



Occupational Hygiene Survey

Including, Ventilation, Illumination, Baseline Ergonomics, Hazardous Chemical Agent Exposure, Noise for NIHL and Facilities/ HBA Assessment

Prepared for

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integrated occupational health services

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Statement page

The site inspection surveys were performed and the report only pertains to the conditions found at the above address at the time of the survey. Interpretations, discussions, conclusions and recommendations made in this report are made in good faith and every effort was made to ensure the professional integrity there-of. The final responsibility, however, lies with the client to ensure the suitability and correctness there-of, prior to implementation of recommendations. Occufit and its employees assume no liability or responsibility for any loss, damage, injury, cost or expense, whether of a financial or other nature, directly or consequentially incurred by the client based on this report.

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CLIENT DETAILS:

Report Title	Occupational Hygiene Survey Including, Ventilation, Illumination, Baseline Ergonomics, Hazardous Chemical Agent Exposure, Noise for NIHL and Facilities/ HBA Assessment
Date(s) of inspection survey on the site	27 Sept to 1 Oct 2021
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Introduction and process description

Scope of inspection survey :

The scope will include the following aspects in the work environment. These will be based on site visit and walkthrough, review of facilities available, collecting of site dimensions and photographs, and collection of data on the work processes.

These will include:

- Legislation and standards review
- Work environment for Employees
- Developing or updates to the Workplace

Process description

Where a survey of a process or workplace is completed the following should be described:

- The process or the area being surveyed
- Conditions at the time of The number of employees o Duration of work shift(s)
- Task frequency and duration
- Diagrams or photographs to show the locations of employees monitored and conditions.

Executive summary

From the findings of these surveys the following summary is provided of the work performed on site.

From these findings, actions to be taken are recommended to improve non-conformances and rectify items to better comply with the OHS Act (no 85 of 1993) requirements for a healthy and safe work environment.

The following findings were made:

FACILITY ASPECTS	SUMMARY OF FINDINGS	RESPONSIBLE PERSON:	ACTION DATE:
<p>Ventilation and indoor air quality</p> <p>Inadequate fresh air supply or defective means of ventilation.</p>	<p>From the Ventilation Survey at the site the following may be concluded:</p> <ul style="list-style-type: none"> • General ventilation in the airport buildings partially complied with the requirements of the National Building Regulations, South African National Standard (SANS) 10400 -O: 2011, in that any habitable room should be provided with uncontaminated, fresh outside air. • The measurement of Carbon dioxide remained within the recommended standard of ASHRAE 62.1 of 2010, where ventilation for acceptable air quality remained less than 700 ppm, above the outdoor CO₂ level, in all occupied sections. Intermittent occupancy contributed to lower levels. • The temperatures evaluated were below the comfort range for sedentary activity adapted from ISO 7730. A Summer range of 22 °C to 27 °C, was applied, and was based on seasonal / ambient conditions. • The measurement of Relative Humidity was partially within the range for summer range of 40 % to 70 % due to ambient levels. • The measurement of Carbon monoxide did not indicate a presence of the gas in the work areas above the National Ambient Air Quality Standards of the United States of America (NAAQS) or the Regulations for Hazardous Chemical Agents, OHSAct (85 of 1993) of 50 ppm OEL. • Air velocities measured did not all comply with the recommended standards of W.P. Jones, Air Conditioning Engineering, 4th Edition National Building Regulations, SANS 10400 -O: 2011 for Acceptable worker comfort of ≥ 0.1 m/s. This was due to some air conditioning systems not creating a draft. • Areas were partially supplied with fresh air ventilation and occupancy was controlled to maintain safe distances for 	<p>Review general ventilation and indoor air quality recommendations as provided in report section, to improve non-complying items and reduce exposure.</p>	<p>Action should be implemented as soon as possible on the best practice basis. Survey to be repeated in 24 months or sooner if work changes are made.</p>

FACILITY ASPECTS	SUMMARY OF FINDINGS	RESPONSIBLE PERSON:	ACTION DATE:
	<p>work environment. Higher occupancy may elevate the Carbon dioxide levels and cause indoor air quality problems, ie arrivals and departure lounges.</p> <p>When the ventilation inside a building is insufficient, pollutants, viruses and allergens cannot be moved and extracted outside. Among other things, they ensure a sufficient exchange of used air with fresh air as well as efficient filtering. In turn, they provide high air quality and thus a healthy indoor climate in the building for employees and public.</p> <p>Corrective action is to be prioritised to ensure that high risk areas are targeted first to ensure a risk based Occupational Health and Safety Management approach is followed.</p>		
<p>Illumination</p> <p>Poor illumination, defective or incorrect lamps.</p>	<p>From the findings of this report the site was evaluated to establish if the illumination complies with the requirements of the Environmental Regulations for Workplaces, OHS Act (No 85 of 1993).</p> <p>The ACSA site had modern lights in most areas that provided illumination in line the legal requirements. A few areas may be improved due to depreciated or defective lamps.</p> <p>Corrective action is to be prioritised to ensure that high risk areas are targeted first to ensure a risk based Occupational Health and Safety Management approach is followed.</p>	<p>Review illumination recommendations as provided in report section, to improve non-complying items and reduce exposure.</p>	<p>Action should be implemented as soon as possible on the best practice basis. Survey to be repeated in 24 months or sooner if work changes are made.</p>
<p>Ergonomics</p> <p>Office related ergonomic issues, chairs and office layout.</p>	<p>From the findings of this ergonomic assessment the following may be concluded:</p> <ul style="list-style-type: none"> • Work areas evaluated included the Airport administrative sections and Workshop / Apron Areas. • The Baseline Ergonomics Assessment was performed in general by means of a walk-through assessment which consisted of inspections of workstations/premises, identification of all occupational health stresses which could occur, and assessment of these stresses according to the potential degree of hazard and risk to the exposed workers. The baseline assessment mainly focusses on physical ergonomics due to time on site and the walk-through format. 	<p>Review ergonomic recommendations as provided in report section, to improve non-complying items and reduce exposure.</p>	<p>Action should be implemented as soon as possible on the best practice basis. Survey to be repeated in 24 months or sooner if work changes are made.</p>

FACILITY ASPECTS	SUMMARY OF FINDINGS	RESPONSIBLE PERSON:	ACTION DATE:
	<ul style="list-style-type: none"> The ergonomic domains considered included: Physical ergonomics the human anatomy, anthropometry, physiology, biomechanics, Organisational Ergonomics, Organisation in terms of structures, policies and procedures, Cognitive ergonomics, Mental processes, activities of work related to perception, memory, reasoning and motor skills or responses. The Administrative, Airport offices, public areas, Emergency Services and sections all had generally modern furniture in various open plan and some smaller occupied offices. A few areas to improve were identified with damaged furniture, cable management and housekeeping. The sections of Airport, Apron, Workshops and Emergency services areas comprised large working areas on the airport site. Ergonomic exposures occur from activities performed by staff in the airport areas, or from the workshop and maintenance duties performed. Here too mobile equipment, and tasks need to be included into an ergonomic program to better manage employee activity and exposure. For the areas evaluated the risk ratings included Low, Medium, or High ratings and the program should focus on the latter two ergonomic control strategies in line with hierarchy of controls. The assessment sheet looking at manual handling work, did indicate that activities presented an increased load situation, where physical overload may be possible for normally resilient persons. Redesign of workplace is recommended. <p>This assessment must be repeated at least every 24 months or sooner if changes in the workplace is implemented in line with regulation 6 of the Ergonomics Regulations, 2018.</p>		
<p>Exposure to Hazardous Chemical Substances</p>	<p>From the results of the Hazardous Chemical Agent survey indicates that under the current conditions employees were not over exposed to inhalable dust or volatile organic compounds (VOCs) as tested during the survey.</p> <p>The employees were evaluated for exposure to inhalable and respirable dust. They worked on the Apron and outside assisting with cleaning, transport work and marshalling duties. The concentrations as measured during the survey less than</p>	<p>Review specific management actions and general recommendations as provided in report section, to improve non-complying items</p>	<p>Action should be implemented as soon as possible on the best practice basis. Survey to be</p>

FACILITY ASPECTS	SUMMARY OF FINDINGS	RESPONSIBLE PERSON:	ACTION DATE:
	<p>10% of the exposure limit for respirable and inhalable dust fractions. The dust in the work area was due to ambient dust and potential dust and particulates from airport/ airplane activity. Grass cutting was not performed during the survey but may be a contributing factor.</p> <p>Employee exposure was monitored for Marshals on the apron during air plane turn around and Emergency Team duties when on site. Jet engines produce volatile organic compounds (VOC) such as CO₂, NO_x, CO, SO_x and low molecular weight polycyclic aromatic hydrocarbons (PAH), and particulate matter (PM) with associated PAH, and metals. Incomplete combustion of fossil fuels, including kerosene, results in the formation of carbon-rich (> 60%), aromatic bi-products called char, and condensates, which are known as soot.* The personal exposures were below the respective OELs and Mixed Exposure Index.</p> <p>Corrective action is to be prioritised to ensure that high risk areas are targeted first to ensure a risk based Occupational Health and Safety Management approach is followed.</p>	<p>and reduce exposure.</p>	<p>repeated in 24 months or sooner if work changes are made.</p>
<p>Exposure to Noise</p>	<p>This noise survey was performed to reflect the results and findings of work place and personal noise exposure measurements for hearing conservation purposes and to obtain baseline noise levels of the work areas for noise zoning. In order to recommend appropriate Occupational Health Risk Management measures aimed at the prevention of occupational diseases and ill health effects, amongst employees and to evaluate these noise levels in accordance with SANS 10083 and to the occupational exposure limit as promulgated in the OHS Act (Act No 85 of 1993).</p> <p>Fire Station</p> <p>At the fire station noise sources were infrequent but high during an emergency. Sources identified in the Fire station area included vehicles and equipment used. High intermittent noise may include Emergency Response Alarm, Fire Truck revving/ acceleration.</p> <p>Further equipment known to be noisy tools included Chain Saw and circular saw that generates fluctuating noise when used. Exposure of 30 minutes in noise can equal to 88.2 dBA daily exposure.</p>	<p>Review specific management actions and general recommendations as provided in report section, to improve non-complying items and reduce exposure.</p>	<p>Action should be implemented as soon as possible on the best practice basis. Survey to be repeated in 24 months or sooner if work changes are made.</p>

FACILITY ASPECTS	SUMMARY OF FINDINGS	RESPONSIBLE PERSON:	ACTION DATE:
	<p>Aircraft and Apron Activity</p> <p>The noise sources comprised Aircrafts and Apron activity and vehicles used. The noise is Fluctuating noise type and intermittent by nature of plane landing and taking off. The longer periods in between planes, mean lower noise exposure for employees.</p> <p>Maintenance and repair teams too are exposed to high noise levels form equipment used, or areas worked in, their exposure is intermittent but present high risk due to exposures when repairing equipment, ie 30 min = 93.6 dBA. The teams must be closely monitored for correct work and adherence to all control strategies for hearing protection.</p> <p>Personal Noise exposures</p> <p>Fire team performed emergency services inspections and Apron marshalling supervision during turn around of the planes. General duties and more office based work had exposures of 70.9 to 79.9 dBA. This exposures were below the exposure limit of 85 dBA.</p> <p>Time spent on apron within a shift depends on the number of planes during a shift. The 8-hour equivalent noise exposures ranged from 87.7 to 95.5 dBA when working on the Apron and close to Airplane noise sources. This was above the exposure limit of 85 dBA.</p> <p>The Grass cutting was not performed during the survey, but will contribute to noise levels.</p> <p>A risk based approach must be followed with the recommendations looking at high risks first and then addressing other issues.</p>		
<p>Facilities and HBA Hygiene Assessment</p>	<p>From the findings of this assessment with regard to a Facilities Evaluation with regard to hygiene and the Hazardous Biological Agents (HBA) Regulations and to review the findings of surface swabs for hygiene and cleanliness. The following may be concluded:</p> <p>Further the results from the swab sampling, it may be concluded:</p> <p>Site makes use of contract cleaners in the various sections. Cleaning equipment and use of cleaning chemicals are applied.</p>	<p>Review specific management actions and general recommendations as provided in report section, to improve non-complying items</p>	<p>Action should be implemented as soon as possible on the best practice basis. Survey to be repeated in</p>

FACILITY ASPECTS	SUMMARY OF FINDINGS	RESPONSIBLE PERSON:	ACTION DATE:
	<p>Of the 20 swabs only 30% compliance was measured with hygiene standards. This indicates that in most areas of the airport an improvement in cleaning and disinfection of areas are required. Refer to Specific Management Interventions.</p> <p>From the drinking water sampling the following may be concluded:</p> <p>From the drinking water sample collected from kitchen tap in Apron Office the samples had no growth and complied with excellent water quality. Maintain water infrastructure on site.</p> <p>Safe drinking-water is required for all usual domestic purposes, including drinking, food preparation and personal hygiene.</p>	<p>and reduce exposure.</p>	<p>24 months or sooner if work changes are made.</p>

1. Ventilation section (#)

1.1 Objectives

The objective of this report is to provide practical guidance in the workplace with a view:

- To reflect the results and findings of the indoor air quality in the workplace.
- To recommend appropriate Occupational Health Risk Management measures aimed at the prevention of occupational diseases and ill health effects, amongst employees.
- All stressors surveyed outside the scope of SANAS accreditation is marked with a [#] on the stressor title page and table of contents.

1.2 Legislative and Standard Overview

The legislation governing Occupational Health compels corporate entities to institute processes to mitigate not only the risk posed to employees but the potential risk to the corporate entity itself. At the same time, occupational health inspection surveys form an essential platform for improving the health of the organisation and the individuals within it.

Occupational health and safety regulations

The Occupational Health and Safety Act aims to provide for the health and safety of persons at work and for the health and safety of persons in connection with the activities of persons at work.

The Environmental Regulations for Workplaces, Section 5(1)(b) & (c) - the TWA concentration of carbon dioxide taken over an 8-hour period may not exceed 0.5% by volume of air. Whereas, the carbon dioxide content at any time may not exceed 3 % by volume of air.

Table 2 of the Regulations for Hazardous Chemical Substances prescribes a TWA of 5000 ppm and a STEL value of 15 000 ppm for carbon dioxide. The Table prescribes a TWA 50 ppm and a STEL value of 300 ppm for carbon monoxide.

SANS 10400-O: 2011 Code of Practice for the Application of the National Building Code:

The following is an extraction of SANS 10400-O: 2011: (numbering in accordance with SANS 10400 for reference purposes)

Natural Ventilation:

Where, for the purposes of natural ventilation, a room is provided with an opening or openings –

- a) the position of such opening or openings in relation to each other and to internal doors to such room shall be such as to enable such room to be ventilated, and
- b) the arrangement and sizes of such openings in a garage shall be such that the quantity of noxious fumes or gases in such garage does not exceed a safe limit.

Every such opening shall be either –

- a) an opening or door in an external wall, or
- b) an openable glazed window in an external wall or in a suitable position in the roof, or
- c) an opening in the ceiling or at the top of an internal wall, connected directly to a vertical ventilating flue.

The total area of an opening, a door or an openable glazed window that complies with the above-mentioned requirements shall be not less than 5% of the floor area of the room, or;

- a) 0,1 m² in respect of category 1 buildings that have an occupancy class of E4, F2, H3, H4 or H5, and;
- b) 0,2 m² in respect of other buildings, whichever is the greater.

Artificial Ventilation:

Table 2 recommends the supply rate of outside air based on certain occupancies (e.g. offices, kitchens, ablutions).

International standards and guidelines:

To keep up-to-date with the latest developments and research in the field of Occupational Hygiene the measurements have been compared with international standards and guidelines provided by ACGIH (American Conference of Governmental Industrial Hygienists), ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) and other applicable ventilation standards which are provided in the Table below.

TABLE 1.2.1 –STATUTORY REQUIREMENTS AND RECOMMENDED STANDARDS
THE FOLLOWING STATUTORY REQUIREMENTS AND RECOMMENDED STANDARDS WERE USED
FOR THE GENERAL VENTILATION AND INDOOR AIR QUALITY SURVEY

Means of Fresh Outside Air Supply

The National Building Regulations, South African National Standard (SANS) 10400 -O: 2011	Any habitable room should be provided with uncontaminated, fresh outside air.
The National Building Regulations, South African National Standard (SANS) 10400 -O: 2011	Extraction ventilation should be provided in the Kitchen, Toilets, Ablution

Linear Air Velocity

Canadian Centre for Occupational Health and Safety (CCOHS)	Air velocities not more than 0.25 m/s do not create any significant distraction even in tasks requiring sustained attention.
W.P. Jones, <i>Air Conditioning Engineering</i>, 4th Edition National Building Regulations, SANS 10400 -O: 2011	Acceptable worker comfort: ≥ 0.1 m/s to < 0.5 m/s
Grandjean 1988, <i>Ergonomics, Fitting the Task to the Man</i>	For naturally ventilated spaces: ≤ 0.5 m/s

Carbon Dioxide

ASHRAE Standard 62.1 of 2010, <i>Ventilation for Acceptable Air Quality</i>	< 700 ppm above the outdoor CO ₂ level
Environmental Regulations for Workplaces, OHSAct (85 of 1993)	8-hr TWA OEL: < 5 000 ppm Short term OEL: < 30 000 ppm

Carbon Monoxide

The National Ambient Air Quality Standards of the United States of America (NAAQS)	8-hr TWA: < 9 ppm Short term: < 35 ppm
Regulations for Hazardous Chemical Agents, OHSAct (85 of 1993)	8-hr TWA OEL: < 50 ppm

Relative Humidity

Grandjean 1988, Ergonomics, <i>Fitting the Task to the Man</i>

<i>Summer: 40 % to 70 %</i> <i>Winter: 30 % to 70 %</i>
--

Dry Bulb Temperature

Comfort range for sedentary activity adapted from ISO 7730.
--

Offices:

<i>Summer: 22 °C to 27 °C</i> <i>Winter: 19 °C to 25 °C</i>
--

ASHRAE Standard 55 of 2010, <i>Thermal Environmental Conditions for Human Occupancy</i>
--

Industrial Environments:

<i>Summer: 23 °C to 26 °C</i> <i>Winter: 20 °C to 23.5 °C</i>
--

1.3 Tools and Methodology

Indoor air Quality:

A calibrated TSI Calc, Model 7545 Indoor Air Quality Monitor (Serial no T75451814003, referenced as 003) was used to evaluate the ventilation in Office/Administrative Areas and Plant Sections (breathing air quality measurements for determining air “freshness”).

Air Velocity:

Air velocity was measured using an Air Velocity Meter Model TA410 (Serial no TA4101812006, referenced as 006) as prescribed by the manufacturer.

In addition to comparing the indoor air quality with the recommended comfort guidelines a comparison between the Indoor and Outdoor Air Quality was established. The measurements attained from this survey were compared to the Thermal Comfort and Indoor Air Quality Guidelines set by ASHRAE.

1.4 Results and Findings

In the following table are listed the findings of the survey performed. It includes relevant standards, findings and comments as may be applicable.

The ambient meteorological conditions on the day of inspection survey are reflected in Table 1.4.1. The results of the General Ventilation and Indoor Air Quality survey are indicated in Table 1.4.2.

Legend:	CO ₂ – Carbon dioxide
	CO – Carbon monoxide
	RH – Relative Humidity
	DBT – Dry bulb temperature

Measurements indicated in the Table was colour coded according to the following.

Conforming indoor air quality parameters

Nonconforming indoor air quality parameters

TABLE 1.4.1 – AMBIENT METEOROLOGICAL CONDITIONS ON THE DAY OF SURVEY

Date	Carbon dioxide CO ₂ (ppm)	Temperature DBT (°C)	Relative Humidity (%)	Carbon monoxide CO (ppm)	Linear Air Velocity (m/s)
28 September 2021	317	17.4	80.5	0.4	0.25-1.67
	316	18.0	78.3	0.1	0.15-1.51

- Ambient conditions were cloudy and rainy.

TABLE 1.4.2 – GENERAL VENTILATION AND INDOOR AIR QUALITY SURVEY PERFORMED FOR ACSA EAST LONDON IN EC, ON 28 SEPTEMBER 2021.

No	Area	Means of Fresh Air Supply / Ventilation System	Carbon dioxide CO ₂ (ppm)	Temperature DBT (°C)	Relative Humidity (%)	Carbon monoxide CO (ppm)	Linear Air Velocity (m/s)	Fresh Air Supply (Y/P/N)	Occupancy (%)
AREA: ACSA EHS BUILDING									
1	Emergency general office	Split level air conditioning for temperature control with windows. Local exhaust ventilation was off.	460	17.5	82.6	0.0	<0.1-0.1	P	50
			369	19.0	76.8	0.0	<0.1-0.1		50
2	Shift control office	Open windows in the rest room and safety control office.	395	18.4	79.8	0.0	<0.1-0.1	P	50
			355	18.0	78.1	0.0	<0.1-0.1		50
3	Rest room	The gymnasium uses 2 ceiling fans for temperature control and has no air conditioner.	399	18.1	77.8	0.0	<0.1-0.12	Y	50
			330	17.9	72.2	0.1	<0.1-0.12		50
4	1 st R1439 Safety control office	Windows that can open was closed at the time of the survey. Air movement depend on fan operation.	553	18.0	79.0	0.0	<0.1-0.1	Y	50
			727	17.7	83.4	0.0	<0.1-0.1		50
5	Gymnasium		328	18.1	75.5	0.0	<0.1-0.5	P	0
			333	18.6	75.3	0.0	<0.1-0.5		0

EVALUATION OF RESULTS AND FINDINGS

- General ventilation in the airport buildings partially complied with the requirements of the National Building Regulations, South African National Standard (SANS) 10400 -O: 2011, in that any habitable room should be provided with uncontaminated, fresh outside air. The offices occupied with closed windows did not comply with fresh air supply.
- The measurement of Carbon dioxide remained within the recommended standard of ASHRAE 62.1 of 2010, where ventilation for acceptable air quality remained less than 700 ppm, above the outdoor CO₂ level, in all occupied sections. Low occupancy contributed to lower levels.
- The temperatures evaluated were below the comfort range for sedentary activity adapted from ISO 7730. A Summer range of 22 °C to 27 °C, was applied, and was based on seasonal / ambient conditions. Cooler condition during the survey prevailed.
- The measurement of Relative Humidity was above the range for summer range of 40 % to 70 % due to ambient levels. The coastal areas have higher ambient humidity.
- The measurement of Carbon monoxide did not indicate a presence of the gas in the work areas above the National Ambient Air Quality Standards of the United States of America (NAAQS) or the Regulations for Hazardous Chemical Agents, OHSAct (85 of 1993) of 50 ppm OEL.
- Air velocities measured did not all comply with the recommended standards of W.P. Jones, Air Conditioning Engineering, 4th Edition National Building Regulations, SANS 10400 -O: 2011 for Acceptable worker comfort of ≥ 0.1 m/s. This was due to some air conditioning systems not used in the offices.
- Areas were partially supplied with fresh air ventilation and occupancy was controlled to maintain safe distances for work environment. Higher occupancy may elevate the Carbon dioxide levels and cause indoor air quality problems.

No	Area	Means of Fresh Air Supply / Ventilation System	Carbon dioxide CO ₂ (ppm)	Temperature DBT (°C)	Relative Humidity (%)	Carbon monoxide CO (ppm)	Linear Air Velocity (m/s)	Fresh Air Supply (Y/P/N)	Occupancy (%)
AREA: MAINTENANCE OFFICE									
6	Office MC 24	Temperature regulation via split level air conditioner and open windows.	348	19.3	72.9	0.0	<0.1-0.2	Y	50
			340	17.9	68.5	0.2	<0.1-0.2		50
7	Electrical maintenance workshop	Workshop has natural ventilation and open windows.	319	19.0	73.7	0.2	<0.1-0.1	Y	0
			327	19.1	74.0	0.0	<0.1-0.1		0

EVALUATION OF RESULTS AND FINDINGS

- General ventilation in the airport buildings partially complied with the requirements of the National Building Regulations, South African National Standard (SANS) 10400 -O: 2011, in that any habitable room should be provided with uncontaminated, fresh outside air.
- The measurement of Carbon dioxide remained within the recommended standard of ASHRAE 62.1 of 2010, where ventilation for acceptable air quality remained less than 700 ppm, above the outdoor CO₂ level, in all occupied sections. Low occupancy contributed to lower levels.
- The temperatures evaluated were below the comfort range for sedentary activity adapted from ISO 7730. A Summer range of 22 °C to 27 °C, was applied, and was based on seasonal / ambient conditions. Cool conditions prevailed during the survey.
- The measurement of Relative Humidity was mostly above the range for summer range of 40 % to 70 % due to ambient levels.
- The measurement of Carbon monoxide did not indicate a presence of the gas in the work areas above the National Ambient Air Quality Standards of the United States of America (NAAQS) or the Regulations for Hazardous Chemical Agents, OHSAct (85 of 1993) of 50 ppm OEL.
- Air velocities measured did not all comply with the recommended standards of W.P. Jones, Air Conditioning Engineering, 4th Edition National Building Regulations, SANS 10400 -O: 2011 for Acceptable worker comfort of ≥ 0.1 m/s. This was due to some air conditioning systems not used in the offices, closed windows.
- Areas were partially supplied with fresh air ventilation and occupancy was controlled to maintain safe distances for work environment. Higher occupancy may elevate the Carbon dioxide levels and cause indoor air quality problems.

No	Area	Means of Fresh Air Supply / Ventilation System	Carbon dioxide CO ₂ (ppm)	Temperature DBT (°C)	Relative Humidity (%)	Carbon monoxide CO (ppm)	Linear Air Velocity (m/s)	Fresh Air Supply (Y/P/N)	Occupancy (%)
AREA: AIRPORT AIRSIDE AREAS									
8	Arrivals	Chiller air conditioner system for temperature control in the areas.	333	19.0	76.0	0.1	<0.1-0.1	P	0/100
			359	19.8	70.2	0.2	<0.1-0.1		0/100
9	Airport land side stop area	Natural ventilation and Fresh air via opening doors.	331	19.1	74.8	0.0	<0.1-0.1	P	50
			332	18.2	78.8	0.0	<0.1-0.1		50
10	Check in side	Natural ventilation and Fresh air via opening doors.	324	18.9	74.4	0.0	<0.1-0.1	P	50
			338	18.6	75.9	0.0	<0.1-0.1		50
11	Departure area	Natural ventilation and Fresh air via opening doors.	382	20.9	68.6	0.0	<0.1-0.1	P	50
			362	21.0	59.7	0.0	<0.1-0.1		50

EVALUATION OF RESULTS AND FINDINGS

- General ventilation in the airport buildings partially complied with the requirements of the National Building Regulations, South African National Standard (SANS) 10400 -O: 2011, in that any habitable room should be provided with uncontaminated, fresh outside air.
- The measurement of Carbon dioxide remained within the recommended standard of ASHRAE 62.1 of 2010, where ventilation for acceptable air quality remained less than 700 ppm, above the outdoor CO₂ level, in all occupied sections. Intermittent occupancy contributed to lower levels.
- The temperatures evaluated were below the comfort range for sedentary activity adapted from ISO 7730. A Summer range of 22 °C to 27 °C, was applied, and was based on seasonal / ambient conditions.
- The measurement of Relative Humidity was partially within the range for summer range of 40 % to 70 % due to ambient levels.
- The measurement of Carbon monoxide did not indicate a presence of the gas in the work areas above the National Ambient Air Quality Standards of the United States of America (NAAQS) or the Regulations for Hazardous Chemical Agents, OHSAct (85 of 1993) of 50 ppm OEL.
- Air velocities measured did not all comply with the recommended standards of W.P. Jones, Air Conditioning Engineering, 4th Edition National Building Regulations, SANS 10400 -O: 2011 for Acceptable worker comfort of ≥ 0.1 m/s. This was due to some air conditioning systems not creating a draft.
- Areas were partially supplied with fresh air ventilation and occupancy was controlled to maintain safe distances for work environment. Higher occupancy may elevate the Carbon dioxide levels and cause indoor air quality problems, ie arrivals and departure lounges.

Legend: Conforming parameters Nonconforming parameters Fresh air Supply = Y, yes, P, partial, N, No

No	Area	Means of Fresh Air Supply / Ventilation System	Carbon dioxide CO ₂ (ppm)	Temperature DBT (°C)	Relative Humidity (%)	Carbon monoxide CO (ppm)	Linear Air Velocity (m/s)	Fresh Air Supply (Y/P/N)	Occupancy (%)
AREA: AIRPORT OFFICES									
12	East permit office	Split Level air conditioners for temperature control in office with openable windows. The first floor offices air conditioners were off. Windows closed because of runway areas.	473	21.1	69.8	0.0	<0.1-0.1	P	50
			552	21.8	66.5	0.0	<0.1-0.1		50
13	First floor offices		602	20.9	68.0	0.2	<0.1-0.1	P	50
			685	21.3	68.9	0.0	<0.1-0.1		50

EVALUATION OF RESULTS AND FINDINGS

- General ventilation in the airport buildings partially complied with the requirements of the National Building Regulations, South African National Standard (SANS) 10400 -O: 2011, in that any habitable room should be provided with uncontaminated, fresh outside air. The offices had limited fresh air provision due to closed design.
- The measurement of Carbon dioxide remained within the recommended standard of ASHRAE 62.1 of 2010, where ventilation for acceptable air quality remained less than 700 ppm, above the outdoor CO₂ level, in all occupied sections. Low occupancy contributed to lower levels.
- The temperatures evaluated were below the comfort range for sedentary activity adapted from ISO 7730. A Summer range of 22 °C to 27 °C, was applied, and was based on seasonal / ambient conditions. Cool ambient conditions prevailed.
- The measurement of Relative Humidity was within the range for summer range of 40 % to 70 % due to ambient levels.
- The measurement of Carbon monoxide did not indicate a presence of the gas in the work areas above the National Ambient Air Quality Standards of the United States of America (NAAQS) or the Regulations for Hazardous Chemical Agents, OHSAct (85 of 1993) of 50 ppm OEL.
- Air velocities measured did not all comply with the recommended standards of W.P. Jones, Air Conditioning Engineering, 4th Edition National Building Regulations, SANS 10400 -O: 2011 for Acceptable worker comfort of ≥ 0.1 m/s. This was due to some air conditioning systems not used in the offices.
- Areas were partially supplied with fresh air ventilation and occupancy was controlled to maintain safe distances for work environment. Higher occupancy may elevate the Carbon dioxide levels and cause indoor air quality problems.

No	Area	Means of Fresh Air Supply / Ventilation System	Carbon dioxide CO ₂ (ppm)	Temperature DBT (°C)	Relative Humidity (%)	Carbon monoxide CO (ppm)	Linear Air Velocity (m/s)	Fresh Air Supply (Y/P/N)	Occupancy (%)
AREA: AIRPORT LANDSIDE AREA									
14	Rental office	Central air conditioner and chiller units for temperature control in offices. Natural ventilation via doors.	367	18.0	79.3	0.0	<0.1-0.1	Y	50
			261	18.7	77.2	0.0	<0.1-0.1		50
15	Main gate, SPC checkpoint	Natural ventilation via windows and no air conditioners at the main gate area.	417	17.0	88.6	0.0	<0.1-0.1	Y	100
			423	17.5	86.1	0.0	<0.1-0.1		100

EVALUATION OF RESULTS AND FINDINGS

- General ventilation in the airport buildings partially complied with the requirements of the National Building Regulations, South African National Standard (SANS) 10400 -O: 2011, in that any habitable room should be provided with uncontaminated, fresh outside air.
- The measurement of Carbon dioxide remained within the recommended standard of ASHRAE 62.1 of 2010, where ventilation for acceptable air quality remained less than 700 ppm, above the outdoor CO₂ level, in all occupied sections. Intermittent occupancy contributed to lower levels.
- The temperatures evaluated were below the comfort range for sedentary activity adapted from ISO 7730. A Summer range of 22 °C to 27 °C, was applied, and was based on seasonal / ambient conditions. Cool ambient conditions prevailed during the survey.
- The measurement of Relative Humidity was above the range for summer range of 40 % to 70 % due to ambient levels. Coastal areas have elevated humidity.
- The measurement of Carbon monoxide did not indicate a presence of the gas in the work areas above the National Ambient Air Quality Standards of the United States of America (NAAQS) or the Regulations for Hazardous Chemical Agents, OHSAct (85 of 1993) of 50 ppm OEL.
- Air velocities measured did not all comply with the recommended standards of W.P. Jones, Air Conditioning Engineering, 4th Edition National Building Regulations, SANS 10400 -O: 2011 for Acceptable worker comfort of ≥ 0.1 m/s. This was due to closed areas with limited throughflow.
- Areas were partially supplied with fresh air ventilation and occupancy was controlled to maintain safe distances for work environment. Higher occupancy may elevate the Carbon dioxide levels and cause indoor air quality problems.

1.5 Actions to be taken

- 1.5.1** Regular planned maintenance (1-3 monthly) need to be carried out on ventilation systems and air conditioners to ensure the efficiency of filters in removing airborne particulates. Good ventilation in rooms help to reduce an infection risk. It is therefore important to keep the number of droplets as low as possible, especially in busy airport terminals, and to continuously replace as much used indoor air as possible with outdoor air. Only a properly operated and regularly maintained HVAC (Heating, Ventilation and Air Conditioning) system can do this effectively.
- 1.5.2** Due to legal requirements and to the ageing and normal wear and tear of machinery, IAQ and Ventilation surveys must be done on a 2-year cycle (minimum). Areas where alterations have been affected, changes made to processes or machinery and new areas constructed must be measured whenever such an action has been completed.
- 1.5.3** Training in the hazards associated with the process as well as the importance of personal hygiene needs to be presented to the employees.
- 1.5.4** It is recommended that an Occupational Hygiene Survey on Hazardous Microbiological Agents be conducted at regular intervals to assess employee exposure to bacteria and other microbiological agents to which they might be exposed to.

1.6 Conclusion*

From the Ventilation Survey at the site the following may be concluded:

- General ventilation in the airport buildings partially complied with the requirements of the National Building Regulations, South African National Standard (SANS) 10400 -O: 2011, in that any habitable room should be provided with uncontaminated, fresh outside air.
- The measurement of Carbon dioxide remained within the recommended standard of ASHRAE 62.1 of 2010, where ventilation for acceptable air quality remained less than 700 ppm, above the outdoor CO₂ level, in all occupied sections. Intermittent occupancy contributed to lower levels.
- The temperatures evaluated were below the comfort range for sedentary activity adapted from ISO 7730. A Summer range of 22 °C to 27 °C, was applied, and was based on seasonal / ambient conditions.
- The measurement of Relative Humidity was partially within the range for summer range of 40 % to 70 % due to ambient levels.
- The measurement of Carbon monoxide did not indicate a presence of the gas in the work areas above the National Ambient Air Quality Standards of the United States of America (NAAQS) or the Regulations for Hazardous Chemical Agents, OHSAct (85 of 1993) of 50 ppm OEL.
- Air velocities measured did not all comply with the recommended standards of W.P. Jones, Air Conditioning Engineering, 4th Edition National Building Regulations, SANS 10400 -O: 2011 for Acceptable worker comfort of ≥ 0.1 m/s. This was due to some air conditioning systems not creating a draft.
- Areas were partially supplied with fresh air ventilation and occupancy was controlled to maintain safe distances for work environment. Higher occupancy may elevate the Carbon dioxide levels and cause indoor air quality problems, ie arrivals and departure lounges.

When the ventilation inside a building is insufficient, pollutants, viruses and allergens cannot be moved and extracted outside. Among other things, they ensure a sufficient exchange of used air with fresh air as well as efficient filtering. In turn, they provide high air quality and thus a healthy indoor climate in the building for employees and public.

Corrective action is to be prioritised to ensure that high risk areas are targeted first to ensure a risk based Occupational Health and Safety Management approach is followed.

References

- ASHRAE. ANSI/ASHRAE Standard-55-2010: Thermal environmental conditions for human occupancy, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, 2004.
- ASHRAE. ANSI/ASHRAE Standard-62.1-2010: Ventilation for acceptable indoor air quality, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, 2004.
- CCOHS: Canadian Centre for Occupational Health and Safety: Indoor Air Quality, 2011.
- SANS 10400 part O – National Building Regulations and Building Standards.
- South African Occupational Health and Safety Act, No. 85 of 1993 - Environmental Regulations for Workplaces (1987).

2 Illumination section (#)

2.1 Objectives

The objective of this report is to provide practical guidance in the workplace with a view:

- The purpose of this report is to establish if the illumination complies with the requirements of the Environmental Regulations for Workplaces, OHS Act (No 85 of 1993).
- To recommend appropriate Occupational Health Risk Management measures aimed at the prevention of occupational diseases and ill health effects, amongst employees.
- All stressors surveyed outside the scope of SANAS accreditation is marked with a [#] on the stressor title page and table of contents.

2.2 Legislative and Standard Overview

The legislation governing Occupational Health compels corporate entities to institute processes to mitigate not only the risk posed to employees but the potential risk to the corporate entity itself. At the same time, occupational health inspection surveys form an essential platform for improving the health of the organisation and the individuals within it.

Occupational health and safety regulations

The Occupational Health and Safety Act aims to provide for the health and safety of persons at work and for the health and safety of persons in connection with the activities of persons at work.

Regulation 3 of the Environmental Regulations for Workplaces, OHSAct (No 85 of 1993).

Illumination at the workplace was evaluated against the illuminance values specified in the Schedule, *Minimum Average Values of Maintained Illuminance*, of Regulation 3 of the Environmental Regulations for Workplaces, OHSAct (No 85 of 1993). The requirements regarding illumination are threefold and employers must ensure the following:

- Sufficient quantity of illumination, i.e. workplaces should be lighted in accordance with the levels specified in the said regulations.
- Good quality illumination, i.e. uniform distribution of light, reduction of glare, elimination of stroboscopic effects on rotating machinery and maintenance of lamps.
- Emergency illumination must be provided where persons habitually work at night.

The **Schedule** to the Environmental Regulations for Workplaces refers to the **Minimum Average Values of Maintained Illuminance** and is measured on the working plane unless otherwise stated.

TABLE 2.2.1 – MINIMUM ILLUMINATION STANDARD FOR THE VARIOUS WORKPLACES

AREA DESCRIPTION	OHS ACT MINIMUM STANDARD (lux)
General Offices and Boardrooms	300
General Kitchens	150
General Ablutions Facilities	100 (f)
Stairs	100 (f)
General work areas	100
Passages and Corridors	75 (f)
Fine painting, spaying and finishing	300
Medium bench and machine work, ordinary automatic machines, rough grinding	200

2.3 Tools and Methodology

Instrument

The measurements taken are representative of the prevailing conditions on the days of the survey. A calibrated, colour and cosine corrected Goldilux GAL-2L Lux Meter (11123/1934) was used to determine the illumination levels. The illuminance meter was also calibrated before and after each set of readings, and the results recorded. The Lux meter is annually calibrated to a national standard.

Method

The recommended standards and/or abridged methods as prescribed in the SANS Code of Practice 10114 – 1 were used to measure the average artificial illumination in the workplace. However, work activities and areas assessed were carefully observed / considered when deciding on the actual measuring points.

Readings were taken at floor level where applicable, as well as at sight level at the different workstations on the working plane and are indicated in the results table. Emphasis was however on areas continuously occupied by employees.

Readings were taken carefully to ensure that no shadows were cast onto the photoelectric cell of the instrument. Average readings for each area were determined. The lux reading, together with any relevant details about the lighting point or fused bulbs etc. were recorded and are included and discussed in the result tables.

2.4 Results and Findings

In the following table are listed the findings of the survey performed. It includes relevant standards, findings and comments as may be applicable.

The results of the illumination survey and the management interventions are reflected in Table 2.4.1.

All the results given in the Tables are average illumination values (Illuminance in Lux) measured at specific working areas.

An average value representing $\geq 100\%$ of the minimum standard is indicated as:

ADEQUATE ILLUMINATION

An average value representing $< 100\%$ of the minimum standard is indicated as a:

PRIORITY DEVIATION

TABLE 2.4.1 – DAY AND ARTIFICIAL (NIGHT) ILLUMINATION SURVEY PERFORMED FOR ACSA EAST LONDON IN EC, ON 27 SEPTEMBER 2021

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
CAR RENTAL BUILDING						
1	General area	825-1095	-	100	Area illuminated by LED lamps and windows and down lights.	Maintain and clean lamps.
2	Facilities Gents		-		Area illuminated by LED lamps,	Maintain and clean lamps.
	- Toilet	291		100f		
	- Urinal	241		100f		
3	Facilities ladies		-		Area illuminated by LED lamps,	Maintain and clean lamps.
	- Toilet	266		100f		
	- Basin	239		100f		
4	Ticket office	713-810		300	Area illuminated by LED lamps and windows	Maintain and clean lamps.
5	CCTV Office (CC02-CC04, CC05)		-		Area illuminated by LED lamps.	Maintain and clean lamps.
	- General	948		300		
6	CCTV Desk	918	-	300		
	- Computer	799		500		
	- Open office	1042		300		
7	CC07 Server	L	-	500	Room locked	Maintain and clean lamps.
8	Office CC08 open plan		-		Incorrect lamp placement.	Relocate desk or lamps to provide better illumination.
	- Desk	390-748		300		
	- Computer	464-504		500		
9	Archive	1028	-	300	Area illuminated by LED lamps.	Maintain and clean lamps.
10	Office CC11		-		Area illuminated by LED lamps and windows	Maintain and clean lamps.
	- Desk	1011		300		
	- Computer	1125		500		

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
11	Office CC09 - Counter - Pay counter	868-1033 644	-	200 200	Area illuminated by LED lamps and windows	Maintain and clean lamps.
AIRPORT AREAS						
1	Departures Facilities Ladies - Toilet - Basin - Disabled toilet	275-330 99-562 281	-	100f 100 100f	Area Illuminated by LED lamps. Lamp defective at basin.	Replace defective lamp to improve illumination levels.
2	Facilities Gentlemen - Toilet - Basin - Urinal	266-274 386-421 209-221	-	100f 100 100f	Area Illuminated by LED lamps and windows.	Maintain and clean lamps.
3	Cleaners' offices - 074 - 073 - 075 - 077 store	1013 958 1004 42	-	300 300 300 300	Area Illuminated by LED lamps Wall lamp depreciated	Replace depreciated lamp.
4	Old clinic	L	-	300	Room locked	Maintain and clean lamps.
5	Stairs to 1 st floor	104-620	-	100	Area Illuminated by LED lamps and natural light	Maintain and clean lamps.
6	1 st level Facilities Gentlemen - Toilet - Urinal - Basin Ladies - Toilet - Basin	190-255 601 326 385-471 773	-	100f 100 100f 100f 100	Area Illuminated by LED lamps	Maintain and clean lamps.

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
7	Permit Office (198) - General Reception - 194 Corridor	605-807 142	-	100 75	Area Illuminated by LED lamps	Maintain and clean lamps.
8	Permit office (188) - Desk - Computer - 187 Document store	699-1003 539-578 1056	-	300 500 100	Area Illuminated by LED lamps.	Maintain and clean lamps.
9	Office 186 - Desk - Computer	841-991 464-721	-	300 500	Area Illuminated by LED lamps Poor output from down lights	Maintain and clean lamps. Replace lamps as per schedule.
10	Kitchen	192-525	-	150	Room illuminated buy LED lamps.	Maintain and clean lamps.
11	Board room 191	881-1625	-	300	Area Illuminated by LED lamps and windows	Maintain and clean lamps.
12	Office 193 - Desk - Computer	1096-1106 1036-1107	-	300 500	Area Illuminated by LED lamps and windows	Maintain and clean lamps.
13	Office 195 - Desk - Computer	841 731	-	300 500	Area illuminated by LED lamps.	Maintain and clean lamps.
14	Office 184 & 185	L	-	300	Rooms locked.	Maintain and clean lamps.
15	Office 182 (Clinic)	857-1257	-	300	Area Illuminated by LED lamps and windows with blinds	Maintain and clean lamps.
16	Kitchen 181	181-1101	-	150	Area Illuminated by LED lamps and windows	Maintain and clean lamps.
17	East wing training / boardroom 180	783-1125	-	300	Area Illuminated by LED lamps and windows	Maintain and clean lamps.
18	Security rest room 185	565-916	-	300	Area Illuminated by LED lamps and windows with blinds	Maintain and clean lamps.

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
19	Office 189 - Desk - Computer	424-507 1013-1212	-	300 500	Area illuminated by LED lamps.	Maintain and clean lamps.
20	Office 190	L	-	300	Room locked	Maintain and clean lamps.
DEPARTURES						
21	Ground departures - Check in que in	342-857	-	100	Area Illuminated by LED lamps	Maintain and clean lamps.
22	Security check point - Pre-X-ray - Post X-ray	563-680 89-291	-	300 300	Area Illuminated by LED lamps Lamps defective and depreciated.	Replace defective/ depreciated lamps to improve illumination.
23	079 Back to airport - Office 080	785	-	300	Area Illuminated by LED lamps	Maintain and clean lamps.
24	Facilities - Toilet - Basin	197-265 504-714	-	100f 100	Area Illuminated by LED lamps and LED downlights.	Maintain and clean lamps.
25	Baby room 082	257	-	100	Area illuminated by LED lamps.	Maintain and clean lamps.
26	Facilities gentlemen - Toilet - Urinal - Basin	288-314 224-298 465-651	-	100f 100f 100	Area Illuminated by LED downlights	Maintain and clean lamps.
STAKEHOLDER LOUNGE (085)						
1	Corridor	168-203	-	75	Area Illuminated by LED lamps	Maintain and clean lamps.
2	Seating area Fly SAF Air Priority Lounge	550-717	-	100	Area illuminated by LED lamps and natural light via windows.	Maintain and clean lamps.
3	Seating – waiting lounge	64-197	-	100	Some lamps may be depreciated and provide lower output.	Maintain and clean lamps. Replace depreciated lamps.
4	Checkout counters - Counters Front - Counters Back	513-699 414-569	-	200 200	Area illuminated by LED lamps and natural light via windows.	Maintain and clean lamps.

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
5	Office 081				Area Illuminated by two different lamps and appear depreciated.	Replace defective/ depreciated lamps to improve illumination.
	- Security	998	-	300		
	- Desk	205		300		
	- Computer	173		500		
6	Banking corridor	164-958	-	75	Area Illuminated by LED lamps, uneven distribution of lamps	Provide adequate lamps with even distribution.
VIP LOUNGE						
1	Lounge	278-304	-	100	Illuminated by combination of lamps, LED, and natural light.	Maintain and clean lamps.
2	Facilities ladies				Area illuminated by LED lamps.	Maintain and clean lamps.
	- Toilet	399	-	100f		
	- Basin	319		100		
3	Facilities gentlemen				Area illuminated by LED lamps.	Maintain and clean lamps.
	- Toilet	219	-	100f		
	- Urinal	402		100f		
	- Basin	726		100		
CHECK IN AREA						
4	Check in aisles / public area	284-574	-	100	Area illuminated by LED lamps.	Maintain and clean lamps.
4	Ticket counter				Area illuminated by LED lamps.	Maintain and clean lamps.
	- Counter	361-761	-	200		
	- Computer	424-665		500		
	- Conveyor	717-861		100		
5	Firearm desk				Area illuminated by LED lamps. Room locked	Maintain and clean lamps.
	- 039	1053	-	300		
	- 040	L		300		
6	Staff entrance				Area illuminated by LED lamps.	Maintain and clean lamps.
	- General area	439-799	-	100		
	- Desk	899		300		
	- Exit	1754		100		

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
7	Office 042 Stakeholder - Arrivals seating area	421-653	-	100	Area illuminated by LED lamps.	Maintain and clean lamps.
8	Baggage and Arrival - General - Conveyor 1 - Conveyor 2 - Facilities	427-599 318-599 369-589 L	-	100 100 100 100	Area Illuminated by LED lamps and natural light via windows.	Maintain and clean lamps.
9	Facilities outside arrivals Gentlemen: - Toilet - Urinal - Basin - Toilet 007 Ladies: - Toilet - Basin	301-518 389-413 267-312 Occ 265-386 544-726	-	100f 100f 100 100f 100f 100	Area Illuminated by LED lamps. Lamp defective at basin. Occupied	Replace defective/ depreciated lamps to improve illumination.
10	Arrivals main corridor	144-720	-	75	Area Illuminated by LED lamps and stakeholder areas.	Maintain and clean lamps.
11	Information desk	518-577	-	300	Area illuminated by LED lamps.	Maintain and clean lamps.
12	Client Manager office 050 - Desk - Computer	645-697 608-645	-	300 500	Area Illuminated by twin LED lamps	Maintain and clean lamps.
13	Stakeholder offices 051/052/053/054	Occ		300	Occupied by Stakeholders.	Maintain and clean lamps.
14	Stairs to Airport (ACSA) admin offices	130-356	-	100	Area Illuminated by LED lamps	Maintain and clean lamps.
ADMIN OFFICES						
1	Reception (general)	303-505		100	Area illuminated by LED lamps.	Maintain and clean lamps.

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
2	Office 144 - Desk - Computer	635 607	-	300 500	Area illuminated by LED lamps.	Maintain and clean lamps.
3	Office 143 - Desk - Computer	1220 1446	-	300 500	Area illuminated by LED lamps.	Maintain and clean lamps.
4	Office 142	L	-	300	Room locked	Maintain and clean lamps.
5	Office 141 - Desk - Computer - Round table	759 1139 1548	-	300 500 300	Area illuminated by LED lamps.	Maintain and clean lamps.
6	Office 140	L	-	300	Room locked	Maintain and clean lamps.
7	Printer area	554-654	-	500	Area illuminated by LED lamps.	Maintain and clean lamps.
8	Boardroom 138	879-1124	-	300	Area illuminated by LED lamps.	Maintain and clean lamps.
9	Manager office	L	-	300	Room locked	Maintain and clean lamps.
10	Server room 132	L	-	500	Room locked	Maintain and clean lamps.
11	Room 129	L	-	300	Room locked	Maintain and clean lamps.
12	Exit 126	227	-	100	Area illuminated by LED lamps.	Maintain and clean lamps.
13	Human Resource Office 123	L	-	300	Room locked	Maintain and clean lamps.
14	Accounting office 118 - Desk - Computer	819 914	-	300 500	Area illuminated by LED lamps.	Maintain and clean lamps.
15	Store 119	1081	-	100	Area illuminated by LED lamps.	Maintain and clean lamps.
16	Office 120 - Desk - Computer	1702 1710	-	300 500	Area illuminated by LED lamps.	Maintain and clean lamps.
17	Weather office 115	L	-	300	Room locked	Maintain and clean lamps.

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
18	Facilities gentlemen 116				Area Illuminated by LED lamps and windows.	Maintain and clean lamps.
	- Toilet	443	-	100f		
	- Urinals	516		100f		
	- Basin	409		100		
19	Facilities ladies 117				Area Illuminated by LED lamps and windows.	Maintain and clean lamps.
	- Toilet	1288	-	100f		
	- Basin	478		100		
20	Office 121 ATNS room	L	-	300	Room locked	Maintain and clean lamps.
21	Office 124	L	-	300	Room locked	Maintain and clean lamps.
22	Tea kitchen	1138	-	150	Area illuminated by LED lamps.	Maintain and clean lamps.
23	Telkom room 130	L	-	300	Room locked	Maintain and clean lamps.
24	Stairs to upper levels	138-201	-	100	Area Illuminated by LED lamps	Maintain and clean lamps.
APRON AREAS (Lamps at 80%)						
25	Apron Work Areas	-			Illuminated by Pilon mast LED lamps. Set to 80% for the readings.	Maintain lamps to ensure efficient illumination of the work areas.
	- Apron Area		33-90	20		
	- Between Masts		34-87	20		
	- Apron length of plane		24-78	20		
	- Walkway		11-24	20		
Arrivals / Departures						
1	Terminal	-	65-88	20	Illuminated by various LED lamps at the airport.	Maintain lamps to ensure efficient illumination of the work areas.
	- Walkway		109-118	20		
2	Park area	-	5-47	10	Area Illuminated by LED mast lamps. Shadows cast by vehicles and structures.	Maintain lamps and review positioning to improve overall illumination.
3	Drop off zone	-	16-821	20	Area Illuminated by LED tubes, affected by spacing	
FIRE STATION GROUND FLOOR						
1	General vehicle area		-		Area Illuminated by sodium vapor lamps and sunlight.	Maintain and clean lamps.
	- General area Front	2421-3331		100		
	- General area Rear	332-609		100		

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
2	General office		-		Area Illuminated by LED lamps and windows.	Maintain and clean lamps.
	- General	760		300		
	- Desk	570		300		
	- Computer	565		500		
3	Shift control office		-		Area illuminated by LED lamps.	Maintain and clean lamps.
	- General	926		300		
	- Desk	713-924		300		
	- Computer	807-925		500		
4	Stairs to 1 st floor	95-243	-	100	Light from corridor and windows.	Improve light at stairs via higher output lamp.
5	Facilities ladies		-		Area Illuminated by LED lamps and windows	Maintain and clean lamps.
	- Lockers	145		100		
	- Shower	710		100		
	- Toilet	580		100f		
	- Basin	298		100		
6	Facilities gentlemen		-		Area Illuminated by LED lamps and windows	Maintain and clean lamps.
	- Lockers	482		100		
	- Shower	507		100		
	- Toilet	494		100f		
	- Urinal	345		100f		
	- Basin	241		100		
7	Archive F505	230-309	-	100	Area Illuminated by twin tubes	Maintain and clean lamps.
8	Kitchen	497	-	150	Area Illuminated by LED lamps and windows	Maintain and clean lamps.
9	Rest room	240	-	100	Area Illuminated by LED lamps and windows	Maintain and clean lamps.
10	Workshop	208-279	-	200	Area Illuminated by LED lamps and windows and 2 LD	Maintain and clean lamps.
11	Stairs to 1 st floor	599-634	-	100	Area Illuminated by bay lights	Maintain and clean lamps.
12	Gym	209-245	-	100	Area Illuminated by twin tubes and windows	Maintain and clean lamps.

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
13	Foam store	148	-	100	Area Illuminated by tube lamp	Maintain and clean lamps.
14	Stairs to 1 st	37-60	-	100	Area Illuminated by wall lamp, poor output from lamp.	Provide higher output lamp or ceiling lamp.
15	Tyre store	192	-	100	Area illuminated by LED lamps.	Maintain and clean lamps.
16	Uniform and stationary store	L	-	100	Room locked	Maintain and clean lamps.
17	General store	154	-	100	Area Illuminated by single tube lamp	Maintain and clean lamps.
18	Air compressor room (BA room)	164	-	200	Area Illuminated by single tube lamp. Low out put.	Replace with LED lamp for improved illumination.
19	Garage	194-265	-	100	Area Illuminated by twin tube lamp door and windows.	Maintain and clean lamps.
FIRE STATION 1st FLOOR						
20	SHEQ Office - Desk - Computer	889 730	-	300 500	Area Illuminated by single tube lamp and window.	Maintain and clean lamps.
21	Apron office - Desk - Computer	817 889	-	300 500	Area Illuminated by tubes and windows.	Maintain and clean lamps.
22	Training office - Desk - Computer	1012 873	-	300 500	Area Illuminated by tube lamps	Maintain and clean lamps.
23	Corridor	291	-	75	Area illuminated by LED lamps.	Maintain and clean lamps.
24	Training room	173-615	-	300	Area Illuminated by twin tube lamps and windows. Lamp defective.	Replace defective/ depreciated lamps to improve illumination.
25	Safety compliance offices - Desks - Computers	637-654 595-673	-	300 500	Area Illuminated by tube lamps	Maintain and clean lamps.
26	Facilities ladies - Toilet - Basin	408 382	-	100f 100	Area Illuminated by single lamp and window	Maintain and clean lamps.

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
27	Facilities gentlemen		-		Area illuminated by LED lamps.	Maintain and clean lamps.
	- Toilet	286		100f		
	- Basin	328		100		
28	Corridor	87-164	-	75	Sodium vapor lamp and fluorescent tube lamps provide illumination.	Maintain and clean lamps.
29	Boardroom 1 / office		-		Area Illuminated by tube lamp and windows. Lamp defective inside.	Maintain and clean lamps.
	- Desk	434		300		
	- Computer	603		500		
30	Bird and wildlife office		-		Area Illuminated by tube lamps.	Maintain and clean lamps.
	- Desk	1095		300		
	- Computer	1112		500		
31	Boardroom 2	467-634	-	300	Area Illuminated by tube lamp and window	Maintain and clean lamps.
32	Controller fire services		-		Area Illuminated by tube lamp and window	Maintain and clean lamps.
	- Desk	518		300		
	- Computer	510		500		
33	Store 1	176	-	100	Area Illuminated by tube lamps with aluminum luminaire.	Maintain and clean lamps.
	- Store 2	178		100		
WORKSHOP COMPLEX						
1	Rest room general	560-574	-	100	Area Illuminated by tube lamps and windows	Maintain and clean lamps.
2	Surface office		-		Area Illuminated by tube lamps	Maintain and clean lamps.
	- Desk	489		300		
	- Computer	502		500		
3	Electrical office		-		Area Illuminated by tube lamps	Maintain and clean lamps.
	- Desk	468-279		300		
	- Computer	485		500		
4	Boardroom	898	-	300	Area illuminated by LED lamps.	Maintain and clean lamps.

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
5	Rooms		-		Area illuminated by LED lamps.	Maintain and clean lamps.
	- MC 06	L		100		
	- MC 05 store	767		100		
	- MC04	868		100		
	- MC10	686		100		
- MC 10 2 nd room	652		100			
6	Corridor to electrical store	449-653	-	75	Area illuminated by LED lamps.	Maintain and clean lamps.
7	Electrical store'		-		Area illuminated by LED lamps.	Maintain and clean lamps.
	- General	472-651		100		
	- Shelves	291-541		100		
8	Facilities gentlemen (MC21)		-		Area Illuminated by tube lamps and windows.	Maintain and clean lamps.
	- Urinal	129		100f		
	- Basin	237		100		
	- Toilet	207		100f		
	- Shower	128		100f		
9	Corridor	61-679	-	75	Area Illuminated by tube lamps. Lamp defective	Replace defective/ depreciated lamps to improve illumination.
10	Transformer room MC38	963-989	-	200	Area Illuminated by tube lamps	Maintain and clean lamps.
11	Generator room 12	179-215	-	200	Depreciated lamp in room provides poor illumination.	Replace defective/ depreciated lamps to improve illumination.
12	AGL workshop	350-906	-	200	Area Illuminated by fluorescent lamp, LED and windows	Maintain and clean lamps.
13	AGL store	115	-	100	Area Illuminated by twin fluorescent lamps	Maintain and clean lamps.
14	Substation MV	314-407	-	100	Area Illuminated by fluorescent lamp and compact fluorescent lamp	Maintain and clean lamps.
15	LV Substation MC 37	1457-1510	-	100	Area Illuminated by LED lamps	Maintain and clean lamps.
16	UPS Room	570	-	100	Area illuminated by LED lamps.	Maintain and clean lamps.

No	Area / Location	Average Illumination Levels (lux)		OHS Act requirement (lux)	Comments / Reasons for Non-Compliance	Management Interventions
		Day	Artificial			
17	MC 26 Corridor	566-602	-	75	Area illuminated by LED lamps.	Maintain and clean lamps.
18	Kitchen	654	-		Area Illuminated by LED lamps	
19	Electrical workshop - Workshop - Benches	859-1010 1404-1535	-	200 200	Area illuminated by LED lamps.	Maintain and clean lamps.
20	MC 28 Store	685	-	100	Area Illuminated by LED lamps and windows.	Maintain and clean lamps.
21	Surface maintenance - Workshop - Benches	590-686 513-522	-	200 200	Area Illuminated by LED lamps and windows.	Maintain and clean lamps.
FOOD COURT						
1	Facilities gentlemen - Toilet - Urinal - Basin	238-292 242 496-602	-	100f 100f 100	Area Illuminated by LED downlights	Maintain and clean lamps.
2	Facilities ladies - Toilet - Basin	276 388	-	100f 100	Area illuminated by LED lamps.	Maintain and clean lamps.
3	Corridor to stakeholder offices	117-649	-	75	Area illuminated by LED lamps.	Maintain and clean lamps.
4	Food court common area and stairs	323-570	-	100	Area Illuminated by LED tubes	Maintain and clean lamps.
5	Viewing Deck	273-730	-	100	Area Illuminated by overcast LED lamps	Maintain and clean lamps.
6	Food court lift car	489	-	100	Area Illuminated by LED downlights	Maintain and clean lamps.

Legend:

- f – Measured at Floor level
- v – Measured on a Vertical plane
- CWS – Computer Workstation
- CP – Control panel

2.5 Actions to be taken

2.5.1 The advantages of good lighting include the following:

- Improved production from better efficiency, less waste and time loss due to errors.
- Improved safety. Approximately 80% of all information is obtained visually; therefore any improvement to facilitate vision will help to detect the causes of accidents, (i.e. unsafe working conditions) and thereby preventing them from occurring.
- Improved quality and accuracy. Adequate illumination enhances the efficiency of inspection.
- Savings in human energy. Improved illumination reduces physical and mental strain, i.e. less fatigue, eyestrain and headaches, resulting in better utilisation of people, materials and space.
- Better working conditions. Well-lit areas promote better housekeeping and improved morale.
- Cost saving: reduce high electricity bills by conserving energy through more effective illumination, thus no unnecessary and dysfunctional lights installed. Lower costs regarding maintenance, electricity consumption, consumables/spares etc.

2.5.2 Legal requirements:

Regulation 3 of the Environmental Regulations for Workplaces, framed under the OHS Act (Act 85 of 1993) clearly states that:

- Every employer shall cause every workplace in his undertaking to be lighted in accordance with the illuminance values specified in the Act (Schedule of minimum illuminance values).
- Every employer shall ensure that:
 - glare in any workplace is reduced to a level that does not impair vision;
 - lighting on rotating machinery is such that the hazard of stroboscopic effect is eliminated; and
 - luminaires and lamps are kept clean and, when defective, are replaced or repaired forthwith.

2.5.3 Regarding emergency evacuation of indoor workplaces without natural lighting or in which persons habitually work at night, every employer shall in such workplaces, provide emergency lighting which are such that when activated, an illuminance of not less than 0, 3 Lux is obtained at floor level to enable workers to evacuate such workplaces and 20 Lux where machinery should be shut down or where dangerous materials are present or dangerous processes are carried out.

In view of the above-mentioned legal requirements, the following **general recommendations and comments** may prove useful:

- Implement an effective lighting maintenance programme to ensure effective lamp replacement. All employees should be urged to promptly report defective lamps. The regular supplier of lamps can be consulted on how long the effective lifespan of the different lamps are, to ensure that they are replaced even before they become ineffective.
- Lights should be placed and distributed in such a way that:
- Easy access for cleaning purposes exists. No dark spots or contrast problems occur, i.e. ensure uniform illuminance distribution.

2.6 Conclusion*

- From the findings of this report the site was evaluated to establish if the illumination complies with the requirements of the Environmental Regulations for Workplaces, OHS Act (No 85 of 1993).
- The ACSA site had modern lights in most areas that provided illumination in line the legal requirements. A few areas may be improved due to depreciated or defective lamps.
- Corrective action is to be prioritised to ensure that high risk areas are targeted first to ensure a risk based Occupational Health and Safety Management approach is followed.

References

- SANS 10114-1:– Standard for Interior Lighting, Part 1: Artificial Lighting of Interiors.
- SANS 10114-2:– Interior Lighting - Part 2: Emergency lighting.
- SANS 10389-1:– Exterior lighting Part 1: Artificial lighting of exterior areas for work and safety.
- South African Occupational Health and Safety Act, No. 85 of 1993 - Environmental Regulations for Workplaces (1987).

3 Ergonomic section (#)

3.1 Objectives

The objective of this report is to provide practical guidance in the workplace with a view:

- To assist management in identifying any potential ergonomic hazards to the workforce by means of a walkthrough;
- To recommend corrective or control measures necessary so that timely and appropriate intervention strategies could be implemented; and
- To assist in complying with the requirements of the OH&S Standards and other national, statutory OH standards and requirements.
- All stressors surveyed outside the scope of SANAS accreditation is marked with a [#] on the stressor title page and table of contents.

3.2 Legislative and Standard Overview

The legislation governing Occupational Health compels corporate entities to institute processes to mitigate not only the risk posed to employees but the potential risk to the corporate entity itself. At the same time, occupational health inspection surveys form an essential platform for improving the health of the organisation and the individuals within it.

The assessment will be performed in line with the Ergonomics Regulations, 2018, under the Occupational Health and Safety Act, no 85 of 1993, and its requirements to provide an "ergonomic risk assessment". This means a programme, process or investigation to identify, analyse, evaluate and prioritise any risk from exposure to ergonomic risks associated with the workplace.

Occupational health and safety regulations, Regulation 8

The Occupational Health and Safety Act aims to provide for the health and safety of persons at work and for the health and safety of persons in connection with the activities of persons at work.

To further the management of ergonomics related issues, numerous standards are available internationally. Some of these include :

- ISO 15534 is one of several ergonomics standards for the safety of machinery.

- EN 614-1 ([2] in the Bibliography) describes the principles designers should adopt in order to take account of ergonomic factors. This part of ISO 15534 describes how these principles should be applied to the design of access openings.
- This part of ISO 15534 is based on EN 547-2:1996 that was prepared as a harmonized standard conforming with the Machinery Directive and associated European Free Trade Association (EFTA) regulations.
- A common characteristic of organizations successful in improving workplace ergonomics is that ergonomics is managed as a process -- one that systematically identifies and effectively reduces the level of employee exposure to the risk factors known to cause musculoskeletal disorders (MSDs).

Typically, ergonomics improvement processes are based on a continuous improvement model such as the quality (ISO 9001), environmental (ISO 14001) or safety (OHSAS 18001 or ANSI Z10) models. Each of these management system models provides a common and familiar set of steps for managing environmental and safety risk, including MSD risks. The ISO 45001 Safety Management System standard provides a new, and soon to be common, model that can be used as an effective system for managing ergonomics.

3.3 Tools and Methodology

The Baseline Ergonomics Assessment was performed in general by means of a walk-through assessment which consists of inspections of workstations/premises, identification of all occupational health stresses which could occur, and assessment of these stresses according to the potential degree of hazard and risk to the exposed workers.

For each group, a list of tasks will be compiled, based on the most frequently performed tasks. These tasks will then be assessed for Ergonomic Risk, regarding the most appropriate category of risk (Upper Body, Limbs, Lower Back, Whole Body, etc.). However, considering the potential magnitude/ multitude of potential tasks to assess, strenuous Manual Handling tasks, for each group will receive precedence.

The most applicable "tool" will be selected, for each respective task, depending on circumstances and the type of and potential severity of the Ergonomics Hazard in question.

It is then possible to obtain an initial indication as to whether or not a certain job or operation entails physical load dangerous to health, and in this way an initial documentary basis for remedial action. This involved familiarity with the work environment, work procedures, and existing control measures.

Ergonomic Assessment Tool Use	
Type of Task	Ergonomic Assessment Tool
Lifting / Lowering	WISHA Lifting Calculator or NIOSH Lifting Equation
Upper Body Posture	Rapid Upper Limb Assessment (RULA)
Entire Body Posture	Rapid Entire Body Assessment (REBA)
Pushing / Pulling / Carrying	Snook Tables
Vibration	Hand-Arm Vibration Calculator

A mathematical of risk (expected loss) found in the literature is Eq. 2: Risk (consequence/unit of time or space) = Frequency (event/unit of time or space) × Magnitude (consequence/event) (2) Risk in construction projects can adversely influence the achievement of the project objectives. The probability of happening and severity are two factors which determine the rate of risk of a hazard.

Ranking hazards regarding risk importance requires a matrix of risk, which is a two-dimensional matrix and uses the likelihood and consequences for assessing the risk on the two axes of a matrix. The risk matrix is a table including several categories of frequency or likelihood for its rows (or columns) and several categories of severity of consequences for its columns (or rows). Risk matrices of 3×3, 5×5 or even 7×7 cell matrix can be used for risk assessment. A 5×5 risk matrix is used in this study indicating that there are five levels of frequency and severity (See Table 1). Table 1 Risk matrix of Ergonomic Risk Factors (ERFs).

Table 1 Risk matrix of Ergonomic Risk Factors (ERFs)

Scale	Severity of consequence	Scale	Likelihood/Frequency	Severity of consequence					
1	Not severe at all	1	Never		1	2	3	4	5
2	Slightly severe	2	Seldom	×	2	4	6	8	10
3	Moderately severe	3	Often		3	6	9	12	15
4	Severe	4	Almost		4	8	12	16	20
5	Extremely severe	5	Always		5	10	15	20	25

= Likelihood / Frequency

The level of risk is given in the box where the row (probability or likelihood) and column (consequences or severity) meet. In order to manage hazards effectively, the relative risk value can be used to prioritize necessary actions (See Table 2).

Table 2 Risk priority according to ranges of risk level-DOSH, Malaysia

Risk	Level	Action
1 - 4	Low (L)	Acceptable; further reduction may not be necessary.
5 - 12	Medium (M)	Requires a planned approach to control the hazard and applies temporary measure if required.
15 - 25	High (H)	Requires immediate action to control the hazard as detailed in the hierarchy of control.

Ref Risk Assessment of Ergonomic Risk Factors at Construction Sites Zahra Jabbarani Torghabehe, Seyyed Shahab Hosseinianb Aziruddin Ressangc.

3.4 Findings

In the following table are listed the findings of the assessment performed. It includes relevant standards, findings and recommendations as may be applicable.

Ergonomics domains:

The below assessment mainly focusses on physical ergonomics due to time on site and the walk through format.

Physical ergonomics

- the human anatomy, anthropometry, physiology, biomechanics

Organisational Ergonomics



- Organisation in terms of structures, policies and procedures

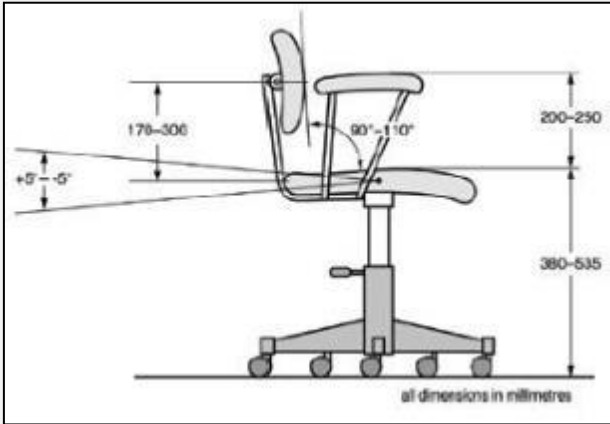
Cognitive ergonomics

- Mental processes, activities of work related to perception, memory, reasoning and motor skills or responses

TABLE 3.4.1 – BASELINE ERGONOMICS ASSESSMENT FOR ADMINISTRATIVE EMPLOYEES WELL BEING PERFORMED FOR ACSA EAST LONDON IN EC, ON 27 September 2021.

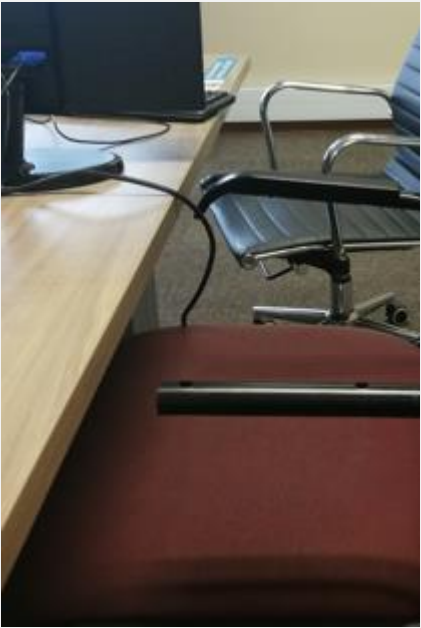
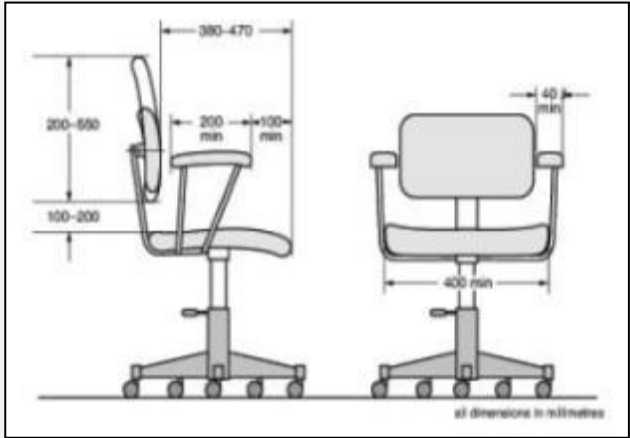
ADMINISTRATIVE AREAS


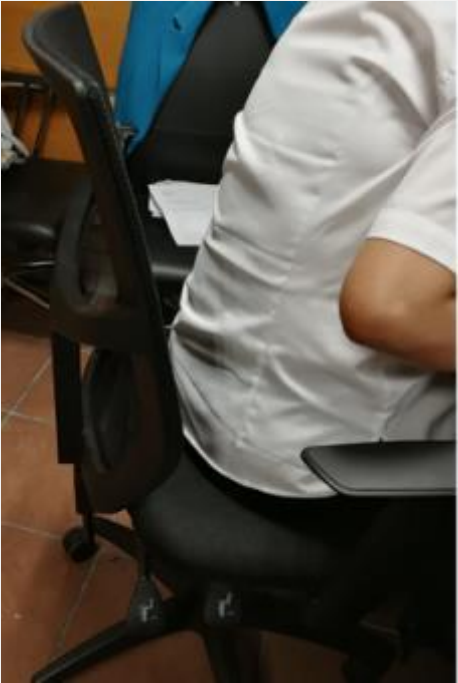
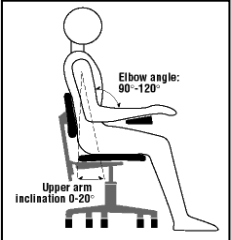
ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p>	<p>Medium - Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Seat:</p> <ul style="list-style-type: none"> The seat needs to adjust in height to meet the needs of a range of users. The size of the seat needs to be wide enough to seat big people comfortably and deep enough to support the legs of tall people, but not so deep that shorter workers cannot use the backrest. The surface of the seat should not be hollowed or deeply shaped, as this makes it harder to get up or change position. The front edge of the seat needs to be rounded-over and well-padded to prevent it digging into the thighs.
<p>Poor seating design:</p> <p>Most chairs were found to be ergonomically sound. Chairs should provide comfortable and adequate support to prevent staying in one position too long, which may cause lower back pain and muscle fatigue.</p>		
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Modern adjustable chairs provided at work stations. Provides adequate support and adjustability.</p> </div> <div style="text-align: center;">  <p>Non-adjustable chairs are not suitable for extended seating or computer work as they do not provide sufficient support.</p> </div> </div>		





Recommended adjustability

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<div data-bbox="512 229 875 611" data-label="Image"></div> <p data-bbox="226 651 1149 708">Non-adjustable four leg chairs are adequate for short durations of sitting and resting. However, these chairs do not provide support for long durations of sitting.</p> <div data-bbox="215 775 589 1283" data-label="Image"></div> <div data-bbox="701 775 1077 1283" data-label="Image"></div> <p data-bbox="226 1321 1149 1378">Damaged chairs do not provide adequate support and may cause injury if used. These should be reviewed and repaired or replaced.</p>		<p data-bbox="1379 268 1485 290">Backrest:</p> <ul data-bbox="1379 304 2078 651" style="list-style-type: none">• The backrest needs to give firm support to the lower and the middle part of the back.• Height adjustment is recommended unless the backrest is high and provides complete support for the back.• There should be adequate space for the buttocks; this is usually achieved by leaving a gap between the seat and the backrest.• Backrests which tilt with the worker, or whose angle can be adjusted, can improve comfort by providing support for the back in a range of working positions.

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p>		
<p>Armrests</p>  <p>Armrests depend on use of the chair. These can restrict arm movement, although for many jobs they can provide comfort. Too big armrests interfere with comfortable sitting and getting close to the table.</p>	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Armrests:</p> <ul style="list-style-type: none"> For most jobs armrests are not essential. They can restrict arm movement, although for many jobs they can provide comfort. They should be set back from the front edge of the seat, or be adjustable to allow the chair to be drawn up close to the work surface. The height of armrests should not be too low or too high, may cause discomfort. <p>Recommended chair dimensions</p>  <p><i>all dimensions in millimetres</i></p>

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p> <p>Employees adopted incorrect sitting habits:</p> <p>Incorrect sitting habits may lead to ergonomic problems such as muscle fatigue and injury to intervertebral disks.</p> <p>Feet that are not well-supported may lead to poor circulation of blood in the legs, varicose veins, an increase in pressure on the back of the knees and thighs, as well as back strain due to the adoption of an unnatural sitting posture.</p> <div style="display: flex; justify-content: space-around;">   </div> <p>Example of Employee adopt incorrect sitting habit. No contact with backrest will cause strain to back and neck. Placement of legs may cause varicose veins and reduce blood circulation to legs.</p>	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Bad sitting posture:</p> <ul style="list-style-type: none"> Do not perch on the front of your seat. Avoid leaning forward, especially when tired from sitting for long periods. Sit back in your chair. If you need to re-arrange your workstation to be comfortable then do so. Likewise do not slouch incorrectly. This results in the loss of the inward curve in the lumbar spine, causing excessive strain on the lumbar discs. Instead move your chair closer to the desk and maintain contact between your back and the seat back. This will be best achieved by a suitably adjusted chair. The lumbar region of the chair will help you maintain the inward curve of the lumbar spine. In the short term, a lumbar support cushion may be helpful, though this will be less effective as a long-term solution. <p>Armrests:</p> <ul style="list-style-type: none"> You should have your elbows close to your sides. If your chair armrests are forcing you to reach outwards to support the elbows, avoid using them or remove them altogether. Armrests may force employees to adapt incorrect sitting posture. Also do not forget to get up and move every 20 minutes or so. <div style="text-align: center;">  <p>Correct sitting posture</p> </div>

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p>		
<p>Incorrect layout of computer workstation:</p>  <p>Keyboard and mouse positioning: A keyboard and mouse too far away from user may cause awkward postures such as reaching with the arms, leaning forward with the torso and extreme elbow angles. Awkward postures may lead to musculoskeletal disorders of the elbows, shoulders, hands and wrists.</p>	<p>Low - Acceptable current control, further control may not be possible.</p>	<p>Correct layout of keyboard:</p> <ul style="list-style-type: none"> • The keyboard should be placed 60-70 mm from the front edge of the desk and parallel to the screen. The wrist should be straight with the elbow flexed at 90° and the forearms level with work height. • Over stretching the fingers to reach shift and function keys should be avoided. Computer breaks in between program operations are important i.e. resting the hands in the lap whilst the document saves. Touch typing skills and keyboard short cuts are advantageous as they cut down on keystrokes and mouse use. • A keyboard tray may be useful if the user has limited desk space or if the chair has armrests that interfere with adequate positioning. • Keyboards with small legs under the back of it may be provided and can be adjusted accordingly to suit the user's need or comfort.  <p>The computer monitor should be positioned directly in front of the user, so that the head, neck and torso face forward when viewing the screen.</p>

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<div data-bbox="405 229 967 719" data-label="Image"> </div> <p data-bbox="197 724 571 751">Positioning of computer monitor:</p> <p data-bbox="197 756 1176 850">When the user is working with the head and neck turned to the side for long periods of time, the risk of the task can load the neck muscles unevenly and increases the risk of fatigue and pain.</p> <div data-bbox="412 884 960 1233" data-label="Image"> </div> <p data-bbox="197 1251 436 1278">Inadequate legroom:</p> <p data-bbox="197 1283 1176 1377">Inadequate legroom was afforded below the work surface due to the desk legs. Employees may twist the lower part of the torso each time he/she performs typing tasks, thereby losing contact with the backrest.</p> <p data-bbox="197 1382 1093 1409">The unnatural sitting posture may cause unnecessary strain on the back and spine.</p>		<div data-bbox="1503 229 1935 735" data-label="Diagram"> <p>Workstation ergonomics: ideal set-up</p> <ul style="list-style-type: none"> Top of monitor at eye level or just below Monitor roughly arm's length away Minimal bend at wrists Document holder Back straight Elbows close to body Backrest supporting lower back Adjustable swivel chair Front of seat not pressing on back of knees Feet flat on ground or resting on footrest </div> <p data-bbox="1541 783 1906 810"><i>(Table continuous on next page)</i></p> <p data-bbox="1368 815 2078 879">Monitors should not be farther than 35 degrees to the left or right.</p> <div data-bbox="1397 898 2047 1201" data-label="Image"> </div> <p data-bbox="1541 1214 1906 1241">Examples of adjustable monitors</p> <p data-bbox="1368 1262 2078 1326">Legroom below a desk workstation should be at least 680 mm wide, 690 mm high and 600 mm deep.</p> <p data-bbox="1368 1342 2078 1469">The computer workstation should be moved to a part of the desk that allows adequate legroom below in order to ensure that the head, neck and torso of the occupant face forward when viewing the computer screen.</p>


ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p>	<p>Low - Acceptable current control, further control may not be possible.</p>	<ul style="list-style-type: none"> Work space design should be based on 2.25 m² space per person occupying an open plan space, as set out in Regulation (6) of the Environmental Regulations for Workplaces (1987). <p>Dimensions of adequate work space layouts.</p>
<p>Inadequate designed work space:</p>		
<p>The work space restricts employee movement which may lead to cramped occupancy and this may cause employee unrest/discomfort. Majority workspaces found to be of adequate size. Ongoing monitoring due to office changes and furniture relocation.</p>		

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
		<ul style="list-style-type: none"> • A well-designed work space allows the employee to occupy a comfortable space in the office environment. Office spaces should allow for easy movement, accommodating visitors where necessary, and storage. <p>In addition to the physical dimensions of the workspace and furniture, other features should also be considered in any design, reorganization or relocation. Some questions to ask are:</p> <ul style="list-style-type: none"> • Does the workspace provide acoustical privacy (for example, can people talk in privacy, according to the level of confidentiality required; do noises and conversations interfere with their concentration; do noises or conversations make it difficult to hear or understand speech if much of their work involves using the telephone?) • Are the walls permanent (i.e., fixed) or is the workspace in an open office environment? • Does the workspace provide visual privacy? • Can an employee personalize his or her individual work space? • Is there access to natural light or only artificial lighting? • Is the workplace layout designed to facilitate interpersonal contact? • Is there need for space for storage or equipment (e.g., immediate access to physical documents, or a second computer screen)?
<p>Section: Airport offices, Public areas, Fire station office</p>		




ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p> <p>Inadequate designed workstations:</p> <p>Poor design workstations may restrict employee movement which may lead to awkward stretching and twisting.</p> <div data-bbox="461 486 911 925" data-label="Image"> </div> <p>Poor designed workstations may potentially lead to unsafe bending and twisting.</p>	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Workstation design should be based on a careful assessment of all aspects of the job, and any special needs of the individual worker. Ensure that each task can be carried out safely, comfortably and as efficiently as possible.</p> <div data-bbox="1451 400 2004 724" data-label="Diagram"> </div> <p>Dimensions of and relationship between chair and work surface</p> <ul style="list-style-type: none"> • A well-designed workstation allows the employee to be seated at a comfortable height and position in relation to the work. Work and equipment that is used frequently needs to be placed within easy reach to prevent awkward stretching and twisting which could lead to back pain or injury. The height of the workstation and seat should ensure that hand work can normally be done at elbow level or below to prevent tiredness from constant raising of the forearm. • Work surface thickness should be the minimum necessary to provide adequate strength. A typical maximum is 30 mm. Surfaces thicker than this tend to restrict the number of people who can sit comfortably at the workstation because it does not provide sufficient clearance for the thighs while allowing the hands to be at around elbow height. The workstation also needs to be sufficiently sized to allow the work equipment to be used safely. For instance, there should be enough space to place equipment such as visual

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p> <p>Use of Footrests:</p> <p>Several employees are not provided with footrests.</p> <p>A footrest should be used if the employee's feet cannot be placed flat on the floor and when feet are not well supported.</p> <div data-bbox="376 683 1003 1254" data-label="Image"> </div> <p>Example of foot rest that can be used to alleviate lower leg pain for shorter employees.</p>	<p>High – Requires immediate action as listed in the hierarchy of controls.</p>	<p>display units at the appropriate distance, whilst still allowing room for using hands.</p> <ul style="list-style-type: none"> Any employee who cannot easily place their feet flat on the ground, when using the seat adjusted to the correct working height, needs a footrest. This should be large enough to allow for foot movement. Adjustable footrests of a selection of heights are preferred. Free-standing footrests should not be so light that they move accidentally. Employees should move feet frequently for circulation. The correct height of the footrest is the distance the feet are off the floor after adjusting the seat height. <p>A footrest should:</p> <ul style="list-style-type: none"> - have a non-slip surface large enough for both feet to rest comfortably (about 30 x 30 cm). - have an adjustable slope (10-20 degrees) to allow a comfortable ankle position when feet are resting on it. - be stable enough so it does not slide or move. <div data-bbox="1570 1010 1883 1302" data-label="Image"> </div> <p>Example of suitable footrest</p>


ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p> <p>Incorrect orientation of computer workstations:</p> <p>No depth of perception for the computer user because she/he faces a wall/window behind the computer monitor.</p> <p>Various working options</p>	<p>Low - Acceptable current control, further control may not be possible.</p>	<ul style="list-style-type: none"> • Maintain good posture when working at the keyboard. • Keep your feet supported on the floor or on a footrest when you work to reduce pressure on your lower back. • Avoid twisting or bending your trunk or neck. ... • Keep your shoulders relaxed with your elbows close to your sides. • The computer workstations should be orientated in such a way that the user is at right angles to walls. • The employee must not face a wall behind the computer monitor. • When the employee refers to source documents, he / she must face away from the wall.
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p> <p>No document holders provided for administration work:</p> <p>Placing the source documents flat on the desk, in front of the user or to the side, may require awkward head postures or frequent movements of the head and neck to look from the monitor to the source document. Awkward postures can lead to muscle fatigue and discomfort of the head, neck and shoulders.</p>	<p>Low - Acceptable current control, further control may not be possible.</p>	<ul style="list-style-type: none"> • Document holders should be provided where employees do a lot of typing from source documents. The appropriate placement of the document holder may reduce or eliminate risk factors such as awkward head and neck postures, fatigue, headaches, as well as eyestrain. • Careful consideration should be given to the appropriate choice of a document holder, to ensure that it matches the tasks and activities of the worker. • When the job task is flipping through multiple pages in a large file, a large holder with a lip or edge to support the

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
 <p data-bbox="479 533 898 560"><i>Document holder options for office use</i></p>		<p data-bbox="1429 236 2074 296">documents is more appropriate than a document holder that requires each page to be clipped.</p> <ul data-bbox="1379 309 2074 970" style="list-style-type: none"><li data-bbox="1379 309 2074 512">• If the job task is primarily data entry from a source document, the documents should be placed on the document holder at the appropriate height and distance from the eyes and situated directly in front of the torso in the primary visual field. In these instances, the monitor should be placed slightly off to one side.<li data-bbox="1379 525 2074 651">• If both the monitor and documents are viewed during the task, the documents should be positioned so both can be viewed in the primary visual zone with little or no head movement.<li data-bbox="1379 663 2074 831">• If a document stand is used alongside the monitor, it is a good practice to occasionally move the stand from one side of the monitor to the other. This incorporates the use of different muscle groups and builds in a recovery period for commonly overused muscle groups.<li data-bbox="1379 844 2074 970">• To accommodate variations in the legibility of source documents and the visual requirements of individual users, the document holder should be adjustable both in angle and distance.

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p>	<p>Medium - Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<ul style="list-style-type: none"> • Correct adjustment of workstations. Adequate working heights and computer stands will ensure ergonomic setup of computer work stations (see figure below). The laptop should be positioned at a viewing distance of 40 to 76 centimetres directly in front of the user — just as a desktop monitor should be. • An external keyboard and input device can be attached to the laptop and positioned so that the hands and wrists are straight with the elbows at one's sides. Hands should be at or slightly below elbow height. • A document holder can be positioned directly next to the monitor to hold documents while the user is working from them. <div data-bbox="1563 778 1928 1098" data-label="Image"> </div> <ul style="list-style-type: none"> • Elevated laptop positions
<p>Laptop setup on desk:</p> <p>Neck and shoulder strain where computers, and laptops are set up too low to use efficiently.</p> <div data-bbox="349 483 1028 992" data-label="Image"> </div> <div data-bbox="376 1010 1028 1361" data-label="List-Group"> <ul style="list-style-type: none"> • Elbows Above the desk, at 90-110 degrees • Shoulders Relaxed as opposed to hunched • Wrists In line with forearms • Hips, Knees, Anides At 90 degrees whilst seated • Feet Flat on the ground or footrest For prolonged standing, consider a mat • Head Upright with ears aligned with shoulders • Eyes Looking at the top third of the screen. Consider the use of a laptop riser with your laptop • Seat length Should be long enough to provide support beneath thighs • Backrest Angled at 90-110 degrees with adequate lumbar support in line with lower back • Keyboard and Mouse G and H of keyboard aligned with your nose. Mouse gripped loosely • Laptop Used with a riser, external keyboard and external mouse </div>		

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p>		
<p>Office and cable maintenance:</p> <p>Offices have numerous electrical machines. All of the machines require electrical cabling.</p>  <p>However, where these cables are not managed, they present a trip, fire or electrical shock hazard.</p>	<p>High – Requires immediate action as listed in the hierarchy of controls.</p>	<ul style="list-style-type: none"> • Work areas and walkways should be kept tidy. • Cabling required in offices should be run along walls or surfaces where no pedestrian traffic is required to cross. • Cables should be protected from impact or damage through proper installation.   <p>Cable organising</p>

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p>		
<p>Glare on computer monitor:</p> <p>Glare on computer monitor may result in eye strain, headache and difficulty in reading on display screen.</p> <div data-bbox="333 544 1039 1278" data-label="Image"> </div> <p>Direct glare is the result of high brightness from a light source in the field of vision. Whereas indirect glare is the result of light that is reflected in the eye. For example, light from the sun being reflected from a surface to a person field of view.</p>	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Glare is not always immediately apparent; its deleterious effects sometimes become evident only after long periods of sustained and exacting work.</p> <p>If windows blinds are available, the closing thereof will block any direct glare.</p> <p>Provide all windows with window blinds and ensure that it is in a working condition.</p> <p>Benefits of anti-glare filters:</p> <ul style="list-style-type: none"> • Helps reduce glare and mirror-like reflections, making screens easier to view in high-glare situations. • Easy to apply, remove and re-attach with no bubbles. • Compatible with most touch-screen displays. • Provides screen protection against scratches, dust and dirt and also hides fingerprints. • Lightweight, thin, frameless design. • Limited one-year warranty. <div data-bbox="1601 1023 1854 1273" data-label="Image"> </div> <p>Anti-glare filters</p>

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Airport offices, Public areas, Fire station office</p> <p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p> <p>General Housekeeping:</p> <p>Poor office housekeeping may affect work efficiency and productivity. Poor housekeeping can contribute to accidents by hiding hazards which cause injuries. If the sight of paper, debris, clutter and spills is accepted as normal, then other more serious health and safety hazards may be taken for granted. Good housekeeping is also a basic part of accident and fire prevention.</p>  <p>Housekeeping in some of the areas were not adequate with many items not stored and packed properly.</p>	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<ul style="list-style-type: none"> Housekeeping is not just cleanliness. It includes keeping work areas neat and orderly; maintaining halls and floors free of slip and trip hazards; and removing of waste materials (e.g., paper, cardboard) and other fire hazards from work areas. It also requires paying attention to important details such as the layout of the whole workplace, aisle marking, the adequacy of storage facilities, and maintenance. Effective housekeeping is an ongoing operation: it is not a hit-and-miss clean-up performed occasionally. Periodic "panic" clean-ups are costly and ineffective in reducing accidents. <p>Housekeeping Rules:</p> <ul style="list-style-type: none"> During the day, all immediate work areas and walkways should be kept tidy. Do not leave any items lying where people could trip over or bump into them. Keep isles and gangways clear of obstructions and never trail cables across gangways. All drawers and cupboards should be closed after use. Eating of meals should not be carried out at workstations but in designated areas such as rest areas and restaurant facilities. Building or equipment defects should be reported immediately to management. At the end of each shift, workstations should be left tidy. All files, personal belongings, etc. should be locked away in drawers and cupboards.

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
		<ul style="list-style-type: none"> Materials should not be stored outside of cupboards and under no circumstances should be stored under desks or on top of tall cupboard (above head height). Running in the workplace, playing games and practical jokes are not appropriate in the workplace. Potentially serious injuries could result from such conduct. Waste produce should be disposed of in the appropriate receptacles and extra care should be taken when disposing of sensitive company and personal information.
<p>Section: Airport offices, Public areas, Fire station office</p>	<p>Medium -</p>	<p>The goal of organizational ergonomics is the attainment of a fully harmonized work system that ensures employee job satisfaction and commitment. It also includes the study of technology's consequences on human relationships, processes, and institutions. Typical interventions are as follows:</p>
<p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p>	<p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<ul style="list-style-type: none"> Including workers in identifying and resolving ergonomic issues. This is also known as participatory ergonomics. Improving total system processes, such as manufacturing value streams and managerial processes. Successfully installing safety as an integral part of the organizational culture.
<p>Organizational ergonomics focuses on optimizing socio-technical systems and organizing structures, policies and processes in order to maximize efficiency, also sometimes known as macro-ergonomics. This domain addresses more subjective aspects of the workplace:</p> <ul style="list-style-type: none"> Communication Crew resources and management Work schedule design Teamwork Participatory design Cooperative work New work paradigms Quality management Virtual organizations Community ergonomics 		<p>Factors that tend to impede balance can be individual or organization-wide:</p> <ul style="list-style-type: none"> A worker lacks the skills or knowledge base to complete tasks effectively and efficiently. Employees disagree with management practices. The organization is harming the environment. Outside factors influence the work environment.





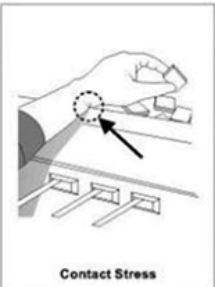




ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:	
<p>Section: Airport offices, Public areas, Fire station office</p>	<p>Medium - Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Aspect of every workstation must function to promote usability and clarity, which are critical to safety. The instrument displays are particularly important, and cognitive ergonomics dictates several modifications.</p> <ul style="list-style-type: none"> • Clear and legible displays and controls logically laid out in line with the operations or activity. • Appropriate lighting and glare reduction decreases the risk of reading errors. • Making controls consistent in every situation makes it easier for employees to react appropriately in an emergency. • A system for suppressing unimportant alarms if more important ones are sounding, allows employees to respond first to the most critical situations. 	
<p>Occupation: Staff performing administrative duties, 1 to 8 hours per day</p>			
<p>Cognitive ergonomics focuses on how well the use of a product matches the cognitive capabilities of users. It draws on knowledge of human perception, mental processing, and memory.</p> <p>Cognitive ergonomics is essentially ergonomics of mental processes. The focus is creating a balance between human cognitive abilities and limitations, and the machine, task, and environment. Thus cognitive ergonomics addresses issues like perception, reasoning, memory, and motor response, as they relate to interacting with a given system. The cognitive ergonomist analyses the work environment in the following domains:</p> <ul style="list-style-type: none"> • Mental workload • Skilled performance • Human-computer interaction • Human reliability • Work stress • Training 			

TABLE 3.4.2 – BASELINE ERGONOMICS ASSESSMENT FOR AIRPORT AND WORKSHOP EMPLOYEES WELL BEING PERFORMED FOR ACSA East London IN EC, ON 27 September 2021


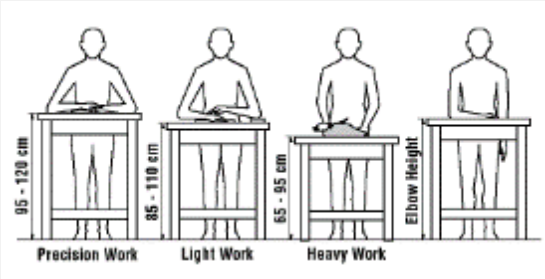
AIRPORT AND WORKSHOP AREAS


ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p> <p>Occupation: Technical and related staff, Day shift mainly</p> <p>General Housekeeping:</p> <p>Poor housekeeping may affect work efficiency and productivity. Poor housekeeping can contribute to accidents by hiding hazards which cause injuries. If the sight of paper, debris, clutter and spills is accepted as normal, then other more serious health and safety hazards may be taken for granted. Good housekeeping is also a basic part of accident and fire prevention.</p> <div data-bbox="421 874 1010 1321" data-label="Image"> </div> <p>Example of how poor housekeeping can be a cause of incidents, such as: tripping over loose objects on floors, stairs and platforms. being hit by falling objects. slipping on greasy, wet or dirty surfaces</p>	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Housekeeping is not just cleanliness. It includes keeping work areas neat and orderly; maintaining halls and floors free of slip and trip hazards; and removing of waste materials (e.g., paper, cardboard) and other fire hazards from work areas. It also requires paying attention to important details such as the layout of the whole workplace, aisle marking, the adequacy of storage facilities, and maintenance.</p> <p>Effective housekeeping is an ongoing operation: it is not a hit-and-miss clean-up performed occasionally. Periodic "panic" clean-ups are costly and ineffective in reducing accidents.</p> <p>Housekeeping Rules:</p> <ul style="list-style-type: none"> • During the day, all immediate work areas and walkways should be kept tidy. • Do not leave any items lying where people could trip over or bump into them. • Keep isles and gangways clear of obstructions and never trail cables across gangways. • All drawers and cupboards should be closed after use. • Eating of meals should not be carried out at workstations but in designated areas such as rest areas and restaurant facilities. • Building or equipment defects should be reported immediately to management.


ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
		<ul style="list-style-type: none"> At the end of each shift, workstations should be left tidy. All files, personal belongings, etc. should be locked away in drawers and cupboards. Materials should not be stored outside of cupboards and under no circumstances should be stored under desks or on top of tall cupboard (above head height). Running in the workplace, playing games and practical jokes are not appropriate in the workplace. Potentially serious injuries could result from such conduct. <p>Waste produce should be disposed of in the appropriate receptacles and extra care should be taken when disposing of sensitive company and personal information</p>
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p>	<p>Medium -</p>	<p>Manage repetitive handling:</p>
<p>Occupation: Technical and related staff, Day shift mainly</p>	<p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<ul style="list-style-type: none"> Plan ahead when beginning work that will require high-frequency and long-duration lifting. This way, the work can be organized in such a way so as to minimize the time workers spend holding loads. Adequate rest breaks can be planned in, as well as job rotation between employees. This includes both rotating tasks (employees trade off on differing tasks) and team work (two or more employees work together doing different parts of the same activity to reduce strain). Planning can also include the pre-assembly of work items to minimize the time spent handling them during the actual work.
<p>Repetitive packing, unpacking loading, splitting or repacking.</p> <p>Holding items for long periods, even if loads are light, increases the risk of back and shoulder injury since muscles can be starved of nutrients and waste products can build up. Repeatedly exerting, such as when pulling wire, can fatigue muscles by limiting recuperation times. Inadequate rest periods do not allow the body time to recover.</p> <p>Repetitive force - using force repeatedly over a period of time to move or support an object.</p>		


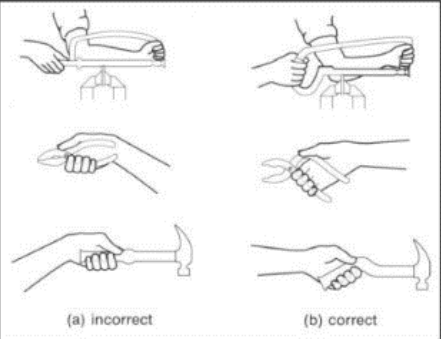
ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="text-align: center;"> Awkward Postures</div> <div style="text-align: center;"> Overhead Work</div> <div style="text-align: center;"> Twisting and Carrying Loads</div> <div style="text-align: center;"> Wrist Deviations</div> <div style="text-align: center;"> Contact Stress</div> <div style="text-align: center;"> Poor Shoulder/Wrist Position</div> <div style="text-align: center;"> Lifting Bulky Loads</div> <div style="text-align: center;"> Hand - Arm Vibration</div> <div style="text-align: center;"> Whole Body Vibration</div> </div> <p><i>Ref: EHS Today</i></p> <p>Examples of repetitive force include:</p> <ul style="list-style-type: none"> • lifting and stacking goods • gripping and handling loads • repetitively pressing components with the thumbs or other part of the hand to assemble an item or control button. 		<p>Consider implementing the following solutions to reduce the risk of injury:</p> <ul style="list-style-type: none"> • Introduce proper task rotation or job enlargement. • Introduce short and frequent work-rest cycles. • Introduce task-specific exercises. • Reduce the pace of the task or the pace of the machine or feeder. • If frequency is very high, provide mechanical aids or automate the task.

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p>	<p>Medium -</p>	<ul style="list-style-type: none"> • The worker suffers not only muscular strain but other discomforts also. Prolonged and frequent standing, without some relief by walking, causes blood to pool in the legs and feet. • When standing occurs continually over prolonged periods, it can result in inflammation of the veins. This inflammation may progress over time to chronic and painful varicose veins.
<p>Occupation: Technical and related staff, Day shift mainly</p>	<p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	
<p>Standing work</p> <p>Standing is a natural human posture and by itself poses no particular health hazard. However, working in a standing position on a regular basis can cause sore feet, swelling of the legs, varicose veins, general muscular fatigue, low back pain, stiffness in the neck and shoulders, and other health problems. These are common complaints among sales people, machine operators, assembly-line workers and others whose jobs require prolonged standing.</p> <div data-bbox="315 651 1115 1222" data-label="Image"> </div> <p>Ref: Grand Valley State University</p> <p>Keeping the body in an upright position requires considerable muscular effort. Standing effectively reduces the blood supply to the loaded muscles. Insufficient blood flow accelerates the onset of fatigue and causes pain in the muscles of the legs, back and neck (these are the muscles used to maintain an upright position).</p>	<p>POSTURAL ASSESSMENT</p> <div data-bbox="1447 632 2069 983" data-label="Image"> </div> <p>Ref https://www.ccohs.ca/oshanswers/ergonomics/standing/standing_basic.html</p> <p>Lifting from below the ankle to above shoulder height was observed, when bending to low trolleys and high shelves and should be avoided.</p>	


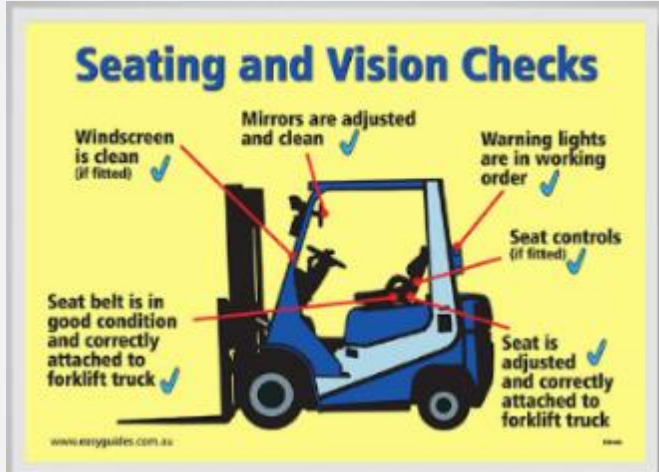
ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p> <p>Occupation: Technical and related staff, Day shift mainly</p> <p>Standing work at Tables:</p> <p>The worker suffers not only muscular strain but other discomforts also. Prolonged and frequent standing, without some relief by walking, causes blood to pool in the legs and feet. When standing occurs continually over prolonged periods, it can result in inflammation of the veins. This inflammation may progress over time to chronic and painful varicose veins.</p>  <p>Various height counters and loading scales provided for different baggaes. Conveyor and Roller table used for transport to back of airport.</p> <p>Table and work surface ranged 900-950 mm from the ground.</p>	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Working tables:</p> <ul style="list-style-type: none"> Working tables and benches should be adjustable. Being able to adjust the working height is particularly important to match the workstation to the worker's individual body size and to the worker's particular task. Adjustability ensures that the worker has an opportunity to carry out work in well-balanced body positions. If the workstation cannot be adjusted, platforms to raise the shorter worker or pedestals on top of workstations for the tall worker should be considered. <p>Work Organisation:</p> <ul style="list-style-type: none"> Organisation of the work space is another important aspect. There should be enough room to move around and to change body position. Providing built-in foot rails or portable footrests allows the worker to shift body weight from one leg to the other. Elbow supports for precision work help reduce tension in the upper arms and neck. Controls and tools should be positioned so the worker can reach them easily and without twisting or bending.  <p>Recommended working heights for different occupations, consideration for the activity, or box packing into and the size of items packed or worked on.</p>



ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p> <p>Occupation: Technical and related staff, Day shift mainly</p> <p>Musculo-skeletal disorders, ie from excessive force, bending or repetitive motions.</p> <p>The risk of MSD injury depends on work positions and postures, how often the task is performed, the level of required effort and how long the task lasts. Risk factors that may lead to the development of MSDs include:</p>  <p>Exerting excessive force. Examples include lifting heavy objects or people, pushing or pulling heavy loads, manually pouring materials, or maintaining control of equipment or tools.</p> <p>Performing the same or similar tasks repetitively. Performing the same motion or series of motions continually or frequently for an extended period of time.</p> <p>Working in awkward postures or being in the same posture for long periods of time. Using positions that place stress on the body, such as prolonged or repetitive reaching above shoulder</p>	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Follow these 10 ergonomic principles to help reduce injuries and improve productivity tasks in the workplace.</p> <ol style="list-style-type: none"> 1. Joints must be in a neutral position. In the neutral position the muscles and ligaments, which span the joints, are stretched to the least possible extent work close to body. 2. Keep work close to the body. If the work is too far from the body, the arms will be outstretched and the trunk bent over forwards bending forward. 3. Avoid bending forward. The further the trunk of the upper body is bent forward, the harder it is for the muscles and ligaments of the back to maintain the upper body in balance. 4. A twisted trunk strains the back. Twisted postures of the trunk cause undesirable stress to the spine. alternate posture. 5. Alternate posture as well as movements No posture or movement should be maintained for a long period of time. Prolonged postures and repetitive movements are tiring. 6. Avoid excessive reaches. It is necessary to limit the extent of forward and sideways reaches to avoid having to bend over or twist the trunk above shoulder level. 7. Avoid carrying out tasks above shoulder level. The hands and elbows should be well below shoulder level when carrying out a task weight load lifted. 8. Limit the weight of a load that is lifted.


ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>height, kneeling, squatting, leaning over a counter, using a knife with wrists bent, or twisting the torso while lifting.</p> <p>Localized pressure into the body part. Pressing the body or part of the body (such as the hand) against hard or sharp edges, or using the hand as a hammer.</p> <p>Ref https://www.osha.gov/SLTC/ergonomics/identifyprobs.html</p>		<p>Be guided on weight limits carrying one hand.</p> <p>9. Avoid carrying loads with one hand.</p> <p>When only one hand is used to carry a load, the body is subject to mechanical.</p> <p>10. Use mechanical aids</p> <p>Many lifting accessories are available to help lift and move loads</p>
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p>	<p>Medium -</p>	<p>Propper lifting practice:</p>
<p>Occupation: Technical and related staff, Day shift mainly</p>	<p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<ul style="list-style-type: none"> Lifting is performed daily during repair and maintenance activities. Employees must perform safe lifting and shared lifting of heavy objects where there are no mechanical means of lifting, ie hoist, crane or forklift. Employees must keep the load close to the body for as long as possible while lifting. Keep the heaviest side of the load next to the body. If a close approach to the load is not possible, try to slide it towards the body before attempting to lift it. Avoid twisting the back or leaning sideways, especially while the back is bent. Keep in mind: Do not attempt to lift by bending forward. Bend your hips and knees to squat down to your load, keep it close to your body, and straighten your legs to lift. Never lift a heavy object above shoulder level. Avoid turning or twisting your body while lifting or holding a heavy object.
<p>Lifting</p> <p>Manual material handling involves lifting, lowering, and carrying objects. If ergonomics principles are ignored, stresses on the muscles, joints, and disks in the back can eventually lead to injury. For objects that are too heavy or bulky for safe manual handling by employees, mechanical lifting devices must be used for lifting and moving.</p> <div data-bbox="376 882 1050 1299" data-label="Image">  </div> <p>Ref US Davies Safety Services.</p>		

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p> <p>Occupation: Technical and related staff, Day shift mainly</p> <p>Tool use and selection</p>  <p>There are three primary ergonomic risk factors:</p> <ul style="list-style-type: none"> • HIGH TASK REPETITION. • FORCEFUL EXERTIONS. • REPETITIVE / SUSTAINED AWKWARD POSTURES.  <p>Figure 1: Recommendations for hand tool handle design [5] Ref. Research Gate .org</p>	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>Tools are another important part of ergonomics.</p> <ul style="list-style-type: none"> • First and foremost, select a tool that fits the job. If a tool is too small or not really designed for your purpose, you're going to be forcing the tool into bad positions. • It's also a good idea to use a power tool rather than a hand tool when possible. Another suggestion is to use the lightest available tool for the job. <p>Other ergonomically desirable things to look for in tools include:</p> <p>Padded handles:</p> <ul style="list-style-type: none"> • Textured grips, rather than grips with pre-cut finger-hold grooves • Triggers that are operated by more than one finger. <p>Tools that can be supported by two hands or an overhead suspension system.</p>

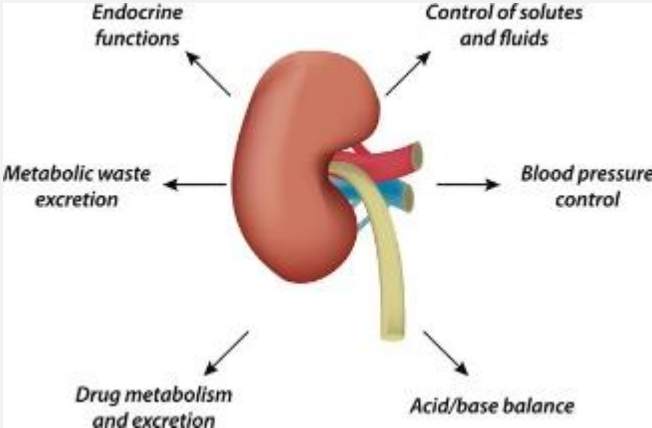
ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p> <p>Occupation: Technical and related staff, Day shift mainly</p> <p>Tools and vibration</p> <p>Reduce excessive gripping force or pressure. Avoid extreme and awkward joint positions. Avoid twisting hand and wrist motion by using power tools rather than hand tools. Avoid repetitive finger movements, or at least reduce their number.</p> <div data-bbox="376 523 1055 1318"> </div> <p>Ref OSHA Train.</p>	<p>Low -</p> <p>Acceptable current control, further control may not be possible.</p>	<p>If employees work with pneumatic tools, grinders, chain saws or other tools that vibrate, you have to be very alert. If you work with these tools when it's cold or if you smoke, you're particularly at risk.</p> <p>Here are the symptoms to watch out for:</p> <ul style="list-style-type: none"> • Tingling • Numbness • Pain • Fingers turning white and losing feeling. • Loss of finger dexterity <p>Vibration-related injuries can be permanently crippling if you don't catch them early.</p> <p>To minimize vibration and its negative physical effects:</p> <ul style="list-style-type: none"> • Operate tools at the lowest speed possible without lengthening the time it takes to do the job. • Keep tools well-maintained. • Hold tools as loosely as safety permits. • Wear gloves designed to protect against vibration. • Use offset or spring-loaded handles or shock-absorbing exhaust mechanisms to reduce vibration. • Use mechanical aids rather than your hands to grasp and hold pieces. • Avoid bending your wrists or placing your hands and arms in awkward positions. • Keep your body, especially your hands, warm. • Try to alternate tasks so you don't spend all day operating a vibrating tool.

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p> <p>Occupation: Technical and related staff, Day shift mainly</p> <p>Forklifts and mobile equipment</p> <p>Sitting for long periods, twisting into awkward positions and spending all day riding in a machine with no suspension are just a few reasons forklift operators find themselves with musculoskeletal and repetitive use injuries.</p>  <p>Lower back pain, musculoskeletal and repetitive strain injuries are some of the most common reasons for absenteeism and workers comp claims.</p> <p>The most common injuries associated with operating a forklift include:</p> <ul style="list-style-type: none"> • Neck and back pain due to vibration, sitting for long periods of time, poor posture and shifting into an awkward position to maintain visibility. • Whiplash Injuries such as headaches, dizziness, and difficulty concentrating from abrupt stops and starts. • Musculoskeletal injuries from repetitive movements • Lower back issues associated with prolonged sitting in combination with shock/vibration caused during travel. 	<p>Medium -</p> <p>Requires a planned approach to control the hazard and applies temporary measure if required.</p>	<p>The correct seat allows operators to sit comfortably during operations, thus reducing the likelihood of the employee being affected by a physical ailment.</p> <p>Using the incorrect forklift seat can lead to physical injury and bad posture.</p> <p>This is ultimately beneficial for several reasons including:</p> <ul style="list-style-type: none"> • Workers complete their shift without injury downtime, resulting in more productivity for the business. • With employees less likely to being injured, it reduces the likelihood of the company having to pay compensation to injured employees. • A reduction in overall business costs as employees are working longer and replacement employees are not required to be sought when injured employees need time off to seek treatment.  <p>Ref. Easyguides.com.au</p>

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
 <p>Correct sitting and seat adjustment is important for efficient seating in mobile equipment or forklift when mobile. Ref Adaptlift Hyster</p>		<p>A secondary application of cognitive ergonomics is product design. Although a poorly designed product may not directly cause accident or injury, it may lead to pain. The resulting dissatisfaction with the product could cause business failure if it is sufficiently widespread.</p>
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p>	<p>Low - Acceptable current control, further control may not be possible.</p>	<p>When buying a new mobile equipment or forklift, look for ergonomic features such as:</p> <ul style="list-style-type: none"> • A vibration-dampening steering column • A mast designed for the best possible visibility • Angled cross braces so looking up through the overhead guard is easy without neck strain • Low step height for easy entry and exit • A small steering wheel combined with a large operator cabin • For stand-up lift trucks, look for intuitive, low force single-hand control operation and low-vibration suspended floorboards <p>Ref https://www.tmhnc.com/blog/how-forklift-drivers-can-prevent-injuries</p>
<p>Occupation: Technical and related staff, Day shift mainly</p>		
<p>Procurement of mobile equipment. All new equipment should be procured with an Ergonomic assessment included to ensure efficient use thereof.</p> 		

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Section: Sections of Airport, Apron, Workshops and Emergency services</p> <p>Occupation: Technical and related staff, Day shift mainly</p> <p>Driving and Risk of life-long injury</p>  <p>Example of damaged chair that may cause injury, on site tractor, used for grass cutting.</p> <ul style="list-style-type: none"> • Sitting for long periods of time. • Incorrect seating position. • Incorrect posture. • Making awkward twists and turns. • Reaching into the footwell or rear of the vehicle. • Manual handling/lifting of goods in and out of the vehicle. • Incorrect posture when reaching into the boot. • Vibration of the road surface. Limited vibration isolation, solid frame mounting. 	<p>High – Requires immediate action as listed in the hierarchy of controls.</p>	<p>An occupational health ‘driver ergonomics’ programme should consider:</p> <p>Choosing a vehicle and trained driver :</p> <ul style="list-style-type: none"> • When selecting a vehicle it is important that the person who will be driving it has a chance to sit in it and have a test drive. • Be aware that different manufacturers offer different features in vehicles, some of which will suit some drivers more than -others. • Remember that every individual driver has different ergonomic needs depending on their size, the type of driving they do and their annual mileage. • Getting into and out of a vehicle, comfortable access, steps as required. • Position the seat as far back as possible to provide you with more room as you step into the vehicle. • Once seated, slide the seat forwards until you can easily reach and press the pedals without stretching. There should be a slight gap (about an inch) between the back of your knees and the edge of the seat. Your thighs should be straight and your knees should be level with your hips. • Further items that employees must follow are protect your neck, position the steering wheel, proper setup for vision, exercise your muscles, take regular breaks, store items appropriately, correct lifting and handling with loading/unloading. <p><i>Source: Ergonomics for drivers. By Personnel Today on 7 May 2010 in Employment Law Features, Occupational Health, Wellbeing.</i></p>

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
<p>Driving and Risk of life-long injury – use of restraint devices or back/kidney belts:</p> <p>The success of kidney-belts in lessening the risk of back injury among uninjured workers remains unproven, and the use of kidney-belts to prevent injuries is not recommended.</p> <p>The kidneys act as very efficient filters for ridding the body of waste and toxic substances, and returning vitamins, amino acids, glucose, hormones and other vital substances into the bloodstream. The kidneys receive a high blood flow and this is filtered by very specialised blood vessels and are surrounded by fatty tissue that protect the organs.</p> <p>In the work place some factors may influence the effect on kidneys, these include whole-body vibration exposure, especially when manning forklifts on uneven surfaces, and how the misuse of back/kidney belts is related to this problem. The wearing of these provides a false sense of protection.</p>	<p>Low - Acceptable current control, further control may not be possible.</p>	<p>The evidence for the effectiveness of back/kidney belts as a control measure against whole-body vibration remains obscure, and other more tested controls such as engineering, administrative and training of drivers should be implemented to address the problem following a holistic approach.</p> <ul style="list-style-type: none"> The control solutions have to consider all risk factors, and be based on sound scientific knowledge, ergonomic and occupational health and safety practice and principles. Engineering control should address factors such as driving terrain and surfaces, forklift designs, ergonomically designed seats to dampen vibration, (preferably systems independent of the driver and offering adequate lumbar support).

ERGONOMIC CONCERN:	EVALUATION RATING:	ACTION TO BE TAKEN FOR RISK CONTROL:
 <p>Kidney functions in the body.</p> <p>From other studies and sources of information that have looked at the effectiveness of kidney belt use for persons involved in manual lifting activities, but these have not come to any satisfactory conclusions, nor do they investigate whole-body vibration in this regard.</p>		<ul style="list-style-type: none">• A consideration when procuring new mobile equipment is the engineering design of forklift seating and vibration damping systems.

TABLES 3.4.3 ASSESSMENT SHEETS

ASSESSMENT OF MANUAL HANDLING TASKS BASED ON KEY INDICATORS Version 2001

Where there are a number of individual activities with considerable physical strains, they must be estimated separately.

Workplace/Activity: ---ACSA East London Goods Handling

1st step: Determination of time rating points (Select only one column!)

Lifting or displacement operations (< 5 s)		Holding (> 5 s)		Carrying (> 5 m)	
Number of working day	Time rating points	Total duration at working day	Time rating points	Overall length of working day	Time rating points
< 10	1	< 5 min	1	< 300 m	1
10 bis < 40	2	5 bis 15 min	2	300 m to < 1km	2
40 bis < 200	4 <input checked="" type="checkbox"/>	15 min to < 1 hr	4	1 km to < 4 km	4
200 bis < 500	6	1 hrs to < 2 hrs	6	4 to < 8 km	6
500 bis < 1000	8	2 hrs to < 4 hrs	8	8 to < 16 km	8
≥ 1000	10	≥ 4 hrs	10	≥ 16 km	10

Examples: • driving trucks • electro workpieces into a machine • taking boxes out of a container and putting them onto a conveyor belt

Examples: • holding and guiding a cast iron slug while working on a wheel stand • operation a hand grinding machine • operating a weed-water

Examples: • furniture removal • delivering scaffolding parts to a building site

2nd step: Determination of rating points of load, posture and working conditions

Effective load ¹⁾ for men	Load rating point	Effective load ¹⁾ for women	Load rating point
< 10 kg	1	< 5 kg	1
10 bis < 20 kg	2 <input checked="" type="checkbox"/>	5 bis < 10 kg	2
20 bis < 30 kg	4	10 bis < 15 kg	4
30 bis < 40 kg	7	15 bis < 25 kg	7
≥ 40 kg	25	≥ 25 kg	25

1) „Effective load“ means in this context the real action force, which are necessary for moving load. This action force does not correspond to the load mass in each case. When lifting a carton, only 50 % of the load mass will have an effect on worker and when using a cart only 10 %.

Typical posture, position of load ²⁾	Posture, position of load	Posture rating point
	• Upper body upright, not twisted • When lifting, holding, carrying and lowering the load is close to body	1
	• Slightly bending forward or twisting the trunk • When lifting, holding, carrying and lowering load is near to medium to body	2
	• Low bending or far bending forward • Slightly bending forward with simultaneous twisting of trunk • Load far from the body or above shoulder height	4 <input checked="" type="checkbox"/>
	• Bending far forward with simultaneous twisting of trunk • Load far from body • Restricted stability of posture when standing • Crouching or kneeling	8

2) For determination of posture weighting the typical body posture when manual handling must be use. I.e. when there are different postures with load a mean values must be used – not occasionally extreme values.

Working conditions	Working conditions rating point
Good ergonomic conditions, e.g. sufficient space, no physical obstacles within the workspace, even level and solid flooring, sufficient lighting, good gripping conditions	0 <input checked="" type="checkbox"/>
Space for movement restricted and unfavourable ergonomic conditions (e.g. 1: space for movement restricted by too low high or working area less than 1,5 m ² or 2: posture stability impaired by uneven floor or soft ground)	1
Strongly restricted space of movement and/or instability of centre of gravity of load (e.g. transfer of patients)	2

3rd step: Evaluation
The rating points relevant to this activity are to be entered and calculated in the diagram.

Load rating points	2
+ Posture rating points	4
+ Working conditions rating points	0
= Total	6

6 X Time rating points **4** = **24**

On the basis of the rating calculated and the table below it is possible to make a rough evaluation. ³⁾ Regardless of this provisions of the Maternity Leave Act apply.

Risk range	Risk score	Description
1 <input type="radio"/>	< 10	Low load situation, physical overload unlikely to appear.
2 <input checked="" type="radio"/>	10 bis < 25	Increased load situation, physical overload is possible for less resilient persons ⁴⁾ . For that group redesign of workplace is helpful.
3 <input type="radio"/>	25 bis < 50	Highly increased load situation, physical overload also possible for normal persons. Redesign of the workplace is recommended.
4 <input type="radio"/>	≥ 50	High load situation, physical overload is likely to appear. Workplace redesign is necessary ⁵⁾ .

Basically it must be assumed that as the number of point rating rises, so the risk of overloading the muscular-skeletal system increases. The boundaries between the risk ranges are fluid because of the individual working technique and performance conditions. The classification may therefore only be regarded as an orientation aid. More exact analyses require specialised ergonomic knowledge.

4) Less resilient persons in this context are persons older than 40 or younger than 21 years, newcomers in the job or people suffering from illness.

5) Design requirements can be determined with reference to the number of point in the table. By reducing the weight, improving the execution conditions or shortening the strain time, elevated stress can be avoided.

Check the workplace necessary for other reasons:

Reasons:

Date of assessment: _____ Assessed by: --- JC

Ed. by ¹⁾Federal Institute of Occupational Safety and Health and ²⁾Regional Committee of Occupational Safety and Safety Technicians (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin - BAuA and ³⁾Länderversuchszentrum für Arbeitsschutz und Sicherheitstechnik - LASS) 2001

Musculoskeletal Disorders

Painful disorders of muscles, tendons, and nerves that develop over time from tasks that repeatedly cause stress and injury to tissues

Common causes

- Material handling** injuries due to repeated lifting, pushing and pulling
- Workstation** furniture, layout, job design and keyboarding
- Repetitive motion injuries** risk factors due to job design, awkward body motions, and tools
- Inadequate job design** pace of work, production pressure, lack of sufficient time to recover from overwork

What employers can do

Hazards are best eliminated at the source. Employers should focus on avoiding repetitive patterns of work through **job design** changes:

- Mechanization** automate tasks
- Team work** distributing work more evenly
- Job rotation** moving between different tasks
- Job enlargement** increasing the variety of tasks

If elimination of repetitive patterns of work is not possible, prevention strategies can focus on:

- Workplace design** fitting the workstation to the worker
- Assistive devices** using carts, hoists, or other mechanical handling devices
- Work practices** training workers, allowing rest periods, and giving workers more job control
- Tool and equipment design** providing proper tools that decrease the force and avoid awkward positions

Symptoms

Musculoskeletal disorders (MSDs) do not happen overnight.



Pain, joint stiffness, muscle tightness, redness, swelling of the affected area, numbness, "pins and needles" sensations, skin colour changes

Musculoskeletal disorders (MSDs) are the most frequent type of lost-time injury and the single largest source of lost-time costs in Canada.

Being aware of the causes and developing a prevention program is essential. Inform and train workers, encourage early reporting of symptoms, and identify and control job-related risk factors.



3.5 General ergonomic recommendations

Ergonomics for seated workers:

Mechanisation and automation have caused for more people to work in a sitting position to operate these machines and processes.

Sitting jobs require less muscular effort, but that does not exempt people from the injury risks usually associated with more physically demanding tasks.

For example, clerks, process controllers, and data entry operators who work in a sitting position may suffer back pain, muscle tenderness and aches.

Reports of varicose veins, stiff necks, and numbness in the legs are more common among seated employees than among those doing heavier tasks.

3.5.1. Health effects of prolonged seated work

When the employee can alternate sitting with other body positions, sitting at work is not a risk for injury or discomfort.

For those who have no choice and must sit for long periods, the situation is different. Although sitting involves less muscular effort than standing, it still causes fatigue.

Sitting requires the muscles to hold the trunk, neck and shoulders in a fixed position. A fixed working position reduces the blood supply to the working muscles, which accelerates fatigue and makes the muscles prone to injury.

Limited mobility contributes to injuries in the parts of the body responsible for movement: the muscles, bones, tendons and ligaments. Another factor is the steady, localized tension on certain regions of the body. The neck and lower back are the regions usually most affected. Prolonged sitting:

- Reduces body movement making muscles more likely to pull, cramp or strain when stretched suddenly,
- Causes fatigue in the back and neck muscles by slowing the blood supply and puts high tension on the spine, especially in the low back or neck, and
- Causes a steady compression on the spinal discs that hinders their nutrition and can contribute to their premature degeneration.

Sedentary employees may also face a gradual deterioration in health (if they do not exercise or do not lead a physically active life). Prolonged sitting drops the employee's physical activity to the lower limit needed for healthy-body functioning.

Decreased fitness, reduced heart and lung efficiency, and digestive problems are common problems experienced by sedentary workers.

3.5.2. A "good" sitting position

A poor body position is largely responsible for the ill effects of prolonged sitting.

Poor body positions can also originate from an unsuitable job design that requires employees to sit uninterrupted for longer than one hour. The duration of sitting, along with the shape of the body in a sitting position, is the most critical risk factor in work in a sitting position.

A "good" position is a set of naturally chosen body positions that fall within an acceptable range. A workstation that allows frequent changes and more mobility allows an employee to have a more natural and healthier work pattern.

Recommendations on how to sit properly are not compulsory. Sometimes, it is acceptable to deviate with outstretched or cramped positions to relieve muscle tension.

The following are general recommendations for good body position during sitting work. Occasional changes beyond the ranges are acceptable and sometimes beneficial.

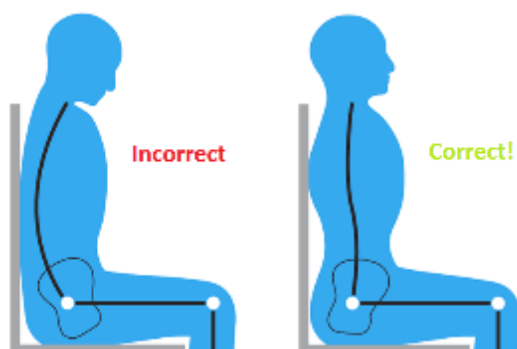


Figure 1: Good body position 1

Keep the head aligned with the spine.

Keep upper arms between vertical and 20° forward.

Keep elbows at an angle between 90° and 120°.

Keep forearms between horizontal and 20° up.

Support the forearms.

At Your Workstation

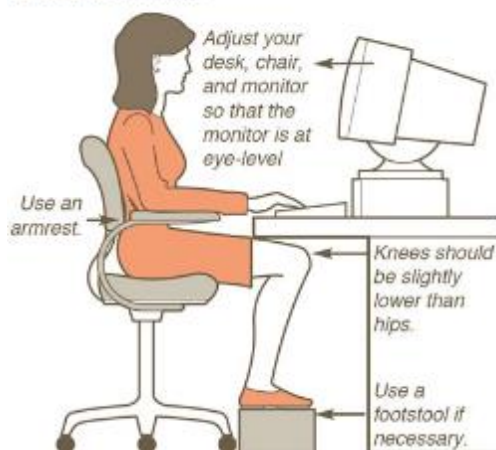


Figure 2: Good body position 2

Keep the joints such as the knees, hips and ankles slightly open (more than 90°)



Figure 3: Good body position 3

Keep the wrists straight and aligned with the forearms.

Place the working object so that it can be seen at viewing angle of 10° to 30° below the line of sight.

A "good" sitting position at work can be achieved only by focusing efforts on the three areas that are identified as potentially hazardous:

- workplace design (including tasks, workstation, and chair design)
- job design, and
- training

3.5.3. Workplace design for seated workstations

A workstation suitable for the worker and the tasks plus good job design is important for workers who work in a sitting position.

The workplace design should enable the employees to carry out work in comfort and safety while allowing them to make voluntary changes in the working posture. To achieve this, the design should include the following elements:

1. tasks
2. work station
3. chair

Before considering the requirements for the design of a workstation and a chair, consider the anticipated tasks. The work may require visual, manual, or foot tasks, or combinations of these. Each of these types of tasks requires different modifications in work station design. A workstation should allow the worker to sit in a balanced body position.

- Use a workstation that ensures that the alignment of the spine is the same whether the worker sits or stands.
- Use a workstation that allows the worker to move the spine freely.
- A work station should allow for frequent changes between varieties of body positions.



Figure 4: The recommended workstation layout
Ensure optimum operator positioning at all workstations:

- Arrange work in a semi-circle.
- The semi-circle layout can be applied to office/desk or control panel workstations.
- Use a swivel chair to reduce body twisting, to allow easy movements, and to reduce side-to-side motions.
- Use sloping work surfaces where practical to reduce bending, and to encourage an upright position while sitting or standing.

The chair should always be considered as an integral component of the workstation and not in isolation. The other workstation components, such as the desk and VDT (computer), workbench or panel in a control room all affect the employee's body position. They, together with a chair, make it possible to work in a balanced body position.

Provide the employee with a fully adjustable chair that can accommodate the maximum range of people (typically 90 to 95 percent of the population).

The chair must have controls to allow easy adjustment of the seat height and tilt, as well as the backrest height and angle. It is important that the employee can operate these controls from a sitting position. The chair's design must match the tasks.

Figure 5: Office chair

This type of chair is recommended for use in offices and control rooms where work is performed in sitting positions.

Select a chair with:

- A backrest shaped to support the lower back.
- Stable base (5 legs).
- Castors for mobility.
- Adjustable height.
- Choose a chair with armrests where practical.

Use a footrest where the feet cannot rest on the floor.



3.5.4. Job design for work that requires prolonged sitting

The main objective of a job design for a seated employee is to reduce the amount of time the person spends "just" sitting. Frequent changes in the sitting position are not enough to protect against blood pooling in the employee's legs.

Five minutes of a more vigorous activity, such as walking for every 40 to 50 minutes of sitting, can protect an employee from swollen legs. These breaks are also beneficial because they give the heart, lungs and muscles some exercise to help counterbalance the effects of sitting for prolonged periods in a relatively fixed position.

Where practical, jobs should incorporate "activity breaks" such as work-related tasks away from the desk or simple exercises, which employees can carry out on the worksite.

3.5.5. Training employees who work in a sitting position

Proper training shapes individual work practices, including sitting habits. Training should encourage employers and employees to adopt methods that reduce fatigue from too little and too much a workload.

Training should also explain the health hazards of prolonged sitting and give recommendations on what a worker in a given workplace can do to improve the working position.

Employees need to know how to adjust the workstation to fit their individual needs for specific tasks. They also must know how to readjust the workstation throughout the day to relieve muscular tension.

Training should also emphasize the importance of rest periods for the employees' health and explain how active rest can do more for keeping employees healthy than passive rest.

3.5.6. Selecting office furniture

The following aspects should be considered when purchasing office furniture:

- Furniture with an adjustability range that can fit all prospective users. Some chairs have interchangeable cylinders to accommodate very tall or short people.
- A fully adjustable chair with height-adjustable armrests.
- An adjustable desk is preferable
- A footrest is highly recommended if you decide on a non-adjustable desk
- Accessories, such as a copyholder, mouse, task lamps, etc. (discuss these with staff and get their feedback as personal preferences are very important).

3.6 Conclusion*

From the findings of this ergonomic assessment the following may be concluded:

- Work areas evaluated included the Airport administrative sections and Workshop / Apron Areas.
- The Baseline Ergonomics Assessment was performed in general by means of a walk-through assessment which consisted of inspections of workstations/premises, identification of all occupational health stresses which could occur, and assessment of these stresses according to the potential degree of hazard and risk to the exposed workers. The baseline assessment mainly focusses on physical ergonomics due to time on site and the walk-through format.
- The ergonomic domains considered included: Physical ergonomics the human anatomy, anthropometry, physiology, biomechanics, Organisational Ergonomics, Organisation in terms of structures, policies and procedures, Cognitive ergonomics, Mental processes, activities of work related to perception, memory, reasoning and motor skills or responses.
- The Administrative, Airport offices, public areas, Emergency Services and sections all had generally modern furniture in various open plan and some smaller occupied offices. A few areas to improve were identified with damaged furniture, cable management and housekeeping.
- The sections of Airport, Apron, Workshops and Emergency services areas comprised large working areas on the airport site. Ergonomic exposures occur from activities performed by staff in the airport areas, or from the workshop and maintenance duties performed. Here too mobile equipment, and tasks need to be included into an ergonomic program to better manage employee activity and exposure.
- For the areas evaluated the risk ratings included Low, Medium, or High ratings and the program should focus on the latter two ergonomic control strategies in line with hierarchy of controls.
- The assessment sheet looking at manual handling work, did indicate that activities presented an increased load situation, where physical overload may be possible for normally resilient persons. Redesign of workplace is recommended.

This assessment must be repeated at least every 24 months or sooner if changes in the workplace is implemented in line with regulation 6 of the Ergonomics Regulations, 2018.

References

- The assessment will be performed in line with the Ergonomics Regulations, 2018, under the Occupational Health and Safety Act, no 85 of 1993, and its requirements to provide an "ergonomic risk assessment".
- Ergonomics in the Office: A Guide to Proper Workstation Design by Karl V. Siegfried, Director of Ergonomics.
- Health and Safety Executive (HSE). (2002) HSG 57. Seating at work. ISBN 978 0 7176 1231 4.
- Risk Assessment of Ergonomic Risk Factors at Construction Sites Zahra Jabbarani Torghabeha, Seyyed Shahab Hosseinianb Aziruddin Ressangc Department of Structure and Materials, Faculty of Civil Engineering, Universiti Teknologi Malaysia, 81300 Skudai, Johor, Malaysia ajtzahra2@live.utm.my, bshseyyed2@live.utm.my, caziruddin@utm.my

4. Hazardous Chemical Agents Survey

4.1 Purpose

The purpose of this survey was:

- To determine exposure levels to Hazardous Chemical Agent (HCA).
- To identify any health risk associated to the possible inadequate control of hazardous chemical agents;
- To notify management of these conditions and to recommend appropriate Occupational Health Risk management interventions aimed at preventing the onset of occupational diseases and ill health effects, amongst employees.
- To comply with Regulation 6 of the Regulations for Hazardous Chemical Agents, 2021, promulgated under the Occupational Health and Safety Act, Act No. 85 of 1993;
- To evaluate compliance with legal requirements.

4.2 Legislative Requirements and Standards

1. Legislative Requirements:

Occupational Health and Safety (OHS) Act; Act No 85 of 1993.

Exposure to hazardous chemical substances in industry, is governed by the Occupational Health and Safety Act (85/1993): Regulations for Hazardous Chemical Agents, 2021, as promulgated under the Occupational Health and Safety (OHS) Act; Act No 85 of 1993.

The Regulations contain Standards (Occupational Exposure Limits), for evaluating whether exposure to airborne hazardous chemical is considered compliant.

"OEL" or "occupational exposure limit" means a limit value set by the Minister, which represents the airborne concentration of an HCA, where the exposure standard may be—

- (a) an eight-hour time-weighted average;
- (b) a ceiling limit; or
- (c) a short-term exposure limit;

"OEL ceiling limit" or "ceiling limit" or "C" means a maximum or peak airborne concentration of an HCA determined over the shortest analytically practicable period of time, which does not exceed 15 minutes;

"OEL eight-hour time-weighted average" or "TWA" means the maximum average airborne concentration of an HCA when calculated over an eight-hour working day, for a five-day working week;

"OEL-ML" or "occupational exposure limit - maximum limit" means an HCA as listed in Table 2 of Annexure 2;

"OEL-RL" or "occupational exposure limit - restricted limit" means an HCA as listed in Table 3 of Annexure 2;

"OEL-short-term exposure limit" or "STEL" means the time-weighted average maximum airborne concentration of an HCA calculated over a 15-minute period;

Standards:

The Occupational Exposure Limits as prescribed in the Regulations for Hazardous Chemical Agents, framed under the Occupational Health & Safety Act (No. 85 of 1993), were used as the reference standards to evaluate the results of this survey.

The regulations incorporate management of chemicals in line with "UN Globally Harmonized System" or "GHS" means the Globally Harmonized System of classification and labelling of chemicals, a guidance document developed by the United Nations for standardising and harmonising the classification and labelling of chemicals globally, as may be updated from time to time, commonly known as the UN Purple Book.

American Conference of Governmental Industrial Hygienists (ACGIH); Threshold Limit Values (TLV) for chemical Substances and Physical Agents; 2014

Threshold Limit Values (TLVs) refer to airborne concentrations of chemicals and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects.

STANDARDS AND INDUSTRY BEST PRACTICE

Legislative Standards:

The following exposure limits were employed for direct comparison to quantitative air monitoring data:

POLLUTANT	REFERENCE	OHS / MHSA ACT – TWA OEL	ACGIH – TWA TLV
Total Inhalable dust As Particles not otherwise specified [PNOS]	8-hour Time Weighted Average (TWA) OEL	10 mg/m ³	10 mg/m ³
Respirable dust	8-hour Time Weighted Average (TWA) OEL	5 mg/m ³	3 mg/m ³
Volatile Organic Compounds (VOC)	8-hour Time Weighted Average (TWA) OEL	As per substance limit value in the results Table	As per substance limit value in the results Table

4.3 Survey Methodology

Strict adherence to the Sampling Strategy as prescribed in Guidance Note EH 42 from The Health and Safety Executive Monitoring Strategies for Toxic Substances and OESSM (Occupational Exposure Sampling Strategy Manual) was

followed, unless risk based sampling was performed in accordance with client specific requirements. As almost all Personal Exposure Limits relate to personal exposure, personal air sampling techniques were used. For this report purposes the most exposed individuals as identified by the client were sampled for exposures.

1. Sampling Strategies:

Personal sampling:

Personal sampling was conducted by placing the sampling pump into a protective pouch and attaching it around the employee's waist. The flexible tubing was placed over the worker's shoulder and the sample train clipped to his/her clothing in order for the inlet port to face downwards, however remaining within the breathing zone. Care was taken to prevent the equipment from interfering with the employee's movements in the area and the employee proceeded with his normal duties. The samples were transported in a secure container to the analytical laboratory.

Static sampling:

Static sampling was conducted by placing the sampling pump into a protective pouch and positioning the sampling head, at approximately head height (of the employee), as near as possible to the actual job location or as near as possible to major sources of the airborne contaminant to which employee's in the respective area are exposed.

2. Sample Methodology:

IOM dual fraction sampler

Inhalable dust sampled with MultiDust PUF discs that are inserted into the standard IOM cassette which transform the IOM into a personal dust sampler, able to sample inhalable and respirable fractions individually or simultaneously. The foams are designed to have a specific porosity such that the penetration characteristics correspond to the respirable fraction. Using this method, respirable particles was collected on the filter at the back of the cassette. The total sample collected in the cassette, including that collected on the foam, was weighed with the filter for determination of the inhalable fraction.

Volatile Organic Compounds (VOC's):

VOC samples were collected in accordance with MDHS 88, using Trace Air OVM passive badges. The OVM Badge was opened and placed on the employee's collar in their breathing zone. After a period of time, representative of a normal working shift; the sample was removed from the employee, the badge sealed and the time recorded. The VOC samples were packed on ice.

All samples were correctly handled to avoid sample contamination and packed according to approved sampling procedures. The samples were subsequently sent to a SANAS approved analytical laboratory for analysis. Samples were analysed for VOC's according to NIOSH 1500/1501.

Mixture Exposure Index:

Work environment is often composed of multiple chemical exposures both simultaneously and sequentially. The MEI is a guideline value to account for the combined effect of chemicals. Mixture Exposure Index was calculated based on the additive or synergistic effects of chemical agents.

$$C1/L1 + C2/L2 + C3/L3 \dots\dots\dots <1$$

Where C1, C2, etc. are the TWA concentrations of constituents in air and L1, L2, etc. are the corresponding exposure limits.

The use of this formula is only applicable where the additive chemical agents have been assigned OELs.

8 hour work shift:

If sampling duration is less than an 8 hour shift, the following equation was used to determine the 8 hour exposure:

$$TWA = \frac{(\text{Concentration} \times \text{Sampling time})}{480 \text{ min}}$$

12 hour work shift:

If sampling duration is more than an 8 hour shift, the following equation was used to determine the 8 hour exposure:

$$TWA = \frac{(\text{Concentration} \times \text{Shift time})}{480 \text{ min}}$$

Field blanks:

Field blanks were utilised in line with the hazardous chemical procedure, as and when required. Field blanks are handled, stored and transported in the same manner as the samples. Field blanks verify that contamination of samples does not occur.

4.4 Hazards and Health Effects

❖ Total Inhalable and Respirable Dust:

- Inhalation of excessive amounts of dust may aggravate existing respiratory disease. It may also cause obstructive lung diseases. Total Inhalable and Respirable Dust is not expected to be irritating to the skin but can be irritating as a foreign object in the eye. Ingestion is not a typical route of occupational exposure.

❖ Volatile Organic Compounds (VOC's):

- Volatile organic compounds or VOC's are organic chemical compounds whose composition makes it possible for them to evaporate under normal indoor atmospheric conditions of temperature and pressure. VOC's are a family of chemicals consisting of aliphatic hydrocarbons (paraffin), aromatic hydrocarbons (benzene), halogenated hydrocarbons (fluorine, bromine, iodine), esters (ethyl acetate), ketones (MEK), alcohols (methanol, ethanol), ethers (ethyl ether), glycols (glycol monoethyl ether) and aldehydes (formaldehyde).
- Short Term Exposure to vapours and mists can cause severe irritation of the eyes and respiratory tract with burning of the nose and throat, a choking sensation, coughing and chest pain. High concentrations cause bronchitis and an asthma-like reaction. Some effects may not appear until several hours after exposure. The respiratory system may become sensitised. Direct contact with liquid VOC's may cause severe irritation of the eyes and skin.
- Repeated or long term exposure may cause respiratory sensitisation. Symptoms include wheezing, difficulty in breathing, chest tightness, coughing and shortness of breath. A progressive decrease in lung capacity can appear with long-term exposure to low levels of VOC's. Allergic skin sensitisation with rashes may develop from prolonged, repeated skin contact. Exposure may cause target organ damage and affect the CNS causing dizziness, drowsiness, asphyxiation, coma, death. *Sources:* Paints, cleaning compounds, glues, insecticides, herbicides, combustion products, coal tar pitch, gasoline vapours, etc.

❖ Mixed exposures:

- Employees in the workplace are exposed to a mixture of chemical agents. The ways in which the constituent agents of a mixed exposure interact, vary considerably. Some mixed exposures involve agents that act on different body tissues or organs, or by different toxicological mechanisms, these various effects being independent of each other. Other mixtures will include agents that act on the same organs, or by similar mechanisms, so that the effects reinforce each other and the agents are additive in their effect.
- The effects of two chemicals given simultaneously produce a response that may simply be additive of their individual responses or may be greater or less than that expected by addition of their individual responses.
- An *additive* effect occurs when the combined effect of two chemicals is equal to the sum of the effects of each agent given alone (example: $2 + 3 = 5$). Common example of additive exposure is welding. This leaves employee

exposed to several metals such as nickel, chromium, manganese etc. Therefore the Mixture Exposure Index is used to assess mixed exposures.

❖ **Chemicals and Noise - A Hazardous Combination:**

- It is no surprise that most work-related hearing loss is caused by noise exposure, and that genetics and age can also be contributors. What may not be as well known is that some chemical exposures can pose a potential risk to hearing. Both animal experiments and human studies suggest that certain chemical exposures may cause "ototoxic" effects (damage the hearing and balance functions of the ear). In general, the exposure concentrations that cause these effects are considered high. However, exposure to some of these chemicals and noise at the same time can significantly increase the risk of developing ototoxic effects.
- Ototoxins are chemicals which can damage hearing and can cause mild to severe hearing loss, tinnitus (ringing in the ears), or deafness. An ototoxin can be ingested, absorbed, or inhaled into the body. Once in the bloodstream, the ototoxin is circulated to the ear and absorbed by the auditory nerve, damaging the nerve and causing hearing loss. Ototoxins can also cause hearing loss by damaging the cochlear hair cells (as happens in hearing loss caused by noise).

❖ **Effects of chemical exposure on hearing:**

- Ototoxic chemicals can cause hearing loss on their own, however when combined with noise exposure, the effects can be even more severe. Organic solvents are the most commonly identified chemicals, but others may also be involved (e.g. metals and chemical asphyxiant). The hearing frequencies affected by solvent exposure are different than those affected by noise. Research suggests that solvents may interact synergistically with noise. Even when noise and chemicals are at permissible exposure levels, the impact of a combined exposure can do more damage than a higher exposure to either hazard alone.
- Several chemicals associated with hearing loss:
 - Benzene
 - Carbon disulphide
 - Carbon monoxide
 - Ethyl benzene
 - Hydrogen cyanide
 - Lead
 - Mercury
 - n-Hexane
 - Solvent mixtures

- Styrene
- Trichloroethylene
- Toluene
- Xylene

4.5 Results and Discussion

The results of the Hazardous Chemical Substance Survey are reflected below. Measurements indicated in the Tables were colour coded according to the following.

Legend:

Below 10% of OEL **Exceeding 10% of OEL** **Exceeding 50% of OEL** **Exceeding OEL**

“Results marked “Not SANAS Accredited” in this report are not included in the SANAS Scope of Accreditation for this inspection body”.

* “Opinions and interpretations expressed herein are outside the scope of SANAS accreditation”.

Δ “Results marked “Subcontracted Test” in this report are not included in the SANAS Scope of Accreditation for this inspection body”.

TABLE 4.5.1 – HAZARDOUS CHEMICAL SUBSTANCE SURVEY ON INHALABLE, RESPIRABLE DUST, PERFORMED FOR ACSA EAST LONDON IN EC, ON 27 September 2021. Δ

SAMPLE NO.	NAME	SECTION/ ACTIVITY	OCCUPATION	RUN TIME (min)	AVERAGE FLOW RATE (ℓ/min)	SAMPLE MASS (mg)	TWA E8hEV CONCENTRATION (mg/m ³)	OHS ACT TWA OEL (mg/m ³)	ACGIH TWA TLV (mg/m ³)
I16459	Siyanda Kale	Baggage handling & dispatch	Swissport handler	440	2.014	0.45 <0.03	Inhalable dust = 0.46 Respirable dust = 0.03	10 5	10
16477	Siza Mcakona	Apron, flight Marshall	Marshall	445	2.011	0.43 0.08	Inhalable dust = 0.45 Respirable dust = 0.08	10 5	10
I16461	Sydney Siduli	Fire station	Fire responder	360	2.011	0.41 0.07	Inhalable dust = 0.42 Respirable dust = 0.07	10 5	10
I16511	Blank filter	Blank passed laboratory test							

DISCUSSION

Discussion of results:

The employees were evaluated for exposure to inhalable and respirable dust. They worked on the apron and outside assisting with cleaning, transport work and marshalling duties. The concentrations as measured during the survey less than 10% of the exposure limit for respirable and inhalable dust fractions. The dust in the work area was due to ambient dust and potential dust and particulates from airport/ airplane activity. Grass cutting was not performed during the survey but may be a contributing factor.

The employees were measured for their time of exposure, some at less than 80% of their shift and the volumes sampled were within the analytical method stipulated.

Engineering Controls:

The buildings are naturally ventilated via structural openings and bay doors. Outside areas have natural ventilation. The open airside areas had natural ventilation.

Administrative Controls:

Safe work procedure. Demarcation in areas and workshops.

Personal Protective Equipment:

Overalls are worn, glasses, gloves, not all employees wore RPE for the full shift but dust masks were available and provides adequate protection when worn.

Legend: **Below 10% of OEL** **Exceeding 10% of OEL** **Exceeding 50% of OEL** **Exceeding OEL**

TABLE 4.5.2 – HAZARDOUS CHEMICAL SUBSTANCE SURVEY ON VOLATILE ORGANIC COMPOUNDS, PERFORMED FOR ACSA EAST LONDON IN EC, ON 27 September 2021. Δ

SAMPLE NO.	NAME	SECTION/ACTIVITY	OCCUPATION	RUN TIME (min)	AVERAGE FLOW RATE (ℓ/min)	SAMPLE VOLUME (m ³)	ANALYTE	TWA E8hEV CONCENTRATION (ppm)	TWA OEL (ppm)
OW31173	Siza Mcakona	Apron, flight Marshall	Marshall	445	-	-	Acetone	0,024	500
							Pentane	0,022	2000
							n-Hexane	0,011	100
							Ethyl Acetate	0,009	800
							Heptane	0,010	800
							Toluene	0,005	40
							Butyl Acetate	0,008	100
							Ethylbenzene	0,005	40
							m+p-Xylene	0,008	200
							Styrene	0,010	40
							o-Xylene	0,005	200
							Propylbenzene	0,011	100
							1,3,5-Trimethylbenzene	0,008	50
							1,2,4-Trimethylbenzene	0,005	50
Benzene	0,009	1							
1,2-Dibromoethane	0,009	0,5							
Mixture Exposure Index								<0.01	< 1
OW3549	Field Blank Field		Blank passed the laboratory test						

Legend: **Below 10% of OEL** **Exceeding 10% of OEL** **Exceeding 50% of OEL** **Exceeding OEL**

SAMPLE NO.	NAME	SECTION/ACTIVITY	OCCUPATION	RUN TIME (min)	AVERAGE FLOW RATE (ℓ/min)	SAMPLE VOLUME (m ³)	ANALYTE	TWA E8hEV CONCENTRATION (ppm)	TWA OEL (ppm)
OW2929	Sydney Siduli	Fire station	Fire responder	360	-	-	Acetone	0,029	500
							Pentane	0,027	2000
							n-Hexane	0,013	100
							Ethyl Acetate	0,011	800
							Heptane	0,012	800
							Toluene	0,011	40
							Butyl Acetate	0,010	100
							Ethylbenzene	0,006	40
							m+p-Xylene	0,010	200
							Styrene	0,012	40
							o-Xylene	0,006	200
							Propylbenzene	0,013	100
							1,3,5-Trimethylbenzene	0,010	50
							1,2,4-Trimethylbenzene	0,006	50
							Benzene	0,012	1
1,2-Dibromoethane	0,011	0,5							
Mixture Exposure Index								<0.01	< 1
OW3549	Field Blank Field						Blank passed the laboratory test		

** Table continuous on next page*

DISCUSSION

Discussion of results.

Employee exposure was monitored for Marshals on the apron during air plane turn around and Emergency Team duties when on site. Jet engines produce volatile organic compounds (VOC) such as CO₂, NO_x, CO, SO_x and low molecular weight polycyclic aromatic hydrocarbons (PAH), and particulate matter (PM) with associated PAH, and metals. Incomplete combustion of fossil fuels, including kerosene, results in the formation of carbon-rich (> 60%), aromatic bi-products called char, and condensates, which are known as soot.* The personal exposures were below the respective OELs and Mixed Exposure Index.

The toxicity of (unburned) jet fuel as such has been considered in many studies and may include skin irritation, neurotoxicity, nephrotoxicity, and renal carcinogenicity. Jet fuels are mixtures of gasoline and kerosene with performance additives.* *Ref. A review of health effects associated with exposure to jet engine emissions in and around airports.*

Engineering Controls:

Airplane engine set up to be efficient as possible but limited control for the exhaust emission expelled when operational.

Administrative Controls:

Safe work procedure. Staff training on safe work practice.

Personal Protective Equipment:

Site clothing worn, but respirators not donned during the survey. Fabric masks worn, for Covid control does not provide protection against volatile organic compounds (VOCs).

4.6. Specific Management Interventions

1. Three important main factors were identified which significantly influenced occupational exposure: proximity to emission sources, where levels were generally higher in close proximity and down-wind to aircraft, fluctuations in emission levels, characterized by exposure peak events such as landing- or take-off, and job type, where outdoor ground-affiliated work types are at highest risk of exposure. These factors must be controlled during the highest exposure times.
2. Emissions from combustion engines and jet engines produce volatile organic compounds (VOC) such as CO₂, NO_x, CO, SO_x and low molecular weight polycyclic aromatic hydrocarbons (PAH), and particulate matter (PM) with associated PAH, and metals. Incomplete combustion of fossil fuels, including kerosene, results in the formation of carbon-rich (> 60%), aromatic by-products called char, and condensates, which are known as soot. Char and soot can either be measured as elemental carbon (EC, used in atmospheric sciences) or black carbon (BC, used in soil and sediment sciences). Many of these chemicals fall in the volatile organic compound chemicals. Here combined with noise, ototoxic exposure may be very prevalent.

Ototoxins are chemicals which can damage hearing and can cause mild to severe hearing loss, tinnitus (ringing in the ears), or deafness. An ototoxin can be ingested, absorbed, or inhaled into the body. Ototoxic chemicals can cause hearing loss on their own, however when combined with noise exposure, the effects can be even more severe. Where these are identified on site specific management intervention may be required to address.

Therefore with the site liberation of chemicals and noise, additional monitoring must be performed on potentially exposed employees, or addressed with stakeholders.

3. Develop and implement a respiratory protective equipment policy outlining the general arrangements in respect to RPE, including the issuing, duration of use and incidental matters pertaining thereto for employees exposed above the action levels.
4. Use of personal protective equipment for employees is crucial. The protection factors must be chosen to provide adequate protection for employees working on aprons and close to airplanes and airplane emissions. Conduct fit testing for all employees issued with half mask respirators.
5. This Hazardous Chemical Substance Exposure Survey must be repeated at intervals not exceeding 24 months or as soon as any changes occur that could result in a change in or redistribution of Hazardous Substance exposure levels, or if there is any suspicion that the current/previous assessment is no longer valid (changes in work processes, introduction of new Hazardous Chemical Agents, change in status or acquisition of new exposure control equipment, etc.).

4.7 General Recommendations

1. Symbolic safety signs:

- It is required to demarcate all areas where chemical or physical stressors may be encountered with in plant or workshop areas.
- It must be conspicuously posted at all entrances to areas as well as within areas where controls rooms, offices or access from other departments.

<p>FIRE</p> <p>BRAND</p>		<p>SL MFP1 - LOCATION OF FIRE FIGHTING EQUIPMENT SL MFP2 - FIRE EXTINGUISHER SL MFP3 - FIRE HOSE SL MFP4 - FIRE HYDRANT SL MFP5 - FIRE ALARM SL MFP6 - SPRINKLER STOP VALVE</p>
<p>MANDATORY</p> <p>VERPLIGTEND</p>		<p>SL MSM1 - EYE PROTECTION SHALL BE WORN SL MSM2 - RESPIRATORY PROTECTION SHALL BE WORN SL MSM3 - HEAD PROTECTION SHALL BE WORN SL MSM4 - HEARING PROTECTION SHALL BE WORN SL MSM5 - HAND PROTECTION SHALL BE WORN SL MSM6 - FOOT AND LEG PROTECTION AGAINST LIQUIDS SHALL BE WORN SL MSM7 - FOOT PROTECTION AGAINST COLLUSION SHALL BE WORN SL MSM8 - FLAME SAFETY LAMP SHALL BE USED SL MSM9 - APRON SHALL BE WORN SL MSM10 - ACE PROTECTION SHALL BE WORN SL MSM11 - AIR-SUPPLIED HOOD SHALL BE WORN SL MSM12 - DUST MASK SHALL BE WORN SL MSM13 - AIR EXTRACTION SHALL BE WORN SL MSM14 - WASTE BINS SHALL BE USED SL MSM15 - FULL BODY WEAR SHALL BE WORN SL MSM16 - SAFETY HARNESS SHALL BE USED</p>
<p>INFORMATION</p> <p>INLIGTING</p>		<p>SL MSG1 - FIRST AID EQUIPMENT SL MSG2 - GENERAL DIRECTION SL MSG3 - DIRECTION TO ESCAPE ROUTE SL MSG4 - DIRECTION TO ESCAPE ROUTE SL MSG5 - MANNED FIRST-AID STATION SL MSG6 - DRINKING WATER SL MSG7 - BLASTING POINT SL MSG8 - TRAVELING WAY SL MSG9 - LOCOMOTIVE REFUELLING POINT SL MSG10 - LATRINE FOR MALE EMPLOYEES SL MSG11 - REFUGE CHAMBER SL MSG12 - TELEPHONE SL MSG13 - WAITING PLACE SL MSG14 - EMERGENCY TELEPHONE SL MSG15 - ELECTRICAL ISOLATOR</p>
<p>PROHIBITORY</p> <p>VERBODEN</p>		<p>SL MSP1 - SMOKING PROHIBITED SL MSP2 - FIRE AND OPEN FLAMES PROHIBITED SL MSP3 - THOROUGHFARE FOR PEDESTRIANS PROHIBITED SL MSP4 - WATER AS EXTINGUISHER PROHIBITED SL MSP5 - DRINKING OF THIS WATER PROHIBITED SL MSP6 - PROCEEDING BEYOND THIS SIGN PROHIBITED SL MSP7 - CYCLING PROHIBITED SL MSP8 - CARRYING OF LONG MATERIAL / OBJECTS PROHIBITED SL MSP9 - HAND TRAMMING PROHIBITED SL MSP10 - LOCOMOTIVES PROHIBITED BEYOND THIS POINT SL MSP11 - USE OF COMPRESSED AIR PROHIBITED SL MSP12 - LOOSE CLOTHING, TIES, JEWELLERY AND UNCONFINED LONG HAIR PROHIBITED</p>
<p>WARNING</p> <p>WAARSKUWING</p>		<p>SL MSW1 - GENERAL WARNING OF DANGER SL MSW2 - WARNING OF FIRE HAZARD SL MSW3 - WARNING OF EXPLOSION HAZARD SL MSW4 - WARNING OF CORROSION HAZARD SL MSW5 - WARNING OF POISONING SUBSTANCES HAZARD SL MSW6 - WARNING OF IONISING RADIATION HAZARD SL MSW7 - WARNING OF ELECTRICAL SHOCK HAZARD SL MSW8 - WARNING OF SUSPENDED LOADS HAZARD SL MSW9 - WARNING OF METHANE HAZARD SL MSW10 - WARNING OF FRAGILE ROOF SL MSW11 - WARNING OF BIOLOGICAL HAZARD SL MSW12 - WARNING OF LASER SL MSW13 - WARNING OF FALLING OBJECTS HAZARD</p>

2. HCS Engineering Control Measures:

Engineering control methods to reduce hazardous exposures are preferred. Methods include mechanical ventilation (dilution and local exhaust), process or personnel enclosure, control of process conditions and process modification (e.g. substitution with a less hazardous material).

Use a non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside. Treatment of exhaust dust/ vapours to prevent environmental contamination may be required. Supply sufficient replacement air to make up for air removed by exhaust systems.

The workshop is installed with mechanical roof extraction fans to remove airborne hazardous chemical agents. The extraction fans were not utilised during the assessment.

Local extraction ventilation (LEV) needs to remove both suspended inhalable particles and intercept the larger particles. LEV is an engineering control system to reduce exposures to airborne contaminants such as dust in a workplace (Figure 1). Most systems, but not all, have the following:

- Hood: This is where the contaminant cloud enters the LEV.
- Ducting: This conducts air and the contaminant from the hood to the discharge point.
- Air cleaner or arrestor: This filters or cleans the extracted air. Not all systems need air cleaning.
- Air mover: The 'engine' that powers the extraction system, usually a fan.
- Discharge: This releases the extracted air to a safe place

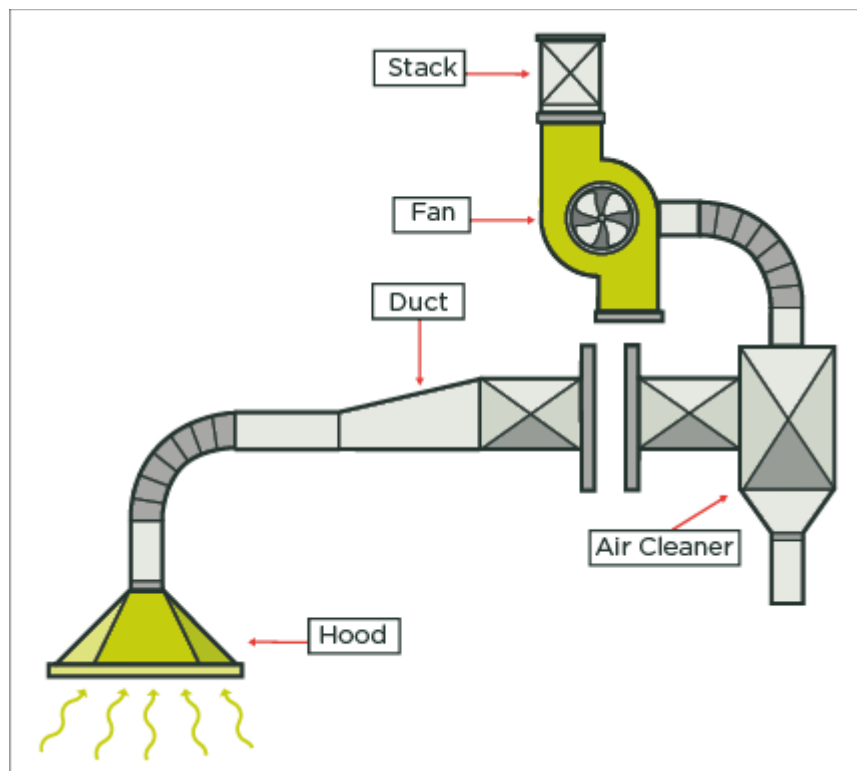


Figure 1: Common elements of a simple LEV system. Source WorkSafe

Employers also need to be aware of:

- the general principles of hood design and application;
- the need for airflow indicators and other instrumentation;
- capture zones, working zones and breathing zones;
- the general principles of ductwork, air movers and air cleaners and how they interact;
- the principles of how to discharge contaminated air safely and replace it with clean air;
- the process of installing and commissioning the LEV system;
- the need for a user manual and logbook;
- the requirement for thorough examination and test of LEV.

What employees need to know to carry out routine checks:

- The parts of an LEV system and their function.
- How the LEV system should be used.
- How to recognise a damaged part.
- Simple checks that the LEV system is delivering its design performance and is effectively controlling emissions and exposure.

Successful LEV systems contain, capture or receive the contaminant cloud within the LEV hood and conduct it away. The greater the degree of enclosure of the source, the more likely it is that control will be successful.

Good practice requires monitoring the performance of the hood, for example, by using an airflow indicator.

Hood selection and design are critical to the performance of an LEV system, and must match the process, the source, production and how the operator carries out the process.

The employer should have assessed whether it is possible to eliminate the source or reduce its size. Examples of sources which are difficult to control using LEV include:

- very large sources; or
- many small sources; or
- moving sources.

Capturing hood:

This is the most common type of LEV hood. The process, source and contaminant cloud are outside the hood. A capturing hood has to generate sufficient airflow at and around the source to 'capture' and draw in the contaminant-laden air. They all work on the same broad principles, but can range in size from a few millimetres for on-tool extraction to metres long in large industrial processes. Hoods can be fixed or moveable. They include rim/lip extraction (slot), downdraught tables or benches and LVHV (low volume high velocity) hoods.

Low volume high velocity extraction (LVHV):

Some industrial tools, such as grinding wheels, have a rapidly moving surface. These surfaces also carry with them a layer of air moving at high speed (a boundary layer). Fine dust particles can be carried in this boundary layer and, because of the high speeds involved, they can be difficult to capture.

Low volume high velocity extraction (LVHV) involves a small hood with a high face velocity, e.g. 100 m/s, located very close to the source. Typically LVHV is applied in hand-held tools, but can be used with fixed equipment. It is difficult to retrofit LVHV. Designers of hand-held equipment that incorporates LVHV must apply ergonomic principles for user-acceptance and successful control.

Receiving hoods:

All receiving hoods work on the same principles:

- The process takes place outside the hood.
- The contaminant cloud is propelled into it by process-induced air movement.
- The hood, especially the face, must be big enough to receive the contaminant cloud.
- The extraction empties the hood of contaminated air at least as fast as it is filled.

A receiving hood can be applied wherever a process produces a contaminant cloud with a strong and predictable direction. For example, a grinding wheel, like all rotating discs, acts as a crude fan. The guard acts as a fan casing and directs the air jet mainly in the direction of the wheel rotation. The receiving hood must be large enough and close enough to intercept the contaminant cloud (invisible) and the jet of fast-moving large particles (visible).



Figure 2: Examples of portable LEV systems. Source Eurovac

The employer, working with the designer, may decide to have LEV to control the main sources and use general ventilation for minor sources or any loss of contaminant from large sources. General ventilation involves replacing contaminated workplace air with cleaned or fresh air. Dilution or mixing ventilation and displacement ventilation are two forms of general ventilation.

Dilution or mixing ventilation:

Clean air dilutes contaminated workplace air by mixing with it. The assumption that the concentration of contaminant is uniform throughout the workplace is common but usually wrong. In practice, mixing is incomplete because there will be some areas with high local concentrations in the workplace, usually near sources.

Displacement ventilation:

Clean air pushes contaminated air away with minimal mixing. This 'piston' or 'plug' flow can be produced by:

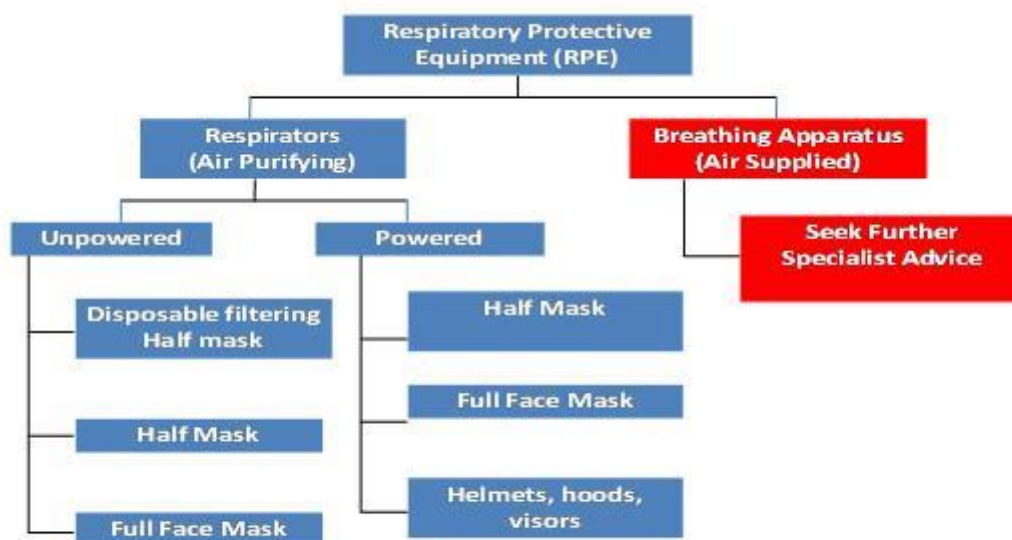
- introducing air at an even rate over a whole wall, displaced through the opposite wall;
- supplying air at a low point in the room that is a few degrees cooler than the workplace air. Warmer contaminated air displaces upwards for clearance (e.g. via louvres);
- supplying warm air at a high level and venting contaminated air at a low level.

For displacement ventilation, the clean air's velocity should be high enough to maintain a uniform flow and low enough to avoid general mixing. Caution: successful large-scale displacement ventilation is difficult to achieve.

3. HCS Personal Protective Equipment:

If engineering controls and work practices are not effective in controlling exposure to this material, then wear suitable personal protective equipment including approved respiratory protection.

- If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.
- Normal FFP1 dust masks are adequate for exposure to dusts up to 5x OEL.
- Normal FFP2 dust masks are adequate for exposure to dusts up to 10x OEL.
- Where required, employees must be provided with adequate gloves for hand and skin protection. The type of glove will depend on the work to be performed, chemical risks and amount of dexterity required.



Respirator Types. Source HSA

4. PPE General:

Regarding the issuing of PPE, the following must also be insured:

- the equipment must be correctly selected and properly used.
- employees must receive the information, instruction, training and supervision that are necessary with regard to the use of the equipment.
- the equipment must be kept in good condition and efficient working order.

- reusable equipment may not be issued, to any person, unless the equipment has been properly decontaminated and sterilised.
- separate containers or storage facilities for respirators, when not in use, must be provided.

5. Personal Hygiene:

All employees must maintain a very high level of personal hygiene, including at least the following:

- Wash full body/shower at end of shift.
- Put on a clean set of work clothes, before every shift.
- Immediately remove work clothes and shower, if it has become soiled with any chemical and put on a clean set of clothes (clothes soiled can become a source of chronic skin exposure).
- Leather gloves that too, that have become soiled with oil/grease must not be worn, as it will become a source (reservoir) of chronic skin exposure. Similarly, employees must be urged not to carry oily/greasy rags in their overall pockets as it has the same effect as being chronically exposed via skin contact.
- Regularly, but at least before each break (meals, tea or smoking) employees must wash their hands, fore-arms and faces, with running hot water and soap.
- Use mild detergents, free from solvents and abrasives.
- A barrier cream, suitable for the specific chemicals the handle could be considered.

It is essential that the employees maintain good standards of personal hygiene at all times to ensure that their food or surfaces they come into contact with does not get contaminated with harmful germs, dirt or “foreign bodies”.

6. Information and Training:

After consultation with the health and safety committee established for that section of the workplace, before any employee is exposed or may be exposed to any Hazardous Chemical Substance (HCS), it must be ensured that the employee is adequately and comprehensively informed and trained, as well as thereafter be informed and trained at intervals as may be recommended by that health and safety committee, with regard to:

- the contents and scope of the Regulations for Hazardous Agents; OHS ACT – No 85 of 1993;
- the potential source of exposure;
- the potential risks to health caused by exposure;
- the potential detrimental effect of exposure on his or her reproductive ability;
- the measures to be taken by the employers to protect an employee against any risk from exposure;
- the precautions to be taken by an employee to protect himself or herself against the health risks associated with the exposure, including the wearing and use of protective clothing and respiratory protective equipment;

- the necessity, correct use, maintenance and potential of safety equipment, facilities and engineering control measures provided;
- the necessity of personal air sampling and medical surveillance;
- the importance of good housekeeping at the workplace and personal hygiene;
- the safe working procedures regarding the use, handling, storage and labelling of the HCS at the workplace; and
- procedures to be followed in the event of spillages, leakages or any similar emergency situation which could take place by accident;

7. Duties of persons who may be exposed to hazardous chemical agents:

Every person who is or may be exposed shall obey a lawful instruction given by or on behalf of the employer or a self-employed person, regarding:

- the prevention of a HCS from being released;
- the wearing of personal protective equipment;
- the wearing of monitoring equipment to measure personal exposure;
- the reporting for health evaluations and biological tests as required by these regulations;
- the cleaning up and disposal of materials containing HCS;
- housekeeping at the workplace, personal hygiene and environmental and health practices.

The employees should wash and dry their hands in particular:

- before starting tea time or lunch break,
- before handling ready-to-eat food,
- after touching raw food, especially raw meat or poultry, and
- after going to the toilet.

8. Medical Surveillance:

Medical surveillance should be implemented additional to the initial health evaluation (that must be performed on all employees, immediately before or within 14 days after a person commences with employment). These tests must be performed at intervals not exceeding two years, or at intervals specified by an occupational medicine practitioner. Implementation of a medical surveillance program for employees performing spray paint tasks will be beneficial.

9. Record Keeping:

- Records of assessments (i.e. this Report), HCS monitoring and all medical surveillance records, including the baseline medical tests of every employee, must be kept for a minimum period of 30 years.

- If the employer ceases activities, his personal records must be handed over or forwarded by registered post, to the relevant provincial director, provided that those records shall contain at least the following information:
 - Each employee's surname, forenames, gender, date of birth, name of spouse or closest relative and, where available, permanent address and postal code
 - A record of the types of work carried out that caused HCS exposure
 - A record of any previous work-related HCS exposure prior to an employee's current employment
 - The dates of medical surveillance and results of all such tests.
- Records of training given to an employee, as detailed above, must be kept for as long as the employee remains employed at the workplace in which he/she is being exposed to an HCS.
- Reports on surveys and maintenance performed on Engineering Control Measures, must be kept for 3 years.

10. General Hazardous Chemical Substance Management:

- No material or substance should be purchased, unless the Material Safety Data Sheet (MSDS), of that substance and at least two alternatives have been obtained from the respective suppliers and the least hazardous one has been selected.
- A substance should further only be accepted from a supplier, when the MSDS is complete and conforms to the minimum requirements specified in the Regulations for Hazardous Chemical Agents, under the Occupational Health and Safety Act; No 85 of 1993.
- No person should be allowed to use a hazardous substance, unless he/she has been made aware of the hazardous nature of the substance, been explained regarding the correct use of the substance, the precautionary measures to follow to prevent exposure (i.e. ventilation requirements, PPE requirements, accidental exposure, spill clean-up and disposal procedures, etc.) and unless the person has been issued with the PPE prescribed in the MSDS.
- When not in use, flammable liquid containers should be kept closed and stored in suitable fire-resistant cabinets or bins, designed to retain spills (110 per cent of the largest container normally stored). The maximum quantities for cabinet or bin storage are:
 - no more than 50 litres for extremely or highly flammable products and flammable liquids with a flashpoint below the maximum ambient temperature of the workroom/working area;
 - and no more than 250 litres for other flammable liquids with a higher flashpoint, up to 55 °C.
- Keep larger stocks in a secure, open-air storage area or in a separate fire-resisting store with spillage retention and good ventilation.

- Proprietary paint-mixing systems reduce the quantities of paints stored and minimise vapour given off during mixing. Exclude sources of ignition and ensure that all electrical equipment around potential flammable sources (e.g. the mixer) is correctly Ex-rated.
- Keep lids on cans and keep containers closed to stop vapour escaping. Contain spillages by decanting paint over a tray and have absorbent material readily available to soak up spillages. Keep contaminated material in a lidded metal bin, and dispose of its contents safely.
- Treat empty flammable liquid containers in the same way as full ones unless they have been properly inserted – they will often be full of vapour.
- Avoid skin contact by using single-use nitrile gloves or similar.
- Spills of reactive hardeners and empty hardener containers need decontamination before disposal. Check for decontaminant information in the product's safety data sheet, or ask the product maker for advice.

11. Prohibitions:

All employees should be informed that it is a prohibition in terms of the OHS Act, to use compressed air as a means of drying; or to clean surfaces from dust deposits, unless no other alternative exists (due to this practise causing unnecessary dust and noise exposure).

In this regard vacuum cleaning or wet cleaning methods can be considered as alternatives. It must, however, be ensured that if vacuum cleaning is selected as an alternative, that the vacuum cleaner has HEPA (High Efficiency Particulate Air) filtration capabilities and itself does not liberate noise levels in excess of 85 dB(A).

4.8 Conclusion*

From the results of the Hazardous Chemical Agent survey indicates that under the current conditions employees were not over exposed to inhalable dust or volatile organic compounds (VOCs) as tested during the survey.

The employees were evaluated for exposure to inhalable and respirable dust. They worked on the Apron and outside assisting with cleaning, transport work and marshalling duties. The concentrations as measured during the survey less than 10% of the exposure limit for respirable and inhalable dust fractions. The dust in the work area was due to ambient dust and potential dust and particulates from airport/ airplane activity. Grass cutting was not performed during the survey but may be a contributing factor.

Employee exposure was monitored for Marshals on the apron during air plane turn around and Emergency Team duties when on site. Jet engines produce volatile organic compounds (VOC) such as CO₂, NO_x, CO, SO_x and low molecular weight polycyclic aromatic hydrocarbons (PAH), and particulate matter (PM) with associated PAH, and metals. Incomplete combustion of fossil fuels, including kerosene, results in the formation of carbon-rich (> 60%), aromatic bi-products called char, and condensates, which are known as soot.* The personal exposures were below the respective OELs and Mixed Exposure Index.

Corrective action is to be prioritised to ensure that high risk areas are targeted first to ensure a risk based Occupational Health and Safety Management approach is followed.

Definitions

“Action Limit” means a recommended exposure limit for a hazardous chemical substance set at 50% of the Occupational Exposure limit at which action needs to be taken to prevent increase in exposure.

“Acute Exposure” occurs when a person is exposed to a high concentration of a HCS for a short period which results in an immediate and serious reaction such as unconsciousness burns etc.

“Air Monitoring” means the monitoring of the concentrations of airborne hazardous chemical agents.

“Assessment” means a program of measurement to determine any risk from exposure to a hazardous chemical substance associated with any hazard thereof at the workplace in order to identify the steps needed to be taken to remove, reduce or control such hazard.

“Chronic Exposure” occurs when a person is exposed to a low concentration of a HCS for prolonged periods with effects developing gradually, usually accompanied by changes in the body, e.g. lung problems and cancers.

“E8hEV,” or “equivalent eight hour exposure value” means the time weighted average exposure of an employee in any 24 hour period to a substance or level of a physical agent for a period of 8 hours, and, if the period of exposure is more or less than 8 hours, the exposure is calculated by multiplying the measured concentration by a factor equal to the period of exposure in hours divided by 8.

“EH 42” means the Guidance Note EH 42 of the Health and Safety Executive of the United Kingdom: Monitoring Strategies for Toxic agents 1989 HSE ISBN 0 11885412 7 as revised from time to time and published in the *Government Gazette*.

“Engineering Control measures” means control measures that remove or reduce the exposure of persons at the workplace by means of engineering methods.

“HCS” or “Hazardous Chemical Substance” means any toxic, harmful, corrosive, irritant or asphyxiant substance, or a mixture of such substance for which-

“OEL” or “occupational exposure limit” means a limit value set by the Minister, which represents the airborne concentration of an HCA, where the exposure standard may be—

(a) an eight-hour time-weighted average;

(b) a ceiling limit; or

(c) a short-term exposure limit;

“OEL ceiling limit” or “ceiling limit” or “C” means a maximum or peak airborne concentration of an HCA determined over the shortest analytically practicable period of time, which does not exceed 15 minutes;

“OEL eight-hour time-weighted average” or “TWA” means the maximum average airborne concentration of an HCA when calculated over an eight-hour working day, for a five-day working week;

“OEL-ML” or “occupational exposure limit - maximum limit” means an HCA as listed in Table 2 of Annexure 2; in the regulation

“OEL-RL” or “occupational exposure limit - restricted limit” means an HCA as listed in Table 3 of Annexure 2 in the regulation;

“OEL-short-term exposure limit” or “STEL” means the time-weighted average maximum airborne concentration of an HCA calculated over a 15-minute period;

“OESSM” means the Occupational Exposure Sampling Strategy Manual, published by the National Institute of Occupational Safety & Health (NIOSH) Publication No. 77 – 173 of 1977, United States of America: Department of Health, Education and Welfare.

“Respirator Zone” means an area where the concentration of an airborne hazardous chemical substance exceeds the recommended limit for that substance.

“RPE/Respiratory Protective Equipment” means a device, which is worn over at least the mouth and nose to prevent the inhalation of hazardous chemical substances and which is of a type, or conforms to a standard approved by the minister.

“STEL” A short-term exposure limit (STEL) is the acceptable average exposure over a short period of time, usually 15 minutes.

“VOC” Volatile Organic Compound.

“TWA” means the average of a number of representative measurements that are taken over a period of time and that are calculated as follows:

$$t_1 + t_2 + t_3 + \dots + t_n$$

Time-weighted average = $\frac{x_1t_1 + x_2t_2 + x_3t_3 + \dots + x_nt_n}{t_1 + t_2 + \dots + t_n}$

were x_1, x_2 etc., are the observed measurements during the corresponding periods t_1, t_2 etc., minutes and $t_1 + t_2 + \dots + t_n$ is the total time in minutes over which the measurements are taken.

References

- South African Occupational Health and Safety Act, No. 85 of 1993 – Regulations for Hazardous Chemical Agents, 2021.
- MDHS (Methods for the determination of hazardous substances). MDHS 14/4. General methods for sampling and gravimetric analysis of respirable, thoracic and inhalable aerosols. Health and Safety Executive. <https://www.hse.gov.uk/pubns/mdhs/>
- NIOSH Manual of Analytical Methods, as per website www.cdc.gov
- NIOSH Pocket Guide to Chemical Hazards. <https://www.cdc.gov/niosh/npg/default.html>
- Occupational Exposure Sampling Strategy Manual (OESSM).
- The American Conference of Governmental Industrial Hygienists (ACGIH). Threshold Limit Values for Chemical Substances and Physical Agents & Biological exposure Indices. www.acgih.org
- A review of health effects associated with exposure to jet engine emissions in and around airports, Katja M. Bendtsen, Elizabeth Bengtsen, Anne T. Saber & Ulla Vogel, Environmental Health volume 2021. <https://ehjournal.biomedcentral.com/articles/10.1186/s12940-020-00690-y#Fig1>

5. Noise Survey

5.1 Purpose

The purpose of this survey was:

- To reflect the results and findings of noise measurements for noise zoning and hearing conservation purposes.
- To reflect the results and findings of Personal Noise exposure measurements for hearing conservation purposes.
- To recommend appropriate Occupational Health Risk Management measures aimed at the prevention of occupational diseases and ill health effects, amongst employees.
- To obtain baseline noise levels of the work areas for noise zoning.
- To evaluate these noise levels in accordance with SANS 10083 and to the occupational exposure limit as promulgated in the OHS Act (Act No 85 of 1993).
- To make the necessary recommendations to ensure legal compliance.

5.2 Legislation and Standards

1. STATUTORY REQUIREMENTS:

Occupational Health and Safety Act (OHS Act; No 85 of 1993)

Regulation 8. General duties of employers to their employees

(1) Every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees.

Noise Induced Hearing Loss Regulations

In terms of Noise Induced Hearing Loss Regulations, 2001, promulgated under the Occupational Health and Safety Act (OHS Act; No 85 of 1993), no employers shall require or permit an employee to work in an environment in which he is exposed to an average, 8 Hour Equivalent Noise Rating Level, equal to or exceeding 85 dB(A).

Furthermore, in terms of the OHS Act in general and the Noise Induced Hearing Loss Regulations - 2001 in specific, every employer has an obligation to assess/identify, evaluate and control all potential health hazards (including noise) to which his employees may be exposed.

2. RECOMMENDED STANDARDS:

SANS 10083:2013 – The measurement and assessment of occupational noise for hearing conservation purposes.

3. INDUSTRY BEST PRACTISE:

Regulation 22.9 (b) (i) (2) of the Mines Health and Safety Act, Act 29 of 1996 specifies the exposure limit for Peak Sound Levels to be 135 dB(A). Although the MHSA is not legally applicable to industries under the OHS Act, the OEL is applied in this report as an “Industry Best Practise”.

The following typical exposure limits were employed for direct comparison:

SOURCE	STATUS	DESCRIPTION/ AREA	NOISE RATING LIMIT ($L_{Req,T}$)
OHS Act SANS 10083	Legislative Requirement	OEL for area and personal noise exposure (8 hour TWA)	85
MHS Act	Industry Best Practise	Peak Sound Level Exposure	135

5.3 Survey Methodology

1. Area Noise Zoning:

An external calibrated type 1, Casella Integrating, Sound Level Meter was used to perform this survey. The sound level meter was internally calibrated before use and verified after measurements with sound level calibrator. This instrument was used to determine the average, equivalent, continuous Noise Levels; $L_{Req,T}$ and 8 Hour Equivalent Noise Rating Levels ($L_{Req,8h}$).

The noise survey was performed in strict accordance with the legislated method for evaluating the workforce for hearing conservation purposes as prescribed in the SANS 10083: The measurement and assessment of occupational noise for hearing conservation purposes. The formulas specified in the above-mentioned code were also used to convert the measured Noise Levels ($L_{Req,T}$) to 8 Hour Equivalent Noise Rating Levels ($L_{Req,8h}$), where applicable.

Measurement positions were determined by selecting representative workstations or alternatively at least 3 positions were selected which are representative of the work area noise characteristics. Each individual measurement was taken over a representative period of time to ensure that all possible variations in noise generation in the area i.e. all possible noise sources are included in the measurement value.

Measurements were taken over shorter periods of time where there was no/ limited variation in the noise generation i.e. the noise generated will be constant/the same for the whole shift or duration of a specific activity (i.e. operating a specific piece of machinery).

The noise rating levels, which can be defined as the values of the impulse-corrected equivalent continuous A-weighted sound pressure levels, within a specific time interval that is representative of the noise in the working environment, were determined and are presented in the Results Tables.

Please consult SANS 10083: for further supporting information on the acoustical terminology and assessment methods utilised in this report. Certificates at end of report.

2. Personal Noise Monitoring (Dosimetry):

A set of calibrated Casella CEL-350/IS, Noise dosimeters was used to determine personal exposure. The instruments were externally calibrated as well as internally calibrated before and verified after measurements using the sound level calibrator. Certificates at end of report.

The noise rating levels, which can be defined as the values of the impulse-corrected equivalent continuous A-weighted sound pressure levels, within a specific time interval that is representative of the noise in the working environment, were determined and are presented in the Results Tables.

The following definitions & formulae were utilised in order to assess noise exposure levels, and are expressed in appropriately corresponding terms when referenced in the results tables.

<p>A-weighted sound pressure level (L_{pA}), in decibels:</p> $L_{pA} = 10 \log (\rho A / \rho O)^2$	<p>Where:</p> <p>ρA – is the A-weighted root-mean-square sound pressure, in Pascal’s; and</p> <p>ρO – is the reference sound pressure ($\rho O = 20 \mu Pa$).</p>
<p>Equivalent continuous rating level ($L_{Req,T}$), in decibels:</p> $L_{Req,T} = LA_{eq,T} + C_i$	<p>Where:</p> <p>$LA_{eq,T}$ – is the equivalent continuous A-weighted sound pressure level (refer to clause 3.1.15 of SANS 10083 for the equation); and</p> <p>C_i – is the impulse correction (a standard adjustment for impulsiveness of the sound)</p>
<p>Where individual work shifts differ in duration from a normal 8 hour work shift, the 8 h equivalent</p>	<p>Where:</p> <p>$L_{Req,8h}$ – is the equivalent continuous rating level,</p>

continuous rating level ($L_{Req,8h}$) was calculated from the following equation:

$$L_{Req,8h} = L_{Req,Ts} + 10 \log \frac{T_s}{8}$$

determined for a time interval of the duration of the work shift;

T_s – is the total duration of the work shift, in hours;

8 – is the total duration of the reference time interval, in hours

Note that if the time duration of the work shift is 8 h, the equivalent continuous shift rating level becomes the equivalent continuous 8 h rating level and this calculation is therefore not required.

Please consult SANS 10083 for further supporting information on the acoustical terminology and assessment methods utilised in this report.

5.4 Hazards and Health Effects

Area and Personal Exposure Noise:

When hearing is lost because of noise exposure, it cannot be restored. By law, companies whose workers are exposed to high noise levels must have an active program for protecting their employees' hearing. This program should contain provisions for identifying and evaluating high noise exposures, controlling and reducing noises in the workplace and, when necessary, protecting workers to prevent hearing loss and monitor their hearing.

Noise may be defined as unwanted, disturbing and physiologically damaging sound. Continuous exposure to noise levels equal to or above 85 dB(A), averaged over eight hour work day, may cause noise induced hearing loss (NIHL) which is permanent and irreversible.

The effects of the above noise exposure on employees include:

- Noise induced hearing loss;
- Acoustic trauma which is sudden hearing damage caused by short burst of extremely loud noise such as a gunshot;
- Tinnitus which is ringing or buzzing in the ear;
- Temporary threshold shift (TTS) which occurs immediately after exposure to high level of noise. Recovery is gradual if the exposed individual spends time in a quiet place, complete recovery may take several hours;
- Permanent threshold shift (PTS) progresses constantly as noise exposure continues month after month. The hearing impairment is noticeable only when it is substantial enough to interfere with routine activities. At this stage a permanent and irreversible hearing loss has occurred. When exposure stops the person does not regain the lost hearing sensitivity. As the person ages, hearing may worsen as "age-related hearing loss" adds to the existing noise induced hearing loss;
- Masking of wanted sounds such as warning signals and conversation;
- Non-auditory effects such as abnormal adrenal hormone secretion, increased heart rate, disturbed sleep patterns and fatigue.

Damage to hearing generally occurs gradually over a number of years and may remain unnoticed until it is too late. Exposure to excessive noise is cumulative. If you have already been exposed to excessive noise at work and then expose yourself to more noise during gardening, hobby or leisure activities (including listening to MP3 players at high volume), your chances of sustaining noise induced hearing loss are substantially increased. Noise induced hearing loss is slow and painless and is permanent. There is no cure but it can be prevented. Exposure to noise in a work environment causes a number of physiological and psychological responses. Noise can have the following effects:

- Annoyance and speech interference;

- Interference with concentration and thought processes;
- Loss of productivity;
- Sleep disturbance;
- Fatigue and aggression;
- Reduced immune response;
- Heart disease.

The body's automatic nervous system attempts to adjust the body functions by:

- Increasing the heart rate and raising the blood pressure;
- Releasing the hormones adrenalin and cortisol.

Adrenalin prepares the body's 'fight or flight' reaction and cortisol prepares the body for stress. However, prolonged high levels of adrenalin and cortisol under stressful working conditions may lead to more serious health effects. Some of the main effects are:

- Raised blood pressure;
- Acceleration of heart rate;
- Stress which can lead to irritability and headaches;
- Hypertension increasing the risk of strokes and heart attacks, reduced white blood cell count;
- Reduced immune response;
- Gastric ulcers.

These effects can happen with both high and low level noise exposures in the workplace. High level noise may initially cause dull hearing with perhaps ringing in the ear as well. With regular exposures, this will lead to loss of hearing as well as health effects.

Low level noise experienced as annoying or as interfering with activities or concentration, causes stress and similar health effects as high level noise. Effective noise control measures have a positive effect on people. They increase a sense of well-being and privacy which in turn results in a greater acceptance of the work environment.

Some indicators that your hearing may be at risk:

- Raising your voice in a noisy workplace when you are talking to someone about one meter away from you.
- Your hearing sounds dull at the end of the working shift.
- Ringing in the ears (tinnitus) during or after work.

Hearing can also be damaged immediately by exposure to impulsive noise such as from explosive powered nail guns, firearms, stamping presses and forges. The hair cells in the inner ear are destroyed by loud noise. Once they are destroyed they do not grow back.

Noise induced hearing loss may result in not being able to hear warning sounds (such as alarms or car horns) or workplace noises such as supervisors giving directions. Work effects include increased absenteeism and lower productivity.

Chemicals and Noise - A Hazardous Combination:

It is no surprise that most work-related hearing loss is caused by noise exposure, and that genetics and age can also be contributors. What may not be as well known is that some chemical exposures can pose a potential risk to hearing. Both animal experiments and human studies suggest that certain chemical exposures may cause "ototoxic" effects (damage the hearing and balance functions of the ear). In general, the exposure concentrations that cause these effects are considered high. However, exposure to some of these chemicals and noise at the same time can significantly increase the risk of developing ototoxic effects.

Ototoxins are chemicals which can damage hearing and can cause mild to severe hearing loss, tinnitus (ringing in the ears), or deafness. An ototoxin can be ingested, absorbed, or inhaled into the body. Once in the bloodstream, the ototoxin is circulated to the ear and absorbed by the auditory nerve, damaging the nerve and causing hearing loss. Ototoxins can also cause hearing loss by damaging the cochlear hair cells (as happens in hearing loss caused by noise).

Effects of chemical exposure on hearing:

Ototoxic chemicals can cause hearing loss on their own, however when combined with noise exposure, the effects can be even more severe. Organic solvents are the most commonly identified chemicals, but others may also be involved (e.g. metals and chemical asphyxiant). The hearing frequencies affected by solvent exposure are different than those affected by noise. Research suggests that solvents may interact synergistically with noise. Even when noise and chemicals are at permissible exposure levels, the impact of a combined exposure can do more damage than a higher exposure to either hazard alone.

Several chemicals associated with hearing loss:

- Benzene
- Carbon disulphide
- Carbon monoxide
- Ethyl benzene
- Hydrogen cyanide
- Lead
- Mercury
- n-Hexane
- Solvent mixtures
- Styrene

- Trichloroethylene
- Toluene
- Xylene

5.5 Results and Discussion

1. Area Noise:

The results of the area noise survey follow in tables below.

Measurements indicated in the Table was colour coded according to the following:

< 82 dB(A)

≥ 82 < 85 dB(A)

≥ 85 dB(A)

Legend:



Demarcated as Noise zone



Proposed demarcation as noise zone

2. Personal Noise Exposure (Dosimetry):

The results of the area personal noise exposure survey follow in tables below.

Measurements indicated in the Table was colour coded according to the following:

< 82 dB(A)

≥ 82 < 85 dB(A)

≥ 85 dB(A)

Exceeding peak sound level 135 dB(A)

TABLE 5.5.1 – NOISE SURVEY FOR HEARING CONSERVATION PURPOSES FOR ACSA EAST LONDON IN EC, ON 29 SEPTEMBER 2021.

MEASUREMENT POSITION	SECTION OR ACTIVITY	MEASURED NOISE LEVELS (L _{Req,T}) IN dB(A)	AVERAGE NOISE RATING LEVEL (L _{Req,T}) IN dB(A)	EQUIVALENT 8 HOUR EXPOSURE RATING LEVEL (L _{Req,8h}) IN dB(A)	EXPOSURE/SHIFT DURATION (HOURS)
AREA: FIRE STATION					
A	General in fire station with ventilation system on/ off.	On - 75.1-79.1 Off - 62.2-78.5	76.7 66.2	76.7 66.2	General noise in the station under normal circumstances.
B	Corridor office at the Fire Station during vehicle testing	86.9-101-6 88.7-95.1 88.6-95.0	91.2 90.9 90.1	Noise during testing = 90.8	Rescue vehicle used for emergencies. Started Daily to ensure all functions are in order.
C	Rosenbaumer FDB835EC	87.1-91.8	89.4	Operational Noise = 89.4	Exposure of 30 minutes in noise can equal to 88.2 dBA daily exposure.
D	Rosenbaumer HLW531GP	89.8-99.4	96.8	Operational Noise = 96.8	
E	Rosenbaumer JDG962GP	91.0-95.4	93.5	Operational Noise = 93.5	
F	Equipment : - Stihl Chainsaw - Stihl Circular Saw	95.4-100.4 91.3-101.1	99.9 97.5	Operational Noise = 99.9 97.5	Noise from equipment when used/ tested. PPE Worn by team.
G	Fire Alarm	93.4-96.1	95.3	Alarm Sounding = 95.3	Alarm tested daily, short time and for emergencies.

DISCUSSION**Noise sources & Findings:**

At the fire station noise sources were infrequent but high during an emergency. Sources identified in the Fire station area included vehicles and equipment used. High intermittent noise may include Emergency Response Alarm, Fire Truck revving/ acceleration.

Further equipment known to be noisy tools included Chain Saw and circular saw that generates fluctuating noise when used. Exposure of 30 minutes in noise can equal to 88.2 dBA daily exposure.

Engineering controls:

Majority of equipment are OE items used and maintained according to the suppliers requirements. Due to the vehicles / equipment application, some of these do generate high noise by design.

Administrative controls:

Employees are trained in safe work and need to adhere to noise control measures and undergo audiometric testing every 12 months. Areas are demarcated as noise zones.

PPE controls:

Employees were provided with PPE, ie Noise Clippers and Ear Muffs (NRR = 25), which provided sufficient protection against noise levels measured. These must be correctly fitted, worn and maintained.

Legend:

< 82 dB(A)

≥ 82 < 85 dB(A)

≥ 85 dB(A)

MEASUREMENT POSITION	SECTION OR ACTIVITY	MEASURED NOISE LEVELS (L _{Req,T}) IN dB(A)	AVERAGE NOISE RATING LEVEL (L _{Req,T}) IN dB(A)	EQUIVALENT 8 HOUR EXPOSURE RATING LEVEL (L _{Req,8h}) IN dB(A)	EXPOSURE/SHIFT DURATION (HOURS)
AREA: APRON WITH PLANE ACTIVITY, AIRLINK, ENB135 AND MAINTENANCE WORKSHOP					
A	Plane Engine at Idle @ 5 m	77.7-87.1	84.5	Equivalent exposure time 1 hour = 75.8	Tug use to push plane as required, each plane takes around 10 min. No activity noise level of 65 dBA used for calculations.
B	Back of the Plane	84.6-101.6	95.6	Equivalent exposure time 1 hour = 86.6 3 hours = 91.3	OPS side used for staff for loading and off-loading during plane turn arounds.
C	Loading on Passenger side	81.5-85.7 79.4-85.2	83.1 81.5 (82.4)	Equivalent exposure time 1 hour = 73.9 3 hours = 78.3	Time spent depends on number of planes. Most of activities take around 20 minutes per turn around.
D	Maintenance workshop - Noisy equipment use, Hammer work - Grinding - Pneumatics, Compressed air	105.6 97.5 98.5	105.6 97.5 98.5	Average use per day 30 Min = 93.6 1 Hour = 96.6	Maintenance sections intermittently make use of equipment that can generate high noise. These must be managed.

DISCUSSION

Noise sources & Findings:

The noise sources comprised Aircrafts and Apron activity and vehicles used. The noise is Fluctuating noise type and intermittent by nature of plane landing and taking off. The longer periods in between planes, mean lower noise exposure for employees.

Maintenance and repair teams too are exposed to high noise levels from equipment used, or areas worked in, their exposure is intermittent but present high risk due to exposures when repairing equipment, ie 30 min = 93.6 dBA. The teams must be closely monitored for correct work and adherence to all control strategies for hearing protection.

Engineering controls:

Modern planes operating at levels by designer, ie Boeing or Airbus.

Administrative controls:

Employees are trained in safe work and need to adhere to noise control measures and undergo audiometric testing every 12 months. Areas are demarcated as noise zones.

PPE controls:

Employees were provided with PPE, ie Noise Clippers and Ear Muffs (NRR = 25), which provided sufficient protection against noise levels measured. These must be correctly fitted, worn and maintained.

Legend:

< 82 dB(A)

≥ 82 < 85 dB(A)

≥ 85 dB(A)

NOISE MAP OF THE FIRE STATION VEHICLES AT ACSA EAST LONDON, ON 27 September 2021



C Rosenbaumer FDB835EC
Noise when operational = 89.4



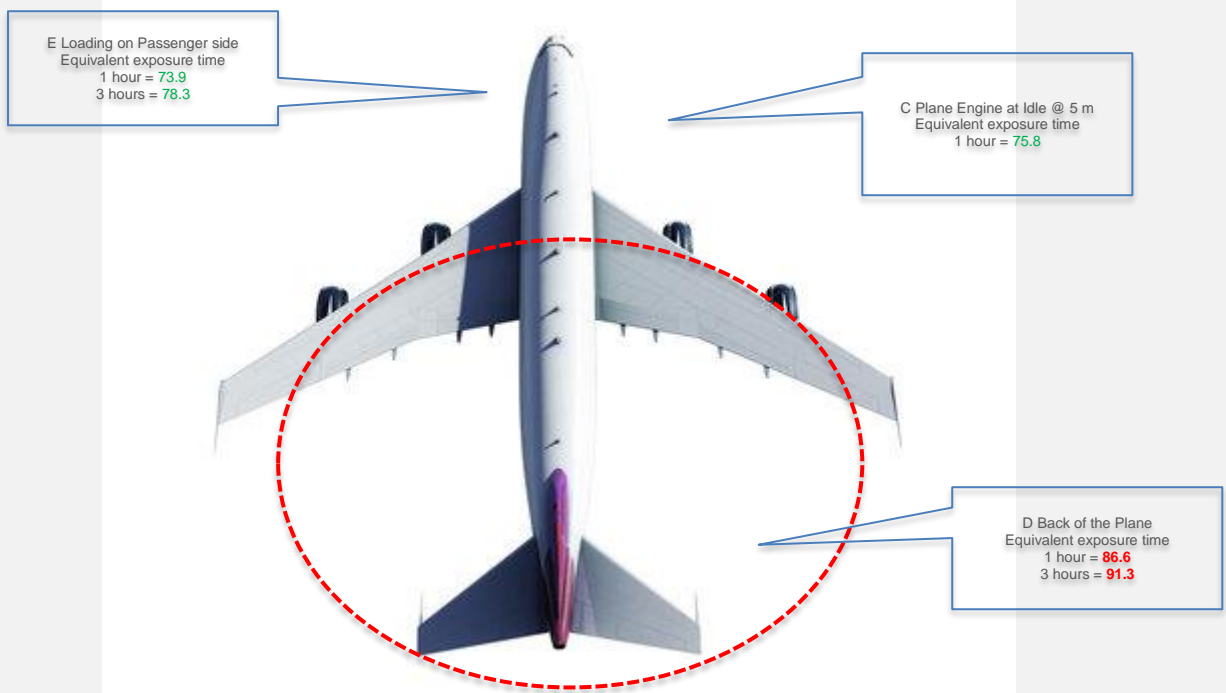
D Rosenbaumer HLW531GP
Noise when operational = 96.8



E Rosenbaumer JDG962GP
= 93.5

Examples of vehicles.

NOISE MAP OF THE APRON SIDE AT ACSA EAST LONDON, ON 27 September 2021



Legend:
A – J

< 82 dB(A)
Measurement positions

≥ 82 < 85 dB(A)

≥ 85 dB(A)



Demarcated as Noise zone



Proposed demarcation as noise zone

TABLE 5.5.2 – NOISE DOSIMETRY SURVEY FOR HEARING CONSERVATION PURPOSES FOR ACSA EAST LONDON IN EC, ON 28 SEPTEMBER 2021.

NAME AND OCCUPATION	SECTION OR ACTIVITY	TWA NOISE RATING LEVEL ($L_{EX,8h}$) dB(A)	PEAK SOUND LEVEL (L_{Cpk})	EXPOSURE COMMENTS
MOBILE EMPLOYEES				
Sydney Siduli Fire Team Responder	Equipment testing in Emergency Services Building	95.5	126.7	Day shift: 07:30 – 16:30 9 hour shift. Shift roster applied as per plane arrivals.
Sydney Siduli Fire Team Responder	General work in Emergency Services and Apron	70.9	117.4	Noise sources: airplanes arrival and departure, apron vehicles, equipment used.
Nadia Wuso Apron Marshall	Fire Team activities in office and Site.	79.9	120.9	Operators provided with HPE (moulded earplugs & custom made earplugs / Variphones).
Nadia Wuso Apron Marshall	Marshall on Apron with airplane arrival and turn around	87.8	111.4	
DISCUSSION				
<p>Fire team performed emergency services inspections and Apron marshalling supervision during turn around of the planes. General duties and more office based work had exposures of 70.9 to 79.9 dBA. This exposures were below the exposure limit of 85 dBA.</p> <p>Time spent on apron within a shift depends on the number of planes during a shift. The 8-hour equivalent noise exposures ranged from 87.7 to 95.5 dBA when working on the Apron and close to Airplane noise sources. This was above the exposure limit of 85 dBA.</p> <p>The Grass cutting was not performed during the survey, but will contribute to noise levels.</p> <p>The peak sound level was not exceeded for the staff on site during the surveys. Peak sound level is the peak level of the sound pressure wave with no time constant applied. The peak level is used to protect employees against sudden large pressure peaks in the environment.</p> <p>Engineering controls: Engineering controls implemented as per design of equipment. Sources generate high noise.</p> <p>Administrative controls: Employees are trained in safe work and need to adhere to noise control measures and undergo audiometric testing every 12 months. Areas are demarcated as noise zones.</p> <p>PPE controls: Employees were provided with PPE, ie Noise Clippers and Ear Muffs (NRR = 25), which provided sufficient protection against noise levels measured. These must be correctly fitted, worn and maintained.</p>				

Legend:

< 82 dB(A)

≥ 82 < 85 dB(A)

≥ 85 dB(A)

Exceeding peak sound level 135 dB(A)

5.6 Specific Management Interventions

1. In light of the evaluation of the results, areas with high noise should be demarcated. Similarly the vehicles or planes should be regarded as noise zones due to the noise levels liberated.
2. Demarcate all entry and exit points to the identified noise zones (not only the exits/ entrances) with the mandatory signs. Ensure that these signs are conspicuous in the working areas to create awareness.
3. Enforce and monitor the use of HPE in the noise zones, this includes management and stake holders.
4. Ototoxins are chemicals which can damage hearing and can cause mild to severe hearing loss, tinnitus (ringing in the ears), or deafness. An ototoxin can be ingested, absorbed, or inhaled into the body. Ototoxic chemicals can cause hearing loss on their own, however when combined with noise exposure, the effects can be even more severe. Where these are identified on site specific management intervention may be required to address.
5. Pre-employment, periodic and post-employment medical surveillance to be conducted for all employees exposed to noise levels ≥ 85 dB(A) in accordance with Section 10 of the Noise Induced Hearing Loss Regulations.

5.7 General Recommendations

1. Area Zoning:

The areas with average noise rating levels above 85 dB(A) must be demarcated as noise zones.

Areas are demarcated as noise zones by posting the following sign at all entrances to, or at the boundaries of the areas. Similarly, Noisy Machinery or mobile equipment can be identified as such by pasting stickers depicting this sign on the equipment itself.



This symbolic sign conspicuously identifies the area as a Noise Zone and indicates that the wearing of Hearing Protection Devices (HPD's) is compulsory, irrespective of the duration of entry into the Noise Zone.

2. Engineering Controls:

In accordance with Regulation 10(2) of the Noise Induced Hearing Loss Regulations, OHS Act (No 85 of 1993), engineering control measures should be implemented in plant areas in order to reduce noise at its source.

These measures may take the form of acoustic isolation of equipment at its source and/or maintenance of noisy equipment in order to prevent vibration or excessive liberation of noise.

When considering a new workplace or modifying an existing one, noise emissions and noise exposure can be limited by careful choice of design, layout and the construction materials used for the building.

Noise levels may be reduced by the following engineering controls:

(a) Screens and barriers:

Screens, barriers or walls can be placed between the source of the noise and the people to stop or reduce the direct sound. Barriers should be constructed from a dense material like brick or sheet steel, although chipboard and plasterboard can be used. The use of screens between noise tasks may be beneficial to reduce noise exposure to surrounding areas.

Screens and barriers work best when they are placed close to the noise source or close to the people you are trying to protect. The higher and wider they are, the more effective they are likely to be. They work best in rooms with either high or sound-absorbent ceilings.

Covering the barrier or screen with noise-absorbing material on the side facing the noise source will have the added advantage of reducing the sound reflected back into that area containing the noise source. Those workplaces which have already been treated with sound-absorbing material will help to create conditions

which will allow the screen or barrier to perform to its maximum potential, since in these cases the direct noise is likely to be the dominant source. Fitting sound absorbent materials to ceilings and walls will reduce noise exposure.



Figure 1: Example of a noise screen

(b) Enclosures:

Noisy areas such as grinding tasks can be conducted in isolated areas (isolated booths) away from employees conducting other tasks. Alternatively, noise barriers can be used to direct noise away from employees.



Figure 2: Example of a noise enclosure

(c) Dampening materials:

Various tools and instruments can be covered with dampening materials to prevent metal on metal contact, and ultimately reducing noise output.



Figure 3: Examples of dampening materials

(d) Mobile equipment and Forklift / Tractor noise:

Referring to the International Standard Ergonomics— Danger signals for public and work areas— Auditory danger signals [ISO 7731, 2003]. The standard states that the alarm signal must not be lower than 65 dB(A) and not greater than 118 dB(A). Also, the difference between the two A-weighted sound-pressure levels of the alarm signal and the ambient noise shall be greater than 15 dB.

The following can also be considered to reduce forklift noise:

- Forklift maintenance, as well as pre-operational checks, your forklift maintenance programme should include a regular schedule of services, preventative maintenance, inspections and cleanings. These pre-operational checks should be done according to the manufacturer's recommendations and relevant standards.
- Types of tyres and road surface contribute to noise exposure.
- Type of Forklift will affect the noise generated e.g. Fuel operated vs. battery powered.
- Vibrating or loose components (metal on metal contact) on the forklift may contribute to noise exposure.
- Components added to the forklift (such as attachments, control and warning devices) must also be maintained and serviced.
- Training and safe driver practises should be applied.

3. Administrative Controls:

Where some employees do noisy jobs all day, and others do quieter ones, consider introducing job rotation. This might need you to train employees to carry out other jobs. You should be aware that this system will reduce the noise exposure of some employees while increasing that of others, so care and judgment is needed. In addition, employees will need to be rotated away from noisy jobs for a significant proportion of time to make

an appreciable difference to their daily exposure. This is because daily exposure is dominated by time in noisy areas.

4. Hearing Protection Devices (HPD's):

Any person required to enter, or work in any of the above-mentioned Noise Zones, must be issued with appropriate Hearing Protective Devices (HPD's).

In order to ensure success with enforcing the compulsory wearing of HPD's in the Noise Zones, individual employees should be allowed to select a HPD of his/her choice from a wide variety of types and sizes.

The HPD's provided to employees (and visitors) should be:

- for the sole use of a person;
- maintained in an efficient and hygienic condition;
- stored in a clean, dust-free container when not in use, and of a type that is comfortable and preferred by employees as this usually assists in breaking down resistance to the wearing of HPD's.

Effectiveness of HPD's are dependant on the correct donning thereof, and therefore it is important that employer ensures that employees are informed concerning the correct use of HPD's. If employee do not encounter a proper fit, the employee should either try a smaller size HPD or a different type. The diagram below describes the correct donning procedure of different types HPD's. Posters like these are available and can be used in the workplace.



Correct donning procedure for various HPD's (HSE Solutions).

5. Training:

After consultation with the health and safety committee and the health and safety representative, designated for that workplace, a Training Program must be established for all employees who may be exposed to noise at or above the Noise Rating Limit that incorporates the following:

- the content and scope of the NIHL Regulations.
- the potential sources of exposure to noise in the specific work environment.
- the potential risks to health and safety caused by exposure to noise.
- the measures taken by the employer to protect an employee against the detrimental effects of exposure to noise.
- the precautions to be taken by the employees to protect themselves against the health risks associated with the exposure, including the wearing and use of earplugs and earmuffs.
- the necessity, correct use, maintenance and limitations of hearing protectors, facilities and engineering control measures provided.
- the assessment of exposure, the purpose of noise monitoring, the necessity for medical surveillance and the long-term benefits and limitations of undergoing such surveillance.

- the Noise Rating Limit for hearing conservation and its meaning.
- the procedures for reporting, correcting and replacing defective personal hearing protectors and for engineering noise control measures.

Records of training given to an employee, as detailed above, must be kept for as long as the employee remains employed at the workplace in which he/she is being exposed to noise.

Such training must also be conducted prior to the placement of the relevant employee.

Refresher training must be conducted annually or at intervals that may be recommended by the health and safety committee and the health and safety representative.

The above-mentioned training must be provided by a person who is competent to do so and who has adequate personal practical experience and theoretical knowledge of all aspects of the work carried out by the employee.

All visitors or persons other than employees who may be affected by noise exposure at the workplace, must also be given adequate information, instruction and training and must be provided with at least disposable hearing protectors.

6. Workplace monitoring:

Noise exposure assessments and/or measurements must be repeated at intervals not exceeding 2 years or as soon as any changes occur that could result in a change in or redistribution of noise levels, or if there is any suspicion that the current/previous assessment is no longer valid (upon acquisition of new machinery/equipment, relocation of potentially noisy equipment, etc.).

7. Records:

Records of assessments, noise monitoring (i.e. this Report), and all medical surveillance must be kept for a minimum period of 40 years.

8. Medical Surveillance:

For the purpose of this noise survey/assessment it is recommended that periodic testing annually accompanied with a (baseline) and an exit (upon termination of employment) audiogram be taken from the site employees.

- (1) Medical Surveillance (in this case, Audiometric Testing) may only be conducted by a certified, competent person. Meaning:
 - A person registered in terms of the Health Professions Act, 1974 (Act No. 56 of 1974), with the Health Professions Council of in any of the following three categories:
 - (i) Otorhinolaryngologist (ear, nose and throat specialist);
 - (ii) speech therapist and audiologist; or
 - (iii) occupational medicine practitioner or
 - A person with a qualification in audiometric techniques obtained from an institution registered with the a Qualification Authority or any of its structures in terms of the n Qualifications Authority Act, 1995 (Act No. 58 of 1995), and registered with the n Society for Occupational Health Nursing (SASOHN);
- (2) All persons that are potentially excessively exposed to noise, or could in future be excessively exposed to noise (i.e. new employees, or those regularly operating noisy machinery, their assistants, and persons regularly working in the noise zones), should be subjected to an audiometric testing

programme, as contemplated in Regulation 8 of the Noise Induced hearing Loss Regulations and SANS 10083, that includes:

- (a) A Baseline Audiogram which is recorded:
 - (i) in the case of a new employee, before the employee commences employment or within 30 days of commencement of such employment; or
 - (ii) in the case of all other employees in the employment of the employer, before 16 November 2003; and
 - (iii) in accordance with the requirements of Instruction No. 171: Provided that the baseline audiogram conducted in terms of that instruction applies to that employee for the rest of his or her working career;
 - (b) a periodic audiogram which is conducted in accordance with SANS 10083 and which, during the first three years of employment, is obtained at least annually and thereafter at intervals which may be extended to a maximum period of two years if no referral threshold shift is evident. **For employees exposed to Noise rating Levels equal to in excess of 105 dB (A); periodic audiograms must be obtained at least 6 monthly.**
 - (c) consist of an exit audiogram, conducted in accordance with SANS 10083, which is obtained for every employee whose employment is terminated or who is permanently transferred to another workplace in respect of which audiometric tests are not required: Provided that an audiogram conducted within six months prior to termination of employment or transfer shall meet this requirement; and
 - (d) is performed by a competent person: Provided that if it is impossible for the competent person to establish a baseline audiogram for an employee as contemplated in paragraph (a), the employee must be referred to an audiologist who may establish baseline-hearing levels by using other techniques, such as speech reception thresholds.
- (3) An employer shall ensure that:
- (a) copies of the audiograms contemplated in subparagraphs (2)(a), (b) and (c) are entered into the employee's record of medical surveillance;
 - (b) a copy of each audiogram contemplated in subparagraphs (2)(a) and (c) is given to the employee when he or she leaves the employment of that employer;
 - (c) new employees provide him or her with their baseline audiograms, exit audiograms or most recent audiograms and the percentage of loss of hearing calculated in accordance with instruction No. 171; and
 - (d) in the case of an employee whose percentage loss of hearing has deteriorated by 10% or more since the baseline audiogram was recorded or an employee for whom no baseline audiogram is available but who has a 10% or more loss of hearing that is not obviously due to medical causes, and that has been confirmed by a repeat audiogram:
 - (i) the relevant health and safety committee or the relevant health and safety representative is informed of the finding;
 - (ii) the employee is retrained and re-instructed;
 - (iii) noise control measures are reassessed; and
- (iv) such hearing loss is reported to the provincial director, on form ECL1/2, as contemplated in Regulation 6 of the General Administrative Regulations, 2003.

5.8 Conclusion *

This noise survey was performed to reflect the results and findings of work place and personal noise exposure measurements for hearing conservation purposes and to obtain baseline noise levels of the work areas for noise zoning.

In order to recommend appropriate Occupational Health Risk Management measures aimed at the prevention of occupational diseases and ill health effects, amongst employees and to evaluate these noise levels in accordance with SANS 10083 and to the occupational exposure limit as promulgated in the OHS Act (Act No 85 of 1993).

Fire Station

At the fire station noise sources were infrequent but high during an emergency. Sources identified in the Fire station area included vehicles and equipment used. High intermittent noise may include Emergency Response Alarm, Fire Truck revving/ acceleration.

Further equipment known to be noisy tools included Chain Saw and circular saw that generates fluctuating noise when used. Exposure of 30 minutes in noise can equal to 88.2 dBA daily exposure.

Aircraft and Apron Activity

The noise sources comprised Aircrafts and Apron activity and vehicles used. The noise is Fluctuating noise type and intermittent by nature of plane landing and taking off. The longer periods in between planes, mean lower noise exposure for employees.

Maintenance and repair teams too are exposed to high noise levels form equipment used, or areas worked in, their exposure is intermittent but present high risk due to exposures when repairing equipment, ie 30 min = 93.6 dBA. The teams must be closely monitored for correct work and adherence to all control strategies for hearing protection.

Personal Noise exposures

Fire team performed emergency services inspections and Apron marshalling supervision during turn around of the planes. General duties and more office based work had exposures of 70.9 to 79.9 dBA. This exposures were below the exposure limit of 85 dBA.

Time spent on apron within a shift depends on the number of planes during a shift. The 8-hour equivalent noise exposures ranged from 87.7 to 95.5 dBA when working on the Apron and close to Airplane noise sources. This was above the exposure limit of 85 dBA.

The Grass cutting was not performed during the survey, but will contribute to noise levels.

A risk based approach must be followed with the recommendations looking at high risks first and then addressing other issues.

Definitions

“Auditory Effect”: Effects relating to hearing, the organs of hearing, or the sense of hearing.

“NRR”: Noise Reduction Rating.

“Noise Zone”: An area where the equivalent noise level is equal to or exceeds 85dB(A) when measured in accordance with SANS 10083 – as amended.

“Effective Noise Reduction Rating”: NRR of HPE minus 7 divided by 2.

“Safe Distance”: $d2 = d1 \times \text{antilog} ((Lp1 - 85)/20)$

where:

d1 – Distance from noise source

Lp1 – Sound level measured

d2 – Safe distance

References

- MHSA (Mine Health and Safety Act and Regulations). (2006) In terms of Regulations 22.9 (2)(b). Occupational exposure limits for physical agents.
- SANS 10083 – The measurement and assessment of occupational noise for hearing conservation purposes.
- SANS 10103 – The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication
- SANS 10182:2006 – The measurement and assessment of acoustic environments for audiometric tests.
- SANS 11688-1:1995 – Acoustics - Recommended practice for the design of low-noise machinery and equipment Part 1: Planning.
- SANS 11688-2:1998 – Acoustics - Recommended practice for the design of low-noise machinery and equipment Part 2: Introduction to the physics of low-noise design.
- SANS 11690-1:1996 – Acoustics – Recommended practice for the design of low-noise workplaces containing machinery Part 1: Noise control strategies.
- SANS 11690-2:1996 – Acoustics – Recommended practice for the design of low-noise workplaces containing machinery Part 2: Noise control measures.
- SANS 1451-1:2008 – Hearing protectors Part 1: Ear-muffs.
- SANS 1451-2:2008 – Hearing protectors Part 2: Ear-plugs.
- SANS 60942:2003 – Electro acoustics - Sound calibrators.
- SANS 61672-1:2003 – Electro acoustics - Sound level meters Part 1: Specifications.
- SANS 61672-2:2003 – Electro acoustics - Sound level meters Part 2: Pattern evaluation tests.
- South African Occupational Health and Safety Act, No. 85 of 1993 – Regulations for Noise Induced Hearing Loss (2003).

6. FACILITIES AND HBA HYGIENE ASSESSMENT

6.1 Purpose

The purpose of this report is:

- To reflect the findings of a Facilities Evaluation with regard to hygiene and the Hazardous Biological Agents (HBA) Regulations.
- To review the findings of surface swabs/ water samples for hygiene and cleanliness.
- To propose the necessary recommendations to ensure compliance to statutory requirements.

6.2 Legislative Requirements and Standards

Occupational Health and Safety Act and Regulations, No 85 of 1993,

Regulations for Hazardous Biological Agents:

Scope of application

(1) Subject to sub regulation (2), these Regulations shall apply to every employer and self-employed person at a workplace where –

(a) HBA is produced, processed, used, handled, stored or transported; or

(b) an incident, for which an indicative list is given in Annexure A to these Regulation occurs that does not involve a deliberate intention to work with a HBA but may result in persons being exposed to HBA in the performance of his or her work.

Classification of biological agents

1. The Biological Agents shall be assigned a classification of Group 1, Group 2, Group 3 or Group 4 according to hazard and categories of contaminant.

2. Where a biological agent has not been assigned a classification as contemplated in sub regulation 1, the employer and self-employed person shall provisionally classify that agent in accordance with sub regulation (3) below, having regard to the nature of the agent and the properties of which he or she may reasonably be expected to be aware.

Facilities Regulations:

Sanitation.

(1) Every employer shall provide sanitary facilities at the workplace in accordance with the provisions of Parts F, P and Q of the National Building Regulations.

Condition of room and facilities.

Every employer shall maintain all rooms and facilities which are prescribed or provided for in terms of the provisions of these regulations, in a clean, hygienic, safe, whole and leak-free condition, and in a good state of repair.

The following interpretation for surface swab results should be applied:

TEST	RESULT/10 cm ²	RESULT ALLOCATION
TPC Coliforms E.coli	0 – 15 Absent Absent	Satisfactory
TPC Coliforms E.coli	16 – 75 Absent Absent	Fairly satisfactory
TPC Coliforms E.coli	>75 Present Present	Unsatisfactory

The following interpretation/guidelines for Microbiological Surface Swab results should apply:

TEST	RESULT / 10 cm ²	RESULT ALLOCATION
Total Plate Count (TPC)	< 10 cfu / 10 cm ²	Excellent
TPC	10-70 cfu / 10 cm ²	Good
TPC	71-99 cfu/ 10 cm ²	Acceptable
TPC	100-1000 cfu/ 10 cm ²	Unacceptable, requires attention
TPC	> 1000 cfu/ 10 cm ²	Unacceptable, requires immediate attention

Note:

Swift SOP Guidelines

- CFU – Colony Forming Unit
- Health Act (Act 63, 1977) suggests that there should be:
 - < 100 cfu/cm² (no more than 100 bacteria/cm²)

6.3 Survey Methodology

Microbial Surface Swab sampling was performed according to SANS 18593 (Horizontal methods for sampling techniques from surfaces using swabs) to determine the level microbial contamination of surfaces in the Ablution Facilities i.e. Kitchens and Toilets, as a means to quantify cleanliness.

Swabs sample analyses known as Total Microbial Activity (TMA) test were performed by, a SANAS Accredited Laboratory.

A water sample collected from the site will be analysed according to SANAS 241 at an approved laboratory to review the microbiological, chemical and physical parameters of the water supplied.

6.4 Discussion

The Facility Regulations refer to various aspects to improve and maintain facilities provided in work places. The aspects in the regulation include sanitation, facilities for safe keeping, change rooms, dining rooms, drinking water and seating. General requirements for rooms and facilities are provided. Access to improved water and sanitation facilities does not, on its own, necessarily lead to improved health. There is now very clear evidence showing the importance of hygienic behaviour, in particular hand-washing with soap at critical times: after defecating and before eating or preparing food. This can only be achieved where proper facilities are provided.

Good hygiene practices have also been shown to reduce the incidence of other diseases, notably pneumonia, trachoma, scabies, skin and eye infections and diarrhoea-related diseases like cholera and dysentery.

A biological agent is defined in the Regulations for Hazardous Biological Agents (HBAs) as: “any micro-organism, cell culture or human endoparasite, including any which have been genetically modified, which may cause an infection, allergy or toxicity, or otherwise create a hazard to human health”.

HBA's are divided into 4 groups:

- Group 1 – HBA's that are unlikely to cause human disease.
- Group 2 –HBA's that may cause human disease and be a hazard to exposed persons, which is unlikely to spread to the community and for which effective prophylaxis is usually available e.g. hepatitis B virus.
- Group 3 –HBA's that may cause severe human disease, which presents a serious hazard to exposed persons and which may present a risk of spreading to the community, but for which effective prophylaxis and treatment is available e.g. mycobacterium tuberculosis.

- Group 4 –HBA’s that causes severe human disease and is a serious hazard to exposed persons and which may present a high risk of spreading to the community, but for which no effective prophylaxis and treatment is available e.g. Ebola virus.

Micro-organism enters the human body through the following:

- The most common way is by hand-to-mouth contact during eating, drinking and smoking, or by wiping the face with contaminated hands or gloves, or by licking splashes from the skin.
- By skin contact, through cuts, scratches, or penetrating wounds, i.e. from discarded hypodermic needles. Certain organisms can enter the body through the surfaces of the eyes, nose and mouth.
- By breathing them in, as either dust, aerosol or mist.

Escherichia coli (E. coli):

E. coli is a bacterium that is commonly found in the gut of humans and warm-blooded animals. Most strains of *E. coli* are harmless. Some strains however, such as Enterohaemorrhagic *E. coli* (EHEC), can cause severe foodborne disease. Person-to-person contact is an important mode of transmission through the oral-faecal route. An asymptomatic carrier state has been reported, where individuals show no clinical signs of disease but are capable of infecting others.

The duration of excretion of EHEC is about one week or less in adults, but can be longer in children. Visiting farms and other venues where the general public might come into direct contact with farm animals has also been identified as an important risk factor for EHEC infection.

Symptoms of the diseases caused by EHEC include abdominal cramps and diarrhoea that may in some cases progress to bloody diarrhoea (haemorrhagic colitis). Fever and vomiting may also occur. The incubation period can range from three to eight days, with a median of three to four days. Most patients recover within 10 days, but in a small proportion of patients (particularly young children and the elderly), the infection may lead to a life-threatening disease, such as haemolytic uraemic syndrome (HUS). HUS is characterised by acute renal failure, haemolytic anaemia and thrombocytopenia.

6.5 Findings and Discussion

The findings of the facilities assessment are reflected in table below.

Legend: Does not comply with the National Building Regulations, South African National Standard (SANS) 10400 -O: 2011 and / or with the Facilities Regulations, Occupational Health and Safety act No 85 of 1993.

TABLE 6.5.1 – MICROBIAL SURFACE SWAB SAMPLING PERFORMED FOR ACSA EAST LONDON IN EC, ON 27 September 2021.

SAMPLE	DESCRIPTION / AREA	TMC* (CFU/AREA)	EVALUATION	ACTION REQUIRED
EL01	Fire Kitchen Counter	620	Unacceptable, requires attention	Improve cleaning and disinfection of areas.
EL02	Fire Kitchen Tap Handle	150	Unacceptable, requires attention	
EL03	Gym Seat	40	Good	Maintain regular cleaning and disinfection of areas.
EL04	Fire Station Gents Tap handle	250	Unacceptable, requires attention	Improve cleaning and disinfection of areas.
EL05	1 st floor East Toilet seat	>10 000	Unacceptable, requires immediate attention	
EL06	1 st floor East Tap Handle	240	Unacceptable, requires attention	
EL07	Arrivals Gents Toile seat	120	Unacceptable, requires attention	
EL08	Arrivals Gents Tap Handle	>10 000	Unacceptable, requires immediate attention	
EL09	Arrivals Ladies Toile seat	30	Good	Maintain regular cleaning and disinfection of areas.
EL10	Arrivals Ladies Tap Handle	1160	Unacceptable, requires immediate attention	Improve cleaning and disinfection of areas.
EL11	East Side Departures Ladies Toilet Seat	2320	Unacceptable, requires immediate attention	
EL12	East Side Departures Ladies Basin Counter	40	Good	Maintain regular cleaning and disinfection of areas.
EL13	East Side Departures Disabled toilet seat	80	Acceptable	
EL14	East Side Departures Gents Toilet seat	250	Unacceptable, requires attention	Improve cleaning and disinfection of areas.
EL15	East Side Departures Gents Basin Counter	450	Unacceptable, requires attention	
EL16	Food court Rest room Gents Toilet Seat	420	Unacceptable, requires attention	
EL17	Food court Rest room Gents Tap Handle	60	Good	

SAMPLE	DESCRIPTION / AREA	TMC* (CFU/AREA)	EVALUATION	ACTION REQUIRED
EL18	Food court Rest room Ladies Toilet seat	180	Unacceptable, requires attention	Improve cleaning and disinfection of areas.
EL19	Food court Rest room Ladies Tap Handle	60	Good	Maintain regular cleaning and disinfection of areas.
EL20	Office Toilet Tap handle	510	Unacceptable, requires immediate attention	Improve cleaning and disinfection of areas.

DISCUSSION

Site makes use of contract cleaners in the various sections. Cleaning equipment and use of cleaning chemicals are applied. Of the 20 swabs only 30% compliance was measured with hygiene standards. This indicates that in most areas of the airport an improvement in cleaning and disinfection of areas are required. Refer to Specific Management Interventions.

Legend: TMC*(CFU/Area) – Total Microbial Count (Coli Forming Units per Area)

The following interpretation/guidelines for Microbiological Surface Swab results should apply:

TEST	RESULT / 10 cm ²	RESULT ALLOCATION
Total Plate Count (TPC)	< 10 cfu / 10 cm ²	Excellent
TPC	10-70 cfu / 10 cm ²	Good
TPC	71-99 cfu/ 10 cm ²	Acceptable
TPC	100-1000 cfu/ 10 cm ²	Unacceptable, requires attention
TPC	> 1000 cfu/ 10 cm ²	Unacceptable, requires immediate attention

TABLE 6.5.2 – MICROBIAL WATER ANALYSIS PERFORMED FOR ACSA EAST LONDON IN EC, ON 28 September 2021.

SAMPLE	DESCRIPTION / AREA	Escherichia coli* (CFU/AREA)	PHYSICAL AND CHEMICAL EVALUATION	ACTION REQUIRED																																																																																																																																																																		
DRINKING WATER SAMPLE, APRON SIDE																																																																																																																																																																						
ELW 1	Drinking Water sample from kitchen tap in Apron Office.	No growth	Excellent	Maintain water infrastructure.																																																																																																																																																																		
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6.6 Specific Management Interventions

1. Protect Yourself and Other Cleaning Staff

- Ensure cleaning staff are trained on proper use of cleaning (and disinfecting, if applicable) products and the cleaning of the work place. Training must focus on means to clean, regular touch surfaces, high contact areas, correct cleaning methods and clean cycles. Incorrect cleaning can lead to cross contamination.
 - Read the instructions on the product label to determine what safety precautions are necessary while using the product. This could include PPE (such as gloves, glasses, or goggles), additional ventilation, or other precautions.
 - Cleaners must wash with soap and water for 20 seconds after cleaning. Be sure to wash hands immediately after removing gloves.
 - If hands are visibly dirty, always wash hands with soap and water.
 - If soap and water are not available and hands are not visibly dirty, use an alcohol-based hand sanitizer that contains at least 60% alcohol, and wash with soap and water.
 - Special considerations should be made for people with asthma. Some cleaning and disinfection products can trigger asthma.
2. Educate workers who clean, wash laundry, and pick up trash to recognize the symptoms of COVID-19.
 3. Develop policies to protect and train workers before assigning cleaning and disinfecting tasks.
 4. To protect workers from hazardous chemicals, training should include when to use PPE, what PPE is necessary (refer to Safety Data Sheet for specific cleaning and disinfection products), how to properly put on, use, and take off PPE, and how to properly dispose of PPE.
 5. The delivery of water that complies with relevant standards within buildings generally relies on a plumbing system that is not directly managed by the water supplier. Reliance is therefore placed on proper installation and maintenance of plumbing and, for larger buildings, on building-specific water safety plans.

To ensure the safety of drinking-water supplies within the building system, plumbing practices must prevent the introduction of hazards to health. This can be achieved by ensuring that:

- pipes carrying either water or wastes are watertight, durable, of smooth and unobstructed interior and protected against anticipated stresses;
- cross-connections between the drinking-water supply and the wastewater removal systems do not occur;
- roof storage systems are intact and not subject to intrusion of microbial or chemical contaminants;

- hot and cold water systems are designed to minimize the proliferation of Legionella
- appropriate protection is in place to prevent backflow;
- the system design of multistorey buildings minimizes pressure fluctuations;
- waste is discharged without contaminating drinking-water;
- plumbing systems function efficiently.

6.7 Conclusion

From the findings of this assessment with regard to a Facilities Evaluation with regard to hygiene and the Hazardous Biological Agents (HBA) Regulations and to review the findings of surface swabs for hygiene and cleanliness. The following may be concluded:

Further the results from the swab sampling, it may be concluded:

Site makes use of contract cleaners in the various sections. Cleaning equipment and use of cleaning chemicals are applied. Of the 20 swabs only 30% compliance was measured with hygiene standards. This indicates that in most areas of the airport an improvement in cleaning and disinfection of areas are required. Refer to Specific Management Interventions.

From the drinking water sampling the following may be concluded:

From the drinking water sample collected from kitchen tap in Apron Office the samples had no growth and complied with excellent water quality. Maintain water infrastructure on site.

Safe drinking-water is required for all usual domestic purposes, including drinking, food preparation and personal hygiene.

6.8 General Recommendations

Ensure that facilities are properly maintained in order to comply with the Facilities Regulations. The provision of proper facilities will encourage personal hygiene practices. This will reduce possible exposure to hazardous biological agents.

1. Administrative Requirements:

Follow proper cleaning techniques:

Proper cleaning techniques can greatly reduce the risk of cross contamination and the spreading of germs and bacteria. By following some basic guidelines on cleaning applications, we can do our part to make the workplace a cleaner and safer place.

- Always wash and dry hands immediately before preparing any food which requires no further cooking
- Always wash and dry hands each time they enter and re-enter the kitchen.
- All surfaces and dining areas must be cleaned before and after use, and disinfected.
- Wash hands thoroughly and always wear appropriate personal protective equipment.
- Scrubbing is the best way to remove dirt, debris, and microorganisms.
- Cleaning is required before any disinfection process because dirt, waste, and other materials can lessen the efficacy on many chemical disinfectants.
- Always clean from the cleanest to the dirtiest areas.
- Always clean from the highest to the lowest areas.
- Clean from the back or the farthest point from the door to the front of the room.
- Daily and deep cleaning is needed to maintain a standard of cleanliness. Schedules and procedures should be maintained according to the latest available research and guidelines.
- Do not leave the room before the cleaning is complete unless gloves are removed and hands are washed first.
- Cleaning methods and written cleaning schedules should be based on the type of surface, the amount and type of soil present, and the purpose of the area.
- Dry sweeping, mopping and dusting should be done carefully, to prevent dust, debris and microorganisms from getting into the air and landing on clean surfaces.
- Buckets that contain cleaning solutions or rinse water should be changed every three rooms, or before that if the bottom of the bucket cannot be seen, and immediately after cleaning blood or other body fluids.

2. Training Requirements:

- Employees should be trained on proper cleaning techniques.
- Employees should be trained to always wash and dry hands after handling raw foods.

3. Ventilation Requirements:

Legislation and Standards:

Extraction ventilation should be provided in the Kitchen, Toilets and Ablutions as required by the SANS 10400 – National Building Regulation, to ensure adequate ventilation of these rooms. These systems should operate at:

- 50 Litre/ second in the Kitchen and 20 Litre/ second per a urinal/shower or toilet cubicle.

A wall/ window mounted extraction fan/s would be sufficient enough to achieve the recommended extraction rates at the required areas (ablutions, kitchen, mess room).

Maintenance:

Maintenance of air conditioners and extraction fans (i.e. Toilets, Kitchens and Offices) should include:

- Ensuring that regular maintenance is performed on all air conditioning units i.e. air conditioners are re-gassed, filters are changed etc.
- regular inspection for signs of damage or malfunction;
- monitoring of performance (e.g. correct temperature readings);
- routine replacement of components known to have a limited life (e.g. drive belts on fans, dirty filters); and prompt repair or replacement of worn or damaged components.

Definitions

“Adjoining”: In relation to premises, means having a common boundary line.

“Drinking water”: Means water that complies with SANS 241.

“Hot water”: Means water at a temperature more than 35 degrees Celsius.

“Hazardous biological agent”: Means a hazardous biological agent defined as such in regulation 1 of the Regulations for Hazardous Biological Agents promulgated by Government Notice No. R. 1390 of 27 December 2001.

“Sanitary facilities”: Means sanitary fixtures as defined in SABS 0400.

References

- South African Occupational Health and Safety Act, No. 85 of 1993 – Facilities Regulations (2004).
- WHO water resource guidelines and fact sheets www.who.org
- CDC safe work practices and hygiene principles for surface cleaning www.cdc.org

Certificates

Dept of Employment and Labour





CERTIFICATE OF ACCREDITATION

In terms of section 23(2)(b) of the Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act, 2006 (Act 19 of 2006), read with sections 23(1), (2) and (3) of the said Act, I hereby certify that:-

OCCUFIT (PTY) LTD
Co. Reg. No.: 2019/219688/07
RANDBURG

Facility Accreditation Number: **OH0237**

is a South African National Accreditation System accredited Inspection Body to undertake **TYPE A** inspection provided that all SANAS conditions and requirements are complied with

This certificate is valid as per the scope as stated in the accompanying scope of accreditation, Annexure "A", bearing the above accreditation number for


OCCUPATIONAL HYGIENE INSPECTION AT WORKPLACES

The facility is accredited in accordance with the recognised International Standard

ISO/IEC 17020:2012

The accreditation demonstrates technical competency for a defined scope and the operation of a management system

While this certificate remains valid, the Accredited Facility named above is authorised to use the relevant SANAS accreditation symbol to issue facility reports and/or certificates


Mr R. Josias
Chief Executive Officer

Effective Date: **12 December 2019**
Certificate Expires: **11 December 2023**

This certificate does not on its own confer authority to act as an Approved Inspection Authority as contemplated in the Occupational Hygiene Regulations. Approval to inspect within the regulatory domain is granted by the Department of Employment and Labour.



2/19/2021

<https://www.saioh.co.za/members/Certification/Certificate.aspx?ID=209905&cguid=178848e0-02b3-4070-8594-5fa65868c26a>



The Southern African Institute for Occupational Hygiene

This is to certify that

Johan Cornelius J

ID Number: 7403065205089

Has satisfied the requirements of
the Constitution of the Institute
and on recommendation of the Professional Certification Committee
is registered as an

Occupational Hygienist (OH)

Member Number: 0301

Valid until: 31 January 2022

Karen du Preez

Chairman, Professional Certification Committee



Member ID: 30914579

Certificate ID: 20914579-209905

Issued by the Southern African Institute for Occupational

Hygiene

SAGA Professional Body ID: 944

IOHA Recognised
Certification Scheme



<https://www.saioh.co.za/members/Certification/Certificate.aspx?ID=209905&cguid=178848e0-02b3-4070-8594-5fa65868c26a>

1/1

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Certificate No	L79948	As Found/As Left	Rev 0
Manufacturer	TSI Airflow		
Description	Hot Wire Anemometer; Probe		
Model No	TA410		
Serial No	TA4101812006		
Plant No	None		
Calibrated for	Occufft OHS		
Address	6 North Road, Dunkeld West, Randburg, 2196		
Temperature	(24.7 to 24.8) °C ± 2 °C		
Relative humidity	(51 to 51) % rh ± 5 % rh		
Date of calibration	22 January 2021		

**American Standard
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Measurement Science Laboratory



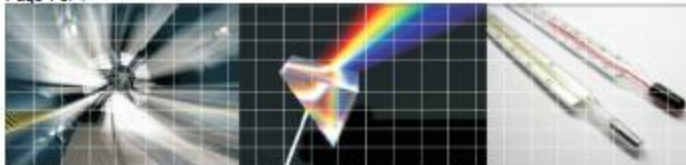
Issue Date 22 January 2021

Calibrated by *Pieter W Botha* Digitally signed by Pieter Botha
Date: 2021.01.22 10:34:44
+02'00'

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Technical Signatory *Pieter W Botha* Digitally signed by Pieter Botha
Date: 2021.01.22 10:34:44
+02'00'

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Air Separation Services SA cc
REG. NO.: 1997/068409/23
VAT NO.: 4370162887

VALIDATION CERTIFICATE

IAQ Tool

Certificate Number		21/013/HI
Description		Gas Analyser
Manufacturer		TSI
Model Number		7545
Serial Number		T75451814003
Instrument Range		-
Validated at		Airsep Labs, 13A Osborne Lane, Bedfordview, 2007
Validated for	Name	Integrated Occupational Health Services (Pty) Ltd
	Address	1st Floor Moorgate Building, Dunkeld Office Park, 6 North Road, Dunkeld West
Environment Temperature		23°C
Environment %RH		56%RH
Issue Date		27/01/2021
Due Date		27/01/2022
Validated by		R vdW
Checked by		V vdW
<p><i>This certificate is issued without alteration. It is a correct record of the measurements made at the time of validation. Copyright of this certificate is owned by AIRSEP and may not be reproduced other than in full, except with the prior written approval of AIRSEP. Subsequently the values will depend on factors such as care exercised in handling the instrument and frequency of use. Revalidation should be performed after a period which has been chosen to ensure that, under normal circumstances, the instruments accuracy remains within the desired limits. The accuracies of all the measurements were traceable to the national measuring standards as maintained in South Africa, unless otherwise noted.</i></p>		
Technical Signatory		 DR RF van de Water

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Certificate No	L79947	As Found/As Left	Rev 0
Manufacturer	Goldilux		
Description	Autoranging Lightmeter		
Model No	GAL		
Serial No	11123/1934		
Plant No	None		
Calibrated for	Occult OHS		
Address	6 North Road, Dunkeld West, Randburg, 2196		
Temperature	23 °C ± 2 °C		
Relative humidity	60 % rh ± 5 % rh		
Date of calibration	26 January 2021		

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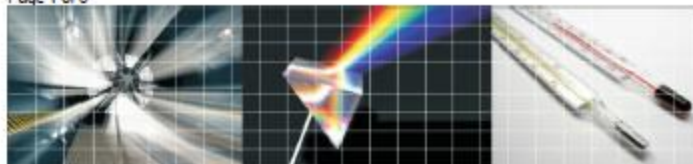
Issue Date 26 January 2021

Calibrated by *Pieter W Botha* Digitally signed by Pieter Botha
Date: 2021.01.26 12:40:23 +02'00'

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Technical Signatory *Luke W Hards* Digitally signed by Luke W Hards
Date: 2021.01.26 08:33:00 +05'00'

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Certificate No	L79952	As Found/As Left	Rev 0
Manufacturer	Casella		
Description	Air Sampling Pump Calibrator		
Model No	FlowDetective		
Serial No	4986084		
Plant No	None		
Calibrated for	Occurfit OHS		
Address	6 North Road, Dunkeld West, Randburg, 2196		
Temperature	22.8 °C ± 2 °C		
Relative humidity	30 % RH ± 5 % r		
Barometric Pressure	853 mbar ± 5 mbar		
Date of calibration	22 January 2021		

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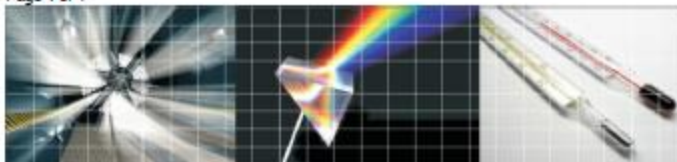
Issue Date 22 January 2021

Calibrated by *Pieter W Botha* Digitally signed by Pieter Botha
Date: 2021.01.22 12:52:47 +02'00'

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Technical Signatory *Pieter W Botha* Digitally signed by Pieter Botha
Date: 2021.01.22 12:53:02 +02'00'

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Certificate No	L79949	As Found/As Left	Rev 0
Manufacturer	Caesla		
Description	Sound Level Meter, Microphone		
Model No	CEL-63X; CEL-495; CEL-251		
Serial No	2382972; 004151; 02929		
Plant No	None		
Calibrated for	OccuFit OHS		
Address	6 North Road, Dunkeld West, Randburg, 2196		
Temperature	20 °C ± 2 °C		
Relative humidity	57.2 % rh ± 5 % rh		
Barometric Pressure	855 mbar ± 5 mbar		
Date of calibration	22 January 2021		

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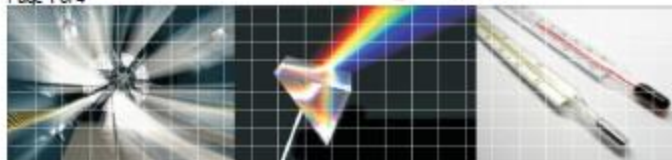
Issue Date 22 January 2021

Calibrated by Digitally signed by Visser Oosthuizen Date: 2021.01.22 10:33:48 +02'00'

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Technical Signatory Digitally signed by Visser Oosthuizen Date: 2021.01.22 10:34:00 +02'00'

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Certificate No	L79950	As Found/As Left	Rev 0
Manufacturer	Casella		
Description	Acoustic Calibrator		
Model No	CEL-120/1		
Serial No	2383856		
Plant No	None		
Calibrated for	OccuFit OHS		
Address	6 North Road, Dunkeld West, Randburg, 2196		
Temperature	23 °C ± 2 °C		
Relative humidity	46.6 % rh ± 5 % rh		
Barometric Pressure	854 mbar ± 5 mbar		
Date of calibration	22 January 2021		

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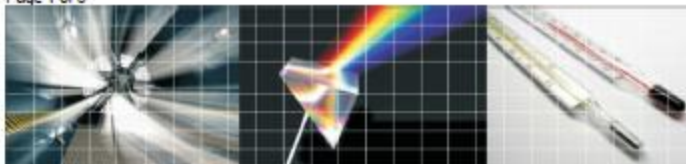
Issue Date 22 January 2021

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Technical Signatory Digitally signed by Enrico Terblanche
Date: 2021.01.22 11:42:36 +02'00'

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Noise Calibrator

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Certificate No	L79951	As Found/As Left	Rev 0
Manufacturer	Casella		
Description	dBadge Noise Dosimeter; Microphone		
Model No	dBadge2		
Serial No	4482202; 73360		
Plant No	None		
Calibrated for	OccuFit OHS		
Address	6 North Road, Dunkeld West, Randburg, 2196		
Temperature	20.5 °C ± 2 °C		
Relative humidity	44.7 % rh ± 5 % rh		
Barometric Pressure	854 ± 5 mbar		
Date of calibration	22 January 2021		

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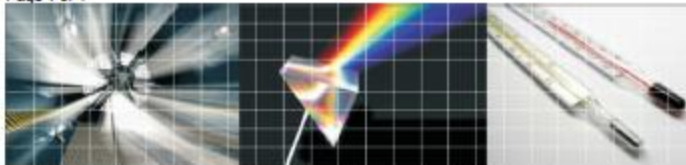
Issue Date 22 January 2021

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Digitally signed by Catharina Magdalena Pretorius
Date: 2021.01.22 13:20:49 +02'00'

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Technical Signatory *C M Pretorius*
Digitally signed by Catharina Magdalena Pretorius
Date: 2021.01.22 13:21:02 +02'00'

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Noise Dosimeter