

## ORIGINAL ARTICLE

# THE EFFICIENCY STUDY OF LOCAL EXHAUST VENTILATIONS (LEV) PERFORMANCE CONDUCTED IN THE WELDING WORKSHOP: A CASE STUDY AT TECHNICAL COLLEGE

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## ABSTRACT

Students who carried out their study in welding workshop may be exposed to health risks from inhaling welding fumes. There are 10 sets of Local Exhaust Ventilation (LEV) system installed in the welding workshop which consist 6 sets - special types of arc welding and 4 sets - special types for welding of MIG / TIG. A total of 7 sets of Local Exhaust Ventilation System that tested the effectiveness for (Capture Velocity) were used to measure the reading at a distance of 6 inches from the air openings and compared with standards set by the American Conference of Governmental Industrial Hygienists (ACGIH). There were 3 sets of Local Ventilation system that cannot function due to damage to the circuits and equipment. Scope of study revolved around the aspects focused on the measurement aperture (hood) where Capture Velocity data were taken and observations throughout the effectiveness of the system. Instruments used were Anemometer, Smoke Tube Tracer Set and Measuring Tape. There was an availability velocity measurement that fails when comparing to the standard that is set for the welding process. There were no maintenance records and test reports of Hygiene Technician II recognized by Department of Occupational Safety and Health (DOSH) as provided under the Occupational Safety and Health Act 1994, Regulations - Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000. According to this study, it is suggested to immediately perform maintenance / repairs to the ventilation system and run a full test of the entire system by Hygiene Technician II. Ensure suitable personal protective equipment is used for welding work. Compliance with the requirements of Regulation 17(1) (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000 that mentions any engineering control equipment provided shall be inspected at each interval being no longer than one month by employer; and examined and tested for its effectiveness by a registered hygiene technician at each interval being no longer than twelve months.

**Keywords:** *Local Exhaust Ventilation System, Engineering Control Equipment, Welding Workshop, Capture Velocity, ACGIH, USECHH Regulations 2000*

## INTRODUCTION

Local Exhaust ventilation is a widely-known engineering control used to mitigate concentration of airborne contaminants released during production or process in workplace. LEV system has potential to loss its performance and can lead to respiratory illness. Findings will revolve around the aspects focused on the measurement aperture (hood) where Capture Velocity data are taken and observations throughout the effectiveness of the system.

The information provided in this fact sheet will be useful to the user (owners, operators, researcher, students and contractors) to comply with the Occupational Safety and Health Act 1994, Regulations - Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000 as amended to protect worker's health due to exposure from inhaling

welding fumes. It is requirement to perform annual inspection, provide data monitoring, review existing assessment, deliver training and in conducting activities involving substances hazardous to health.

## METHODS

Assessment of available data and information through the measurements of Capture Velocity at a distance of 6 inches from hood using anemometer, interview workshop staff on duty, and make observations on the system workplace and how students perform welding work. Smoke Tube Tracer Set was used for identifying the direction of airflow and duct leakages. The results were then comparing according to standards set by the American Conference of Governmental Industrial Hygienists (ACGIH) values for Capture Velocity.

Evaluation of the system performance was done by considering result of inspection. If the inspection result shows mitigation of system performance  $\pm 10\%$  out from design

specification, further investigation must be performed to ensure system work proper and supply adequate controls.

### RESULTS AND DISCUSSION

The results of measurements taken are shown in Figure 2 until Figure 8 on each line. Based on LEV's mapping plan as in Figure 1, there are a total 10 sets of LEV system which consists of 6 sets for Line Arc Welding and 4 sets for Line MIG/TIG Welding. The red background indicates that section failed to comply with reference standard as stipulated in ACGIH Reference Value for Capture Velocity.



Figure 1 LEV's Mapping Plan and Performance Evaluation

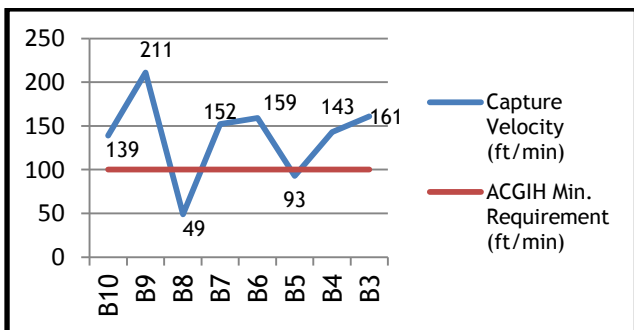


Figure 2 Measurements of LEV's at Line B

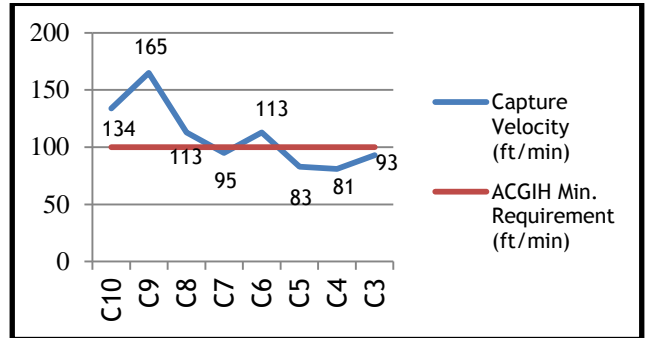


Figure 3 Measurements of LEV's at Line C

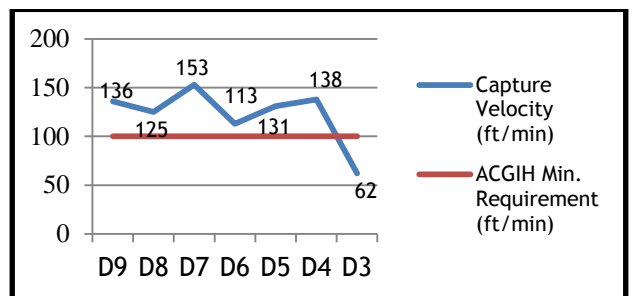


Figure 4 Measurements of LEV's at Line D

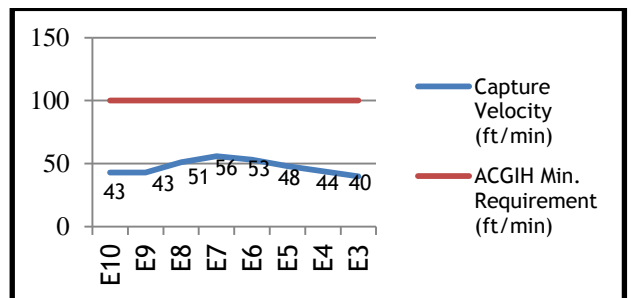


Figure 5 Measurements of LEV's at Line E

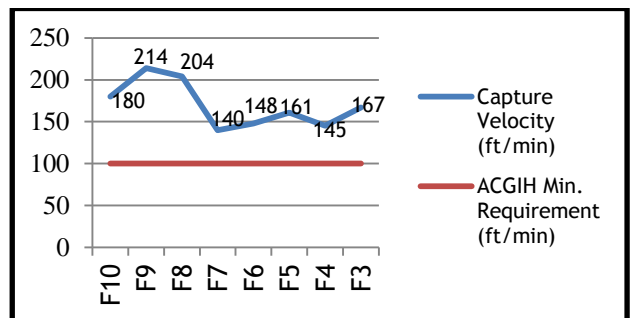


Figure 6 Measurements of LEV's at Line F

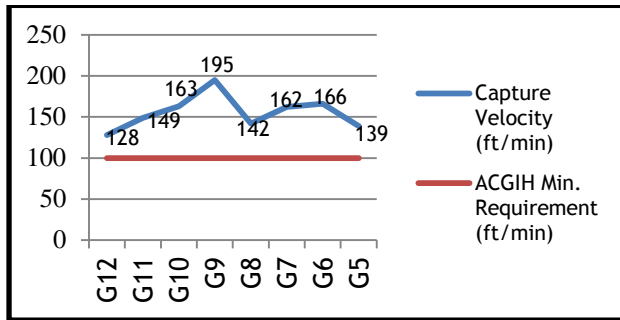


Figure 7 Measurements of LEV's at Line G

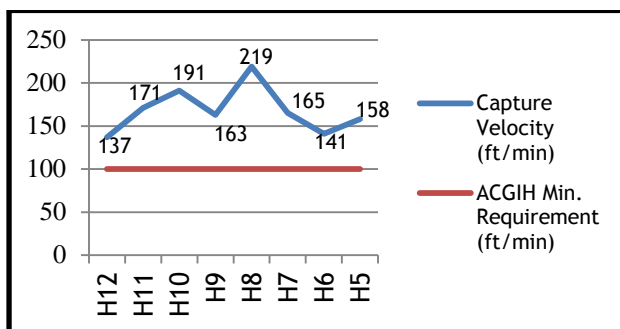


Figure 8 Measurements of LEV's at Line H

There was an availability velocity measurement that fails when comparing to the standard that is set for the welding process. 3 System of the Line A, I and J cannot be tested due to damaged equipment and wiring. Turns out ventilation system is not in maintenance and has never tested its effectiveness before. There were no maintenance records and test reports of Hygiene Technician II recognized by DOSH as provided under the Occupational Safety and Health Act 1994, Regulations - Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000. From observations, most appliances ventilation system air leak in the Hood. There are also damaged fan belts on (Line A & J) and too noisy (Line F).

## CONCLUSION

The technical college must immediately perform maintenance / repairs to the ventilation system and run a full test of the entire system by Hygiene Technician II. They must also ensure suitable personal protective equipment is used for welding work. Compliance with the requirements of Regulation 17(1) (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000 that mentions any engineering control equipment provided shall be inspected at each interval being no longer than one month by employer; and examined and tested for its effectiveness by a registered hygiene technician at each interval being no longer than twelve months.

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## COMPETING INTERESTS

There is no conflict of interest.

## REFERENCES

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