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May 2, 2016 – FINAL REPORT

TO: Dale Perrett, Category Manager,
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FROM: Andrew Streifel, Hospital Environmental Specialist
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RE: Paris Laundry (DuBois) and University of Pittsburgh Medical Center - UPMC

Objective

At the request of Dale Perrett (Category Manager, UPMC Supply Chain Management) a site visit was conducted February 1, 2016 at the Paris laundry facility in DuBois, Pennsylvania and February 2, 2016 at the University of Pittsburgh Medical Center (UPMC). The purpose of the visit was to evaluate the Paris laundry facility and the Montefiore (MUH) and Presby (PUH) linen storage facilities regarding best practices related to microbiological contamination of a hospital laundry. Fungal air quality and contact surface sampling was conducted to determine airborne particle concentrations and surface particle deposition in the laundry facility and linen storage support service areas. Particle counts were conducted to measure particle concentrations at different size ranges and pressure differential comparisons and airflows in or out of the rooms and buildings.

Fungal Sampling Materials and Methods

Twenty six impactor SAS (Surface Air System) air fungal samples were collected on February 1 and 2, 2016 at Paris (DuBois) and UPMC linen storage areas. The indoor air sample volume collected was 200 liters. SAS air fungal samples were also collected outdoors and used as control samples for this sampling activity. The outdoor air sample volume collected was 200 liters.

Fifty four surface (contact) agar samples were collected at Paris (DuBois) and UPMC linen storage areas on February 1 and 2, 2016.

Two tease tape samples were collected at Paris (DuBois) linen facility on February 1, 2016. The tease tape samples were collected from visually observed suspect fungal material that was identified during this investigation.

Bulk samples were collected at Paris on February 1, 2016 and UPMC on February 2, 2016. All bulk samples were transferred to media using a Biological Safety Cabinet and incubated.

A Casella high volume single slit vacuum air sampler was used to vacuum the surface of clothing and linen material collected at Paris and UPMC. This procedure was conducted in a Class 0 Clean Room where the vacuumed materials were impacted onto media. The room was verified with negative air sample controls.

All samples were collected on sterile Malt Extract Agar (MEA) a general medium, and incubated in darkness at either 25 or 37 degrees Celsius. The concentration of fungal organisms collected on the air sample plates is presented as colony forming units per cubic meter of air (CFU/M³). The concentration of fungal organisms on the contact samples is given as colony forming units per plate (CFU/plate). The fungal loading on the tease tapes, bulk samples, and Casella vacuum samples is given as the amount of particle loading on the respective collection method.

Fungal organisms were identified by the Scotch Tape Technique. The Scotch tape is placed on the edge of a fungal colony and then placed on a slide with a small amount of 85% lactic acid mounting fluid. The gross morphology of the fruiting body is examined under a microscope and identified according to standard fungal keys.

Results

SAS air samples at 37 degrees Celsius collected February 1, 2016 at Paris (DuBois)

Location	CFU/M³	Primary Organisms	Plate count percentage
1 – Paris (DuBois) – Clean Pack Out	20	*Yeast/Bacteria* *NSM*	75 25
2 Paris (DuBois) – Clean Pack Out – Adjacent dock	65	*Yeast/Bacteria*	100
3 – Paris (DuBois) – Clean Pack Out – Adjacent Sheet iron 2	115	*Yeast/Bacteria* *Penicillium spp.*	74 26
4 – Paris (DuBois) – Clean Pack Out – After Production – 3:05 PM	20	*Yeast/Bacteria* *NSM*	75 25
5 – Paris (DuBois) – Soil Sort – Dirty area	90	*Yeast/Bacteria* *Aspergillus niger*	94 6
6 – Paris (DuBois) – Outside Control	45	*Yeast*	100

Results

SAS air samples at 25 degrees Celsius collected February 1, 2016 at Paris (DuBois)

Location	CFU/M³	Primary Organisms	Plate count percentage
1 – Paris (DuBois) – Clean Pack Out	40	*Geotrichum sp.* *Alternaria spp.* *Yeast*	50 25 25
2 Paris (DuBois) – Clean Pack Out – Adjacent dock	65	*Geotrichum sp.* *Cladosporium sp.*	92 8
3 – Paris (DuBois) – Clean Pack Out – Adjacent Sheet iron 2	115	*Geotrichum sp.* *Penicillium spp.* *Yeast* *NSM*	30 30 30 10
4 – Paris (DuBois) – Clean Pack Out – Post Production – 3:05 PM	70	*Geotrichum sp.*	100
5 – Paris (DuBois) – Soil Sort – Dirty area	105	*Penicillium spp.* *Geotrichum sp.* *Yeast* NSM	62 19 14 5
6 – Paris (DuBois) – Outside Control	65	*Geotrichum sp.* *Cladosporium sp.* *Yeast* *NSM*	76 8 8 8

SAS air samples at 37 degrees Celsius collected February 2, 2016 at UPMC linen storage

Location	CFU/M³	Primary Organisms	Plate count percentage
1 – MUH – Room N-403.16 – Linen storage	30	*Yeast/Bacteria*	100
2 – MUH Corridor – Adjacent Room N403.16	5	*Penicillium sp.*	100
3 – MUH – Loading dock	15	*Aspergillus fumigatus*	100
4 – PUH – Room D170 – Linen storage	30	*Yeast/Bacteria*	100
5 – PUH – Room D170 – Agitate flat sheets	135	*Yeast/Bacteria* *Aspergillus niger*	96 4
6 – PUH Corridor – Adjacent Room D170	30	*Yeast/Bacteria*	100
7 – PUH – Loading dock	20	*Yeast/Bacteria* *Penicillium sp.*	75 25

SAS air samples at 25 degrees Celsius collected February 2, 2016 at UPMC linen storage

Location	CFU/M³	Primary Organisms	Plate count percentage
1 – MUH – Room N-403.16 – Linen storage	50	*Yeast /Bacteria*	100
2 – MUH Corridor – Adjacent Room N403.16	40	*Penicillium spp.* *Yeast* *Cladosporium sp.*	63 25 12
3 – MUH – Loading dock	35	*Penicillium sp.* *Aspergillus spp.* *NSM* *Rhizopus sp.*	29 29 29 13
4 – PUH – Room D170 – Linen storage	5	*Yeast*	100
5 – PUH – Room D170 – Agitate flat sheets	90	*Yeast* *NSM*	89 11
6 – PUH Corridor – Adjacent Room D170	20	*Penicillium spp.* *NSM*	75 25
7 – PUH – Loading dock	45	*Yeast* *Cladosporium spp.* *Aspergillus sp.* *Acremonium sp.* *NSM*	44 22 11 11 11

Results

Contact agar samples at 37 degrees Celsius collected February 1, 2016 at Paris (DuBois)

Location	CFU/plate	Primary Organisms	Plate count percentage
1 – Paris (DuBois) – Clean Pack Out – Concrete floor	5	*Yeast*	100
2 – Paris (DuBois) – Clean Pack Out – Concrete floor – Adjacent clean carts bound for UPMC		*No Growth*	
3 – Paris (DuBois) – Clean Pack Out – Thermal blanket	>50	*Yeast*	*
4 – Paris (DuBois) – Clean Pack Out – Cart with plastic only – Side of cart	1	*Yeast*	100
5 – Paris (DuBois) – Clean Pack Out – Cart with plastic only – Side of cart	1	*Yeast*	100

Results

Contact agar samples at 37 degrees Celsius collected February 1, 2016 at Paris (DuBois)

Location	CFU/plate	Primary Organisms	Plate count percentage
6 – Paris (DuBois) – Clean Pack Out – Cleaned cart – After wash		*No Growth*	
7 – Paris (DuBois) – Sheet Iron #4 – Bar top	2	*Aspergillus sp.* *Chaetomium sp.*	50 50
8 – Paris (DuBois) – Sheet Iron #4 – Sheet on floor (front)	9	*Yeast*	100
9 – Paris (DuBois) – Sheet Iron #4 – Concrete floor (front)	>50	*Yeast* *Penicillium sp.*	*
10 – Paris (DuBois) – Sheet Iron #4 – Conveyer belt on floor	2	*Yeast*	100
11 – Paris (DuBois) – New Dryer Room – Exterior wall	>25	*Yeast* *Chaetomium sp. (1)*	*
12 – Paris (DuBois) – Roof – AHU #6 – Side	1	*Yeast*	100
13 – Paris (DuBois) – Roof – AHU #6 – Floor	21	*Yeast* *Cladosporium spp.* *Alternaria spp.* *Rhinocladin sp.*	76 10 10 4
14 – Paris (DuBois) – Trailer #1405 – Wood bed		*No Growth*	
15 – Paris (DuBois) – Trailer #1405 – Wood side	4	*Rhizopus sp.* *Aspergillus niger* *Penicillium sp.* *Yeast*	25 25 25 25
16 – Paris (DuBois) – Soil Sort – Dirty Cart – Incoming		*No Growth*	
17 – Outside Control – Concrete sidewalk – Dock	7	*Yeast* *Chaetomium sp.*	86 14

Results

Contact agar samples at 25 degrees Celsius collected February 1, 2016 at Paris (DuBois)

Location	CFU/plate	Primary Organisms	Plate count percentage
1 – Paris (DuBois) – Clean Pack Out – Concrete floor	7	*Geotrichum sp.* *Chaetomium sp.* *Yeast* *Penicillium sp.*	29 29 29 13
2 – Paris (DuBois) – Clean Pack Out – Concrete floor – Adjacent clean carts bound for UPMC		*Rhizopus sp.*	*
3 – Paris (DuBois) – Clean Pack Out – Thermal blanket	>50	*Yeast*	*
4 – Paris (DuBois) – Clean Pack Out – Cart with plastic only – Side of cart		*No Growth*	
5 – Paris (DuBois) – Clean Pack Out – Cart with plastic only – Side of cart		*No Growth*	
6 – Paris (DuBois) – Clean Pack Out – Cleaned cart – After wash	1	*Yeast*	100
7 – Paris (DuBois) – Sheet Iron #4 – Bar top	15	*Yeast* *Cladosporium sp.* *Epicoccum sp.* *Alternaria sp.* *Chaetomium sp.* *NSM*	40 13 13 13 13 8
8 – Paris (DuBois) – Sheet Iron #4 – Sheet on floor (front)	4	*Yeast*	100
9 – Paris (DuBois) – Sheet Iron #4 – Concrete floor (front)	>100	*Yeast* *Penicillium spp.* *NSM*	*
– 10 Paris (DuBois) – Sheet Iron #4 – Conveyer belt on floor	2	*Yeast*	100
11 – Paris (DuBois) – New Dryer Room – Exterior wall	19	*Cladosporium spp.* *Yeast* *Penicillium spp.* *Chaetomium spp.* *NSM*	32 26 21 16 5

Results

Contact agar samples at 25 degrees Celsius collected February 1, 2016 at Paris (DuBois)

Location	CFU/plate	Primary Organisms	Plate count percentage
12 – Paris (DuBois) – Roof – AHU #6 – Side	14	*Yeast* *Alternaria sp.* *Cladosporium sp.*	71 21 8
13 – Paris (DuBois) – Roof – AHU #6 – Floor	34	*Epicoccum sp.* *Alternaria spp.* *Cladosporium spp.* *Yeast* *NSM* *Aspergillus niger*	53 12 12 12 9 2
14 – Paris (DuBois) – Trailer #1405 – Wood bed		*No Growth*	
15 – Paris (DuBois) – Trailer #1405 – Wood side	26	*Curvularia sp.* *Cladosporium spp.* *Alternaria spp.*	50 38 12
16 – Paris (DuBois) – Soil Sort – Dirty Cart – Incoming		*No Growth*	
17 – Outside Control – Concrete sidewalk – Dock	11	*Yeast* *NSM* *Penicillium sp.* *Alternaria sp.*	45 27 18 9

Results

Contact agar samples at 37 degrees Celsius collected February 2, 2016 at UPMC Linen

Location	CFU/plate	Primary Organisms	Plate count percentage
1 – MUH Room N-403.16 – Flat sheet cart – Wet sheet	1	*Yeast*	100
2 – MUH Room N-403.16 – Flat sheet cart – Wet sheet	1	*Yeast*	100
3 – MUH Room N-403.16 – Flat sheet cart – Plastic liner	1	*Yeast*	100
4 – MUH Room N-403.16 – Flat sheet cart – Cart bottom	1	*Yeast*	100
5 – MUH Loading Dock – Concrete floor	17	*Yeast* *Aspergillus sp.*	94 6
6 – PUH Room D170 – Flat sheet cart – Wet sheets		*No Growth*	

Results

Contact agar samples at 37 degrees Celsius collected February 2, 2016 at UPMC Linen

Location	CFU/plate	Primary Organisms	Plate count percentage
7 – PUH Room D170 – Flat sheet cart – Wet sheets	4	*Yeast*	100
8 – PUH Room D170 – Cart 1656 – Cart side		*No Growth*	
9 – PUH Room D170 – Cart 1341 Cart side	1	*Yeast*	100
10 – PUH Loading Dock – Concrete floor	>50	*Yeast* *Rhizopus sp.*	*

Results

Contact agar samples at 25 degrees Celsius collected February 2, 2016 at UPMC Linen

Location	CFU/plate	Primary Organisms	Plate count percentage
1 – MUH Room N-403.16 – Flat sheet cart – Wet sheet		No Growth	
2 – MUH Room N-403.16 – Flat sheet cart – Wet sheet		No Growth	
3 – MUH Room N-403.16 – Flat sheet cart – Plastic liner	4	Yeast	100
4 – MUH Room N-403.16 – Flat sheet cart – Cart bottom		No Growth	
5 – MUH Loading Dock – Concrete floor	17	Penicillium spp. Cladosporium spp. NSM Yeast	44 31 12 12
6 – PUH Room D170 – Flat sheet cart – Wet sheets		No Growth	
7 – PUH Room D170 – Flat sheet cart – Wet sheets		No Growth	
8 – PUH Room D170 – Cart 1656 – Cart side	2	Penicillium sp. NSM	50 50
9 – PUH Room D170 – Cart 1341 Cart side		No Growth	
10 – PUH Loading Dock – Concrete floor		Cladosporium spp. (8) Rhizopus sp.	*

Results

Tease tape samples collected February 1, 2016 at Paris (DuBois)

Location	Primary Organisms	Fungal Loading
T-1 – Roof area – Adjacent dryer exhaust and intake – Lint build-up	Mucor sp. Rhizopus sp.	Heavy
T-2 – Sheet iron area – Fiberglass pipe insulation (exterior) – Water stained	None Identified	

Results

Bulk samples at 37 degrees Celsius collected February 1, 2016 at Paris (DuBois)

Location	Primary Organisms	Fungal Loading
B-1 – Roof area – Adjacent dryer exhaust and intake – Lint build-up	Yeast (TNTC) Aspergillus spp. Rhizopus sp.	Heavy
B-2 – Interior Dryers 7,8,9,10 – Lint	Yeast Aspergillus spp. Aspergillus niger	Moderate

Bulk samples at 25 degrees Celsius collected February 1, 2016 at Paris (DuBois)

Location	Primary Organisms	Fungal Loading
B-1 – Roof area – Adjacent dryer exhaust and intake – Lint build-up	Yeast (TNTC) Mucor sp. Rhizopus sp.	Heavy
B-2 – Dryers 7,8,9,10 – Lint	Yeast Aspergillus niger Penicillium spp.	Light

Casella vacuum samples at 37 degrees Celsius collected February 5, 2016 in Environmental Chamber

Location	Primary Organisms
C-1 – Shirt and Pant – Paris (DuBois) – Worn by investigator	*Yeast (TNTC)* *Aspergillus spp.* *Rhizopus sp.*
C-2 MUH Room N-403.16 – Flat sheet – Wet	*Yeast (TNTC)*

Casella vacuum samples at 25 degrees Celsius collected February 5, 2016 in Environmental Chamber

Location	Primary Organisms
C-1 – Shirt and Pant – Paris (DuBois) – Worn by investigator	*Yeast* *Rhizopus sp.* *Cladosporium spp.*
C-2 MUH Room N-403.16 – Flat sheet – Wet	*Yeast* *Cladosporium spp.* *Mucor plumbeus* *NSM* *Rhizopus sp.*

Definitions:

* - Overgrowth prevented precise determination of plate count percentage
TNTC – Too Numerous To Count
No Growth – No growth was observed on the plate at incubation term
CFU - Colony forming unit - a distinct separate colony growing on a culture plate
sp. - Member of a genus
spp. - Members of a genus
CFU/ M^3 – colony forming units per cubic meter
CFU/plate - colony forming units per plate
Plate count - percent of total organisms identified
MEA – Malt Extract agar
NSM – non-sporulating mycelia

Air and Surface Sampling:

Samples collected on February 1, 2016 indoor SAS air samples had moderate fungal growth. At 37 degrees Celsius, the concentration on the indoor air samples is higher than the outdoor samples. Samples #2 and #3 were analyzed to contain higher concentrations of *Yeast/Bacteria* which are most likely caused by the high volume of human activity in those areas during sample collection. At 25 degrees Celsius, the concentration on the indoor air samples are higher than the outdoor air samples. Samples #2, #3, and #4 contained concentrations of *Geotrichum sp.* which was also found outside during sample collection.

Samples collected on February 2, 2016 indoor SAS air samples had light fungal growth. At 37 degrees Celsius, the concentration on the indoor air samples is higher than outdoor air samples. Samples #1, #4, and #6 contained higher concentrations of *Yeast/Bacteria* which are most likely caused by the high volume of human activity in those areas during sample collection. At 25 degrees Celsius, the concentration on the indoor air samples is higher than the outdoor air samples. Samples #1 and #5 contained higher concentrations of *Yeast/Bacteria* which are most likely caused by the high volume of human activity in those areas during sample collection. Sample #5 contained concentrations of *Penicillium spp.* which was also found outside during sample collection.

Samples collected on February 1, 2016, fungal growth varied from light to moderate on the contact agar samples. At 37 degrees Celsius, sample #15 contained *Rhizopus sp.* which is an

organism of concern in this investigation and could be caused by inadequate house cleaning techniques and/or a local source. At 25 degrees Celsius, sample #2 contained *Rhizopus sp.* which is organisms of concern in this investigation and could be caused by inadequate house cleaning techniques and/or a local source.

Samples collected on February 2, 2016, fungal growth was light on the contact agar samples.

Isolates were obtained from organisms recovered from this investigation.

On February 1, 2016 tease tape samples collected from the Paris laundry roof indicated heavy fungal growth (*Mucor sp.* and *Rhizopus spp.*) on the lint pile adjacent to the dryer exhaust/intakes. Tease tape samples collected from the Sheet iron area fiberglass pipe insulation did not indicate fungal growth in any of the samples.

On February 2, 2016 linen (flat sheet) samples were collected from the MUH laundry storage area from the middle of a delivered cart. The samples were vacuumed using a Casella in a class 0 clean room and the air samples were impacted onto media. The vacuumed samples indicated heavy fungal growth (*Mucor sp.* and *Rhizopus spp.*) on the wet sheets collected from the UPMC laundry carts.

Particle Counts:

Particle counts were collected using a Fluke 983 optical particle counter in several areas of Paris and UPMC. The particles counted ranged from 0.3 to 10 micrometers (μ) in diameter; primary focus was on greater than (>) .5μ particle size for this investigation. The range of particle counts in the above mentioned size range on the interior of the Paris facility were much higher inside the facility than outside; most likely due to the building negative pressure differential, the amount of human activity, process equipment in use during sample collection and observed dust on infrastructure floors and walls.

The range of particle counts in the above mentioned size range on the interior of the UPMC MUH and PUH laundry storage areas were 60-78% lower than outside. The particle count is a surrogate analysis for filtration system efficacy and potential source detection. Particle counts were also collected outside for control purposes. Complete particle count data is located in Table 1 of this report.

Pressure Meter:

Pressure readings were collected with a Digital Pressure Gauge from The Energy Conservatory, Minneapolis, MN (Note: 250 Pascals per 1.0 inch water gauge) throughout the Paris DuBois laundry facility and UPMC linen storage areas. The Paris DuBois facility tested very negative pressure differential (-44 Pa airflow into laundry from outside). The UPMC MUH and PUH laundry storage area tested had airflow out of the laundry room for MUH and neutral to slightly negative for PUH. The Complete pressure differential data is located in Table 2 of this report.

Paris Laundry Facility (DuBois) Review Process

A meeting and site tour with Paris DuBois staff including management and facility staff was held to review existing policies, procedures, process equipment, personnel training, delivery vehicles/carts, disinfection processes, chemicals, and monitoring data that have been implemented to date at the Paris Laundry (DuBois) facility. Paris Laundry (DuBois) has implemented a number of HLAC (Hospital Laundry Accreditation Council) policies and procedures which upon review have provided Paris DuBois the framework for an HLAC accredited healthcare laundry facility. Summary items from the meeting and site tour are listed below:

- The Paris laundry has three plants that serve 180 customers including 22 UMPC hospitals. The DuBois facility annually process 44 million pounds of laundry and has a total plant capacity of 50 million pounds. The plant opened in 2009 and has had 2 major renovations; one in 2011 and another in 2014. The plant runs two shifts that are approximately 10 hours in duration for 5 days (Monday-Friday). After the second shift is completed, three blow down fans operate from approximately 12:30 to 4:30 AM. Saturday the plant runs one shift. Sunday the plant is scheduled to be maintained and cleaned to include manual lifts with air hoses to clean the upper section of the plant. In addition, three ceiling mounted fans blow down lint/debris continuously during cleaning operations.

- The plant is conditioned (heated and cooled) by 10 - 20 ton roof top units that run continuously at 60 Hz (maximum) fan speed which by design is equivalent to 10 air changes per hour. The units are filtered by Merv 9 (<50% at 1-3μ sized particles) efficient paper filters that are changed monthly regardless of filter pressure drop data. During the summer, the plant is conditioned to 80 °Fahrenheit.

- The laundry process for Paris laundry was described as follows: All laundry is considered "isolation" when brought into the facility in recycled plastic bags (2-3 days). The laundry is sorted by customer then blended together to be washed "like with like". Laundry is dried by temp linen (heat), then cooled by using "unfiltered" outside air brought in from the roof. After drying, laundry is brought to the clean pack out area for ironing and folding to be finally stacked on transport carts.

- The Paris staff provided a tour to simulate the movement of laundry through the plant from soiled sort through dry fold. The plant was noted to contain state of the art laundry processing equipment with an automated chemical distribution system. The tour also included the facilities maintenance shop, mechanical room, and roof. The plant appears to be efficient in operations and plant management staff were very generous in providing information and very open to discussion and suggestions.

- The delivery truck/trailer process are used by Paris to transport laundry to UPMC (approximately 2.5-3 hours) was reviewed. After the soiled laundry is unloaded into the soiled sort area, the trucks/trailers are dry swept and the bed/floors are sprayed with a disinfectant. The truck/trailers are then brought to the front loading dock adjacent to the clean pack out area and loaded with clean carted laundry for delivery.

- The cart management process used by Paris to clean carts was reviewed. The carts are brought from the soiled sort area directly to a cart wash tunnel. The automated cart wash

cleans three carts at a time that connects to the clean pack out area of the plant. A bin liner was added last summer to complement the bin cover. In addition, Paris provides UPMC with "exchange carts" for ICU. The carts are UPMC owned steel racks that are delivered from the UPMC docks directly to the floor where laundry is to be used.

Paris Laundry Facility (DuBois) Observations

- The training programs are well documented for employees in all aspects of plant operations. The HLAC requirements are also well documented.

- The plant (on the day of this evaluation) was observed to have lint accumulation at various locations: on the floor where irons were processing flat linen, on the walls at entrances, and around the tunnel washers. Lint was also observed on mechanical columns and other structural supports of the building. Equipment used to clean floors was observed to be very heavy with lint and dirt. The plant was cleaned the day prior to this inspection.

- Three blow down fans were observed in the plant proper; these fans are used intermittently.

- The plant building when checked with a DG 500 digital pressure gauge was observed to have -.16 inches negative pressure with airflow into the plant from the outside. This means the airflow into the plant through openings can exceed greater than 1500 linear feet per minute through openings to the exterior. It was observed that there was considerable turbulence around the entrances (loading dock doors and garage doors) to the building and specifically in the clean pack out area where there was observed clean uncovered laundry open to the vicinity.

- While precautions were taken to place sheets on the floor to protect clean laundry, it was observed that those pieces of protective laundry were soiled.

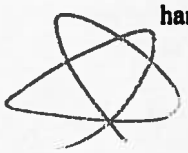
- Water damaged cardboard was observed in the maintenance area of the plant.

- The cart bins used to transport clean laundry were observed to have some bins that were wet inside.

- The trucks/trailers used to transport clean laundry were inspected with a UV light and considerable dust was observed on the interior walls. Also, some truck/trailers were observed to have wood interiors. Cleaning is accomplished via dry sweeping followed by a pressurized system. Doors are closed after cleaning.

- The roof of the plant had considerable accumulated lint. The lint is located adjacent to discharge and intake air scoops (vents) which were in close proximity to each other. The roof is periodically cleaned by dry sweeping and bagging material.

- Unfiltered air is taken into the driers from the roof top vents to cool down the load before handling.



UPMC Linen Storage Review Process

- A meeting and site tour with the UPMC Supply Chain Management staff was held to review existing clean laundry delivery processes to loading docks and storage rooms at UPMC (MUH and PUH). Summary items from the meeting and site tour are listed below:

- On the day of this evaluation, pressure differential between the laundry storage areas and the adjacent hospital areas was found to be from the laundry storage rooms into the corridors. Particle counts indicated a significant reduction of .5μ sized particles in the laundry storage rooms compared to outside controls.

- On the day of this evaluation, the MUH and PUH laundry storage rooms were visually clean.

- Clean laundry was wrapped in plastic and covered. Two carts with clean laundry were observed to have water against the plastic cart. The laundry inside the protective plastic was wet to the touch. A Tramex wet test meter registered 18% moisture content. The relative humidity and temperature of that laundry was 82% RH and 74 °Fahrenheit respectively and a 69 ° Fahrenheit dew point. Note: moisture levels of the dried laundry bound for UPMC was checked at Paris (clean pack out) and found to have 0 moisture content. However, this is not the same as relative humidity of the air around the laundry.

Recommendations:

- The cleaning procedures of the Paris DuBois laundry facility should be consistent with the HLAC cleaning procedures. Several areas were noted to have excessive lint build-up throughout the facility. Dust management in the areas where patient ready items are stored need to be protected and cleaned by removing visible dust and debris. Lint build-up could also be reduced by increasing frequency (vs. continuous) blow down fan operation and increasing the number of fans for blow down based on laundry engineering evaluation. Blow down fans should be added based on visual observation of cleaning effectiveness. No visible dust should be observed.

- On the day of this evaluation, the Pressure differential is -44 Pa (approximately 1000-2000 ft/minute of outside air) into the building from outside. This very large negative pressure should be reviewed with laundry engineering to assure exterior dust/debris from exterior areas isn't coming into the laundry clean pack out area.

- Universal moisture detection methods in laundry from Paris to UPMC should be developed to ensure that moisture levels are normal and consistent for all laundry in each cart delivered to UPMC. These recommendations are valid only if the carts and laundry are completely dry.

    1. Textiles must be wrapped in fluid resistant bundles or placed as unwrapped bundles into fluid resistant covered carts or hampers. Wrapping material should be plastic or other material that will protect the textile from environmental contamination per HLAC Accreditation Standards 2016 edition.

2. Unwrapped textiles should be covered at all times until delivered to designated locations. Carts that do not have a solid bottom (i.e. drain holes) must be lined with a hygienically clean barrier to prevent environmental contamination prior to placing textiles inside per HLAC Accreditation Standards 2016 Edition.
3. Carts should be washed in a more comprehensive manner with increased water pressure and increased final inspection that focused on cleaning and drying.
4. Linen packaging should include decreasing the bulk volume of linen per cart and consideration of universal exchange racks as a long-term goal.

- An engineering design concept should be developed for lint management to include: routine roof inspection of lint build-up and cleaning frequency. There should be no drifting of lint on the roof. Cleaning should be conducted on a regular basis to prevent lint build-up.

    1. Future design issues for consideration: roof design for lint management to avoid accumulation.

    2. Degrees of separation between air intake and discharge air from the plant for the dryers. Cool down air intake management should be developed to prevent unnecessary contamination of linen.

    3. Physical separation of dirty and clean areas within the laundry facility should be addressed. RYTEK doors are a good example of physical barriers between spaces needing separation.

- Delivery trucks/trailers should be routinely inspected and cleaned. Wood lined trailers should be cleaned and painted with a washable anti-microbial paint. General cleaning should include thorough (top, sides, and floor) and consistent cleaning with appropriate chemicals.

- Consider uniforms for Paris laundry staff which should be consistent and up to the same standards as counterpart UPMC laundry staff.

- Cross facility site visits to inspect for infection control best practices should be conducted at other Paris laundry facilities.

<u>Laundry sampling protocol:</u>

- Air and surface sampling protocols are under consideration to include surface sampling of product linen, plant sanitation inspections with surface sampling, pressure monitoring for locations in Paris and UPMC.

- The initial sampling should focus on source management of contaminated lint. The frequency of sampling should follow a plan that is focused on contaminated source mitigation.

If you have questions please feel free to contact.

Written By:

Andrew Streifel

Written By:

Michael Buck

ENCL: Tables of Particle Counts and Pressure Readings at Paris and UPMC