occurred. Again, this may be

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attributed to the reduction in dust levels that may carry these fungus onto the surfaces. However, in comparing the various genera of fungus identified in both locations, it was observed that common genera of fungus were present. Some of these common genera included Cladosporium, Penicillium, Alternaria alternata, Aspergillus niger, and Epicoccum nigrum. As indicated earlier, some of the genera identified may not cause symptoms in individuals typically, but several genera that have been identified may cause possible symptoms in susceptible persons. In attempting to show a comparison of fungal material present on the surface of the forms in both locations, the following assumptions and calculations were performed:

- A.) CT Circular Form measurement is 8.5" x 11" or 93.5 square inches
- B.) Dust Concentration for CT Circular Form in P1 Outside Storage: 0.003 grams
- C.) Dust Concentration for CT Circular Form in Exise Room (Rm. 1404): None Detected

To Determine Concentration of Fungal Material (DG18) per Square Inch for Form in P1 Outside Storage:

- ◆ $(2,496,000 \text{ CFU/g}) \times (0.003 \text{ g}) = 7,488 \text{ CFU}$
- ◆ $(7,488 \text{ CFU}) / 93.5 \text{ Sq. Inches} = 80.08 \text{ CFU/ Sq. In.}$

To Determine Concentration of Fungal Material (MEA) per Square Inch for Form in P1 Outside Storage:

- ◆ $1,803,000 \text{ CFU/g}) \times (0.003 \text{ g}) = 5,409 \text{ CFU}$
- ◆ $(5,409 \text{ CFU}) / 93.5 \text{ Sq. Inches} = 57.85 \text{ CFU/ Sq. In.}$

To Determine Concentration of Fungal Material (DG18) per Square Inch for Form in Exise Room:

- ◆ $(4,000 \text{ CFU}) / 93.5 \text{ Sq. Inches} = 42.78 \text{ CFU/ Sq. In.}$

To Determine Concentration of Fungal Material (DG18) per Square Inch for Form in Exise Room:

- ◆ $(4,450 \text{ CFU}) / 93.5 \text{ Sq. Inches} = 47.59 \text{ CFU/ Sq. In.}$

Comparison of Fungal Concentration by Surface Area of CT Circular Form:

| Type of Media Used | P1 Outside Storage | Exise Room |
|--------------------|--------------------|------------|
| DG18 | 80.08 | 42.78 |
| MEA | 57.85 | 47.59 |

It is observed from the above calculations that the concentration of surface fungal material declined with both media used in incubation. There is an appreciable decline in concentration seen with the DG18 media, indicating that the specific genera of fungus grown on this media was correlated not

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only to the dust levels on the surface, but also to fungal materials that may have grown on the paper itself. This may be attributed to the environmental conditions present in the P1 outside storage area.

- 5.) Data collected from the Human Resource's conference room indicated no increased growth of fungal material on paper products in this location at the time of the evaluation. In comparing the paper surface vacuumed versus the cabinet surface, there was no significant difference in the level of concentration for fungal genera identified.
- 6.) Data collected from paper surface from a file cabinet in Room 1930 showed either no growth or low level concentration of fungal material. It does not appear that fungal growth is occurring on paper products in this location at the present time.
- 7.) Data collected from the two locations at 92 Farmington Avenue indicated no increase in fungal concentration on paper products at this time. The sample obtained from the wall of E. Taylor's cubicle that was brought over from 25 Sigourney Street did not show differential in growth versus the other samples obtained in this evaluation.
- 8.) Data collected from paper products at the two locations at 38 Wolcott Hill Road showed no amplification of fungal genera at this time. It was observed that the levels of fungal material found on paper in the banker's box were found to be higher than that found in the file cabinet. This may be attributed to moisture being able to be more readily absorbed into cardboard, retained and transmitted to the inside of the box. However, levels found in the box were not amplified at the time of this evaluation.

Conclusions and Recommendations

Based on the evaluation conducted at the three locations for DRS, EnviroMed Services makes the following conclusions and recommendations:

The findings of this evaluation show that the fungal concentrations are not amplified on paper products and surfaces where paper products are used at this time in the three DRS locations evaluated. This includes file cabinets and trays where papers may be temporarily stored.

However, the evaluation did find that storage of paper products in the parking garage, which is considered an outdoor location, does not contain environmental controls and is likely a contributing factor in the increased concentrations of fungal growth observed on the paper products in this location. Paper products that are in direct contact with vehicular movement and air currents are susceptible to attracting moisture, dust, pollen, and other materials that may be able to transmit fungal components. Based on this finding, it is recommended that the practice of storing paper products in the parking garage not continue.

In improving the interior storage space for paper products, a combination of sealing of the concrete floor with installation of environmental controls to maintain proper temperature, relative humidity, and reduction in ambient contaminants from entering the space should be considered.

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Until the above consideration is implemented, the following steps need to be considered as a minimum for storage of the paper products:

- 1.) Stock paper should be left in their original wrapping and not disturbed while in stock to protect it from dust infiltration.
- 2.) Storage of papers in cardboard containers where moisture can be retained should be avoided
- 3.) A reduction and/or elimination of paper inventory products stored in the outdoor location.

These three steps would assist in reducing the potential for transferring fungal materials from this location to the occupied spaces.

Appendix A

Table of Results for Fungal Sampling

Table 1
Results of Vacuum Microbiological Sampling
October 7, 2002

| Sample Location | Fungi Concentration 1 | Genera Prevalence | Fungi Concentration 2 | Genera Prevalence |
|--|-----------------------|---|-----------------------|--|
| 25 Sigourney Street, Hartford Conference Room 1929 Application in Tray on Table | 140 | Cladosporium (100) Eurotium (Aspergillus) amstelodami (20) Aureobasidium pullulans (10) Penicillium (10) | 90 | Penicillium (40) Cladosporium (30) sterile fungi (10) Trichoderma koningii (10) |
| 25 Sigourney Street, Hartford Conference Room 1929 Top of Cabinet | 110 | Cladosporium (60) yeasts (30) Penicillium (10) sterile fungi (10) | 120 | Cladosporium (80) Alternaria alternata (30) Trichoderma harzianum (10) |
| 25 Sigourney Street, Hartford Office 1930 - Paper from File Folder in Middle Drawer | 10 | Cladosporium (10) | <10 | No Growth |
| 25 Sigourney Street, Hartford Excise Room 1404 Circular CT Form | 4000 | Cladosporium (3500) Alternaria alternata (250) Aspergillus niger (150) Epicoecum nigrum (50) Penicillium (50) | 4450 | Cladosporium (3700) Penicillium (350) Alternaria alternata (150) Aspergillus niger (150) sterile fungi (100) |
| 25 Sigourney Street, Hartford P1 Stock Room Floor | 417600 | Penicillium (340,000) Cladosporium (69,000) Syncephalastrum (8600) | 428,600 | Penicillium (270,000) Cladosporium (150,000) Trichoderma (8600) |
| 25 Sigourney Street, Hartford P1 Stock Room New Box of Donlar Paper Top Sheet (Stock # 44004) | 30 | Cladosporium (30) | 10 | Cladosporium (10) |

¹ Colony forming units per gram on DG18 media.

² Colony forming units per gram on malt extract agar (MEA) media.

Table 2
Results of Vacuum Microbiological Sampling
October 7, 2002

| Sample Location | Fungi Concentration ¹ | Genera Prevalence | Fungi Concentration ² | Genera Prevalence |
|--|----------------------------------|--|----------------------------------|--|
| 25 Sigourney Street, Hartford PI Storage Circular CT Form | 2,496,000 | Cladosporium (2,200,000) Penicillium (190,000) Alternaria alternata (53,000) Epicoccum nigrum (27,000) Aspergillus flavus (13,000) Aspergillus niger (13,000) | 1,803,000 | Cladosporium (1,600,000) Penicillium (150,000) Epicoccum nigrum (27,000) sterile fungi (13,000) Trichoderma harzianum (13,000) |
| 25 Sigourney Street, Hartford PI Storage Paper Roll | 4,990,000 | Cladosporium (4,100,000) Penicillium (530,000) Aspergillus niger (120,000) Eurotium (Aspergillus) amstelodami (120,000) sterile fungi (120,000) | 4,037,000 | Cladosporium (3,500,000) Alternaria alternata (240,000) Penicillium (120,000) Aspergillus niger (59,000) Epicoccum nigrum (59,000) sterile fungi (59,000) |
| 92 Farmington Avenue, Hartford Room 107 - E. Taylor's Cube July '01 Schedule on Wall | 310 | Cladosporium (200) Penicillium (70) Alternaria alternata (20) Aspergillus versicolor (10) sterile fungi (10) | 240 | Cladosporium (140) Penicillium (50) Alternaria alternata (30) Aspergillus niger (10) Paecilomyces variotii (10) |
| 92 Farmington Avenue, Hartford 2nd Floor - N. Rehman's Desk Paperwork - 25 Sigourney Street | 230 | Cladosporium (220) Aspergillus niger (10) | 170 | Cladosporium (140) sterile fungi (20) Penicillium (10) |
| 38 Wolcott Hill Rd., Wethersfield V. Chappelle's Office Paper from File (4/12/00) Second Drawer | 10 | Cladosporium (10) | 30 | Cladosporium (20) Acremonium strictum (10) |
| 38 Wolcott Hill Rd., Wethersfield V. Chappelle's Office Paper from File in Banker's Box | 90 | Cladosporium (60) Penicillium (20) sterile fungi (10) | 240 | Cladosporium (110) Penicillium (110) Aspergillus niger (10) Aspergillus ustus (10) |

¹ Colony forming units per gram on DG18 media.

² Colony forming units per gram on malt extract agar (MEA) media.

Appendix B

Table of Results for Total Dust Weight

**25 Sigourney Street and Other Locations
Department of Revenue Services
Total Dust Concentrations**

| <i>Sample Location</i> | <i>Total Dust Weight (grams)</i> |
|---|----------------------------------|
| <i>25 Sigourney St., Conference Room 1929, Application in Tray on Table</i> | N/A |
| <i>25 Sigourney St., Conference Room 1929, Top of Cabinet</i> | N/A |
| <i>25 Sigourney St., Office 1930, Paer from file folder in Middle Drawer</i> | N/A |
| <i>25 Sigourney St., Exise Room, Room 1404 CT Circular Form</i> | N/A |
| <i>25 Sigourney St., P1 Stock Room Floor</i> | 0.186 |
| <i>25 Sigourney St., P1 Stock Room, New Box of DomTar Paper, Top Sheet (Stock # 44004)</i> | N/A |
| <i>25 Sigourney St., P1 Outside Storage, CT Circular Form</i> | 0.003 |
| <i>25 Sigourney St., P1 Outside Storage, Paper Roll</i> | 0.027 |
| <i>92 Farmington Ave., Room 107, E. Taylor's Cubicle, July '01 Schedule on Wall</i> | N/A |
| <i>92 Farmington Avenue, 2nd Floor, N. Rehman's Desk, Paperwork from 25 Sigourney Street</i> | N/A |
| <i>38 Wolcott Hill Road, V. Chappelle's Office, Paper from file (4/12/00), Second Drawer</i> | N/A |
| <i>38 Wolcott Hill Road, V. Chappelle's Office, Paper from file in Banker's Box</i> | N/A |

Appendix C
Laboratory Analysis

P & K Microbiology Services, Inc.

The Environmental Microbiology and Mycology Specialists
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Fax: 856-489-4085

Email: pnkmicrobiology@envirocenter.com

Website: www.envirocenter.com

Client: EnviroMed Services, Inc, Meriden, CT 06540

Project ID: 25 Sigourney St. Htfd

Date Sampled: October 7, 2002

Date of Inoculation: October 9, 2002

Samples Submitted By: Marigrace Harkins

Date Characterization Completed: October 18, 2002

P&K Report No.: 021008-052

Fungal/Bacterial Analysis (Culture Method)

Bulk Dust Samples

| P&K Sample ID Client Sample ID Location | Weight used (g) | Medium used | Dilution factor | Fungal / Bacterial ID | Colony counts | Conc. ** (CFU/g) | Percentage* | |
|---|--------------------|----------------|--------------------|------------------------------------|------------------|---------------------|-------------|--|
| 021008-052-001 1 | NA | DG18 | 10X | Fungi | | | | |
| | | | | Aureobasidium pullulans | 1 | 10 | 7% | |
| | | | | Cladosporium | 10 | 100 | 71% | |
| | | | | Eurotium (Aspergillus) amstelodami | 2 | 20 | 14% | |
| | | | | Penicillium | 1 | 10 | 7% | |
| | | | | Total: 140 | 100% | | | |
| | | MEA | 10X | Fungi | | | | |
| | | | | Cladosporium | 3 | 30 | 33% | |
| | | | | Penicillium | 4 | 40 | 44% | |
| | | | | sterile fungi | 1 | 10 | 11% | |
| Trichoderma koningii | 1 | | | 10 | 11% | | | |
| | | Total: 90 | 100% | | | | | |
| 021008-052-002 2 | NA | DG18 | 10X | Fungi | | | | |
| | | | | Cladosporium | 6 | 60 | 55% | |
| | | | | Penicillium | 1 | 10 | 9% | |
| | | | | sterile fungi | 1 | 10 | 9% | |
| | | | | yeasts | 3 | 30 | 27% | |
| | | | | Total: 110 | 100% | | | |
| | | MEA | 10X | Fungi | | | | |
| | | | | Alternaria alternata | 3 | 30 | 25% | |
| | | | | Cladosporium | 8 | 80 | 67% | |
| | | | | Trichoderma harzianum | 1 | 10 | 8% | |
| | | Total: 120 | 100% | | | | | |

| P&K Sample ID Client Sample ID Location | Weight used (g) | Medium used | Dilution factor | Fungal / Bacterial ID | Colony counts | Conc. ** (CFU/g) | Percentage* |
|---|--------------------|----------------|--------------------|---|------------------------|-----------------------------------|-----------------------------|
| 021008-052-003 3 | NA | DG18 | 10X | Fungi Cladosporium | 1 | 10 | 100% |
| | | MEA | 10X | Fungi No Growth | NA | < 10 | NA |
| 021008-052-004 4 | NA | DG18 | 50X | Fungi Alternaria alternata Aspergillus niger Cladosporium Epicoccum nigrum Penicillium | 5 3 69 1 1 | 250 150 3,500 50 50 | 6% 4% 88% 1% 1% |
| | | MEA | 50X | Fungi Alternaria alternata Aspergillus niger Cladosporium Penicillium sterile fungi | 3 3 73 7 2 | 150 150 3,700 350 100 | 3% 3% 83% 8% 2% |
| 021008-052-005 5 | 0.186 | DG18 | 1600X | Fungi Cladosporium Penicillium Syncephalastrum | 8 39 1 | 69,000 340,000 8,600 | 17% 81% 2% |
| | | MEA | 1600X | Fungi Cladosporium Penicillium Trichoderma | 17 31 1 | 150,000 270,000 8,600 | 35% 63% 2% |
| 021008-052-006 6 | NA | DG18 | 10X | Fungi Cladosporium | 3 | 30 | 100% |
| | | MEA | 10X | Fungi Cladosporium | 1 | 10 | 100% |

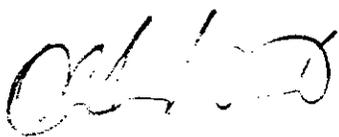
| P&K Sample ID Client Sample ID Location | Weight used (g) | Medium used | Dilution factor | Fungal / Bacterial ID | Colony counts | Conc. ** (CFU/g) | Percentage* | |
|---|--------------------|------------------|--------------------|------------------------------------|------------------|---------------------|-------------|--|
| 021008-052-007 7 | 0.0030 | DG18 | 40X | Fungi | | | | |
| | | | | Alternaria alternata | 4 | 53,000 | 2% | |
| | | | | Aspergillus flavus | 1 | 13,000 | < 1% | |
| | | | | Aspergillus niger | 1 | 13,000 | < 1% | |
| | | | | Cladosporium | 167 | 2,200,000 | 88% | |
| | | | | Epicoccum nigrum | 2 | 27,000 | 1% | |
| | | | | Penicillium | 14 | 190,000 | 8% | |
| | | | | Total: 2,496,000 | 100% | | | |
| | | MEA | 40X | Fungi | | | | |
| | | | | Cladosporium | 121 | 1,600,000 | 89% | |
| | | | | Epicoccum nigrum | 2 | 27,000 | 1% | |
| | | | | Penicillium | 11 | 150,000 | 8% | |
| | | | | sterile fungi | 1 | 13,000 | < 1% | |
| | | | | Trichoderma harzianum | 1 | 13,000 | < 1% | |
| | | Total: 1,803,000 | 100% | | | | | |
| 021008-052-008 8 | 0.027 | DG18 | 1600X | Fungi | | | | |
| | | | | Aspergillus niger | 2 | 120,000 | 2% | |
| | | | | Cladosporium | 69 | 4,100,000 | 82% | |
| | | | | Eurotium (Aspergillus) amstelodami | 2 | 120,000 | 2% | |
| | | | | Penicillium | 9 | 530,000 | 11% | |
| | | | | sterile fungi | 2 | 120,000 | 2% | |
| | | | | Total: 4,990,000 | 100% | | | |
| | | MEA | 1600X | Fungi | | | | |
| | | | | Alternaria alternata | 4 | 240,000 | 6% | |
| | | | | Aspergillus niger | 1 | 59,000 | 1% | |
| | | | | Cladosporium | 59 | 3,500,000 | 87% | |
| | | | | Epicoccum nigrum | 1 | 59,000 | 1% | |
| | | | | Penicillium | 2 | 120,000 | 3% | |
| | | | | sterile fungi | 1 | 59,000 | 1% | |
| | | Total: 4,037,000 | 100% | | | | | |
| 021008-052-009 9 | NA | DG18 | 10X | Fungi | | | | |
| | | | | Alternaria alternata | 2 | 20 | 6% | |
| | | | | Aspergillus versicolor | 1 | 10 | 3% | |
| | | | | Cladosporium | 20 | 200 | 65% | |
| | | | | Penicillium | 7 | 70 | 23% | |
| | | | | sterile fungi | 1 | 10 | 3% | |
| | | | | Total: 310 | 100% | | | |
| | | MEA | 10X | Fungi | | | | |
| | | | | Alternaria alternata | 3 | 30 | 13% | |
| | | | | Aspergillus niger | 1 | 10 | 4% | |
| | | | | Cladosporium | 14 | 140 | 58% | |
| | | | | Paecilomyces variotii | 1 | 10 | 4% | |
| | | | | Penicillium | 5 | 50 | 21% | |
| | | | | Total: 240 | 100% | | | |

| P&K Sample ID Client Sample ID Location | Weight used (g) | Medium used | Dilution factor | Fungal / Bacterial ID | Colony counts | Conc. ** (CFU/g) | Percentage* |
|---|--------------------|----------------|--------------------|--|--------------------|--------------------------------------|--------------------------------|
| 021008-052-010 10 | NA | DG18 | 10X | Fungi Aspergillus niger Cladosporium | 1 22 | 10 220 Total: 230 | 4% 96% 100% |
| | | MEA | 10X | Fungi Cladosporium Penicillium sterile fungi | 14 1 2 | 140 10 20 Total: 170 | 82% 6% 12% 100% |
| 021008-052-011 11 | NA | DG18 | 10X | Fungi Cladosporium | 1 | 10 Total: 10 | 100% 100% |
| | | MEA | 10X | Fungi Acremonium strictum Cladosporium | 1 2 | 10 20 Total: 30 | 33% 67% 100% |
| 021008-052-012 12 | NA | DG18 | 10X | Fungi Cladosporium Penicillium sterile fungi | 6 2 1 | 60 20 10 Total: 90 | 67% 22% 11% 100% |
| | | MEA | 10X | Fungi Aspergillus niger Aspergillus ustus Cladosporium Penicillium | 1 1 11 11 | 10 10 110 110 Total: 240 | 4% 4% 46% 46% 100% |

* Percentage of each group of fungi/bacteria in total population.

** Concentration is rounded to two significant digits. Concentration is in CFU/Sample if sample amount/area is NA.

Media types: cellulose agar(CA), czapek cellulose agar(CCA), cornmeal agar(CMA), 2% malt extract agar(MEA), 2% malt extract agar plus 20% sucrose(MEA+S), inhibitory mold ager(IMA), pseudomonas isolation agar(PIA), rose bengal agar(RBA), sabouraud dextrose agar(SDA), tryptic soy agar(TSA), nutrient agar(NTA), blood agar(BA), staphylococcus medium 110(Staphy). The detection limit of fungal and bacteria analysis using culture methods is one colony. The quantitation limits vary from analysis to analysis and from processing procedure to processing procedure. Contact us to determine your quantitation limits.

Approved by:  _____
Chin S. Yang, Ph.D. Microbiologist

Quality control checked by:  _____

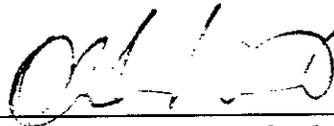
P & K Microbiology Services, Inc.
The Environmental Microbiology Specialists
7 Allison Drive, Cherry Hill, New Jersey 08003

Tel: 856-489-4455
Fax: 856-489-4085

Client: EnviroMed Services, Inc., Meriden, CT
Date sampled: October 7, 2002
Project ID: 25 Sigourney St. Htfd
Samples submitted by: Marigrace Harkins
Date completed: October 9, 2002
Sampling method: Bulk Dust
Analyses performed: Total dust weight
P&K Report No.: 021008-052

| Sample ID# | Total Dust Wt. (g) |
|------------|--------------------|
| 1 | NA |
| 2 | NA |
| 3 | NA |
| 4 | NA |
| 5 | 0.186 |
| 6 | NA |
| 7 | 0.003 |
| 8 | 0.027 |
| 9 | NA |
| 10 | NA |
| 11 | NA |
| 12 | NA |

Characterization approved by: _____



Chin S. Yang, Ph.D., Microbiologist

Quality control checked by: _____



Appendix D
Chain of Custody

P&K Project # _____

P & K Microbiology Services, Inc. Tel: 856-427-4044 Fax: 856-427-0232
 The Environmental Microbiology Specialists 1950 Old Cuthbert Road Unit #L, Cherry Hill, New Jersey 08034

Chain-of-Custody and Analysis Request Form

P&K Client: EnviroMed Services, Inc.
 Address: 470 Muldock Ave
Medford, NJ 06450

Telephone #: (203) 238-4844
 Fax #: (203) 238-4243
 Date sampled: 10-7-02

Project ID: 25 Sigourney St, Hfd
 P.O.#: _____
 Date submitted: 10-7-02

| Sample # | Sample Type: air, wipe, bulk, dust, water | Air vol. (L) | Area (in ²) | Water Source 2,3 | Sample location | Analysis Requested (see back of sheet) | Special Instructions ⁴ & Comments |
|----------|---|--------------|-------------------------|------------------|--|--|--|
| 1 | bulk-vacuum | - | 93.5 | - | Cont. Rm 1929-Application in Tray on Table | P+K 105A | DGIR+MEA |
| 2 | bulk-vacuum | - | 112 | - | Cont. Rm 1929-Top of Cabinet | P+K 105A | |
| 3 | bulk-vacuum | - | 93.5 | - | Office 1930-paper from file folder-middle drawer | P+K 105A | |
| 4 | bulk-vacuum | - | 93.5 | - | Exise Rm 1044-Circular CT Form | P+K 105A | |
| 5 | bulk-vacuum | - | 93.5 | - | P-Stack Rm Floor | P+K 105A | |
| 6 | bulk-vacuum | - | 93.5 | - | P-Stack Rm-New Bin of Paper Top Sheet | P+K 105A | |

1. Please make sure to provide essential information (air vol. and surface area in in²) so that a complete report can be generated.
2. Please indicate whether a water sample is potable, non-potable or waste water.
3. Please indicate whether a water sample is for compliance analysis.
4. Please indicate specific requirements: incubation temperature and media selection.

Submitted by: (sign) _____ (print) _____ Contact Person: _____
 Received by: (sign) _____ (print) _____ Date & time Received: _____
 (For lab use only) Samples processed by: _____ Date: _____

566-5074

P&K Project #

P & K Microbiology Services, Inc. Tel: 856-427-4044 Fax: 856-427-0232

The Environmental Microbiology Specialists 1950 Old Cuthbert Road Unit #L, Cherry Hill, New Jersey 08034

Chain-of-Custody and Analysis Request Form

P&K Client: EnviroMed Services, Inc.
Address: 470 Muddock Ave
Mexico, CT 06450

Telephone #: (203) 238-4846
Fax #: (203) 238-4243
Date sampled: 10-7-02

Project ID: 25 Siquinney St, H44d
P.O.#: _____
Date submitted: 10-7-02

| Sample # | Sample Type: air, wipe, bulk, dust, water | Air vol. (L) | Area (in ²) | Water Source 2,3 | Sample Location | Analysis Requested (see back of sheet) | Special Instructions ⁴ & Comments |
|----------|---|--------------|-------------------------|------------------|---|--|--|
| 7 | bulk-vacuum | - | 93.5 | - | PI Storage - Circular CT Farm | P&K 105A | DG18 + MEA |
| 8 | bulk-vacuum | - | 93.5 | - | PI Storage - Paper Roll | P&K 105A | |
| 9 | bulk-vacuum | - | 93.5 | - | Rm 107 E. Taylor's Cafe | P&K 105A | |
| 10 | bulk-vacuum | - | 93.5 | - | Div 101 Schedule Herington Hill | P&K 105A | |
| 11 | bulk-vacuum | - | 93.5 | - | 277-N. Rehman's Desk Paperwork from Sig. St. | P&K 105A | |
| 12 | bulk-vacuum | - | 93.5 | - | Chapel's Office Paperwork File (11/100) - second drawer | P&K 105A | |
| | | | | | Chapel's Office Paperwork File in the Juice Box | P&K 105A | |

2 Environmental
File
↓
38 Solvent
11, 12, 13
↓

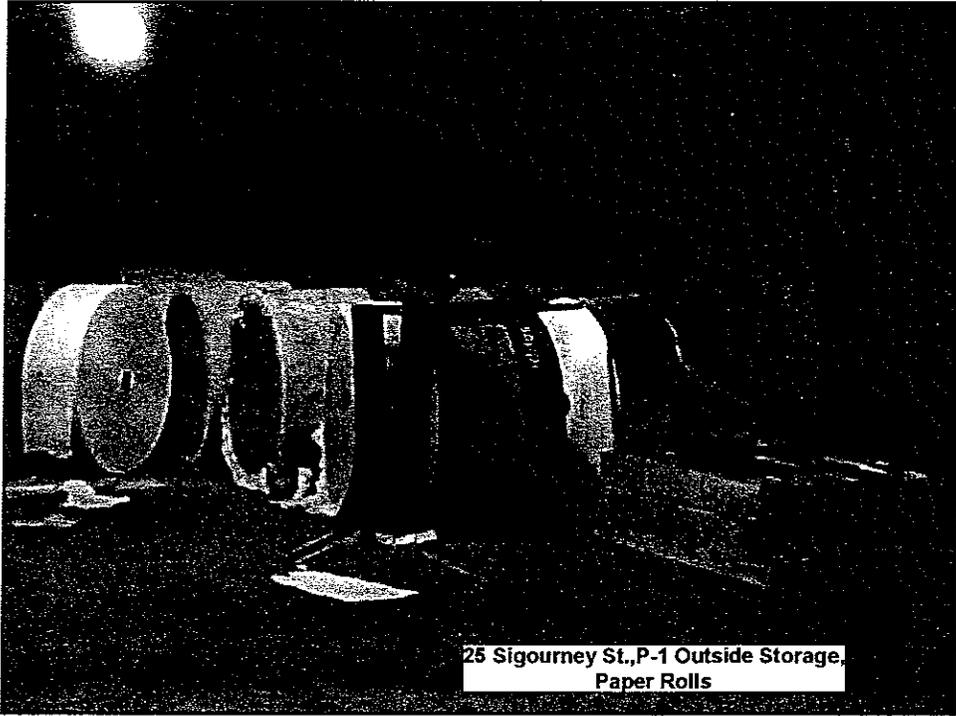
1. Please make sure to provide essential information (air vol. and surface area in inch²) so that a complete report can be generated.
2. Please indicate whether a water sample is potable, non-potable or waste water.
3. Please indicate whether a water sample is for compliance analysis.
4. Please indicate specific requirements: incubation temperature and media selection.

Submitted by: (sign) _____ (print) _____ Contact Person: _____
Received by: (sign) _____ (print) _____ Date & time Received: _____

(For lab use only) Samples processed by: _____ Date: _____

Appendix E

Photographs of Facilities



25 Sigourney St., P-1 Outside Storage,
Paper Rolls



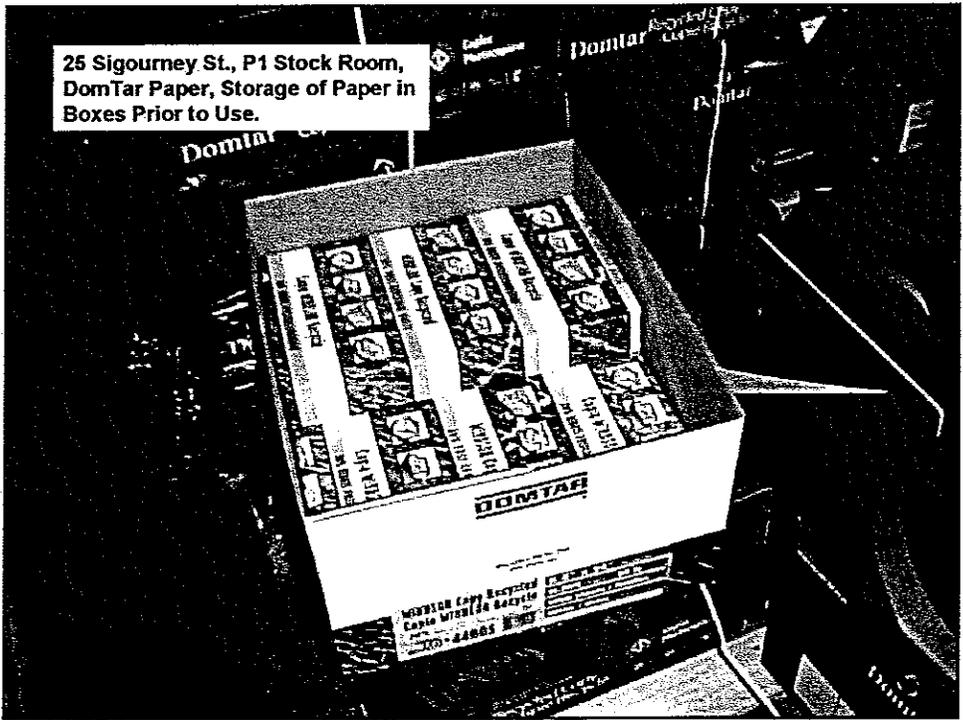
25 Sigourney St., P1 Stockroom,
DomTar Paper Storage

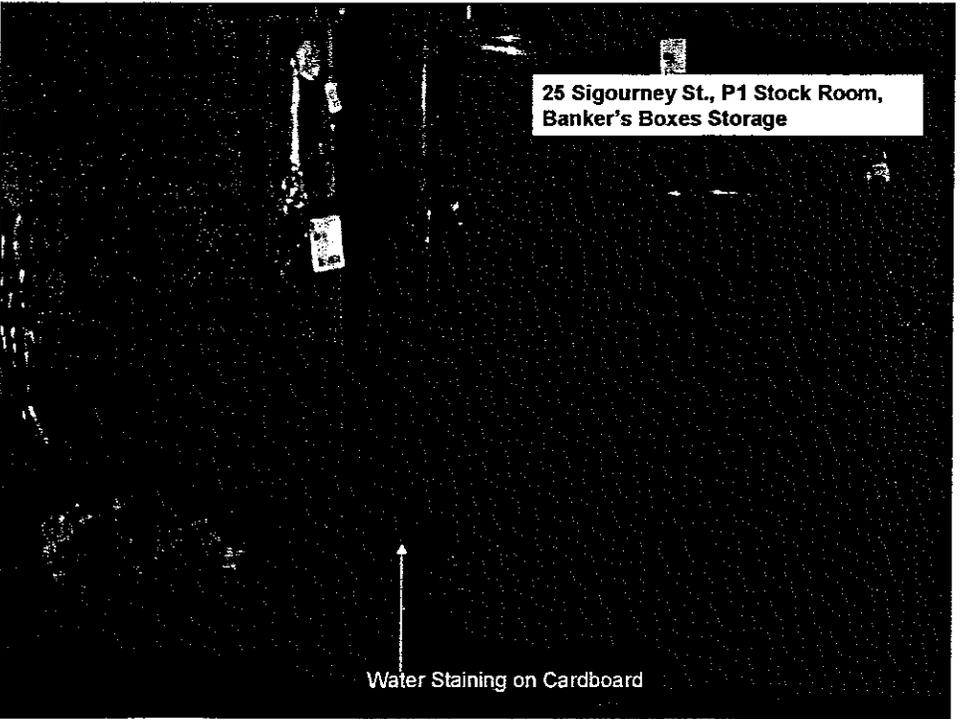
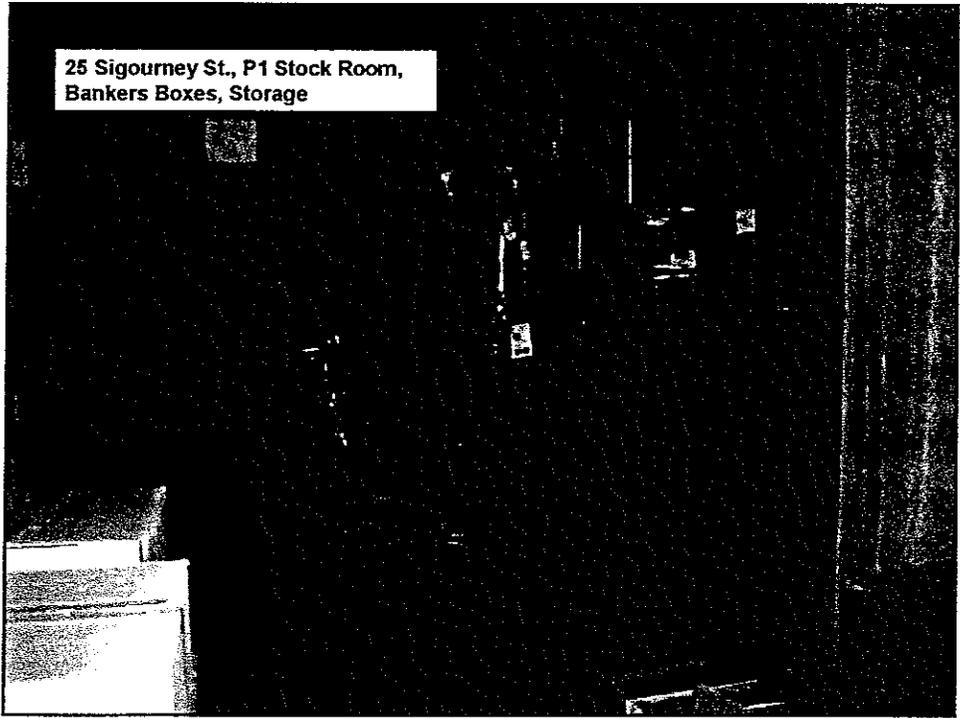
25 Sigourney St., P1 Stock Room,
DomTar Paper, Specifications

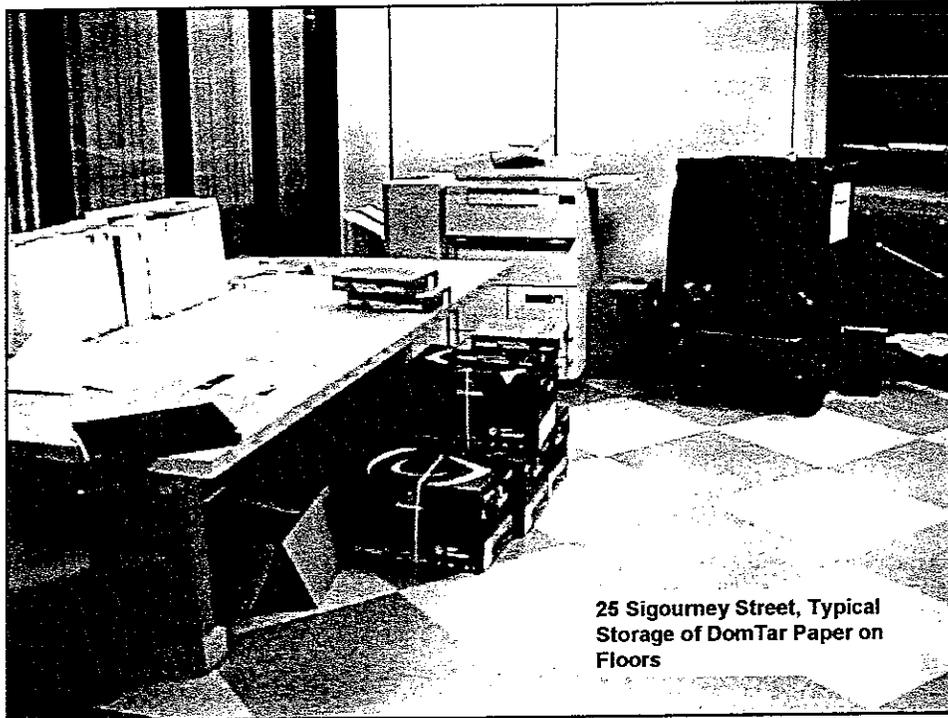
31 31 00
FORM
DIP 4-100-1



25 Sigourney St., P1 Stock Room,
DomTar Paper, Storage of Paper in
Boxes Prior to Use.







25 Sigourney Street, Typical Storage of DomTar Paper on Floors



25 Sigourney St., Printing Operations, Typical Storage of Paper Rolls

Dirt from Storage on Side of Roll

25 Sigourney St., Printing
Operations, Typical Storage
Prior to Use of DomTar Paper

