Analysis of Safety Practices by Small and Medium Enterprises (Welders) at Siwdo Kokompe

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ABSTRACT

The process of joining metals permanently by melting the points or areas to be joined is known as welding. This act of fabrication is done at Siwdo – Kokompeat Cape Coast and the artisans involve are called welders. At Siwdo gas welding is common than arc welding and the joint metals act as one metal. The welding profession also involves estimation of the components and the total cost of welding.Since welding is a dangerous process, welders must protect themselves by wearing gloves, goggles, aprons, helmets, safety shoes and ear plugs. They must also have fire extinguishers available always. These welders must also have intense education for use of all safety devices. These welders must be educated on the available and usage of all safety devices.

Key words: Welding, Materials, Safety, Cost, Availability.

INTRODUCTION

Welding as done at Siwdo Kokompe in Cape Coast is the process of permanently joining two or more metals by melting the points or areas. These molten parts of metals quickly cool and are permanently bonded. The practice of welding is an act of fabrication or sculptural process that joins metals. Thus welding involves melting the work piece and adding filter materials to form a pool of molten material that cools to become strong joint. The welding process at Siwdo takes place alongside pressure and heat. At Siwdo Kokompe, welding is the most economical and efficient way of joining metals permanently to make them a single piece .These welders have make welding vital to the Ghanaian economy which also

ranks high among other industrial processes. Furthermore, welding involves more science as well as variables of measurement as compared to other industrial processes. Welding at Siwdo is differentiated from soldering and blazing by the fact that soldering and blazing involves melting of lower melting point materials (metals) to form bonds between the metals. Also at Siwdo, the energy sources use by these welders are gas flame and hydro-electricity. Other sources of energy that welders at different locations will use are laser, electron beam, friction and ultrasound. Welders at other locations may do welding under water. Ignoring the precautions (safety) of welding by welders will result to hazardous conditions such as burns, electrical shocks, vision damage, inhalation of poisonous gases and exposure to intense ultraviolet radiations. Arc welding as done at Siwdo, makes use of power supply source (hydro-electricity) to create as well as maintain an electric arc between an electrode and the base metal to melt the metal at melting voltage. The amount of heat input is directly related to the current. Also, constant voltage or current supplies are important for automatic welding processes such as arc welding, flux core arc welding and submerged arc welding. These types of welding are length consistent due to the fact that any fluctuation in the distance between the electrode and the base metal is quickly rectified by a large change in current. Gas tungsten arc welding is a type of non-consumable electrode process for which the electrode rod only creates the arc but does not provide filler material. Stick welding involves using electric current to stick an arc between the base metal and the consumable electrode rod. This consumable electrode rod is made of filler material(steel) and is covered with a flux material that protects the weld area from oxidation and contamination by producing carbon dioxide (CO_2) gas during the welding process. Plasma arc welding uses plasma gas to make relatively more concentrated arc. Oxyacetylene or oxyfuel welding is the most common type of welding at Siwdo.

Oxyfuel or gas welding is the combustion of acetylene in oxygen to produce welding arc at flame temperature of about 3100^0 C which is less concentrated than an electric arc that causes slower weld cooling. Atomic hydrogen welding, electro gas welding, flux core arc welding, electroslag welding, electromagnetic welding, stud welding, resistance welding, ultrasonic welding, explosive welding and shielded metal arc welding are not found at Siwdo. Resistance welding results from heat generated by passing current through the heat resistor. Resistances welding is efficient, cause little pollution, limited in application but relatively expensive. Types of resistance welding are spot, seam, built, flash, projection and upset welding. Ultrasonic welding is a welding process which involves connecting thin sheets of metals by vibrating them at high frequency and pressure. The equipment and processes of ultrasonic welding is similar to that of resistance welding. Explosive welding involves the joining of dissimilar metals by pushing them together under extremely high pressure.Shielded metal arc welding is the process use in under water welding for construction, repair of ships, offshore platforms and pipelines.

Generally, $\left(\frac{v \times 1 \times 60}{5 \times 1000}\right)$ x Efficiency = Q

Where Q – heat input

V = Voltage

I = Current

S = Welding speed.

REVIEWED LITERATURE

Welding profession

Tradesmen who specialize in welding metals together are called welders and need to have good technical knowledge about the metals they weld. The profession of welding leads to the provision or manufacturing of equipment, automobiles, subways, bridges, pollution control devices, coffee pots, sky scrapers, oil drilling rigs, pipes, bulldozers, cranes, materials handling equipment, office machines, food processing machines, textiles and printing machinery. Welders at Siwdo Kokompe are also involved in maintenance and repairs. Also welders can seek employment in steel mills, smelting industries, refineries, aviation and petroleum industries.

Welding expenditure

The total cost involves in welding plays crucial roles to determine the quality and quantity of services provided by welders. Energy cost, material cost, labour cost, equipment cost and transportation cost are some of the many different variables that determine total cost of welded products. These variables influence the type of welding and products at particular times. Automated welding is more expensive than manual welding.

Welding safety

Welding is a very direct dangerous and unhealthy profession. Thus, if proper precautions (safety) and care are not taken by these welders, then they stand the risk of beingexpose to devastating industrial health hazards as well as injuries. At Siwdo, welding is a hot work process involving open fire at excessively high temperatures. Thus,welders must wear protective personal equipment such as leather gloves, long sleeves jackets, goggles, helmets and safety shoes. They must surround all welding areas with translucent

welding curtains made of polyvinyl chloride plastic to protect outsiders and bystanders from the ultraviolet lighting of the arc.

Fire Extinguishers

Generally, the extinguishers are designed to put off or control fires. The contents of fire extinguisher containers or bottles are known as extinguishing agents. These are water, chemical foam, dry chemical, carbon dioxide (co_2), aqueous film forming foam (AFFF) and halon. The common types of fire extinguishers that must be use at Siwdo are water, multi-purpose dry chemical foam and compressed gas. The use of wrong fire extinguisher can be devastating.

Welding Gloves

Safety gloves that welders at Siwdo must wear whiles welding should be the split or tough leather derive from the hide of cow, deer, elk, goat and swine. These gloves will provide these welders comfort and sensitivity and comes in all sizes ranging from extra small to extra large. These gloves are moisture resistant, dust resistant, brightly colored and prevent electric shock as well as enduring high heat conditions. These gloves must also with stand tear, cuts, scrape and puncture. The gloves are of sufficient thickness so that they can protect the hands and arms of these welders from the rays of the arc, molten metal spatter, spots and wear.

Welding Helmets

Welders at Siwdo must use or wear helmets made of pressed fiber insulating material. These helmets have adjustable headband so that welders of all head sizes can wear them. The helmets are all dull black in colour in order to maximize reflection and glave produce by the intense light. These welders need these helmets to protect their face, eyes and heads from harmful ultraviolet light. Hand-held shields also give the same protection to them as helmets do. These helmets have lenses fixed in the front to protect the eyes of these welders from flash burns, absorption of infrared as well as ultraviolet ray produced by the arc.

Welding safety goggles

Whenever welders at Siwdo are welding, they must wear their safety goggles to protect their eyes from weld spatter, slag particles, hot spots and photokeratitic (welders flash). The best or recommended goggles are the tinted safety glasses with side shields. These goggles also provide protection for the welders at Siwdo during chipping and grinding.

Safety shoes

The upper part of the recommended safety shoes for these welders at Siwdo are made of barton printed leather which is very tough. The linings of these shoes are made of mesh fabric. Their soles are made of dual high density rubber and the shoes'sizesvaries to fit the feet of all welders. These shoes are oil resistant, anti-slip abrasion resistant, durable, breathable, anti-static water proof and electric shock resistant. These shoes have the toes made of steel caps and can withstand high temperatures.

Earplugs

The welders at Siwdo must put on dual sided earplugs which protect their ears from damage. These devices allow the welders to hear conversations, signals and other critical sounds clearly without impairment. During arc flash, the calibrated noise filter acts instantaneously in order to suppress the noise to safer level to prevent these welders impairment.

Other safety devices

During other head welding, the welders must put on leather skull cap and shoulder cover to prevent head and shoulder burns. When these welders are welding under extreme temperature conditions, they must wear water proof aprons or jackets made of wool, chemically treated cotton which reduces combustibility, leather and resistant materials. These aprons protect the welders from any form of heat and radiation damages. The welders at Siwdo must make sure that all moving parts are covered with guards, there are restricted areas for safety devices such as fire extinguishers, all rooms or enclosed areas for welding are well ventilated, cleaning equipment must be use for proper cleaning, faulty equipment and tools must not be used.

METHODOLOGY

There is relatively large number of welders at Siwdo – Kokompe at Cape Coast in the Central Regional Capital of Ghana. Due to this reason, the author chose Siwdo – Kokompe for data collection in order to have substantive, relatively accurate as well as general data covery to validate the conclusion and recommendations. Through the administering of well-structured questionnaires made of open and close questions, qualitative and quantitative data was obtained. This data collection and analysis was the best means of creating awareness of the welders' problems. This data signifies the fact that collaborative measures are needed to improve working conditions of these welders.

TABLE 1

SHOP NUMBER GIVEN B Y CAPE COAST METROPOLITAN ASSEMBLY	SHOP NAME	SHOP MASTER'S NAME
CCMA/ SW/ 240	JOHN KNAF	JOHN KWAME FOSU
CCMA/ SW/ 161	NYAME ADOM	MASTER LATIE ABASS
CCMA / SW/ 140	EMMA'S YARD	EMMANUEL ANOBIL
CCMA / SW/ 320	GEOKA METAL HOWE	OTENG ANDOH
CCMA / SW/ 135	AMOAKOH SHOP	AMOAKOH ESHUN
CCMA/SW/ 230	NYIMPAH HIP MMOA	F. ACQUAH
	WELDING WORKSHOP	
CCMA /SW/ 076	UNITY WELDING SHOP	MASTERS MUCA
CCMA /SW/ 137	WOKA METAL WORKS	MOHAMMED IBRAHIM
CCMA /SW/ 208	OPPON WELDING SHOP	B. OPPON
CCMA /SW/ 047	MARTIN AKOH WELDING SHOP	MARTIN AKOH
CCMA /SW/ 204	MANSURU WELDING SHOP	MANSURU
CCMA /SW/ 079	BAKOS METAL SHOP	PATRICK KOOMSON
CCMA /SW/ 148	MAGID WELDING SHOP	MAGID SOLE MAN
CCMA /SW/ 331	GYE NYAME METAL WORKS	MASTER EKOW
CCMA /SW/ 205	AMEN WORK SHOP	MASTER KWAME
CCMA /SW/069	THE LORD IS MY LIGHT WELDING SHOP	MASTER KUMI
CCMA /SW/ 152	TWERE NYAME SHOP	ATO ATTA
CCMA /SW/ 279	THY WIIL BE DONE SHOP	MASTER OPOOMAN
CCMA /SW/ 301	IN GOD TRUST WELDING SHOP	J. AMOAH
CCMA /SW/ 206	YESU MO SHOP	MR. A. AKUSSI
CCMA /SW/323	PAUL'S WELDING SHOP	PAUL ATO MENSAH
CCMA /SW/ 132	AKWASI WELDING SHOP	AKWASI BOATENG
CCMA /SW/ 153	ELIJAH SHOP	ELIJAH MENSAH
CCMA /SW/ 166	KING OF KINGS METALS WORKS	EMMANUEL KWOFIE
CCMA /SW/ 205	KWAME NYAME SHOP	KWAME TUFFOR
CCMA /SW/ 241	OYE NYAME DZIN	MASTER ABPERU

SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 2

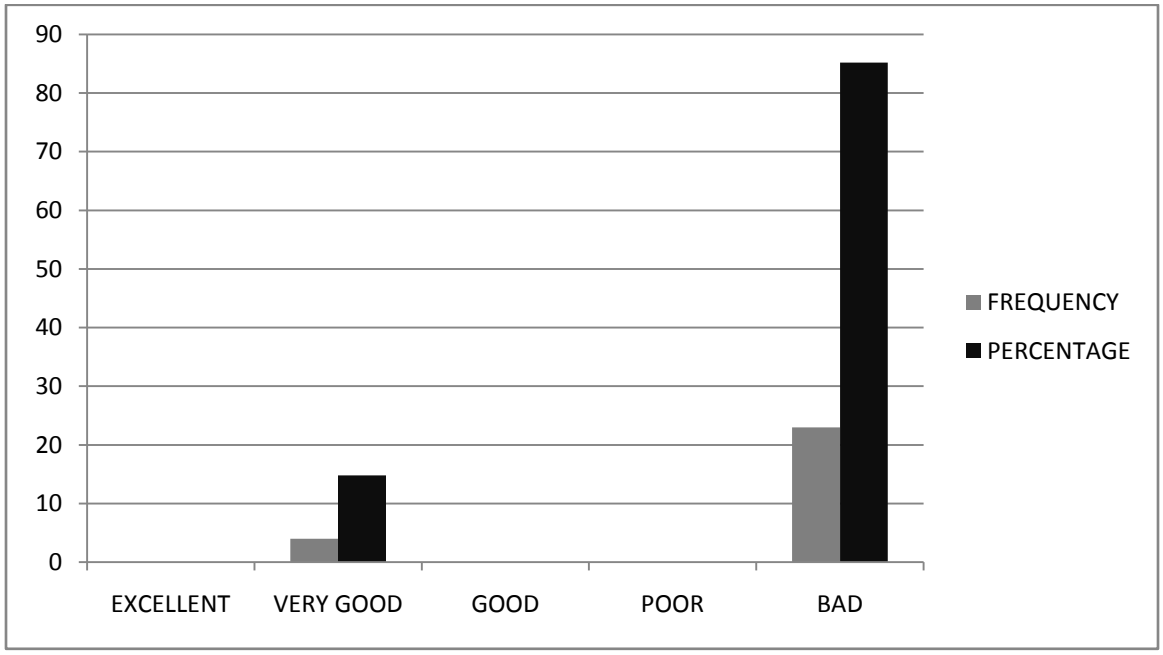
AVAILABILITY OF ROADS AND PATHS FOR FREE PASSAGE OF VEHICLES

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	0	0
Very good	4	14.8
Good	0	0
Poor	0	0
Bad	23	85.2
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 2

AVAILABILITY OF ROAD PATHS FOR FREE PASSAGE OF VEHICLES



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 3

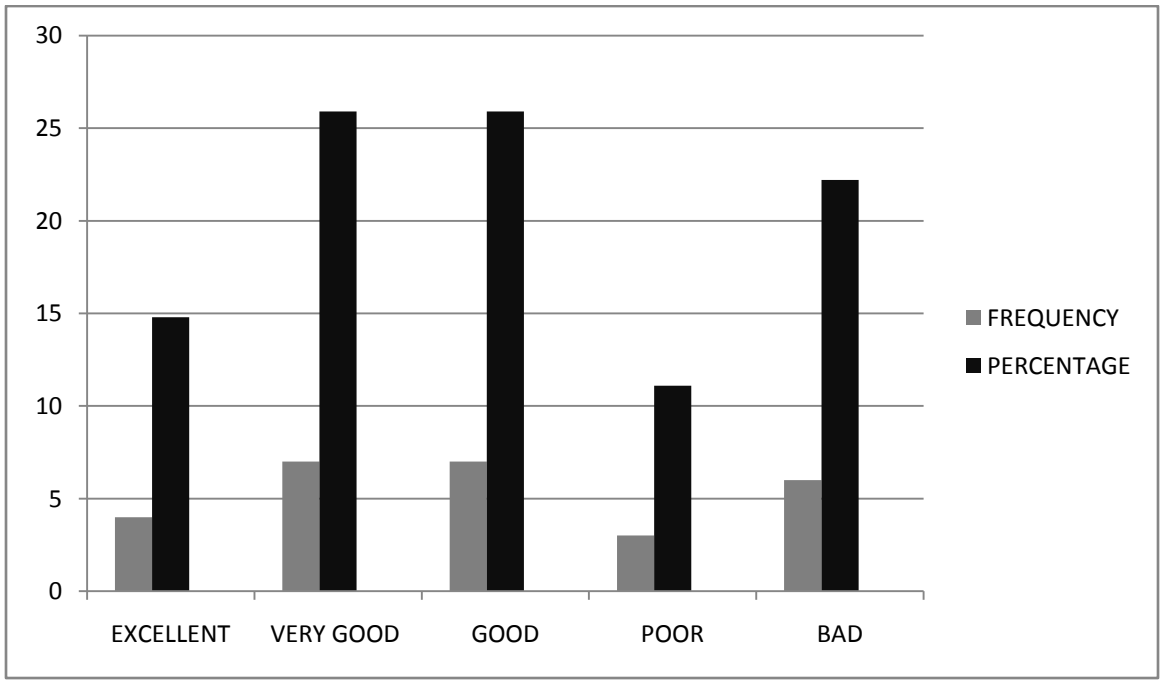
AVALIABILITY AND USE OF GLOVES

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	4	14.8
Very good	7	25.9
Good	7	25.9
Poor	3	11.1
Bad	6	22.2
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 3

AVALIABILITY AND USE OF GLOVES



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 4

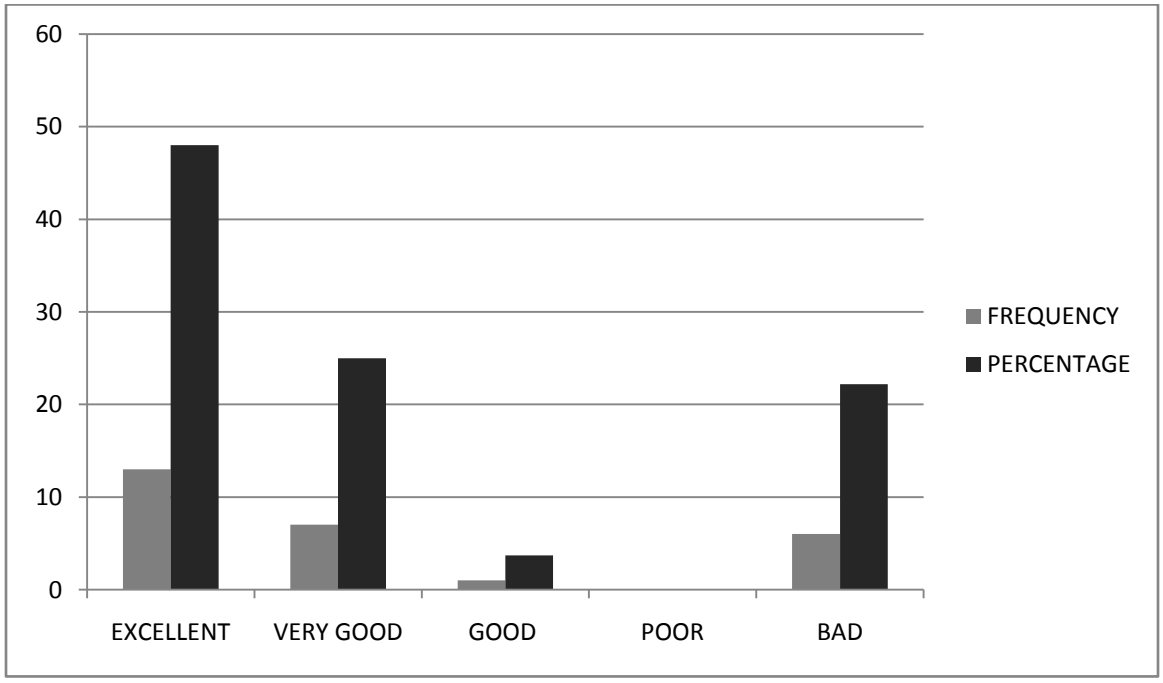
AVAILABILITY AND USE OF SAFETY BOOTS

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	13	48
Very good	7	25
Good	1	3.7
Poor	0	0
Bad	6	22.2
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 4

AVAILABILITY AND USE OF SAFETY BOOTS



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 5

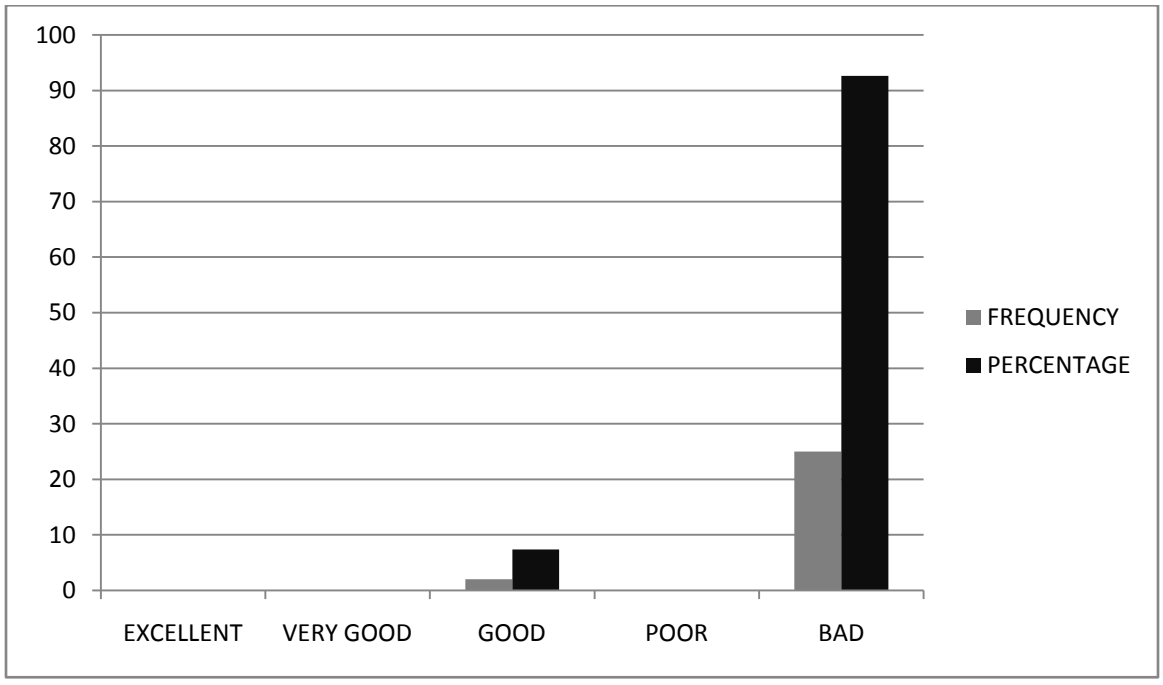
AVAILABILITY AND USE OF FIRE EXTINGUISHERS

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	0	0
Very good	0	0
Good	2	7.4
Poor	0	0
Bad	25	92.6
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 5

AVALIABILITY AND USE OF FIRE EXTINGUISHERS



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 6

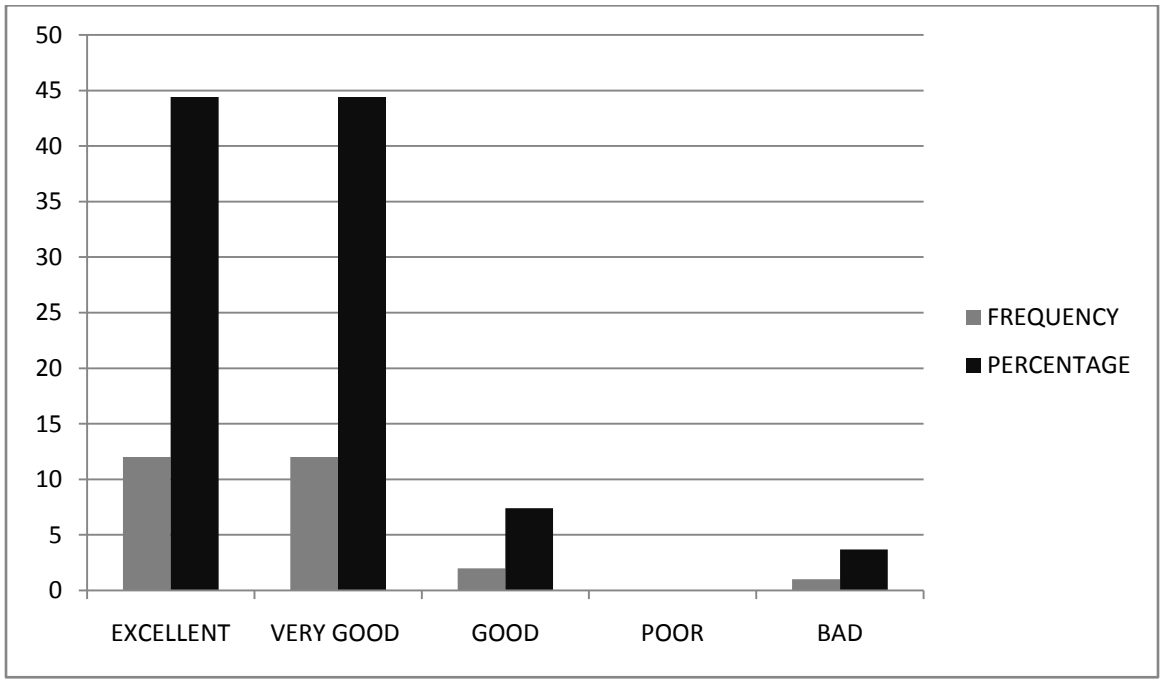
AVAILABILITY AND USE OF GOGGLES

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	12	44.4
Very good	12	44.4
Good	2	7.4
Poor	0	0
Bad	1	3.7
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 6

AVAILABILITY AND USE OF GOGGLES



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 7

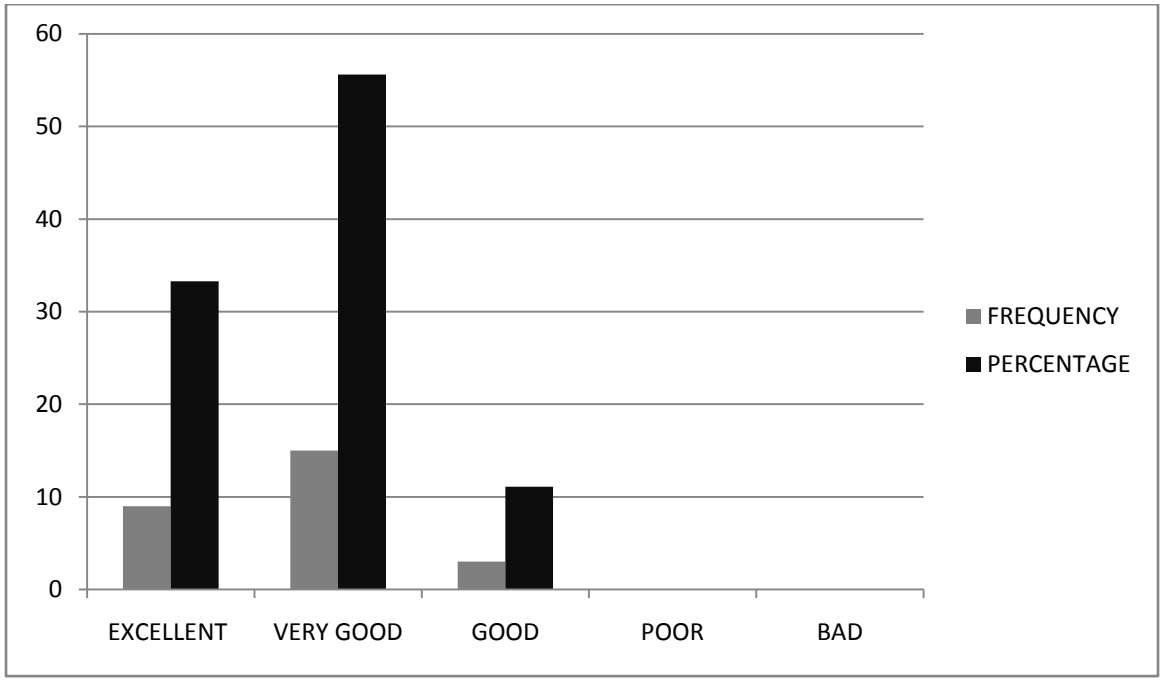
RELATIVE AVAILABILITY OF THE RIGHT TOOLS

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	9	33.3
Very good	15	55.6
Good	3	11.1
Poor	0	0
Bad	0	0
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 7

RELATIVE AVAILABILITY OF THE RIGHT TOOLS



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 8

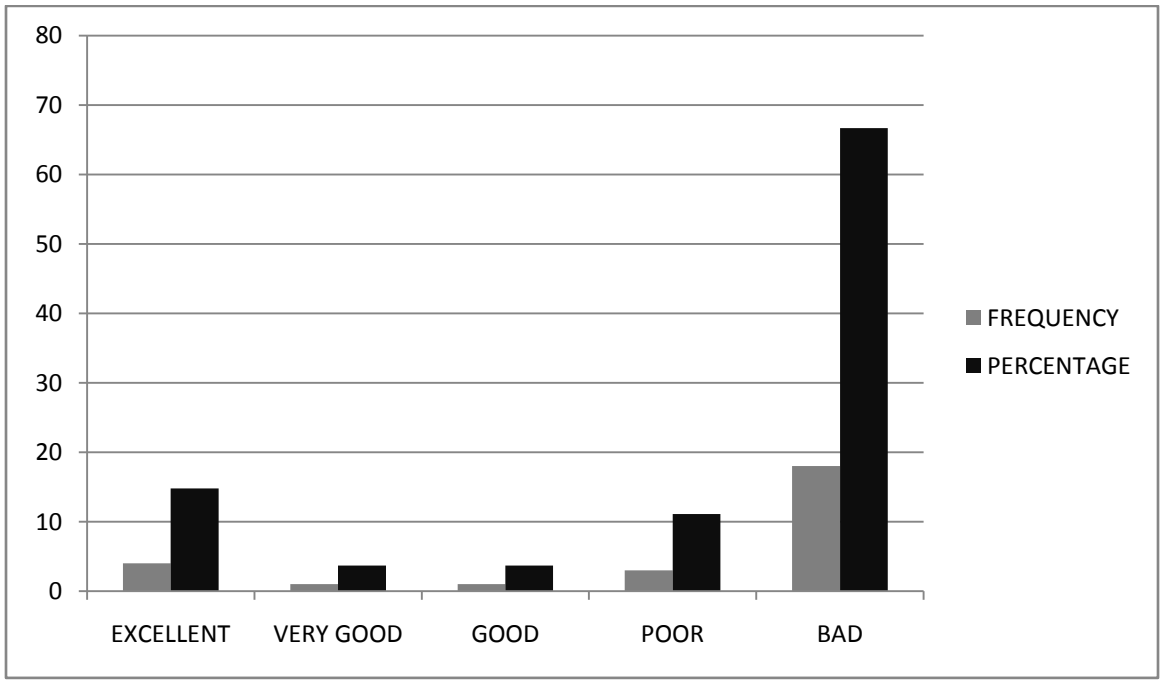
AVAILABILITY AND USE OF EARPLUG

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	4	14.8
Very good	1	3.7
Good	1	3.7
Poor	3	11.1
Bad	18	66.7
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 8

AVAILABILITY AND USE OF EARPLUG



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 9

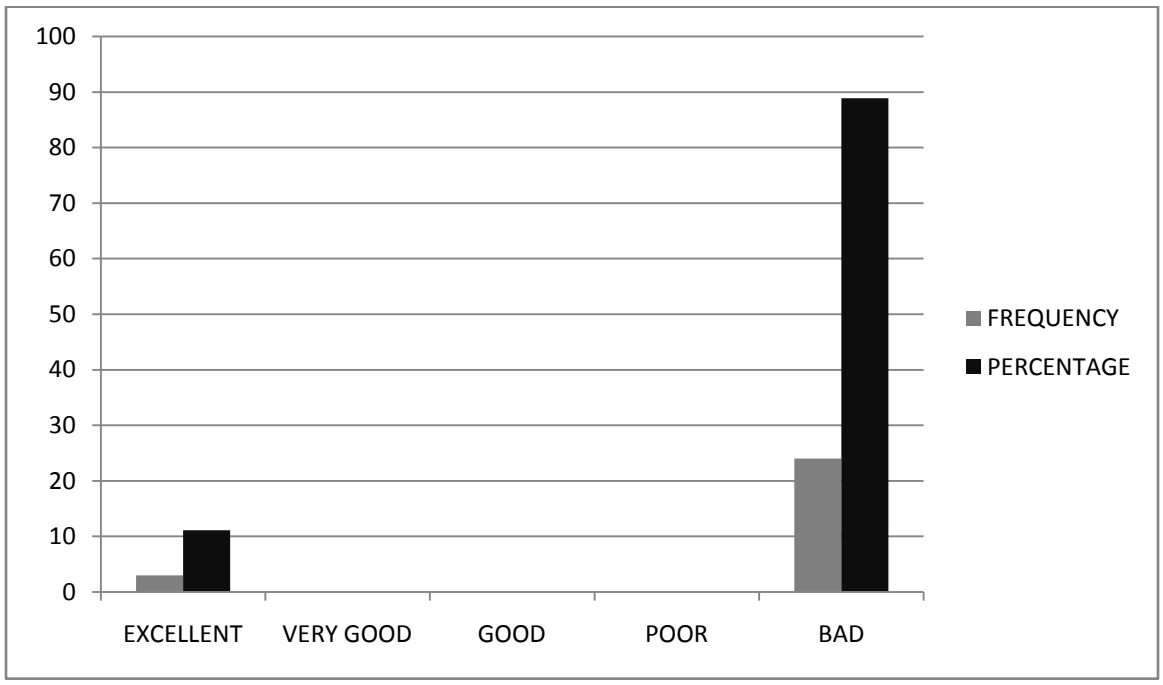
AVAILABILITY AND USE OF HELMENT

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	3	11.1
Very good	0	0
Good	0	0
Poor	0	0
Bad	24	88.9
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 9

AVAILABILITY AND USE OF HELMENT



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 10

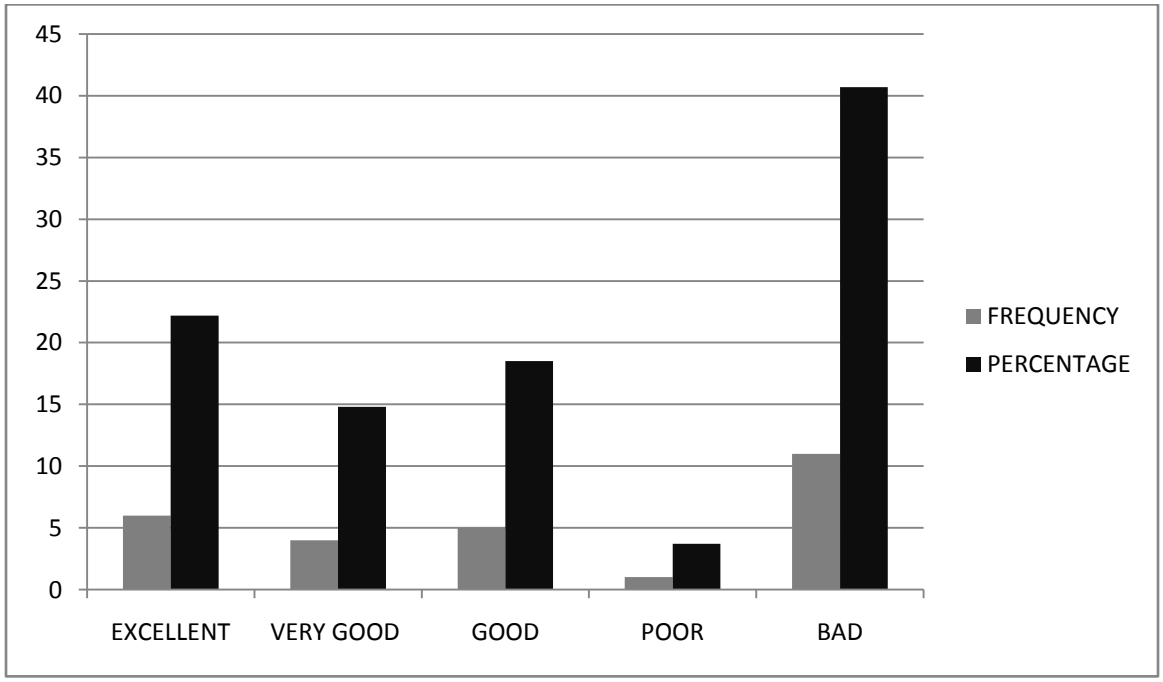
AVAILABILITY OF GUARDS COVERING MOVING PARTS

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	6	22.2
Very good	4	14.8
Good	5	18.5
Poor	1	3.7
Bad	11	40.7
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 10

AVAILABILITY OF GUARDS COVERING MOVING PARTS



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 11

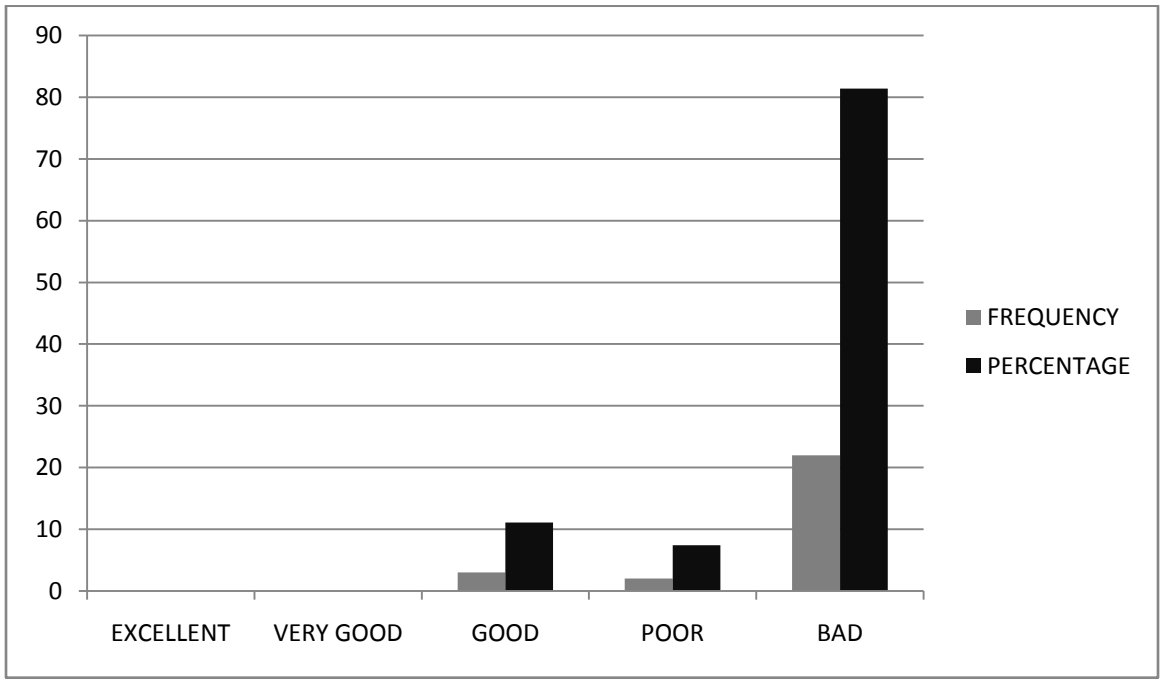
AVAILABILITY OF FIRE WARNING SIGNS

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	0	0
Very good	0	0
Good	3	11.1
Poor	2	7.4
Bad	22	81.4
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 11

AVAILABILITY OF FIRE WARNING SIGNS



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 12

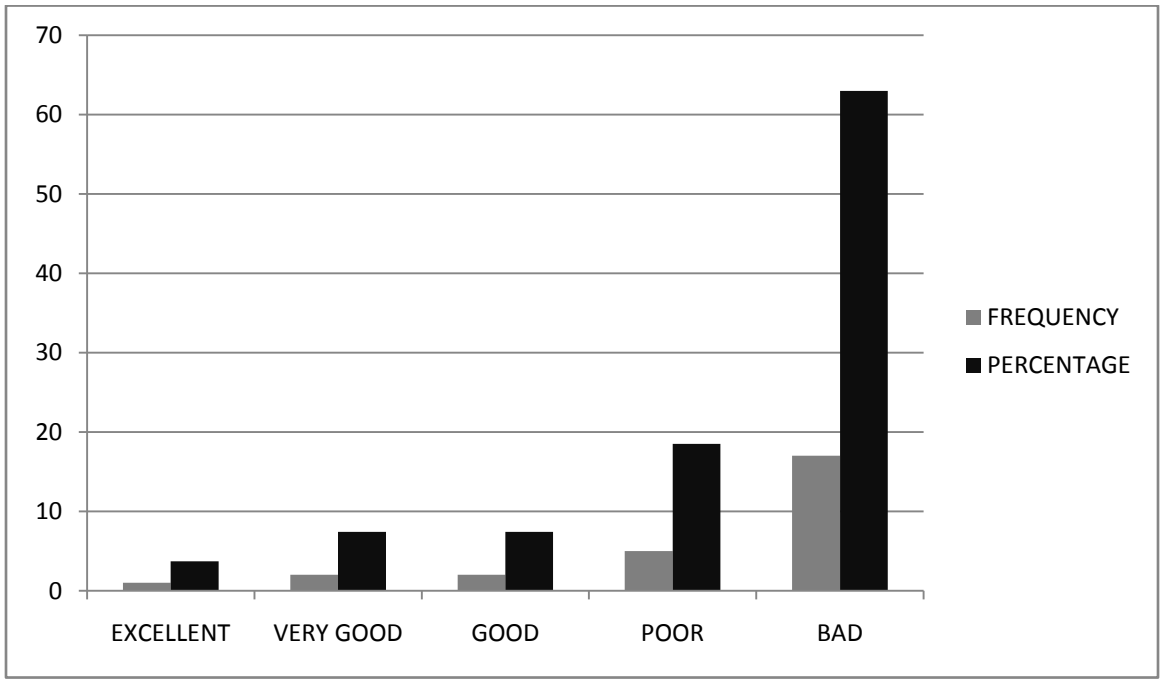
AVAILABILITY OF RESTRICTED AREAS OR ROOMS

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	1	3.7
Very good	2	7.4
Good	2	7.4
Poor	5	18.5
Bad	17	63
TOTAL	27	100

SOURCE: AUTHOR'S WORK 2013

FIGURE 12

AVAILABILITY OF RESTRICTED AREAS OR ROOMS



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 13

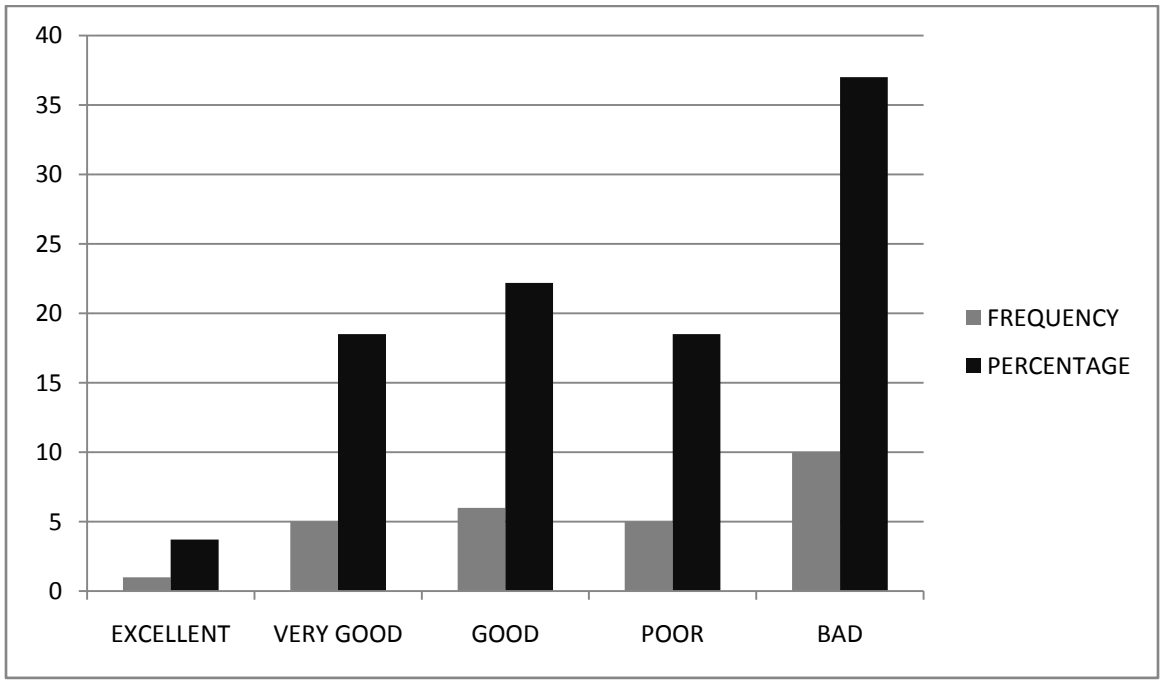
AVAILABILITY OF FAULTY EQUIPMENT

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	1	3.7
Very good	5	18.5
Good	6	22.2
Poor	5	18.5
Bad	10	37
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 13

AVAILABILITY OF FAULTY EQUIPMENT



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 14

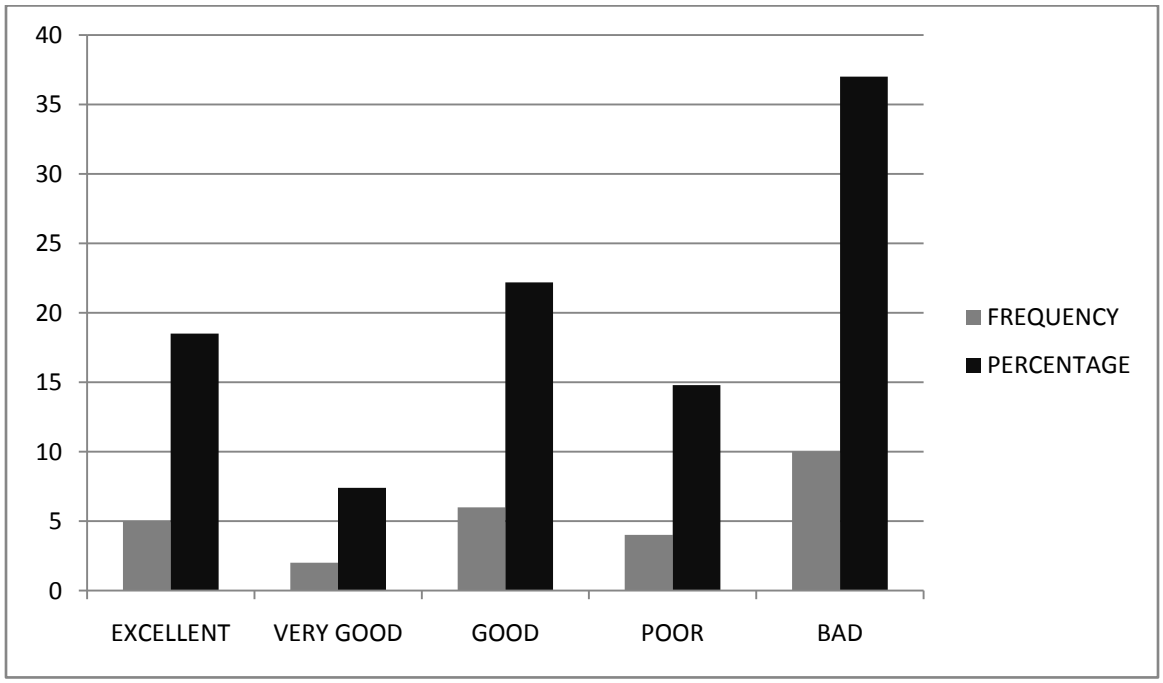
AVAILABILITY OF VENTILATED ROOMS

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	5	18.5
Very good	2	7.4
Good	6	22.2
Poor	4	14.8
Bad	10	37
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 14

AVAILABILITY OF VENTILATED ROOMS



SOURCE: AUTHOR'S FIELD WORK 2013

TABLE 15

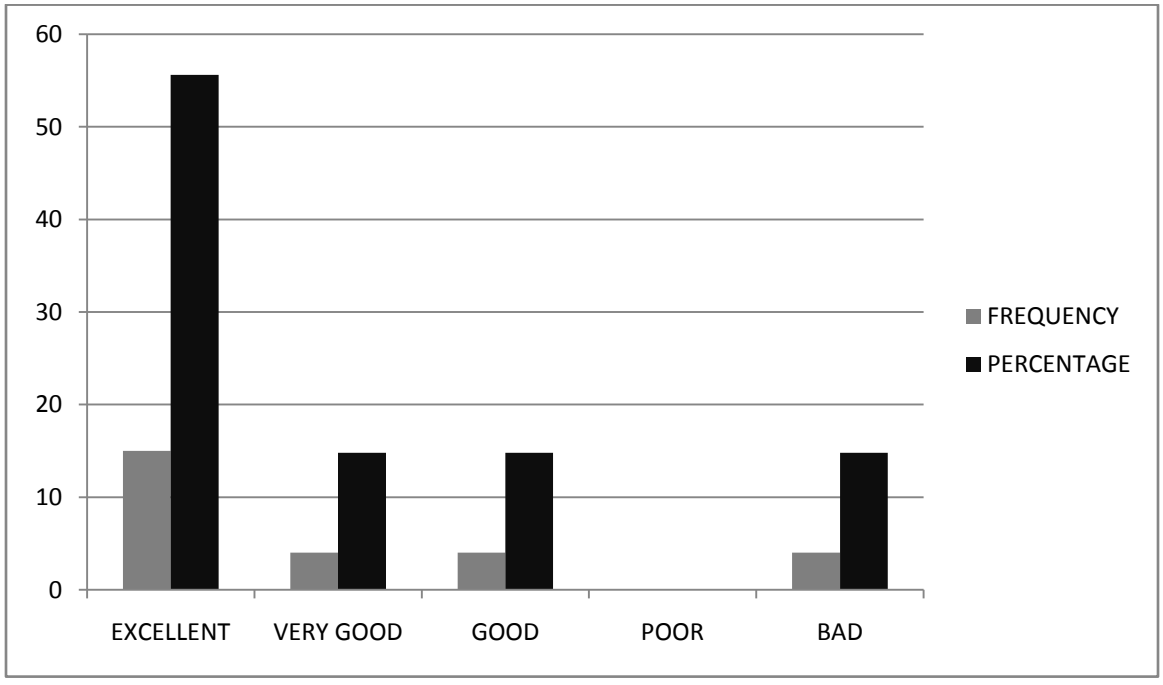
EFFECTIVE CLEANING OF EQUIPMENT BEFORE USING

RESPONDENT	FREQUENCY	PERCENTAGE
Excellent	15	55.6
Very good	4	14.8
Good	4	14.8
Poor	0	0
Bad	4	14.8
TOTAL	27	100

SOURCE: AUTHOR'S FIELD WORK 2013

FIGURE 15

EFFECTIVE CLEANING OF EQUIPMENT BEFORE USING



SOURCE: AUTHOR'S FIELD WORK 2013

DISCUSSIONS OR ANALYSIS

According to table 2 and graph 2, there are no excellent roads in the Siwdo Kokompe working area. Only 14.8% of the roads are in very good condition. None of the roads are in good and poor conditions with 85.2% of these roads in the bad state. Only 14.8% of the gloves these welders use are in the excellent state, about 5% are in the state of very good and good collectively. 11.1% are in poor condition whiles 22.2% of these gloves are in the bad state. Almost half of the safety shoes use by the welders at Siwdo are in the excellent condition with 25.9% in very good condition. 3.7% of these shoes available are in good condition with 0% in poor state and 22.2% in bad condition. At Siwdo, 92.6% of the fire extinguishers available for use by these welders are in bad condition with only 7.4% good. 0% of these extinguishers are in excellent, poor and very good conditions. The goggles available for these welders for use are in the conditions of 44.4% excellent, 44.4% very good, 7.4% good, 3.7% bad and 0% poor. 33.3% of the right tools available for welders' usage are in excellent condition, 55.6% are in very good condition, 11.1% are in good condition, whiles 0% is in poor and bad conditions. 92.6% of the earplugs available for usage are in the bad condition, 0% in poor condition and 7.4% in good condition. 88.9% of helmets available to these welders at Siwdo for use are in the bad condition, 11.1% are in excellent condition, 0% are in very good, good and poor conditions. 40.7% of the guards covering moving parts available are in the bad state, 3.7% are in poor condition, 18.5% in the good condition, 14.8% in very good condition and 22.2% in excellent condition. At Siwdo Kokompe, 81.5% of the available fire warning signs are in bad condition, 7.4% are in poor condition, 11.1% are in good condition, 0% are in very good and excellent conditions. 63% of the available restricted rooms or areas are in bad condition, 18.5% in poor condition, 3.7% in excellent condition with 7.4% in goodand very good conditions each. At Siwdo, the state of faulty equipment available to the welders are 37% bad, 18.5%poor, 22.2% good, 18.5% very good and 3.7% excellent. 37% of the ventilated rooms for these welders are badly ventilated, 14.8% are in poor state, 22.2% are in good condition, 7.4% are in very good condition and 18.5% in excellent condition. 14.8% of the effective cleaning of equipment before use are badly done, 0% in poor condition, 55.6% in excellent done condition with 14.8% in good and very good conditions.

CONCLUTION

Relatively, the roads at Siwdo cluster of artisans are in the bad state. Some of the shoes that are available to the welders to wear are in bad condition. Some of the gloves that the welders must wear to protect themselves are in bad and poor conditions.

Conditions of goggles available for use by these welders as protection devices are relatively better. The right tools available for use are comparably in the best conditions.

Earplugs availability and usage for the welders are worse. Almost all the helmets that are available to be use by these welders are in bad state.

Fire warning signs are either absent or available in the bad state. About two-thirds of the restricted rooms or areas are in bad condition.

RECOMMENDATIONS

There is the urgent need to educate the welders at Siwdo Kokompe on health hazards and safety of chemicals .Fire extinguishers need not be heavy because of easy handling, thus the heavy fire extinguishers must be provided with wheels for easy movement and handling. These welders need to replace the old fire extinguishers with new ones. They must place enough fire extinguishers at locations where they can be easily reached and their ways as well as visibility must not be block by materials or machines. They must also place fire extinguishers at marked locations where they will not be damage by tracks, cranes, corrosion by chemical processes or other work activities. These welders at Siwdo must be train to properly maintain the fire extinguishers by way of testing, recharging, servicing, inspecting and records keeping by personnel of National Fire Service.

The roads at Siwdo must be properly constructed for easy movement of vehicles and services. Safety devices such as shoes, gloves, goggles, curtains and helmets must be made available in good conditions and in sufficient quantities by the welders for use. They must also be educated on the uses of such safety or protective devices. There is also the need for drastic improvement in ventilation, fire warning signs and restricted rooms areas.

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