# FINAL REPORT- Part 1 & Part 2

| | |
|---|---|
| Customer Name | Shaw Industries Group Inc |
| Customer Address | 1010 VD Parrott Jr Pkwy,<br>Dalton, GA 10722, USA |
| Contact | Paul Murray |
| Sample Description | Carpet |
| Number of Samples | 9 |
| Commencement Date | November, 2010 |
| Project Number | ASCR001993 |
| Report Date | April 2012 |

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# Test Item Description:

The following samples were received from Shaw Industries Group Inc:

| Sample No. | Flooring type | Description |
|---|---|---|
| Hard Floor 1 | Hard Floor | Epic Hardwood, style: Symphonic 5” color #774 Red Oak Natural |
| Carpet 1 | Carpet | Nylon 6 |
| Carpet 2 | Carpet | Nylon 6 |
| Carpet 3 | Carpet | Unbranded N6 Broadloom, ‘Full of Life’ style #52N09. Face weight ~25oz/yd |
| Carpet 4 | Carpet | ANSO Broadloom (medium pile height): Style: Anso nylon textured cut pile (low, tight and dense construction) called Sandy Hollow I, style # Q4273. Face weight is approximately 40 oz./yd. |
| Carpet 5 | Carpet | ANSO Broadloom (high/shaggy pile height): Style: Anso nylon cut pile in a loose, high pile (shag) construction called Design Statement, style # Q3978. Face weight is approximately 50 oz./yd. |
| Carpet 6 | Carpet | BCF PET Broadloom: Style: QS050, High twist, high pile 38 oz. |
| Carpet 7 | Carpet | Unbranded N6 Broadloom, ‘Full of Life’ style #52N09. Face weight ~25oz/yd. WITHOUT R2X |
| Carpet 8 | Carpet | Unbranded N6 Broadloom, ‘Full of Life’ style #52N09. Face weight ~25oz/yd. WITH R2X |

# Introduction:

Many medical, educational and patient bodies have arrived at the general conclusion that carpets in the home represent a health hazard to individuals and in particular those with asthma and allergic diseases. The body of work to be performed by ASC intends to provide to Shaw the definitive scientific data to be able to evaluate this standpoint.

As has been discussed with Shaw, those bodies mentioned above, and the scientific community at large, would require incontrovertible, basic scientific and clinical evidence that properly maintained carpeting in the home of an asthmatic/allergic individual does not represent a risk factor for disease.

This requires that the testing performed is of the highest quality, particularly where test performance, analysis and interpretation are concerned. The commissioning of an environmental test chamber plays a central role in this. The chamber that has been built at ASC's test facilities is to American Society of Testing and Materials (ASTM) specifications with upgrades to allow for complete control over all environmental parameters.

Flooring coverings were received from Shaw Industries Group Inc. in 2010 and 2011. Samples were stored as delivered until required for testing. Carpets were cut to size, and prior to installation and testing all carpets were vacuumed as per IEC60312, i.e. to ensure an excess of fibre did not remain on the carpet, they were vacuumed until the fibre being removed was $<0.1 g/m^2$.

A further element was agreed with Shaw following review of all data obtained from study of the original six carpets. Given the presence of R2X treatment on some of the carpets, it was felt necessary to determine whether this modality was impacting particle retention by individual carpets. An addendum to the study was agreed to address this question (see Carpets 7 and 8 above).

# Procedure:

### Test Chamber

Each of the nine floor types (Hard Floor 1 and carpets 1-8) were individually tested in the 28.5m$^3$ Environmental Test Chamber which had a floor area of 11.4 m$^2$. Each floor type was laid so it completely covered the chamber floor. Test Protocols Part I (Allergen Testing) and Part II (Bioaerosol Testing) were conducted at 21°C ±3°C, 55% ±5% relative humidity (RH) with an air exchange rate of 1.0/hour.

The flooring was allowed to equilibrate overnight under these conditions before testing commenced. During natural decay, room disturbance and cleaning, serial airborne particle counts, surface and airborne allergen/bioaerosol measurements were undertaken for each floor type. See Part I and Part II Test Protocols below.

## Part I: Allergen Testing

Allergen Test dust (ATD) of known composition, containing Cat allergen; *Fel d1*, House Dust Mite Allergen; *Der p1* and Pollen; *Phl p5* (Code TD104) was introduced into the chamber via an entry port using compressed air @ >50psi. The ATD was distributed using a mounted ceiling fan. 12g of ATD was introduced at each of 4 introductions over 2 days giving a final ATD concentration of 4g/m$^2$. See Part I Test Protocol below for the testing outline.

### Sampling Methodologies

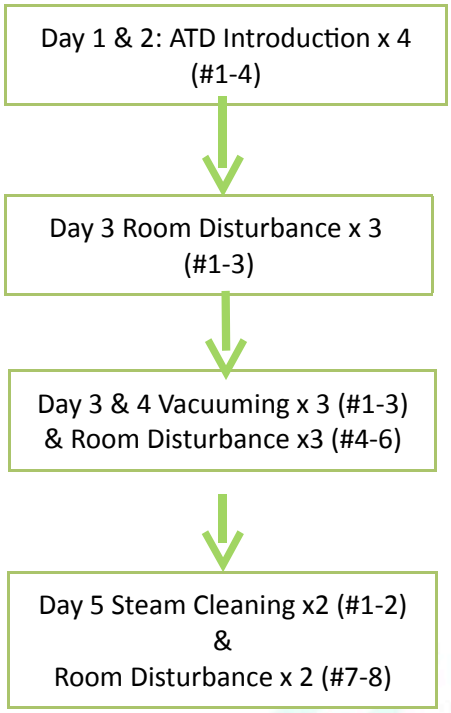
Airborne particles ranging in size from 0.3 to 3$^{ss}$m were counted using a CLIMET laser diffraction particle counter. Background particle counts were taken at the start of each day. Particle counts were then taken at each stage of the Part 1 Test Protocol shown below.

Surface allergen samples (0.25m$^2$) were taken in duplicate using mitest$^{TM}$ filters after each stage of the Part 1 Test Protocol. Samples were analysed for *Der p1*, *Fel d1* and *Phl p5* by allergen-specific ELISA.

Airborne allergen samples were collected onto filter cassettes (at 0.75m and 1.5m heights) using Side Kick pumps (2L/min) during each stage of the Part 1 Test Protocol. Samples were analysed for *Der p1* and *Fel d1* by augmented ELISA.

### Part I Test Protocol

The testing proceeded in the following manner:




Appendix 1A is a quick reference guide to show the performance of each carpet at each testing stage. Part I test results are outlined in Appendix I of this report for Hard Floor and Carpets 1-6. Part I test results are outlined in Appendix III of this report for Carpets 7&8. The results relate to particle, airborne and surface allergen data.

## Part II: Bioaerosol Testing:

After Part I testing was completed, the eight carpets were steam cleaned, allowed to dry and stored until required. An identical hard floor was supplied by Shaw for this part of the project, as it was not possible to re-use the initial hard floor.

For Bioaerosol Testing, carpets were laid in the test chamber as before and the chamber was operated under the same conditions as for part 1 testing. During natural decay, room disturbance and cleaning, serial airborne particle counts, surface and airborne bioaerosol measurements were undertaken for each floor type.

See Part II Test Protocol below for the testing outline.

## Bioaerosols

### 1. Bacteria

*Staphylococcus epidermidis*, a universal human skin contaminant, was aerosolized into the chamber via a Collision Jet nebuliser, attached to a compressor set at 20psi, which was located outside the chamber. After 20min, aerosolisation of the bacteria was complete.

### 2. Viruses

MS2 coliphage, a surrogate for human respiratory viruses, was aerosolized into the chamber via a Collision Jet nebuliser, attached to a compressor set at 20psi, which was located outside the chamber. After 20min, aerosolisation of the virus was complete.

### 3. Fungi

Dry *Aspergillus niger* spores, a common airborne fungus, mixed with ISO Fine Dust were aerosolized into the chamber under >50psi pressure.

The bioaerosols were distributed in the chamber using a mounted ceiling fan.

## Sampling Methodologies

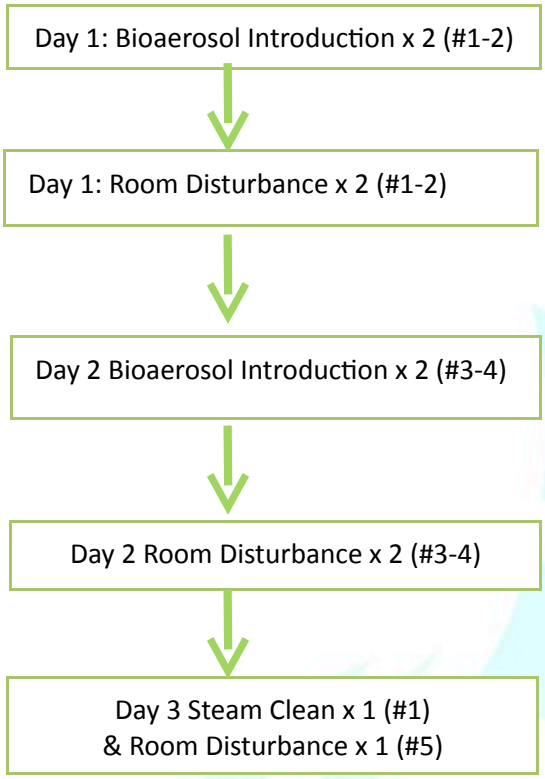
Particle counting, using a laser diffraction particle counter, was performed at all stages of testing, as outlined in Part II Test Protocol below. Particle counts in the size range of 0.3 to 3$^{ss}$m were recorded. Background counts were taken at the start of each day prior to bioaerosol introduction and room disturbance.

Air samples were collected for 5min duration onto a biostage impactor, operated under vacuum at 28.5L/min at each of the test stages of the Part II Test Protocol below. The air samples were collected onto 2 selective agars specifically for the growth of *A.niger* and *S.epidermidis*.

Air samples were collected into sample buffer with an SKC Biosampler, operated under vacuum at 12.5L/min, and analysed for MS2 coliphage. Sampling duration was 30min per SKC sample.

### Part II Test Protocol

The testing proceeded in the following manner:




Appendix IIA is a quick reference guide to show the performance of each carpet at each testing stage

Part II test results are outlined in Appendix II of this report for Hard Floor 1 and Carpets 1-6.

Part II test results are outlined in Appendix IV of this report for Carpets 7 & 8. The results relate to particle counts, surface and airborne bioaerosol recovery data.

# Part I Conclusion (Carpets 1-6)- ATD

**Test dust introduction**

- Particle sizes relevant in an allergen bearing sense (1$^{ss}$m and >3.0$^{2ss}$m) became airborne to the greatest extent on Hard Floor 1, they became airborne in the carpet samples to a significantly lesser extent
- Carpet 3 consistently showed the lowest levels of particles in the air
- Carpets 4-6 provided difficulty in recovery of surface allergen, probably associated with pile height dimension

**Room disturbance**

- Airborne allergen measurements were greater during room disturbance for Hard Floor 1, Carpets 1, 2 and 4 at particle sizes of 1ssm and >3.02ssm
- Surface allergen appeared to be driven into Carpet 3 following room disturbance, hence lower levels of airborne allergen were detected
- Carpet 4 and 6 released allergen into the air following room disturbance

**Vacuuming and Room Disturbance**

- Vacuuming exaggerated the differences observed between airborne allergen levels for hard floor versus carpet 3, in particular
- Successive vacuuming brought particle counts down to almost baseline levels for the hard floor
- The same trend was seen for the Carpets, but to a lesser extent
- Carpet 3 showed increasing amounts of surface allergen as vacuuming progressed, which was likely to be due to allergen particles previously 'driven in,' being slowly released
- Vacuuming appeared to be effective at removing surface allergen from Carpets 4-6.

**Steam Cleaning and Room Disturbance**

- The pressure of steam applied to the carpets resulted in a peak in particle counts for all carpets tested, with counts remaining elevated for Carpet 2, 4 and 6
- Steam Cleaning was most effective on Carpets 1, 3 and 5 and least effective on Carpet 2
- Steam cleaning appeared to be an effective addition to vacuum cleaning in terms of allergen removal

# Part II Conclusion- (Carpets 1-6)- Bioaerosols

**Bioaerosol Introduction and Room Disturbances**

- There was no appreciable difference between particle counts associated with bioaerosol introduction for any of the floorings. This finding is unsurprising in view of particle sizes.
- Room disturbance does show some differences for hard floor and certain carpets, again hard floor is greatest followed by carpet 1, with carpets 5, 2 and 3 being lowest.

**Airborne Microorganisms**

- There is no evidence that room disturbance-associated airborne microorganism levels are greater for carpets than for hard floor. Indeed some carpets appear to be associated with lower levels under such circumstances.

# Conclusion -Carpets 7 & 8

**Allergen Test Dust (ATD) Introduction**:

- Any differences observed between Carpet 7 (without R2X) and Carpet 8 (with R2X) were not significant.

**Room Disturbance**

- Once again 'Carpet 3' gives rise to very low particle counts during and after room disturbance. This is evident with and without R2X treatment.

**Vacuuming and Room Disturbance**

- During vacuuming, the carpet without R2X (carpet 7) performed even better than that with R2X (carpet 8) on the first 2 vacuuming procedures.
- Carpet 8 with R2X, was better on the third vacuuming procedure.
- The initial rise in small particle coinciding with the vacuum cleaner being turned on is likely to be motor emissions.
- The data for room disturbance is consistently very good with and without R2X.
- These observations also apply to steam cleaning.

**Surface and Airborne Allergen**

- Surface allergen was very low for both carpets 7 and 8 after vacuuming and steam cleaning. Both procedures are highly effective with and without R2X.
- Airborne allergen is low for both carpets for up to 2 hours after ATD introduction and also following room disturbance, vacuuming and steam cleaning.

In summary, Carpet 3, (100% Nylon, medium pile height, broadloom) is once again highly effective at trapping allergen particles and is associated with low levels of exposure via the airborne route. It also appears that vacuuming and steam cleaning have a significant effect. R2X treatment does not appear to be the reason why this carpet functions so well. Bioaerosol data (Part II) further confirms the absence of a consistent R2X effect.

# Overall Conclusion

Our chamber studies indicate that different floor coverings have a significant impact on airborne particle concentration. In general, airborne particle concentrations were lower with carpet as opposed to the hard floor. This difference was also shown to be dependent on the ability of the carpets to trap and retain particles from the air. The pile height and carpet fibre composition seemed to influence the particle retention capacity of the carpets. The possibility that there are other physical factors e.g. charge will need to be considered.

Carpet 3, a 100% nylon medium pile height broadloom carpet, consistently performed best in terms of low levels of airborne allergen and bioaerosol detected throughout the study. This carpet acted as a reservoir for allergen resulting in increased surface allergen levels, yet reduced airborne exposures during room disturbance. Airborne allergen levels also remained low for carpet 3 during vacuuming and steam cleaning. This particle retention effect was mirrored to an extent with bioaerosols in the case of carpet 3.

The data for Carpet 3 provides the possibility of submitting a provisional standard to the Asthma and Allergy Foundation of America (AAFA) relating to the possibility of particular carpet designs being certifiable as asthma & allergy friendly™. Prior to such a submission, it will be necessary to demonstrate that such carpets can be effectively cleaned, thereby removing the dust reservoir which has accumulated over time.

Report compiled by:

| | |
|---|---|
| Angela Southey, PhD | Maire Fox MSc |
| Technical Manager | Laboratory Manager |

# Appendix I-A: Quick Reference Tables for Part I

**Legend:**

| | |
|---|---|
| | GOOD PERFORMANCE |
| | POOR PERFORMANCE |
| | AVERAGE PERFORMANCE |

**Particle Counts**:

| | Test Dust Introduction | Room Disturbance | Vacuuming & Room Disturbance | Steam Cleaning & Room Disturbance |
|---|---|---|---|---|
| Hard Floor | | | | |
| Carpet 1 | | | | |
| Carpet 2 | | | | |
| Carpet 3 | | | | |
| Carpet 4 | | | | |
| Carpet 5 | | | | |
| Carpet 6 | | | | |

**Surface Allergen**:

| | Test Dust Introduction | Room Disturbance | Vacuuming & Room Disturbance | Steam Cleaning & Room Disturbance |
|---|---|---|---|---|
| Hard Floor | N/A | N/A | | |
| Carpet 1 | | | | |
| Carpet 2 | | | | |
| Carpet 3 | | | | |
| Carpet 4 | | | | |
| Carpet 5 | | | | |
| Carpet 6 | | | | |

**Airborne Allergen**

| | Test Dust Introduction | Room Disturbance | Vacuuming & Room Disturbance | Steam Cleaning & Room Disturbance |
|---|---|---|---|---|
| Hard Floor | | | | |
| Carpet 1 | | | | |
| Carpet 2 | | | | |
| Carpet 3 | | | | |
| Carpet 4 | | | | |
| Carpet 5 | | | | |
| Carpet 6 | | | | |

# Appendix I-B: Part I Particle Count Graphs

Hard Floor 1

Carpets 1-6

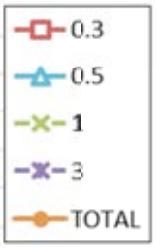
**Legends**

Fel d 1 – cat allergen

Der p 1 – house dust mite allergen

Phl p 5 – Timothy grass pollen

Particle sizes (µm):




**Axes**

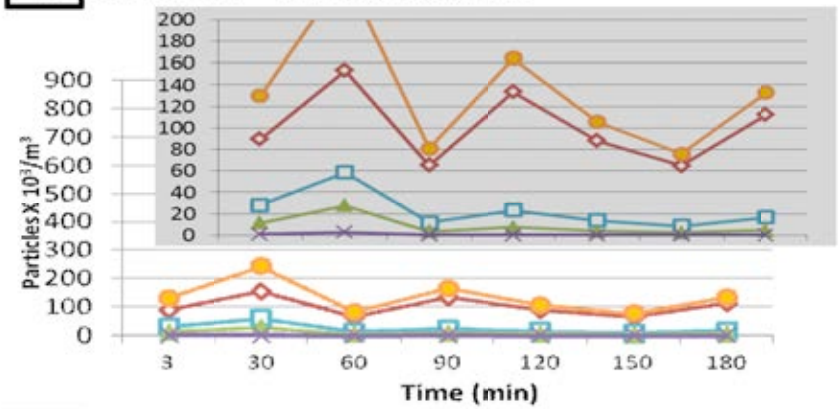
**IMPORTANT:** All Particle count data (per $m^3$) is divided by $10^3$ for the purposes of representation. Therefore, the actual numerical figure is 1000 times that displayed on the graph.

Graphs 72-99: Duplicate graphs with 2 different scales (2000 $x10^3$ particles/$m^3$ and 12000$x10^3$ particles/$m^3$) are shown for each carpet for clarity.

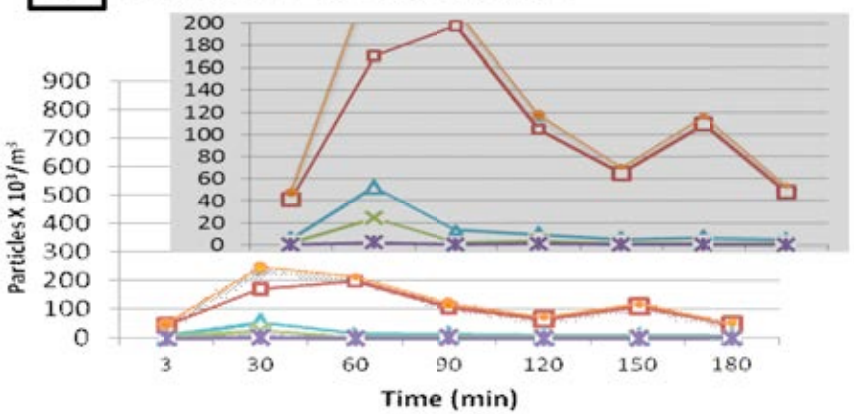
**Note:**

The bold red arrow on Graphs 84 and 86 (→), located to the left of the y-axis indicates the maximum particle count level for the steam cleaner running in a room with no ATD and no carpet.

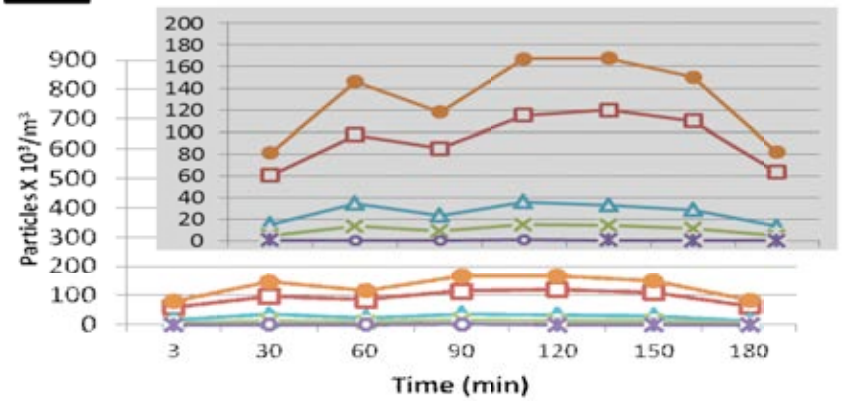
1 Hard Floor 1 – ATD Introduction 1



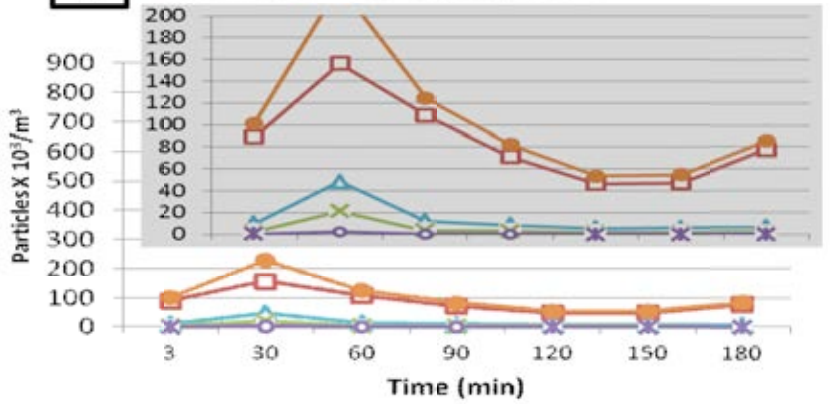

2 Hard Floor 1 – ATD Introduction 2




3 Hard Floor 1 – ATD Introduction 3




4 Hard Floor 1 – ATD Introduction 4



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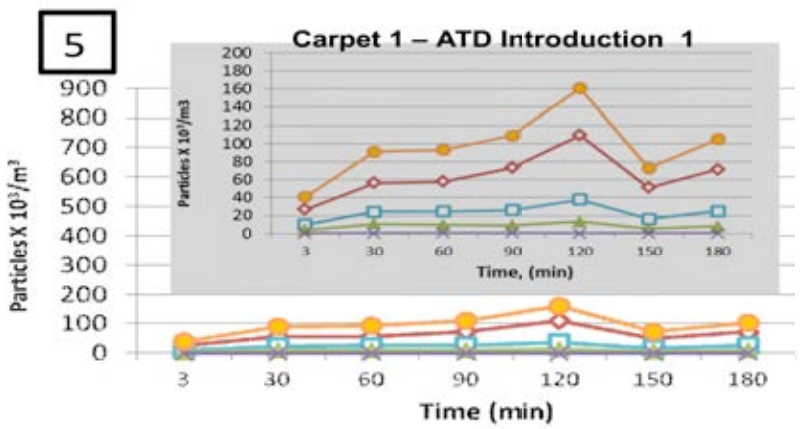
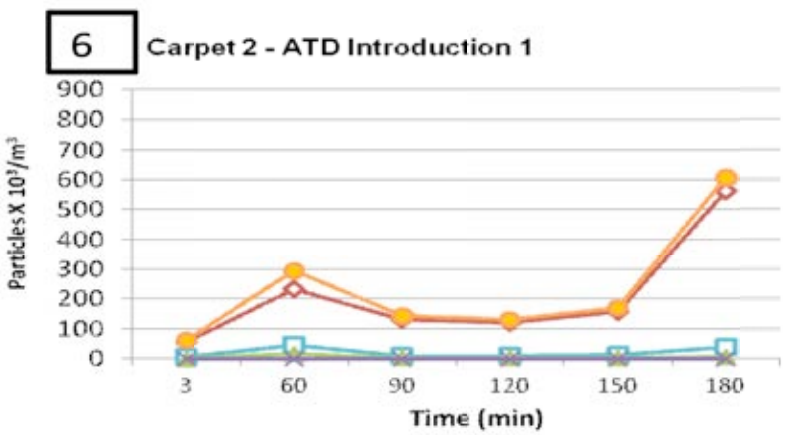
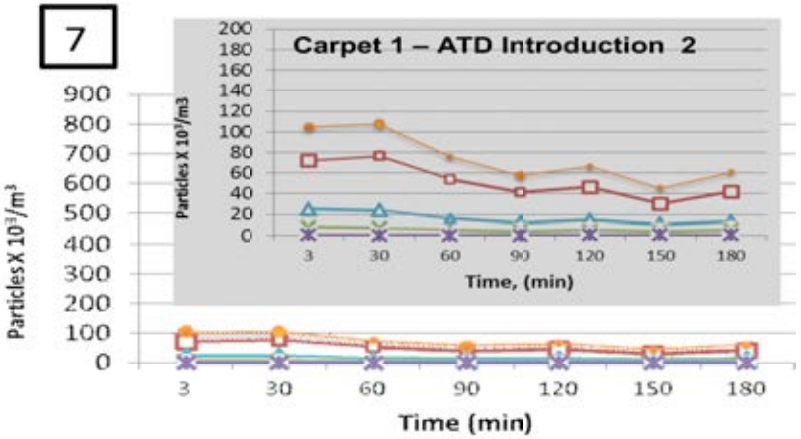

Carpet 1 – ATD Introduction 1
Particles X 10³/m³
Time (min)
Time, (min)

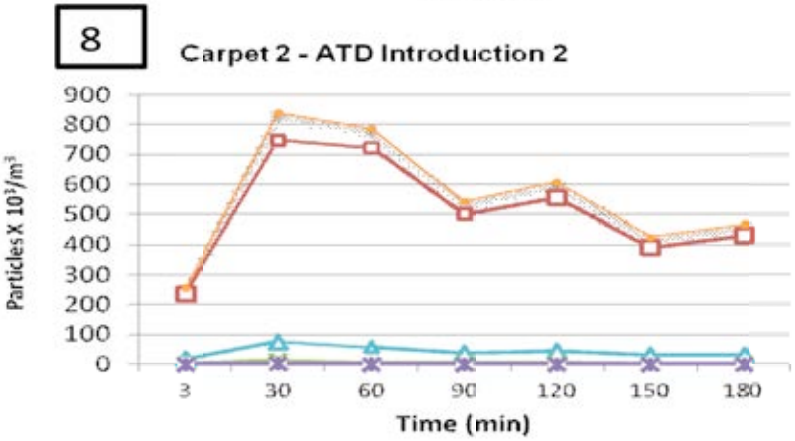
6


Carpet 2 - ATD Introduction 1
Particles X 10³/m³
Time (min)

7


Carpet 1 – ATD Introduction 2
Particles X 10³/m³
Time (min)
Time, (min)

8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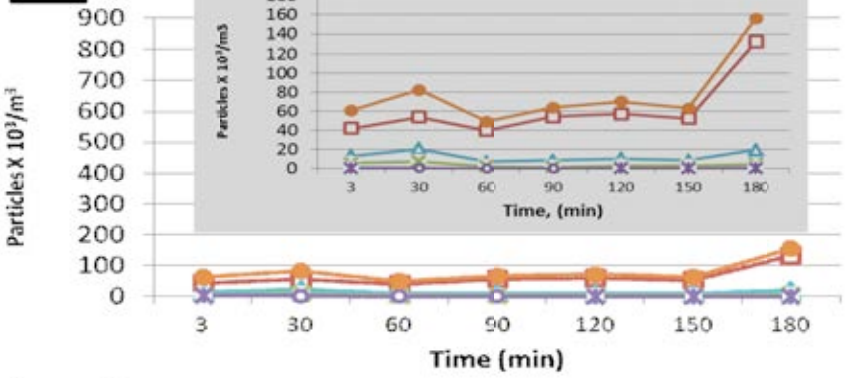
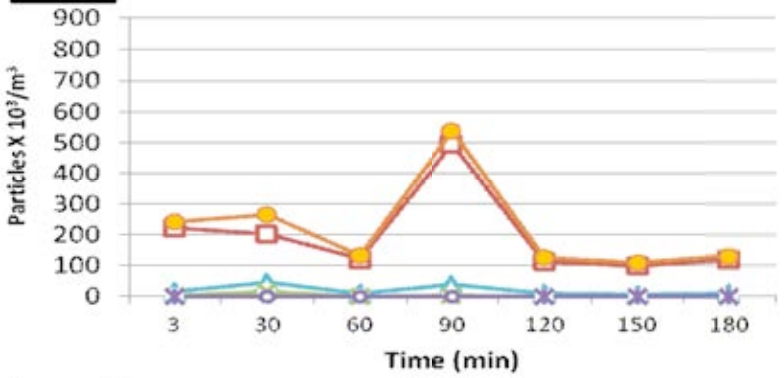
Particles X 10³/m³
Time (min)

9


Carpet 1 – ATD Introduction 3
Particles X 10³/m³
Time (min)
Time, (min)

10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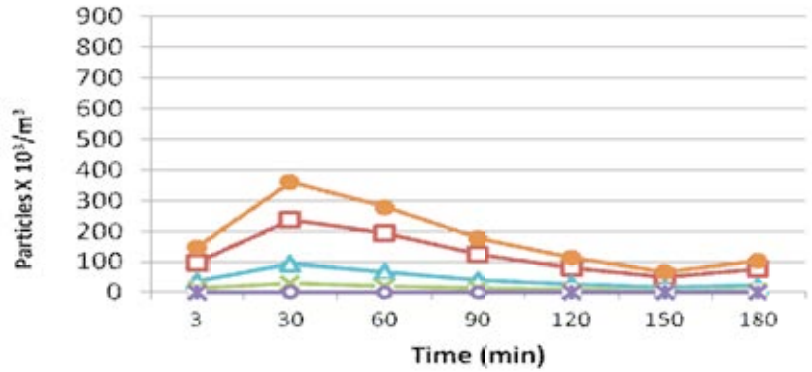
Particles X 10³/m³
Time (min)

11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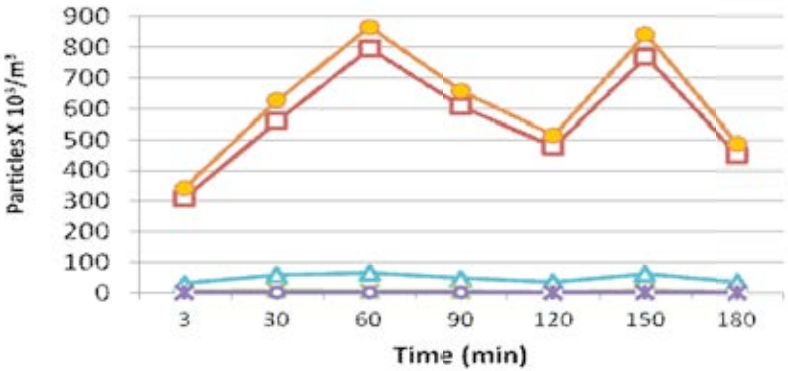
Particles X 10³/m³
Time (min)

12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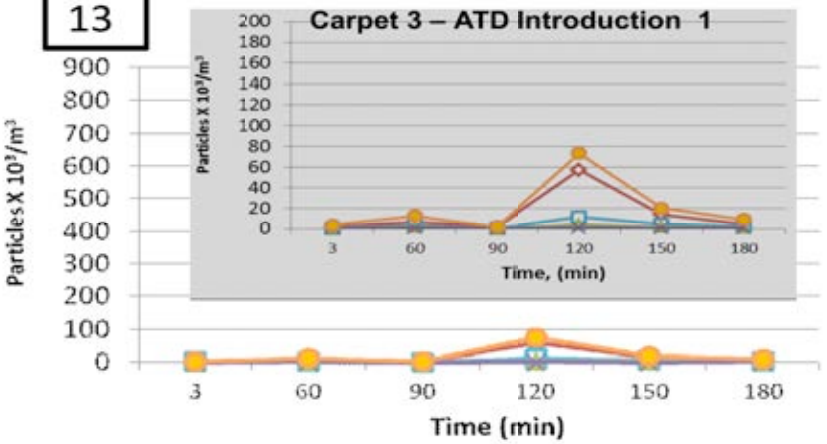
Particles X 10³/m³
Time (min)

13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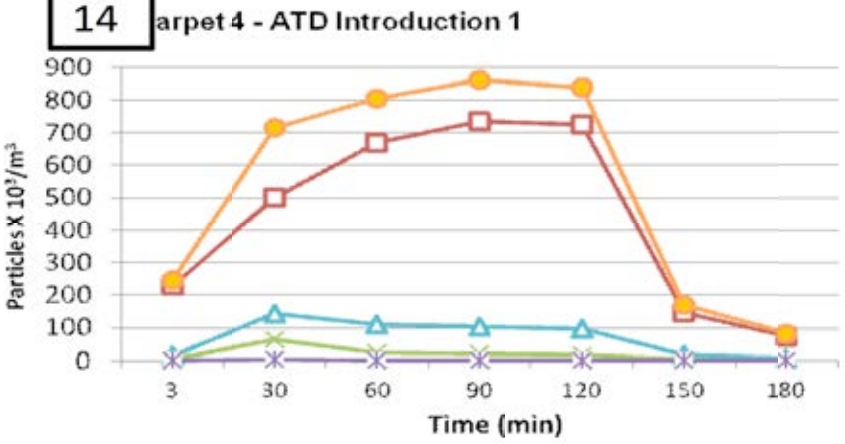
Particles X 10³/m³
Time, (min)
Time (min)

14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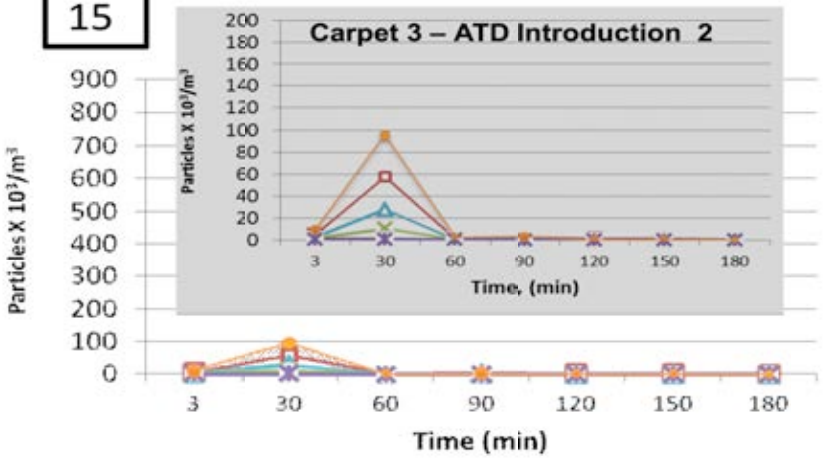
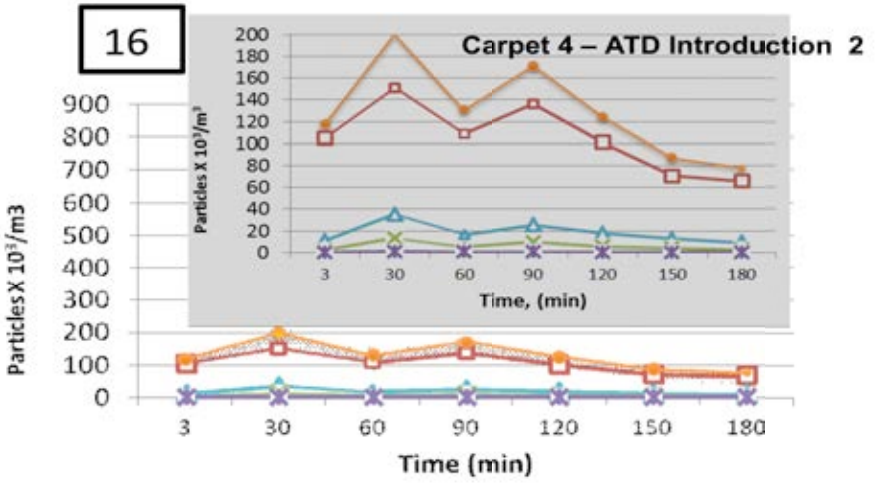
Particles X 10³/m³
Time (min)

15


Carpet 3 – ATD Introduction 2
Particles X 10³/m³
Time, (min)
Time (min)

16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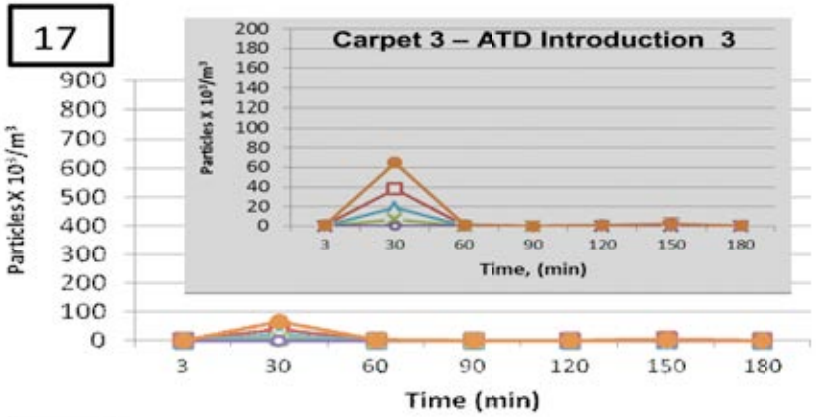
Particles X 10³/m3
Time, (min)
Time (min)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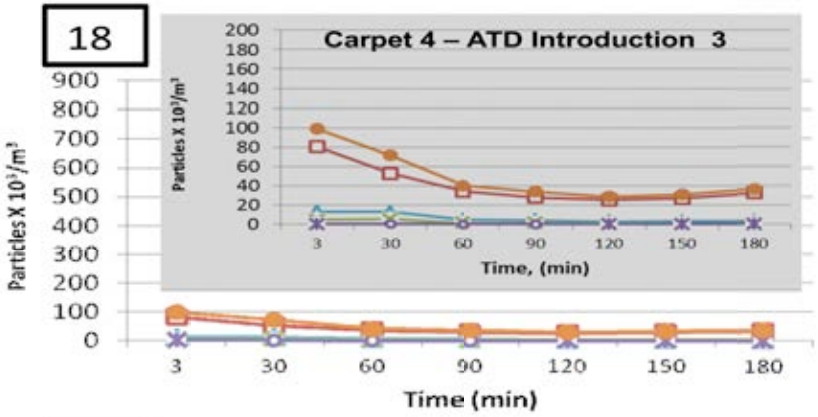
Particles X 10³/m³
Time, (min)
Time (min)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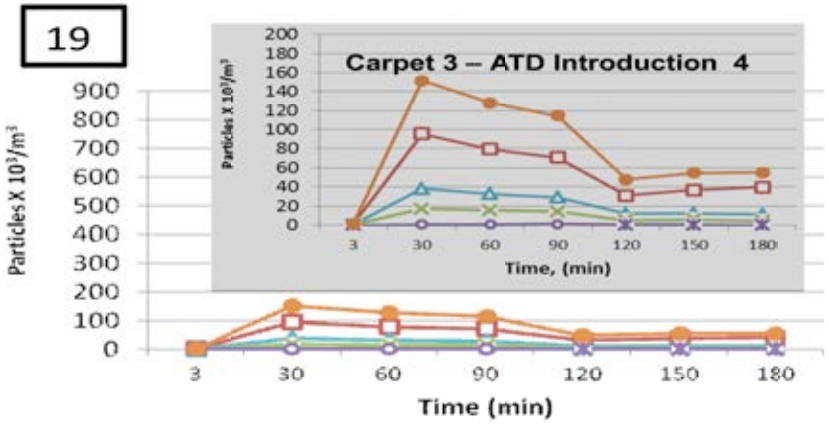
Carpet 4 – ATD Introduction 3
Particles X 10³/m³
Time, (min)
Time (min)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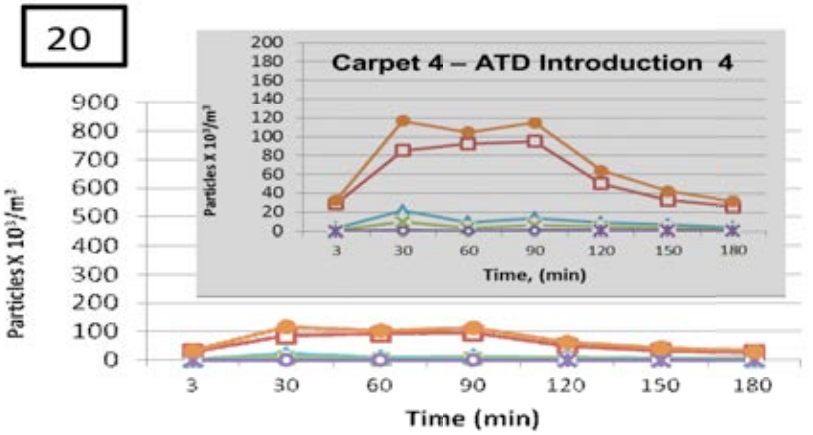
Carpet 3 – ATD Introduction 4
Particles X 10³/m³
Time, (min)
Time (min)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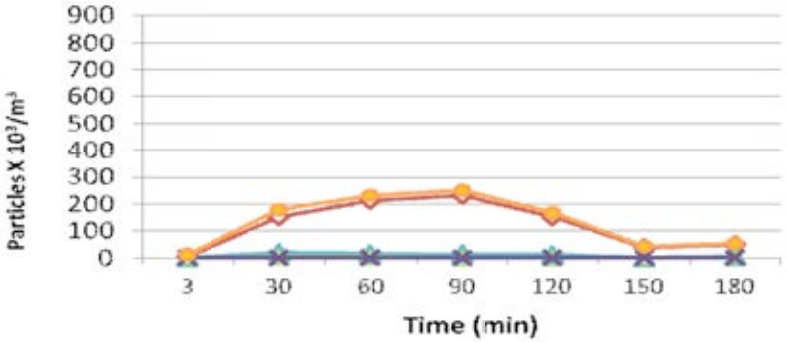
Carpet 4 – ATD Introduction 4
Particles X 10³/m³
Time, (min)
Time (min)

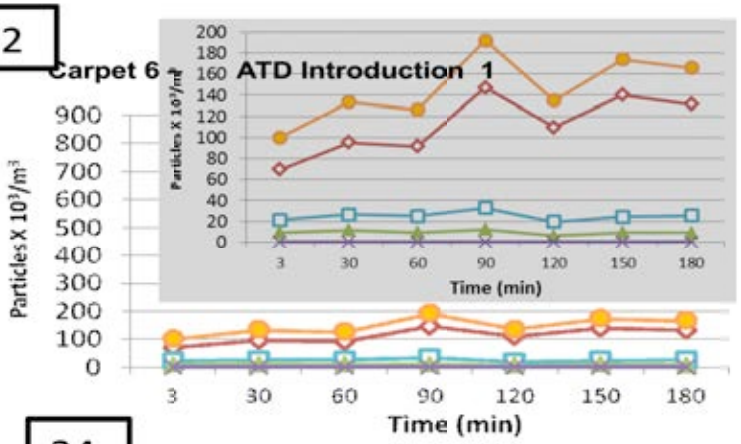
21

Carpet 5 - ATD Introduction 1



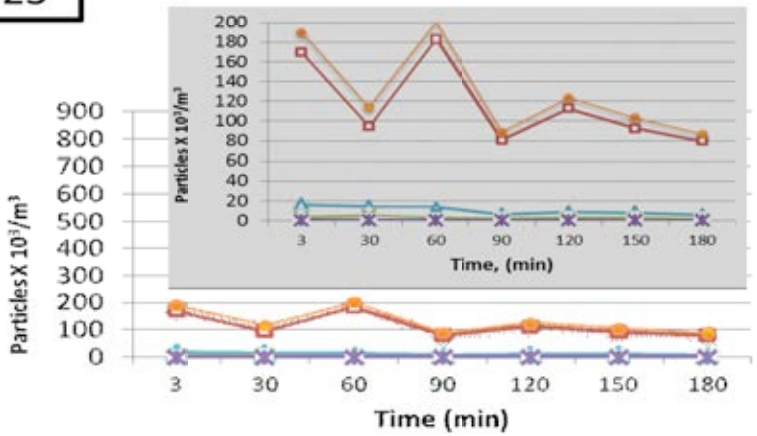

22

Carpet 6 – ATD Introduction 1




23

Carpet 5 – ATD Introduction 2

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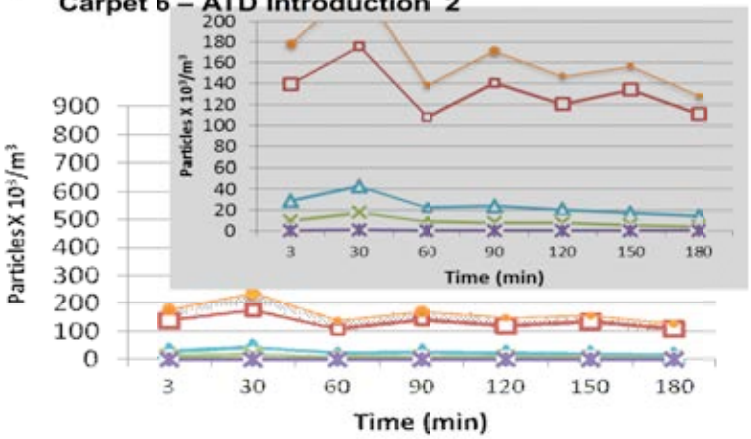
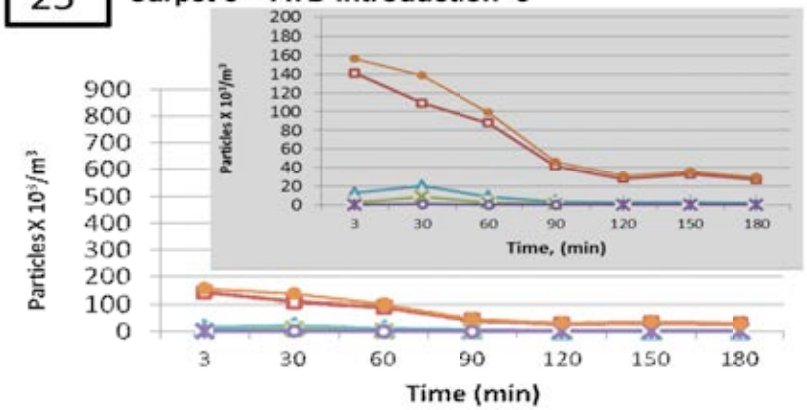
Carpet 6 – ATD Introduction 2



25

Carpet 5 – ATD Introduction 3

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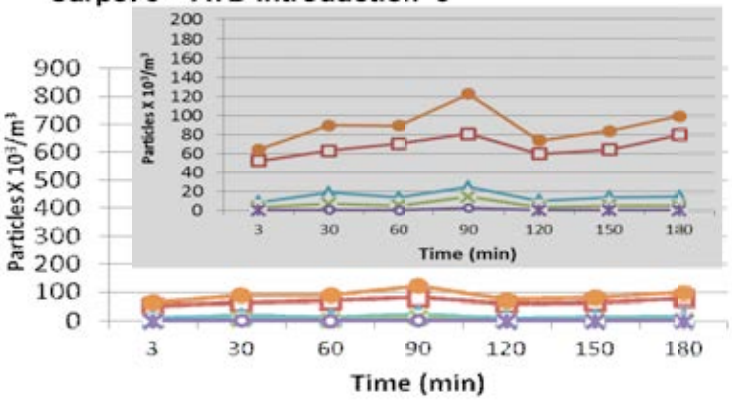
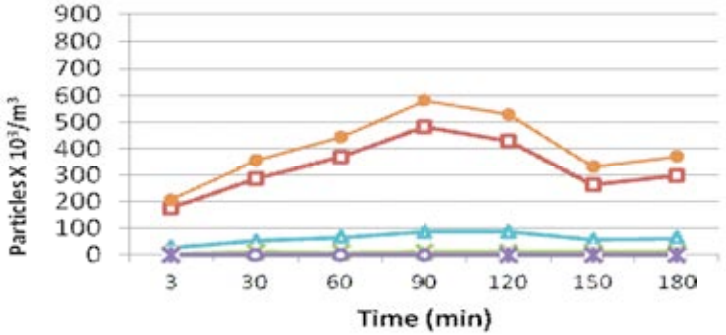
Carpet 6 – ATD Introduction 3



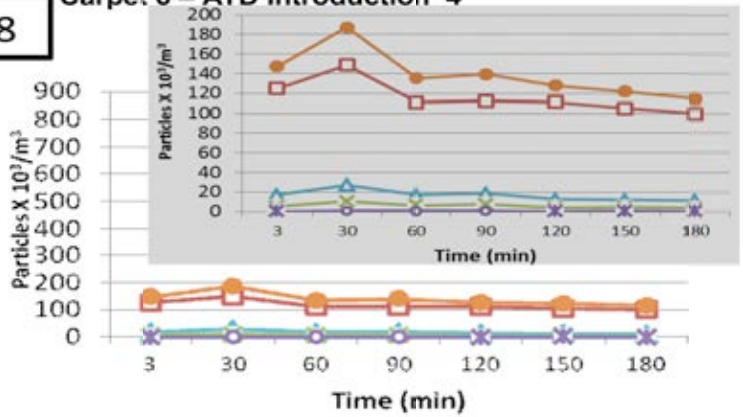

27

Carpet 5 - ATD Introduction 4




28

Carpet 6 – ATD Introduction 4



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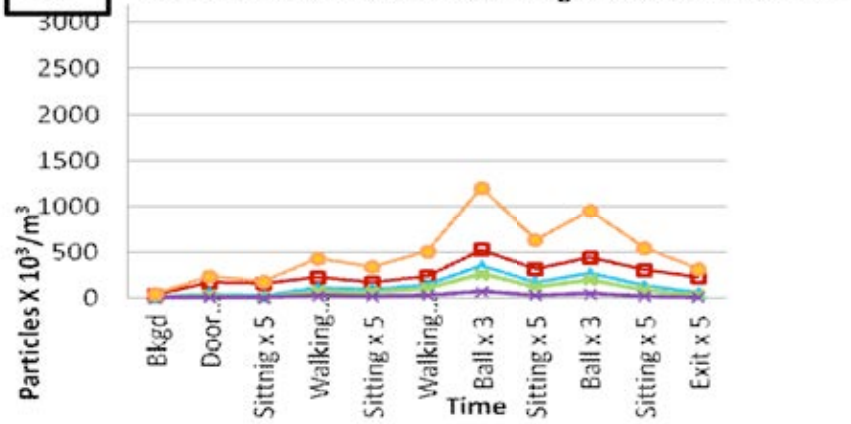
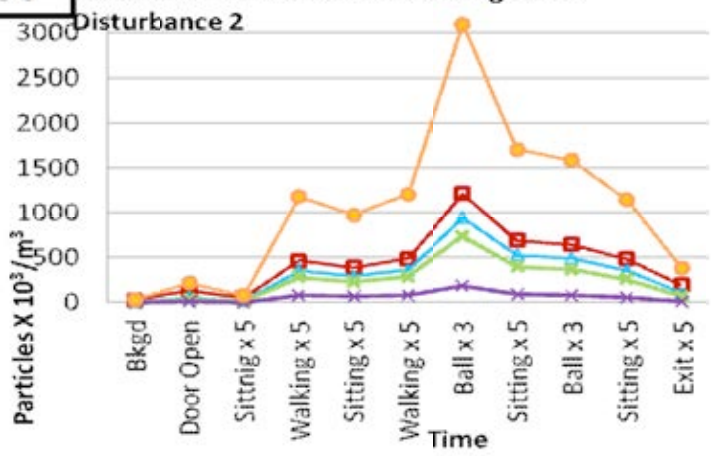
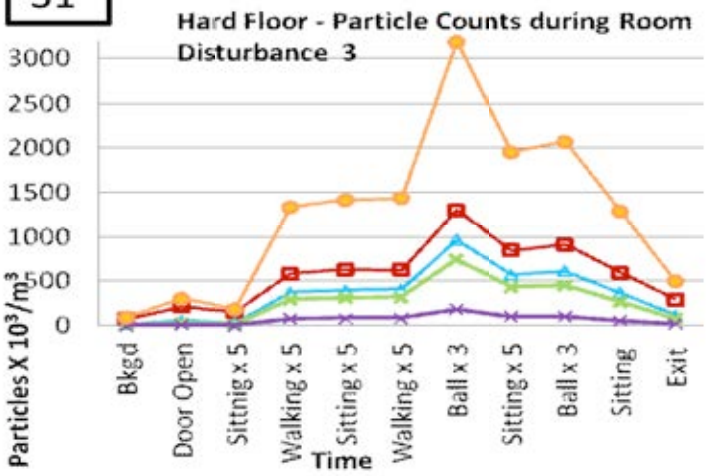

Hard Floor - Particle Counts during Room Disturbance 1
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door ..
Sittnig x 5
Walking ..
Sitting x 5
Walking ..
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 5
Time

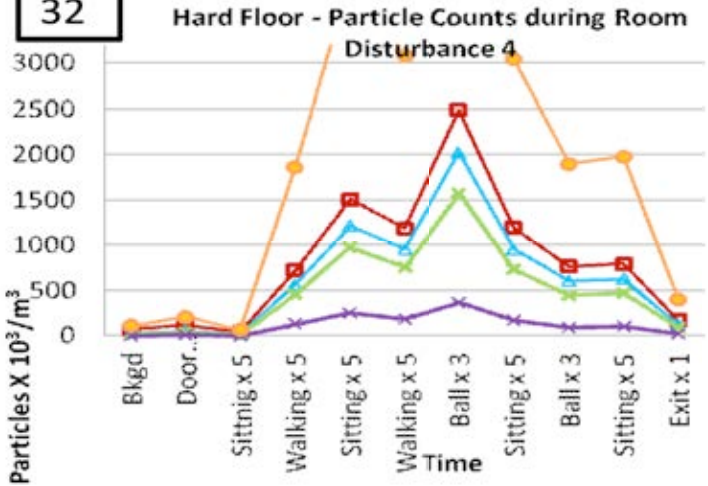
30


Hard Floor - Particle Counts during Room Disturbance 2
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 5
Time

31

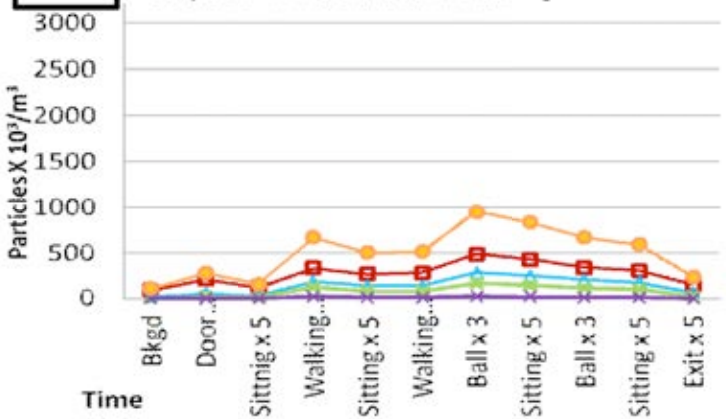

Hard Floor - Particle Counts during Room Disturbance 3
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting
Exit
Time

32


Hard Floor - Particle Counts during Room Disturbance 4
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door ..
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 1
Time

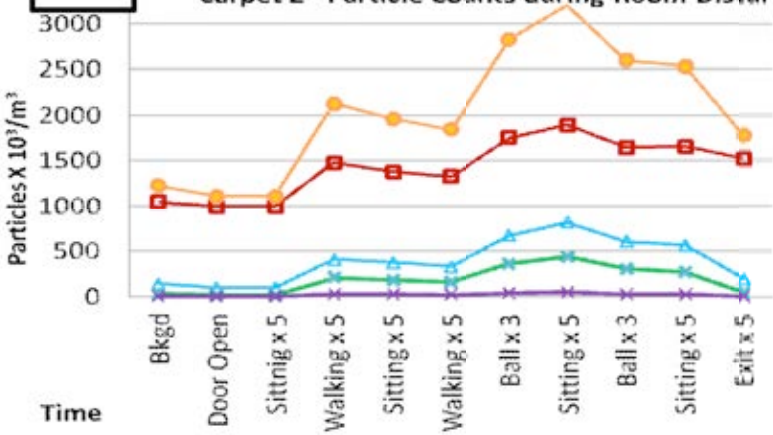
33

Carpet 1 - Particle Counts during Room Disturbance 1



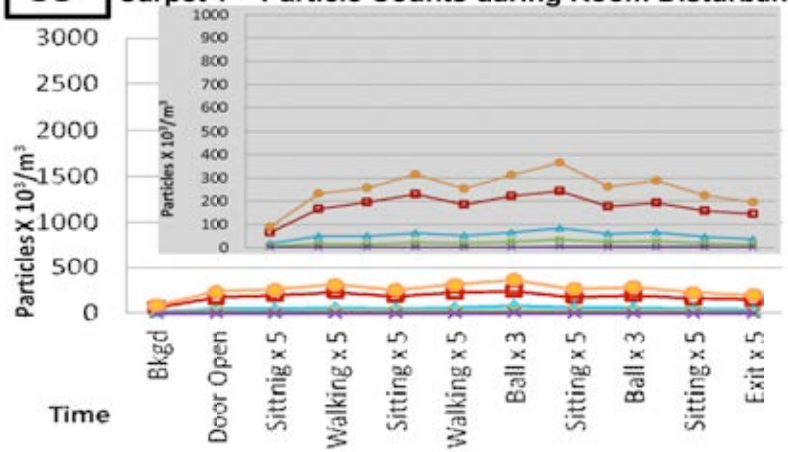

34

Carpet 2 - Particle Counts during Room Disturbance 1



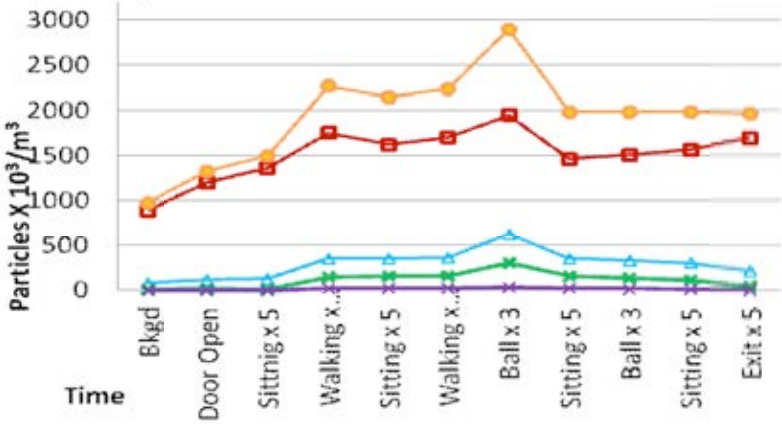

35

Carpet 1 – Particle Counts during Room Disturbance 1

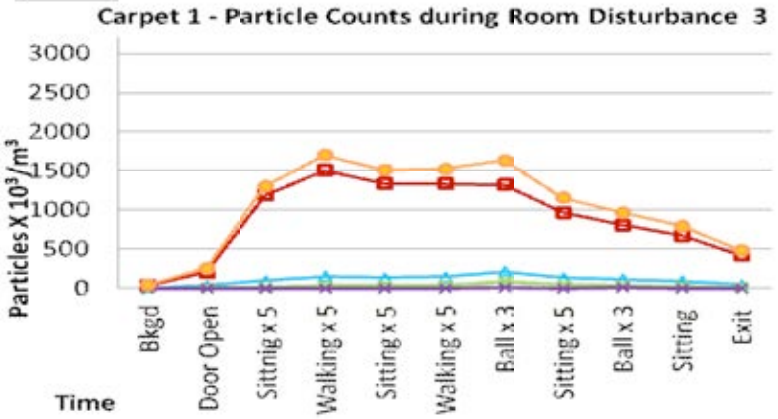



36

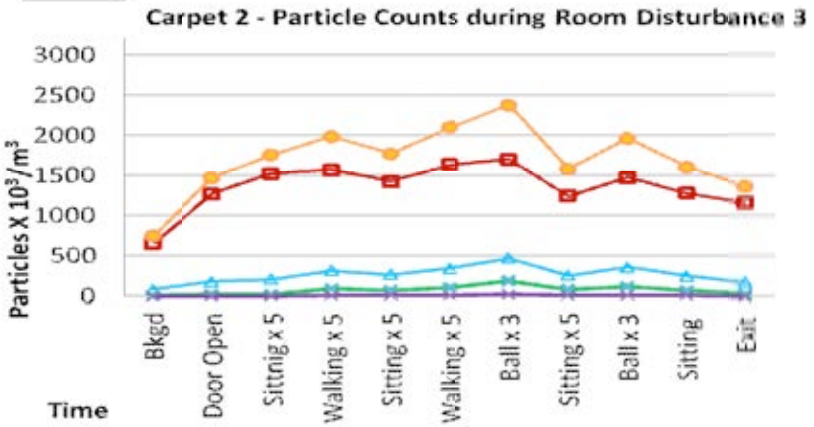
Carpet 2 - Particle Counts during Room Disturbance 2



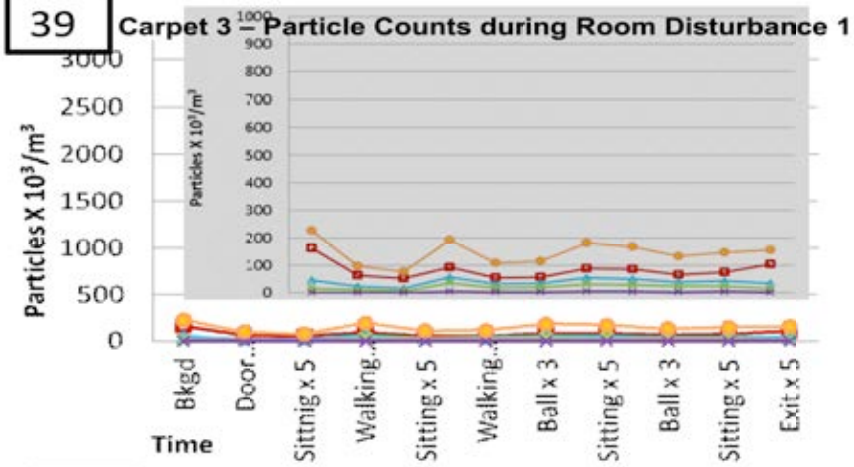
37


Carpet 1 - Particle Counts during Room Disturbance 3
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting
Exit
Time

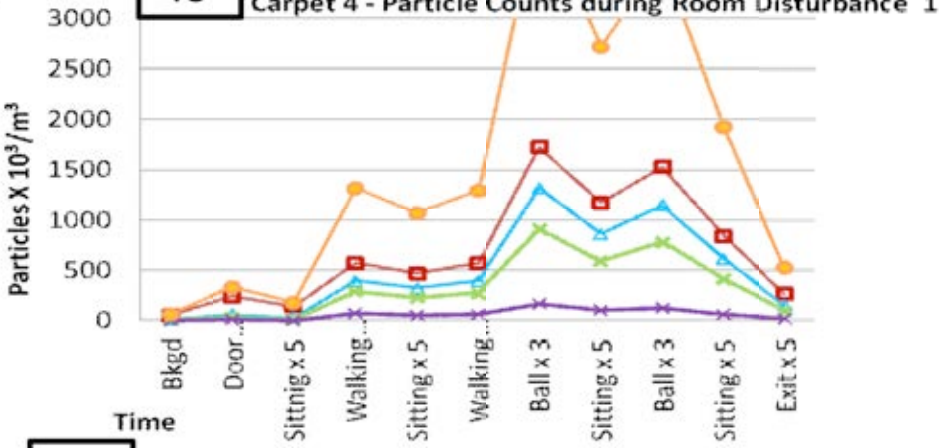
38


Carpet 2 - Particle Counts during Room Disturbance 3
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting
Exit
Time

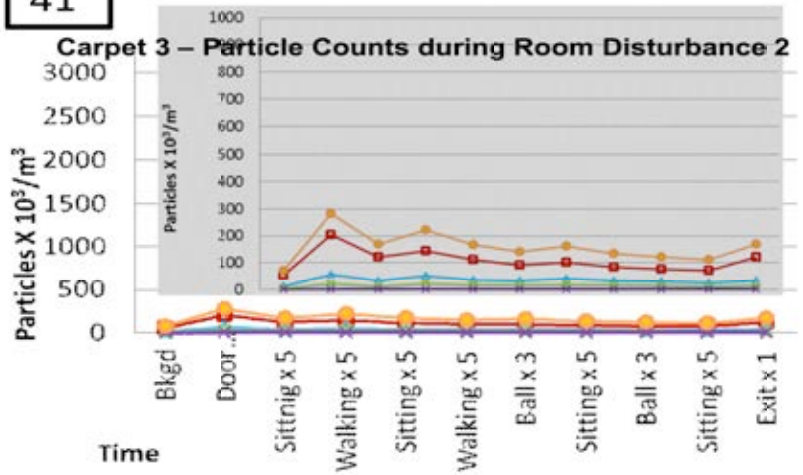
39


Carpet 3 – Particle Counts during Room Disturbance 1
Particles X 10³/m³
Time
Bkgd
Door ...
Sittnig x 5
Walking ...
Sitting x 5
Walking ...
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 5

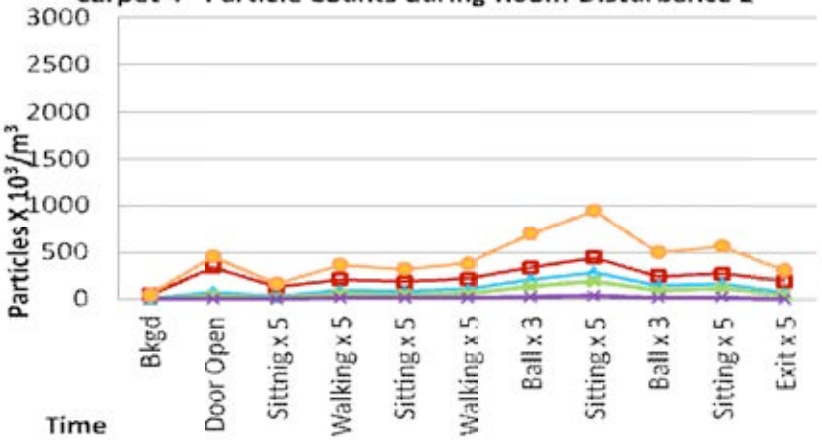
40


Carpet 4 - Particle Counts during Room Disturbance 1
Particles X 10³/m³
Time
Bkgd
Door ...
Sittnig x 5
Walking ...
Sitting x 5
Walking ...
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 5

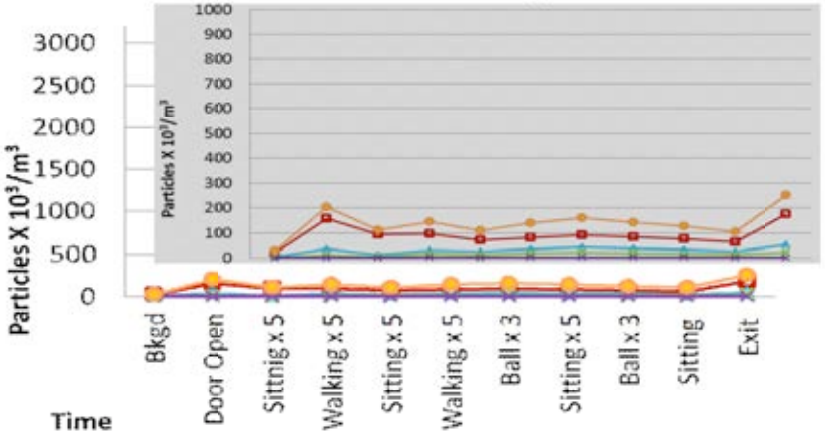
41


Carpet 3 – Particle Counts during Room Disturbance 2
Particles X 10³/m³
Time
Bkgd
Door ...
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 1

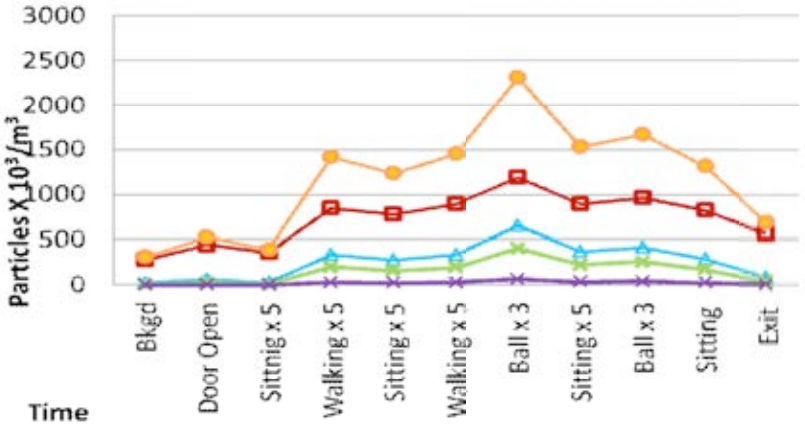
42


Carpet 4 - Particle Counts during Room Disturbance 2
Particles X 10³/m³
Time
Bkgd
Door Open
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 5

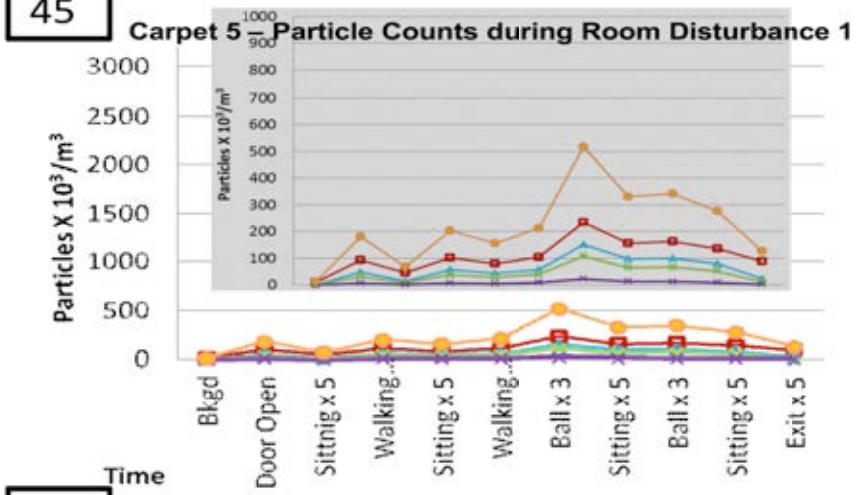
43


Carpet 3 – Particle Counts during Room Disturbance 3
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting
Exit
Time

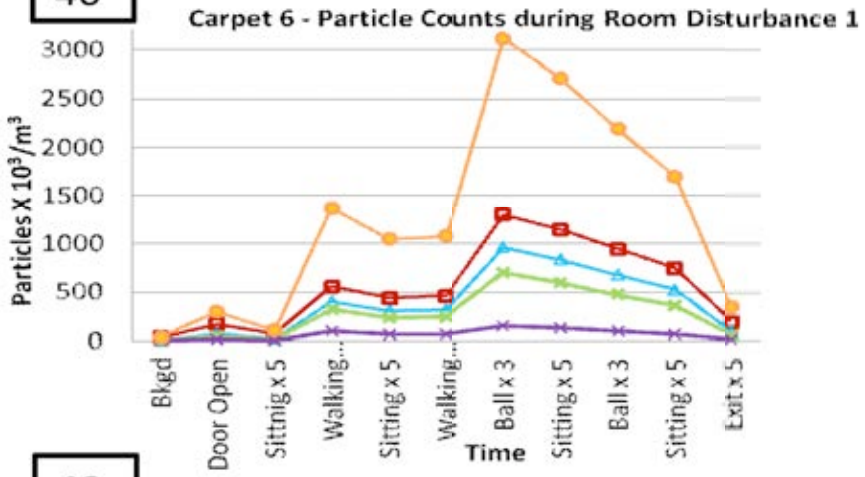
44


Carpet 4 - Particle Counts during Room Disturbance 3
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting
Exit
Time

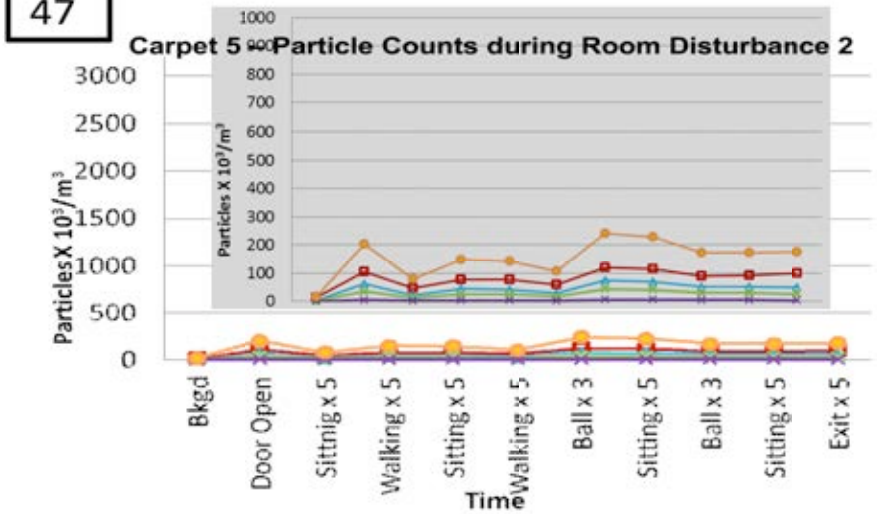
45


Carpet 5 – Particle Counts during Room Disturbance 1
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking...
Sitting x 5
Walking...
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 5
Time

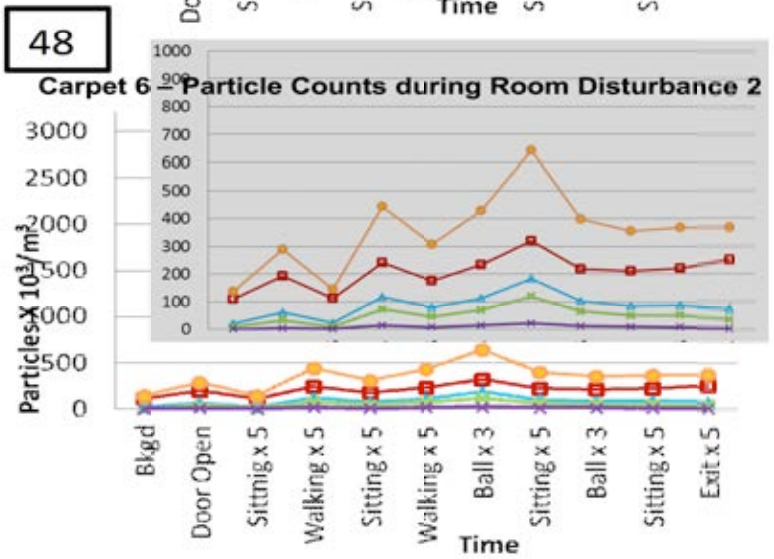
46


Carpet 6 - Particle Counts during Room Disturbance 1
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking...
Sitting x 5
Walking...
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 5
Time

47

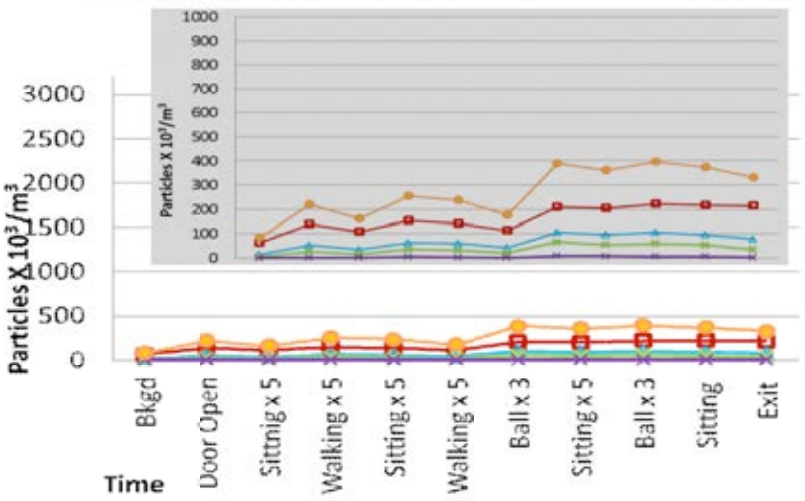

Carpet 5 – Particle Counts during Room Disturbance 2
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 5
Time

48


Carpet 6 – Particle Counts during Room Disturbance 2
Particles X 10³/m³
3000
2500
2000
1500
1000
500
0
Bkgd
Door Open
Sittnig x 5
Walking x 5
Sitting x 5
Walking x 5
Ball x 3
Sitting x 5
Ball x 3
Sitting x 5
Exit x 5
Time

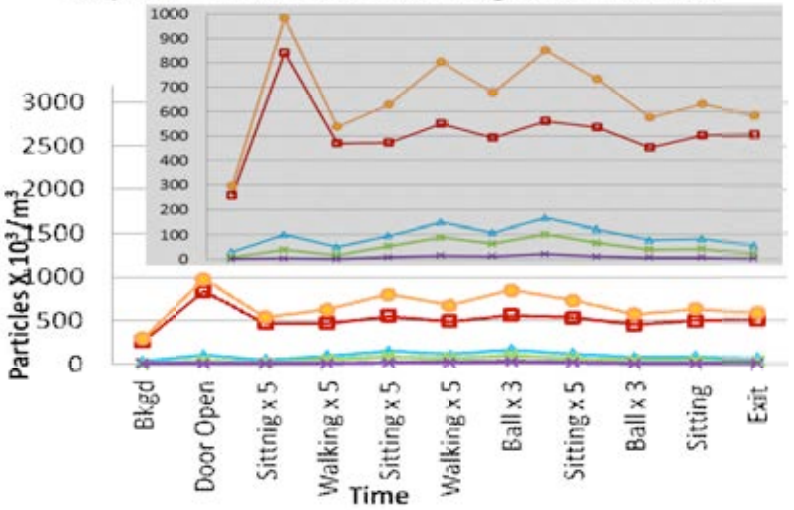
49

Carpet 5 – Particle Counts during Room Disturbance 3

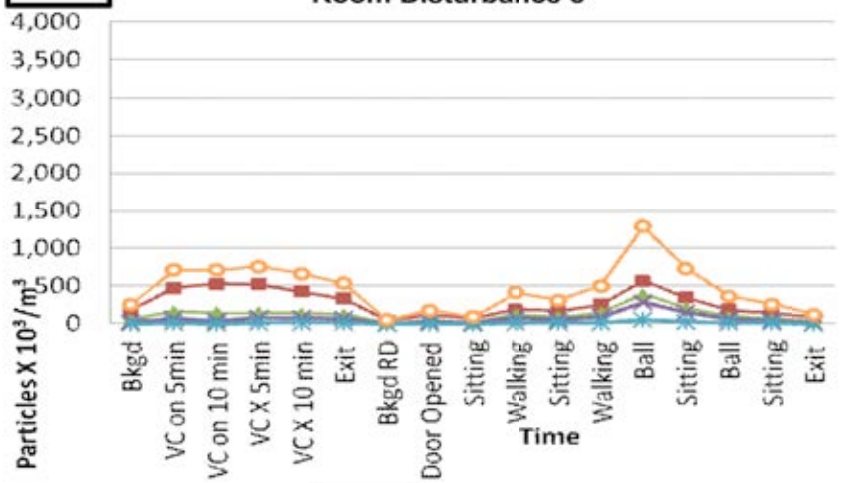



50

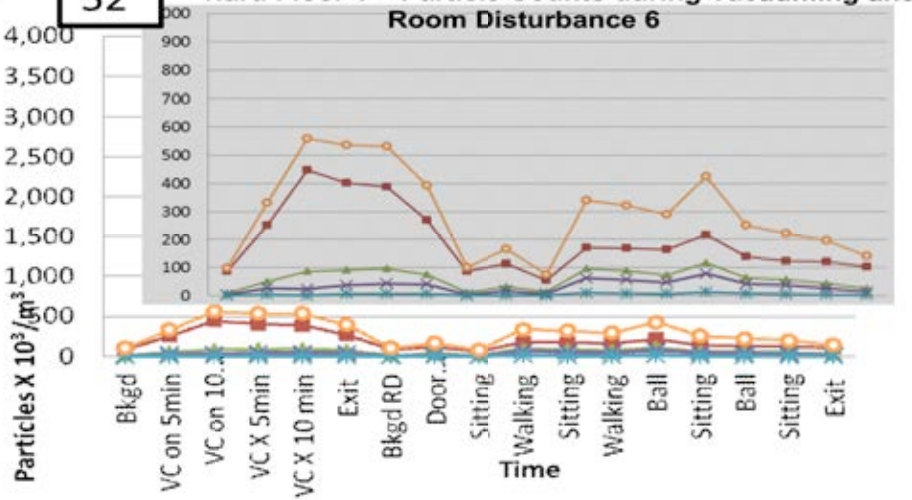
Carpet 6 – Particle Counts during Room Disturbance 3



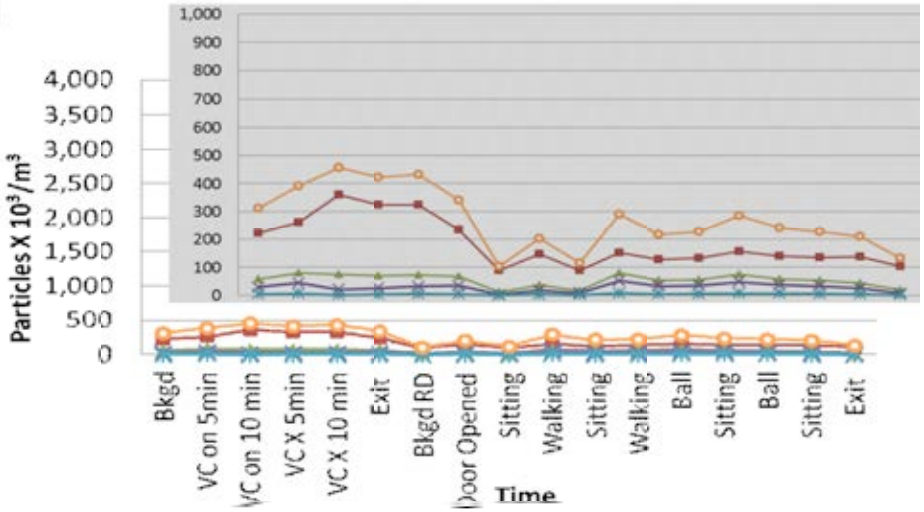
51


Hard Floor 1 – Particle Counts during Vacuuming and Room Disturbance 5
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Bkgd
VC on 5min
VC on 10 min
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

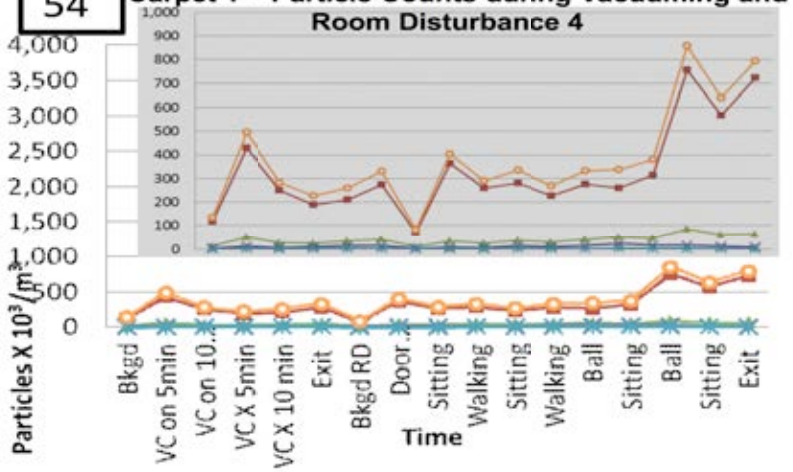
52


Hard Floor 1 – Particle Counts during Vacuuming and Room Disturbance 6
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
900
800
700
600
500
400
300
200
100
0
Bkgd
VC on 5min
VC on 10..
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door..
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

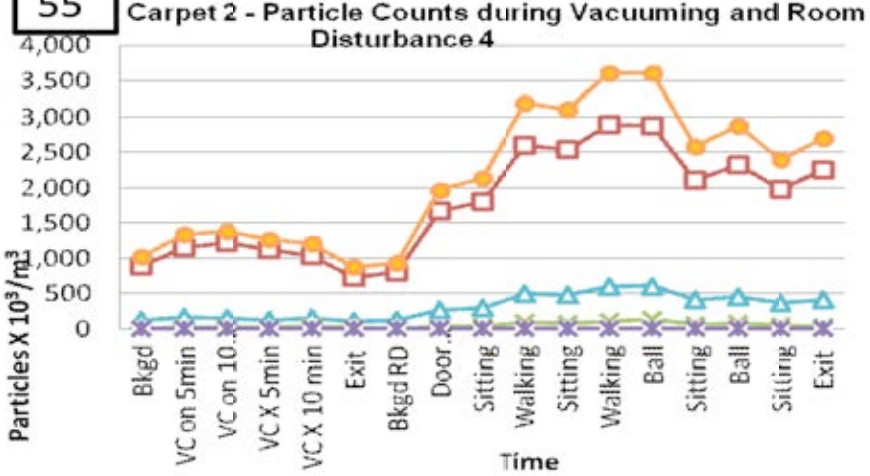
53


Hard Floor 1 – Particle Counts during Vacuuming and Room Disturbance 7
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1,000
900
800
700
600
500
400
300
200
100
0
Bkgd
VC on 5min
VC on 10 min
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

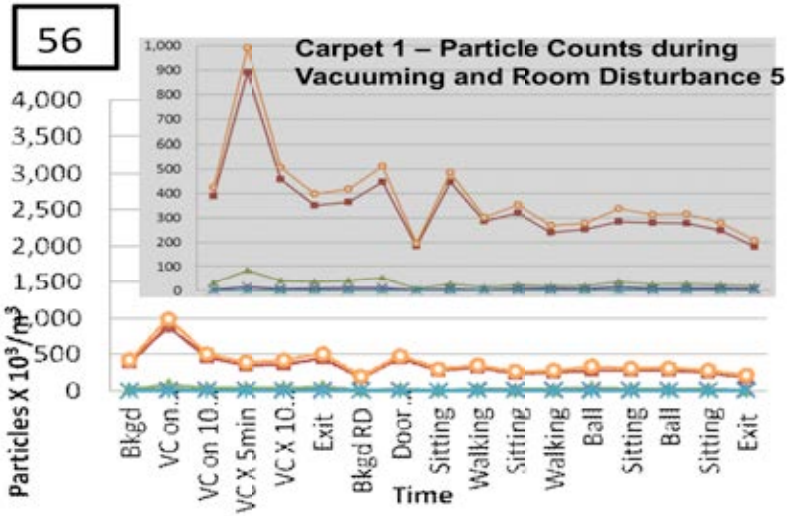
54


Carpet 1 – Particle Counts during Vacuuming and Room Disturbance 4
Particles X 10³/m³
Time
Bkgd
VC on 5min
VC on 10..
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door..
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit

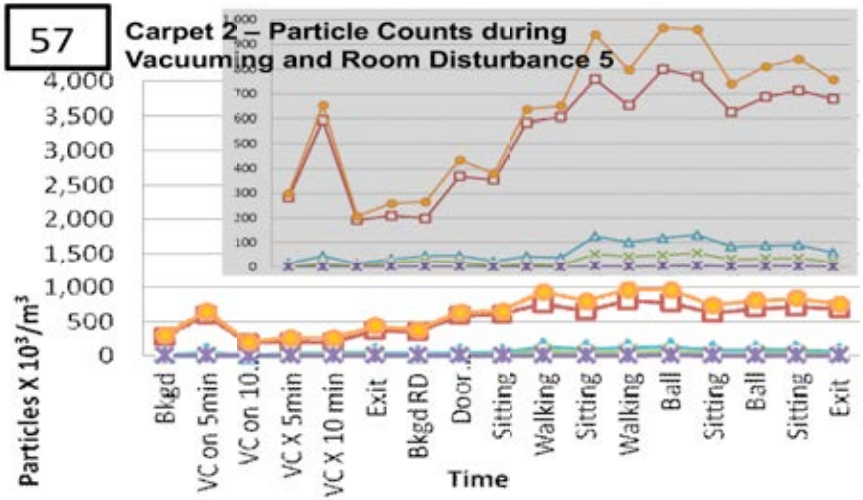
55


Carpet 2 - Particle Counts during Vacuuming and Room Disturbance 4
Particles X 10³/m³
Time
Bkgd
VC on 5min
VC on 10..
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door..
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit

56

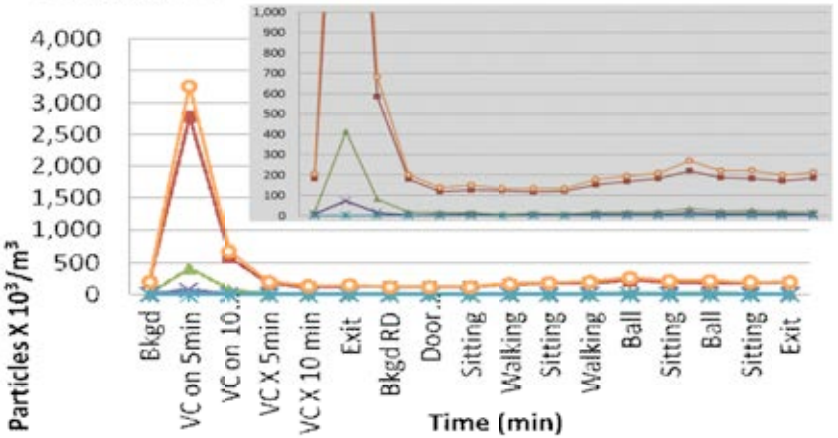

Carpet 1 – Particle Counts during Vacuuming and Room Disturbance 5
Particles X 10³/m³
Time
Bkgd
VC on..
VC on 10..
VC X 5min
VC X 10..
Exit
Bkgd RD
Door..
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit

57


Carpet 2 – Particle Counts during Vacuuming and Room Disturbance 5
Particles X 10³/m³
Time
Bkgd
VC on 5min
VC on 10..
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door..
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit

58

**Carpet 1 – Particle Counts during Vacuuming and Room Disturbance 6**

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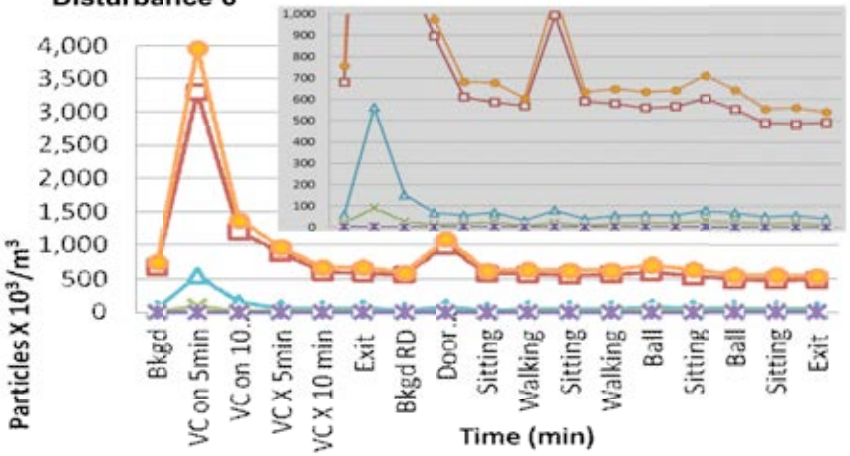
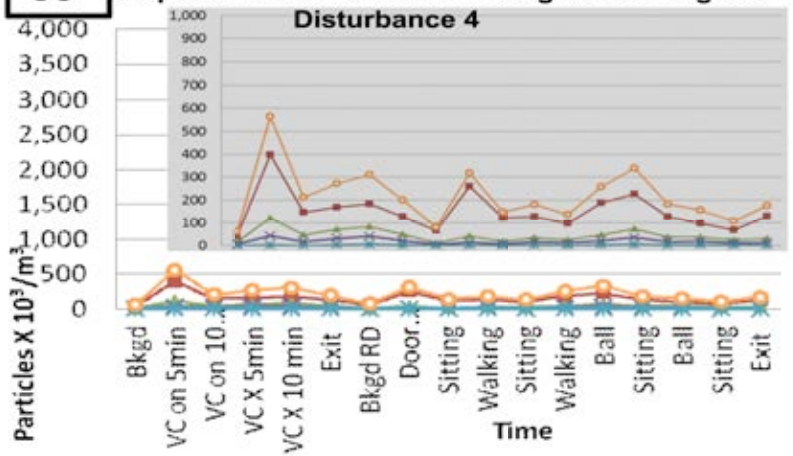
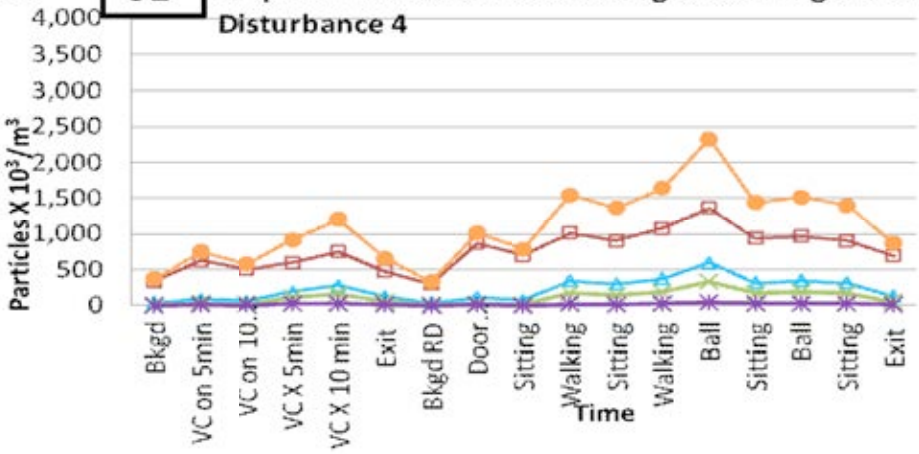
**Carpet 2 – Particle Counts during Vacuuming and Room Disturbance 6**



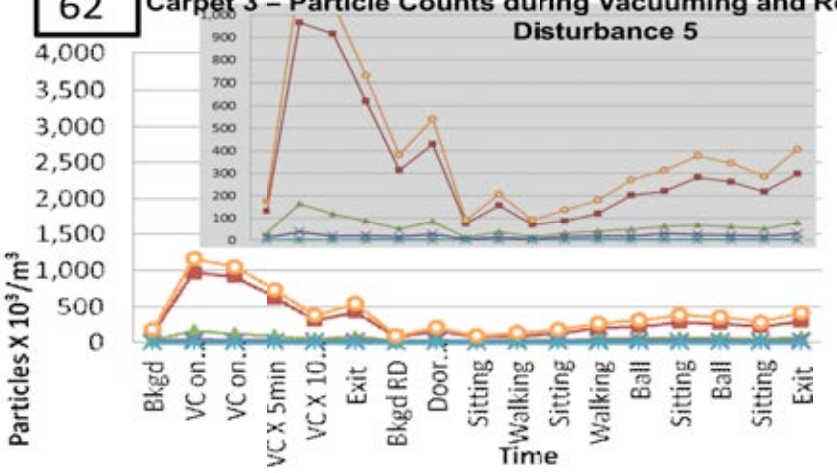
60


Carpet 3 – Particle Counts during Vacuuming and Room Disturbance 4
Particles X 10³/m³
Time
Bkgd
VC on 5min
VC on 10..
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door..
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit

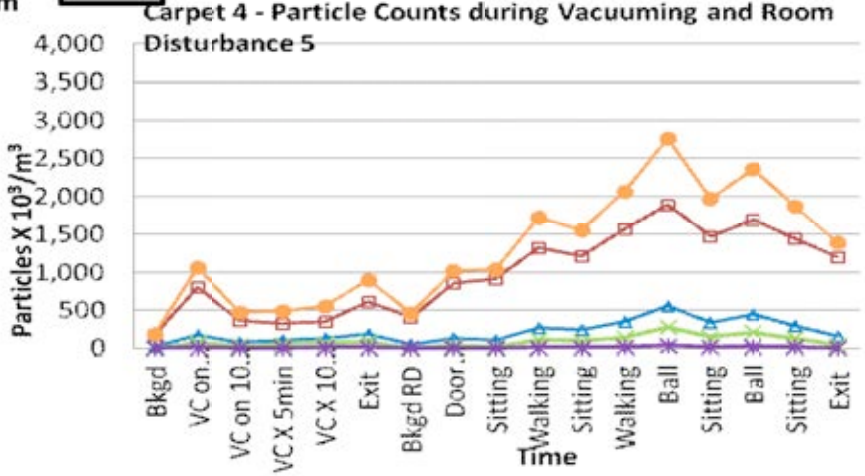
61


Carpet 4 - Particle Counts during Vacuuming and Room Disturbance 4
Particles X 10³/m³
Time
Bkgd
VC on 5min
VC on 10..
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door..
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit

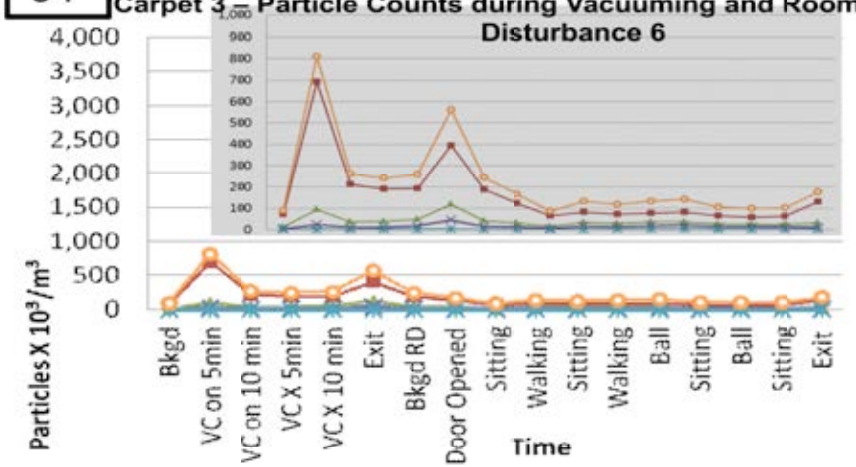
62


Carpet 3 – Particle Counts during Vacuuming and Room Disturbance 5
Particles X 10³/m³
Time
Bkgd
VC on..
VC on..
VC X 5min
VC X 10..
Exit
Bkgd RD
Door..
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit

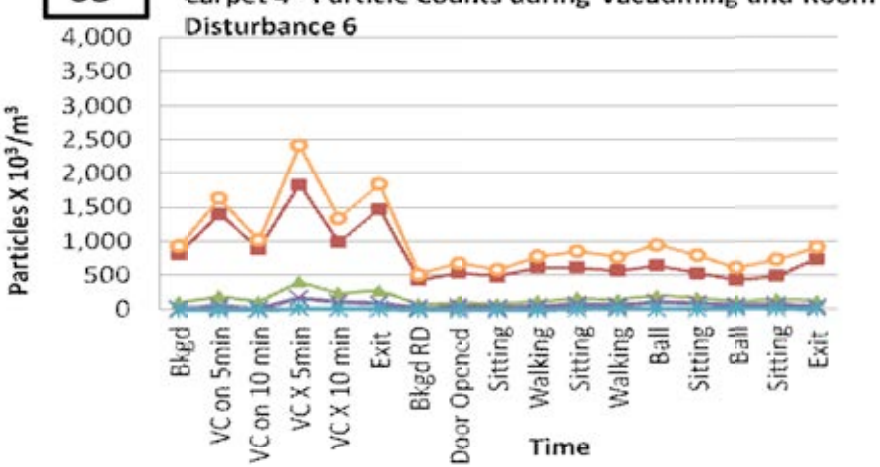
63


Carpet 4 - Particle Counts during Vacuuming and Room Disturbance 5
Particles X 10³/m³
Time
Bkgd
VC on..
VC on 10..
VC X 5min
VC X 10..
Exit
Bkgd RD
Door..
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit

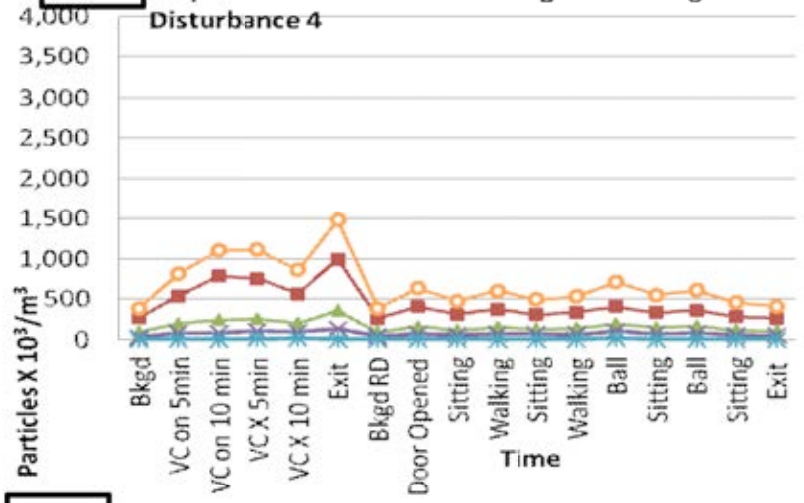
64


Carpet 3 – Particle Counts during Vacuuming and Room Disturbance 6
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Bkgd
VC on 5min
VC on 10 min
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

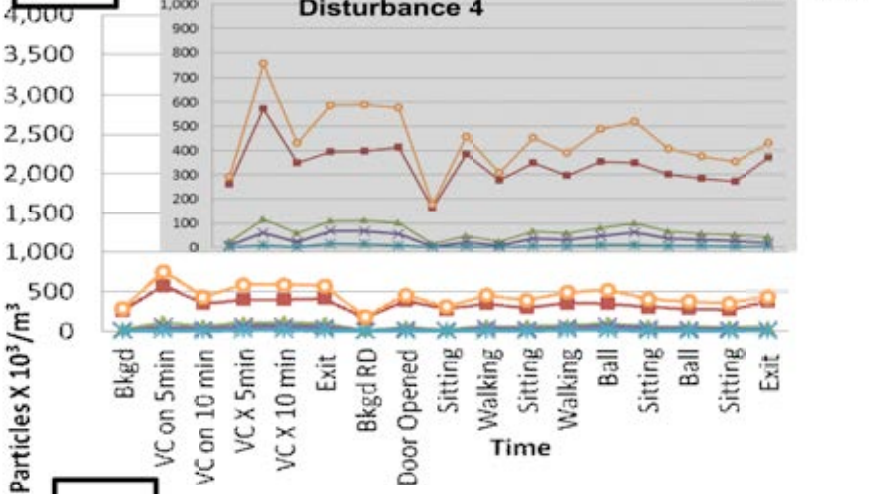
65


Carpet 4 - Particle Counts during Vacuuming and Room Disturbance 6
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Bkgd
VC on 5min
VC on 10 min
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

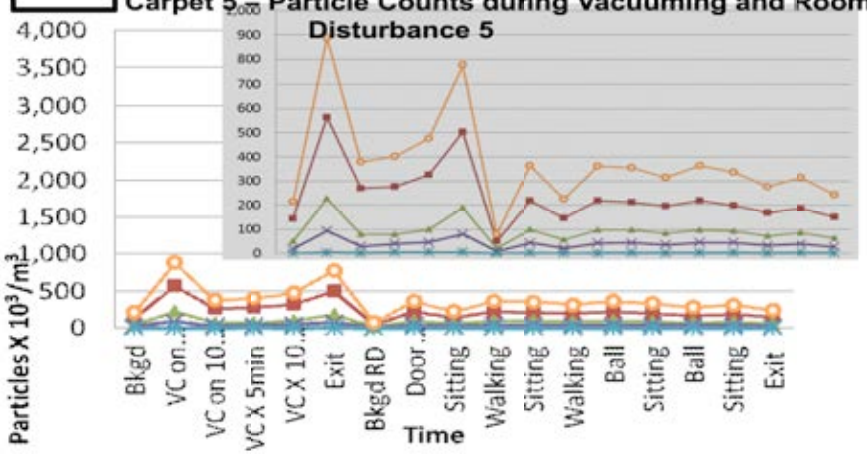
66


Carpet 5 - Particle Counts during Vacuuming and Room Disturbance 4
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Bkgd
VC on 5min
VC on 10 min
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

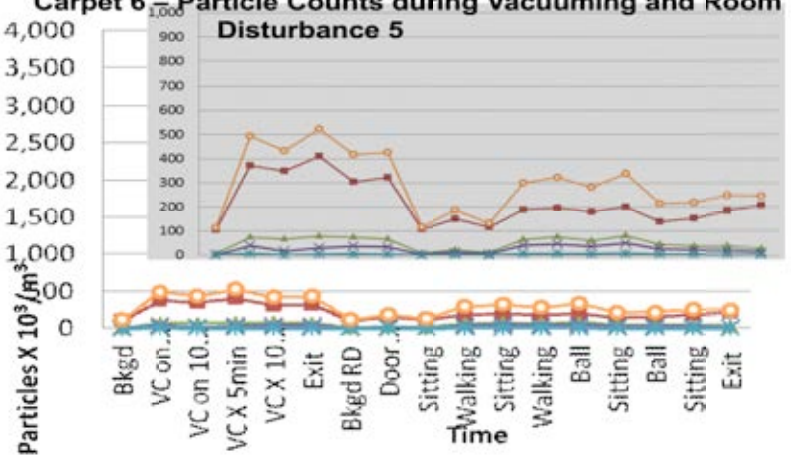
67


Carpet 6 – Particle Counts during Vacuuming and Room Disturbance 4
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1,000
900
800
700
600
500
400
300
200
100
0
Bkgd
VC on 5min
VC on 10 min
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

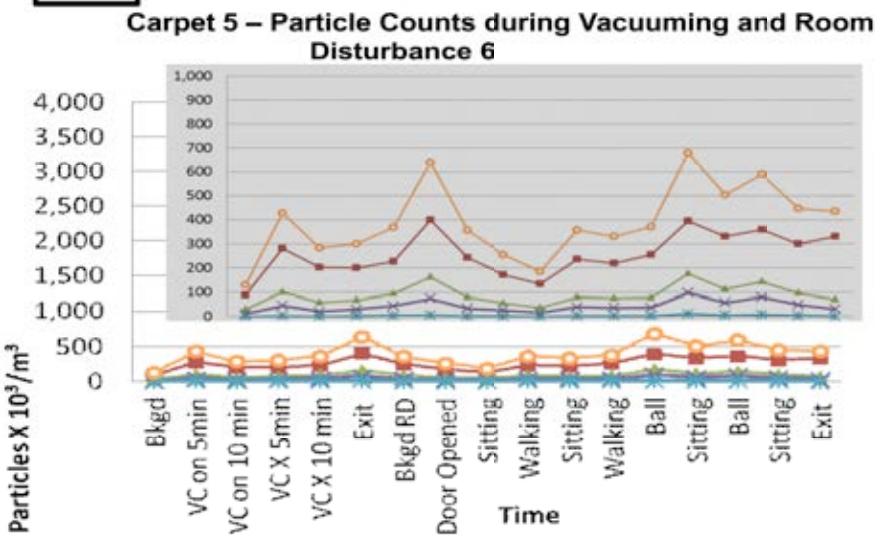
68


Carpet 5 – Particle Counts during Vacuuming and Room Disturbance 5
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1,000
900
800
700
600
500
400
300
200
100
0
Bkgd
VC on...
VC on 10...
VC X 5min
VC X 10...
Exit
Bkgd RD
Door...
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

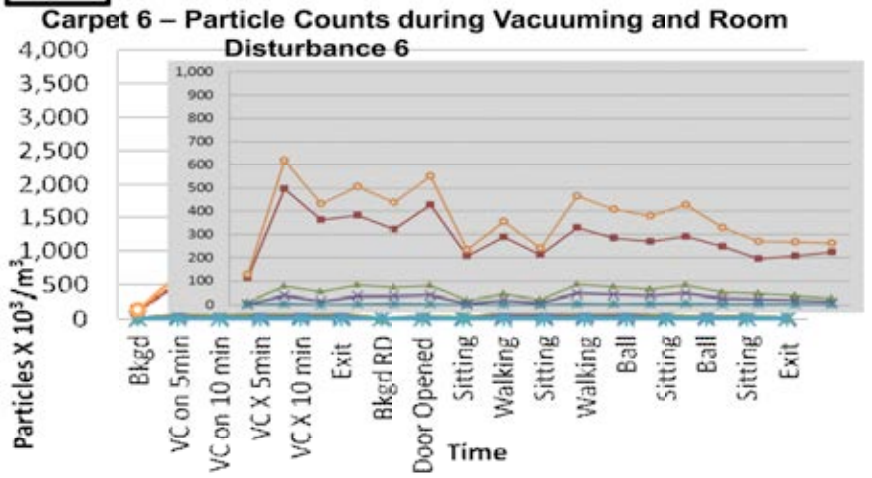
69


Carpet 6 – Particle Counts during Vacuuming and Room Disturbance 5
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1,000
900
800
700
600
500
400
300
200
100
0
Bkgd
VC on...
VC on 10...
VC X 5min
VC X 10...
Exit
Bkgd RD
Door...
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

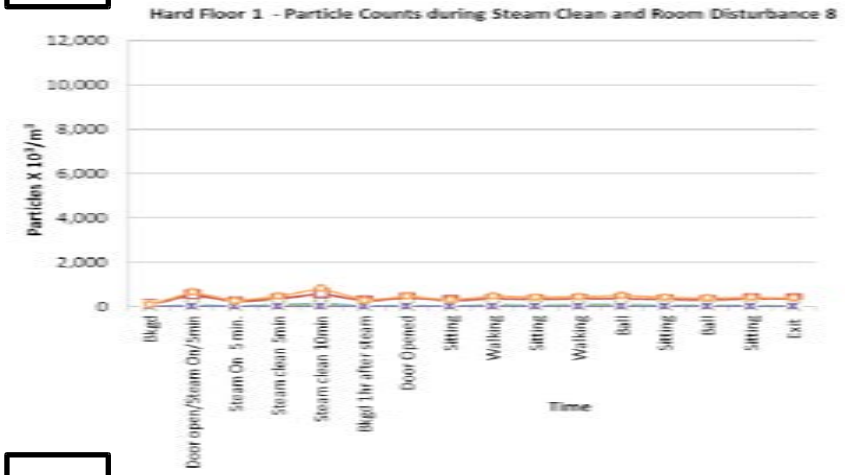
70


Carpet 5 – Particle Counts during Vacuuming and Room Disturbance 6
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1,000
900
800
700
600
500
400
300
200
100
0
Bkgd
VC on 5min
VC on 10 min
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

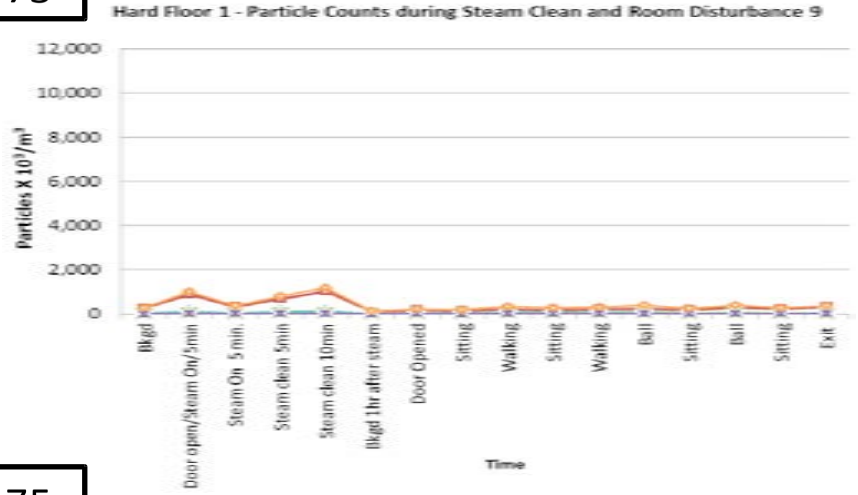
71


Carpet 6 – Particle Counts during Vacuuming and Room Disturbance 6
Particles X 10³/m³
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1,000
900
800
700
600
500
400
300
200
100
0
Bkgd
VC on 5min
VC on 10 min
VC X 5min
VC X 10 min
Exit
Bkgd RD
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

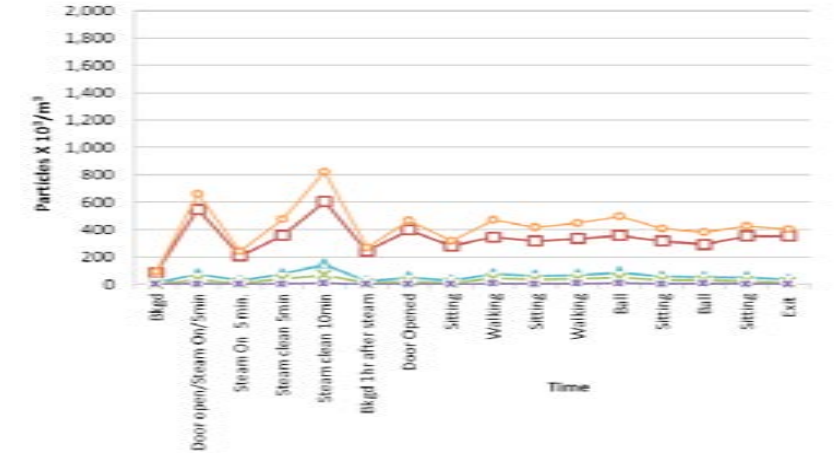
72


Hard Floor 1 - Particle Counts during Steam Clean and Room Disturbance 8
Particles X 10³/m³
12,000
10,000
8,000
6,000
4,000
2,000
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Bail
Sitting
Bail
Sitting
Exit
Time

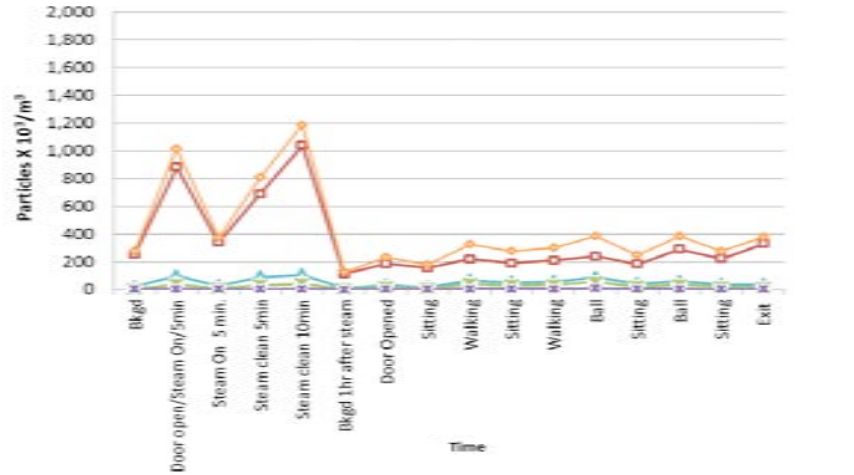
73


Hard Floor 1 - Particle Counts during Steam Clean and Room Disturbance 9
Particles X 10³/m³
12,000
10,000
8,000
6,000
4,000
2,000
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Bail
Sitting
Bail
Sitting
Exit
Time

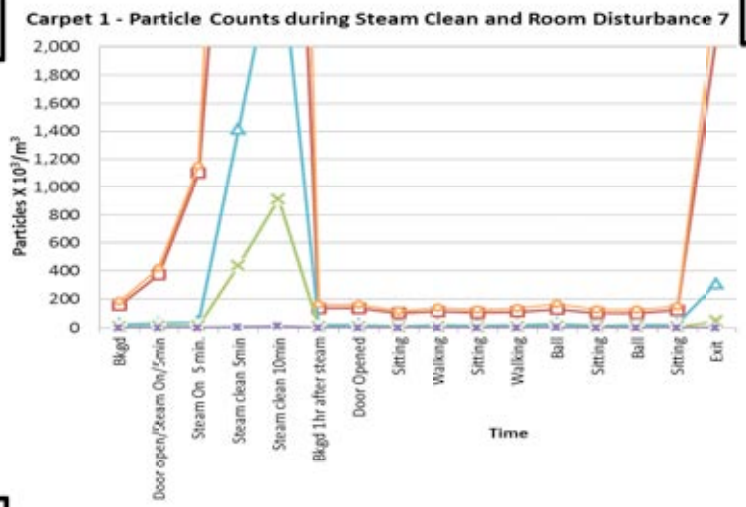
74


Hard Floor 1 - Particle Counts during Steam Clean and Room Disturbance 8
Particles X 10³/m³
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Bail
Sitting
Bail
Sitting
Exit
Time

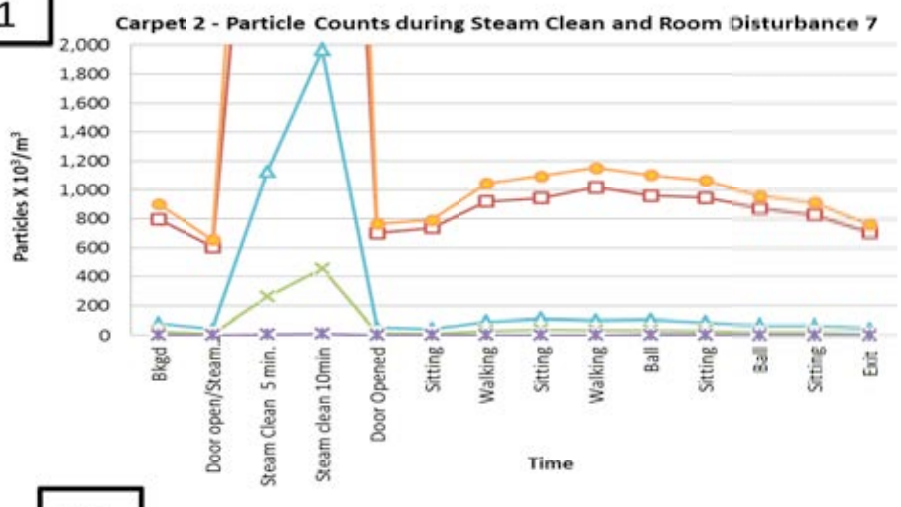
75


Hard Floor 1 - Particle Counts during Steam Clean and Room Disturbance 9
Particles X 10³/m³
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Bail
Sitting
Bail
Sitting
Exit
Time

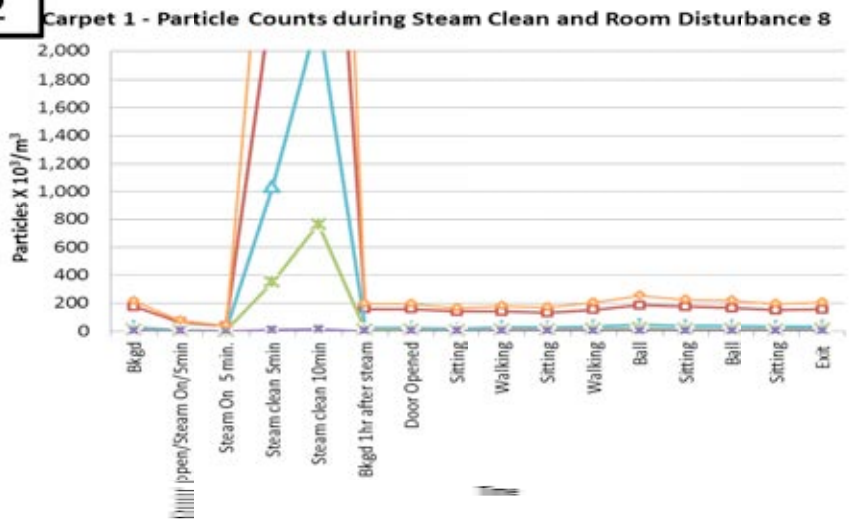
80


Carpet 1 - Particle Counts during Steam Clean and Room Disturbance 7
Particles X 10³/m³
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

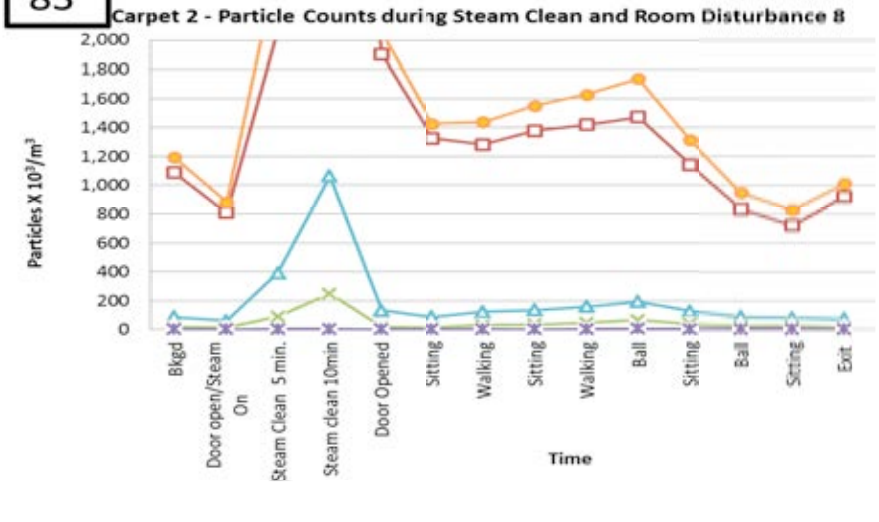
81


Carpet 2 - Particle Counts during Steam Clean and Room Disturbance 7
Particles X 10³/m³
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Bkgd
Door open/Steam...
Steam Clean 5 min.
Steam clean 10min
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

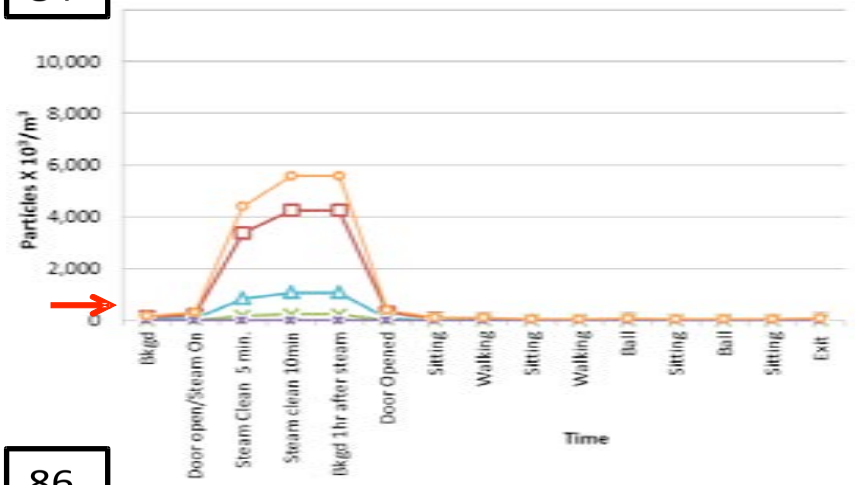
82


Carpet 1 - Particle Counts during Steam Clean and Room Disturbance 8
Particles X 10³/m³
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Bkgd
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit

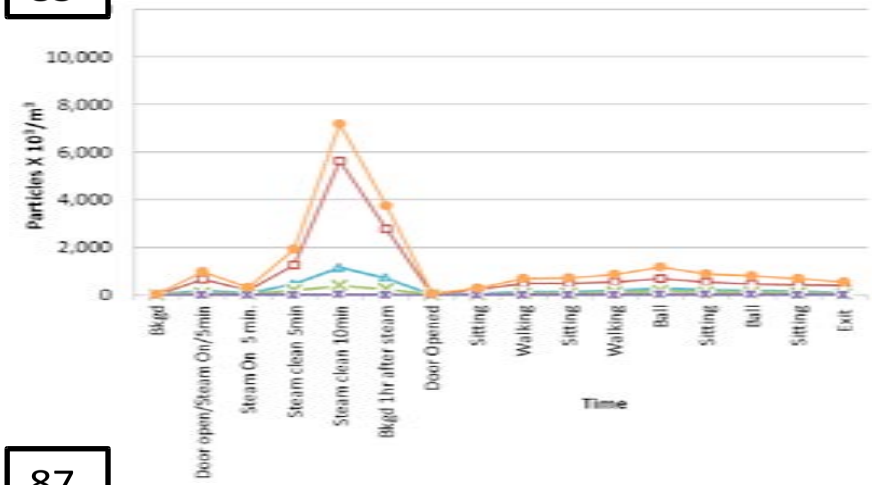
83


Carpet 2 - Particle Counts during Steam Clean and Room Disturbance 8
Particles X 10³/m³
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Bkgd
Door open/Steam On
Steam Clean 5 min.
Steam clean 10min
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

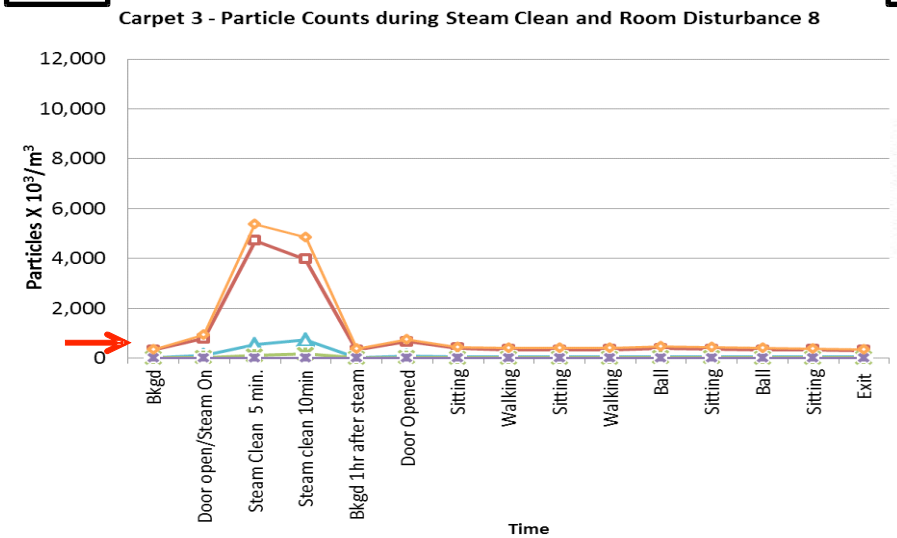
84


Carpet 3 - Particle Counts during Steam Clean and Room Disturbance 7
Particles X 10³/m³
10,000
8,000
6,000
4,000
2,000
0
Bkgd
Door open/Steam On
Steam Clean 5 min.
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

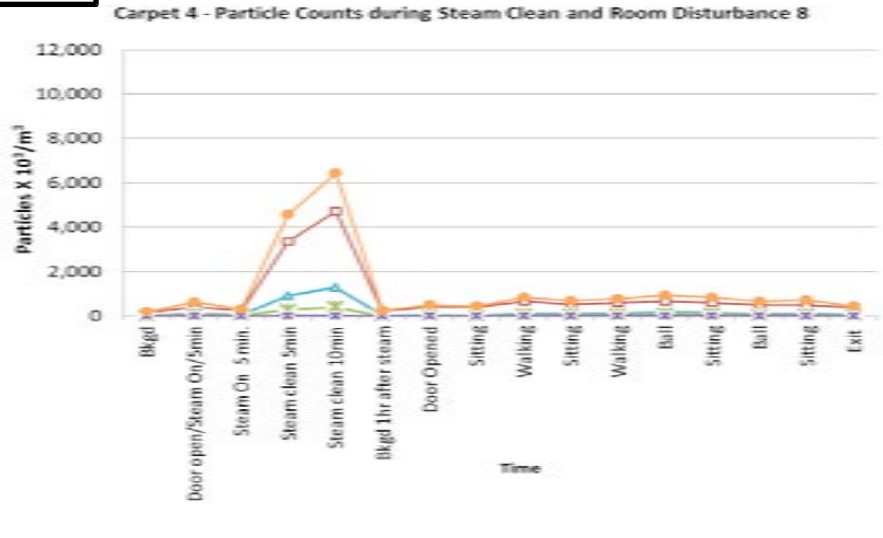
85


Carpet 4 - Particle Counts during Steam Clean and Room Disturbance 7
Particles X 10³/m³
10,000
8,000
6,000
4,000
2,000
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

86

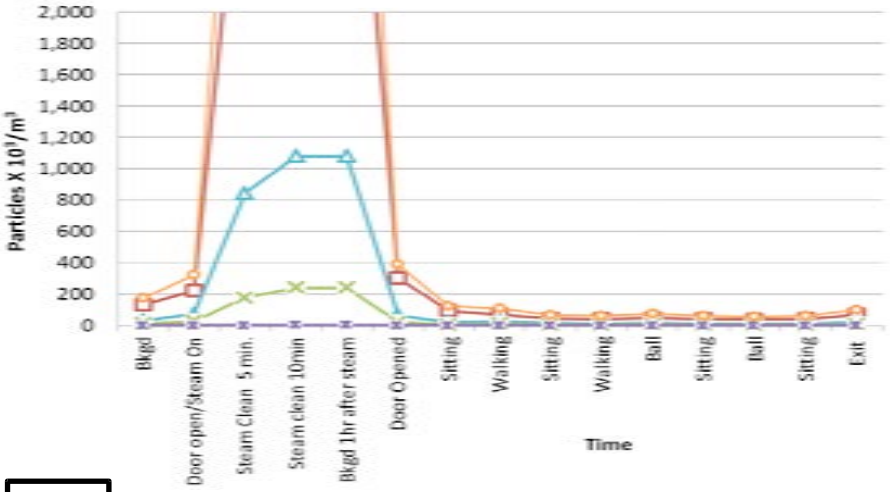

Carpet 3 - Particle Counts during Steam Clean and Room Disturbance 8
Particles X 10³/m³
12,000
10,000
8,000
6,000
4,000
2,000
0
Bkgd
Door open/Steam On
Steam Clean 5 min.
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

87


Carpet 4 - Particle Counts during Steam Clean and Room Disturbance 8
Particles X 10³/m³
12,000
10,000
8,000
6,000
4,000
2,000
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

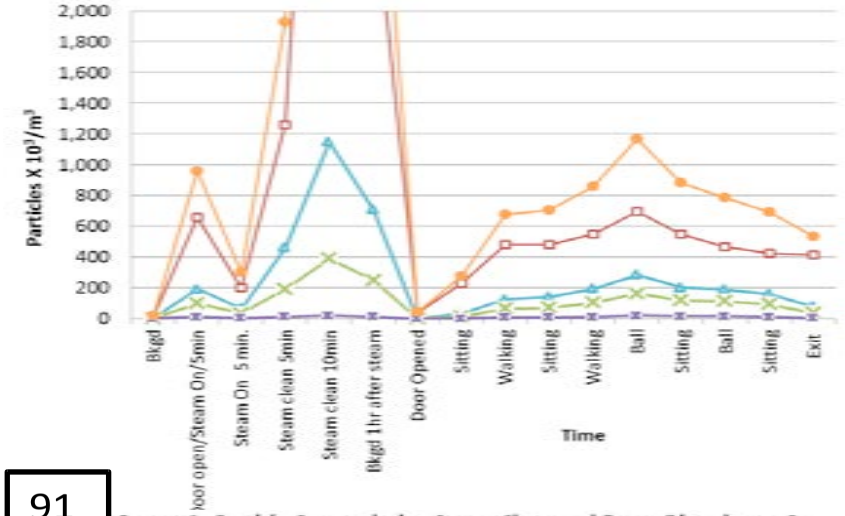
88

Carpet 3 - Particle Counts during Steam Clean and Room Disturbance 7



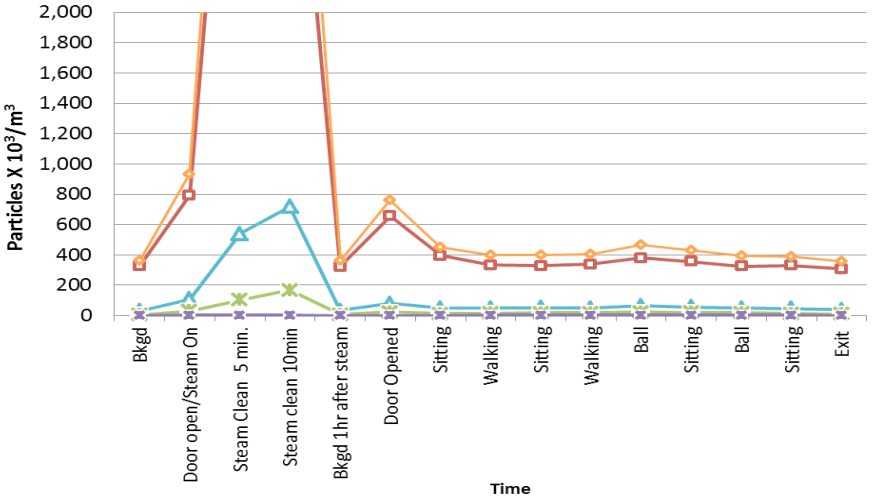

89

Carpet 4 - Particle Counts during Steam Clean and Room Disturbance 7



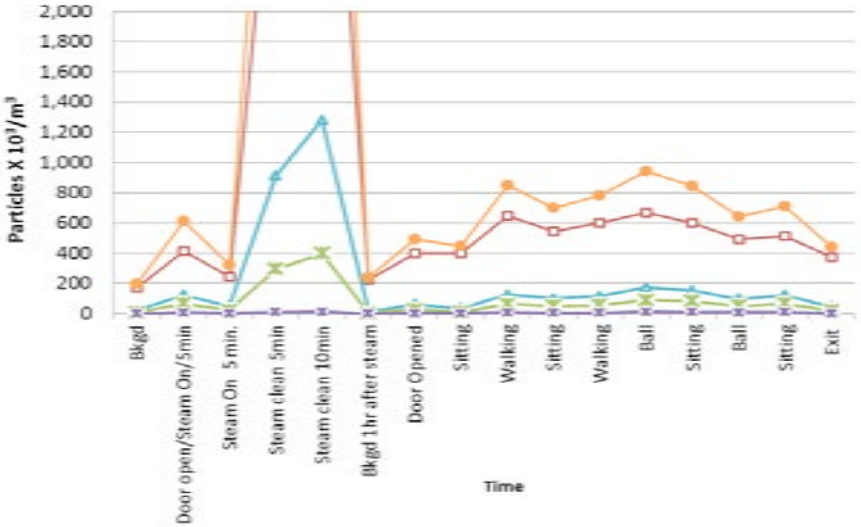

90

Carpet 3 - Particle Counts during Steam Clean and Room Disturbance 8

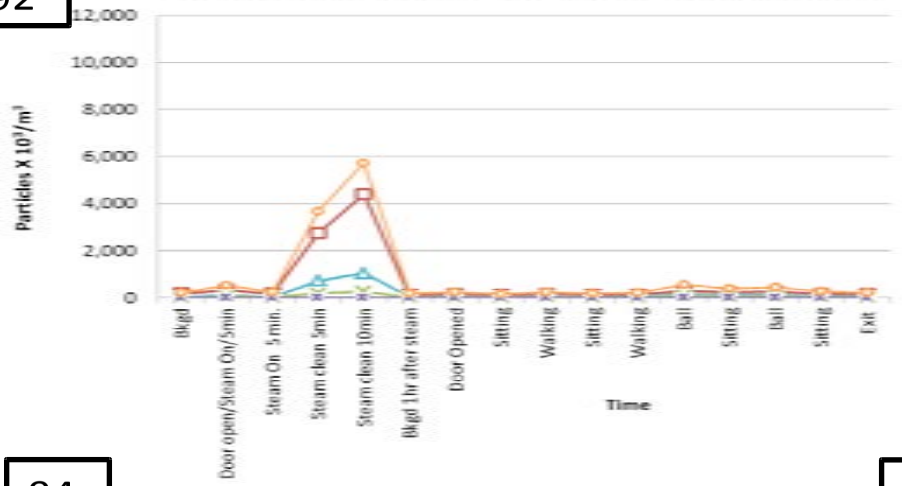



91

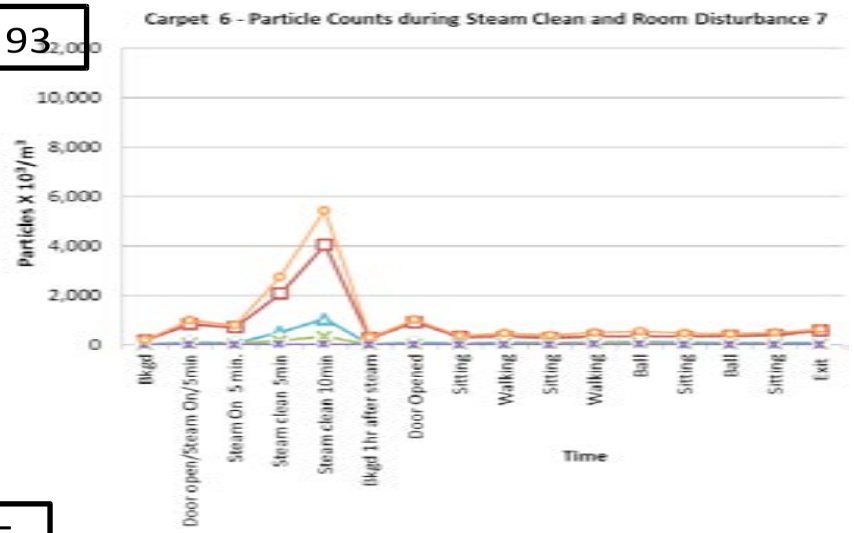
Carpet 4 - Particle Counts during Steam Clean and Room Disturbance 8



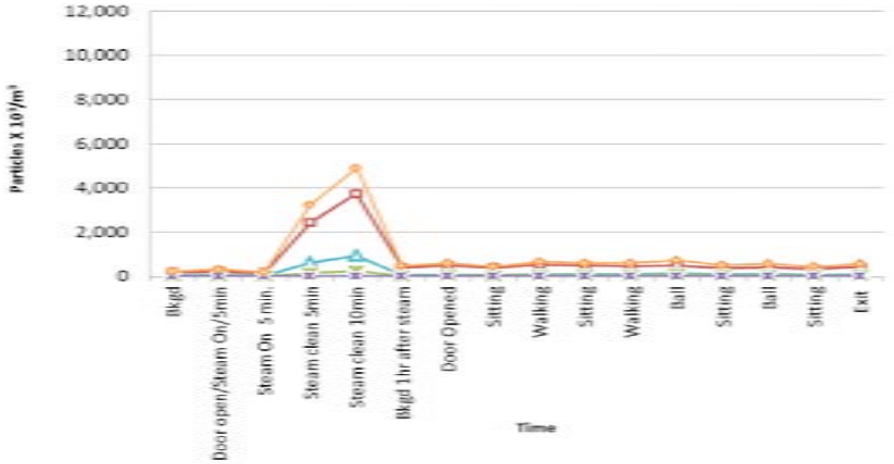
92


Carpet 5 - Particle Counts during Steam Clean and Room Disturbance 7
Particles X 10³/m³
12,000
10,000
8,000
6,000
4,000
2,000
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

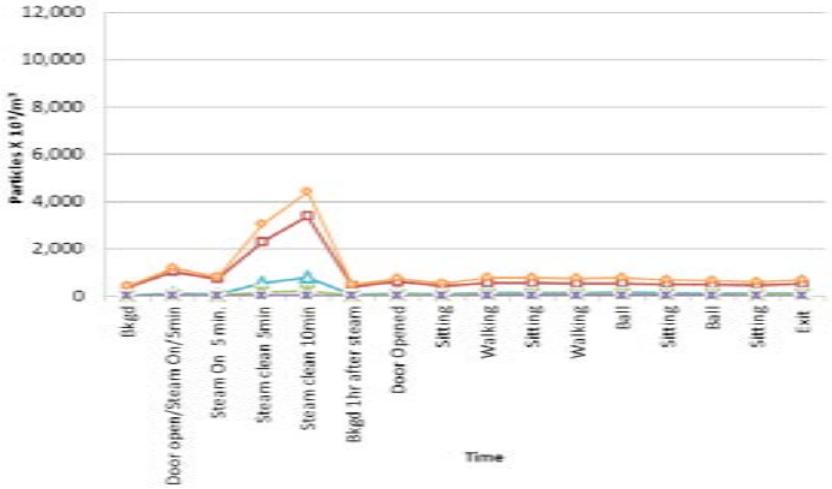
93


Carpet 6 - Particle Counts during Steam Clean and Room Disturbance 7
Particles X 10³/m³
10,000
8,000
6,000
4,000
2,000
0
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

94

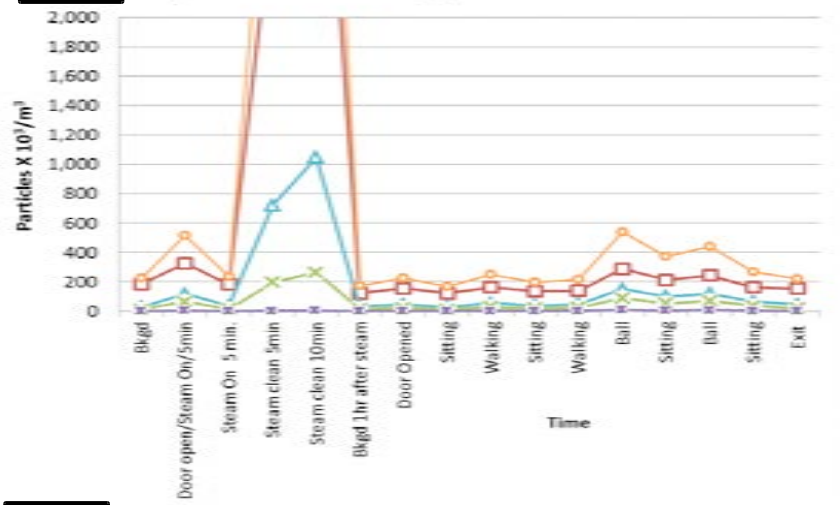

Carpet 5 - Particle Counts during Steam Clean and Room Disturbance 8
Particles X 10³/m³
12,000
10,000
8,000
6,000
4,000
2,000
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

95


Carpet 6 - Particle Counts during Steam Clean and Room Disturbance 8
Particles X 10³/m³
12,000
10,000
8,000
6,000
4,000
2,000
0
Bkgd
Door open/Steam On/5min
Steam On 5 min.
Steam clean 5min
Steam clean 10min
Bkgd 1hr after steam
Door Opened
Sitting
Walking
Sitting
Walking
Ball
Sitting
Ball
Sitting
Exit
Time

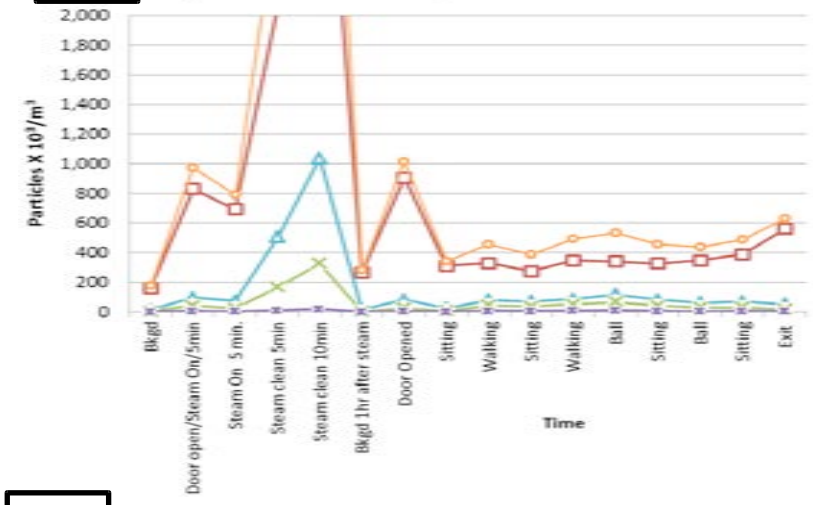
96

Carpet 5 - Particle Counts during Steam Clean and Room Disturbance 7



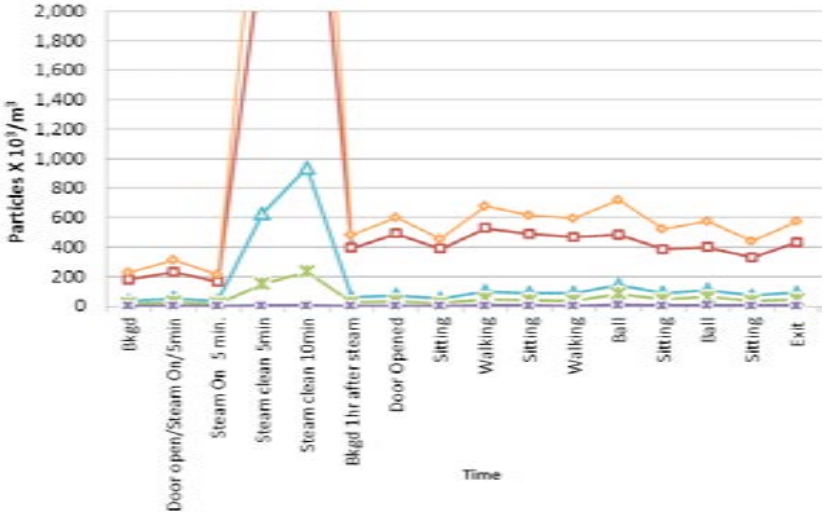

97

Carpet 6 - Particle Counts during Steam Clean and Room Disturbance 7



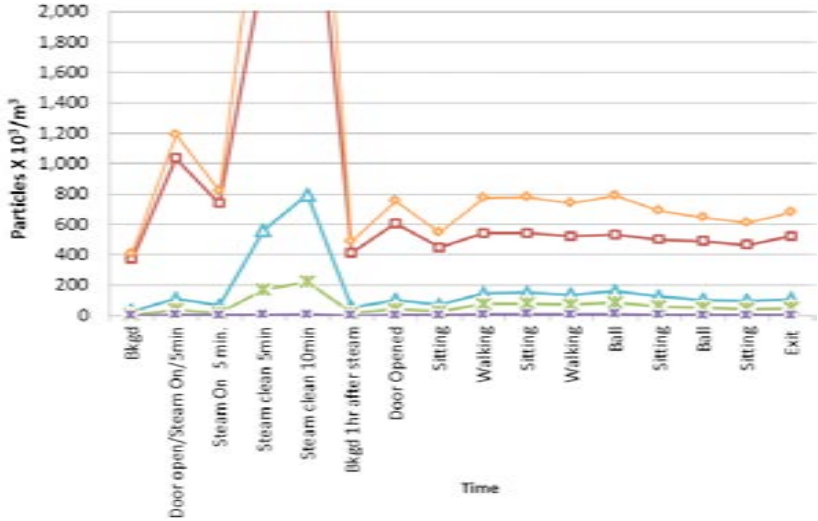

98

Carpet 5 - Particle Counts during Steam Clean and Room Disturbance 8

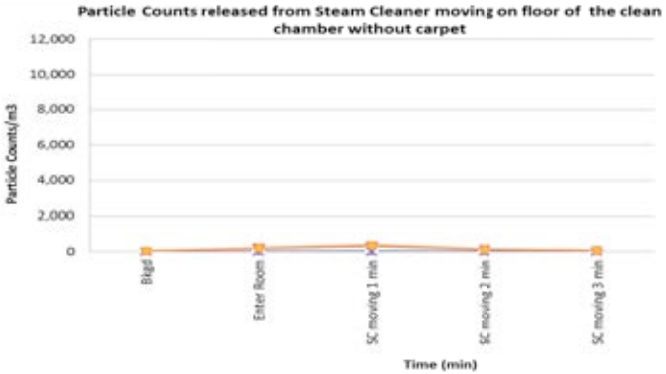



99

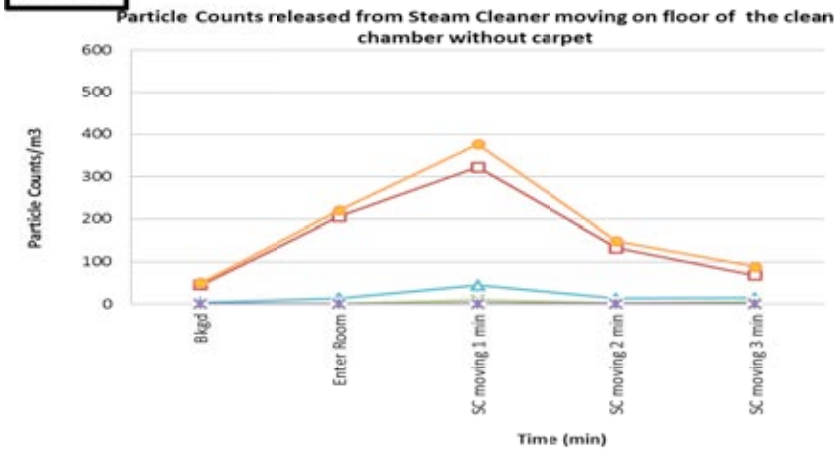
Carpet 6 - Particle Counts during Steam Clean and Room Disturbance 8



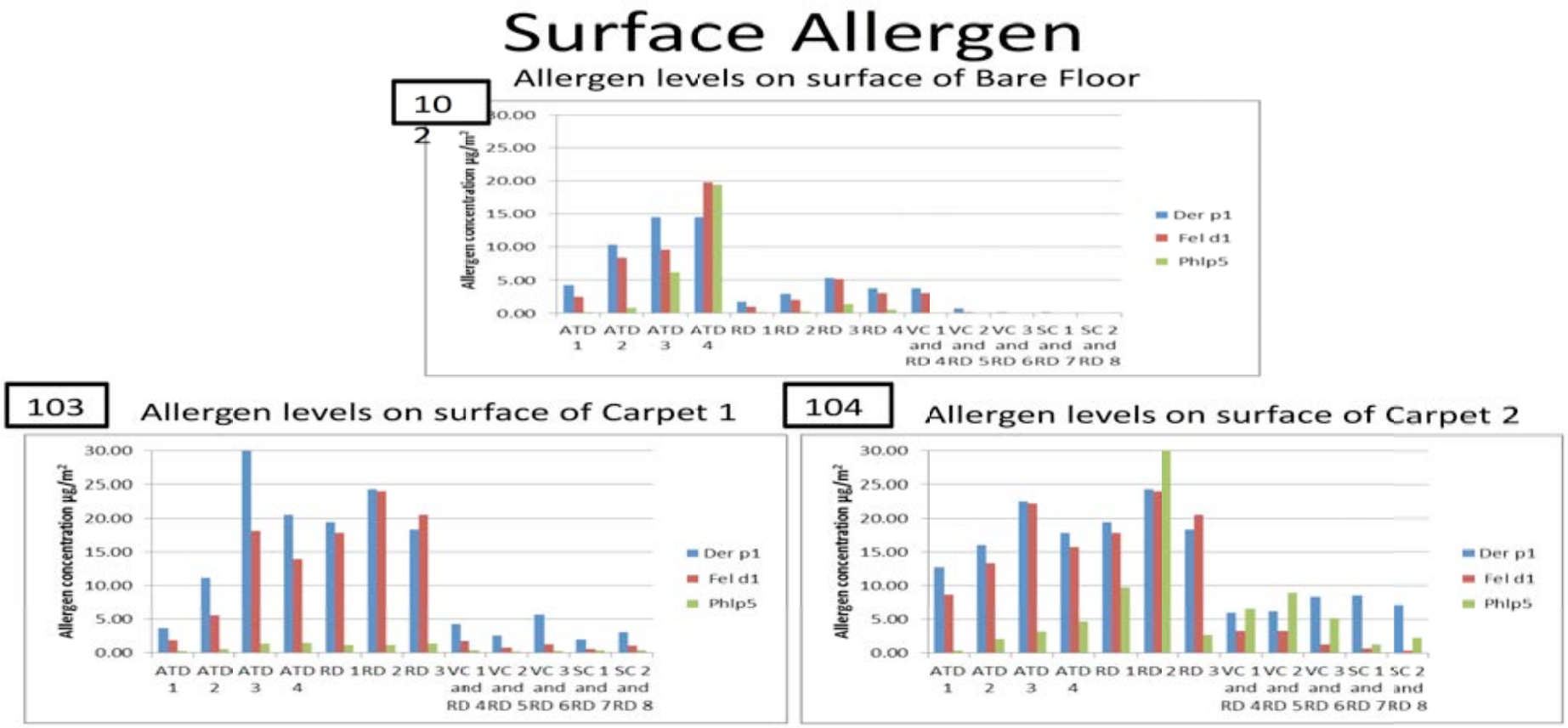
100


Particle Counts released from Steam Cleaner moving on floor of the clean chamber without carpet
12,000
10,000
8,000
6,000
4,000
2,000
0
Particle Counts/m3
Bkgd
Enter Room
SC moving 1 min
SC moving 2 min
SC moving 3 min
Time (min)

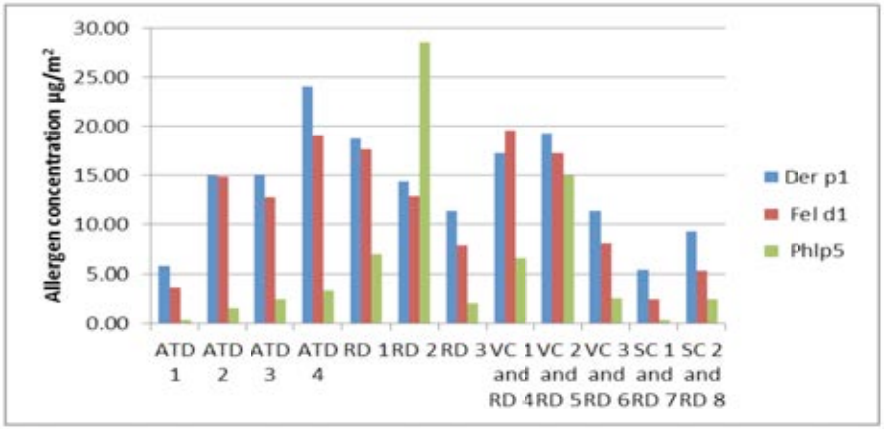
101


Particle Counts released from Steam Cleaner moving on floor of the clean chamber without carpet
600
500
400
300
200
100
0
Particle Counts/m3
Bkgd
Enter Room
SC moving 1 min
SC moving 2 min
SC moving 3 min
Time (min)

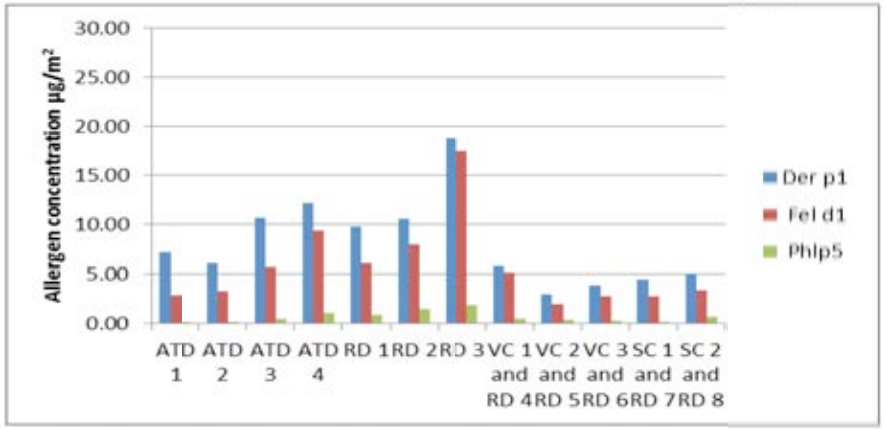
## Appendix I-C: Part I Surface Allergen Graphs



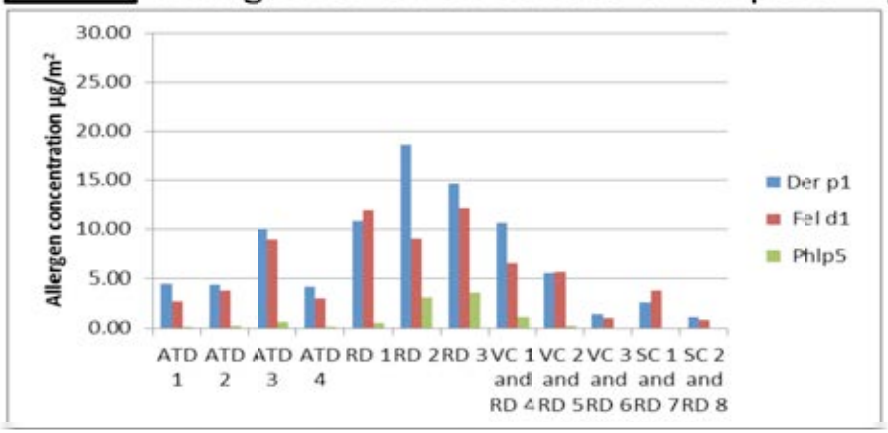
105 Allergen levels on surface of Carpet 3



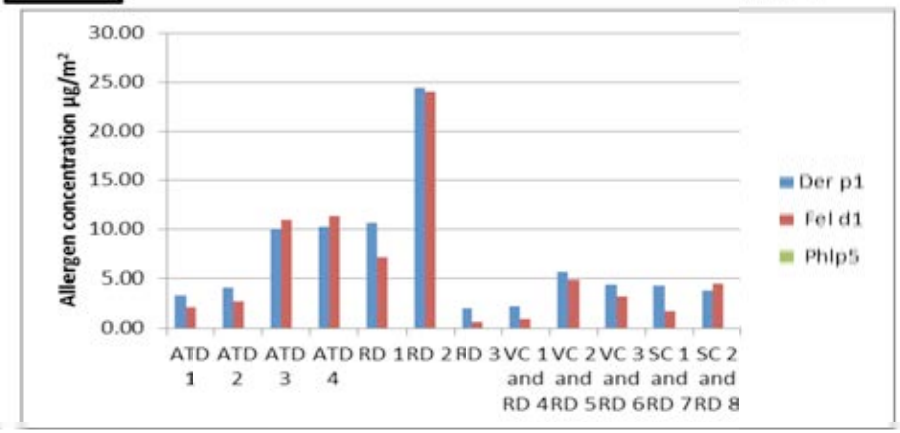

106 Allergen levels on surface of Carpet 4




107 Allergen levels on surface of Carpet 5




108 Allergen levels on surface of Carpet 6

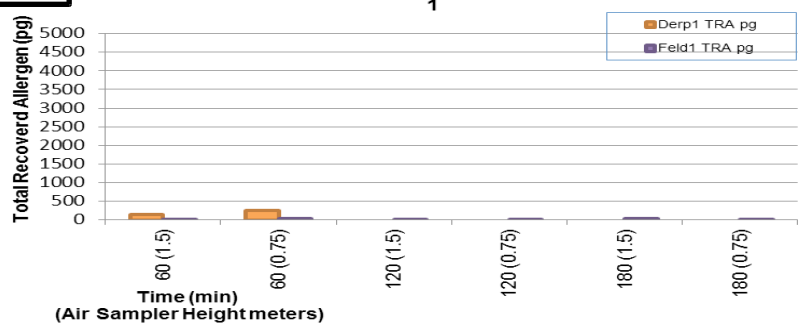


## Appendix I-D: Part I Airborne Allergen Graphs

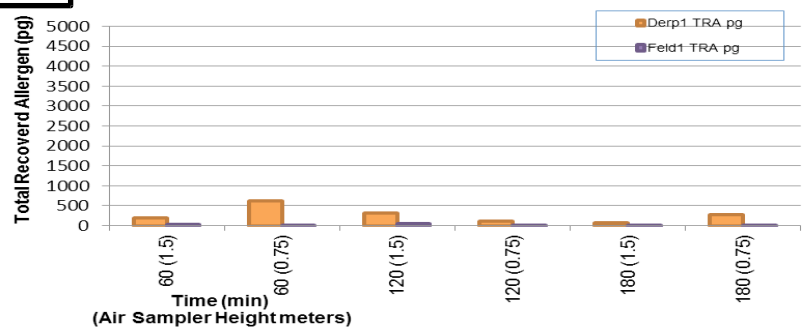
# Airborne Allergen

Hard Floor 1 - Airborne allergen levels obtained after ATD Introduction

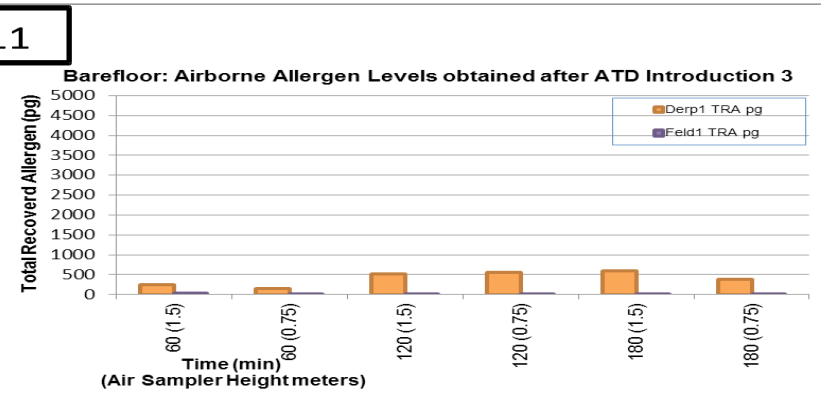
109



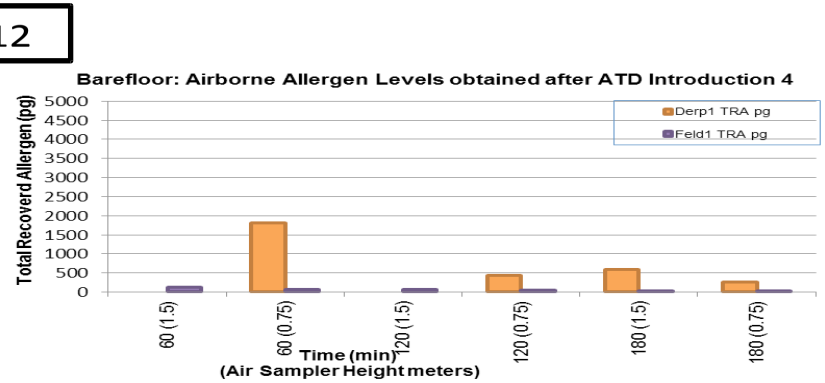

110



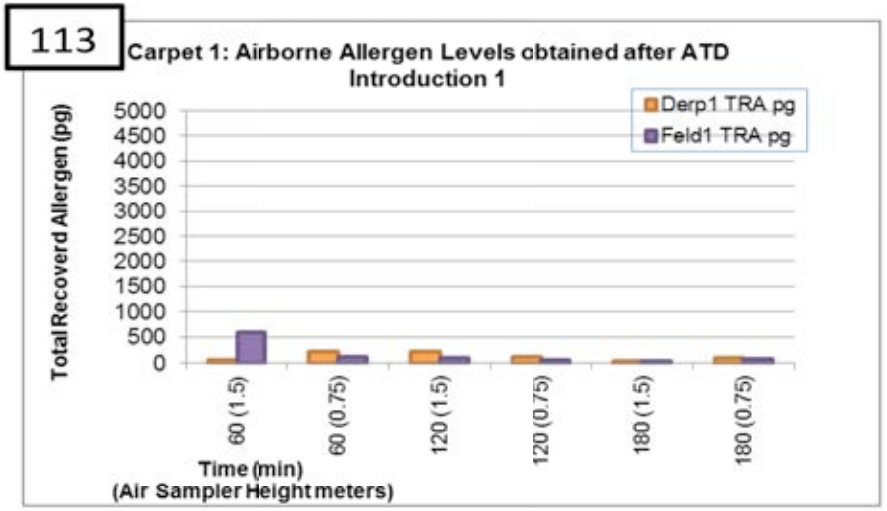

111



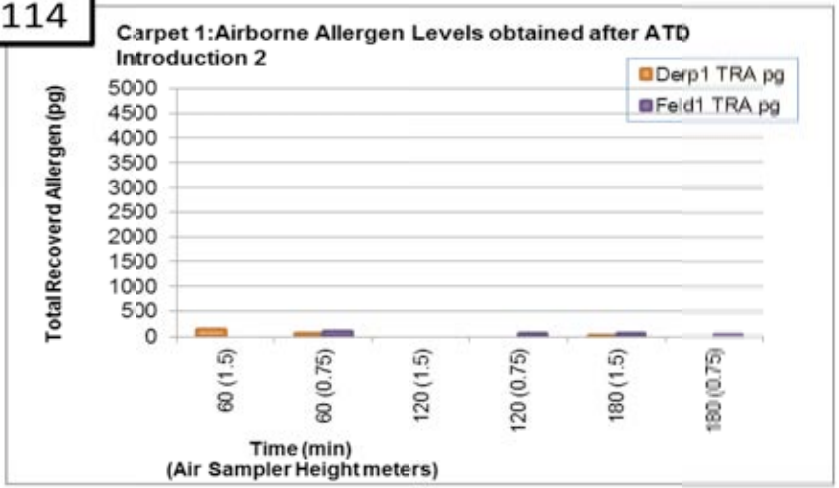

112



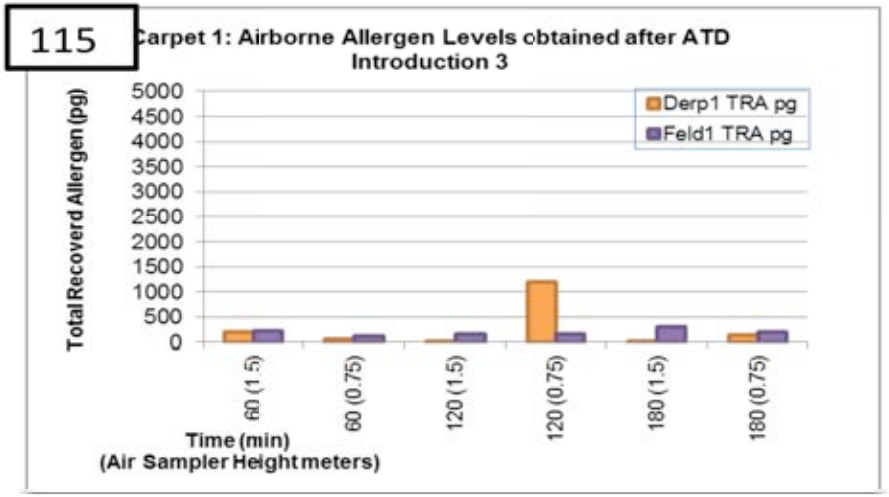
113



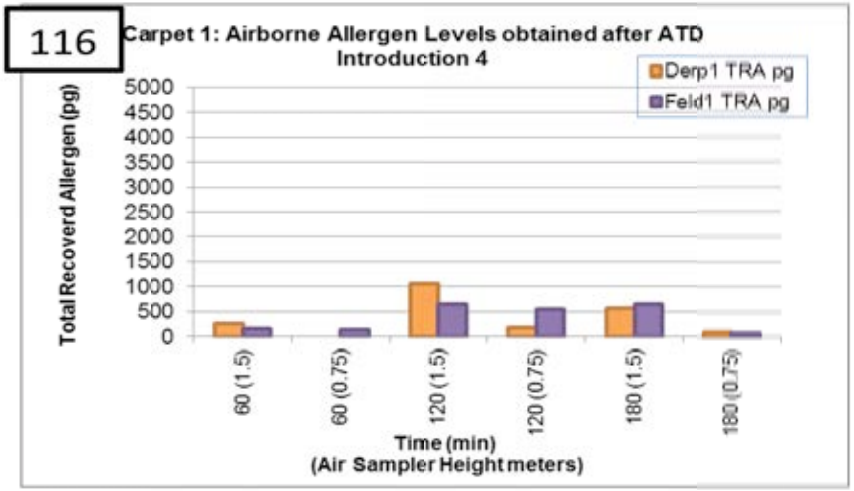

114



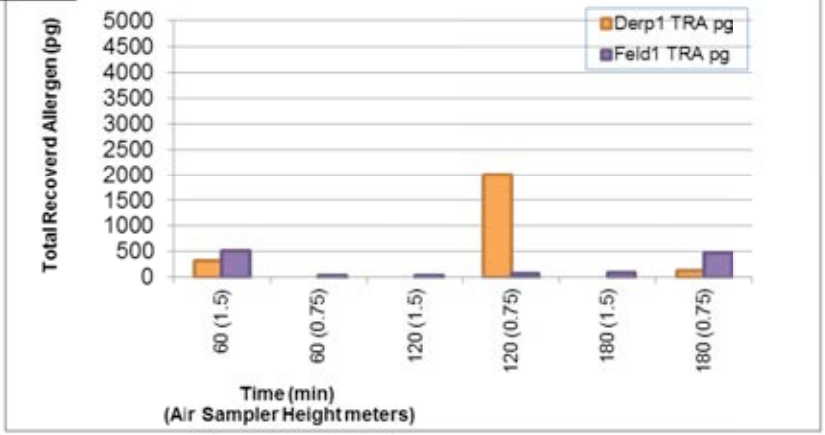

115



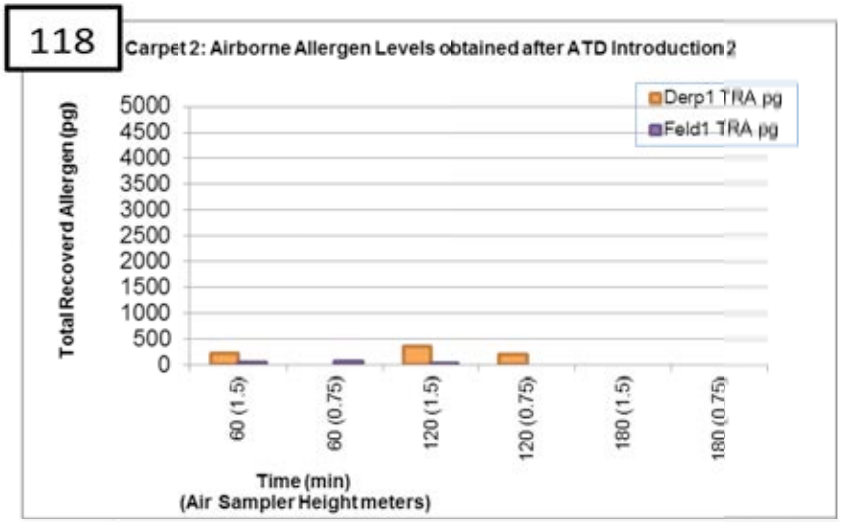

116



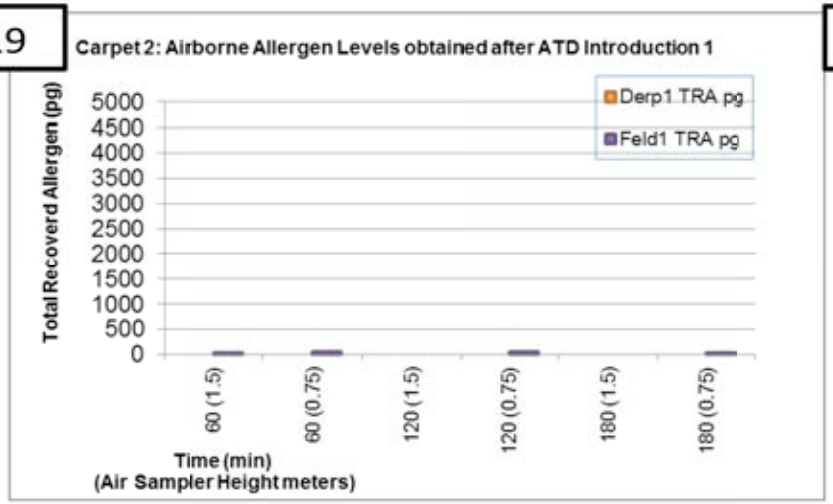
117



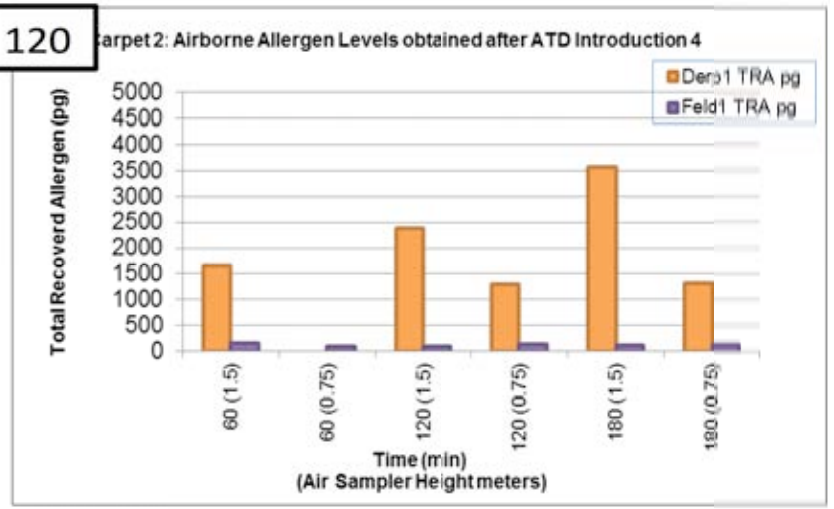

118



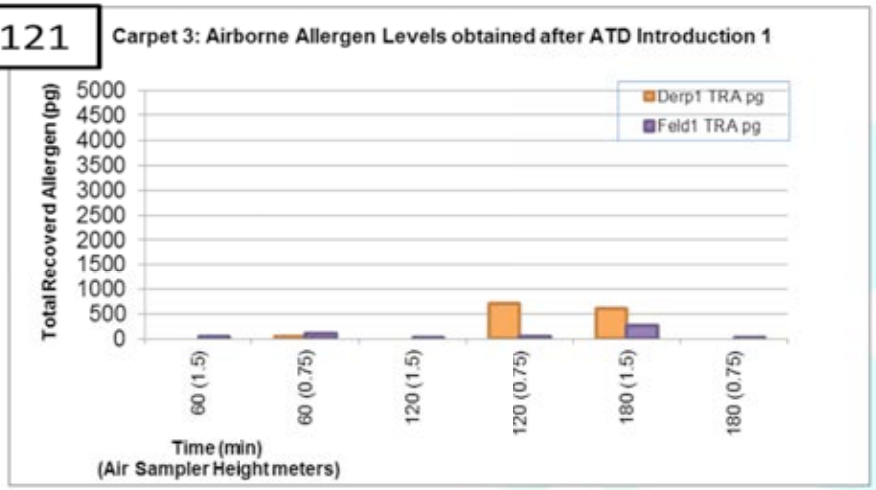

119



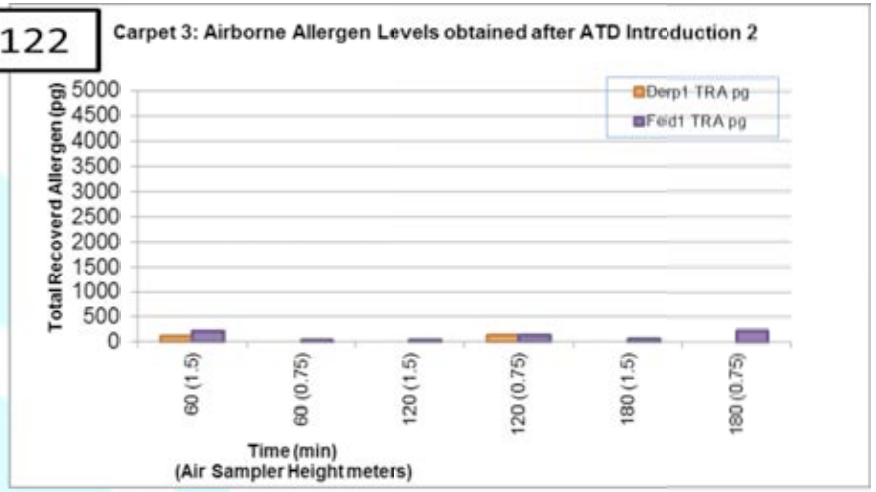

120

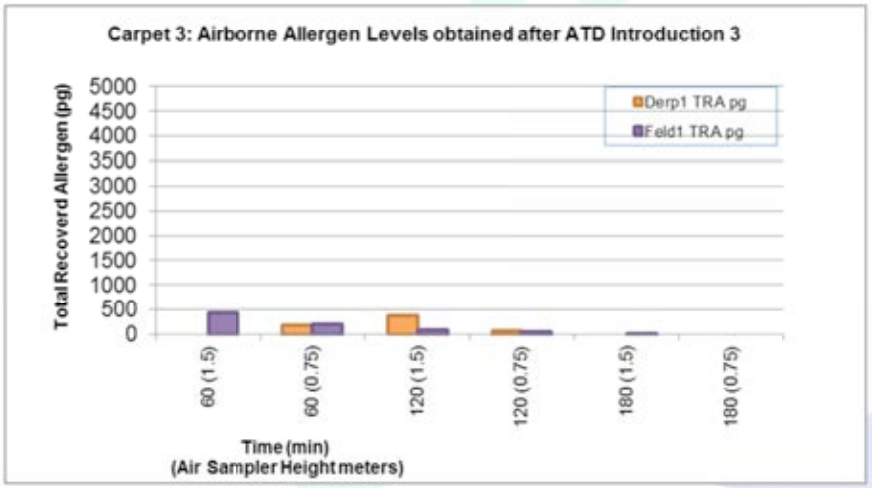


121

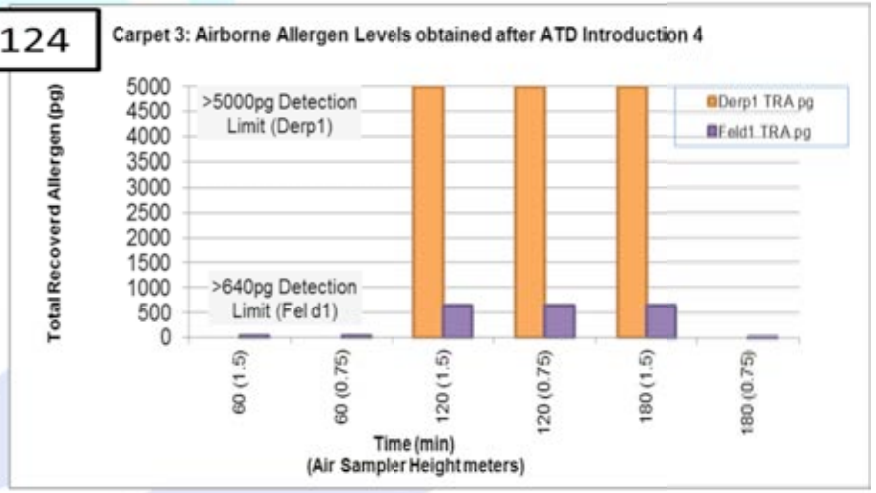



122

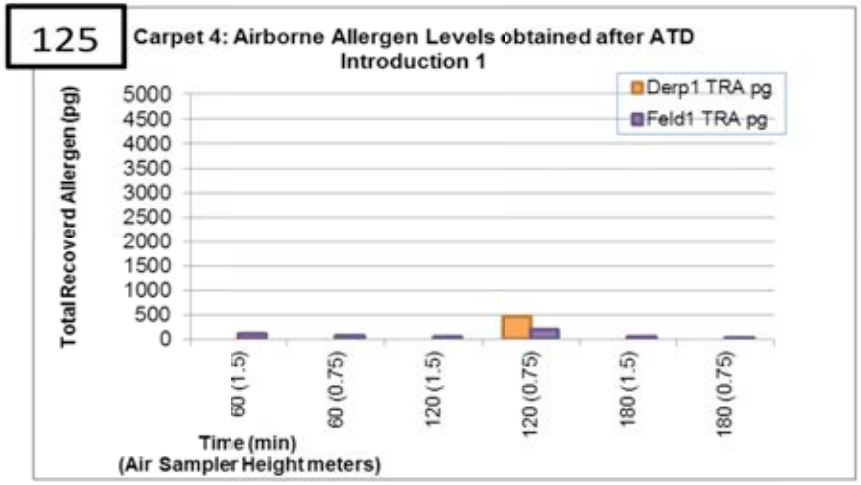


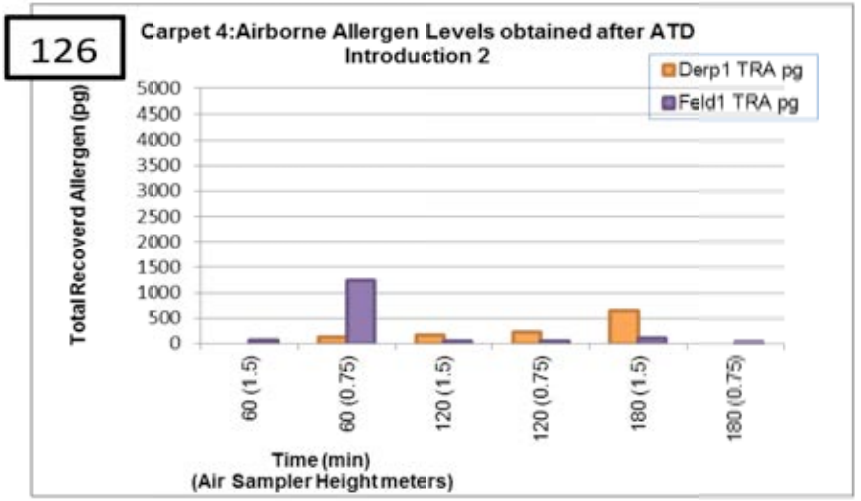



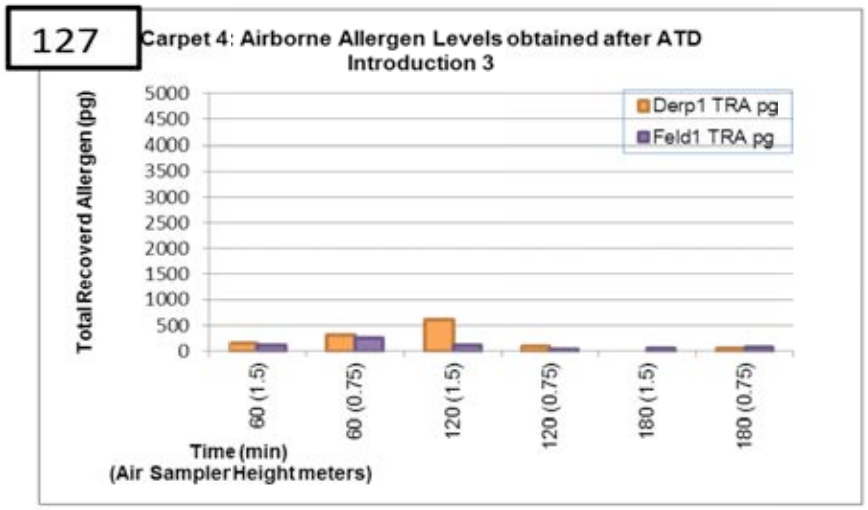

124

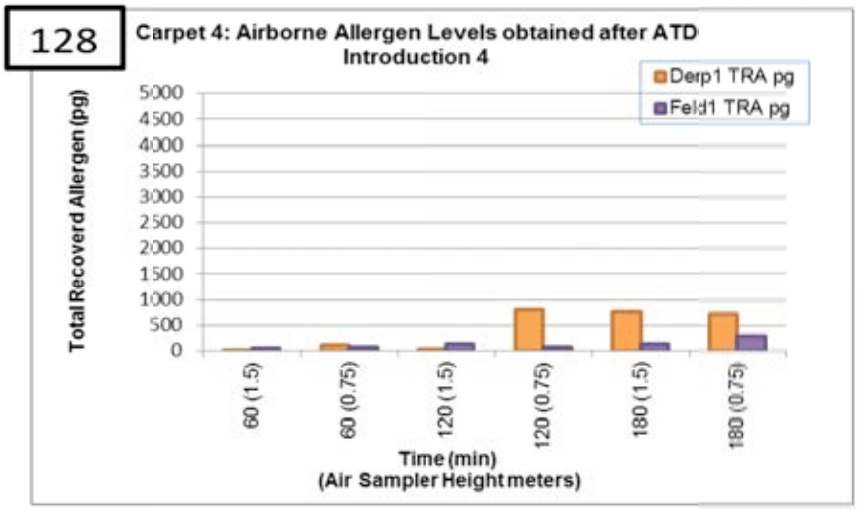



***Note:*** *The unusually high airborne allergen levels observed for carpet 3 in Graph 124 may be due to contamination of the air filters when removed from air sample cassettes. This was not observed after room disturbance or vacuuming/steaming.*


125
Carpet 4: Airborne Allergen Levels obtained after ATD
Introduction 1
Derp1 TRA pg
Feld1 TRA pg
Total Recoverd Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
60 (1.5)
60 (0.75)
120 (1.5)
120 (0.75)
180 (1.5)
180 (0.75)
Time (min)
(Air Sampler Height meters)

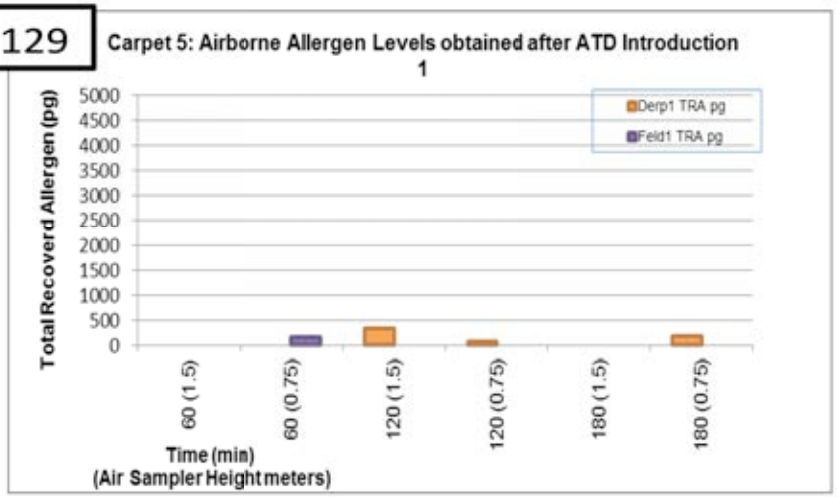

126
Carpet 4:Airborne Allergen Levels obtained after ATD
Introduction 2
Derp1 TRA pg
Feld1 TRA pg
Total Recoverd Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
60 (1.5)
60 (0.75)
120 (1.5)
120 (0.75)
180 (1.5)
180 (0.75)
Time (min)
(Air Sampler Height meters)


127
Carpet 4: Airborne Allergen Levels obtained after ATD
Introduction 3
Derp1 TRA pg
Feld1 TRA pg
Total Recoverd Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
60 (1.5)
60 (0.75)
120 (1.5)
120 (0.75)
180 (1.5)
180 (0.75)
Time (min)
(Air Sampler Height meters)


128
Carpet 4: Airborne Allergen Levels obtained after ATD
Introduction 4
Derp1 TRA pg
Feld1 TRA pg
Total Recoverd Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
60 (1.5)
60 (0.75)
120 (1.5)
120 (0.75)
180 (1.5)
180 (0.75)
Time (min)
(Air Sampler Height meters)

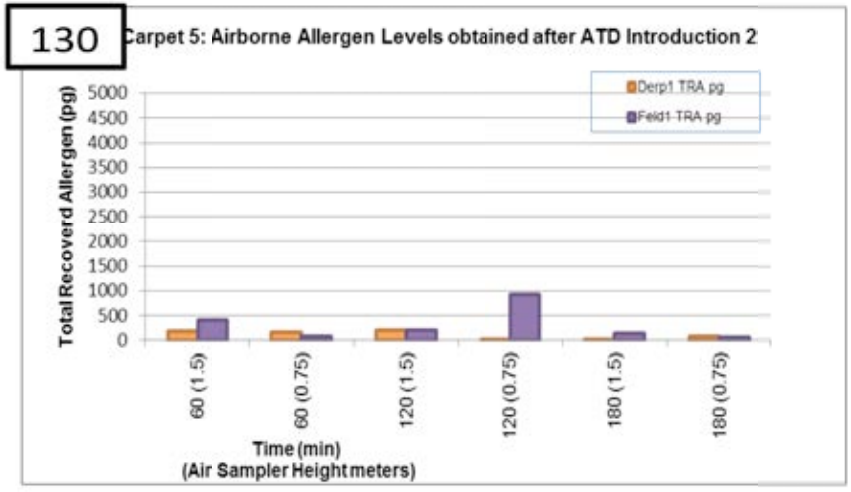
129

Carpet 5: Airborne Allergen Levels obtained after ATD Introduction 1



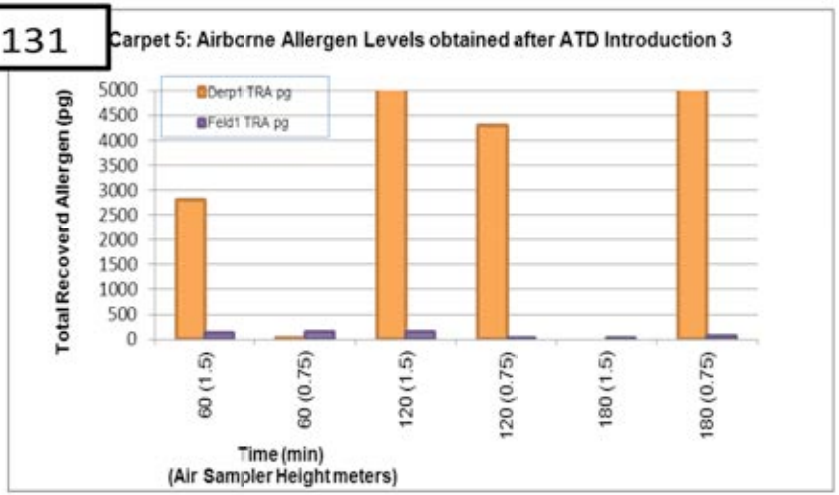

130

Carpet 5: Airborne Allergen Levels obtained after ATD Introduction 2



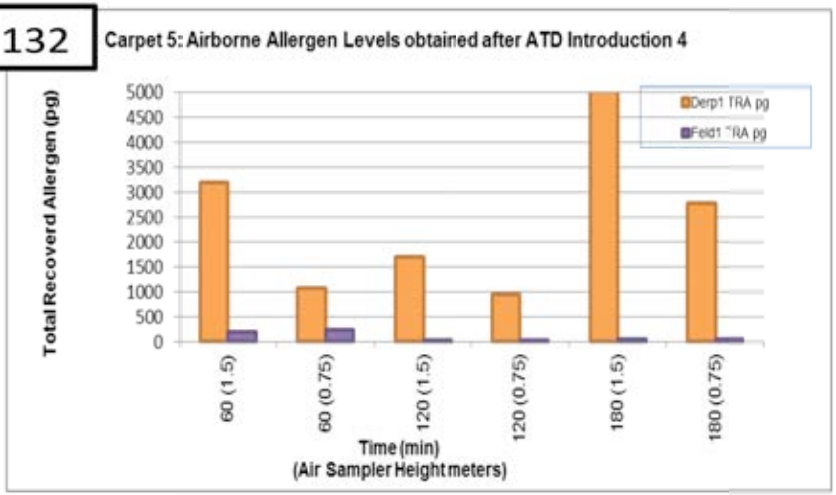

131

Carpet 5: Airborne Allergen Levels obtained after ATD Introduction 3



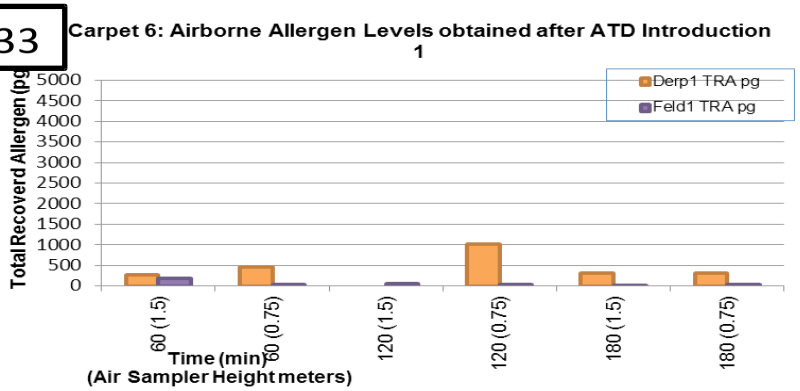

132

Carpet 5: Airborne Allergen Levels obtained after ATD Introduction 4

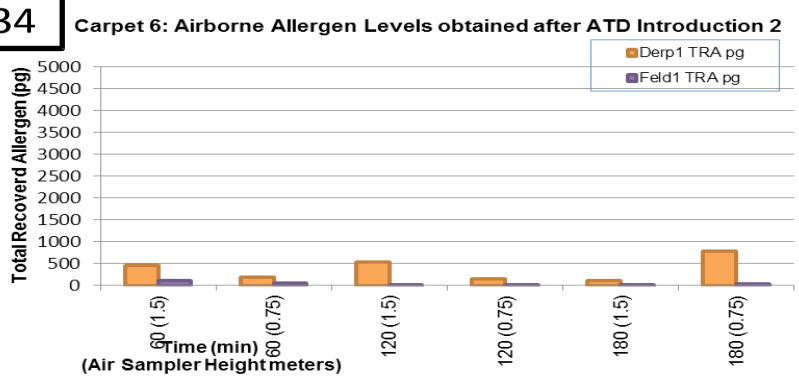


# Carpet 6 - Airborne allergen levels obtained after ATD Introduction

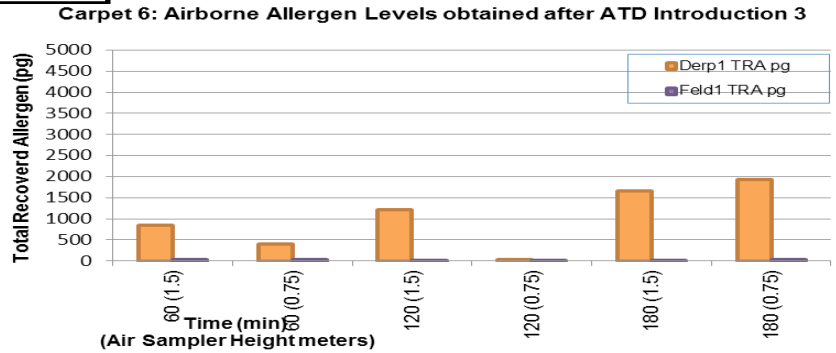
133



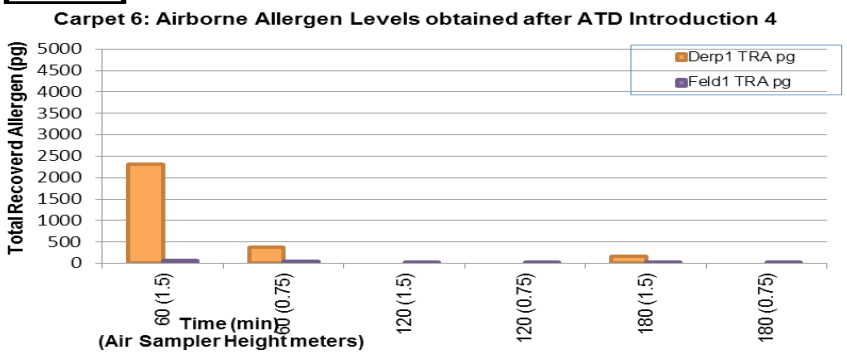

134




135

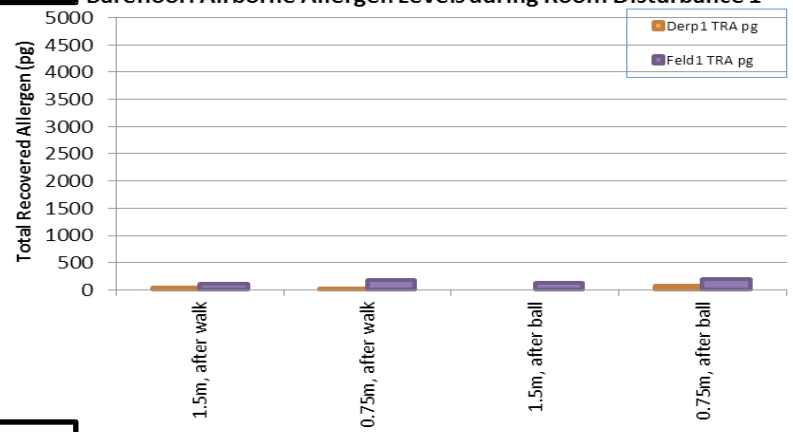



136

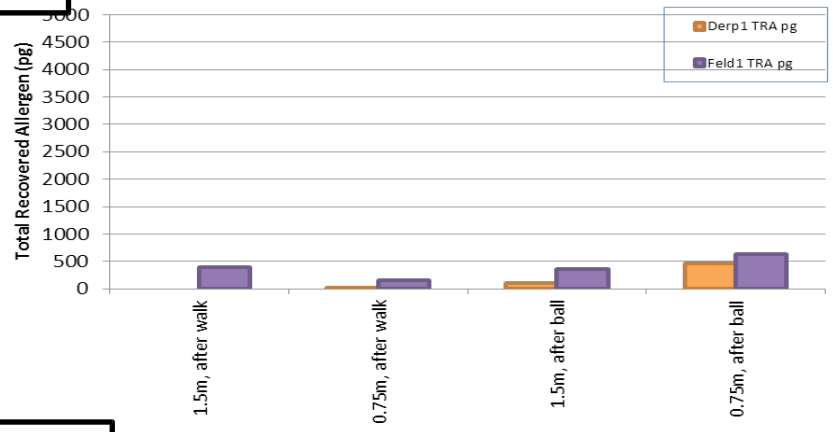


# Hard Floor 1 - Airborne allergen levels obtained after Room Disturbance

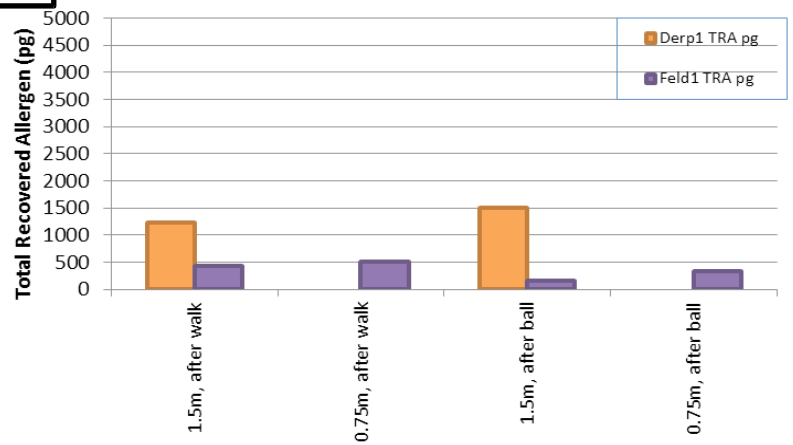
137



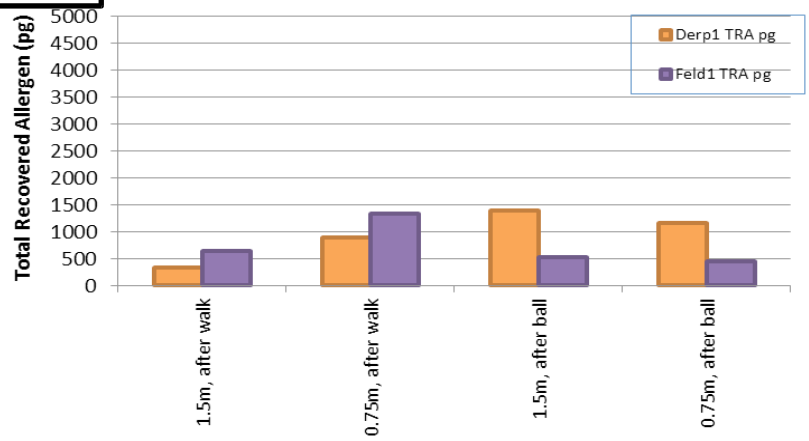

138



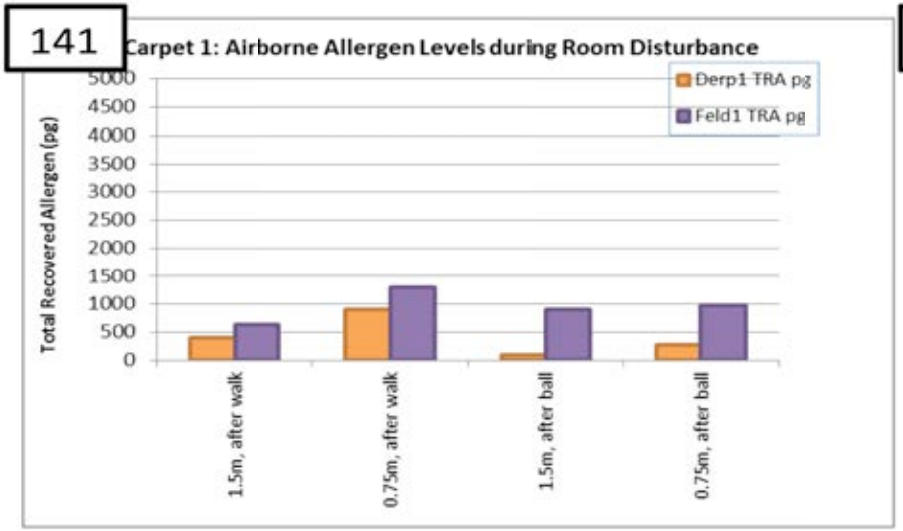

139



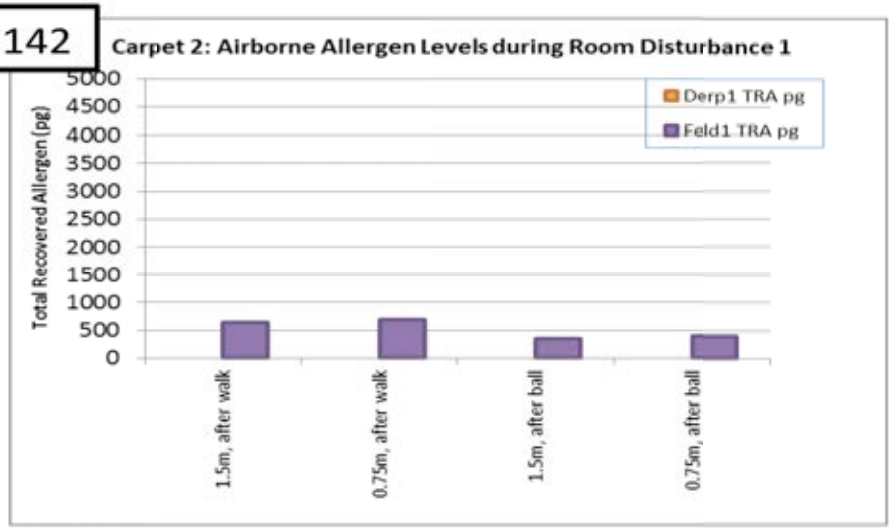

140



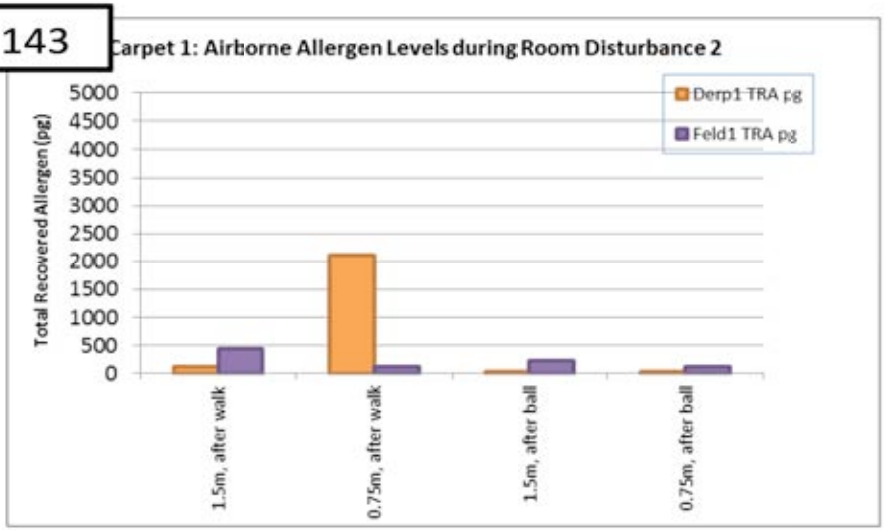
141



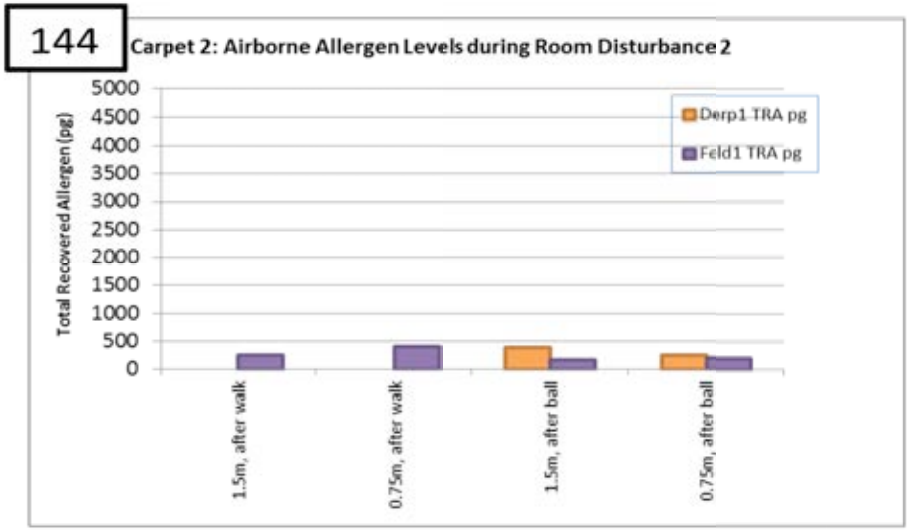

142



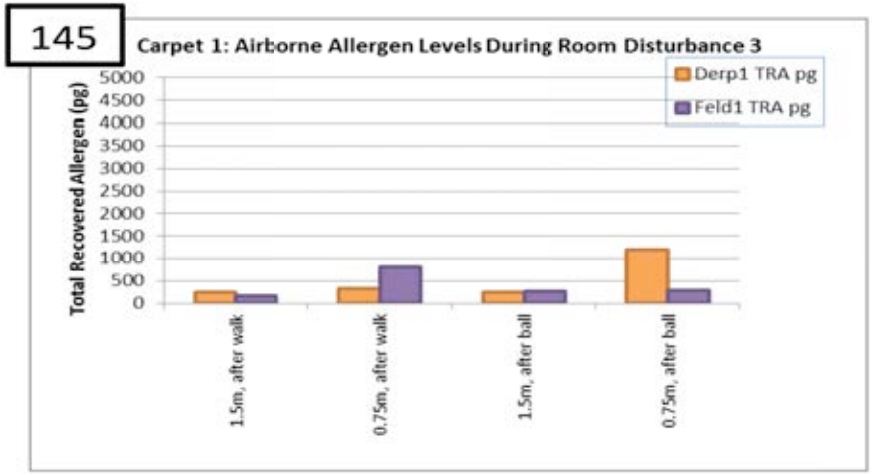

143



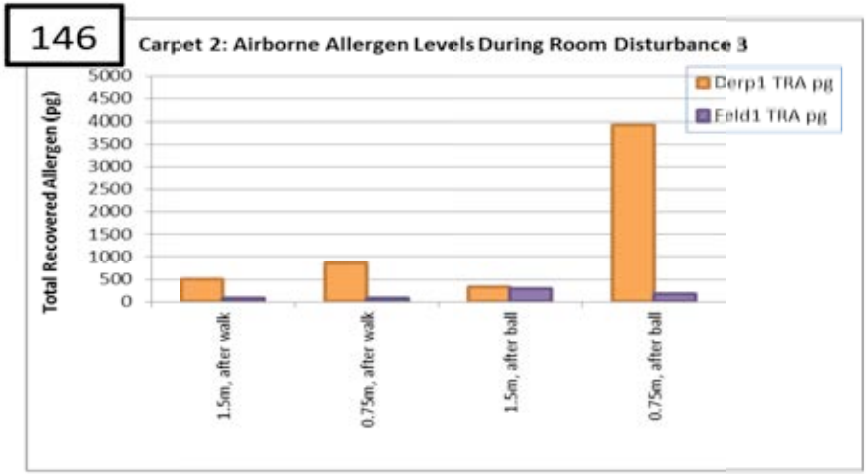

144



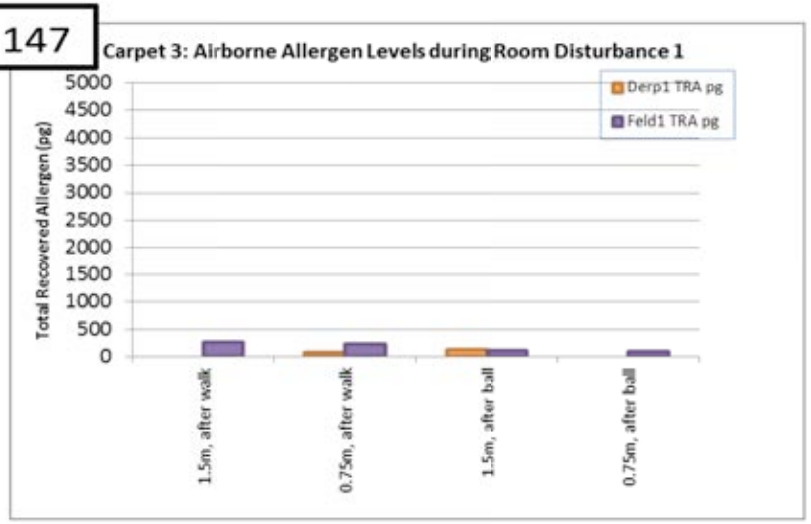
145


Carpet 1: Airborne Allergen Levels During Room Disturbance 3
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Derp1 TRA pg
Feld1 TRA pg
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

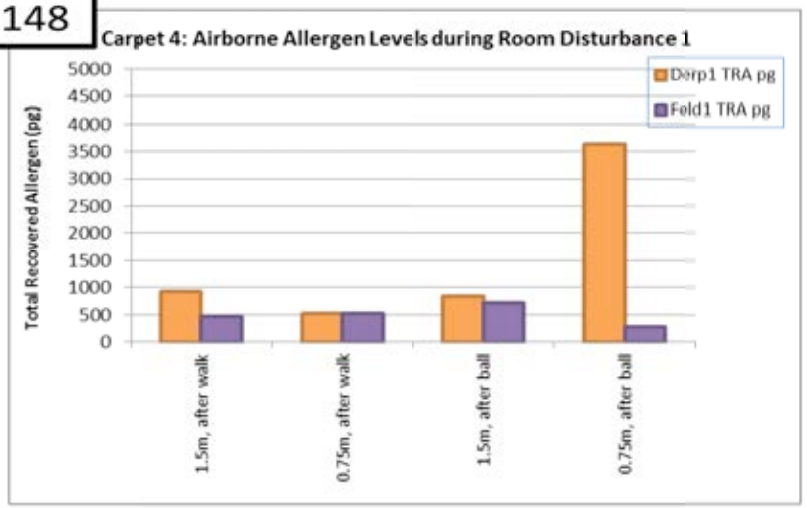
146


Carpet 2: Airborne Allergen Levels During Room Disturbance 3
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Derp1 TRA pg
Feld1 TRA pg
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

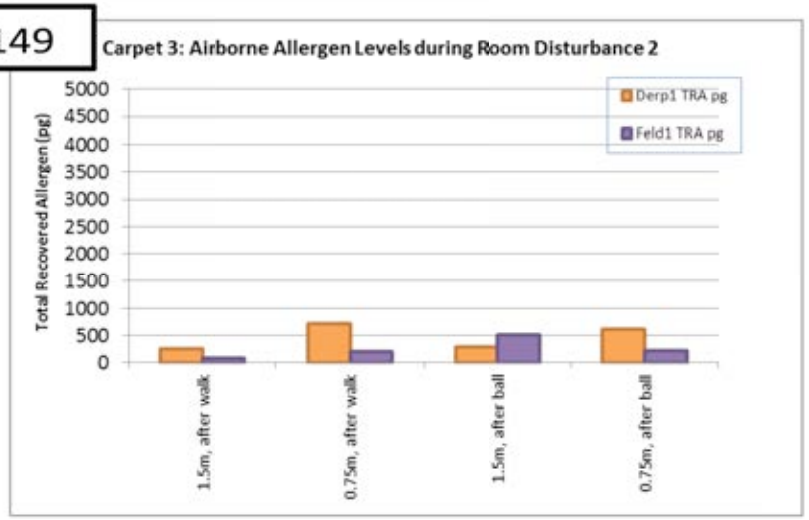
147



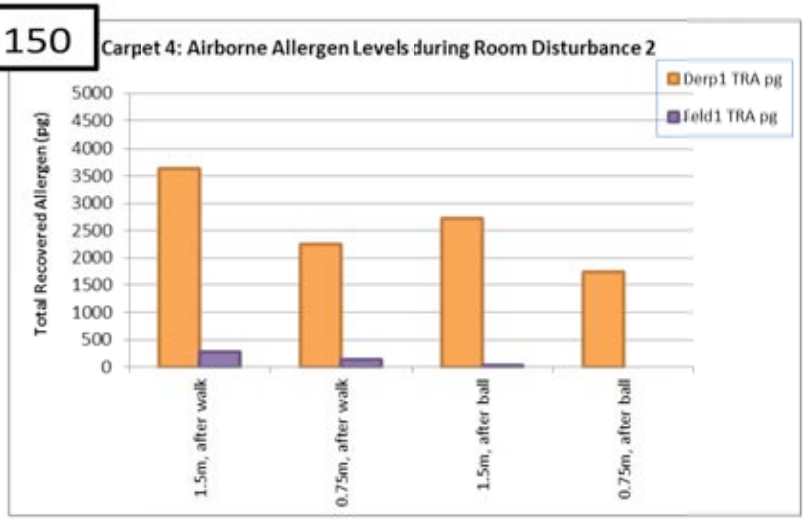

148



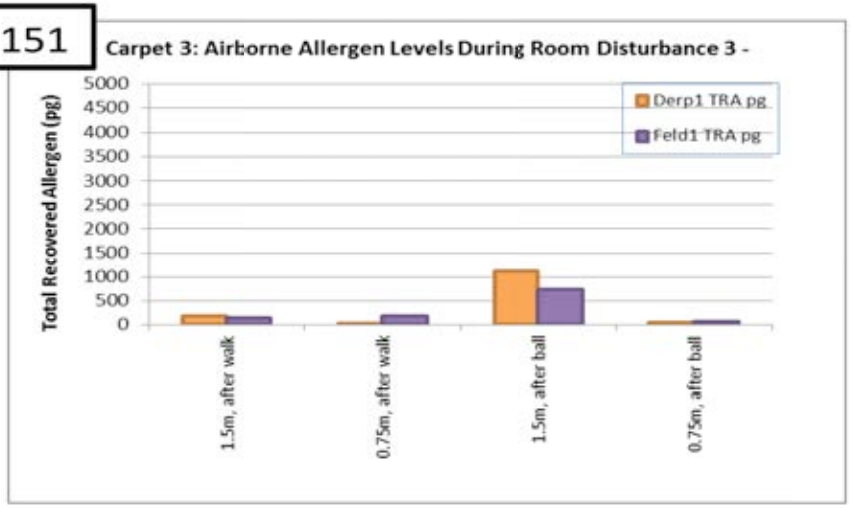

149



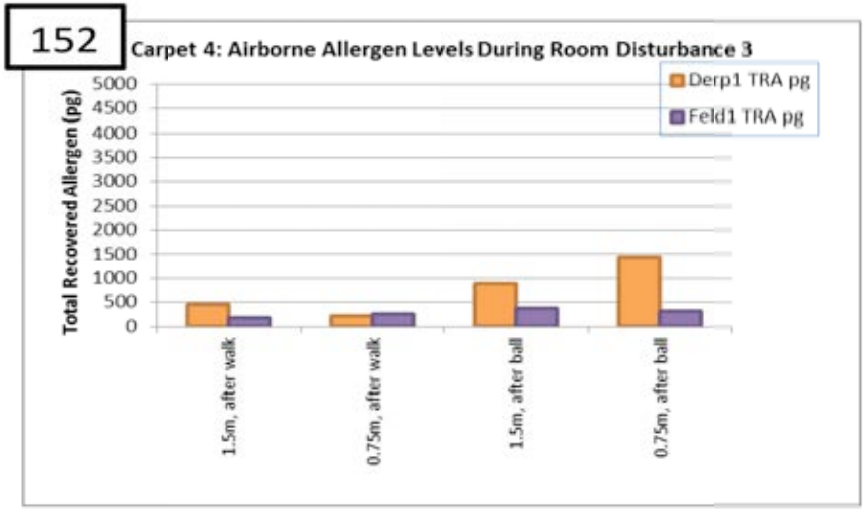

150



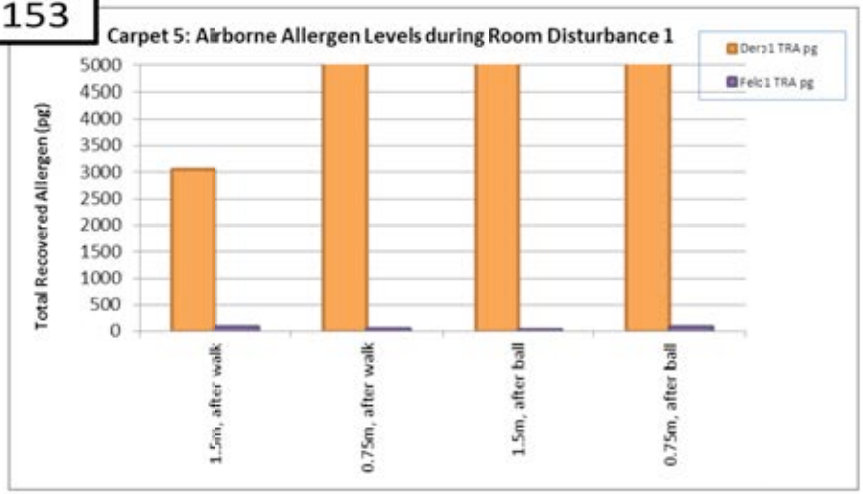
151


Carpet 3: Airborne Allergen Levels During Room Disturbance 3 -
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Derp1 TRA pg
Feld1 TRA pg
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

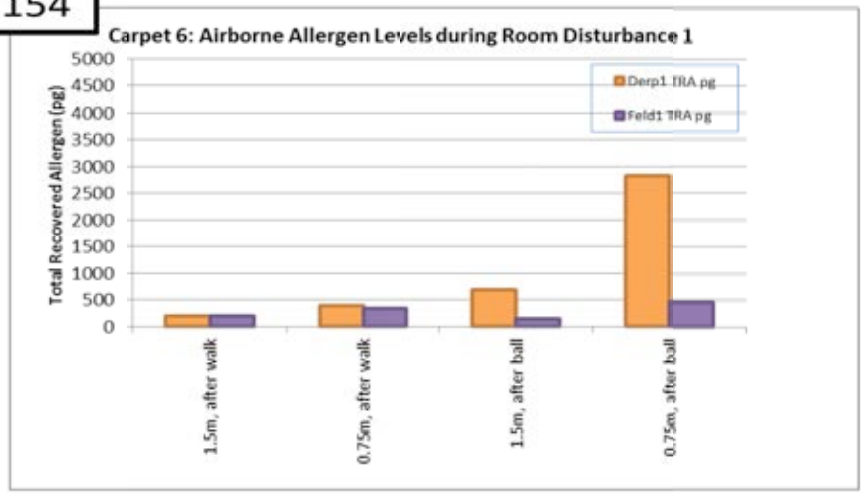
152


Carpet 4: Airborne Allergen Levels During Room Disturbance 3
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Derp1 TRA pg
Feld1 TRA pg
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

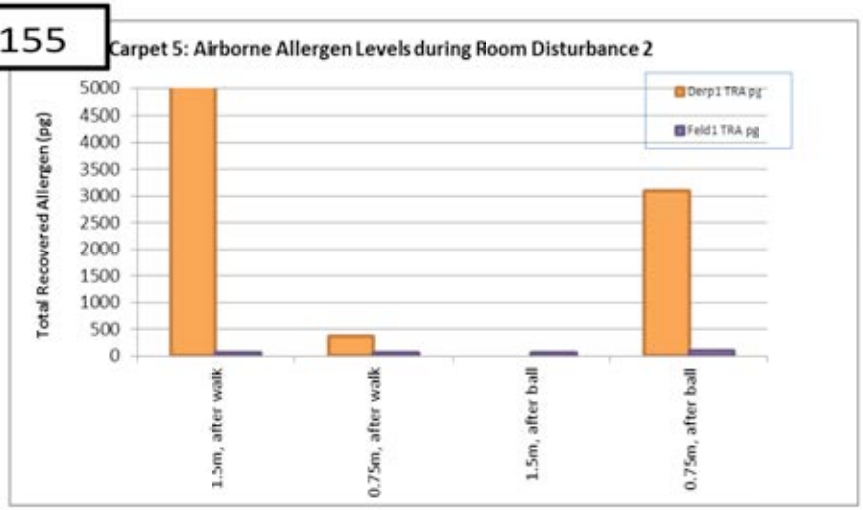
153



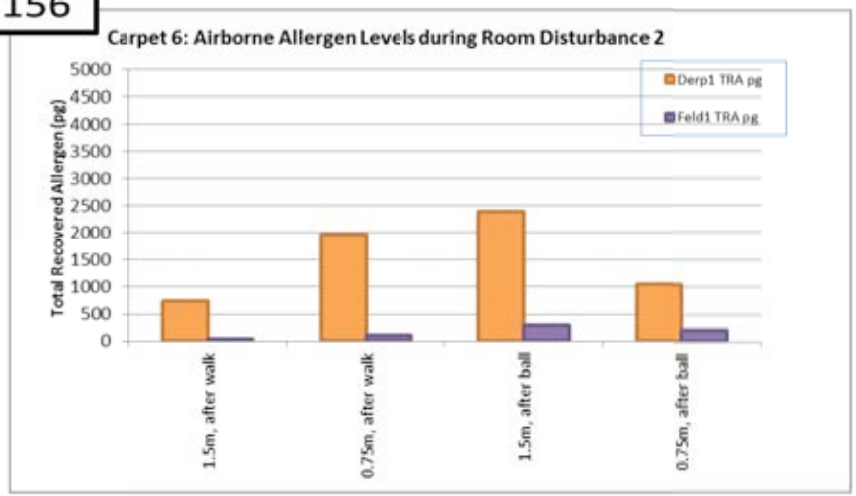

154



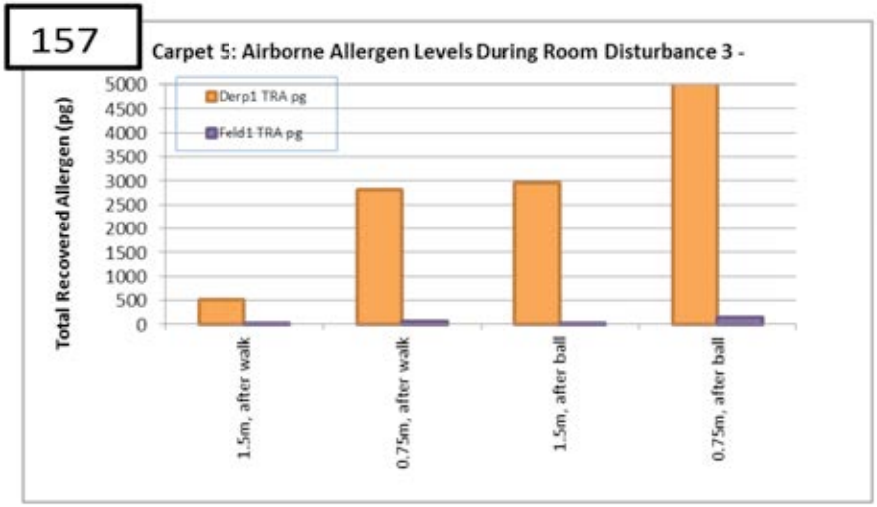

155



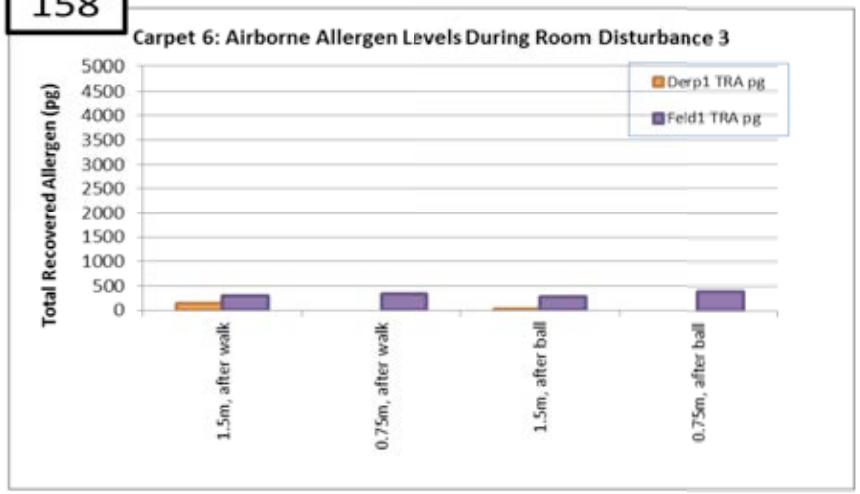

156



157

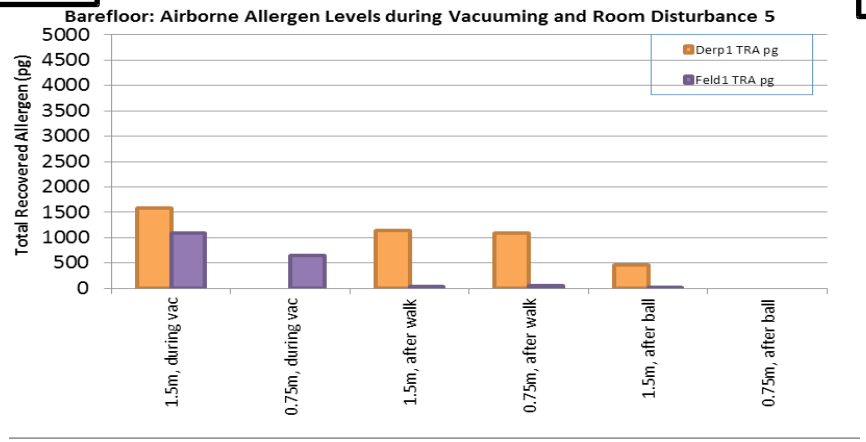

Carpet 5: Airborne Allergen Levels During Room Disturbance 3 -
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Derp1 TRA pg
Feld1 TRA pg
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

158

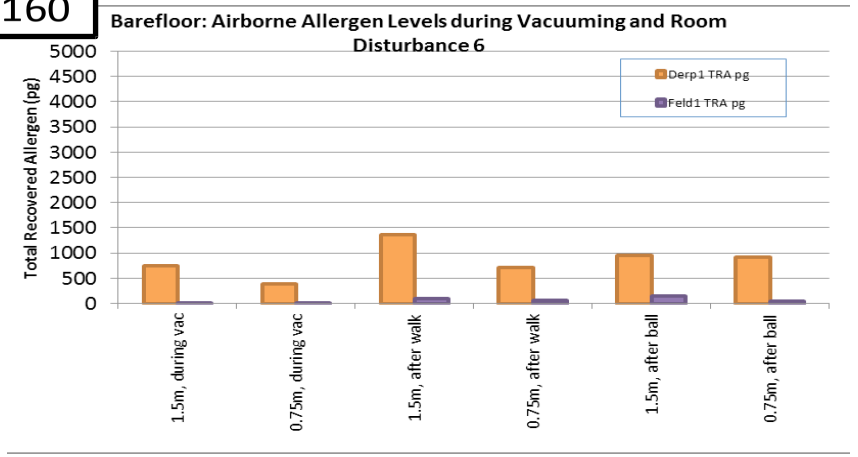

Carpet 6: Airborne Allergen Levels During Room Disturbance 3
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Derp1 TRA pg
Feld1 TRA pg
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

# Hard Floor 1 - Airborne allergen levels obtained after Vacuuming and Room Disturbance

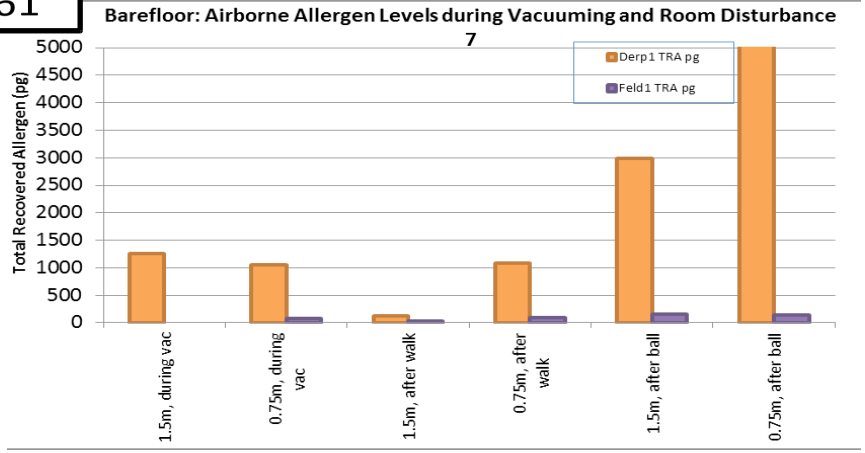
159



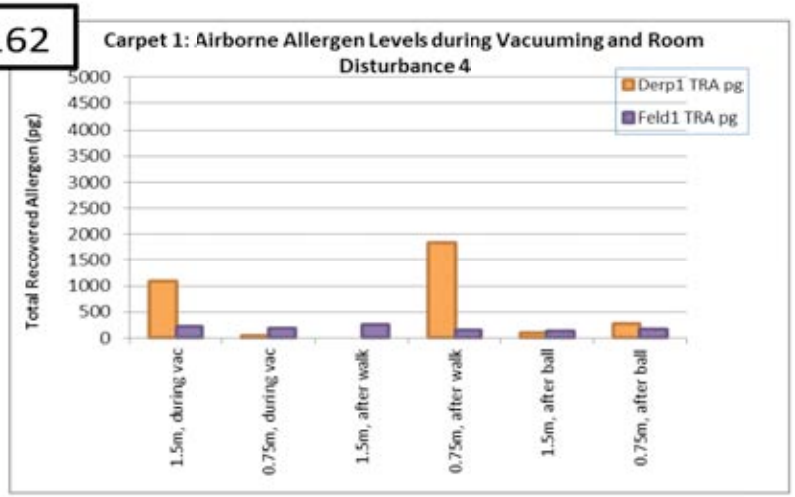

160



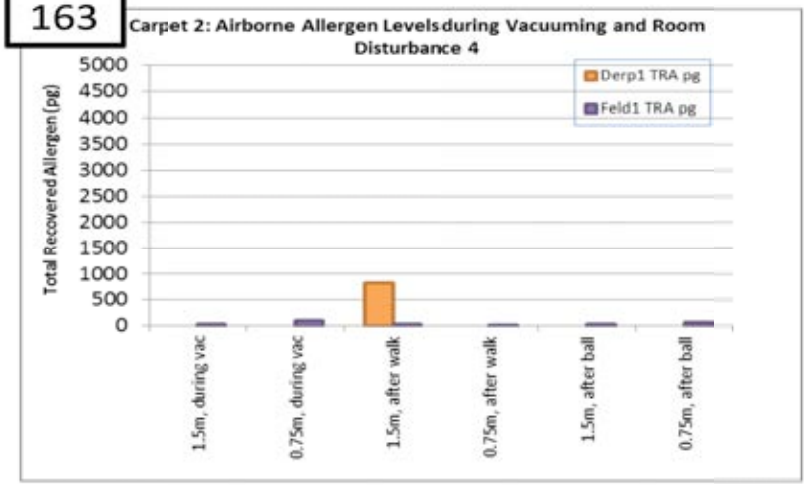

161



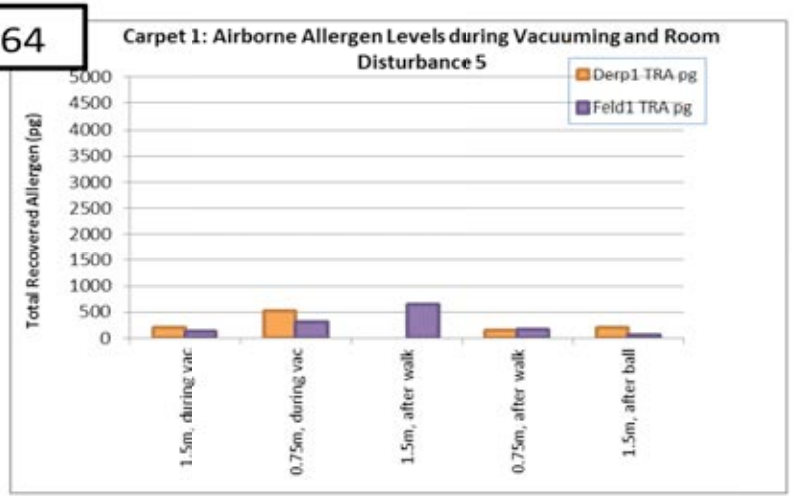
162



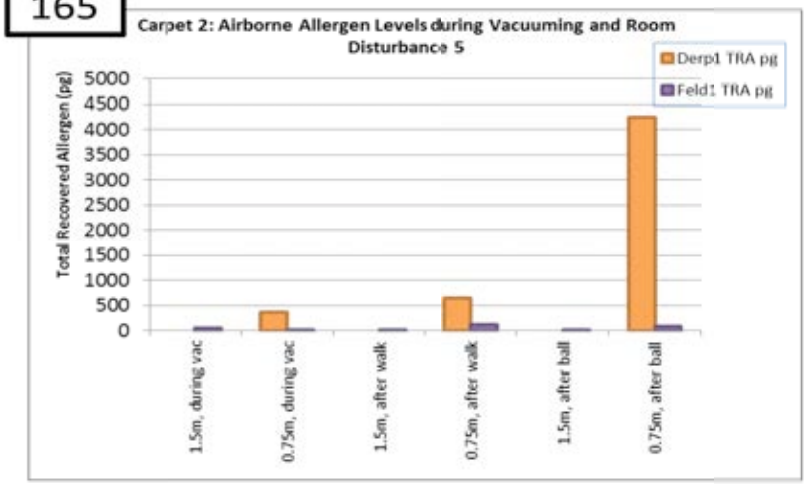

163



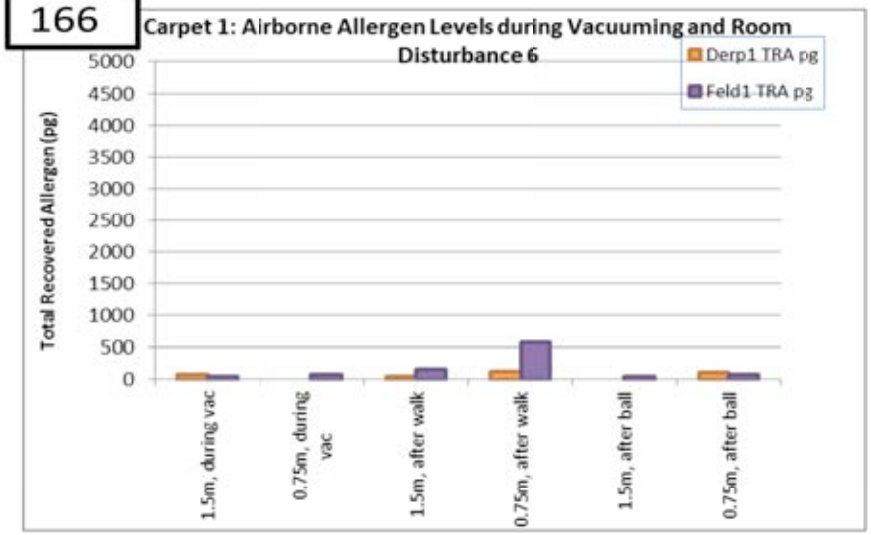

164



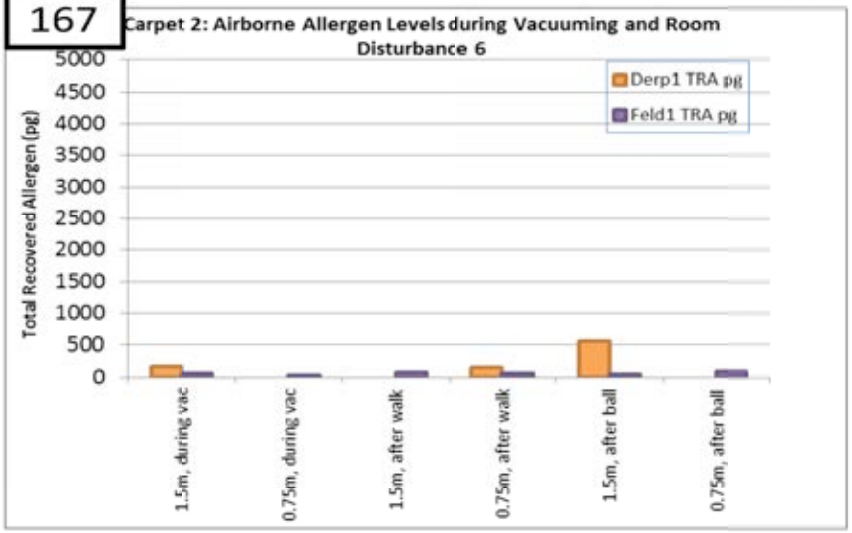

165



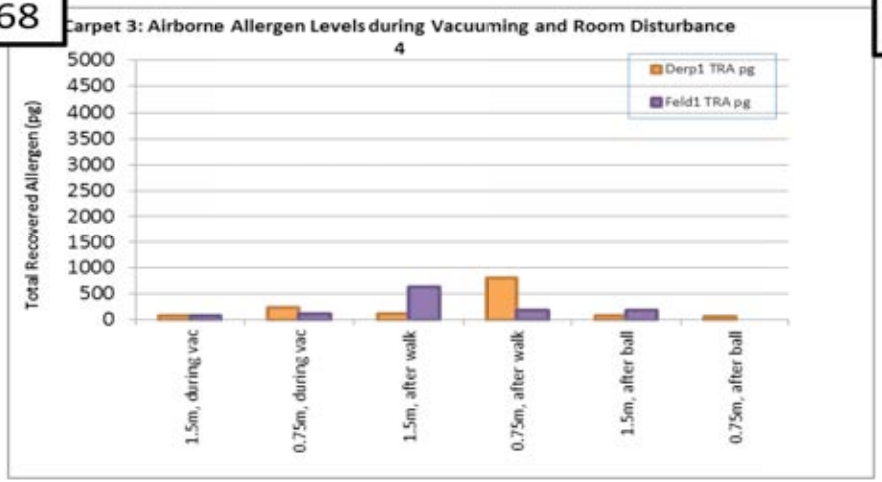
166


Carpet 1: Airborne Allergen Levels during Vacuuming and Room Disturbance 6
Derp1 TRA pg
Feld1 TRA pg
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1.5m, during vac
0.75m, during vac
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

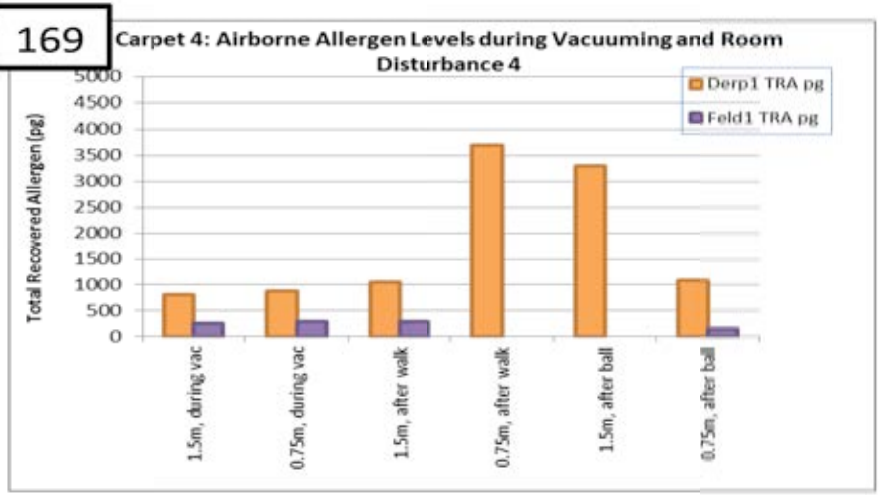
167


Carpet 2: Airborne Allergen Levels during Vacuuming and Room Disturbance 6
Derp1 TRA pg
Feld1 TRA pg
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1.5m, during vac
0.75m, during vac
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

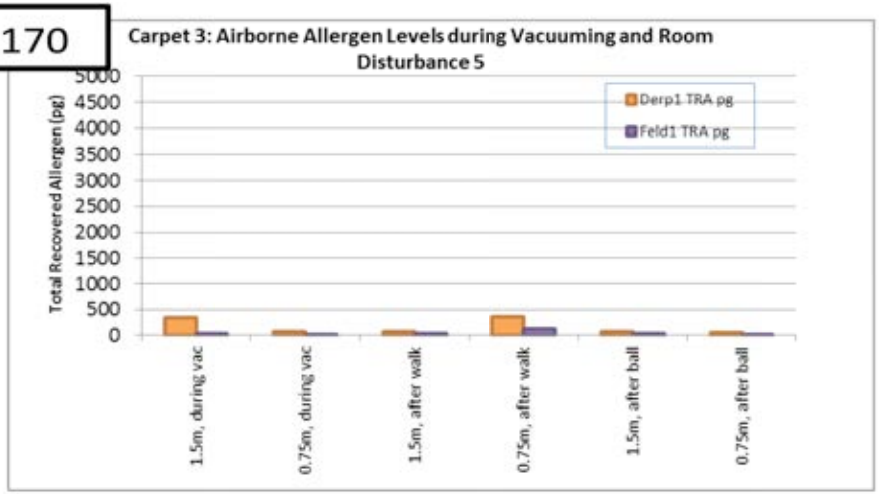
168



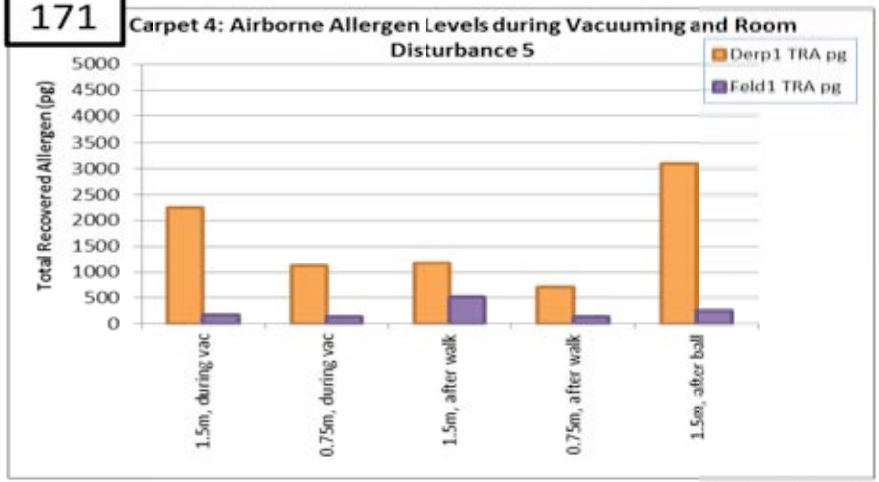

169



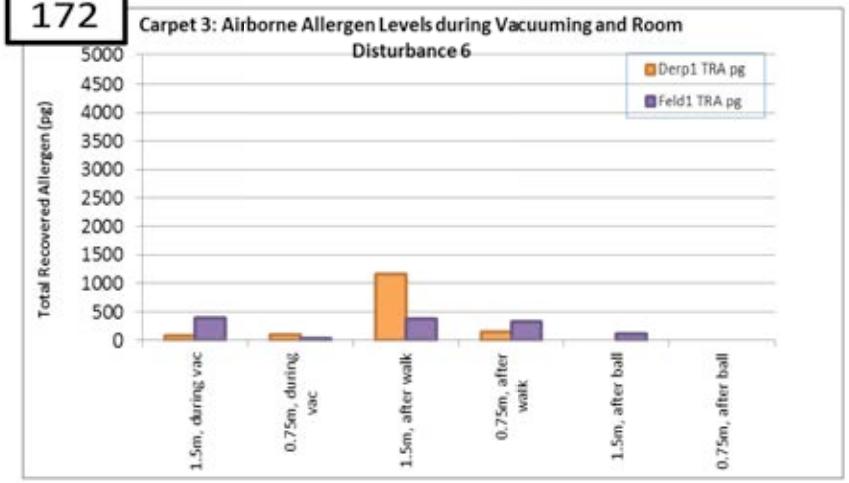

170



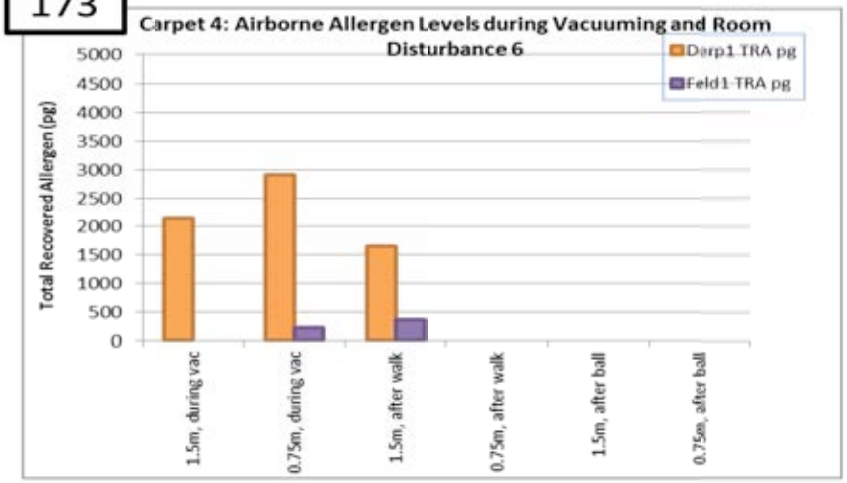

171



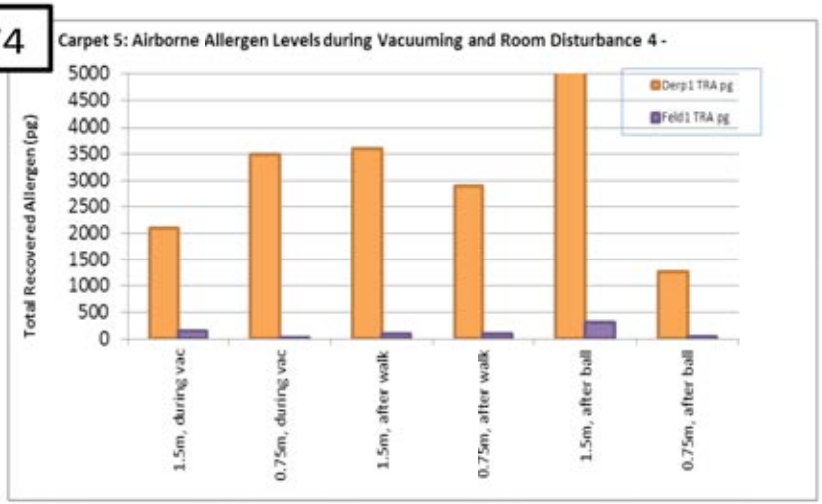
172


Carpet 3: Airborne Allergen Levels during Vacuuming and Room Disturbance 6
Derp1 TRA pg
Feld1 TRA pg
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1.5m, during vac
0.75m, during vac
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

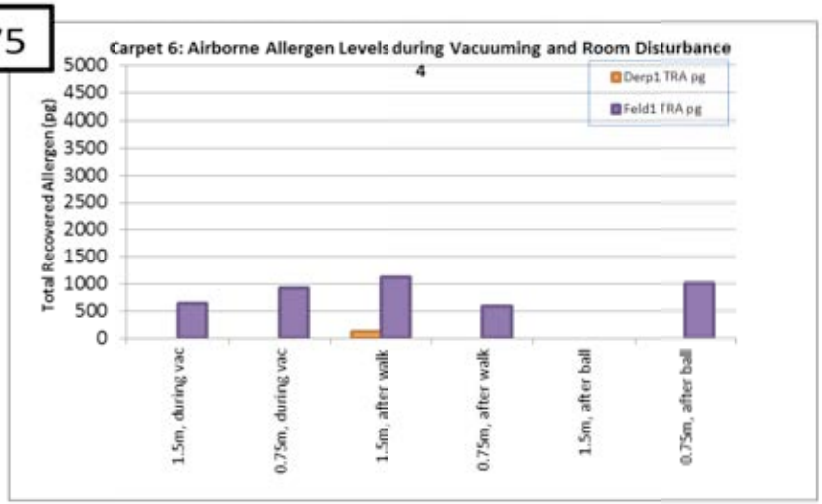
173


Carpet 4: Airborne Allergen Levels during Vacuuming and Room Disturbance 6
Derp1 TRA pg
Feld1 TRA pg
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1.5m, during vac
0.75m, during vac
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

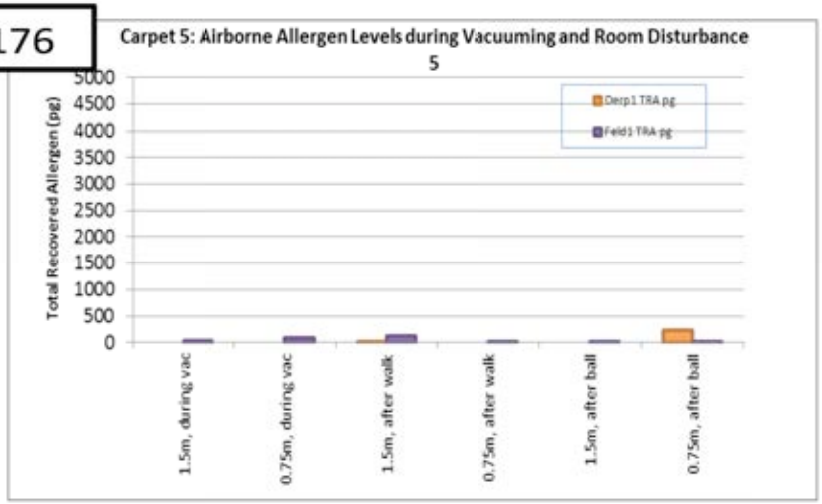
174



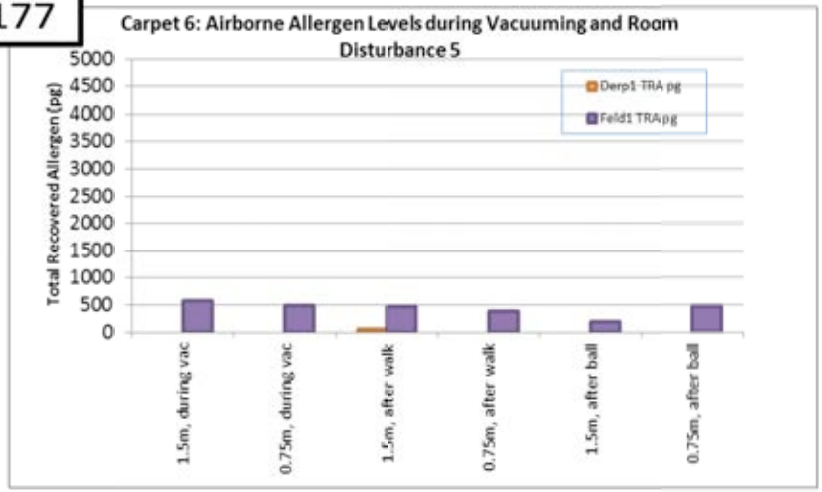

175



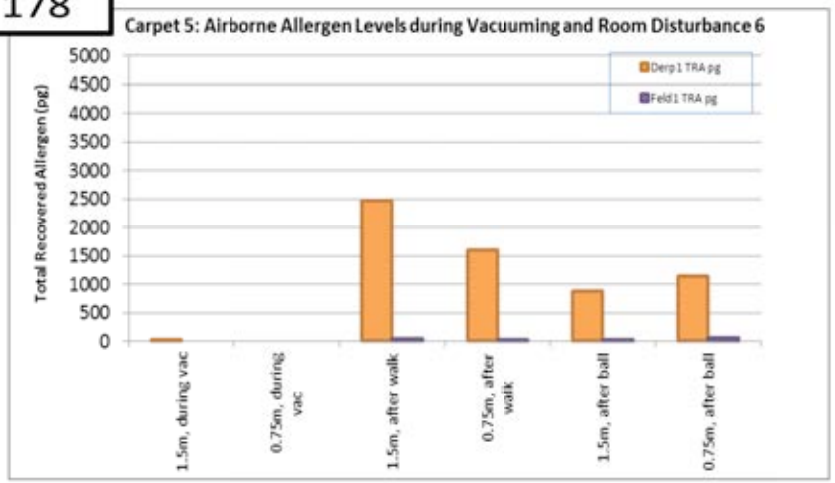

176



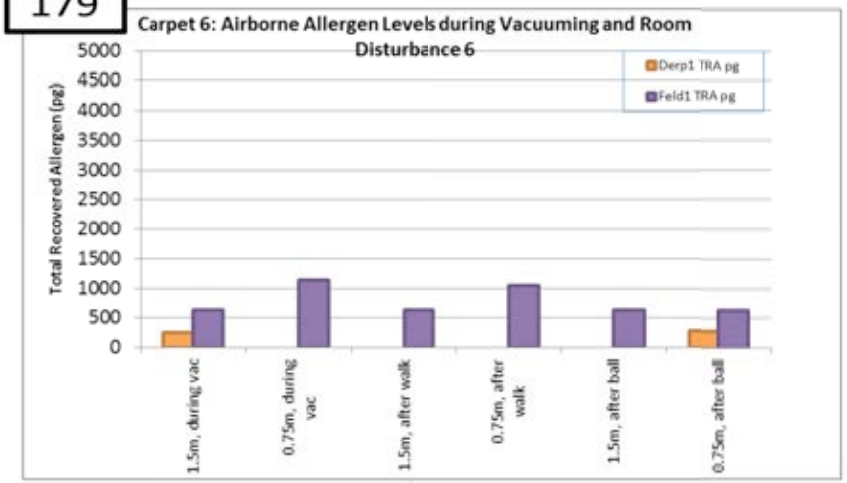

177



178

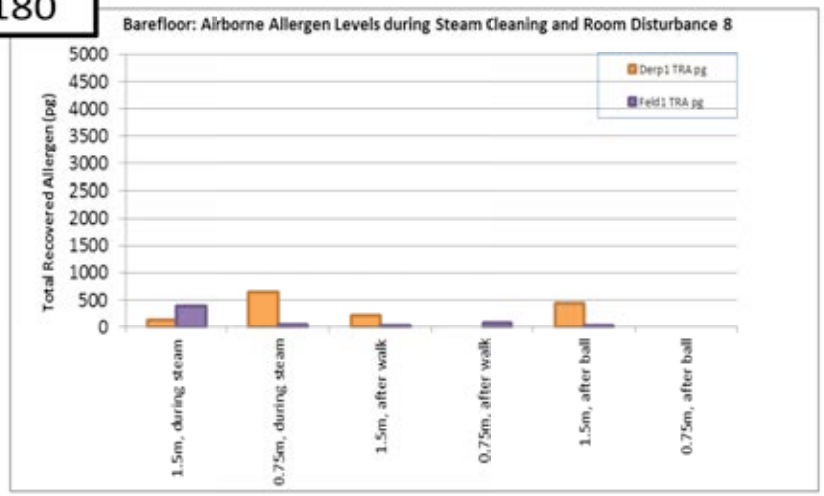

Carpet 5: Airborne Allergen Levels during Vacuuming and Room Disturbance 6
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Derp1 TRA pg
Feld1 TRA pg
1.5m, during vac
0.75m, during vac
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

179

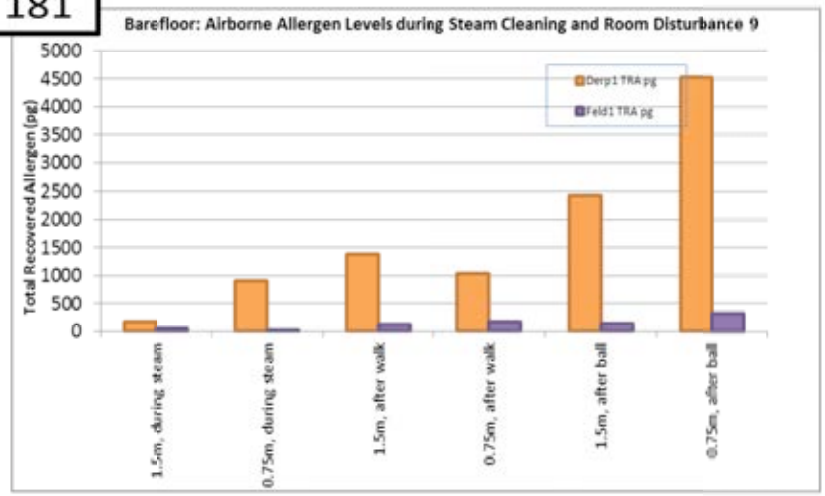

Carpet 6: Airborne Allergen Levels during Vacuuming and Room Disturbance 6
Total Recovered Allergen (pg)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Derp1 TRA pg
Feld1 TRA pg
1.5m, during vac
0.75m, during vac
1.5m, after walk
0.75m, after walk
1.5m, after ball
0.75m, after ball

# Hard Floor 1 - Airborne allergen levels obtained after Steam Cleaning and Room Disturbance

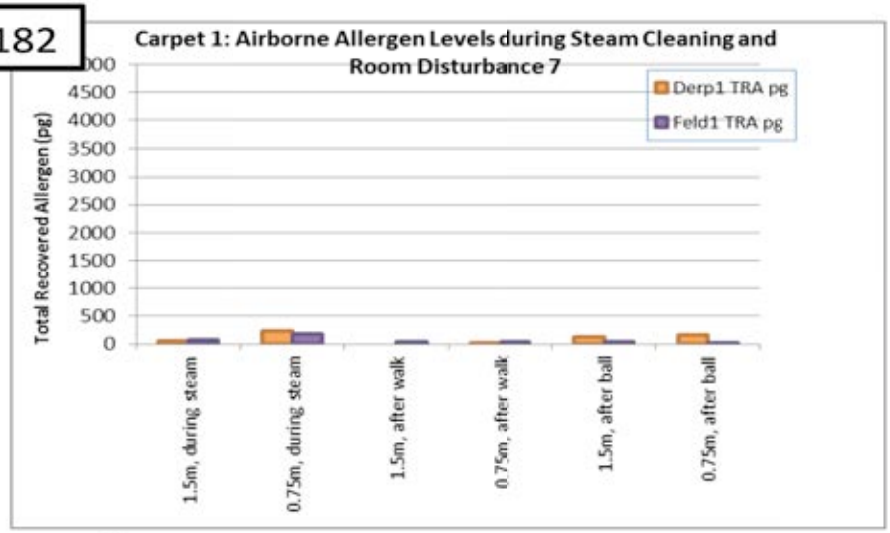
180



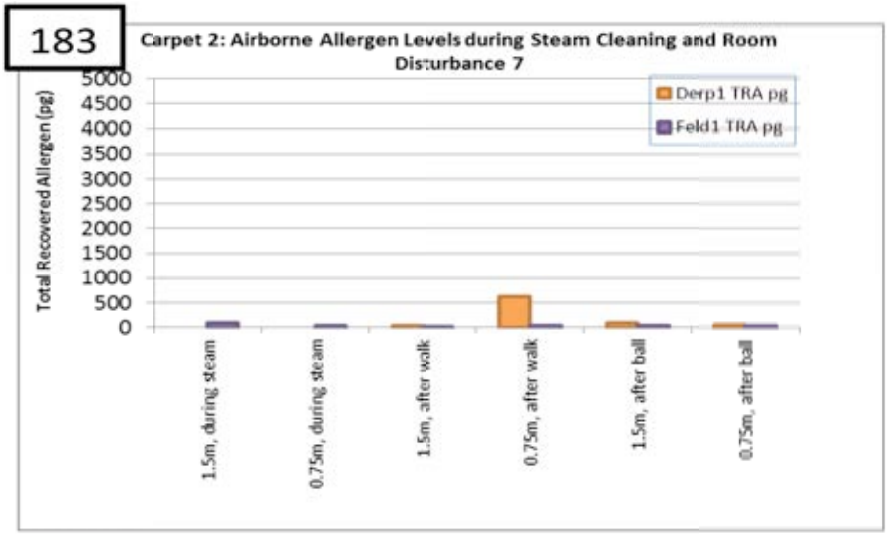

181



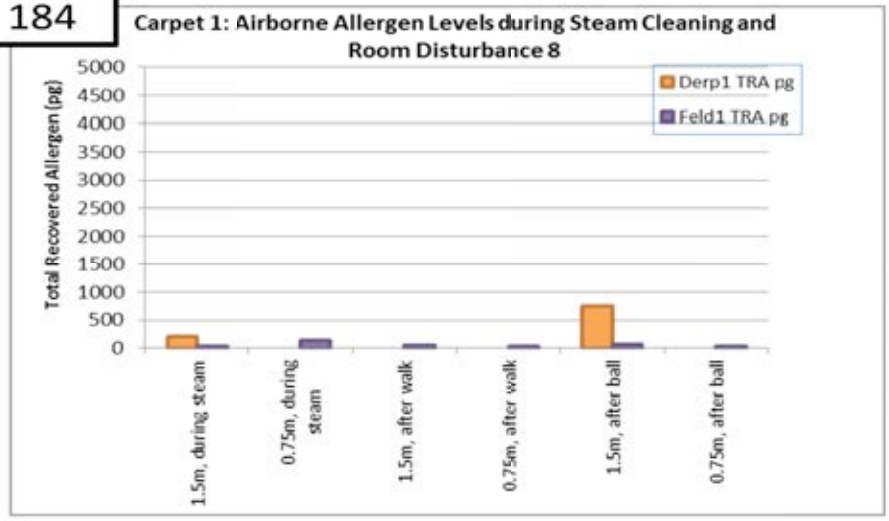
182



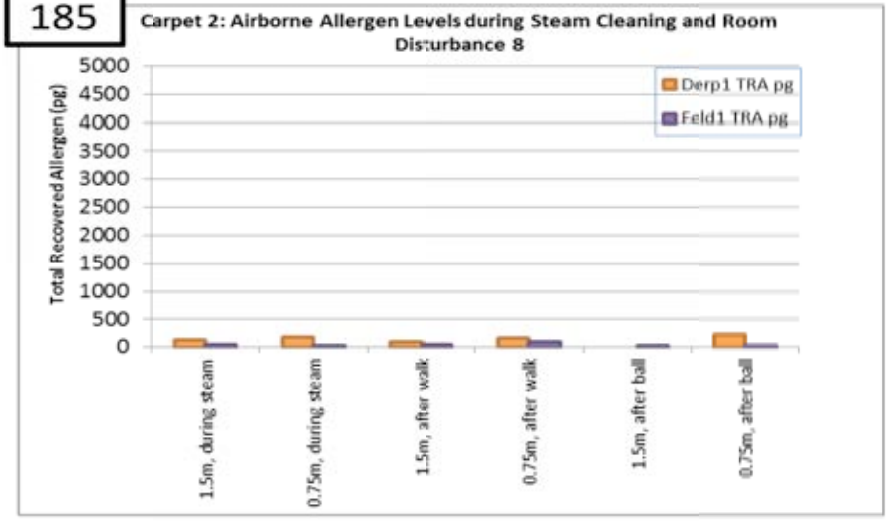

183



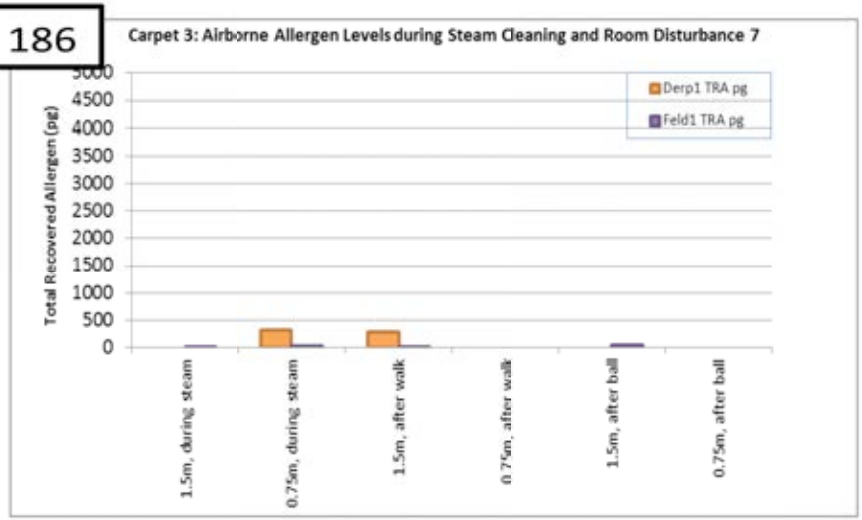

184



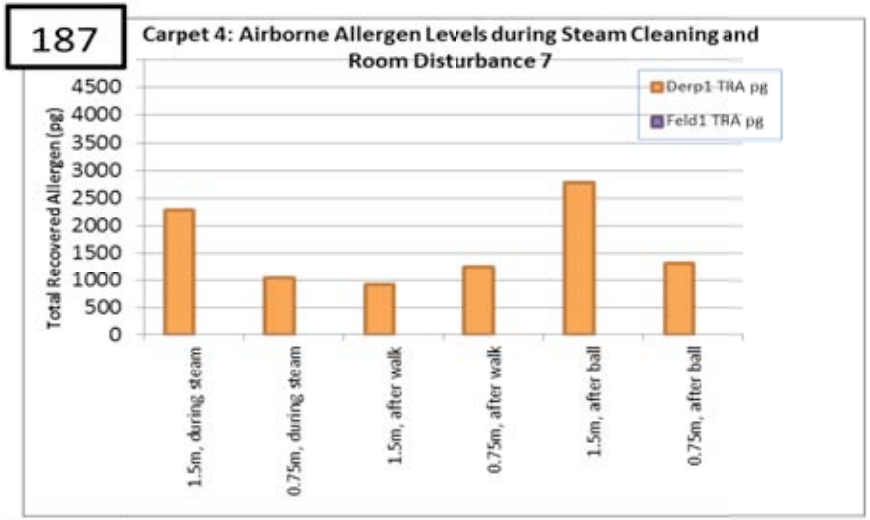

185



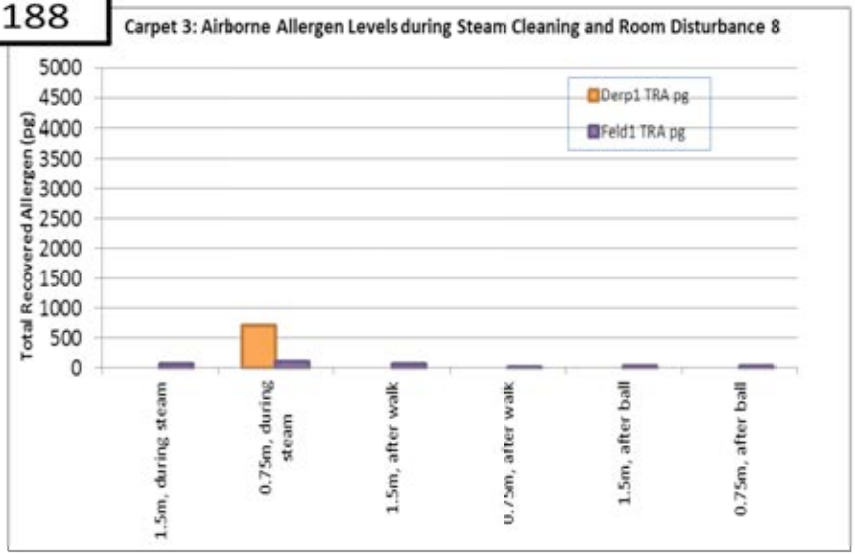
186



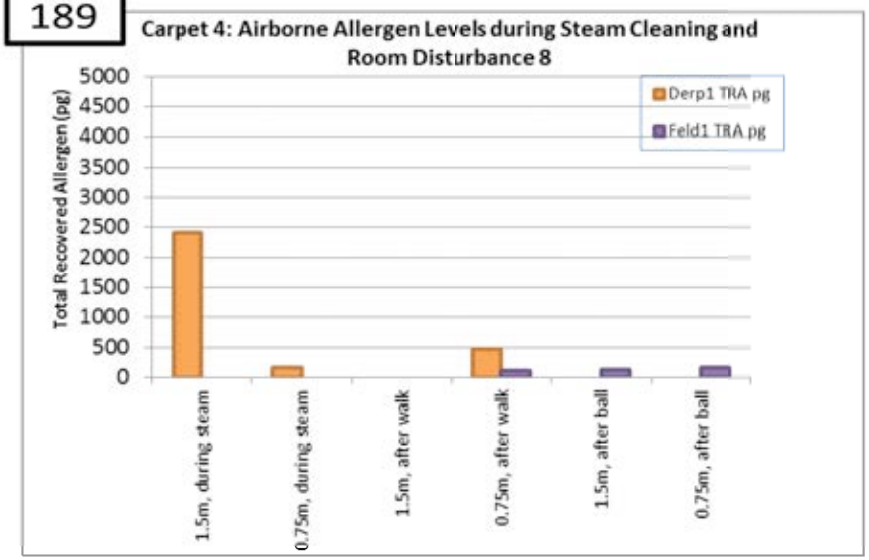

187



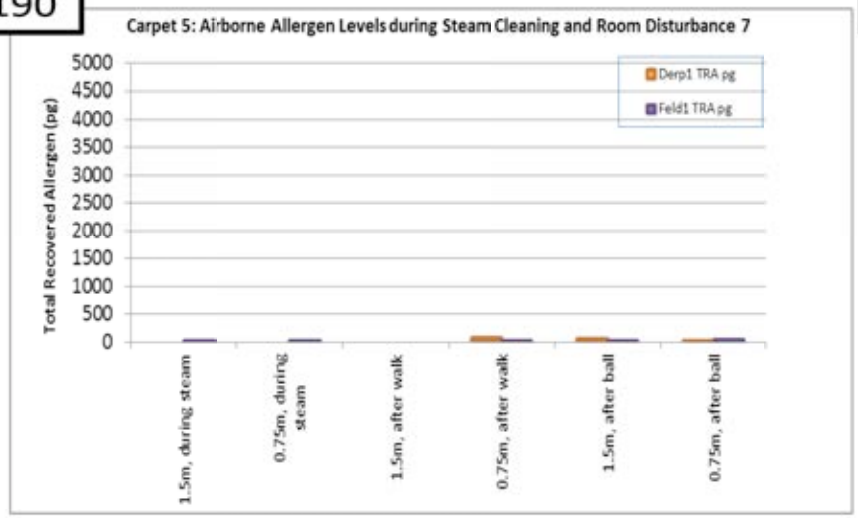

188



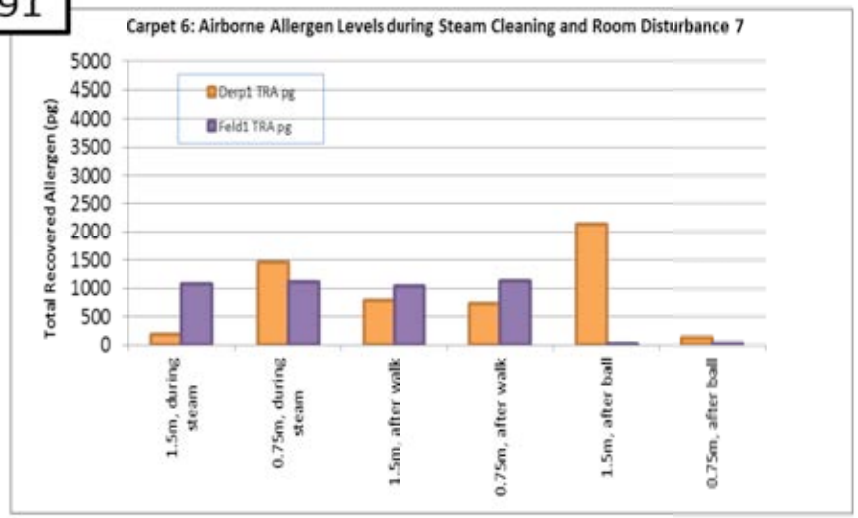

189



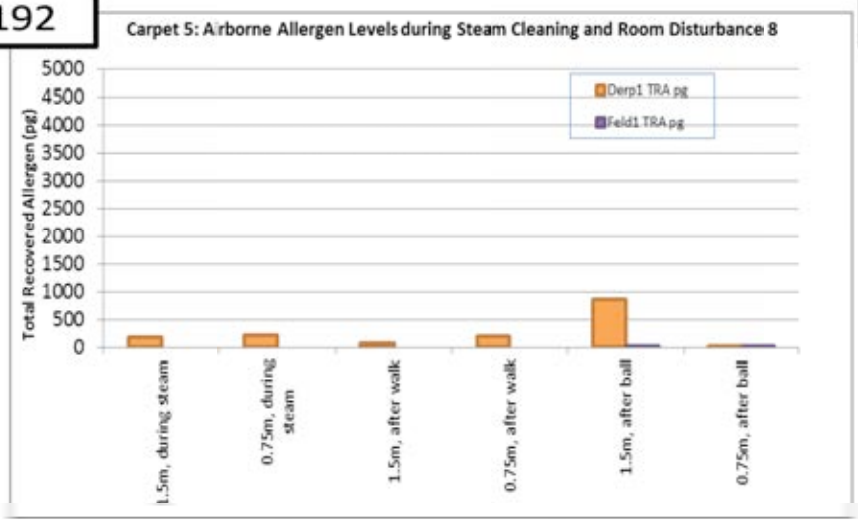
190



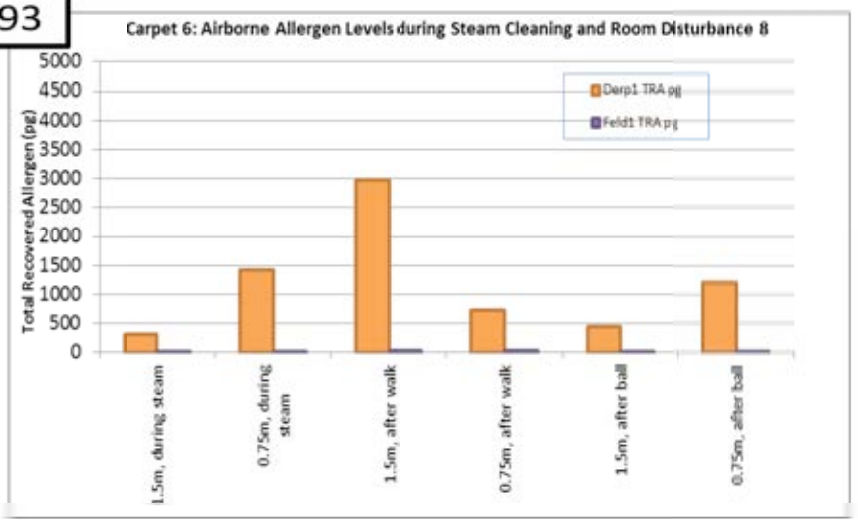

191




192




193



# Appendix II-A: Quick Reference Tables for Part II

**Legend:**

| | |
|---|---|
| | GOOD PERFORMANCE |
| | POOR PERFORMANCE |
| | AVERAGE PERFORMANCE |

**Particle Counts**:

| | Bioaerosol Introduction | Room Disturbance |
|---|---|---|
| Hard Floor | | |
| Carpet 1 | | |
| Carpet 2 | | |
| Carpet 3 | | |
| Carpet 4 | | |
| Carpet 5 | | |
| Carpet 6 | | |

**Airborne Bioaerosol**:

| | Bioaerosol Introduction | Room Disturbance |
|---|---|---|
| Hard Floor | | |
| Carpet 1 | | |
| Carpet 2 | | |
| Carpet 3 | | |
| Carpet 4 | | |
| Carpet 5 | | |
| Carpet 6 | | |

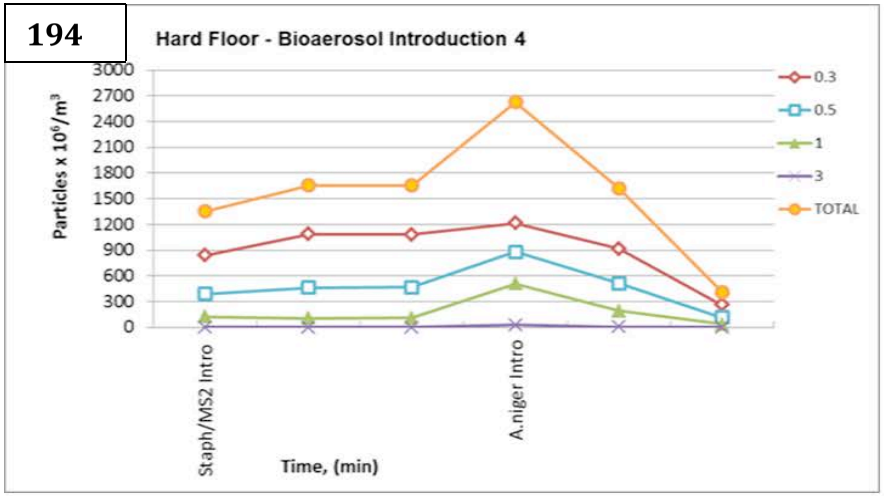
# Appendix II-B: Part II Particle Count Graphs

Graphs of Particle Counts during Bioaerosol Introduction and Room Disturbance for Hard Floor and Carpets 1-6

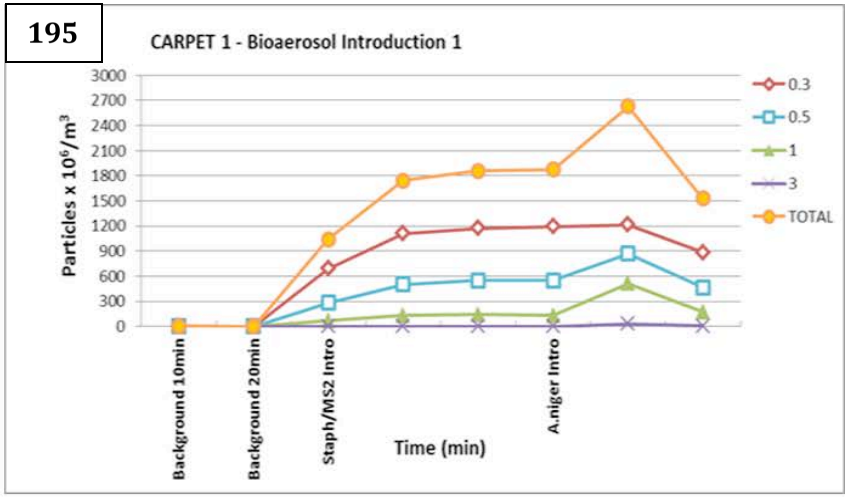
**Important Note for y-axes**:
For Graphs No. 194 – 207: The Particle count data (per $m^3$) are divided by $10^6$ for the purposes of representation. Therefore, the actual numerical counts are 6 orders of magnitude greater than that displayed on the graph.
For Graphs No. 208 – 214: Particle count data (per $m^3$) are divided by $10^5$ for the purposes of representation. Therefore, the actual numerical counts are 5 orders of magnitude greater than that displayed on the graph.

## Particle Counts x $10^6$ during Bioaerosol Introduction– Hardfloor , Carpet 1, Carpet 2 and Carpet 3

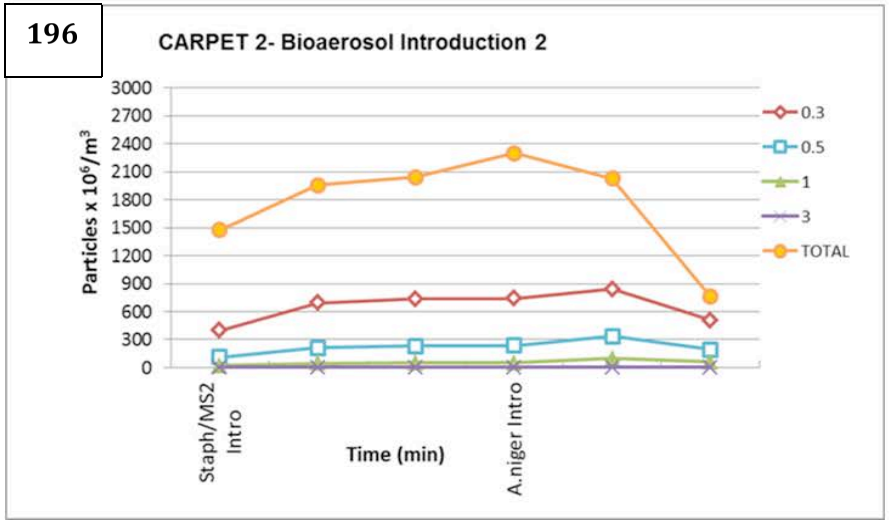
194




195




196

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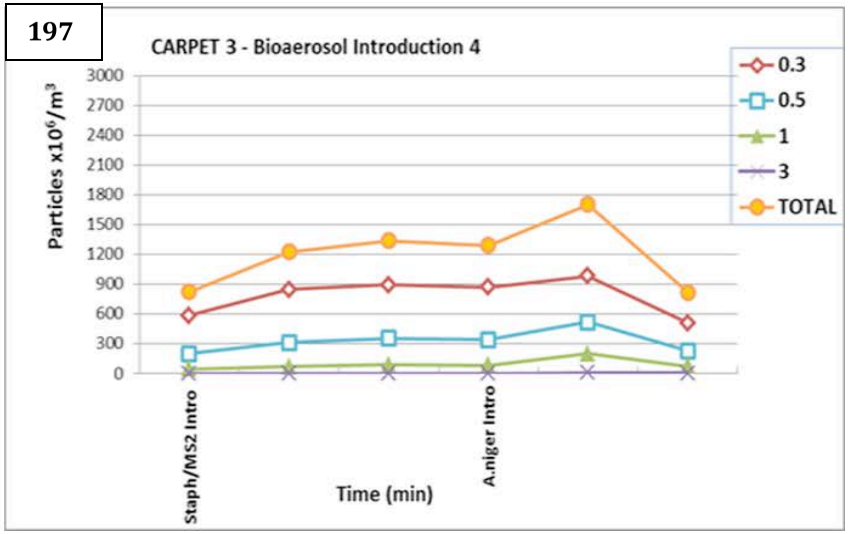
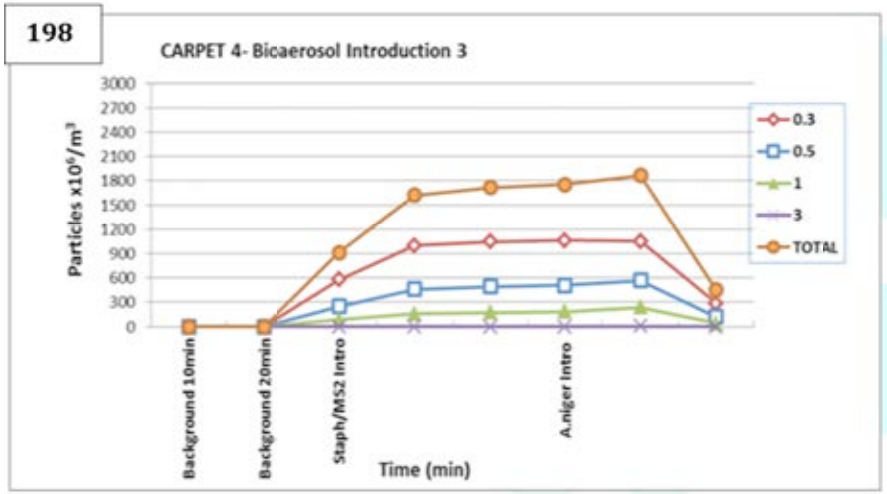
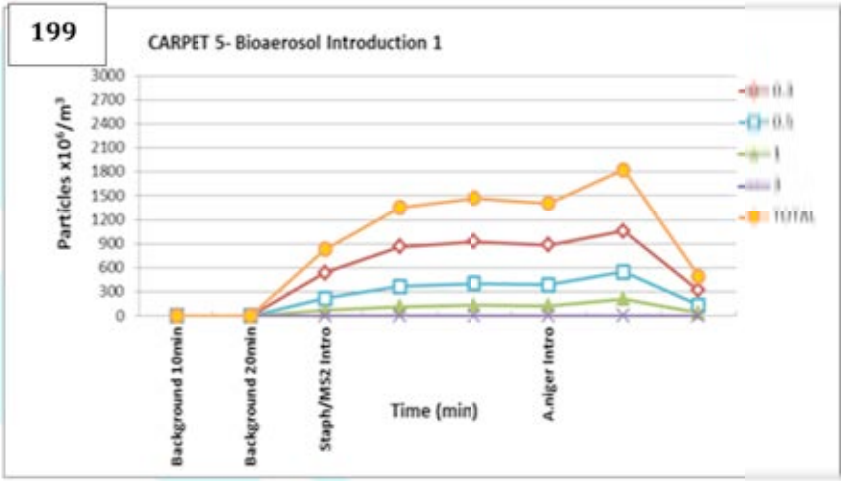


## Particle Counts x10⁶ during Bioaerosol Introduction – Carpet 4, Carpet 5 and Carpet 6

198




199

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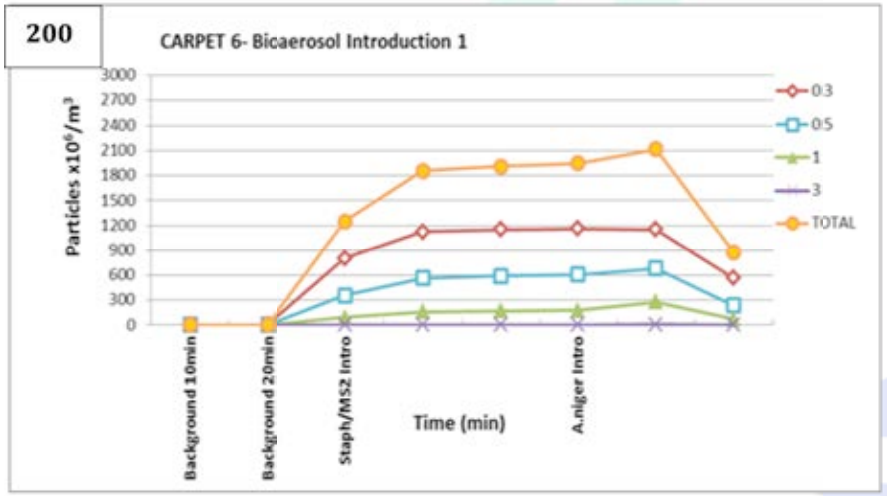
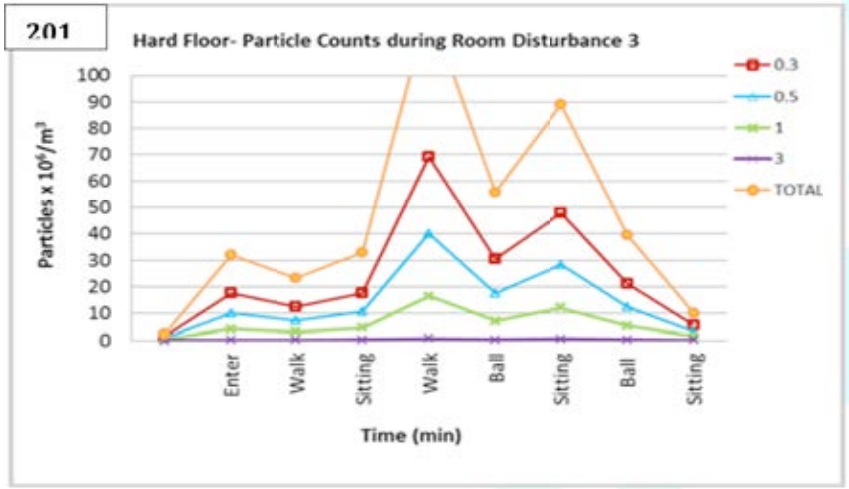


## Particle Counts x $10^6$ during Room Disturbance –Hard floor, Carpet 1, Carpet 2 and Carpet 3

201

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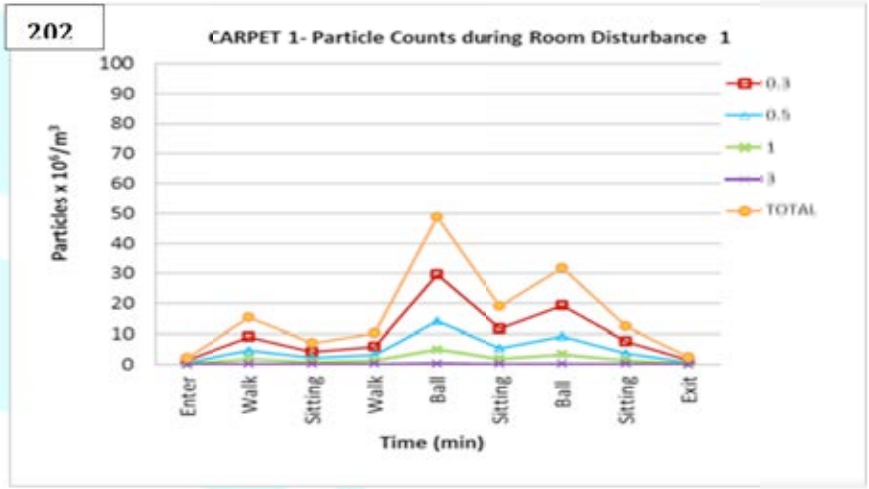
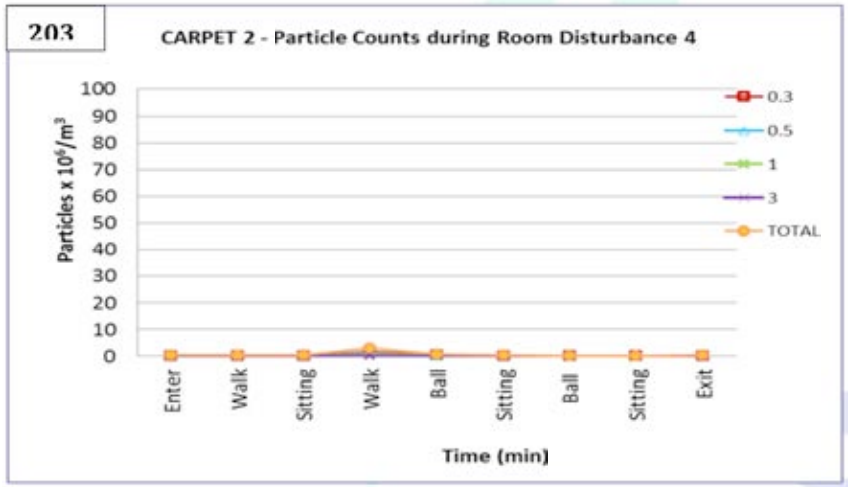
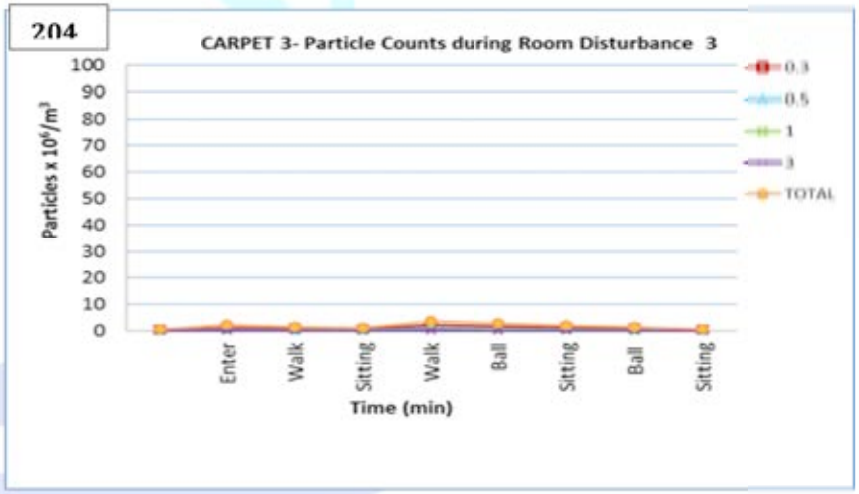



203




204

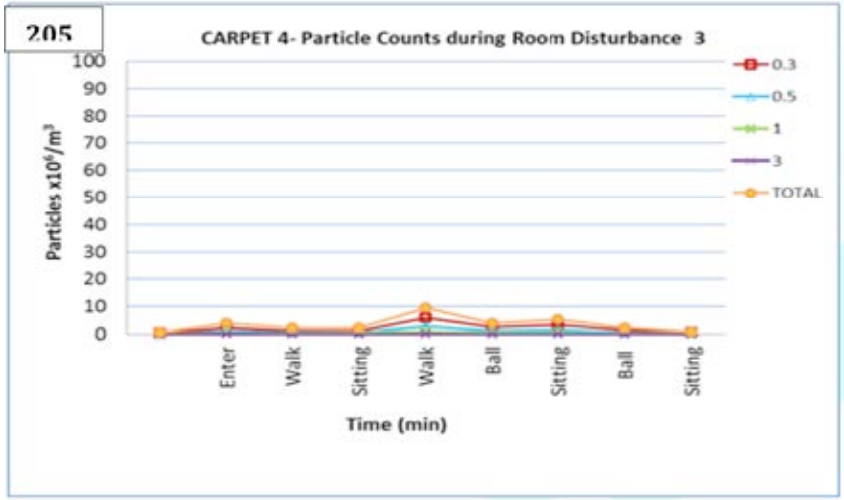




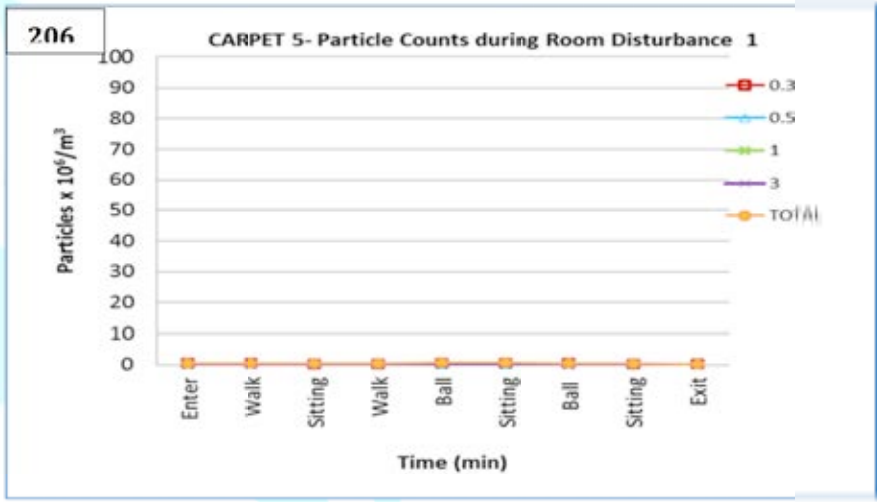

202

## Particle Counts x $10^6$ during Room Disturbance –Carpet 4, Carpet 5 and Carpet 6

205




206

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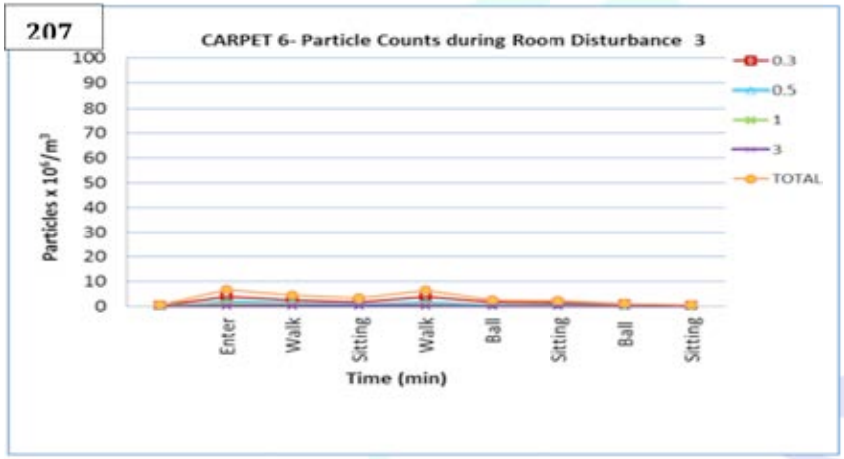
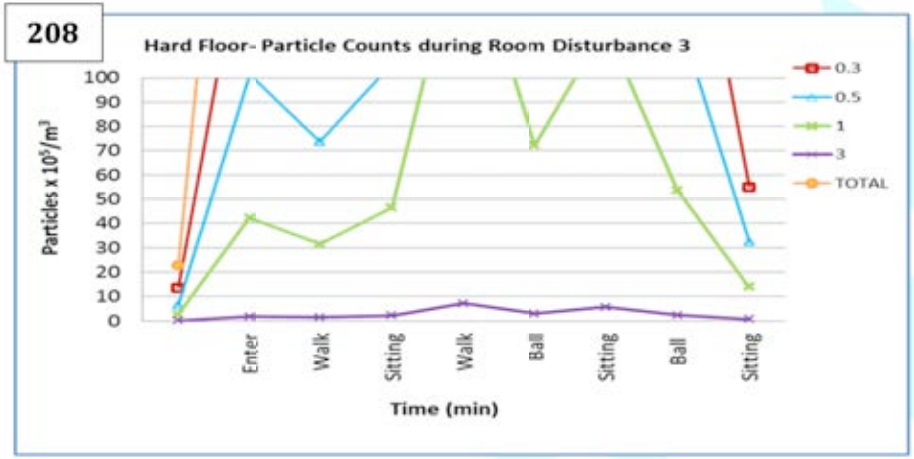
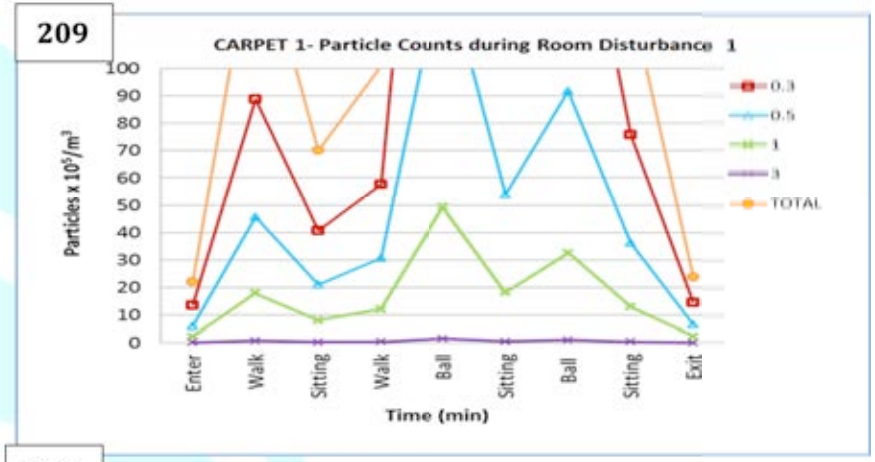


## Particle Counts x $10^5$ during Room Disturbance –Hard floor, Carpet 1, Carpet 2 and Carpet 3

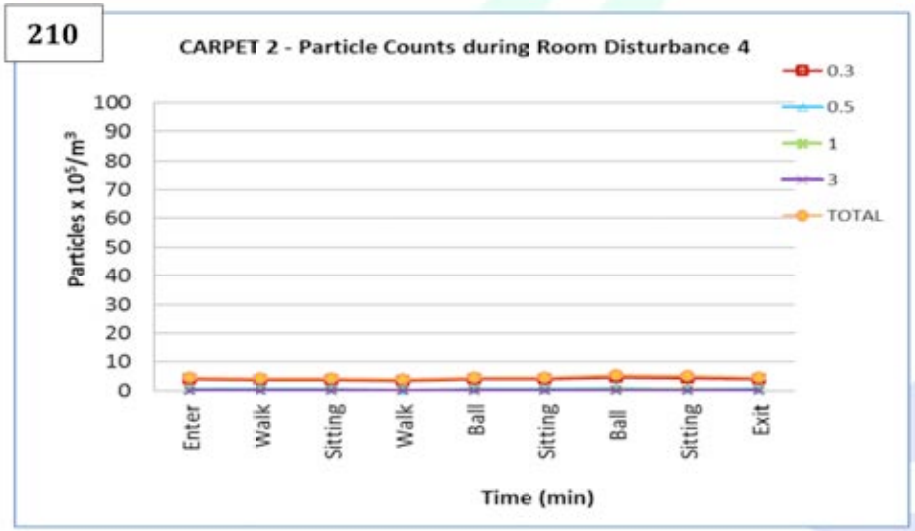
208



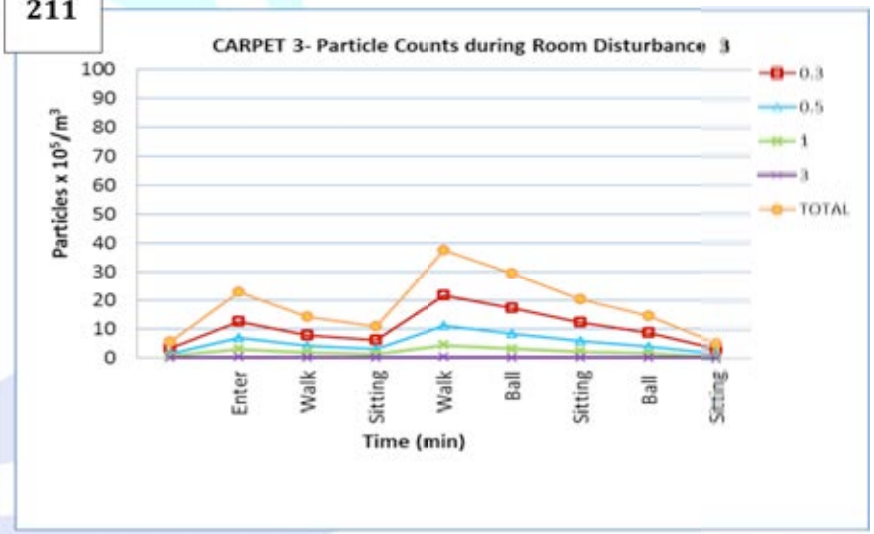

209




210

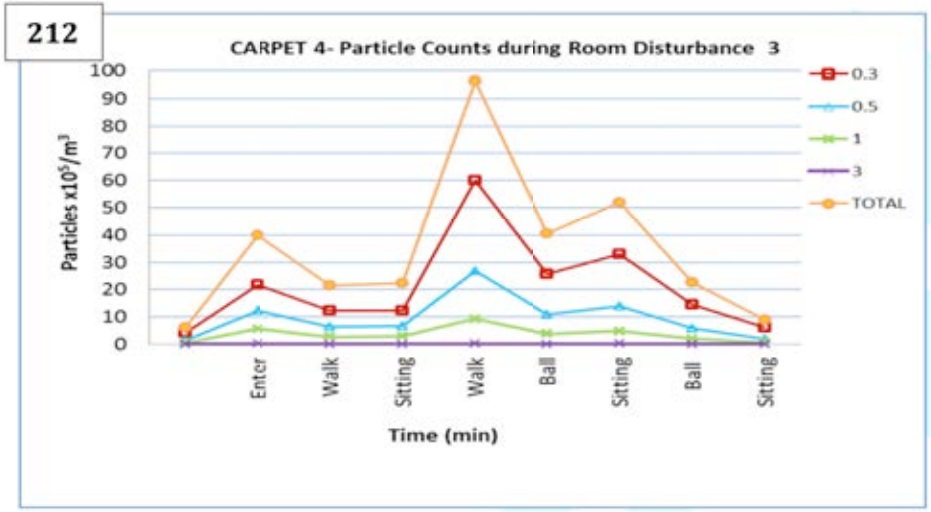



211

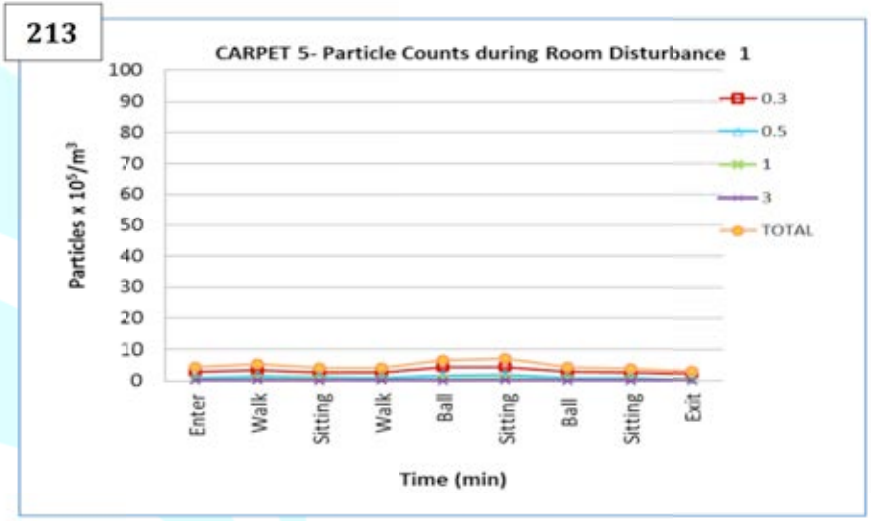


## Particle Counts x $10^5$ during Room Disturbance –Carpet 4, Carpet 5 and Carpet 6

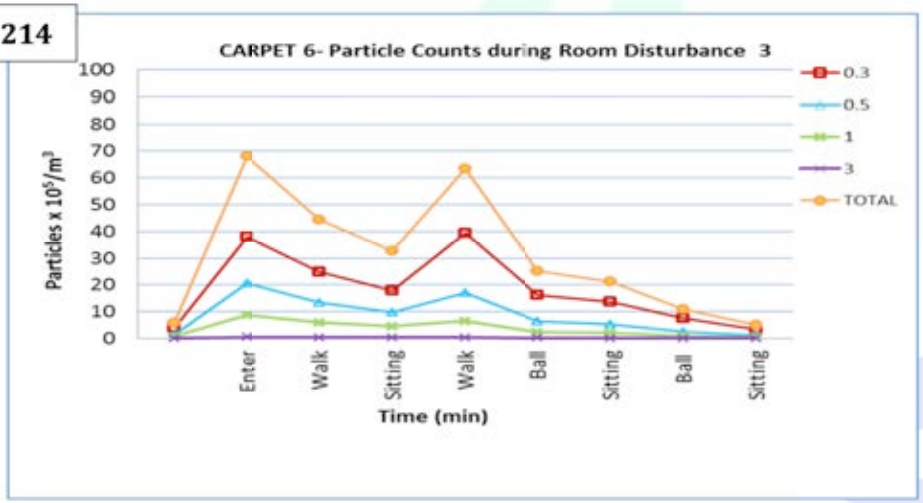
212




213




214



# Appendix II-C: Part II Bioaerosol Graphs

Recovery of *A .niger*, *S. epidermidis* and MS2 coliphage during Bioaerosol Introduction and Room Disturbance for Hard Floor and Carpets 1-6

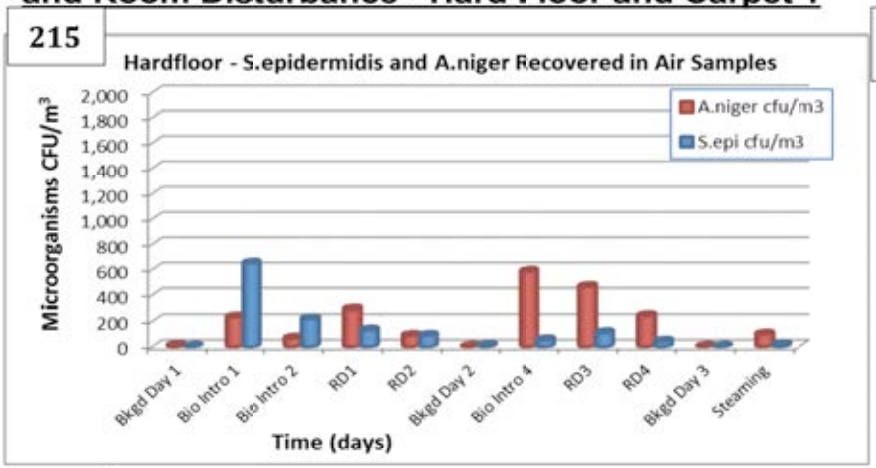
**Important Note for y-axes**:

The recovery of *A .niger* and *S. epidermidis* from the air are expressed as colony forming units (CFU) per $m^3$

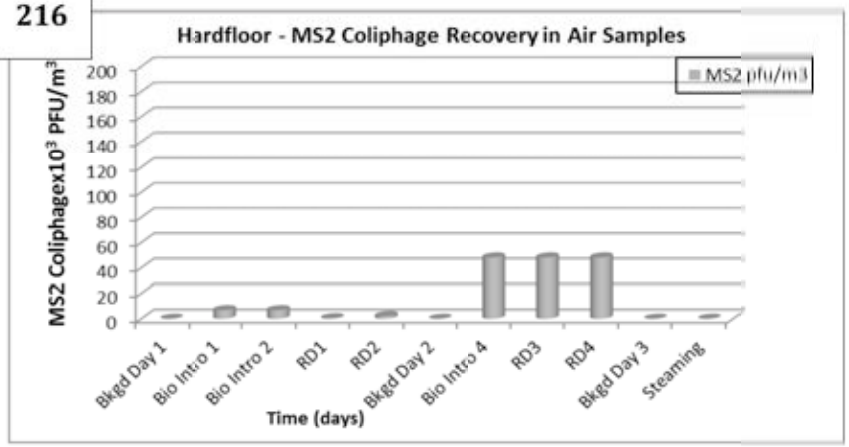
The recovery of MS2 coliphage is expressed, on separate graphs, as plaque forming units (PFU) x $10^3$ per $m^3$. The PFU are divided by $10^3$ for the purposes of representation, therefore the actual numerical values are 3 orders of magnitude greater than that displayed on these graphs.

## Recovery of *A.niger*, *S.epidermidis* and *MS2 Coliphage* in Air Samples during Bioaerosol Introduction and Room Disturbance - Hard Floor and Carpet 1

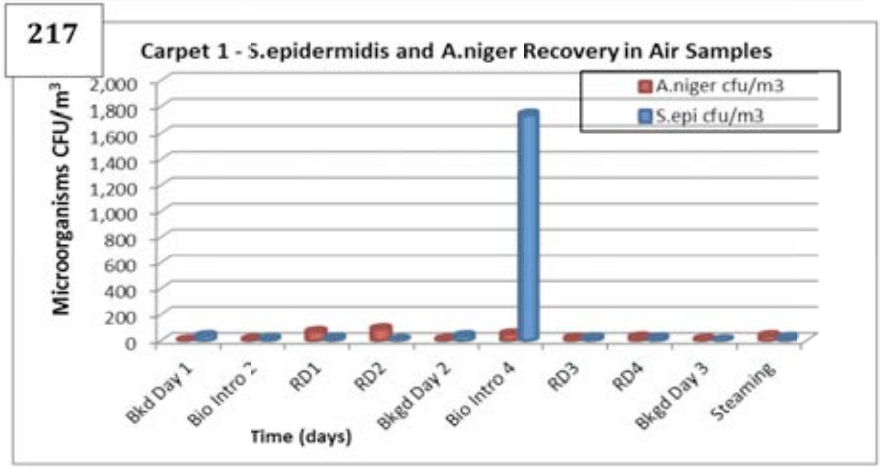
215




216

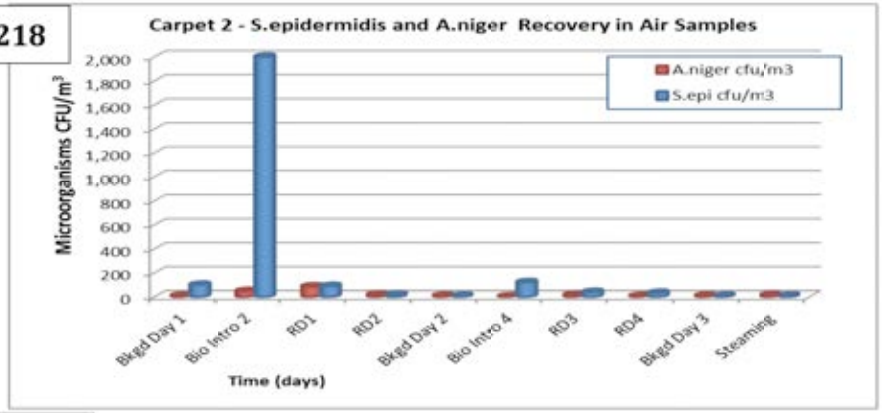



217

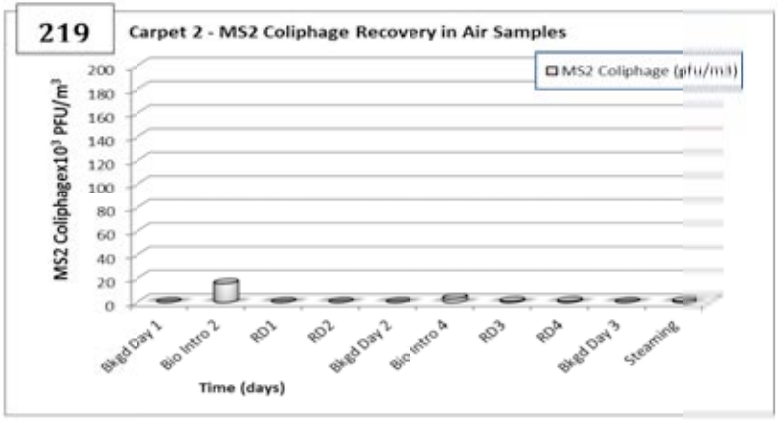


## Recovery of *A.niger*, *S.epidermidis* and *MS2 Coliphage* in Air Samples during Bioaerosol Introduction and Room Disturbance – Carpet 2 and Carpet 3

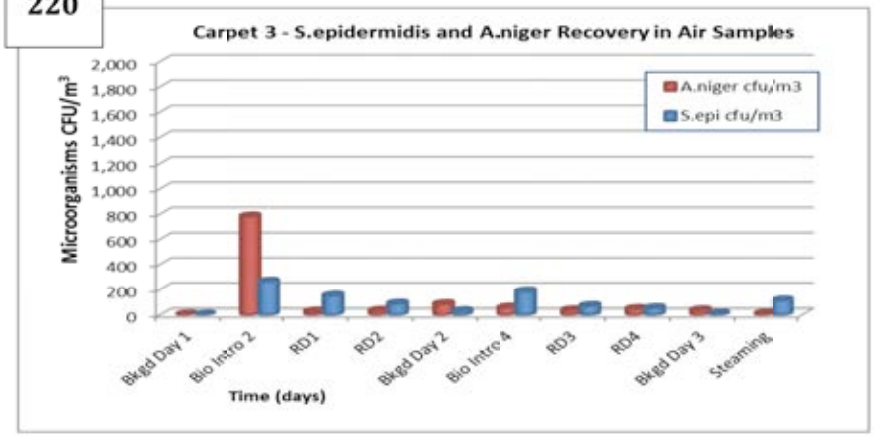
218



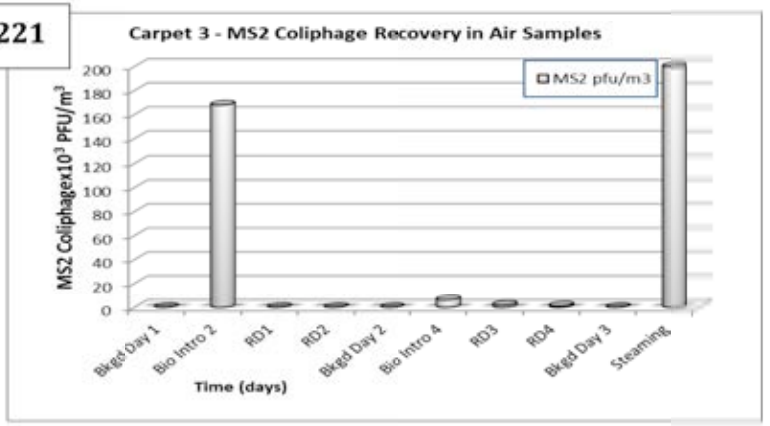

219




220

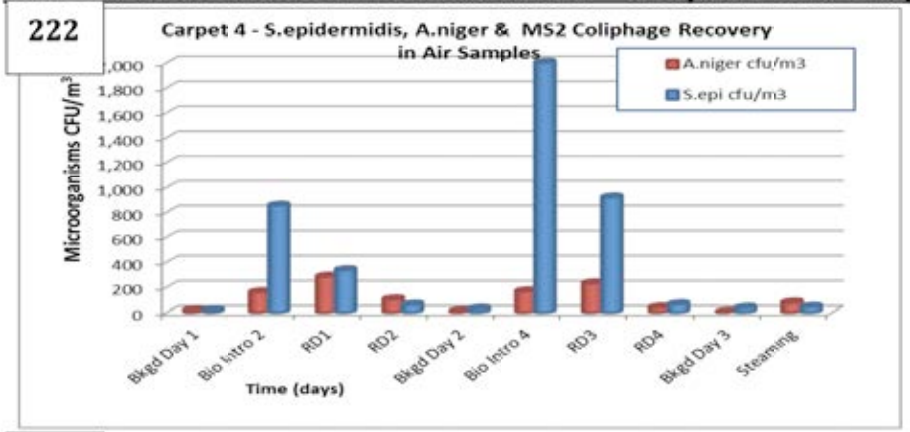



221

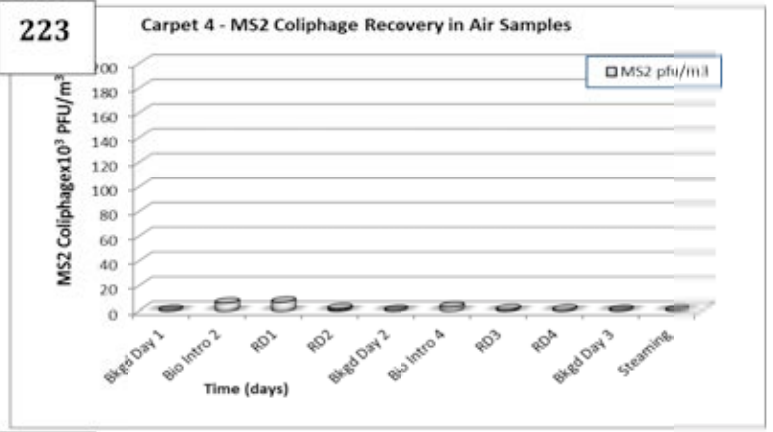


## Recovery of *A.niger*, *S.epidermidis* and *MS2 Coliphage* in Air Samples during Bioaerosol Introduction and Room Disturbance – Carpet 4 and Carpet 5

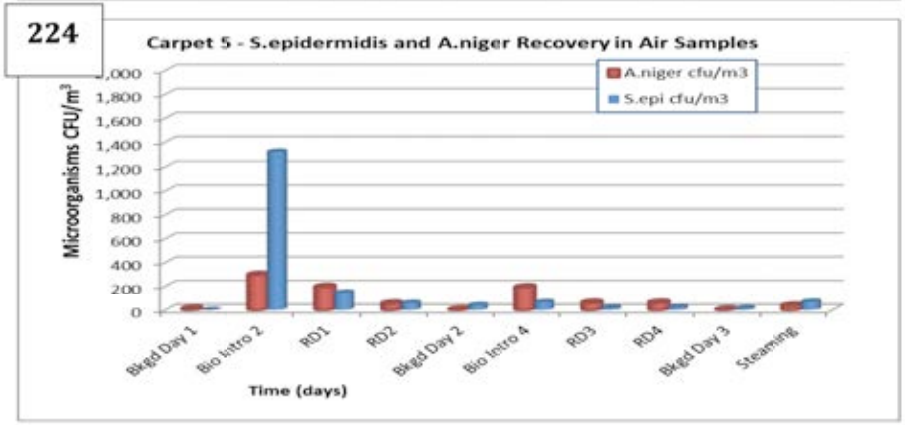
222



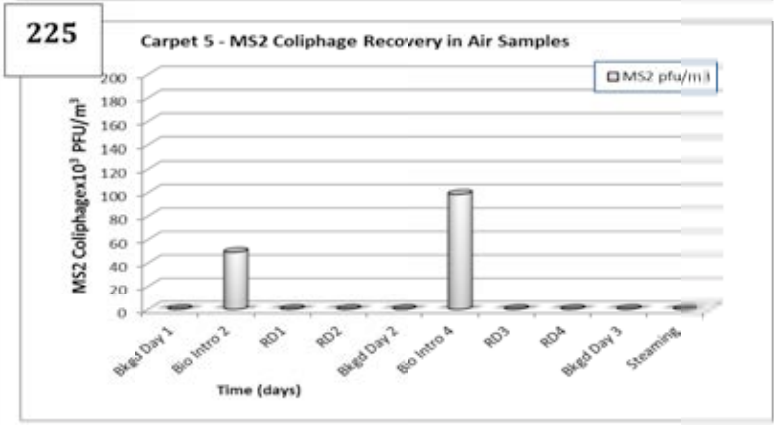

223




224




225



## Recovery of *A.niger*, *S.epidermidis* and *MS2 Coliphage* in Air Samples during Bioaerosol Introduction and Room Disturbance – Carpet 6