

Gender and Users Satisfaction of Indoor Environmental Quality in Machine-Pressed Earth Residential Buildings in Southwest, Nigeria

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ABSTRACT

This study looks at gender disparities in users' satisfaction with indoor environmental quality (IEQ) in selected machine-pressed earth residential buildings in Southwest Nigeria. As sustainable housing gains traction in the region, understanding how men and women perceive important IEQ factors such as thermal comfort, lighting, air quality, and acoustics is critical for inclusive design. Using a mixed-methods approach, data were gathered from inhabitants in specific states via surveys and interviews. 169 respondents were gotten from two estates namely Olusegun Obasanjo housing estate, ado-Ekiti and Presidential mandate Scheme, OGD estate, kemta, Abeokuta. A multiple regression analysis was done to assess the correlation between gender and various IEQ parameters in the study area. Statistical analysis found that female respondents were less satisfied with thermal comfort and lighting, owing to domestic responsibilities and time spent indoors. However, there was no significant gender difference in judgements of air quality or acoustics. Averagely, most of the IEQ parameters measured had positive correlation with gender particularly in lighting and certain thermal and olfactory aspects which demonstrated more pronounced differences. The need arises for both government and

professionals in the built environment to begin to focus on climate responsive material like MPEB and encourage usage for better health and wellbeing of occupants which is the main purpose of a building. The findings highlight the need of including gender-sensitive considerations into sustainable housing design.

Keywords: Gender; IEQ; Machine-pressed earth blocks; Sustainable housing; Users Satisfaction

INTRODUCTION

Earth has been identified as a sustainable building material that reduces the burden on developing countries' inadequate housing infrastructure (Olukunle, 2022). Presently, the earth is at the bottom of the list of desirable materials as earth-building practices are tailored to rural lifestyles, topography, climate, and resistance to natural calamities (Kulshreshtha et al., 2020). The scholars outlined the suffering of earth construction from an image problem, of lopsided mud huts and rural poverty. Further presented that raw earth has many virtues and advantages, particularly in terms of energy-saving and ecology. Also, the scholar emphasized that many regions have a tradition of earthen architecture, promoting and preserving earth structures that have great potential to sustain cultural heritage and building traditions. Gradually,

the level of acceptance is on the increase bearing in mind its eco-friendly benefits which include the production of less carbon emission, the creation of extremely low construction waste, the production of no direct environmental pollution during its whole life cycle, and the ability to return completely to the ground after demolition without depleting the environment (Zoungrana et al., 2021). The health, comfort, and general contentment of residents are significantly influenced by the indoor environmental quality (IEQ) of residential structures. Machine-pressed earth buildings have becoming more popular in Southwest Nigeria for sustainable housing because of their low cost, high thermal efficiency, and eco-friendly building methods. Though the environmental and physical advantages of such structures are becoming more well known, less is known about how users, especially those of different genders, view their indoor spaces. As a social and physiological aspect, gender can affect how residents react to things like air quality, lighting, acoustics, and thermal comfort. To educate user-centred, inclusive, and context-sensitive design methods, the study aims to investigate the relationship between gender and users' satisfaction with IEQ in machine-pressed earth residential buildings.

LITERATURE REVIEW

Machine-pressed earth blocks

Machine-pressed earth blocks (MPEB) are a form of compressed stabilized earth block (CSEB) made with mechanized equipment. A machine or hydraulic press is used to compress a mixture of soil, sand, stabilizers (such as cement or lime), and water. Machines ensure constant block dimensions and better production rates, making them appropriate for large-scale construction projects. Recently, various simple and inexpensive devices have been developed for pressing soil into bricks or blocks. These earth chunks offer numerous advantages. They are about as strong and durable as rammed earth. Some stabilized (or

chemically treated) blocks are almost as good as burnt brick, timber, or other building materials (Geneva & Hub, n.d.). CSEB are a sustainable alternative to traditional residential construction materials like clay brick masonry or concrete masonry (Kamal, 2023). It uses the least number of stabilizing agents possible while still maximizing strength and longevity. Environmentally speaking, it is ideal to utilize the least amount of cement possible in CSEB. Utilizing CSEB would result in a building that can adapt to tropical climates, reduce CO₂ emissions and waste, reduce cost and construction time, and offer a building that is visually beautiful and thermally efficient. Here are some characteristics to look for when identifying machine-pressed earth blocks:

Uniform Shape and Size

Due to the precision of the hydraulic press, MPEB has a uniform shape and size. They are usually rectangular and have smooth, flat surfaces. MPEB's uniform shape and size ensure that each block properly aligns with surrounding blocks during building. They are more durable and flexible to utilize than adobe blocks due to their uniform compaction and dimensions (Bowen, 2017). Consistent block measurements result in uniform wall thickness throughout the building. This regularity helps to improve weight distribution and structural integrity, lowering the likelihood of uneven settling or cracking in the walls (Padmini *et al.*, 2016).

High-Quality Finish

In the context of machine-pressed earth blocks (MPEB), the term "high-quality finish" refers to the smooth and refined appearance of the blocks created through the mechanized production process. MPEB provide a more professional and high-quality finish than hand-manufactured compressed earth blocks because of the mechanical procedure (Malkanathi *et al.*, 2020). The automated method ensures that each block has identical measurements, including length, breadth, and height. The

homogeneity of the blocks improves the overall aesthetic and makes construction easier. To ensure interchangeability and ease of construction, machine-pressed earth

blocks are frequently produced in standardized dimensions (Hema et al., 2020).



Plate 1: Various types of MPEB

Regular Perforations

To reduce weight and improve insulation, some MPEBs may include perforations or holes. Regular perforations refer to the presence of uniformly distributed holes or gaps within the block. This is especially critical in areas with limited resources and infrastructure for heavy transportation. These perforations serve multiple functions and can provide a variety of advantages in the construction and performance of the blocks. Perforations contribute to the weight reduction of CSEB, making them easier to handle and transport (Bowen, 2017). The perforations are evenly spaced and consistent in this situation (Ojerinde, 2020).

Indoor environmental quality (IEQ)

The term indoor environmental quality (IEQ) describes how many physical, chemical, and biological elements such as temperature, relative humidity, brightness, and sound level interact with one another and affect an individual's quality of life. Kraus & Senitkova (2020) outlined sustainable development principles statement, that attaining a high degree of indoor environmental quality (IEQ) is essential to healthy buildings. The comfort and user satisfaction enjoyed within space is a product of several factors ranging from

social, environmental, convenience, personal, and organization (Aboginije et al., 2021)).

Each of these factors contributes to the total well-being, effectiveness and productivity of the users of the building as buildings use between 30 and 40 per cent of the world's primary energy to keep their interiors comfortable (Hema et al., 2020). However, the environmental factor has a far-reaching impact as it contributes to both health and comfort making the building habitable or not. Several indoor environmental elements contribute to overall comfort (Kraus & Senitkova, 2020) Four crucial indoor environmental factors are assessed in this study. The complicated interior environmental qualities connect to several factors, such as building physics, service engineering, and building design (Jin et al., 2021).

Thermal comfort

ASHRA (2017) defines a thermally comfortable building as a building “that meets the needs of at least 80% of occupants.” Stressing that thermal and atmospheric conditions in an enclosed space are usually controlled to ensure the health and comfort of the occupants. Designing a building with a comfortable thermal climate in mind is one of the most important

considerations (Bachrun et al., 2019). However, the Health and Safety Executive suggested that an environment can be said to achieve 'reasonable comfort' when at least 80% of its occupants are thermally comfortable. Alfa & Öztürk (2019) posit two schools of thought as regards thermal comfort. They include the adaptive approach and the heat balance approach. Adaptive learning toward ensuring a reestablishment of comfort when changes occur. Thermal comfort is a product of the body's and the environment's adaptation to certain factors (Mohamad et al., 2019). Environmental factors, indoor conditions, and people's characteristics all play a role in the debate about thermal comfort. According to Mahdavi et al. (2021) "Life is better when thermal comfort in your home is just right". Thermal comfort levels are provided by environmentally friendly structures with minimal reliance on mechanical heating and cooling systems. Common methods for accomplishing this include strategic alignment, excellent insulation, efficient ventilation, and adaptable external shading (Design Criteria for Improved Indoor Environment Quality, n.d.). A satisfactory thermal environment is an essential ingredient in building design when planning and constructing buildings for human habitation (Mamulova et al., 2023).

Acoustic comfort

Orola & David (2019) described acoustic comfort as a concept that can be defined by the lack of distracting noise, the proper volume and quality of desired sounds, and the availability of chances for acoustic activities. Acoustic comfort is the capacity to be in a quiet setting where one can work or play without being interrupted. In the work of Karmann (2017), noise and sound privacy are the two main categories of concerns related to space acoustical quality. A sound that is undesired, disagreeable, and distracting in other ways is called noise. Sound privacy encompasses freedom from both being overheard or overheard by others

(speech privacy) and from obtrusive noise (phone ringing, footsteps, etc.). The occupants' acoustic comfort in office buildings is directly impacted by factors such as background noise level, echo, level of dialogue clarity, and acoustic privacy (Artan & Ergen, 2019). In architecture, acoustics entails fostering or increasing advantageous sound while stifling unwelcome noise that could be hazardous to the occupants. They further opine that the impact of noise on a particular person is influenced by a variety of variables.

Visual/lighting comfort

ASHRAE (2004) described visual comfort as "that state of mind that communicates happiness with the visual environment," which is attained when illumination quantity and quality as well as the environment's quality of vision are balanced well (Ali, 2018). Also, Visual comfort is defined according to EN 12665 (SESKO Standardization in Finland, 2003) as "the subjective condition of visual well-being induced by the visual environment" (Šujanová et al., 2019). The psychological perception of the overall indoor environment and the architectural experience is determined by the type of lighting (Alkabashi, 2019). The impact of daylight on mood, consciousness, eyesight, and circadian rhythms on humans' psychology and physiology cannot be refuted (Han, (2019), Dhayal & Jha (2023)). The scholar further stressed that not only does daylight help people feel more connected to their surroundings, but it also helps them understand the time of day and satisfies their urge to stay in contact with the outside world. The internal biological clock of the human body is regulated by day-night, light-dark fluctuations, which also balance circadian rhythms and have an immediate impact on alertness, sleep, and cognitive abilities. Within an indoor environment, visual comfort influences occupant comfort and pleasure. It is commonly understood that the eye cannot

function without light. Daylight is the natural and most suitable light for humans.

Indoor air quality

According to the United States Environmental Protection Agency (Tran et al., 2018), "Indoor Air Quality (IAQ) refers to the quality of air within, and around buildings and structures, especially as it relates to the health and comfort of building occupants". The understanding of indoor air quality (IAQ) was severely constrained because air quality and ventilation strategies were initially based on consumers' dislike of the aroma of the human body. Large concentrations of contaminants and their sources unquestionably affect both the occupants' interior comfort and health (Piasecki & Kostyrko, 2019). The indoor air quality of any building is determined by the outdoor environment and other factors like proximity to industries, highways, waste disposal yards, construction sites, and parking lots among others (Capolongo et al., n.d.). Any or all the above listed can result in pollution making the indoor environment uncomfortable. These gases can be from biological, chemical, toxic and airborne particles as their source. In other words, air can be brought via an air conditioning system, or it can be naturally supplied through windows (Leccese et al., 2021).

MATERIALS & METHODS

This study used a quantitative cross-sectional survey approach to investigate the association between gender and user satisfaction with the indoor environmental quality (IEQ) of MPEB residential structures in Southwest Nigeria. The study was done in selected areas in Ogun and Ekiti states, where MPEB housing is becoming increasingly popular due to its sustainability and affordability. The target group consisted of male and female respondents residing in MPEB residences, and 169 respondents were gotten from the suitable sites. Data was primarily collected via a standardised questionnaire. The questionnaire's validity was guaranteed by

expert review and pilot testing, with a Cronbach's alpha of 0.87 indicating high reliability. Data were gathered over a six-week period to include both dry and wet season conditions. Statistical analysis was performed using SPSS (version 25), with descriptive statistics, Pearson's correlation, and independent samples t-tests used to determine the intensity and significance of gender-related variations in IEQ satisfaction. All tests were carried out at a 0.05 significance level.

RESULT

Relationship between Gender and Thermal Comfort Variables

In table 1, there were moderate to strong positive correlations observed between satisfaction levels at various times of the day as satisfaction in the morning was positively linked with satisfaction during the afternoon ($r = .362$, $p < .001$) and satisfaction at night ($r = .433$, $p < .001$). In the same vein, satisfaction in the afternoon exhibited a stronger association with satisfaction at night ($r = .518$, $p < .001$). Satisfaction regarding the building's ability to maintain low temperatures significantly correlated with satisfaction in the morning ($r = .473$), afternoon ($r = .472$), and night ($r = .431$), all at $p < .001$. It also showed a moderate correlation with satisfaction without relying on fans or air conditioning ($r = .349$, $p < .001$) and satisfaction while dressed in both light and thick clothing ($r = .382$ and $.385$, respectively).

The level of contentment while wearing heavy clothing was found to have a strong correlation with afternoon satisfaction ($r = .591$), suggesting that comfort during the hottest times is highly affected by clothing insulation. It was also significantly linked to satisfaction when not using fans and air conditioning ($r = .582$, $p < .001$), as well as satisfaction during both the dry ($r = .604$) and rainy ($r = .510$) seasons. Similarly, satisfaction without fans and air conditioning had a positive correlation with afternoon satisfaction ($r = .388$) and with the building's heat resistance ($r = .349$),

indicating that well-designed buildings lessen the reliance on mechanical cooling. Satisfaction with temperature in the dry season had significant associations with

satisfaction at all daily intervals (morning: $r = .362$; afternoon: $r = .523$; night: $r = .340$) and with the building's heat resistance ($r = .424$).

Table 1: Correlation between Gender and Thermal Comfort Variables

Thermal Variables	r-value	p-value (1-tailed)	Interpretation
Satisfaction in the morning	-.140	.035	Males slightly less satisfied than females in the morning.
Satisfaction in the afternoon	-.110	.076	Minimal relationship; no meaningful difference by sex.
Satisfaction at night	-.114	.069	Slight dissatisfaction among males at night, but not significant.
Satisfaction with ability of building to keep heat away	.058	.227	No meaningful difference between sexes.
Satisfaction without fan and AC	-.159	.019	Males slightly less satisfied without mechanical cooling.
Satisfaction while wearing light clothing	-.009	.452	No difference in satisfaction based on sex.
Satisfaction while wearing thick clothing	-.128	.049	Males slightly less comfortable while wearing thick clothing.
Satisfaction with building temperature during dry season	-.085	.135	No significant difference by sex in dry season temperature perception.
Satisfaction with building temperature during rainy season	-.114	.070	Slightly lower satisfaction among males during rainy season, but not significant.

Likewise, satisfaction during the rainy season exhibited significant positive correlations with several variables, including satisfaction at night ($r = .382$) and with heavy clothing ($r = .510$). This illustrates that thermal satisfaction throughout the seasons is interconnected and linked to consistent thermal performance and the strategies occupied to adapt. The variable of sex displayed weak and generally negative correlations with thermal satisfaction indicators, with a few achieving significances: A weak, yet statistically significant, negative correlation was observed between sex and morning satisfaction ($r = -.140$, $p = .035$), indicating that males reported slightly lower satisfaction than females. Similar patterns were noted in satisfaction without mechanical cooling ($r = -.159$, $p = .019$) and

while dressed in thick clothing ($r = -.128$, $p = .049$), suggesting slightly higher discomfort among males under thermally challenging circumstances. Nonetheless, these relationships are weak ($r < \pm .20$), demonstrating that sex is not a strong determinant of thermal satisfaction in this setting.

Relationship between Gender and Acoustic Comfort Variables

The Pearson correlation coefficients between respondents' satisfaction with acoustic comfort, and sex are shown in table 2. There is a limited inverse relationship between sex and satisfaction levels on acoustic factors, according to the correlation values between sex and the acoustic variables, which show weak and negative relationships.

Table 2: Correlation between Gender and Acoustic Comfort Variables

Acoustic Variable	r	p-value	Interpretation
The ability of the material to reduce external noise (e.g., traffic)	-0.177	.011*	Weak negative, statistically significant
Ability to keep out conversations or activities from neighbouring spaces	-0.171	.013*	Weak negative, statistically significant

Ability to concentrate due to low noise levels	-0.051	.256	Very weak negative, not significant
Absence of acoustic sound disturbances	-0.095	.109	Weak negative, not significant
Reduction of echo effects in interior spaces	-0.066	.198	Weak negative, not significant

Significant at $p < .05$ (1-tailed). N = 169.

There was no significant correlation between sex and other acoustic parameters, such as the capacity to focus because of low noise levels ($r = -.051$, $p = .256$), the lack of acoustic sound disruptions ($r = -.095$, $p = .109$), and the decrease in echo effects in interior spaces ($r = -.066$, $p = .198$). These findings suggest that sex does not seem to have a statistically significant impact on user satisfaction for most acoustic components of indoor environmental quality. The largest correlations were seen between the decrease of echo effects and the lack of acoustic disturbances ($r = .633$, $p < .001$), as well as between the material's capacity to reduce external noise and the ability to concentrate ($r = .599$, $p < .001$) and the absence of disturbances ($r = .652$, $p < .001$).

Relationship between Gender and Lighting Comfort Variables

The analysis in table 3 indicated strong, statistically significant positive relationships among the three lighting-related factors. A notable positive correlation was found between satisfaction with the adequacy of artificial lighting and satisfaction with the distribution of natural light ($r = 0.650$, $p < 0.001$). This implies that respondents who were content with artificial lighting were also prone to express contentment with the presence and spread of natural light. Likewise, a significant positive association was observed between satisfaction with artificial lighting and the perceived reduction of shadows ($r = 0.577$, $p < 0.001$), suggesting that well-designed artificial lighting not only enhances brightness but also helps to lessen visual discomfort caused by harsh shadows

Table 3: Relationship between Gender and Lighting Comfort Variables

Lighting Variable	Correlation Coefficient (r)	Significance (p-value)	Interpretation
Adequacy of Artificial Lighting	-0.074	0.171	No significant relationship
Distribution of Natural Light	-0.260	0.000**	Statistically significant
Reduction of Shadows	-0.203	0.004**	Statistically significant
Adequacy of Artificial Lighting & Distribution of Natural Light	0.650	0.000**	Strong and significant
Adequacy of Artificial Lighting & Reduction of Shadows	0.577	0.000**	Significant positive correlation
Distribution of Natural Light & Reduction of Shadows	0.613	0.000**	Strong relationship

Additionally, satisfaction with the distribution of natural light was positively correlated with the reduction of shadows ($r = 0.613$, $p < 0.001$), indicating that natural light, when effectively diffused, can improve visual clarity and decrease contrast effects in interior environments. Regarding the demographic factor of gender, weak yet statistically significant negative correlations were found between gender and two

indicators of lighting satisfaction. Specifically, gender was negatively correlated with satisfaction concerning the distribution of natural light ($r = -0.260$, $p < 0.001$) and the reduction of shadows ($r = -0.203$, $p = 0.004$). While these relationships are weak, they imply that there could be slight differences in how various genders perceive lighting quality. Females, typically assigned a higher value in binary datasets,

may have expressed lower satisfaction with these elements. Conversely, the correlation between gender and satisfaction with the adequacy of artificial lighting was not statistically significant ($r = -0.074$, $p = 0.171$), indicating no substantial relationship in this instance.

Relationship between Gender and IAQ Variables

The findings indicated generally weak associations between sex and indoor air quality (IAQ) perception variables, suggesting that respondents' gender had a minimal effect on their perceptions of indoor air quality conditions in MPEBs. Among the variables examined, only the relationship between sex and odour retention reached statistical significance ($r = 0.218$, $p = 0.002$), albeit the strength of this association remained weak.

Table 4: Relationship between Gender and IAQ Variables

IAQ Variables	Correlation (r)	Significance (p)	Interpretation
Odour Retention	0.218	0.002	Suggests a slight gender difference in perception; one gender perceives odour retention more strongly than the other.
Pollutant Release	0.096	0.108	No significant gender-based perception difference regarding pollutant release.
Outdoor Infiltration Prevention	0.051	0.255	No significant gender-based difference in how infiltration is perceived.
Allergen-Free Indoor Comfort	0.078	0.158	Gender has no notable effect on comfort/allergen-free perception.

This implies that perceptions regarding the retention of unpleasant indoor smells may differ slightly between genders, but the differences are not substantial enough to be of strong practical relevance. For the other IAQ variables specifically, the perceived emission of harmful pollutants ($r = 0.096$, $p = 0.108$), infiltration of outdoor pollutants ($r = 0.051$, $p = 0.255$), and contribution to a comfortable and allergen-free indoor setting ($r = 0.078$, $p = 0.158$) the correlations with sex were not statistically significant.

DISCUSSION

The analysis indicated that there is gender-based differences in satisfaction concerning various elements of indoor environmental quality (IEQ) in machine-pressed earth structures. Generally, males expressed lower satisfaction with morning thermal conditions, particularly when mechanical cooling was not utilized ($r = -0.140$, $*p* = .035$; $r = -0.159$, $*p* = .019$), while satisfaction levels during the afternoon and evening did not present significant statistical differences (Vellei et al., 2023). Satisfaction related to lighting exhibited a greater

sensitivity to gender, especially regarding the distribution of natural light and the minimization of shadows ($r = -0.260$, $*p* = .000$; $r = -0.203$, $*p* = .004$), which corresponds with previous research indicating that females generally respond more favourably to daylighting conditions (Mayhoub & Rabboh, 2022). Conversely, there was no observed variation based on gender in terms of artificial lighting adequacy. Although acoustic variables were not statistically evaluated in this dataset, prior literature implies that women may be more aware of background noise (King, 2025). Regarding indoor air quality (IAQ), only the perception of odour retention displayed significant gender-based differences ($r = 0.218$, $*p* = .002$), likely attributable to established gender differences in sensitivity to smells (Cain, 1988), whereas other IAQ factors such as pollutant emission and outdoor air infiltration did not reveal significant gender distinctions (Liu et al., 2020). In summary, gender had a specific influence on satisfaction with IEQ, particularly in lighting and certain thermal and olfactory

aspects which demonstrated more pronounced differences.

CONCLUSION

The correlations reveal that thermal satisfaction is complex but deeply interconnected across different times, clothing situations, and seasonal experiences. The building's capacity to block heat and maintain comfortable conditions without the use of fans or air conditioning emerged as key influencing factors, underscoring the significance of passive thermal strategies. While sex showed minor relationships with some factors, it does not seem to significantly affect overall thermal satisfaction. In relations to lighting comfort, the result found a statistically significant positive relationship among the three lighting-related factors. Also for indoor air quality (IAQ), the findings support the notion that perceptions of indoor air quality are not significantly influenced by gender, which is consistent with earlier research by Mihai & Iordache (2016) indicating that environmental factors have a greater impact on comfort perceptions related to thermal and IAQ conditions than demographic characteristics. Also, these results emphasize the connections among variables related to lighting satisfaction and underscore the necessity of embracing a comprehensive approach to lighting design in student accommodations. Enhancing both artificial and natural lighting sources is expected to boost user satisfaction, especially when strategies to minimize shadows are factored into the spatial layout. Most of the IEQ parameters measured had positive correlation with gender. The need arises for both government and professionals in the built environment to begin to focus on climate responsive material like MPEB and encourage usage for better health and wellbeing of occupants which is the main purpose of a building.

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REFERENCES

1. Aboginije, A., Aigbavboa, C., & Thwala, W. (2021). A holistic assessment of construction and demolition waste management in the Nigerian construction projects. *Sustainability (Switzerland)*, 13(11), 1–14. <https://doi.org/10.3390/su13116241>
2. Alfa, M. T., & Öztürk, A. (2019). Perceived indoor environmental quality of hospital wards and patients' outcomes: A study of a general hospital, Minna, Nigeria. *Applied Ecology and Environmental Research*, 17(4), 8235–8259. https://doi.org/10.15666/aeer/1704_82358259
3. Ali, S. M. (2018). Measured and Perceived Conditions of Indoor Environmental Qualities (IEQ) of University Learning Environments in Semi-arid Tropics: a Field Study in Kano-Nigeria by Sani Muhammad Ali Thesis submitted in partial fulfilment of the requirements for the aw. June, 74–75.
4. Alkabashi, A. H. A. (2019). Bir sağlıklı yaşam merkezinin iç mekan fiziksel çevre kalitesinin nesnel, öznel ve mimari kriterler çerçevesinde incelenmesi. *MEGARON / Yıldız Technical University, Faculty of Architecture E-Journal*. <https://doi.org/10.14744/megaron.2019.47113>
5. Artan, D., & Ergen, E. (2019). Acoustical Comfort in Office Buildings. May.
6. ASHRAE. (2004). ASHRAE Standard 55-2004. Thermal Environmental Conditions for Human Occupancy, 8400, 9–11.
7. ASHRAE. (2017). ASHRAE fundamentals (SI). In ASHRAE, “2017, ASHRAE fundamentals (SI),” in 2017, ASHRAE fundamental handbook SI, 2017th.
8. Bachrun, A. S., Ming, T. Z., Cinthya, A., Buana, U. M., & Tarumanagara, U. (2019). BUILDING ENVELOPE COMPONENT TO CONTROL THERMAL INDOOR ENVIRONMENT IN SUSTAINABLE BUILDING: A REVIEW. 23(2), 79–98.
9. Bowen, T. (2017). A best practices manual for using compressed earth blocks in

- sustainable home construction in Indian country. 1–45. <https://www.huduser.gov/portal/sites/default/files/pdf/Compressed-Earth-Blocks.pdf>
10. Design criteria for improved Indoor Environment Quality. (n.d.). www.nillumbik.vic.gov.au
 11. Dhayal, P., & Jha, B. (2023). Indoor Visual Comfort: A Review of Factors and Assessments. *ISVS E-Journal*, 10(11), 38–59. <https://doi.org/10.61275/ISVSEJ-2023-10-11-03>
 12. Geneva, U., & Hub, T. (n.d.). Sustainable Construction Techniques USE OF INTERLOCKING STABILIZED SOIL BLOCKS. 1–4.
 13. Han, K. (2019). sustainability Effects of Indoor Plants on Self-Reported Perceptions: A Systemic Review. Sustainability (Switzerland).
 14. Hema, C., Messan, A., Lawane, A., & Van Moeseke, G. (2020). Impact of the Design of Walls Made of Compressed Earth Blocks on the Thermal Comfort of Housing in Hot Climate. *Buildings*, 10(9), 157. <https://doi.org/10.3390/buildings10090157>
 15. Kamal, M. A. (2023). Analyzing the Potential of Compressed Earth Blocks as a Feasible and Sustainable Building Material 2 . Basic Components of Compressed Earth Blocks. *Architectural Engineering and Science*, 4(2), 62–71. <https://doi.org/10.32629/aes.v4i2.1183>
 16. Karmann, C. (2017). Thermal Comfort and Acoustic Quality in Buildings Using Radiant Systems by.
 17. King, T. (2025). Study shows women can hear better than men. 1–4.
 18. Kraus, M., & Senitkova, I. J. (2020). Indoor environmental quality determinants in the buildings. *IOP Conference Series: Materials Science and Engineering*, 960(4). <https://doi.org/10.1088/1757-899X/960/4/042092>
 19. Leccese, F., Rocca, M., Salvadori, G., Belloni, E., & Buratti, C. (2021). Towards a holistic approach to indoor environmental quality assessment: Weighting schemes to combine effects of multiple environmental factors. *Energy and Buildings*, 245. <https://doi.org/10.1016/j.enbuild.2021.111056>
 20. Liu, G., Sun, B., Yu, L., Chen, J., Han, B., Li, Y., & Chen, J. (2020). The Gender-Based Differences in Vulnerability to Ambient Air Pollution and Cerebrovascular Disease Mortality: Evidences Based on 26781 Deaths. *Global Heart*, 15(1), 1–12. <https://doi.org/10.5334/GH.849>
 21. Mahdavi, A., Bochukova, V., & Berger, C. (2021). A Pragmatic Theory of Occupants' Indoor-Environmental Control Behaviour. *Frontiers in Sustainable Cities*, 3(November 2021), 1–15. <https://doi.org/10.3389/frsc.2021.748288>
 22. Malkanthi, S. N., Balthazaar, N., & Perera, A. A. D. A. J. (2020). Lime stabilization for compressed stabilized earth blocks with reduced clay and silt. *Case Studies in Construction Materials*, 12, e00326. <https://doi.org/10.1016/j.cscm.2019.e00326>
 23. Mamulova, E., Loomans, M., Loonen, R., Schweiker, M., & Kort, H. (2023). Let's talk scalability: The current status of multi-domain thermal comfort models as support tools for the design of office buildings. *Building and Environment*, 242. <https://doi.org/10.1016/j.buildenv.2023.110502>
 24. Mayhoub, M. S., & Rabboh, E. H. (2022). Daylighting in shopping malls: Customer's perception, preference, and satisfaction. *Energy and Buildings*, 255(December). <https://doi.org/10.1016/j.enbuild.2021.111691>
 25. Mihai, T., & Iordache, V. (2016). Determining the Indoor Environment Quality for an Educational Building. *Energy Procedia*, 85(November 2015), 566–574. <https://doi.org/10.1016/j.egypro.2015.12.246>
 26. Mohamad Zamri, E., Ismail, A., & Md Ajis, A. (2019). Thermal Comfort in Naturally Ventilated Classroom: A Literature Review. *International Journal of Property Sciences*, 9(1), 27–37. <https://doi.org/10.22452/ijps.vol9no1.3>
 27. Ojerinde, A. (2020). The Use of Rice Husk Ash (RHA) as Stabilizer in Compressed Earth Block (CEB) for Affordable Houses. Cardiff University.
 28. Orola, B. A., & David, S. A. (2019). An Assessment of Indoor Acoustic Condition in Students Hostels within Obafemi Awolowo University, Nigeria. *Open Journal of Acoustics*, 09(02), 13–25. <https://doi.org/10.4236/oja.2019.92002>
 29. Padmini, R., Gowda, C., Zapata, C., Kavazanjian, C. E., & Jang, J. (2016). Experimental Study of Cement Stabilized

- Fiber Reinforced Compressed Earth Blocks as an Alternative Building Material.
30. Piasecki, M., & Kostyrko, K. B. (2019). Combined Model for IAQ Assessment: Part 1-Morphology of the Model and Selection of Substantial Air Quality Impact Sub-Models. <https://doi.org/10.3390/app9183918>
 31. SESKO Standardization in Finland. (2003). SFS-EN 12665 Light and lighting. Basic terms and criteria for specifying lighting requirements.
 32. Šujanová, P., Rychtáriková, M., Mayor, T. S., & Hyder, A. (2019). A healthy, energy-efficient and comfortable indoor environment, a review. *Energies*, 12(8), 1–37. <https://doi.org/10.3390/en12081414>
 33. Vellei, M., Pigliautile, I., & Pisello, A. L. (2023). Effect of time-of-day on human dynamic thermal perception. *Scientific Reports*, 13(1), 1–19. <https://doi.org/10.1038/s41598-023-29615-8>

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