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1. ILLUMINATION REPORT

1.1 Purpose

The purpose of this survey was:

- The purpose of this Report is to establish if the illumination at National Credit Regulator complies with the requirements of the Environmental Regulations for Workplaces, OHSAct (No 85 of 1993).
- To recommend appropriate Occupational Health Risk management measures and for the prevention of occupational diseases and ill health effects, amongst employees.

1.2 Legislation and Standards

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.

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1.3 Survey Methodology

A calibrated, colour and cosine corrected Goldilux GAL-2L Lux Meter (Serial no: 11123/1047) was used to determine the illumination levels. The Lux meter was zeroed before the survey commenced. The Lux meter was calibrated to a national standard by Technology Solutions in 2014.

The recommended standards and/or abridged methods as prescribed in the SANS Code of Practice 10114 – 1: 2005 were used to measure the average artificial illumination in the workplace.

1.4 Results

The results of the Illumination survey performed at the National Credit Regulator on 26 March 2015 are indicated in Table 1.4.1

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

An average value representing ≥100% of the minimum standard is indicated as:

ADEQUATE ILLUMINATION:

An average value representing >50 %< 100% of the minimum standard is indicated as a:

LOW PRIORITY DEVIATION:

An average value representing <50% of the minimum standard is indicated as a:

SIGNIFICANT PRIORITY DEVIATION:

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TABLE 1.4.1 – DAY TIME ILLUMINATION SURVEY AT THE NATIONAL CREDIT REGULATOR – MIDRAND ON 26 MARCH 2015. [redacted]

No.	Area / Location	Average Illumination Levels (lux)		Required Illumination (lux)	Observations / Remarks / Non-Compliance	Possible Corrective / Maintenance Action
		Day	Artificial			
NATIONAL CREDIT REGULATOR						
GROUND FLOOR						
1	**Reception** - Security check point - Reception counter - Reception CWS	 **165** **207** **117**		 300 200 300	Low priority deviation. Significant priority deviation. Compact fluorescent lights with an open cover. Fluorescent tubes with an open cover. Lights were depreciated and defective. Natural illumination.	Replace depreciated and defective luminaire. Regularly clean and maintain luminaire.
2	**1st floor (left wing)** - R0053 (board room) - R0054 CWS 1 - CWS 2 - CWS 3 - CWS 4 - CWS 5 - Gent Toilet - Ladies Toilet - R0055 - R0056 CWS - R0057 (kitchen) - Wash basin - Printer room - R0058 CWS - R0059 CWS - R0060 CWS 1 - CWS 2 - R0061 CWS - R0062	 **347** **77** **168** **380** **169** **116** **350** **188** - **120** **220** **170** **193** **144** **180** **108** **240** **145** -		 300 300 300 300 300 300 100(f) 100(f) - 300 150 150 500 300 300 300 300 300 -	Adequate illumination. Low priority deviation. Significant priority deviation. Fluorescent tubes with a decorative cover. Compact fluorescent lights with an open cover in the ablutions. Fluorescent tubes with a prismatic cover in the printer room. Lights were depreciated and defective. Lights were not correctly positioned above work stations. Natural illumination.	Replace depreciated and defective luminaire. Install lights above work station. Regularly clean and maintain luminaire.

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No	Area / Location	Average Illumination Level (lux)		OHSAct Requirement (lux)	Comments / Reasons for Non-Compliance	Possible Corrective / Maintenance Actions
		Day	Artificial			
	- R0063 CWS 1 - CWS 2 - CWS 3	204 115 172		300 300 300	Refer above	
3	Stairs from 1st floor to Ground floor.	83-147		100 (f)	Adequate illumination. Low priority deviation. Compact fluorescent lights with an open cover. Lights were installed very high. Natural illumination.	Install lights lower/closer to stairs. Regularly clean and maintain luminaire.
4	**Ground Floor Compliance and Registration.** - Open plan office CWS 1 - CWS 2 - CWS 3 - CWS 4 - R0049 CWS 1 - CWS 2 - R0050 CWS - R0051 - R0048 (printer) - R0047 - R0046 - R0044 CWS 1 - CWS 2 - CWS 3 - CWS 4 - R0043 CWS - R0042 CWS - Thembu Tyesi CWS - R0041 CWS - R0040 - Gents toilet - Ladies toilet - Kitchen WS	 100 75 81 140 128 140 261 - 262 - - 81 69 148 157 160 164 152 184 - 252 246 152		 300 300 300 300 300 300 300 - 500 - - 300 300 300 300 300 300 300 300 - 100(f) 100(f) 150	Adequate illumination. Low priority deviation. Significant priority deviation. Fluorescent tubes with a decorative cover. Compact fluorescent lights with an open cover in the ablutions. Lights were depreciated and defective. Lights were not correctly positioned above work stations. Natural illumination.	Replace depreciated and defective luminaire. Install lights above work station. Regularly clean and maintain luminaire.

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No.	Area / Location	Average Illumination Level (lux)		OHSAct Requirement (lux)	Comments / Reasons for Non-Compliance	Possible Corrective / Maintenance Actions
		Day	Artificial			
	- Wash basin	280		150		
5	Stairs to Reception from Ground floor.	18-44		100(f)	Significant priority deviation. Fluorescent tubes with an open cover. Lights were defective. Natural illumination.	Replace defective luminaire.
6	**Executive Area**				Adequate illumination. Low priority deviation. Significant priority deviation. Compact fluorescent lights with an open cover. Fluorescent tubes with an open and decorative cover. Lights were depreciated and defective. Lights were not correctly positioned above work stations, especially at R0036 CWS. Natural illumination.	Replace depreciated and defective luminaire. Install lights above work stations, especially at R0036 CWS. Regularly clean and maintain luminaire.
	- R0027 CWS	360		300		
	- R0023	-		-		
	- R0028 (passage)	90 – 220		100(f)		
	- R0029	-		-		
	- R0030 (boardroom)	151 – 170		300		
	- R0031 CWS	377		300		
	- R0031 (passage)	41 – 90		100(f)		
	- Printer	40		500		
	- R0033 CWS	426		300		
	- R00 32	-		-		
	- R0034	-		-		
	- RQ035 CWS	193		300		
	- RQ036 CWS	111		300		
	- R0038 CWS	422		300		
	- R0037 CWS	464		300		
7	**HR Offices**					
	- R0006 CWS 1	512		300		
	- CWS 2	431		300		
	- R0065 CWS	530		300		
	- R0005	-		-		
	- Passage in front of HR Offices	85-1003		100(f)		
8	**Finance Department**				Adequate illumination. Low priority deviation. Significant priority deviation. Fluorescent tubes with an open and decorative cover. Compact fluorescent lights with a prismatic	Replace depreciated and defective luminaire. Install lights above work station. Regularly clean and maintain luminaire.
	- R0003 R0002-procurement.	-		-		
	- CWS 1	101		300		
	- CWS 2	94		300		
	- R0001 CWS 1	288		300		
	- CWS 2	584		300		
	- Open plan offices CWS 1	437		300		

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No	Area / Location	Average Illumination Level (lux)		OHSAct Requirement (lux)	Comments / Reasons for Non-Compliance	Possible Corrective / Maintenance Actions
		Day	Artificial			
	- CWS 2 - CWS 3 - CWS 4 - Ladies toilet - Gent toilet	673 379 384 40 150		300 300 300 100(f) 100(f)	cover in the ablutions. Lights were not correctly positioned above work stations. Lights were depreciated and defective Natural illumination.	
9	**Slu's Office** - R008 (passage) - R0009 CWS - R0010 (kitchen) - Kitchen WS - R0012 (board room)	35 – 378 244 154 1194 -		100(f) 300 150 300 -	Adequate illumination. Low priority deviation. Significant priority deviation. Fluorescent tubes with an open and decorative cover. Lights were depreciated and defective. Natural illumination.	Replace depreciated and defective luminaire. Regularly clean and maintain luminaire.
10	**Bank Office Area** - R0013 (passage) - R0014 CWS - R0015 CWS - Open plan office CWS 1 - CWS 2 - CWS 3 - CWS 4	28 – 55 160 225 95 43 83 162		100(f) 300 300 300 300 300 300	Adequate illumination. Low priority deviation. Significant priority deviation. Fluorescent tubes with an open and decorative cover. Lights were depreciated and defective. Lights were not correctly positioned above work stations especially in the Investigation Area. Natural illumination.	Replace depreciated and defective luminaire. Install lights above work station. Regularly clean and maintain luminaire.
11	**Investigation Area** - R0016 - R0019 CWS - R0020 CWS 1 - CWS 2 - R0017 CWS - R0018 CWS - Open plan office CWS 1 - CWS 2 - CWS 3 - CWS 4	- 159 95 106 148 110 41 140 96 147		- 300 300 300 300 300 300 300 300 300		

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No	Area / Location	Average Illumination Level (lux)		OHSACT Requirement (lux)	Comments / Reasons for Non-Compliance	Possible Corrective / Maintenance Actions
		Day	Artificial			
12	**Call Centre R0021** - Open plan office CWS 1 - CWS 2 - CWS 3 - CWS 4 - R0022 CWS	**490** **238** **236** **260** **165**		300 300 300 300 300	Adequate illumination. Low priority deviation. Fluorescent tubes with an open cover. Lights were depreciated and defective. Lights were not correctly positioned above work stations. Natural illumination.	Replace depreciated and defective luminaire. Install lights above work station. Regularly clean and maintain luminaire.

Legend:
f – Measured at Floor level
v – Measured on a Vertical plane
CWS – Computer Workstation

1.5 Discussion

The lighting in a workplace can influence the occupants in many ways. At the most basic level, the lighting will determine what can be seen and, hence, how quickly and easily visual work can be done. Lighting can also affect the occupants' health--in extreme cases through tissue damage, or, more generally, through eyestrain. It is important for the safety and health practitioner to be able to identify what constitutes good and bad lighting and to have some idea of how bad lighting might be made good.

Trying to work in conditions that make it difficult to see what needs to be seen is a sure recipe for poor visual performance and eyestrain. Therefore, a prerequisite for evaluating and improving workplace lighting is to consider what it is that makes things visible. The visibility of an object is determined by the stimulus the object presents to the visual system and the operating state of that system. These two factors can be quantified in terms of five parameters: visual size, luminance contrast, colour difference, retinal image quality and retinal illumination.

These five parameters imply that it is the interaction between the object to be seen, the background against which it is seen, and the lighting of both object and background that determine the stimulus the object presents to the visual system and the operating state of the visual system. It is the stimulus and the operating state of the visual system that determines the level of visual performance achieved. This visual performance then contributes to task performance.

Most apparently, visual tasks have three components: visual, cognitive and motor. The visual component refers to the process of extracting information relevant to the performance of the task using the sense of sight. The cognitive component is the process by which sensory stimuli are interpreted and the appropriate action determined. The motor component is the process by which the stimuli are manipulated to extract information and/or the actions decided upon are carried out.

Of course, these three components interact to produce a complex pattern between stimulus and response. Further, every task is unique in its balance between visual, cognitive and motor components and, hence, in the effect lighting conditions have on task performance. The effect of lighting on the performance of a specific task depends on the structure of the task and specifically the place of the visual component relative to the cognitive and motor components. Tasks in which the visual component is large will be more sensitive to changes in lighting conditions than tasks where the visual component is small.

There exist several sources of advice about the amount and form of lighting that should be provided for different types of work. The general principle behind most of this guidance is that the lighting provided should be sufficient to avoid the need to use the visual system close to its limits. If such a situation arises - and even the most comprehensive guidance is unlikely to cover all types of work - the following steps can be taken to make

the visual component of the work easier. Some of these steps relate to the task characteristics and some to the lighting. Not all of the steps will be possible in every situation and not all are appropriate for every problem, but they will all be effective in increasing the visibility of what needs to be seen.

The advantages of good lighting include the following:

- Improved production from better efficiency, less waste and time loss.
- 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 results in less error and enhances the efficiency of inspection.
- Savings in human energy. Improved illumination reduces physical and mental strain, i.e. less fatigue, eyestrain and headaches.
- Better working conditions. Well-lit areas promote better housekeeping and improved morale.
- Better utilisation of people, materials and space.
- 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.

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1.6 Conclusion

From the results of the illumination survey it can be concluded that 31% of the measurements within the various areas evaluated complied with the OHS Act (Environmental Regulations) and SANS 10114-1:2005 illumination requirements. Whereas, 31% was found to be low priority deviations and 38% was found to be of significant priority deviation.
These low readings are due to some defective and depreciated luminaire or lights that were not correctly positioned above work stations.

At the time of the survey it was a very rainy and cloudy day, these factors may contribute to the low readings detected. It can be anticipated that on a sunny day with clear skies the illumination at work station could increase.

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1.7 Recommendations

1.7.1 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 th 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.

1.7.2 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.

1.7.3 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.

1.7.4 Exposure to glare in the workplace:

From under the harsh florescent lights found in office buildings to the bright, natural rays coming through windows, the workforce is constantly viewing information on their computer screens in less than optimal lighting situations. This, coupled with a rise in devices with glossy displays being released by computer manufacturers, has forced employees to close the blinds, change their computer's angle or even move the physical location of their workstation to avoid a harsh screen glare.

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Glare affects visual performance negatively. It can be described as "light out of place" and can be caused by any source of excessive luminance in the visual field. The source of glare could be the sky viewed through windows in walls and roofs, or the luminaires in the room, and might be seen either direct or by reflection from polished surfaces. Glare is not always immediately apparent; its deleterious effects sometimes become evident only after long periods of sustained and exacting work. Under the high levels of illuminance characteristic of modern installations, little or no direct disability to vision will occur, but there could well be serious discomfort caused by the complex interplay of the luminances, sizes and positions of the light sources as seen against the luminance of the general surroundings.

Due to high illuminance on work surface that cause glare, several employees intentionally switched off luminaires. Discomfort glare tends to increase with observer age and contributes to stress, and fatigue. Employee should not be seated facing windows (unless they are fitted with blinds or curtains) or considerable areas of well-lit high reflectance walls. Work areas facing windows should be avoided and if not possible, some means should be provided to reduce possible glare.

Following techniques can be implemented to reduce window glare:

a) The use of external or internal devices, such as louvres,
b) Deep splayed reveals on the side of the windows, finished with a high reflectance surface, and with the same finish applied to any frames and glazing bars.
c) The use of tinted low transmission glazing.
d) Movable partition screens between the computer workstation and direct sunlight.
e) Repositioning the computer workstation to avoid facing windows.
f) Installation of Anti-Glare Filters to reduce screen glare in ambient and brighter lighting, but also ensure that screen resolution remains crisp and clear.

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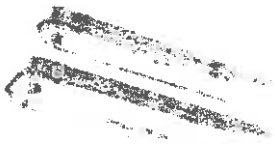
TYPES OF LUMINAIRES

TYPE	DESCRIPTION	EXAMPLE
Incandescent vs compact fluorescent luminaire	A compact fluorescent light bulb (CFL) is fluorescent lighting designed to be used in a standard (incandescent) light bulb socket. Fluorescent lighting works by passing a current through a gas-filled tube. Requires luminaire to provide directional illumination. Flat round CFL provide poor illumination due to lack of directional focus. Incandescent light works by heating up a metal filament until it is white-hot. Incandescent bulbs produce mostly heat, which is why a fluorescent using only 13 watts of electricity can produce light comparable to an incandescent 60 watts.	
Single and twin tube fluorescent luminaires –plastic cover luminaire or open luminaire.	Fluorescent lighting works by passing a current through a gas-filled tube. Twin fluorescent provides higher light output (lux/ lumens). Plastic cover protects lamp but may accumulate dust that will reduce light output.	
Single to four tube fluorescent luminaires - Metal diffuser luminaires	Fluorescent lighting works by passing a current through a gas-filled tube. Provides best reflection of light and improves illumination. Does not accumulate dust as to lamps are not enclosed.	
Light Emitting Diodes (LED)	Light Emitting Diodes (LED) is bulbs without a filament that are low in power consumption and have a long life span. LEDs are just starting to rival conventional lighting but provide efficient bright light with various lamps that fit in conventional luminaires.	
Solar powered lamps	Equipped with one of a variety of different size solar panels, sealed-gel batteries, and a fixture head fitted with from 18W to 32W compact fluorescent lamps may be used in various locations. This designed lighting system incorporates many innovative features, such as the controller programmable regulator which controls flow of energy from panels to batteries and lamping. No cabling, no trenching, no wiring, and no electric bills