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WORKING ENVIRONMENT MEASUREMENT REPORT

Tae Sung Phils. Co., Inc.



CRL Calabarquez Corporation

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stack emission | ambient | WEM | IAQ | RATA | CGA | gas analysis...



CRL Calabarquez Corporation

7 January 2015

MS. ZENaida G. CRUZ
Tae Sung Phils. Co., Inc.
Lot 3&5, Blk 24, Phase 4, CEPZ
Rosario, Cavite

Dear Ms. Cruz:

Greetings!

We are sending herewith the report for the **Working Environment Measurement** that was conducted on November 6, 2014 at your facility.

We trust that you find everything in order.

Thank you so much!

Very truly yours,


ENGR. WALTER G. FIESTA
QA/QC Manager

REPORT CERTIFICATION

WORKING ENVIRONMENT MEASUREMENT
OF

TAE SUNG PHILS. CO., INC.

Lot 3&5, Blk 24, Phase 4, CEPZ, Rosario, Cavite

Project No.: P00002592

The sampling and analyses data reflected on this report were checked and verified to the best of my knowledge.

Prepared by: _____


Ramil G. Peralta
QA/QC Officer
CRL Calabarquez Corporation

Date: _____

7 JAN 2015

Certified by: _____


Walter G. Fiesta
QA/QC Manager
CRL Calabarquez Corporation

Date: _____

1/7/15



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TAE SUNG PHILS. CO., INC.
Lot 3&5, Blk 24, Phase 4, CEPZ, Rosario, Cavite

SUBMITTED TO

MS. ZENaida G. CRUZ
Tae Sung Phils. Co., Inc.
Lot 3&5, Blk 24, Phase 4, CEPZ
Rosario, Cavite

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TEST DATE

6 November 2014



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Definitions

Working Environment Measurement (WEM)

It is the evaluation of the magnitude of hazards through quantitative measurement of chemicals or biological and/or physical parameters at work environment. Thus, it is the assessment of safety and comfort levels within the workplace.

Indoor Air Quality (IAQ)

It refers to the quality of air within and around buildings and structures, especially as it relates to the health and comfort of building occupants.

WEM = IAQ + Physical Agents

Physical Agents are, but not limited to, noise, illumination, heat, and ventilation.

Legals (DOLE)

In the Philippines, the Department of Labor and Employment (DOLE) has promulgated standards or set of standards for working environment, health and safety, through the power vested in the Department under Article 162 of Labor Code of the Philippines, for guidance and compliance of all concerned. This Standards is called "Occupational Safety and Health Standards" (OSH Standards).

OSH Standards (OSHS) [Yellow Book]

The Occupational Safety and Health Standards was formulated in 1978 in compliance with the constitutional mandate to safeguard the worker's social and economic well-being as well as his physical safety and health. (*Excerpt from Foreword of OSHS*)

Threshold Limit Values (TLV)

TLV refers to the airborne concentration of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed daily WITHOUT adverse effect.

OSHS Rule 1070: "Occupational Health and Environmental Control" establishes TLVs for toxic and carcinogenic substances and physical agents which may be present in the atmosphere of the work environment.

Permissible Noise Exposure Limit (PNEL)

PNEL refers to the corresponding noise exposure limit for each specific work hour/s exposure per day. It represents noise levels under which it is believed that workers may be repeatedly exposed daily WITHOUT adverse hearing effect. PNEL for 8-hr workday is 90.0 dB(A) (OSHS). A more strict PNEL of 85 dB(A) (ACGIH) is also used in some industries.



Not Detected (ND)

"ND" means either: (1) the corresponding contaminant is not detected during the test [i.e., contaminant not present] or (2) the contaminant is below the instrument/method detection limit [i.e., contaminant cannot be detected by the instrument or the method of testing].

Ventilation

Merriam-Webster defines ventilation as "a system or means of providing fresh air" and *The Free Dictionary* defines it as "a process of supplying fresh air to an enclosed space and removing from it air contaminated by odors, gases, or smoke".

Ventilation is a method of controlling the environment with air flow. In industrial applications, it generally involves the use of supply and exhaust ventilation to control airborne contaminants in the workplace to acceptable levels (US Occupational Safety and Health Administration).

Ventilation is the most important engineering control available for improving or maintaining the quality of the air; on the other hand, when not addressed properly, it may aggravate the potential workplace hazards.

Ventilation may be deficient in confined spaces, facilities failing to provide adequate maintenance of ventilation equipment, facilities operated to maximize energy conservation, areas without windows, and areas with high occupant densities.

Institutional References [and their acronyms]

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
ATDSR	Agency for Toxic Substances and Disease Registry (US)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
CCOHS	Canadian Center for Occupational Health and Safety
IMA	Industrial Minerals Association (Europe)
NIOSH	National Institute for Occupational Safety and Health (US)
NPI	National Pollutant Inventory (Australia)
OSHA	Occupational Safety and Health Administration (US)
PATI	Prism Analytical Technologies, Inc.
SKC	SKC Incorporated



Table of Contents

DEFINITIONS

TABLE OF CONTENTS

1.0 INTRODUCTION

Tae Sung Phils., Co., Inc. WEM 2014	1
Table 1.1 Parameters, Methods and Standards	1
Ventilation Discussion	1

2.0 RESULTS

2.1 Total Respirable Dust Levels	3
2.2 Carbon Monoxide Levels	3
2.3 Carbon Dioxide Levels	4
2.4 Methylene Chloride Levels	4
2.5 Toluene Levels	5
2.6 Temperature and Relative Humidity Levels	5
2.7 General Ventilation (as Air Velocity)	6
2.4 Illumination Levels	7
2.5 Noise Levels	7

III. ANNEXES

- Annex A. Chain of Custody
- Annex B. Test Results
- Annex C. Analytical Results
- Annex D. Equipment Calibration Records
- Annex E. Sampling Personnel
- Annex F. Sampling Working Conditions
- Annex G. Fact Sheets



Introduction

Tae Sung Phils. Co., Inc. contracted the services of CRL Calabarquez Corporation (CRLC) to conduct Working Environment Measurement (WEM) within its facility which is located at Lot 3&5, Blk 24, Phase 4, CEPZ, Rosario, Cavite.

The WEM was conducted on November 6, 2014. Most of the measurements conducted were short-term measurements and the outcomes are compared to the OSHS TLVs, OSHS PNEL and other applicable standards or guideline values. The results of the tests will dictate the course of action/s that needs to be done in order to address problems that may be found during the tests.

The parameters tested with their corresponding sampling methods and instruments, analyses methods and applicable standards are tabulated and are shown in Table 1.1 below.

Table 1.1 Parameters, Methods & Standards

PARAMETER	TEST REFERENCE	INSTRUMENT	INSTITUTION: STANDARDS
Total Respirable Dust (TRD)	NIOSH 0600 (Air Filtration)	Mini pump, cyclone, filter	OSHS (Rule 1076.04, Table 8a: Mineral Dusts): 5,000 $\mu\text{g}/\text{m}^3$ (TLV)
Carbon Monoxide	Direct Readout (Gas Sensing)	CO Analyzer	OSHS (Rule 1076.04, Table 8: TLV for Airborne Contaminants): 50 ppm (TLV)
Carbon Dioxide	Direct Readout (Gas Sensing)	CO ₂ Analyzer	OSHS (Rule 1076.04, Table 8: TLV for Airborne Contaminants): 5,000 ppm (TLV)
Toluene	Drager (Sorbent Adsorption)	Drager pump and tube	OSHS (Rule 1076.04, Table 8: TLV for Airborne Contaminants): 100 ppm (TLV)
Methylene Chloride	Drager (Sorbent Adsorption)	Drager pump and tube	OSHS (Rule 1076.04, Table 8: TLV for Airborne Contaminants): 500 ppm (TLV)
Illumination	Direct Readout (Light Sensing)	Light Meter	OSHS (Rule 1075): variable, see OSHS Rule 1075.03 or Table 8c on minimum illumination level
Temperature	Direct Readout (Temperature Sensing)	Digital Thermometer	ASHRAE (Standard 55-2010): Between 19.4 and 28.8°C (67 – 82 °F)
Relative Humidity	Direct Readout (Humidity Sensing)	Digital Hygrometer	ASHRAE (Standard 62.1-2010): Relative humidity less than 65% (RH < 65%)
General Ventilation (as Air Velocity)	Direct Readout (Speed Sensing)	Anemometer	variable, see succeeding discussion
Noise	Direct Readout (Noise Sensing)	Noise Meter	OSHS (Rule 1074.02, Table 8b: Permissible Noise Exposure): 90.0 dB(A) (PNEL)



Ventilation (Measures of)

Different measures of ventilation have been used by various institutions or organizations for quantitative assessment of ventilation. There have been many terms used such as general ventilation, local ventilation, air supply, air change, etc. that were used to express the state of ventilation on an area of concern. The measure of ventilation used in Tae Sung Phils. Co., Inc. WEM is "general ventilation as air velocity".

GENERAL VENTILATION. When pollutants generated at a worksite are to be controlled by ventilating the entire locale we speak of general ventilation. The use of general ventilation implies accepting the fact that the pollutant will be distributed to some degree through the entire space of the worksite, and could therefore affect workers who are far from the source of contamination. General ventilation is, therefore, a strategy that is the opposite of localized extraction (ILO, International Labour Organization).

Air Velocity/Air Movement. Air velocity or more correctly called the air speed (non-vector quantity, no direction) is the measure of how fast the air is. In occupational settings, air speed that is too high causes objectionable drafts that will likely create discomfort to workers. OSHA provides a standard of less than 15 meters per minute (m/min) (50 fpm) during rainy season and 45 m/min (150 fpm) during summer season (Rule 1076.04). Likewise, ACGIH provides another useful standard based on either air-conditioned or non-air-conditioned area. For air-conditioned work areas, 15-22 m/min (50-70 fpm) while for non-air-conditioned work areas, 23-38 m/min (75-125 fpm) (Industrial Ventilation: A Manual of Recommended Practices).



Results

Presented below are the results of measurement vis-à-vis their corresponding standards. A discussion is also included to provide interpretation of the measurements plus recommendations for the areas which did not meet the standard.

For additional knowledge on the test parameters, discussions are provided on Annex G: Fact Sheets. These Fact Sheets include the sources of contaminants, health effects and other relevant information.

Table 2.1. Measured Total Respirable Dust versus OSH Standard

Location	TRD
	$\mu\text{g}/\text{m}^3$
Spray Booth and Production Area (Subject Worker: Herminio N. Quinan)	367
Press Area (Subject Worker: Efren H. Magnifico, Jr.)	900
OSH Standard	90,000

The results of Total Respirable Dust (TRD, the dust that can be inhaled and can be deposited in the lungs) exposure of the workers presented above fall within the Occupational Safety and Health (OSH) Threshold Limit Value (TLV) of $5,000 \mu\text{g}/\text{m}^3$ for TRD. Thus, respirable dust levels in the tested areas are tolerable to human or worker exposure.

Table 2.2. Measured Carbon Monoxide versus OSH Standard

Location	CO
	ppm
Spray Booth and Production Area	ND
Press Office	ND
Press Area	ND
OSH Standard	50

ND – Not detected or below detection limit of 1ppm (CO)

There were no detected [or were below detection limits of] carbon monoxide in the tested locations listed above (Table 2.2).



Table 2.3. Measured Carbon Dioxide versus OSH Standard

Location	CO ₂
	ppm
Spray Booth and Production Area	509
Press Office	1,256
Press Area	482
OSH Standard	5,000

ND – Not detected or below detection limit of 1ppm (CO₂)

The detected levels of carbon dioxide are within the Threshold Limit Value (TLV) of 5,000ppm for CO₂; thus, tolerable to human or worker exposure.

Table 2.4. Measured Methylene Chloride Levels versus OSH Standard

Location	DCM
	ppm
Washing Area	ND
OSH Standard	500

ND – Not detected or below detection limit of 20ppm (DCM)

There was no detected [or was below detection limits of] methylene chloride in the tested location listed above (Table 2.4).



Table 2.5. Measured Toluene Levels versus OSH Standard

Location	Toluene
	ppm
Washing Area	50
OSH Standard	100

ND – Not detected or below detection limit of 5ppm (Toluene)

The result of toluene measured in the Washing Area fall within the Occupational Safety and Health (OSH) Threshold Limit Value (TLV) of 100ppm for toluene. Thus, toluene level in the tested area is still tolerable to human or worker exposure (provided the operation remains constant as what it was during the conduct of the test).

Table 2.6. Measured Temperature and Relative Humidity Levels versus Applicable Guideline Values

Location	Ta (Temperature)	RH (Relative Humidity)
	°C	%
Spray Booth and Production Area	33.5	49.4
Press Office	25.3	30.0
Press Area	31.8	51.1
Washing Area	29.7	56.9
Applicable Guideline Values	19.4 – 28.8	< 65

There is no available value or range from the OSH standards which can be used to compare the results of temperature and relative humidity measurements. However, American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) provides a general standard (for temperature and relative humidity), which is a widely accepted standard, which can be referred into.

ASHRAE Standard 62.1-2010 (*Ventilation for Acceptable Indoor Air Quality*) recommends that relative humidity in occupied spaces should be controlled to less than 65% to reduce the likelihood of conditions that can lead to microbial growth.



ASHRAE Standard 55-2010 (*Thermal Environmental Conditions for Human Occupancy*) notes that for thermal comfort purposes, temperature could range from between approximately 67 and 82 °F (19.4 and 28.8 °C).

The results of temperature levels measured in three areas (listed in Table 2.4) fall outside the ASHRAE guideline values or recommended range; thus, temperature levels in these areas may not be tolerable to workers. On the other hand, relative humidity levels in all the tested areas met the ASHRAE guideline values.

Table 2.7. Measured Air Velocity versus OSH Standards

Location	Air Velocity	OSH Standard
	ft/min	ft/min
Spray Booth and Production Area	75 – 80	<50 ^[R] , <150 ^[S]
Press Office	100 – 160	
Press Area	165 – 250	

^[R]rainy season; ^[S]summer season | ft/min – feet per minute

The air velocity in all the areas tested exceeded the rainy season standard (the season when the measurement was conducted).

Likewise, ACGIH provides another useful and more appropriate standard or guideline value based on either air-conditioned or non-air-conditioned area. For air-conditioned work areas, 15-22 m/min (50-70 fpm) while for non-air-conditioned work areas, 23-38 m/min (75-125 fpm) (Industrial Ventilation: A Manual of Recommended Practices).

Adjusting the setting of fans, moving the fans or sources of ventilation to a distance enough to produce lower air velocities, providing minimal blockage or barriers to lower the high air velocities, relocating the workers in a location with lower air velocities, or other ways to lower the air velocity levels may be employed in areas where air velocities are high.



Table 2.8. Measured Illumination Levels versus OSH Standards

Location	Illumination	OSH Standard (minimum lighting level)
	lux	lux
Spray Booth and Production Area	643	500
Press Office	291	300
Press Area	265	300

500 lux: Where discrimination of fine detail is involved

300 lux: Where close discrimination of detail is essential

Illumination levels in two out of three areas (Press Office and Press Area) did not meet their respective suggested minimum illumination levels. Thus, illumination levels in these areas are not enough or insufficient based on the kind of work area and/or kind of work performed.

Increasing the illumination levels by cleaning the light sources, having additional sources of light or increasing the wattage of light sources in the work areas or locations that did not meet the standard is recommended to improve the lighting quality in those work areas.

Table 2.9. Measured Noise Levels versus OSH Standard

Location	Noise	OSH Standard
	dB(A)	dB(A)
Press Office	66.5	90.0*
Press Area	104.2	89.0**

*for 8-hr shift noise exposure (OSHS & CCOHS);

**for 12-hr shift noise exposure (CCOHS)

Note: Refer to Annex B for remarks on the source of noise

The permissible noise exposure limit (PNEL) for 8-hour time-weighted average noise exposure is 90.0 dB(A) and 89.0 dB(A) for 12-hour noise exposure. The noise level measured in the press office is within the 8-hour and 12-hour PNELs. Thus, worker exposure to noise levels in this area is safe without hearing protection.

On the other hand, noise level in the Press Area exceeded the PNEL, which means that exposure to this noise level without hearing protection can cause adverse hearing effects.



To prevent exposure to high noise levels, the hierarchy of controls can be followed: **(1) Elimination or Substitution:** removing or substituting the noise sources with equipment or processes that produce lower noise levels, **(2) Engineering Control:** maintenance, repair, isolation, etc. of the noise sources, **(3) Administrative Control:** shorter work shift, work rotations, longer breaks, etc., and when all of these are not effective or impossible to attain, the last option is **(4) Personal Protective Equipment:** use of ear plugs, ear muffs, etc. to lower the noise exposure of workers.

Exposure to 92 dB(A) of noise must not be more than 6 hours; 95 dB(A), 4 hours; 97 dB(A), 3 hours; 100 dB(A), 2 hours; 102 dB(A), 1.5 hours; 105 dB(A), 1 hour; and 110 dB(A), 0.5 hour.

