INVESTIGATION OF POSSIBLE MERCURY CONTAMINATION WITHIN 3 LOCATIONS AT THE UNIVERSITY OF MANCHESTER

AT

THE UNIVERSITY OF MANCHESTER
COUPLAND 1 BUILDING[i]

FOR

C&D INDUSTRIAL SERVICES LTD
UNIT 10
WOODROW BUSINESS CENTRE
WOODROW WAY
IRLAM
M44 6NN

Report No:	**11826.2 amendment**	**Client Ref:**	**Mercury Monitoring**
Survey Date:	**18th February 2010**	**Site Contact:**	**Mr Alan Lee**
Report Date (first issue):	**26th February 2010**	**Server Reference:**	**Occupational Hygiene Special Projects 2010**

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CONTENTS

EXECUTIVE SUMMARY

ALcontrol On-Site Services were appointed by C&D Industrial Services Ltd to undertake a series of surveys on their behalf within 3 rooms located at the University of Manchester Coupland 1 Building, prior to significant building modifications.

The surveys where identified in ALcontrol On-Site Services Quotation document reference OH10336 and comprised of:

- Mercury contamination investigation, primarily within the loft space above rooms 2.62 & 2.63 and the studded wall between rooms 2.58 & 2.62.

All samples were obtained on the 18th February and results reflect the conditions prevailing at the time of the investigation

Airborne concentrations of mercury vapour were previously assessed on the 25th January 2010 within 3 rooms at the University of Manchester Coupland 1 Building (Rooms 2.58, 2.62 and 2.63).

A radiological contamination survey was performed in the loft area prior to the survey by ALcontrol consultants.

The results and information obtained during the visit indicate that:

No mercury vapour was detected within the wall space between rooms 2.58 and 2.62 and bulk samples were found to be below the limit of detection for mercury contamination.

The bulk sample taken from the miscellaneous piece of plasterboard was found to be below the limit of detection for mercury contamination.

Readings of between zero and 0.006 $mg.m^{-3}$ of mercury vapour was detected within the loft space, although no specific source could be identified. No bulk samples were taken on this occasion.

No mercury vapour was detected in the 'plug' holes, within the brickwork, inside rooms 2.62 and 2.63. The wooden plugs had been removed for the survey purposes.

It should be noted that it was identified by the University of Manchester after the survey that the pre-existing holes in the wall may not fully penetrate the cavity and although no mercury vapour was identified at the time, a more comprehensive investigation will be undertaken during the planned remedial work to clarify the situation.

A significant concentration of mercury vapour was found beneath the floor area in Room 2.62. This is consistent with the findings of the initial report.

The mercury vapour has the potential to contaminate the air within these rooms through any breaks in the surface materials on the walls and floors.

During the inspection inside the loft area two samples were taken for possible Asbestos Containing Materials (ACM's). The first sample was two pieces of a cement tile. This indicated chrysotile (white) asbestos. The entire sample was removed and disposed of by ALcontrol. The second sample taken was of the decayed insulation off the redundant pipe, this sample did not contain any ACM.

SURVEYED BY :

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1 INTRODUCTION

ALcontrol On-Site Services were appointed by C&D Industrial Services Ltd to undertake a series of surveys on their behalf within 3 rooms located at the University of Manchester Coupland 1 Building, prior to significant building modifications.

The surveys where identified in ALcontrol On-Site Services Quotation document reference OH10336 and comprised of:-

- Mercury contamination investigation, primarily within the loft space above rooms 2.62 & 2.63 and the studded wall between rooms 2.58 & 2.62.

Airborne concentrations of mercury vapour were previously assessed on the 25th January 2010 within these three rooms.

All samples were obtained on the 18th February and results reflect the conditions prevailing at the time of the investigation

2 OBSERVATIONS and OBJECTIVES

The loft area above the two rooms (2.62 and 2.63) was surveyed along with the partition wall between rooms 2.58 (toilet) and 2.62. Rooms 2.62 and 2.63 are currently unoccupied former office areas, although historically had been laboratory workshops.

Initially the Mercury Vapour Indicator (MVI) was used to determine concentrations in all areas before any sampling work was performed.

'Pilot' holes were then drilled in the plaster both sides of the wall to 2.58 and the airspace was then analysed for concentrations of mercury vapour.

Full depth bulk samples of the plaster were then taken from either side of the wall at 2.58.

A miscellaneous sample of plasterboard was produced by a representative of the University of Manchester. The source of this material was not made clear and it was the understanding of ALcontrol On-Site Service that the material was not from either of the rooms under current investigation.

It should be noted that the photograph of the plasterboard was photographed in Room 2.62, but was tested in room 2.63.

Workplace Exposure Limits (WELs) EH40

Although the possible mercury vapour is not strictly in an area currently occupied by staff, the following should be considered.

Under the COSHH Regulations a single type of occupational exposure limit is specified for substances hazardous by inhalation, this is the Workplace Exposure Limit. An employer must ensure that a WEL is not exceeded and in addition when a substance can cause occupational asthma, cancer or genetic effects then exposure must be reduced as low as reasonably practicable. The limits are time weighted average concentrations of substances in the air using either 8-hours or 15-minutes (short term exposure limit) as the reference period.

Regulation 7 also requires that where there is exposure to a substance hazardous to health, then control of that exposure shall only be treated as adequate if the principles of good practice for the control of exposure to substances hazardous to health set out in Schedule 2A are applied.

The COSHH Regulations also place a duty on the employer to apply principles of good occupational hygiene practice for the control of substances hazardous to health (regardless of whether a substance has an exposure limit or whether exposures are below any published limit).

Mercury has not currently been assigned a WEL, therefore as guidance the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) was used for the purposes of this report. This is set at 0.025 $mg.m^{-3}$ based on an 8-hour Time Weighted Average (TWA).

It should be noted that there is also a draft Europe wide proposed Indicative Occupational Exposure Limit (IOELV) of 0.020 $mg.m^{-3,}$ which may also be used for comparison.[ii]

Mercury - Basic toxicology

Mercury vapour can cause effects in the central and peripheral nervous systems, lungs, kidneys, skin and eyes in humans.

It is also mutagenic and affects the immune system. Acute exposure to high concentrations of mercury vapour causes severe respiratory damage, while chronic exposure to lower levels is primarily associated with central nervous system damage.

Chronic exposure to mercury is also associated with behavioural changes and alterations in peripheral nervous system. Pulmonary effects of mercury vapour inhalation include diffuse interstitial pneumonitis with profuse fibrinous exudation. Glomerular dysfunction and proteinuria have been observed mercury exposed workers.

Chronic mercury exposure can cause discoloration of the cornea and lens, eyelid tremor and, rarely, disturbances of vision and extra ocular muscles.

Delayed hypersensitivity reactions have been reported in individuals exposed to mercury vapour. Mercury vapour is reported to be mutagenic in humans, causing aneuploidy in lymphocytes of exposed workers.

Mercury contaminated material waste

Currently the Waste Acceptance Criteria (WAC) for mercury contaminated materials determined as leachate is as follows:-

<0.01 mg/kg	–	Inert waste
<0.2 mg/kg	–	stable non-reactive hazardous waste
0.2-2 mg/kg	-	Hazardous landfill
>2mg/kg	–	Pre treatment needed

3 MONITORING

Airborne concentrations of mercury vapour were measured using a direct reading Mercury Vapour Indicator (MVI).

Bulk samples were analysed using Inductively Coupled Plasma- Optical Emission Spectrometry (ICP-OES) to determine mercury concentrations within the plaster using Scientific Analysis Laboratories Ltd In-house method listed in appendix IV of this report.[iii]

4 RESULTS

Concentrations of mercury vapour monitored are reported in Tables 1A – 1B – APPENDIX I

Concentrations of mercury within bulk materials are reported in Table 2 – APPENDIX II

Asbestos Containing Materials (ACM's) are reported in Table 3 – APPENDIX III

5 DISCUSSION

Mercury vapour concentrations

Ambient mercury vapour readings of between 0 - 0.006[iv] $mg.m^{-3}$ was found in the roof space (loft), although no specific source was identified. No bulk mercury samples were taken in this area. The loft was constructed of concrete, wooden beams and protruding brickwork.

Pilot holes were drilled either side of the toilet partition wall 2.58 into room 2.62. The Mercury Vapour Monitor was then inserted and readings indicated zero.

Readings were taken at the brick work plug holes formerly filled by wooden plugs in both rooms (2.62 & 2.63), all indicated zero for mercury vapour.

Mercury vapour was detected up to 0.020 $mg.m^{-3}$ beneath the wooden floor panelling in room 2.62 and at the floor joints; this was found to be localised and consistent with the previous report.

Background readings of 0.006[v] $mg.m^{-3}$ were detected in room 2.63 until windows were opened and room was vented.

Bulk Samples

5 full plaster depth bulk samples were taken during the survey. ICP-OES analysis was performed. All the samples were found to be below the limit of detection on this occasion.

Asbestos Containing Materials

Two samples were taken for possible Asbestos Containing Materials (ACM's) within the loft area. The first was a cement tile broken into two pieces, this was identified as chrysotile. The entire tile was removed and disposed of by ALcontrol. The second material was the decayed insulation from the redundant pipe, no asbestos was detected.

6 CONCLUSIONS AND RECOMMENDATIONS

It was concluded that mercury vapour was present in the loft area this is probably propagating from the same source as the vapour within the wall spaces and beneath the floor. No specific source was identified. No bulk mercury samples were taken in this area. The loft was constructed of concrete, wooden beams and protruding brickwork.

No mercury vapour was detected in the walls of room 2.58 and also no contamination within the bulk samples was found. It should be noted however that removal of this partition wall may impact on older possibly contaminated building fabric and any risk assessment for the removal of this wall should take this into account.

No mercury vapour was detected at the plug holes. *It should be noted that it was identified by the University of Manchester after the survey that the pre-existing holes in the wall may not fully penetrate the cavity and although no mercury vapour was identified at the time, a more comprehensive investigation will be undertaken during the planned remedial work to clarify the situation*.

The vapour has the potential to contaminate rooms 2.62 & 2.63 and the loft space through anywhere that the air can get too from the source, which is as yet unidentified.

Vapour was also prevalent beneath the wooden floor panels in room 2.62.

The source of the mercury is yet to be found, although it is suspected to be within the main structure of the rooms, within brickwork and joists etc…

APPENDIX I

MERCURY VAPOUR MEASUREMENTS

Table No: 1A Levels of mercury vapour – Coupland 1 Building Room 2.62 & 2.63 Loft

Room	Location	MERCURY[1] EXPOSURE	
		mg.m^{-3}	% TLV
Room 2.62 & 2.63 - Loft	Measurements varied although no specific source was identified.	0 – 0.006	Up to 24

[1] TLV for mercury vapour = 0.025 mg.m^{-3} 8-hour TWA

% TLV expressed for guidance illustrative purposes only. Not representative of past or present personal exposure.

Table No: 1B Levels of mercury vapour – Coupland 1 Building 2.58 / 2.62 partition wall

Room	Location	MERCURY[1] EXPOSURE	
		mg.m^{-3}	% TLV
Room 2.62 to 2.58 – Main partition wall	Pilot hole 1 - Above the plastic ducting at 0.3m height. Bulk sample M19	Nil	-
Room 2.62 to 2.58 – Side partition wall	Pilot hole 2 - Above the plastic ducting at 0.3m height. Bulk sample M20	Nil	-
Room 2.58 to 2.62 – Main partition wall	Pilot hole 3 - Above the plastic ducting at 0.3m height. Bulk sample M21	Nil	-
Room 2.58 to 2.62 – Side partition wall	Pilot hole 4 - Above the plastic ducting at 0.3m height. Bulk sample M22	Nil	-

[1] TLV for mercury vapour = 0.025 mg.m^{-3} 8-hour TWA

% TLV expressed for guidance illustrative purposes only. Not representative of past or present personal exposure.

Table No: 1C Levels of mercury vapour – Coupland 1 Building Room 2.62 & 2.63 plug holes

Room	Location	MERCURY[1] EXPOSURE	
		mg.m^{-3}	% TLV
Room 2.62– Brick wall close to window	Unplugged hole	Nil	-
Room 2.63 – Brick wall above window	Unplugged hole	Nil	-

[1] TLV for mercury vapour = 0.025 mg.m^{-3} 8-hour TWA

% TLV expressed for guidance illustrative purposes only. Not representative of past or present personal exposure.

Table No: 1D Levels of mercury vapour – Coupland 1 Building Room 2.62

Room	Location	MERCURY[1] EXPOSURE	
		mg.m^{-3}	% TLV
Room 2.62 - Floor	Measurements at pilot holes in wooden floor and around joins	Up to 0.020	*Up to 80

[1] TLV for mercury vapour = 0.025 mg.m^{-3} 8-hour TWA

% TLV expressed for guidance illustrative purposes only. Not representative of past or present personal exposure.

*** Localised concentrations only**

APPENDIX II

BULK MONITORING RESULTS TABLE AND SAMPLE LOCATIONS

Table 2
Bulk Sample Mercury Results
(For sample locations see below)

Sample Number	Mercury concentration mg/kg
M19	<d.l. <1
M20	<d.l. <1
M21	<d.l. <1
M22	<d.l. <1
M23	<d.l. <1

<d.l. = below the limit of detection

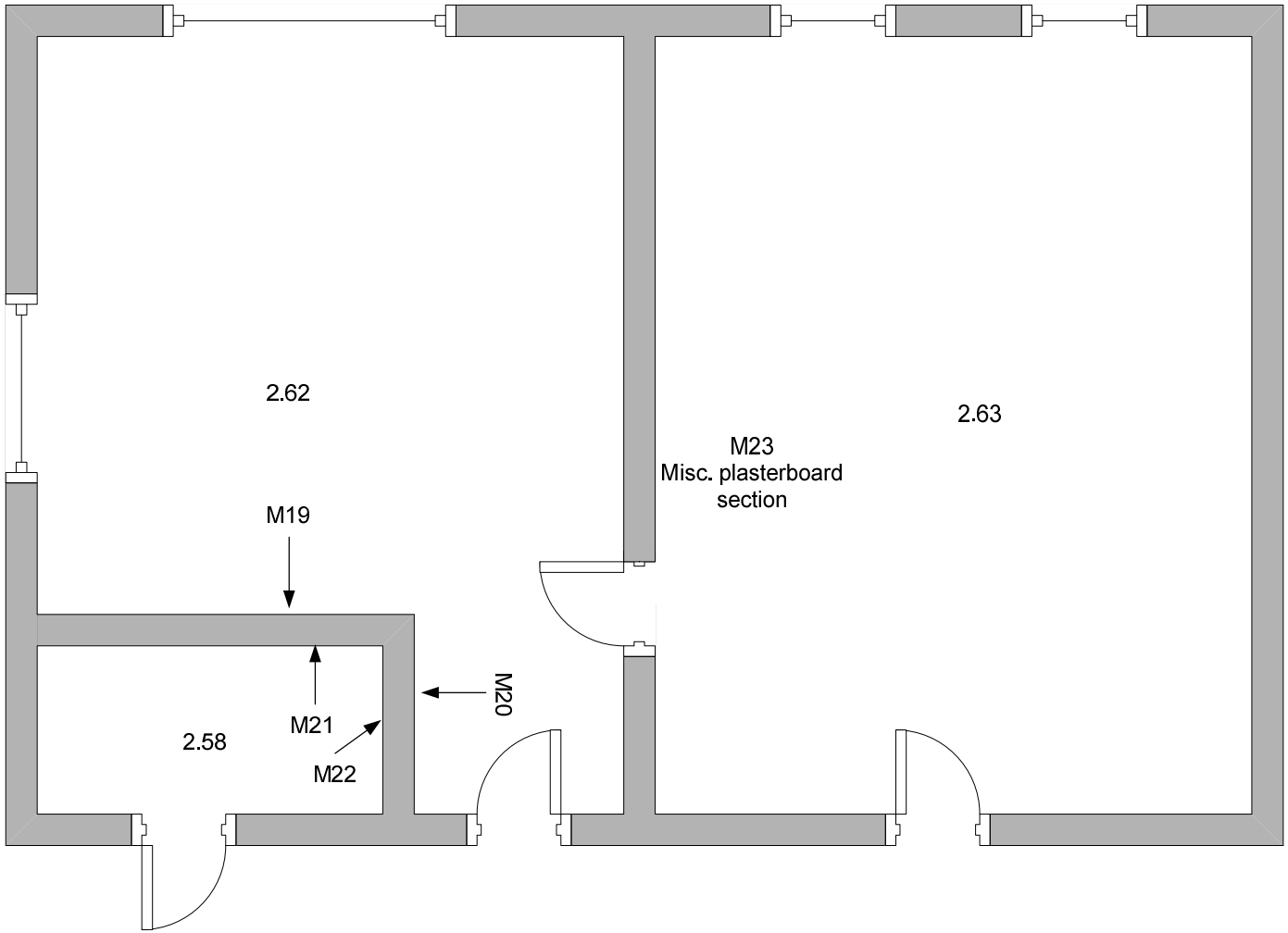

Diagram showing bulk sample locations (not to scale)

Photographs of sample locations

Partition Wall 2.58 / 2.62

Miscellaneous plasterboard

APPENDIX III

ASBESTOS CONTAINING MATERIALS (ACM's)

Table No: 3 Asbestos Containing Materials

Location	Suspected material and sample no.	Analysis result
Room 2.62 & 2.63 Loft	Cement tile broken into two pieces (sample A1)	Chrysotile asbestos confirmed

Location	Suspected material and sample no.	Analysis result
Room 2.62 & 2.63 Loft	Decayed insulation within pipe covering (sample A2)	No asbestos detected

APPENDIX IV

SAL LTD ANALYTICAL METHOD STATEMENT

SCIENTIFIC ANALYSIS LABORATORIES Ltd

Method Statement for Mercury in a Bulk Product

Weigh 1.00 +/- 0.01g of the 425um sub-sample into a 50 ml polyethylene digestion vessel that has been labelled with the correct sample identifier.	Depending on the nature of some samples, it may not be possible to dry and grind them.

Acidifying samples:

Add 2.0 +/- 0.2 ml of 1:1 nitric acid to the sample. Allow any effervescence or excessive frothing to subside.	Carry out this procedure in a fume hood using a dispenser.
Add 5.0 +/- 0.2 ml of 1:4 hydrochloric acid to the sample.	Carry out this procedure in a fume hood using a dispenser
Place the vessel in the digestion block and cover with a screw cap and heat to 95 ^{0} C. Heat the sample for one hour.	Note that the screw cap is only gently placed onto the vessel and must not be tightly attached.
Remove the sample from the hotblock and allow to cool to ambient temperature.	
Carefully add deionised water to the 50 ml mark. Gently agitate the vessel then allow to stand to allow any non-dissolved solids to settle.	In some cases the solids do not settle, in which case a 'filtermate' or syringe filter may be used to remove the solids before transfer of the extract.
Transfer circa 10 mls of the extract to an autosampler vial and place it in the sample rack. Record the order of loading the samples onto a rack loading sheet for subsequent entry into the ICP-OES sequence table.	

SAL Reference: 191287
Customer Reference:

Bulk Product Analysed as Bulk Product
Miscellaneous

				SAL Reference	191287 001	191287 002	191287 003	191287 004	191287 005
				Customer Sample Reference	M19	M20	M21	M22	M23
				Test Sample	AR	AR	AR	AR	AR
Determinand	Method	LOD	Units	Symbol					
Mercury	ICP/OES	1	mg/kg	N	<1	<1	<1	<1	<1

APPENDIX V
LIST OF AMMENDMENTS

[i] All references to Rutherford removed and replaced by the Building name Coupland 1 at the request of the University of Manchester

[ii] Addition of proposed Draft IOELV for mercury

[iii] Removal of HSE method reference and addition of SAL Ltd in-house method for mercury determination in bulk materials of varying matrices, shown in appendix IV

[iv] Correction of typographical error 0.06- 0.006

[v] Correction of typographical error 0.06- 0.006