International Journal of Latest Research in Engineering and Management" (IJLREM)
ISSN: 2456-0766
www.ijlrem.org Volume 2 Issue 5 ǁ October. 2018 ǁ PP 14-25

Fire Safety Compliance in Public Senior High Schools within the Cape Coast Metropolis

Benjamin Boahene Akomah[1], Samuel Kotey[1]
[1]*Department of Building Technology, Cape Coast Technical University, Ghana*

ABSTRACT: *Over the past one and half decades, fire has razed down a number of Public Senior High School (PSHS) dormitories and school blocks in eight different regions, destroying valuable State's assets and personal belongings of students worth millions of Ghana Cedis. The study objectives were to determine (1) the level of fire safety compliance in PSHS; and (2) the reasons for non-compliance with fire safety regulations in PSHS. Two different sets of populations were used. The first category comprised of head teachers while the second category covered physical structures made up of dormitories and kitchens. The census method was employed in the selection of both head teachers and physical structures. The study identified first class schools to be more compliant than second and third class schools when it comes to the provision of fire hydrants. It was discovered that none of the third class schools in the metropolis had fire hydrant. Lack of funds and high cost of fire safety equipment were identified to be the key reasons for non-compliance with fire safety. The minimum fire safety compliance level was established to be 0% with 40.0% being the maximum, which means some structures on PSHS campuses within Cape Coast are zero percent fire safety compliant.*

KEYWORDS: *Fire Safety Compliance, PSHS, Bonferroni Multiple Comparisons, Cape Coast*

I. INTRODUCTION

Fire can be a useful tool, but it can also be a deadly nightmare. According to [1], fire is a good servant but can also be a bad master. For some PSHS in Ghana, fire became their nightmare and bad master when their dormitories, kitchens and school blocks were razed down. The truth is, most PSHS in the country have no fire safety equipment or devices. Fire safety should be the responsibility of all stakeholders: government, schools' management, the Ghana National Fire Service, Parent Teacher Associations, students, and all workers employed in such schools. Fire safety is the set of practices intended to reduce the destruction caused by fire [2]. He stated that fire safety should be a matter of concern for all in order to save lives and properties. In most Ghanaian PSHS, the issue of fire safety seems to be taken for granted when one looks at new building developments or refurbishments. The World Fire Statistics has expressed this problem using the term, the banality of fire. Fire should be, of course, far from banal to any society, due to its economic and human cost [12]. An examination of the degree to which fire safety compliance is applied or breached in public schools gives an indication of the effectiveness of the safety culture in such schools. This is because almost all the factors that affect the implementation of fire safety compliances are in the direct control of management of PSHS [15]. A dormitory in Bolgatanga was gutted by fire in 2005 and it took the intervention of the Ghana National Fire Service (GNFS) to put it out. In 2008, one of the modern structures serving as Boys Hostel for the Bibiani Senior High School was burnt to ashes when it caught fire. There were no casualties but students were displaced, lost their personal effects, stationeries and foam mattresses to the fire [3]. In the year 2011, fire gutted Ntonso SDA Girls Senior High School dormitory and classroom block in the Kwabre-East District, destroying the dormitory and classroom block, as well as personal belongings of most of the boarding students [4]. The study found only one recorded case for private senior high schools. This occurred at Tema Senior High School in the Greater Accra Region on the 13th June, 2008. These events cost the nation, parents, and students and schools a fortune and raises a scare. Below is the full list of events of fire outbreaks on various PSHS campuses over the past one and half decades in Ghana.

Table 1: Fire outbreak incidents in PSHS in GHANA

Serial Number	Name of school	Month and year of fire outbreak	Type of structure affected	Town	Region
1	Saint Francis Girls SHS	1st June, 2002	Two Dormitories	Jirapa	Upper West Region
2	Lassia-Tuolu SHS LASSEC	26th July, 2003	Boys Dormitory	Wa	Upper East Region
3	Bibiani SHS	14th/15th June, 2008	Boys Dormitory	Bibiani	Western Region
4	Begoro Presbyterian SHS	1st March, 2009	Dormitory	Begoro	Eastern Region
5	Saint Francis SHS	3rd June, 2010	Girls Dormitory	Jirapa	Upper West Region
6	Amaniampong SHS	24th January, 2011	Boys Dormitory	Asante-Mampong	Ashanti Region
7	Ntonso SDA Girls SHS	28th and 29th October, 2011	Dormitory/School Block	Ntonso	Ashanti Region
8	Our Lady of Apostles (OLA) SHS	14th February, 2012	Two Dormitories	Ho	Volta Region
9	Gomoa STS	1st October, 2013	Girls Dormitory	Dawurampong	Central Region
10	Bolga SHS	29th November,14	Boys Dormitory	Bolgatanga	Upper East Region
10	Bolgatanga SHS	29th November, 2014	Boys Dormitory	Bolgatanga	Upper East Region
11	Bekwai SDA SHS	27th January, 2016	Boys Dormitory	Bekwai	Ashanti Region
12	Oti Boating SHS	29th January, 2016	Boys Dormitory	Koforidua	Eastern Region
13	Ghana SHS (GHANASS)	17th march, 2016	Girls Dormitory	Koforidua	Eastern Region
14	Kumasi STS	27th April, 2016	Girls Dormitory	Kumasi	Ashanti Region
15	T.I. AHMADIYA GIRLS SHS	27 APRIL 2016	Dormitory/School Block	Fomena	Ashanti Region
16	Okuapeman SHS	8th May, 2016	Boys Dormitory	Akropong	Eastern Region
17	Saint Charles SHS	21st March, 2017	Boys Dormitory	Tamale	Northern Region
18	Asuom SHS	6th October, 2017	Boys Dormitory	Asuom	Eastern Region
19	T.I. AHMADIYA GIRLS SHS	17th October, 2017	Two Dormitories	Fomena	Ashanti Region
20	Kokongo odumase SHS	9th December, 2017	Boys Dormitory	Konogo Odumase	Ashanti Region
21	Pong-Tamale SHS	9th April, 2018	Girls Dormitory	Savelugu	Northern Region

Fire Safety Compliance: Fire safety compliance is the adequacy of fire safety provisions in buildings demonstrated by the provision of performance requirements [14]. To ensure that a building is fully compliant, fire safety appliances must be installed within a building, a given space or premise to perform vital functions by protecting lives and preventing injury in the event of fire [5].

Fire Safety Requirement in Buildings: According to [6], safety requirements for schools ensure that every student or individual within a school's environment has a healthy learning and working experience. These requirements signify the existence of a working safety plan for both students and management in case of emergency. To ensure maximum fire safety, a school must meet all the necessary guidelines set by the Ghana National Fire Service and management [6]. On the other hand, the safety of classroom users are assured if the following safety requirements are in place: means of escape, fire resisting construction, means of access, fire safety management, fire safety certificate acquisition and source of water, fire hydrants, call points, sounders or bells, fire extinguishers, exit signs, general fire notices, emergency lighting, evacuation plan, evacuation procedures, smoke detectors and control panels.

II. FIRE SAFETY MANAGEMENT

Users of school's facilities have legal responsibility to take reasonable measures to prevent the occurrence of fire in order to protect lives and ensure the safety of occupants in the event of fire [7]. Students, teachers and management can take active or passive stance on fire safety measures out of naivety unless they become conscious of the significance of the measures, of their role with regard to prevention of fire and of the appropriate actions to be taken in the event of fire. Every PSHS needs fire safety programme. It must be established in order to correctly ensure fire safety and also meet legal obligations. The time is due for PSHS to have fire safety managers with the responsibility for drawing up, implementing and overseeing fire safety programmes. Whoever is employed into such a position should be a person on top of his or her job to be able to adequately and effectively discharge his or her assigned responsibilities. Stringent fire safety measures and programmes are required in PSHS to prevent and respond to fire outbreaks to safeguard lives and public assets [7].

Fire Safety Certificate Acquisition: A fire safety certificate is a certificate issued by the District Planning Authority and any other authority charged with that responsibility to certify that works or buildings for which applications relate, will if constructed in accordance with the plans and specifications submitted, comply with the requirements of the National Building Regulations, 1996: L.I. 1630.

Procedure for Acquiring Fire Safety Certificate: In Ghana, the procedure for acquiring fire certificate can be grouped under two main headings: the role of the client and the responsibility of the fire inspector.

(A) The role of the client: A prospective client first has to obtain an application form from the Fire Service office in the Region. The client in the form sold to him has the responsibility to clarify whether the application he or she is seeking for is for an existing structure with the necessary fire features installed already or a proposed structure yet to be built or existing building without any fire features mounted. The client after that prepares and presents to the Fire Service, four copies of fire conceptual report with some copies of fire engineering drawings explaining the fire features to be installed, the specific types and the quantities of the equipment needed. The client then provides zone status from the Assembly that the site plan falls within or E.P.A. permit in the case of LPG installations or a fuel service station [16].

(B) The responsibilities of the fire inspector: The fire inspector books an appointment with the client to inspect the structure under consideration after all the necessary documents required have been provided. After this, the fire inspector reviews the drawings based on the structure on the site or block plan and assesses the area where the proposed structure will be built. The inspector carries out a re-inspection after the proposed structure is built to establish compliance or otherwise [16].

III. COMPLIANCE WITH FIRE SAFETY MEASURES

Compliance with fire safety measures is very important for the overall wellbeing of students, workers and management of PSHS. The purpose of fire safety measures according to [13], is to discover and correct conditions that can threaten lives and properties. Fire safety measures serve as motivation for students and management, for the prevention of future fire hazards. A study undertaken by [8] revealed that residential accommodations are sometimes non-compliant with fire safety standards. Unfortunately, the same is the case for most PSHS in Ghana [9].

Methodology: Fire safety compliance is a crucial issue in PSHS. In order for a fair assessment to be done, there was the need to collect data using specific research instruments with the intention of analyzing them and drawing out very significant lessons. With this in mind, questionnaire and observation were deemed appropriate. The questionnaire was built out of a checklist collected from the Ghana National Fire Service (GNFS), Cape Coast. It sought to solicit information on the reasons for non-compliance with fire safety measures in PSHS. The questionnaire was structured using closed ended questions. This was to ensure consistency and uniformity in responses. Another set of data was collected using structured observation checklist. The checklist had three sections, namely; means of escape, firefighting equipment and fire detection and alarm system or device drawn from the LI 1724. Series of observations were carried out in the kitchens and dormitories of all 10 schools with the aid of the structured observation checklist. This was to establish at firsthand, provisions made by management. Other secondary sources of information were also solicited. Two different sets of populations were used. One category comprised of head teachers of PSHS within the metropolis while the other category comprised of physical structures made up of dormitories and kitchens on the various campuses of the schools. The population for the first category was 10 representing head teachers and the second category was 80 representing physical structures. The census method was employed in sampling all head teachers and physical structures. According to [10], census sampling is a complete enumeration of all items in a population. This method is recommended for populations which are sufficiently small and completely bias free. The study used all 10 head teachers and 80 physical structures. The use of this method was aimed at obtaining responses that could fairly represent the categories of populations. Descriptive statistics was employed in the description of the various features of the data collected. The level of fire safety compliance was achieved using Bonferroni multiple comparisons.

IV. RESULTS AND DISCUSSION

(A) Distribution of Dormitories: A clear picture of the distribution of dormitories can be seen in Figure 1. Ghana National College has the highest number of dormitories (13 of the 70) as captured by the study. This is followed by Adisadel College with 12 dormitories. Oguaa Senior High/Technical and Efutu Senior High/Technical have the least number of dormitories (2 dormitories each).

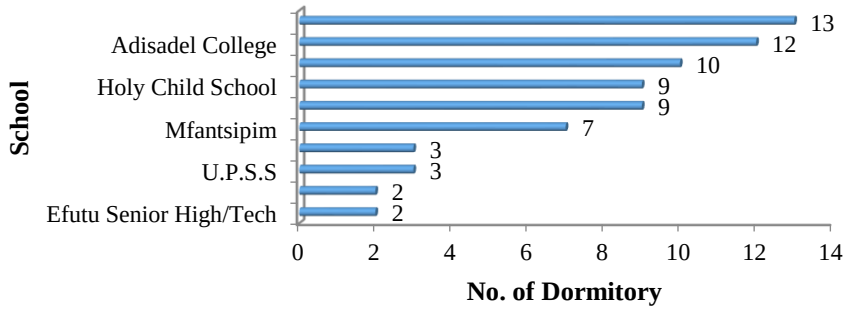

Fig. 1 Dormitories by Schools

(B) Distribution of Number of Dormitories by Class of School: Figure 2 shows the distribution of number of dormitories by class of schools. It can be observed that, first class schools have the highest number of dormitories (47 of the 70). This is followed by second class schools with 18 dormitories. Third class schools recorded the least number of dormitories (5 dormitories).

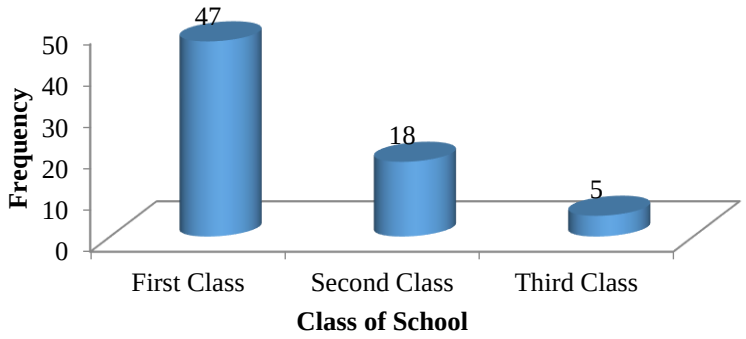

Fig. 2 Number of Dormitories by Class of Schools

(C) Distribution of Number of Dormitories by Type of School: The distribution of number of dormitories by type of school can be seen in Figure 3. Boys schools have more dormitories than other types of schools. They registered 29 out of the 70. This is followed by mixed schools with 23 dormitories. Girls schools have the least number of dormitories (18 dormitories).

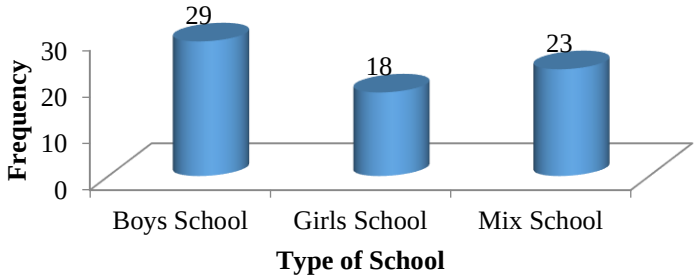

Fig. 3 Number of by Dormitories Type of Schools

(D) Distribution of Number of Dormitories by Type of Dormitory: Boys dormitories are in the majority as depicted in Figure 4. There are 39 boys' dormitories constituting about 56% of the total number of dormitories captured in the study with (31) going for girls.

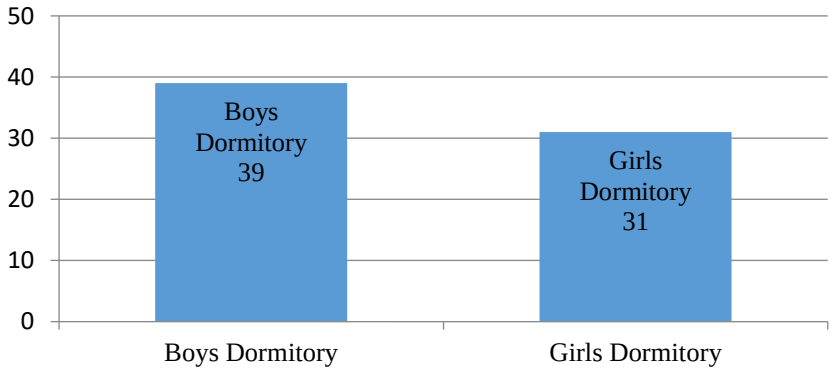

Figure 4. Number of Dormitories by Type of Dormitory

(E) Fire Safety Compliance: The analysis here gives the general picture of fire safety compliance in the various schools. From Table 2, it can be observed that 59 out of 70 (84.3%), 33 out of 70 (47.1%), 30 out of 70 (42.9%), 21 out of 70 (30.0%) and 7 out of 70 (10.0%) dormitories respectively have fire hydrants, call points, sounders/bells, extinguishers and exist signs. None of the dormitories have exit directional signs, general fire notices, emergency lightings, evacuation plans, evacuation procedures, smoke detectors and control panels.

Table 2: Fire safety compliance in Dormitories

Fire Safety Compliance		Class of School			Type of School			Type of Dormitory		Total
		First Class	Second Class	Third Class	Boys School	Girls School	Mixed School	Boys	Girls	
Fire Hydrants	Freq.	47	12	0	29	18	12	32	27	59
	%	100.0%	66.7%	0.0%	100.0%	100.0%	52.2%	82.1%	87.1%	84.3%
Call Point	Freq.	29	2	2	29	0	4	32	1	33
	%	61.7%	11.1%	40.0%	100.0%	0.0%	17.4%	82.1%	3.2%	47.1%
Sounder/Bell	Freq.	18	12	0	0	18	12	2	28	30
	%	38.3%	66.7%	0.0%	0.0%	100.0%	52.2%	5.1%	90.3%	42.9%
Extinguisher	Freq.	18	3	0	0	18	3	2	19	21
	%	38.3%	16.7%	0.0%	0.0%	100.0%	13.0%	5.1%	61.3%	30.0%
Exit Sign	Freq.	7	0	0	7	0	0	7	0	7
	%	14.9%	0.0%	0.0%	24.1%	0.0%	0.0%	17.9%	0.0%	10.0%
	Freq.	0	0	0	0	0	0	0	0	0

Exit Directional Sign	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
General Fire Notice	Freq.	0	0	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Emergency Lighting	Freq.	0	0	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Evacuation Plan	Freq.	0	0	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Evacuation Procedure	Freq.	0	0	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Smoke Detector	Freq.	0	0	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Control Panel	Freq.	0	0	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	**Freq.**	**47**	**18**	**5**	**29**	**18**	**23**	**39**	**31**	**70**

(F) Fire Safety Compliance in Kitchens: Table 3 looks at fire safety compliance in kitchens. The observation made is that, 5 out of the 10 schools have call points and extinguishers for their kitchens. Only one school out of the 5 schools has exit sign and evacuation plan. None of the schools have exit directional signs, general fire notices, sounders or bells, evacuation procedures, heat detectors, smoke detectors and gas detectors.

Table 3: Fire safety compliance in Kitchens

Fire Safety Compliance		Class of School			Type of School			Total
		First Class	Second Class	Third Class	Boy Schools	Girl Schools	Mixed Schools	
Call Point	Freq.	3	2	0	2	2	1	5
	%	75.0%	50.0%	0.0%	66.7%	100.0%	20.0%	50.0%
Extinguisher	Freq.	3	2	0	2	2	1	5
	%	75.0%	50.0%	0.0%	66.7%	100.0%	20.0%	50.0%
Exit Sign	Freq.	1	0	0	1	0	0	1
	%	25.0%	0.0%	0.0%	33.3%	0.0%	0.0%	20.0%
Evacuation Plan	Freq.	1	0	0	1	0	0	1
	%	25.0%	0.0%	0.0%	33.3%	0.0%	0.0%	20.0%
Exit Directional Sign	Freq.	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
General Fire Notice	Freq.	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Evacuation Procedure	Freq.	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Heat Detector	Freq.	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Smoke Detector	Freq.	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sounder/Bell	Freq.	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gas Detector	Freq.	0	0	0	0	0	0	0
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	**Freq.**	**4**	**4**	**2**	**3**	**2**	**5**	**10**

(G) Reasons for Non-Compliance with fire safety measures by Schools: Almost all the head teachers stated lack of funds for procurement of fire safety equipment and high cost of fire safety equipment as the reasons for non-compliance with fire safety measures. These two reasons each recorded a mean agreement of 3.7 and a standard deviation of 0.67. Also, 8 out of the 10 head teachers indicated lack of fire safety equipment purchasing points, lack of maintenance of fire safety equipment, inadequate knowledge on the use of fire safety devices and inadequate communication between GNFS and management of PSHS as some fundamental reasons for non-compliance. The least rated reason is insufficient legislative instrument as recorded in Table 4.

Table 4: Reasons for Non-Compliance by Schools

Reasons for Non-Compliance	N Agreement	% Agreement	Mean	Standard Deviation
Lack of Funds for the Procurement of fire safety Equipment	9	90.0	3.7	0.67
High Cost of Fire Safety Equipment	9	90.0	3.7	0.67
Lack of fire safety equipment Purchasing Point	8	80.0	3.1	0.99
Lack of Maintenance of fire Safety Equipment	8	80.0	3.0	0.94
Inadequate Knowledge on the use of fire Safety device	8	80.0	2.9	1.10
Inadequate Communication between GNFS and School's Management	8	80.0	2.9	0.88
Lack of Fire safety programmes by GNFS	7	70.0	2.6	0.70
Unclear fire code requirement	6	60.0	2.8	0.79
Lack of fire Safety Policy	6	60.0	2.7	0.95
Lack of Fire safety education from GNFS	6	60.0	2.7	0.95
The lack of desire to comply with fire safety by school's management	6	60.0	2.7	1.16
Insufficient Knowledge about the appropriate legislative instrument	4	40.0	2.3	0.67

(H) Reasons for Non-Compliance with Fire Safety by Class of Schools: According to Table 5, the reasons for non-compliance with fire safety in first class schools are lack of funds for procurement of fire safety equipment and high cost of fire safety equipment. This registered a mean level of agreement of 3.5 and a standard deviation of 1.00. Second class schools agreed with first class schools on the same reasons and recorded a mean agreement of 3.8 and a standard deviation of 0.50. For third class schools, the most significant reasons are lack of funds for procurement of fire safety equipment, high cost of fire safety equipment, lack of maintenance of fire safety equipment, lack of fire safety education from GNFS, and the lack of desire to comply with fire safety regulations by management of PSHS. All these reasons recorded a mean agreement level of 4.0 and a standard deviation of 0.00.

Table 5: Reasons for non-compliance by class of schools

Reasons for Non-Compliance	Class of Schools								
	First Class (n=4)			Second Class (n=4)			Third Class (n=2)		
	n Agreement	Mean	SD	n Agreement	Mean	SD	n Agreement	Mean	SD
Lack of Funds for the Procurement of fire safety Equipment	3	3.5	1.00	4	3.8	.50	2	4.0	0.00
Inadequate Knowledge on the use of fire Safety device	3	3.0	1.41	3	2.8	1.26	2	3.0	0.00
High Cost of Fire Safety Equipment	3	3.5	1.00	4	3.8	.50	2	4.0	0.00
Lack of fire Safety Policy	2	2.3	.96	2	2.8	.96	2	3.5	.71
Lack of Maintenance of fire Safety Equipment	3	2.5	1.00	3	3.0	.82	2	4.0	0.00
Lack of fire safety equipment Purchasing Point	3	2.8	1.26	3	3.3	.96	2	3.5	.71
Lack of Fire safety education from GNFS	1	2.0	82	3	2.8	.50	2	4.0	0.00

Lack of Fire safety programmes by GNFS	2	2.3	.96	3	2.8	.50	2	3.0	0.00
Inadequate Communication between GNFS and School's Management	3	2.8	.50	3	2.8	1.26	2	3.5	.71
Insufficient Knowledge about the appropriate legislature Instrument	0	1.8	.50	2	2.5	.58	2	3.0	0.00
Unclear fire code requirement	1	2.5	1.00	3	3.0	.82	2	3.0	0.00
The lack of desire to comply with fire safety by school's management	2	2.3	.96	2	2.5	1.29	2	4.0	0.00

(I) Reasons for Non-Compliance with Fire Safety by Type of Schools: Schools which are purely boys asserted that, lack of funds for procurement of fire safety equipment and high cost of fire safety equipment are the reasons for non-compliance. These reasons recorded mean agreement of 3.0 and standard deviation of 1.15 as captured in Table 6. Purely girls schools pointed out the same reasons but recorded mean agreement of 4.00 and standard deviation of 0.00. Mixed schools agreed with the position of the two types of schools mentioned earlier but recorded mean agreement level of 3.8 and standard deviation of 0.45.

Table 6: Reasons for non-compliance by type of schools

Reasons for Non-Compliance	Type of Schools								
	Boys Schools (n=3)			Girls Schools (n=2)			Mixed Schools (n=5)		
	n Agreement	Mean	SD	n Agreement	Mean	SD	n Agreement	Mean	SD
Lack of Funds for the Procurement of fire safety	2	3.3	1.15	2	4.0	0.00	5	3.8	.45
Inadequate Knowledge on the use of fire Safety device	2	2.7	1.53	2	4.0	0.00	4	2.6	.89
High Cost of Fire Safety Equipment	2	3.3	1.15	2	4.0	0.00	5	3.8	.45
Lack of fire Safety Policy	1	2.0	1.00	2	3.5	.71	3	2.8	.84
Lack of Maintenance of fire Safety Equipment	2	2.3	1.15	2	3.0	0.00	4	3.4	.89
Lack of fire safety equipment Purchasing Point	2	2.7	1.53	2	3.0	0.00	4	3.4	.89
Lack of Fire safety education from GNFS	1	2.0	1.00	1	2.5	.71	4	3.2	.84

Lack of Fire safety programmes by GNFS	1	2.0	1.00	2	3.0	0.00	4	2.8	.45
Inadequate Communication between GNFS and School's Management	2	2.7	.58	2	3.0	0.00	4	3.0	1.22
Insufficient Knowledge about the appropriate legislature Instrument	0	1.7	.58	1	2.5	.71	3	2.6	.55
Unclear fire code requirement	1	2.7	1.15	1	3.0	1.41	4	2.8	.45
The lack of desire to comply with fire safety by school's management	1	2.0	1.00	1	2.5	.71	4	3.2	1.30

(J) Level of Compliance: From Table 7, the 80 structures studied recorded a mean fire safety compliance of 30.67% with a standard deviation of 11.15. The minimum and maximum compliance levels are 0% and 40.0% respectively, indicating that some structures on PSHS campuses are not fire safety compliant. Those who are compliant are only 40.0% compliant. With respect to class of schools, first class schools recorded a mean compliance of 35.29% and standard deviation of 6.58. For second- and third-class schools, their mean compliances are recorded as 25.45% and 13.33% respectively. Purely girls' schools recorded a mean of 37.67% and a standard deviation of 7.18, while boys' schools had a mean level of 33.23% and a standard deviation of 6.43. Mixed schools recorded a mean compliance of 22.74% and a standard deviation of 13.05.

Table 7: Level of fire safety compliance

Variable	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	F	Sig.
					Lower Bound	Upper Bound				
First Class	51	35.29	6.58	0.92	33.44	37.14	8.33	40.00	24.25	.000
Second Class	22	25.45	12.06	2.57	20.11	30.80	0.00	33.33		
Third Class	7	13.33	11.55	4.36	2.65	24.01	0.00	26.67		
Boys School	32	33.23	6.43	1.14	30.91	35.55	8.33	40.00	16.55	.000
Girls School	20	37.67	7.18	1.61	34.31	41.03	16.67	40.00		
Mixed School	28	22.74	13.05	2.47	17.68	27.80	0.00	33.33		
Boys Dormitory	39	32.14	7.47	1.20	29.71	34.56	6.67	40.00	41.22	.000
Girls Dormitory	31	35.48	7.77	1.40	32.63	38.33	6.67	40.00		
Kitchen	10	10.00	9.46	2.99	3.23	16.77	0.00	25.00		
Total	**80**	**30.67**	**11.15**	**1.25**	**28.19**	**33.15**	**0.00**	**40.00**		

From Table 7 again, the value of F=24.25 with a significant value of 0.000 which is smaller than significant level of 0.05 shows that there is a deal of evidence to infer that the mean level of compliance differ among the classes of schools. Also, the value of F=16.55 with a significant value of 0.000 which is smaller than significant level of 0.05 shows that mean level of compliance differ among the types of schools. Again, there is evidence to infer that

the mean level of compliance differ among the types of structures since the value of F=24.25 with a significant value of 0.000 is smaller than significant level of 0.05. However, the question is which type of school, class or structure contributes to the difference in level of compliance to fire safety? The following Bonferroni Multiple Comparisons test in Table 8 seeks to deal with this aspect.

(K) Level of Fire Safety Compliance using Bonferroni Multiple Comparisons: In Table 8, Bonferroni Multiple Comparisons reveal some differences in the level of compliance with fire safety among the type of schools, class of schools and type of structures. For the class of school, the mean level of compliance to fire safety is significant (sign. <0.05) meaning the level of compliance of first-class schools varies from second- and third-class schools, and from second class schools to third class schools. Also, for the type of schools, the mean level of compliance with fire safety is significant (sign.<0.05) meaning compliance from boys schools and girls schools to mixed schools differ, but there is no significant (sign.>0.05) difference in the mean level of compliance between boys schools and girls schools. Similarly, for the type of structure, the mean level of compliance is significant (sign.<0.05). There are significant differences in compliance between boys dormitories and kitchens and girls dormitories and kitchens, but there is no significant (sign.>0.05) difference in the mean level of compliance between boys dormitories and Girls dormitories.

Table 8: Bonferroni Multiple Comparisons on level of Fire Safety Compliance

Variables	G1	G2	Mean Difference (G1- G2)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Class of School	First Class	Second Class	9.84	2.26	.000	4.32	15.36
		Third Class	21.96	3.56	.000	13.24	30.68
	Second Class	First Class	-9.84	2.26	.000	-15.36	-4.32
		Third Class	12.12	3.84	.007	2.73	21.51
	Third Class	First Class	-21.96	3.56	.000	-30.68	-13.24
		Second Class	-12.12	3.84	.007	-21.51	-2.73
Type of School	Boys School	Girls School	-4.44	2.69	.310	-11.02	2.15
		Mixed School	10.49	2.44	.000	4.51	16.47
	Girls School	Boys School	4.44	2.69	.310	-2.15	11.02
		Mix School	14.93	2.76	.000	8.16	21.69
	Mixed School	Boys School	-10.49	2.44	.000	-16.47	-4.51
		Girls School	-14.93	2.76	.000	-21.69	-8.16
Type of Structure	Boys Dormitory	Girls Dormitory	-3.35	1.89	.241	-7.97	1.27
		Kitchen	22.14	2.78	.000	15.33	28.94
	Girls Dormitory	Boys	3.35	1.89	.241	-1.27	7.97
		Kitchen	25.48	2.85	.000	18.50	32.47
	Kitchen	Boys Dormitory	-22.14	2.78	.000	-28.94	-15.33
		Girls	-25.48	2.85	.000	-32.47	-18.50

V. SUMMARY OF FINDINGS

The study reveals that first-class schools are 100% compliant when it comes to the provision of fire hydrants for dormitories, second class schools are only 66.7% compliant while third class schools are 0% compliant. On the issue of fire hydrant, boys and Girls schools are 100% compliant but mixed schools are only 52.2%. First class schools are 75% compliant when it comes to the provision of fire extinguishers and call points for kitchens; meanwhile, second class schools are 50% compliant in each. Girls schools are found to be 100% compliant than boys and mixed schools. Looking at Table 2 and Table 3, it can be said that the general fire safety compliance in dormitories and kitchens are very poor.

The minimum fire safety compliance level for the structures studied is 0% and the maximum is 40.0%, indicating that there are some structures with no compliance at all and some with 40.0% compliance. The general reasons for non-compliance with fire safety in Senior High Schools are lack of funds for procurement of fire safety equipment and high cost of fire safety equipment. These two reasons cut across the different classes of schools and types. The Bonferroni Multiple Comparisons revealed that the level of compliance of first class schools differs

from that of second and third class schools, and from second class schools to third class schools. Purely boys and girls schools compliance with fire safety measures differ from mixed schools, but there is no significant difference in the mean level of compliance between boys schools and girls schools. There is however significant differences in compliance between boys dormitories and kitchens and girls dormitories and kitchens. No significant difference of compliance existed between boys dormitories and girls dormitories.

VI. CONCLUSIONS

The study concludes that: The general fire safety compliance in dormitories and kitchens are very poor. No school has exit directional sign, general fire notice, emergency lighting, evacuation plan, and evacuation procedure, smoke detectors and control panels. The maximum average fire safety compliance for these schools is 40% which is extremely low. The implication of the result is that schools can do very little when there are fire outbreaks on campus. Lack of funds for procurement of fire safety equipment is the general reason across the various classes and types of schools for non-compliance with fire safety in Public Senior High Schools within the Cape Coast metropolis.

VII. RECOMMENDATIONS

The paper recommends based on the findings that: Government or school authorities should ensure that adequate fire-fighting equipment and fire detectors are provided in all kitchens and dormitories of Public Senior High Schools in the metropolis to strategically position them to prevent and combat any future fire outbreaks. Schools should provide exit directional signs, exit signs, evacuation plan, general fire notice, and call points since these things will not cost so much to have them in place. Where schools for some financial reasons cannot provide, they should fall on their alumnae bodies and Parent Teacher Associations to assist them. The Ghana National Fire Service and the Local Authority should put together an inspecting team to check and enforce safety compliance in all Public Senior High Schools. Regular inspections by this team will help reduce or eliminate the risk of fire outbreak and create a fire free environment for teachers, students, workers, visitors and the public at large. Inspections by this team should be done at least twice every year to put head teachers on their toes. The team should institute fire safety compliance award to serve as motivation and also create competition among schools. The Ghana National Fire Service should intensify fire safety education programmes in Public Senior High Schools in the metropolis. Fire education programmes should also be organised for these schools at least twice in a year. GNFS should assist schools to regularly maintain their fire-fighting equipment and detectors to keep them in good condition. Fire education programmes should not be compromised for anything else. Heads of schools should contact corporate bodies and non-governmental organizations for financial assistance to enable them meet their fire safety compliance requirements as stated in the Fire Safety Code LI 1724, 2003. Corporate organizations should channel some of their corporate-social responsibilities to Senior High Schools to help them establish adequate fire safety measures.

ACKNOWLEDGEMENT

We would like to acknowledge Mr. Casely M. Johnson, the Ghana National Fire Service and head teachers, management, students and workers of the schools used for the study for their cooperation and support.

REFERENCES

[1] Winston and Trollope, Working on fire international: Fire - a good servant but a bad master, 2009. http://www.ngunicattle.info/publication/journals/2009/fire.pdf

[2] N. Dempsey, Fire safety in Pre-schools, 1999. http://www.environ.ie/en/publications/community/fireandemergencyservice

[3] Ghana News Agency, Fire guts Bibiani senior high school, 2008. http://www.ghanadistricts.org/education/ntonso-sda-shs-students-to-attend-classes-under-trees 34436

[4] Ghana News Agency, Ntonso SDA SHS students to attend classes under trees, 2008. https://www.ghanabusinessnews.com/2011/10/10/ntonso-sda-shs-students-to-attend-classes-under-trees/

[5] Environmental Planning and Assessment Regulation, Essential fire safety measures information sheet, 2000. http://www.essential_fire_safety_measures.pdf

[6] K. Swain, Ehow online encyclopaedia: School Safety Requirement, 2012. http://www.ehow.com

[7] N. J. Ogajo, Influence of fire disaster or mitigation and preparedness in commercial premises, 2013. http://www.cae.uonbi.ac.ke.pdf

[8] J. Argueta, D. Mittelman, R. Salvatori, N. Brown, B. Renda, and A. Smeal, an assessment of fire safety in Australians international student housing, 2009. http://www.assessmentoffiresafety.pdf

[9] Regulation Impact Assessment-Australia, Assessment of options for residential smoke alarm, provision in the natural construction code, (Australian Government, 2012). http://www.residentialsmokealarm.pdf

[10] C. R. Kothari, *Research methodology methods & techniques* (New Delhi, New Age International (P) Limited, 2004).
[11] National Building Regulations, LI 1630, (Accra: Ghana Publishing Company Limited -Assembly Press, 1996).
[12] World Fire Statistics Bulletin, Fire as vulnerability: the value added from adopting a vulnerability approach, 2012.
[13] Fire Protection Research Foundation (2008). Measuring Code Compliance Effectiveness for Fire-Related Portions of Codes. Quincy, MA: NFPA.
[14] Buildings Department, Code of practice for fire safety in buildings, Hong Kong, 2012.
[15] A. Furness and M. Muckett, *Introduction to fire safety management: the handbook for students on NEBOSH and other fire safety courses (1st ed.)*, Butterworth-Heinemann, 2007.
[16] Fire Protection Premises Regulation, LI 1724, (Accra: Ghana Publishing Company Limited -Assembly Press, 2003).