



(REVIEW ARTICLE)



Level of compliance by the Bulacan State University with the fire and safety requirements of the law

Ma Victoria Villanueva Umali *

Architecture Department, College of Architecture and Fine Arts, Bulacan State University, City of Malolos, Bulacan, Philippines, 3000

Global Journal of Engineering and Technology Advances, 2021, 08(03), 038–056

Publication history: Received on 08 September 2021; revised on 10 September 2021; accepted on 12 September 2021

Article DOI: <https://doi.org/10.30574/gjeta.2021.8.3.0122>

Abstract

This study aims to determine the level of compliance of each of the buildings at the Bulacan State University (BulSU) – Main Campus with the provisions of the Fire Code of the Philippines. It was noted during the site inspections conducted in the eighteen (18) buildings at the campus that all buildings were not fully compliant with the requirements provided under the said code. The most pressing concerns on BulSU's non-compliance with the code are the lack of full knowledge with fire and safety requirements of the law, the absence fire brigade team or any official personnel assigned to do the checking and upkeep of the requirements, and absence of the proper regulatory permit requirements such as the building permits and occupancy permit that have implemented by the local government units. Non-compliance also contributed to the non-existing or inadequate number of safety items in each building. Standardized checklist utilized by the Bureau of Fire Protection (BFP) and a survey questionnaire accomplished by the members of the administration council as the respondents were used in data gathering. A structured interview to respective personnel of different offices in the campus sought also to investigate the qualitative aspect of the study. Through the data gathering procedures employed, the researcher was able to derive information that formed the basis for the conclusions and recommendations for the action plan that would be suggested to the administration of Bulacan State University.

Keywords: Fire; Fire safety; Fire safety compliance; Fire code; Fire protection; Fire hazard

1. Introduction

In the Philippines, fire is considered as lethal natural occurrence which normally results in the loss of countless innocent lives as well as millions-worth of damage to property. Unfortunately, despite serious efforts by the government to diminish fire incidences, it still increased by 0.84% in 2018 as compared to the preceding year [1]. Fire is man-induced occurrence which stemmed from the non-compliance of the people to fire-prevention policies and fire-safety measures.

The education sector is not exempted from the perils and dangers fire poses to its stakeholders. In fact, it is the primordial obligation of the school administrators to ensure the safety of their students and prevent any fatal mishaps inside the school premises. Implementation of fire safety in school buildings is of utmost importance. Majority of the occupants of these buildings are children and young adults who need to be managed in the event of an emergency or crisis. Damages may be devastating when a school catches a fire. Such damage constitutes loss of life, property and possible curtailment of school operations [2]. Since educational institutions greatly contribute to the development of current and future generations, construction of school buildings must be imbued with great importance. They play an important role in the personality and educational development of children. These are the foregrounds wherein children

* Corresponding author: Ma Victoria Villanueva Umali
Architecture Department, College of Architecture and Fine Arts, Bulacan State University, City of Malolos, Bulacan, Philippines, 3000

and adolescents establish lifelong friendships, discover their talents, and hone their skills and abilities. As such, government officials from various countries give full attention on the maintenance of school facilities including the proper observation of the pertinent laws and policies involving fire protection and safety.

One of the foremost concerns of every institution like the Bulacan State University (BulSU) is the safety and security of all its clients and stakeholders as well as its physical facilities. It is inherent in any organization that occupational hazards need to be eliminated, if not, mitigated for the promotion of the well-being of its stakeholders. While there are many natural and man-made risks which pose danger to the lives of people and destruction to property, one cannot underestimate the extreme dangers that fire hazards present. The facility operation and maintenance provider must ensure the topnotch operating condition of the buildings' fire and safety systems. The building occupants have the right to have an access to a safe and risk-free environment that must be supplied by the government. The importance of routine or regular maintenance has been noted to ensure that operations will run smoothly – whether the building is used for academic or business purposes [3]. Proper and consistent maintenance of electro-mechanical machineries and supplies will prevent any fatal accidents both to the machine operator and the building occupants.

Like all other buildings and establishments, a school must be fully equipped with all precautionary measures for the safety of thousands of students inside the campus and should conform to the requirements provided by the Revised Performing Rules and Regulations of Fire Code of the Philippines, otherwise known as Republic Act (R.A.) 9514 [4]. This law implicitly states that "it is the objective of the land to make sure public safety, raise economic development through the prepossession and suppression of all kinds of ruinous fire." Fire protection measures must be enforced in the form of regulations, commonly via building codes and standards, in which various requirements are listed [5].

For this reason, it is mandated that all buildings, including all its sub-components and facilities, must be maintained in a safe, sanitary and good working condition. Time and again, the necessity for proper maintenance of the facilities and equipment equates to the safety and security of the occupants. If only the proper safety measures and precautions were observed in every establishment, the senseless loss of lives and property would have been greatly minimized.

With this in mind, the researcher found enough reasons to conduct an investigation on the level of compliancy of Bulacan State University to the fire and safety requirements of the law. Since it is an inherent part of the safety measures of every establishment, following safety regulations will ensure the protection for its occupants as well as its immediate community.

2. Material and Methods

2.1. Methods and Techniques of the Study

This study utilized the descriptive method of research that intended to record, describe, analyze, and interpret data on the buildings of Bulacan State University- Main Campus. Descriptive study is applicable to researches that deal with conditions or relationships, opinions and ongoing processes, effects that are evident or trends that are developing [6]. The method lends itself to the basis of this study on the compliance to the fire and safety requirements of all existing buildings in the University. This study determined and evaluated the coverage of the Fire and Safety Requirements of the Fire Code of the Philippines (P.D. 1185 with Republic Act 9514) as it is being implemented in the university as a reference for upgrading the fire and safety system of the buildings. The study was intended primarily for the assessment of the level of compliance of the university to such laws, or if there are some deficiencies in its implementation, possible suggestions and/or recommendations may be based on the data obtained from the respondents of the survey and inspection checklist.

2.2. Population and Sample of the Study

The respondents for the survey questionnaire were the eighteen (18) members of the administrative council with varying designations such as college deans, administration officers, or directors of the different departments in the University.

The considerations for sampling covered only the main campus and was limited to eighteen (18) structures as shown in Figure 1, namely the Mendoza Hall (CSPS), Chocolate Building (CCJE), Federizo Hall (CS / CAL / CAFA), Valencia Hall (Gymnasium), Flores Hall (Administration Building), Alumni Building, Hostel, Science Research and Learning Center (SRLC), Natividad Hall (COE), College of Hospitality and Tourism Management Building (CHTM), Carpio Hall (Laboratory High School), Roxas Hall (COEd), Marcelo H. del Pilar Hall (COL), Alvarado Hall (CIT), Pimentel Hall

(CICT/CON), Athletes Quarter (NSTP), Activity Center (AC) and University Canteen. Thus, the satellite campuses would not be included.

Furthermore, for the interview, the target informants were the respective head personnel of different offices in the university such as the Budget Office, Supplies Office, Procurement Office, Facility Management Office (FMO), Project Management Office (PMO) and Building and Ground Management Office (BGMO).



Figure 1 Site Development Plan of BulSU- Main Campus

2.3. Research Instruments

The data-gathering instrument consisted of two (2) parts:

The first part utilized the Inspection Checklist adopted from the provisions of Republic Act 9514 and was used by the researcher as the main instrument to gather the data. This checklist was used to verify the extent of implementation, the level of compliance, and the lapses observed with regard to the operation of the buildings. The Inspection Checklist is composed of ten (10) sections, and a total of two hundred thirty-one (231) checklist items which includes complying, non-complying and not applicable items. “Complying” means that the building meets the required safety standards or specifications, “non-complying” means not being in compliance with the safety requirements and “not applicable” means that the required items do not apply in the building.

The second part was the survey questionnaire which was intended for the building occupants or administrators as its respondents. The questionnaire specifically seeking to know the problems that lead the university to non-compliance to the Fire Code of the Philippines. A standard questionnaire [7] was adapted and slightly modified to fit the conditions of the study, and with the help of the researcher’s adviser and critic, the instrument was validated ensuring adherence to the study’s objectives.

In addition to the survey questionnaire, the researcher conducted interviews with the head personnel of the different offices of the university. Upon the researcher’s request, the answers of the participants were recorded for the convenient, accurate and unbiased transcription of responses.

2.4. Data-Gathering Procedure

During the initial stage of data collection method, a letter was forwarded personally by the researcher to the Bureau of Fire Protection (BFP), City of Malolos through the Operations Chief. The chief verbally agreed with the researcher and instructed the two (2) Fire Inspectors under his authority to accompany the researcher in the conduct of the inspection. Before the conduct of the inspection, a permission, through a request letter, was also sought by the researcher from the University President. Upon the grant of the request for permission, the researcher, together with the fire inspectors and a Professional Mechanical Engineer, proceeded with the ocular site inspection of the eighteen (18) buildings at the BulSU Main Campus. All the inputs and data obtained during the ocular inspection were considered as valuable information to the study in order to bring about an objective and impartial assessment of the study.

The last data collection method was done through the distribution of copies of a survey questionnaire. Along with it was a copy a duly signed cover letter which emphasizes the sincerity of the researcher’s commitment to ensure the strict confidentiality of the data that would be given by the respondents. After the questionnaires were accomplished, the researcher collated and organized the data.

Data from the interview were recorded using an electronic audio recorder. The voice recording would also be used by the researcher as a reference in formulating recommendations for the action plan that the researcher would craft. The conversations were transcribed, collated, and simplified to obtain concise answers to the questions.

2.5. Data Processing and Statistical Treatment

In presenting information on the description of the school buildings, frequency distribution was the statistical treatment used for the number of storey, total height, area per floor, total floor area, and specific usage.

The gathered quantitative data were tallied, tabulated, and analyzed based on the stated problems in this study. The responses to the surveys were collected a week after the distribution and administration. The gathered data were recorded and updated as responses came in. Results were tabulated in Microsoft Excel spreadsheets with the coded sheet that was developed to measure the responses from the data of the survey results. The interviews were conducted to supplement the data. The responses of informants were collated and summarized to enrich the content and elucidate analysis of the results.

The compliance of the school buildings was the highlight of the study, wherein each building was assessed according to the standard set by the Bureau of Fire Protection based on the Fire Code of the Philippines in terms of exit details, lighting and signs, features of fire protection, building service equipment, hazardous area, and operating features. Identification of fire hazards is a process of recognizing that fire hazards exist and defining their characteristics [8]. The existing buildings are compliant to the standard if all these requirements were being provided and complied. The results were also tabulated in Microsoft Excel spreadsheets. Yes or no option, whether they are compliant or not and percentage of level of compliance were the statistical treatment used. The researcher would need these in formulating recommendations at the end of the research.

3. Results and discussion

The eighteen (18) buildings listed in Table 1, were categorized according to function. The first part of this study describes the identified set of characteristics of the existing eighteen (18) buildings at Bulacan State University. The identifiers for each building are number of storey, height of building in meters, area per floor in square meters, total floor area in square meter, and, specific usage such as educational/ administrative, residential, place of assembly and official business/ health care facility.

Table 1 Buildings in BulSU Main Campus

Name of Building	
Educational/ Administrative	
1	Mendoza Hall (CSSP)
2	Chocolate Building (CCJE)
3	Federizo Hall (CS/CAL/CAFA)
4	Science Research and Learning Center (SRLC)
5	Natividad Hall (COE)
6	Carpio Hall (Laboratory High School)
7	Roxas Hall (COEd)
8	Marcelo H. del Pilar Hall (COL)
9	Alvarado Hall (CIT)
10	Pimentel Hall (CICT/CON)
Place of Assembly	
11	Valencia Hall (Gymnasium)
12	Activity Center (AC)
13	University Canteen
Mixed Occupancies (Educational/ Residential)	
14	Hostel
15	Athletes Quarter (NSTP)
Mixed Occupancies (Educational/ Place of Assembly)	
16	College of Hospitality and Tourism Management Building (CHTM)
Official Business/ Health Care Facility Building	
17	Flores Hall (Administration Building)
18	Alumni Building

The second part presents the information on the compliance of each building on the fire and safety standards set by Bureau of Fire Protection based on the Fire Code of the Philippines. The identifiers were established as exit details, lighting and signs, features of fire protection, building service equipment, hazardous area, and operating features.

The third part presents the data wherein the factors that lead to non-compliance to the requirements of the Fire Code of the Philippines were tabulated according to its rank. The last part has the objective to improve the operation, maintenance and monitoring that may help the BulSU to keep up with the standard requirements of the Fire Code of the Philippines.

3.1. The Existing Buildings of Bulacan State University - Main Campus

The researcher began the study by focusing on the physical profile of the existing buildings in BulSU- Main Campus. Table 2 shows the Frequency Distribution of the existing buildings in terms of building description.

Table 2 Frequency Distribution of the Existing Buildings in BulSU – Main Campus in terms of Building Description

Number of Storey	f	Height (m)	f	Area per Floor (sm)	f	Total Area (sm)	f	Specific Usage	f
5	3	16 - 20	3	Above 2000	3	Above 8000	1	Educational/ Administrative	10
4	1	11 - 15	8	1501 - 2000	1	5001 - 8000	3	Place of Assembly	3
3	7	5 - 10	7	1001 - 1500	3	3001 - 5000	3	Mixed Occupancies (Educational/ Residential)	2
2	6	6	-	501 - 1000	7	1001 - 3000	7	Mixed Occupancies (Educational/ Place of Assembly)	1
1	1	3	-	Below 500	4	Below 1000	4	Business	2
Total	18	Total	18	Total	18	Total	18	Total	18

In number of storey, three (3) of the buildings of the total number are classified as five (5)-storey. Only one (1) building of the total number have four (4) storey. Majority of the buildings, as the table illustrates, are ranging from two to three storey. Accordingly, the only single storey building understudy is the University Canteen.

The highest building has a height of 19.10 (nineteen point one) meters while the lowest is five (5) meters. Three (3) buildings have a total height between 16-20 meters, seven buildings have a height between 11-15 meters and six buildings having an average height of 5-10 meters. In terms of area per floor of the buildings, only three (3) buildings have above 2000 square meters area per floor, only one (1) building has a floor area per floor of 1501-2000 square meters. Three (3) buildings have a floor area per floor of 1001-1500 square meters, seven (7) buildings have a floor area per floor of 501-1000 square meters and a total of four (4) buildings have a floor area per floor below 500 square meters.

The table also presents the frequency distribution of specific usage of the building. Educational/ administrative occupancy buildings used for instruction and administration purposes. Assembly occupancy includes, but not limited to, the building or portions of the building used for gathering together of fifty (50) or more persons for purposes such as entertainment, eating, drinking, or similar uses. Residential is the occupancy in which sleeping accommodations are provided for normal residential purposes. Mixed occupancies refer to two or more classes of occupancies occurring/ located/ situated/ existing in the same building and/or structures. Business buildings are those used for the transaction of business, for keeping of accounts and records and similar purposes while health care facility covers the infirmary or clinic of the university.

3.2. Construction of the Existing Buildings Compliant to the Standards set by the Fire Code of the Philippines

Table 3 presents the compliance of the existing buildings in BulSU – Main Campus to the standards set forth by the Fire Code of the Philippines. The compliance of the buildings with the standards is extremely important to ensure the safety of the occupants. The conformity of the existing buildings with regards to exit details, lighting and signs, features of fire protection, building service equipment, hazardous area, and operating features are being evaluated on this study.

From Table 3, the summary of compliance of the existing buildings in BulSU – Main Campus was shown in Table 4. Based on all relevant information gathered from existing buildings within the BulSU Main Campus, with the use of the BFP checklist, it was found that all of the buildings are non-complying to the Fire Code of the Philippines.

Table 3 Compliance of the Existing Buildings in BulSU-Main Campus to the Provisions of Fire Code of the Philippines

Name of Building		Compliance																	
		Exit Details			Lightings and Signs			Feature of Fire Protection			Building Service Equipment			Hazardous Area			Operating Features		
		Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Educational/ Administrative																			
1	Mendoza Hall (CSSP)	43	3	60	0	15	0	11	0	52	7	1	25	0	0	10	3	1	0
2	Chocolate Building (GS)	30	6	70	0	15	0	8	3	52	7	1	25	0	0	10	3	1	0
3	Federizo Hall	30	7	69	2	13	0	11	1	51	6	1	26	0	0	10	3	1	0
4	Science Research and Learning Center (SRLC)	37	2	67	5	10	0	10	1	52	9	0	24	0	0	10	3	1	0
5	Natividad Hall (COE)	38	34	34	6	8	1	13	32	18	6	5	22	0	0	10	3	1	0
6	Carpio Hall (Laboratory High School)	37	5	64	5	10	0	13	1	49	7	1	25	0	0	10	3	1	0
7	Roxas Hall (COEd)	30	25	51	6	9	0	14	25	24	7	1	25	0	2	8	3	1	0
8	Marcelo H. del Pilar Hall (COL)	36	5	65	8	7	0	13	0	50	6	2	25	0	0	10	3	1	0
9	Alvarado Hall (CIT)	41	8	57	5	4	6	24	0	39	6	2	25	9	0	1	3	1	0
10	Pimentel Hall (CICT/CON)	33	11	62	5	10	0	12	0	51	8	1	24	0	0	10	3	1	0
Place of Assembly																			
11	Valencia Hall (Gymnasium)	47	11	48	6	9	0	8	0	55	5	0	28	0	0	10	3	1	0
12	Activity Center (AC)	26	3	77	0	15	0	1	10	52	5	1	27	0	0	10	3	1	0
13	University Canteen	23	1	82	0	11	4	6	4	53	8	0	25	1	4	5	3	1	0
Mixed Occupancies (Educational/ Residential)																			
14	Hostel	35	16	55	8	7	0	12	2	49	11	1	21	0	1	9	3	1	0
15	Athletes Quarter (NSTP)	30	12	64	6	9	0	11	2	50	6	1	26	0	0	10	3	1	0
Mixed Occupancies (Educational/ Place of Assembly)																			
16	College of Hospitality and Tourism Management Building (CHTM)	35	20	51	3	12	0	13	28	22	7	1	25	1	4	5	3	1	0
Official Business/ Health Care Facility																			
17	Flores Hall (Administration Building)	46	3	57	4	11	0	15	0	48	6	1	26	0	0	10	3	1	0
18	Alumni Building	15	4	87	0	15	0	11	6	46	7	1	25	0	0	10	3	1	0

Table 4 Summary of Buildings Compliance

Name of Building		% of Compliance to Fire Safety Code	Compliant	
			Yes	No
Educational/ Administrative				
1	Mendoza Hall (CSSP)	76%		✓
2	Chocolate Building (GS)	65%		✓
3	Federizo Hall (CS/ CAL/ CAFA)	69%		✓
4	Science Research and Learning Center (SRLC)	82%		✓
5	Natividad Hall (COE)	45%		✓
6	Carpio Hall (Laboratory High School)	78%		✓
7	Roxas Hall (COEd)	49%		✓
8	Marcelo H. del Pilar Hall (COL)	81%		✓
9	Alvarado Hall (CIT)	85%		✓
10	Pimentel Hall (CICT/CON)	73%		✓
Place of Assembly				
11	Valencia Hall (Gymnasium)	77%		✓
12	Activity Center (AC)	54%		✓
13	University Canteen	66%		✓
Mixed Occupancies (Educational/ Residential)				
14	Hostel	71%		✓
15	Athletes Quarter (NSTP)	69%		✓
Mixed Occupancies (Educational/ Place of Assembly)				
16	College of Hospitality and Tourism Management Building (CHTM)	48%		✓
Official Business/ Health Care Facility				
17	Flores Hall (Administration Building)	82%		✓
18	Alumni Building	57%		✓

The percentage compliance of each building, ranges from 45% to 85%. These percentages of compliance cover the following areas of concern on each building as pointed out in the BFP Checklist. The buildings with highest compliance but did not reach the 100% compliance are the Alvarado Hall (CIT) – 85%, Flores Hall (Administration Building) and Science Research and Learning Center (SRLC) which both got 82% and Marcelo H. del Pilar Hall (COL) with 81%. On the contrary, the buildings with lowest compliance are the Natividad Hall (COE) – 45%, College of Hospitality and Tourism Management Building (CHTM) – 48% and Roxas Hall (COEd) – 49%.

3.3. Factors that Lead to Non-Compliance with the Fire Code of the Philippines

Table 5 presents the factors that lead to non-compliance of BulSU to the Fire Code of the Philippines as perceived by the respondents. Among the factors/ results obtained, it is lack of full knowledge with fire and safety requirements of the law that ranked first, with all the eighteen (18) university heads agreeing that they were not fully aware of the specifications of the Fire Code of the Philippines. Personnel responsible for handling a fire emergency may lack a well-defined understanding of how they should move dwellers in response to a fire given the fire protection features of a building and the competencies of its occupants [9]. Absence of a fire brigade team or even an official/personnel of BulSU

who are responsible to do the checking and preventive maintenance of the fire and life safety requirements ranked second among the factors that lead to non-compliance with the Fire Code. Periodic inspection and preventive maintenance must be performed on all building facilities including fire and safety systems. The researcher already prepared and furnished an advanced inspection forms to FMO that they can use as guide during the inspection of the facility. Further, third in rank is the non-application of building permits by BulSU. Majority of BulSU buildings mostly donated were not applied with building permit. Fourth in rank is the non-regular monitoring/checking of the condition of the buildings at BulSU main campus. Tied at 5.5 rank is the absence of the provision of the fire safety requirements in the designs of the building and the inconsistent monitoring of the maintenance and functionality of such provisions, if present. Ranked 7th is the insufficiency of supplies regarding fire safety. This holds true with the lack of allocated budget and the unavailability of the needed supplies for fire safety which are tied at the 8.5 rank. Next, as observed by the respondents, is the unwillingness to uphold compliance to the fire and safety requirements of the law. Absence of any desire or interest in compliance to the provisions of the Fire Code is surely a problem for an institution like BulSU. Lastly, those which were considered by the respondents as the least problematic reasons of the non-compliance of BulSU to the Fire Code may be consolidated into the non-implementation of fire safety training program and seminar for BulSU and the inclusion of the supplies in the Annual Procurement Plan (APP).

In addition to the tabulated survey results, the summarized interview responses of respective personnel of different offices in BulSU Main Campus such as the Budget Office, Supplies Office, Procurement Office, Facility Management Office (FMO), Project Management Office (PMO) and Building and Ground Management Office (BGMO) are also presented.

Table 5 Factors that Lead to Non-Compliance with the Fire Code of the Philippines

Factors	f	Rank
Lack of full knowledge with Fire and Safety Requirements of the Law	15	1
No Fire Brigade Team or official personnel assigned to do the checking and maintenance of the fire and life safety requirements	14	2
No applied Building Permit	13	3
No periodic checking conducted on the building	11	4
No provisions of the system in the design of the building	10	5.5
Lack of Consistency in checking the functionality and maintenance	10	5.5
Insufficient Supplies	8	7
Lack of Budget	6	8.5
Unavailability of the needed supplies	6	8.5
Unwillingness to comply with the requirements	2	10
No training program and seminar for fire safety	1	12
Creation of office to oversee the fire safety of the university	1	12
Supplies of materials and equipment needed are not included in the Annual Procurement Plan (APP)	1	12

3.4. Fire and Safety Program on the Operation, Maintenance and Monitoring for the BulSU to Keep Up with the Standard Requirements of the Fire Code of the Philippines

As revealed on this study, there are several problems that are prevalent among the existing buildings in the BulSU – Main Campus. These buildings encounter various fire safety and security problems which need to be fully taken care of to ensure that all building occupants are working in a safe environment.

The proposed fire and safety program has the objective to improve the operation, maintenance and monitoring of buildings inside the main campus in terms of the compliance with the standard requirements of the Fire Code of the Philippines. In order to achieve this objective, the researcher proposed the implementation of the fire and safety program the soonest. Nonetheless, the proposed program may be modified as may be necessitated by each building.

This program is divided into three separate projects. The first project pertains to the acquisition of supplies and installation of safety items to address the inadequate quantity of fire safety items in the buildings such as emergency lights, exits signs, warning/ safety signs, fire exit route plan, manual fire alarm units, stand-alone smoke detector and portable fire extinguishers. This project aims to provide adequate quantity of fire safety items in every building, which will ensure added safety to all occupants when evacuating the buildings during fire emergency, as well as the necessary first aid fire protection with the usage of portable fire extinguishers.

The second project shall address the provision and improvement of the features of fire protection such as protection of vertical openings, fire alarm system, standpipe system, automatic fire suppression or fire sprinkler system as well as fire exit provisions. Also included are the compartmentation improvements such as, the provision of fire rated enclosure and fire rated doors for fire exit stairs, provision of stairs pressurization system for enclosed fire exits like in Natividad Hall and provision of smoke extraction system for atrium also similar to Natividad Hall. The source of funds shall be from the Capital Outlay Budget- Infrastructure Projects of the university.

The third project aims to formalize and enforce the composition and structure of an efficient Emergency Management Team (EMT) which must be composed of a Team Leader, a BFP certified fire safety practitioner who is also a Professional Mechanical Engineer (PME), a Professional Electrical Engineer (PEE) or a Professional Electronics and Communications Engineer (PECE), reporting directly to the BulSU President, with members such as pertinent faculty member and/or non-teaching personnel assigned from different colleges/buildings, preferably engineers, including all maintenance personnel of FMO and BGMO.

The operation and maintenance monitoring checklist, Table 6, 7 and 8 adopts the list of standards and requirements of the Fire Code of the Philippines, provides a detailed listing of fire safety items that must be checked and maintained on a daily, weekly, monthly and quarterly basis to ensure proper operation of all fire and safety systems during emergency situations.

Table 6 Daily Fire and Safety Operation and Maintenance Monitoring Checklist

NAME OF BUILDING: _____

MONTH & YEAR: _____

INSPECTION ITEM/ TASK: Put check (√) if done or condition is acceptable, cross (x) if not done or condition is not acceptable, and N/A if not applicable during inspection.

MEANS OF EGRESS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
Vertical Exit																																	
Main Stairway																																	
Clear / Remove Obstruction																																	
Railings provided																																	
Fire Rated Enclosure Provided																																	
Fire Rated Door Provided																																	
Door equipped w/ Self-closing device																																	
Door swing in the direction of exit																																	
For buildings 5 storeys and higher:																																	
Stairways Pressurized																																	
Operational																																	
Secondary Exit																																	

Area Of Safe Refuge																																						
Provided																																						
Type: Exterior																																						

REMARKS:

Date	Description of Abnormality/ Defect & Action Taken	Checked by:
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

NOTES:

Table 7 Weekly Fire and Safety Operation and Maintenance Monitoring Checklist

NAME OF BUILDING: _____

MONTH & YEAR: _____

INSPECTION ITEM/ TASK: Put check (√) if done or condition is acceptable, cross (x) if not done or condition is not acceptable, and N/A if not applicable during inspection.

LIGHTING AND SIGNS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
A. Emergency Lights																																	
Exit path properly illuminated																																	
Source of Power: AC/DC																																	
No. of Units per Floor																																	
Located at:																																	
Hallway																																	
Stairway Landings																																	
Operational:																																	
Tested Monthly:																																	
Minimum AEL Power Duration: at least one (1) hour																																	
B. Exit Signs																																	
Exit Signs Illuminated																																	
Source of Power : AC/DC																																	

Table 8 Monthly Fire and Safety Operation and Maintenance Monitoring Checklist

NAME OF BUILDING: _____

MONTH & YEAR: _____

INSPECTION ITEM/ TASK: Put check (√) if done or condition is acceptable, cross (x) if not done or condition is not acceptable, and N/A if not applicable during inspection.

FEATURE OF FIRE PROTECTION	J	F	M	A	M	J	J	A	S	O	N	D
A. Protection of Vertical Openings												
Properly protected												
B. Alarm System												
Fire Alarm Provided												
Manual Pull Station _____												
Smoke Detectors												
Heat Detectors												
Date Last Tested _____												
<i>For Buildings 5 Storeys and Above</i>												
C. Standpipe System												
Provided												
D. First Aid Fire Protection Equipment (Portable Fire Extinguishers)												
Type: Dry Chem _____ HCFC _____												
Capacity _____ lbs												
E. Automatic Fire Suppression System (Sprinkler System)												
Jockey Pump Capacity												
Fire Pump Capacity												
Date Last Tested												
F. Generator Set												
Provided												

Capacity													
G. Refuse (Garbage) Handling Facility													
Provided													
H. Electrical System													
Load Capacity													
Electrical Inspection													
Type of Hazard													
Location of Electrical Hazard													
I. Mechanical System													
Any mechanical hazard													
J. Other Building Service Systems													
Water Treatment Facility													
Waste Water/ Sewage Treatment Facility													
K. HAZARDOUS AREA													
Kitchen													
Presence of hazardous materials													

REMARKS:

Date	Description of Abnormality/ Defect & Action Taken	Checked By
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

NOTES:

4. Conclusion

The eighteen (18) existing buildings at the BulSU Main Campus have not fully complied with the requirements set forth by the Fire Code of the Philippines. The conclusions are summarized based on the findings of the study:

- Majority of the buildings inside the BulSu- Main Campus have three (3) and four (4) storey and height of the buildings range from five (5) meters to fifteen (15) meters. The sum-up area of each building depends on the available land area where the building was constructed. Thirteen (13) out of eighteen (18) buildings were being used for educational purposes. The remaining three (3) and two (2) buildings were primarily used for places of assembly and official business/ health care facility respectively.
- The building with highest percentage of compliance at 85% is the Alvarado Hall (CIT). Meanwhile, non-compliance of 15% is due to the non-operational emergency lights, the absence of illuminated exit signs, emergency exit routes and warning/safety signs at hallways and in rooms, some exposed wirings, and the lack of a fire brigade organization.
- Those buildings that stand 15 meters or higher - Natividad Hall (COE), College of Hospitality and Tourism Management Building (CHTM) and Roxas Hall (COEd) were the buildings mostly with low rating of compliance. Most pressing and critical concerns of non-compliance are the deficiency in the provision of the fire detection and alarm system, automatic fire sprinkler system, non-installation of wet stand pipe system with complete fire pump system, and the absence of an emergency power generator.
- Among the factors, lack of full knowledge with fire and safety requirements of the law, the absence of a fire brigade team or any official personnel assigned to do the checking and upkeep of the fire and safety requirements as well as the lack of duly applied building permit were at the top of the list in the non-compliance of BulSU with the fire code and local government units regulatory requirements as perceived by the university personnel concerned on each building. While the following, absence of a training plan for fire safety, the creation of the office to oversee any emergency including fire safety of the university, and the non-inclusion of materials and equipment for fire safety in the Approved Procurement Plan (APP) were perceived as the least ranked problems that the University experienced.

As revealed in this study, the total average percentage of compliancy of the BulSU is 68.30% and there are several problems when it comes to the compliance of BulSU with the requisite of the code. Indeed, the University is encountering problems on how to maintain compliance of the buildings with the standard safety features as the law mandates. To be able to improve the current situation on the buildings of the university, a need for a concerted efforts within the BulSU organizations to ensure full compliance of the code is of paramount importance and have to implement the soonest.

Compliance with ethical standards

Acknowledgments

The researcher acknowledges above all things, the God Almighty for providing all strength, and the persistence she needed for the successful completion of this study and will always be indebted to all who shared their time and effort in the realization of this study, to deans, administration officers, department's heads, technical staff, colleagues and friends. To all of them, deep gratitude and appreciation from the bottom of the researcher's heart.

References

- [1] Tupaz, Emmanuel. Fire incidents increased by 0.84 percent in 2018. Philippine Star. December 28, 2018. Available from: <https://www.philstar.com/nation/2018/12/28/1880369/fire-incidents-increased-84-percent-2018>.
- [2] A Hassanain M. Towards the design and operation of fire safe school facilities. Fire safe school facilities. 2006; 15: 838-846.
- [3] Csanyi E. Maintenance of Electrical Equipment in Buildings. Electrical Engineering Portal. July 08, 2015. Available from: <https://electrical-engineering-portal.com/maintenance-of-electrical-equipment-in-buildings>.

- [4] Republic Act No. 9514, Presidential Decree No. 1185. Fire Code of the Philippines with Revised Implementing Rules and Regulations. ISBN 917-8961-18-6. Manila: A.V.B. Printing Press. 2017.
- [5] Park, Haejun & Goulthorpe, Mark. Enhancing Building Fire Safety Performance by Reducing Miscommunication and Misconceptions. 2013;2.
- [6] Best, John W. Research in Education, 9th Edition, New York: San Francisco. 2003.
- [7] Ramiah T. Organizational Culture, Leadership Style, and Commitment towards Occupational Safety and Health Management in Selected Construction Companies in Malaysia (dissertation). Bulacan State University, Philippines. 2015.
- [8] Jing Xin and Chong Fu Huang. Fire risk analysis of residential buildings based on scenario clusters and its application in fire risk management. Beijing Normal University, Beijing 100029, PR China. 2013;73.
- [9] Groner, Norman. A decision model for recommending which building occupants should move where during fire emergencies. Fire Safety Journal 80 (2016) 20–29, John Jay College of Criminal Justice, City University of New York, 524 West 59th Street, New York, NY 10019, United States.