Downdraft Ventilated Workstation

Performance Type Test Report

Carried Out By:	Crowthorne Hi-Tec Services Ltd
Report No:	960815/1
Tested At:	PSE Engineering Ltd - Type Test Room
Date of Test:	15th August 1996

CONTENTS

1. INTRODUCTION

This report covers the performance testing of a Downflow design Ventilated Workstation as designed and manufactured by J Marston Engineers the tests included velocity measurements, observation of smoke test and measurement of >containment= using a tracer gas.

The work was carried out at the purpose built Type Test Room provided by PSE Engineering Ltd by Dr. Steve D. Robertson of Crowthorne Hi-Tec Services Ltd on the 15th August 1996.

The room temperature during the test was 22.1 C (dry bulb) and relative humidity 55%.

All instrumentation used for the study was in procession of calibration traceable to National Standards, copies of the calibration certificates are available on request.

2. GENERAL DESCRIPTION OF THE WORKSTATIONS

The table tested was constructed from 316 grade satin polished stainless steel with a removable perforated worktop measuring 1160mmx695mm. Control of vapours (formaldehyde) was by downflow through the work top to a plenum and then ducted extract system with 100% exhausted air.

All tests were carried out with total extract volume set to 0.40m/second measured by pilot traverse of the exhaust duct.

3. TEST METHODS

3.1 Velocity Profiling:-

The downflow velocity was measured using a 100mm dia rotating vane anemometer held in a retort stand over a series of grid points both at worktop level and 100mm above it.

The area of the perforated worktop 1160x695 was divided up into 12 No. cells; A1 to A3, B1 to B3, C1 to C3 and D1 to D3.

3.2 Smoke Test:-

Observation of the airflow patterns was made using a Draeger smoke pencil released at heights of from 100mm to 300mm above the perforated worktop and outside the perimeter of the table. Tests were also carried out using a blank plate measuring 450mmx300mm placed on the worktop to simulate equipment or cutting blocks placed on it.

3.3 Containment Testing:-

Tracer gas (10% sulphur hexaflouride in nitrogen) was released horizontally along the centre of the perforated worktop through a P40 sintered crucible at a height of 100mm above it, >Loss= of containment was measured through a grid of sampling probes (each 5mm id) pointed downwards connected to a sampling pump (SKC) and electron capture detector (Ai Cambridge model 120) having a limit detection of 0.1ppb.

The sampling grid was based upon that (12No. Cells) used for velocity profiling but with the probes 100mm in from the perimeter of the worktop.

The probes were arranged at 75mm above the top of the sintered crucible.

The tracer gas was released for 2 minutes with the pump and detector running to allow the system to equilibrate and then monitored for 15 minutes.

The test was repeated with the crucible at 200mm and 250mm above the worktop.

The tracer gas release rate in each instance was 1.96 litre/minute.

A further test was carried out with the crucible at 250mm using a blockage on the perforated worktop as described in 3.2 above.

The ECD was calibrated on site prior to use using a standard reference leak supplied by the instrument manufacturers.

A copy of the calibration certificate for this leak is available on request.

4. RESULTS

4.1 Velocity Profile:-

The velocity profile obtained at each height tested is shown on the following:-

DOWNFLOW @ WORKTOP HEIGHT (m/second)			**DOWNFLOW @ 100MM ABOVE WORKTOP HEIGHT (m/second)**		
0.50	0.48	0.48	0.30	0.30	0.31
0.50	0.47	0.48	0.31	0.29	0.30
0.51	0.49	0.50	0.31	0.32	0.29
0.49	0.49	0.51	0.32	0.31	0.30
MEAN VELOCITY = 0.49m/sec			MEAN VELOCITY = 0.31m/sec		

4.2 Smoke Test:-

The smoke pencil tests showed good capture with release heights up to 300mm above the worktop height.

Release up to 400mm showed capture but were easily disturbed by cross draughts.

Release of smoke at the sintered crucible, 250mm above worktop, with the 300mmx450mm >blockage= in place showed capture around the perimeter of the object, no loss was observed.

Release of smoke up to 200mm outside the rim of the table showed good capture although this was open to disturbance by operator movements etc.

4.3 Containment Tests:-

In each test no tracer was detected at the sampling probes for limit of detection of 0.1ppb.

Monitoring close to the open end of the sintered crucible showed tracer above the upper limit of the detector for only a very short distance (D100mm) from the mouth, this being drawn strongly downwards towards the perforated worktop.

Placing the blockage on the worktop did not appear to extend the distance to which the tracer travelled horizontally before being drawn downwards. All tracer was found to be captured around the perimeter of the object on the worktop.

These results were in line with those observed during the smoke pencil test.

5. DISCUSSION OF RESULTS

The test carried out in this study showed good capture of tracer gas released at up to 75mm above the perforated worktop when monitoring for that tracer 75mm above the release position.

Placing the blockage upon the worktop did not appear to significantly affect the performance of the workstation.

The largest objects to be used on the table during an autopsy were reported by the users to be substantially in area than the blockage used and to be a maximum height of 150mm (usually D100mm).

The vapour to be controlled, formalderhyde, arises from the use of ca.4% formalin solution used as preservative for tissues within sample jars placed upon the worktop. It is therefore felt that the tests carried out in this study represent a significantly harsher test than is likely to be the case in actual use of the facilities.

Due to the designation of the Maximum Exposure Limit (MEL) by the Health & Safety

Executive (HSE) however it is recommended operator exposure monitoring be carried out following installation of the tables in order to comply with the COSHH regulations.

This will also allow the effect of the room environment to be ascertained.