ADOPTION OF NATURAL VENTILATION STRATEGIES FOR THERMAL COMFORT: A CASE STUDY OF THE NATIONAL YOUTH SERVICE CORP ORIENTATION CAMP, UYO, AKWA IBOM STATE

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ABSTRACT

The study examined the adoption of thermal comfort and natural ventilation strategies: a case study of the national youth service corp orientation camp, Uyo, Akwa Ibom State. In carrying out the study, a need assessment survey design (personal interaction and oral interview) was adopted. The targeted population for the study comprised all staff and youth Corp members of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom State. This shall include people with disability. It will also include all the architects, civil engineers, structural engineers and mechanical engineers in Akwa Ibom State. A proportionate stratified random sampling technique will be used to select the respondents which will include 5 staff and 100 National Youth Service Corp members. Others include 30 architects, 20 civil engineers, 20 structural engineers and 10 mechanical engineers from Akwa Ibom State. This gave a total of 185 respondents used for the study. The instrument used for data collection was a structured questionnaire titled "Adoption of Thermal Comfort and Natural Ventilation Strategies Questionnaire (ATCNVSQ)". Face and content validation of the instrument was carried out by an expert in test, measurement and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.89, and this was high enough to justify the use of the instrument. Descriptive and inferential statistics was used by the researcher. For the research questions mean statistics was used in answering them while the hypotheses were tested using dependent t-test, one-way analysis of variance and Pearson Product Correlation Analysis. The study concluded that the adaptable buildings are widely recognized as intrinsic to a sustainable built environment. In principle, a building that can last while its parts gradually change will place a lighter load on natural and human resources and provide value to future generations. Further, if the parts that do change over time are designed for assembly, disassembly and reuse, if not recycling, this is an additional benefit in the service of a sustainable future. One of the recommendations made was that enlightenment should be made to the youth corpers on how to manage building structure to continue to maintain adequate ventilation and comfort of the orientation camp.

KEYWORDS: Thermal Comfort, Natural Ventilation, Strategies, National Youth Service Corp, Orientation Camp, Uyo and Akwa Ibom State.

INTRODUCTION

Building's natural ventilation can be based on a variety of different ventilation strategies. The ventilation strategy will depend on the design of the building, internal thermal loads, and the positioning of openings (typically windows). Natural ventilation is the use of wind and thermal buoyancy to create air movement in and out of your home without the use of mechanical systems, with the goal of bringing fresh air into your home (Window Master, 2012). During nighttime in the summer months natural ventilation can provide free cooling and reduce your home energy use. For natural ventilation to be achieved appropriate strategies need to be used. Natural Ventilation Strategies include single-sided ventilation (i.e a typical situation in an office with single side-ventilation, i.e., a room with windows on only one side), cross ventilation and stack ventilation. These classes of ventilations are functions of the design of adequate spaces. Today, the point is not so much about tearing down walls as it is about the variety of ways in which individuals occupy space. It is important to ask how one really lives (using a home setting as case study). If the bedroom doubles as your home office, or the kitchen is the place where entertaining is liveliest, thus, letting the design serve both ends. —Designing spaces that are flexible but multipurpose is the surest way to maximize your pleasure in using them, (Daoana, 2009). Spaces are no longer the cut-out, one-purpose-at-a-time areas that we have thought them to be. This is considered positive since it only means that we do not have to fit our activities and habits within specific spaces contained by four walls and that all the space we need is already there in the first place. We now perceive spaces from the point of view of how it can serve us well and also optimized for other purposes.

Thermal comfort is maintained when the heat generated by human metabolism is allowed to dissipate, thus maintaining thermal equilibrium with the surroundings. And the one of the main goals of building design is to provide a comfortable space for living. This was the reason of creation for a new field in science called “Thermal Comfort”. Thermal comfort is a psychological phenomenon defined by the American society of heating refrigerating and air-conditioning engineers (ASHRAE) as ‘the state of mind which expresses satisfaction with the thermal environment’. This psychological phenomenon is often taken to be a response to the physical environment and the psychological state of the body, but is almost certainly affected by the attitude of the person to their surroundings as their experience of thermal environment as well as it current state. An NYSC orientation camp, just like any other camp has built in facilities that, apart from serving its purpose during the three-week orientation course could be utilized optimally for other purposes when the orientation programme is not in progress. It is quite obvious the corps members and staff spend much of their time in the camp to perform their stewardship there is a dire need to make the space adaptable enough for them. Adaptability of spaces for other non-NYSC activities on the other hand, if applied in the planning and design of such camps will promote an availability of different relevant spaces at one place; just like Korschildgen (2006) pointed out that relevant spaces can be made available all in one place either short term or long term orientated, related to specific activities. Adaptable space is expected, among others, to create thermal comfort for the students in the camp.

STATEMENT OF THE PROBLEM

A well-ventilated home or building is very important not only for the health and comfort of the occupants but also for longevity of the people and structure as well. Sometimes natural ventilation is inhibited by the design of the building and this is detrimental in all situations. Indeed, it is painful to observe some shortfalls in enjoying the natural ventilations. It obvious that a notable short fall of natural ventilation is the difficulty in controlling the building's airflow which in away hampers good ventilations in the building. It is also interesting to note that a fully-functional natural ventilation system requires careful planning and attention to pressure differences in air entry and exit points. It is a well-known fact that these pressure differences are what encourage old air to exit the building and new air to enter at appropriate amounts. It is also obvious that the functionality and performance of a natural ventilation system in a house does not only depend on the climate and weather, which may cause regions experience changes in weather on a daily and seasonal basis but it is also dependent upon the natural ventilation strategies adopted in the design and building.

OBJECTIVES OF THE STUDY

Specifically, the following objectives of the study are to:

1. To determine the difference in the level of natural ventilation received in buildings with such natural ventilation strategies as single-sided ventilation, cross ventilation or stack ventilation.
2. To find out the relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom.

RESEARCH QUESTIONS

The following research questions were formulated to guide the study:

1. What is the difference in the level of natural ventilation received in buildings with such natural ventilation strategies as single-sided ventilation, cross ventilation or stack ventilation?
2. What is the relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom?

HYPOTHESES

The following hypotheses were tested.

1. There is no significant difference in the level of natural ventilation received in buildings with such natural ventilation strategies as single-sided ventilation, cross ventilation or stack ventilation.

2. There is no significant relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom.

CONCEPT OF THERMAL COMFORT

Thermal comfort is the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation (ANSI/ASHRAE Standard 55, 2017). The human body can be viewed as a heat engine where food is the input energy. The human body will release excess heat into the environment, so the body can continue to operate. The heat transfer is proportional to temperature difference. In cold environments, the body loses more heat to the environment and in hot environments the body does not release enough heat. Both the hot and cold scenarios lead to discomfort (Çengel and Boles, 2015). Maintaining this standard of thermal comfort for occupants of buildings or other enclosures is one of the important goals of HVAC (heating, ventilation, and air conditioning) design engineers. According to Wikipedia, (2022), thermal neutrality is maintained when the heat generated by human metabolism is allowed to dissipate, thus maintaining thermal equilibrium with the surroundings. The main factors that influence thermal comfort are those that determine heat gain and loss, namely metabolic rate, clothing insulation, air temperature, mean radiant temperature, air speed and relative humidity. Psychological parameters, such as individual expectations, also affect thermal comfort. The thermal comfort temperature may vary greatly between individuals and depending on factors such as activity level, clothing, and humidity.

Furthermore, Ecophon, (2017) stated that thermal comfort describes the human satisfactory perception of the thermal environment. It refers to a number of conditions in which the majority of people feel comfortable. Thermal comfort is rated amongst the most important conditions for improving comfort and satisfaction of occupants with their indoor environment. Environmental factors (such as humidity and sources of heat in the workplace) combine with personal factors (ie your clothing) and work-related factors (how physically demanding your work is) to influence your 'thermal comfort'. Thermal comfort is very difficult to define as you need to take into account a range of environmental, work-related and personal factors when deciding what makes a comfortable workplace temperature. The best that you can realistically hope to achieve is a thermal environment that satisfies the majority of people in the workplace. Thermal comfort is not measured by room temperature, but by the number of employees complaining of thermal discomfort (HSE, 2017).

Building Designs that Improve Natural Ventilation and Thermal Comfort

Natural ventilation: Ventilation is the process of removing stale air and replacing it with fresh air, either through mechanical systems or by natural methods. When no mechanical systems are employed, it is referred to as natural ventilation or passive ventilation. Natural ventilation is important because it is an effective passive cooling design technique that reduces the need for electricity. Two advantages of natural ventilation are that it reduces the energy use while increasing thermal comfort. For example, stack ventilation, which is based on temperature differences, can improve a building's natural ventilation. Openings on the upper level let the warm air inside the building escape, while the cooler fresh air infiltrates through openings at a lower level in the building.

Fig. 1: A typical building with Natural ventilation

Indirect Natural Light: The use of indirect natural light to illuminate a building's interior is an effective way of reducing energy use and interior thermal gains from artificial lighting. The orientation, shape, and surface openings of a building can influence the penetration of natural light, but apart from windows and doors, indirect natural light can be acquired through skylights, light reflectors, atria, and similar installations. Skylights and atria can provide plenty of natural light, but they must be glazed in tropical climates to limit excessive heat penetration. Skylights and atria can also have openings at the top, which further promote stack ventilation.

Fig. 2: A typical building with Indirect Natural Light

Roof Ventilation: The roof is the part of a building that receives the most solar radiation that is then transmitted to the interior of the building. This causes the indoor spaces to heat up. There are several ways to minimize solar heat penetration from the roof, such as encouraging natural ventilation of the space between the roof and ceiling insulation. Another is by introducing natural vegetation on a building's roof (also called a green roof or living roof). The latter is a particularly effective way of reducing temperatures especially in cities and other built environments with limited trees.

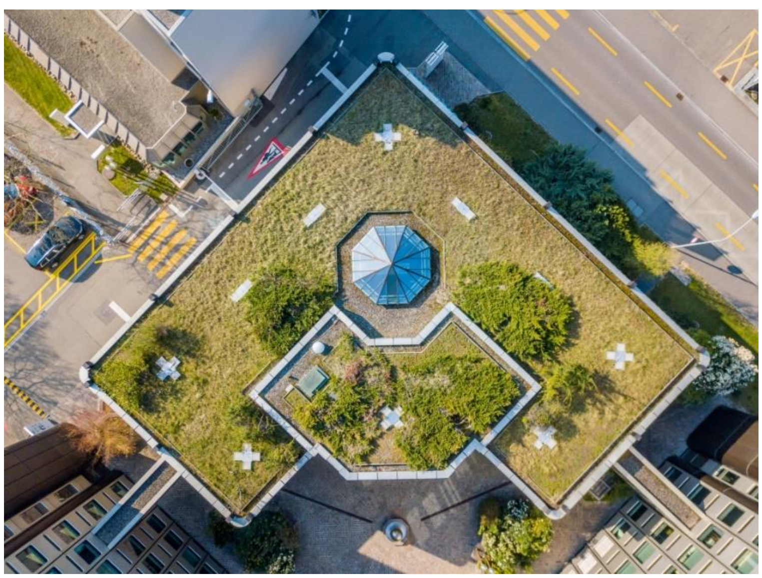

Fig. 3: A typical building with Roof Ventilation

Thermal mass materials: Building materials with high thermal mass take a long time to heat up and also to cool down; therefore, lightweight, low-thermal-mass materials are recommended in hot climates, such as low thermal conductivity wood, cork, straw bales, vermiculite concrete, vacuum insulated panels, and hollow clay tiles.

Fig. 4: A typical building with Thermal mass materials

External Walls: The use of light colors or reflective paints for external surfaces reduces the temperature at the surface of a building and, hence, the building's incidental heating. Solar shading can also be used, such as simple overhangs, vegetation on the outside of a building that does not hinder natural ventilation, and vertical louvers that not only provide shade but are also aesthetically pleasing.

Fig. 5: A typical building with External Walls

Outdoor and Transition Spaces: The intermediate space between the inside and outside of a building, also called transition spaces, can provide a shaded space for a building that has a cooling effect on the incoming air. There are many types of transition spaces that can be used in building design, such as balconies, terraces, atria, and corridors. Natural vegetation can also be added to these transition spaces, which provide an added cooling effect.

Fig. 6: A typical building with Outdoor and Transition Spaces

Natural Ventilation and Thermal Comfort

Indoor environmental quality can be defined by parameters such as indoor air quality, thermal comfort, visual comfort, and acoustics. Among these parameters, indoor environmental quality is mostly affected by thermal comfort (Cao 2012). Today, indoor thermal comfort in buildings is increasingly being achieved by application of air-conditioners (Santamouris, 2016). This increased use of air-conditioners results in an increase in energy consumption and consequent negative environmental effects. Natural ventilation is one of the most effective passive cooling strategies, especially for cooling-dominant climates and can provide building occupants with a comfortable thermal condition and a healthy indoor environment (Liping 2007). Furthermore, 30% to 40% less energy consumption is reported in naturally ventilated buildings compared to mechanically ventilated building. Natural ventilation design, however, can be challenging due to the complex and turbulent flows in and around buildings especially in dense urban areas. Accordingly, natural ventilation has been largely disregarded in the design of high-rise buildings resulting in them being highly energy intensive due to the use of mechanical ventilation systems.

Natural ventilation performance is influenced by a combination of different design features such as ventilation mode (i.e. single-sided ventilation and cross ventilation), window to wall ratio, opening type, and floor area. Among these parameters, ventilation mode has the largest impact on the ventilation rate of a building. Fung (2014) states that the primary objective of ventilation in occupied space is to supply fresh air and remove contaminates in order to assure thermal comfort. Thermal comfort is said to be achieved in a building when the highest possible percentage of all occupants are thermally comfortable. Wang and Wong (2006), recommended that optimum air can improve indoor thermal comfort for full day ventilation and proved that symptoms of occupancy discomfort often show to be related to volume of air supplied to a building and type of ventilation provided. Gail and Sam (2008), state that it has been demonstrated that naturally ventilated buildings in some climates can operate for the entire cooling season within adaptive comfort constrains without mechanical cooling. People have always been in pursuit of creating comfort in their environment through natural ventilation due to its low cost. It is still one of the most important matters taken into account in the building design process.

BENEFITS OF NATURAL VENTILATION

Natural ventilation can practically supply a high ventilation level more economically due to the employment of natural powers and large openings. They are more energy effective, especially if heating is not needed. The systems which are well designed could be utilized to provide higher levels of daylight. The other principal advantage contended for natural ventilation is that it helps keep a sustainable building environment (Window master 2022). The advantage of natural ventilation is its capability to supply a very high air change level at a low cost, with a very ordinary system. *Other benefit of natural ventilation is;*

Indoor Air Quality Impacts: Since natural ventilation systems directly affect building ventilation systems and rates, they willimpact indoor air quality and the potential exists to have a significant impact on occupant comfort and productivity. That impact could be either positive or negative depending on the natural ventilation system design, installation, operation and maintenance.

Reduced Equipment Cost: Mechanical solutions for HVAC requirements require significant amounts of equipment and space to sufficiently ventilate or air condition an indoor space. Natural ventilation requires much fewer mechanics and ducting. While natural ventilation does need some controls to function, there is much less space and financial investment required (Linquip 2020).

Lower Maintenance; Natural ventilation systems also lower long-term costs for businesses. Mechanical systems require costly ongoing maintenance, and also typically require reconditioning or replacement every 15 to 20 years. Natural ventilation equipment lasts significantly longer, and when equipment replacement is needed, the components usually cost much less.

Improved Work Environment; Fresh air and natural lighting can do much to improve the work environment. These free resources are abundantly available when using natural ventilation. While mechanically controlled climates, for the most part, cannot be easily adapted to suit individual comfort, natural ventilation can provide employees with the option to open windows for fresh air (Ezioc 2022). Systems can also be designed to allow sunlight to provide facility lighting. These benefits can make the work environment much more enjoyable for employees.

Humidity control; When indoor air is too humid, moisture can quickly build-up, and it can pose a higher risk of damage to your electronics and furniture. Too much moisture in the air can also create the perfect environment for mold, mildew, and fungus to grow. When left unchecked, it can produce a musty or moldy smell around your house. Natural ventilation allows homeowners to have access to continuous airflow that provides better humidity control. With this, you can save even more money because you won't have to invest in dehumidifiers just to improve the air quality in your house.

Healthy buildings and indoor climate; Studies show that occupants of buildings with natural ventilation have fewer building-related symptoms, such as headaches and eye irritation. Health expenses for occupants are also reduced by about 0.8 - 1.3% while also reducing respiratory illness, like asthma and allergies by up to 90%.

Lower energy consumption; Natural ventilation and hybrid ventilation consume less energy when compared with mechanical ventilation systems. Even less energy is consumed by the use of hybrid ventilation.

Relationship Between Level of Natural Ventilation and Thermal Comfort in The Buildings

Natural ventilation has been known to human for centuries. This method has been proved to be an efficient mean to improve indoor air and achieve building energy harvesting although it is not prevalent than mechanical means. While, the manner of mechanical ventilation takes up the largest proportion more than 50% energy consumption of building. Natural ventilation is an important sustainable building design strategy which is known to mankind for centuries. In some studies, it is recommended to improve indoor air for buildings natural ventilation and according to other research, the energy consumption in building can be minimized, also by exploiting natural ventilation. Some authors showed that the effective distribution of fresh air within an occupied space is of considerable importance in ensuring thermal comfort and good indoor air quality. Fanger (2005) defines thermal comfort as the condition of the mind which expresses satisfaction with the thermal environment. Thermal comfort is said to be achieved in a building when the highest possible percentage of all occupant are thermally comfortable. Natural ventilation efficiency and building thermal comfort are affected by both internal and external factors (Cai and Wai, 2010). Internal factors are majorly dependent on openings control setup and building designs and can be varied or engineered for the desired conditions while external factors include building orientation, location and prevailing weather conditions. These are usually natural and constrained. Natural

Ventilation is where the airflow in a building is as a result of wind and buoyancy through openings or cracks within the building envelop (Hazim, 2010). Natural ventilation can be defined as;

- *Single-sided ventilation* where the ventilation rate is limited to zones close to the openings. Wind turbulence and thermal buoyance are the main driving forces. On comparison with other principals, lower ventilation rates are registered with single-sided ventilation.
- *Cross ventilation* where two or more openings on opposite walls of a building cover a zone. The openings are usually windows or vents. Effect of cross ventilation is dependent on wind pressure and opening size.
- *Stack ventilation* is where buoyancy-driven gives larger flows. It relies on two principles which take the advantage of air density. I.e. As warms, it rises to the exit and the warm air is replaced by cool air hence ventilation. Here ventilation openings are at both high and low levels

Haves, (2003) state that it has been demonstrated that naturally ventilated buildings in some climates can operate for the entire cooling season within adaptive comfort constrains without mechanical cooling. The concept of natural ventilation doesn't seem to be complicated but it's a challenge to design naturally ventilated buildings due to the fact that naturally ventilation is difficult to control since it is a medium of passage for solar latent loads from the external environment (Hazim 2010). To achieve the goal of energy efficiency in buildings, natural ventilation is one of the suggested practices emphasized and adopted in many buildings around the world of which educational facilities have been a major target as an opportunity of achieving thermal comfort and energy efficiency goals simultaneously. Natural ventilation can provide building occupants with thermal comfort and a healthy indoor environment. Among all the design related parameters that affect ventilation performance, ventilation mode (i.e. single-sided and cross ventilation) is perhaps the main one. Natural ventilation is one of the most effective passive cooling strategies, especially for cooling-dominant climates and can provide building occupants with a comfortable thermal condition and a healthy indoor environment. Furthermore, 30% to 40% less energy consumption is reported in naturally ventilated buildings compared to mechanically ventilated buildings (Schule 2013). Natural ventilation design, however, can be challenging due to the complex and turbulent flows in and around buildings (Gratia 2004), especially in dense urban areas. Accordingly, natural ventilation has been largely disregarded in the design of high-rise buildings resulting in them being highly energy intensive due to the use of mechanical ventilation systems (Kenned 2015). Natural ventilation performance is influenced by a combination of different design features such as ventilation mode (i.e. single-sided ventilation and cross ventilation), window to wall ratio, opening type, and floor area. Among these parameters, ventilation mode has the largest impact on the ventilation rate of a building.

METHODOLOGY

In carrying out the study, a need assessment survey design (personal interaction and oral interview) was adopted. The targeted population for the study comprised all staff and youth Corp members of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom State. This shall include people with disability. It will also include all the architects, civil engineers, structural engineers and mechanical engineers in Akwa Ibom State. A proportionate stratified random sampling technique will be used to select the respondents which will include 5 staff and 100 National Youth Service Corp members. Others include 30 architects, 20 civil engineers, 20 structural engineers and 10 mechanical engineers from Akwa Ibom State. This gave a total of 185 respondents used for the study. The instrument used for data collection was a structured questionnaire titled "Adoption of Thermal Comfort and Natural Ventilation Strategies Questionnaire (ATCNVSQ)". Face and content validation of the instrument was carried out by an expert in test, measurement and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.89, and this was high enough to justify the use of the instrument. Descriptive and inferential statistics was used by the researcher. For the research questions mean statistics was used in answering them while the hypotheses were tested using dependent t-test, one-way analysis of variance and Pearson Product Correlation Analysis.

HYPOTHESES TESTING

Hypothesis One: The null hypothesis states that there is no significant difference in the level of natural ventilation received in buildings with such natural ventilation strategies as single-sided ventilation, cross ventilation or stack ventilation. In order to test the hypothesis, one-way analysis of variance was used to determine the difference in the level of natural ventilation received in buildings with such natural ventilation strategies as single-sided ventilation, cross ventilation or stack ventilation. (see table 1).

Table 1: One-way analysis of variance of the difference in the level of natural ventilation received in buildings with such natural ventilation strategies as single-sided ventilation, cross ventilation or stack ventilation.

Groups	N	$\bar{X}$	SD
Single sided ventilation	108	17.2037	0.7583
Cross ventilation	95	18.5579	0.4993
Stack ventilation	97	19.6598	0.4762
Total	**300**	**55.4214**	**1.7338**

Source of variance	SS	Df	Ms	F
Between group	310.663	2	155.332	432.272*
Within groups	106.723	297	0.359	
Total	**417.386**	**299**		

***Significant at 0.05 level; df = 2 & 299; critical F - value = 2.60**

The above table 1 presents the obtained F-value as (432.272). This value was tested for significance by comparing it with the critical F-value (2.60) at 0.05 level with 2 & 297 degree of freedom. The obtained F-value was greater than the critical value. Hence, the result was significant. The result of the data analysis is proved that there is significant difference in the level of natural ventilation received in buildings with such natural ventilation strategies as single-sided ventilation, cross ventilation or stack ventilation.

Hypothesis Two: The null hypothesis states that there is no significant relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom. Regression analysis was used to determine the relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom. (See table 2).

TABLE 2: Simple Regression Analysis of the relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom.

Model	R	R-Square	Adjusted R Square	Std. error of the Estimate	R Square Change
1	0.97a	0.94	0.94	0.35	0.94

***Significant at 0.05 level; df= 298; N= 300; critical R-value = 0.197**

In the above table 2 discussing the relationship between level of natural ventilation and thermal comfort in the buildings, the calculated R-value (0.97) was greater than the critical R-value of 0.113 at 0.5 alpha levels with 298 degrees of freedom. The R-Square value of 0.94 predicts 94% of the relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom. This rate of percentage is moderately positive and therefore means that there is significant relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom. It was also deemed necessary to find out the relationship of the variance of each class of independent variable as responded by each respondent (see table 3).

TABLE 3: Analysis of variance of the relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom.

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	593.36	1	593.36	4983.54	.000b
Residual	35.48	298	0.12		
Total	628.84	299			

a. Dependent Variable: Post thermal comfort
b. Predictors: (Constant), Natural ventilation

The calculated F-value (4983.54) and the P-value as (.000b). Being that the P-value (.000b) is below the probability level of 0.05, the result therefore means that there is significant extent exerted by the independent variables i.e. natural ventilation on the dependent variable which is Post thermal comfort.

DISCUSSION OF THE FINDINGS

The results of the data analysis in table 1 proved that the result was significant due to the fact the calculated F-value (432.272) was greater than the critical value of 2.60 at 0.05 level of significance with 2 and 297 degrees of freedom. The result means that there is a significant difference in the level of natural ventilation received in buildings with such natural ventilation strategies as single-sided ventilation, cross ventilation or stack ventilation. The significance of the result is in agreement with the opinion of Lipping (2007) who said that natural ventilation is one of the most effective passive cooling strategies, especially for cooling-dominant climates and can provide building occupants with a comfortable thermal condition and a healthy indoor environment. The significance of the result caused the null hypothesis to be rejected while the alternative one was upheld.

The results of the data analysis in table 2 proved that the result was significant due to the fact the calculated R-value (0.97) was greater than the critical value of 0.197 at 0.05 level of significance with 298 degree of freedom. The result means that there is significant relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom. The result therefore means that there is significant relationship between level of natural ventilation and thermal comfort in the buildings of the National Youth Service Corp Orientation Camp, Uyo, Akwa Ibom. The result therefore is in agreement with the research findings of Haves (2003) who noted that naturally ventilated buildings in some climates can operate for the entire cooling season within adaptive comfort constrains without mechanical cooling. The significance of the result caused the null hypotheses to be rejected while the alternative was upheld.

CONCLUSION

The study concluded that the adaptable buildings are widely recognized as intrinsic to a sustainable built environment. In principle, a building that can last while its parts gradually change will place a lighter load on natural and human resources and provide value to future generations. Further, if the parts that do change over time are designed for assembly, disassembly and reuse, if not recycling, this is an additional benefit in the service of a sustainable future.

RECOMMENDATIONS

- Enlightenment should be made to the youth corpers on how to manage building structure to continue to maintain adequate ventilation and comfort of the orientation camp.
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- Federal and State Ministries of health environment as well as sundry stakeholders should be effective in packaging effective statistics in the areas of managing building structures such as government houses, estates, civil offices and roads dimension.

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