**“How Can the Provision of Energy-Efficient and Durable Exterior Wall Systems Be Improved In the UK Construction Industry? A Study of Best Practices for Design, Installation, and Maintenance.”**

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# LITERATURE REVIEW

## Introduction

A catastrophe is on the horizon for the United Kingdom as the gap between energy utilisation and availability continues to widen. Along with the growing demand for energy in the country, which has increased by 12% since 1990, the country's greenhouse gas emissions from diesel have also skyrocketed (Yüksek and Karadayi, 2017). The process of establishing and maintaining control over all aspects of a project's lifecycle, from the initial conception to the final evaluation, including the establishment of a scope, schedule, and budget, is referred to as project management. This process takes place during the course of managing a project. During the building process, which includes the planning and construction of external walls, efficient project management is important to the success of the endeavour (Wang et al., 2018). These days, project managers place a much greater reliance on environmentally favourable construction methods such as passive walls.

The present energy crisis is being caused by a number of factors, including the deterioration of existing infrastructure, the reduction of oil and diesel supplies from the North Sea, and increasing rates of energy consumption (Assimakopoulos et al., 2020). Building energy consumption has therefore converted into an international emphasis which necessitates further development in the UK construction sector.

## Challenges for enhancing the provision of energy-efficient and energy-durable wall systems in the UK Construction Industry

Regarding the construction of green structures, there is a lack of robust policy and limited awareness at the present time. In order to address the current energy crisis, the United Kingdom government has committed to the objectives of the Paris Declaration on Climate Change and set a goal of carbon neutrality by 2050 (Natividade et al., 2022). This involves achieving carbon neutrality for greenhouse gas emissions in the United States by 2050. Energy costs are escalating daily, and the construction and building industries consume over 30% of all energy produced (Anaokar, 2020). The use of fossil fuels to generate electricity is one of the primary contributors to global warming, the primary cause of climate change.

In the United Kingdom, one of the most significant contributors to the country's overall emissions of greenhouse gases is the energy industry, which is responsible for approximately 25 percent of all emissions (Saud et al., 2022). Some of the major challenges faced by the construction sector currently are fast urbanisation and overpopulation, global climate change and greenhouse gas emissions, resident climate change and urban overheating, high global environmental impact and high energy consumption amongst others (Assimakopoulos et al., 2020).

The manufacture of a building with a suitable envelope or the refurbishment of a prevailing one is measured to be a reflexive quantity, being a normal deed of the thermal conflict of the envelope to temperature exchange by exterior elements which will assist in the internal thermal control. From the evaluation of the thermal comfort of the residents, peaks in energy demand, and periods of tenancy of the environment, it would be probable to recognise opportunities for minimising energy consumption. Some of the features which can impact thermal circumstances such as building orientation and type, energy levels, set point and climate, apartment orientation and size fiscal factors among others.

In a study undertaken by Yüksek and Karadayi (2017), the outline of the building is a substantial element impacting heat damage and expansion and it can be described through geometric variables creating a building such as the building height, quantity of building depth to building length, type of roof, bossages and type of gradient. Buildings have a great potential for energy efficacy and to attain this substantial probable there is a requirement for some initiatives and regulations to enhance the effectiveness of buildings in the UK. Through a conscious and accurate energy-shielded landscape scheme, it is conceivable to minimise the cost of energy spent on cooling and heating during winter and summer seasons by 30%. The strategies of energy conserving landscape are reliant on a region.

Carbon emission minimisation of prevailing houses gives the impression is the chief concern for the government of the UK to meet the net zero target. Up to 90% of an individual's time is spent in the house in developed nations and 69% of this indoor time is spent at home. As a consequence, buildings are accountable for over 40% of the energy usage in Europe and even more in the UK, thus enhancing its energy efficiency has become pivotal in addressing the target of carbon emission to make the dream a reality (Misopoulos et al., 2019). One of the most challenging parts for the UK construction sector is building retrofits, considering the complexity and scale of housing and process.

The most shared building features which make millions of UK prevailing housing perform ailing encompass less insulation in floors and roofs sold walls and single-glazed windows, predominantly in social housing. The schemes of fabric incentives are yet to attain the full assortment of social and private housing (Yüksek and Karadayi, 2017). It was appealed by this study that retrofit procedures might not be as efficient as predicted owing to various reasons encompassing lack of monitoring, and poor quality of building constituents installations which might be amplified the use of heating after being refurbished. Irrespective of that, building retrofit is considered to be a chief element towards attaining the policy of energy efficiency with significant energy-redeemable potentials mainly in the residential industry (Assimakopoulos et al., 2020).

As stated by Hodgkin and Sasse (2022) the price of energy is predicted to rise further and remain higher for a longer period of time than before the crisis. The UK is specifically exposed to these price upsurges due to its reliance on gas as compared to other nations, using it for heating buildings and homes, supplying industry and producing electricity. This reliance has deep roots that encompass the availability of gas in the North Sea and struggles to diversify the energy utilised for heating have been tampered with by governments unswervingly loading policy charges onto electricity but not gas. The main weakness in some of the schemes of the UK encompassing the Green Deal has been due to the failure to adequately comprehend customer incentives leading to low take-up (Misopoulos et al., 2019). The awareness of the potential advantages of energy efficiency enhancements remains low and is considered to be of low priority as compared to other home improvements.

## Role of External Walls in Addressing Energy Crisis

### Types of External Wall Systems – Trombe Walls, Double Skin Facades, Green Wall Systems, PCM Enhanced Walls

It is impossible to exaggerate how important external obstacles are to the process of finding a solution to the energy challenge. Buildings are among the largest consumers of energy and contributors to greenhouse gas emissions. Exterior walls play an important role in reducing the energy requirements of buildings, which are among the largest consumers of energy. The quantity of heat, light, and oxygen that is allowed to penetrate a structure from the outside is regulated by the building's exterior walls and roof. (Cabral and Blanchet, 2021) It is possible to cut down on the amount of energy needed to heat, chill, and illuminate a building by using walls that either surround the building, walls that provide ventilation, or walls that do both of these things.

The walls of a trombe, which are a form of passive solar heating system, are built from solid stone and have a translucent surface that faces south. This orientation allows the sun to be used as a source of heat in the structure. The wall absorbs the heat from the sun during the day and releases it at night, keeping you warm while reducing the amount of money you spend on heating your home (Saud et al., 2022). The double-skin facade is an additional kind of wall system that can serve as a divider between the interior and exterior of the building by separating the two different levels of the structure. By eliminating the need for artificial illumination and air conditioning, and utilising the plants' ability to absorb carbon dioxide, systems that incorporate plants into walls (sometimes dubbed "living walls") can decrease cooling expenses (Wang et al., 2018). These systems are sometimes referred to as "living walls." They insulate against the heat and reduce the effect that urban heat islands have.

Walls that have been upgraded with phase change materials (PCMs) store and release heat using these materials, which creates thermal insulation and reduces the demand for Ventilation systems (Misopoulos et al., 2019). It is imperative that buildings have obstacles that require a lower amount of energy in order to make headway in resolving the energy issue. Different types of wall construction should be utilised depending on the climate, the architecture of the structure, and the required amount of energy. By implementing energy-efficient external wall systems, we can reduce our overall effect on the environment as well as the amount of money we spend on natural fuels (Assimakopoulos et al., 2020).

### Performance of Passive Walls against Traditional External Walls Systems

It is extremely important to find a solution to this issue because the majority of a building's energy is wasted through its external walls. If the external walls of the building are not well insulated and sealed, then the cost of heating and cooling the building will increase for both the owner of the building and the residents (Yüksek and Karadayi, 2017). As a direct result of this, the planning and building of external walls have taken on an increasingly important role within the context of environmentally friendly architecture. Passive walls are an innovative method of constructing external walls that cut down on energy use by making use of natural materials and design principles that are inactive (Natividade et al., 2022).

Passive walls are also known as "green" walls or "passive architecture." These walls perform their function by restricting the amount of heat that can be transmitted through the wall system of the building, which in turn reduces the need for heating, ventilation, and air conditioning (HVAC) systems within the building itself. Insulation is generally installed within the wall space of a building so that warm air can be retained during the winter and hot air can be kept out during the summer (Kiani Mavi et al., 2021). Limestone and concrete, two popular materials for external walls, both have a substantial heat density but inadequate insulation values. Masonry has a higher heat density than concrete (Santamouris and Vasilakopoulou, 2021).

The high heat capacity of these walls makes it possible for there to be an extreme accumulation of heat during the summer, as well as a loss of heat during the winter. The demand for electricity is expected to continue to rise, which means that heating and ventilation systems will need to exert more effort (Yüksek and Karadayi, 2017). Homeowners who install passive walls see a significant reduction in the amount they pay in monthly electricity costs. This is a problem that has been demonstrated to be solvable. According to the findings of recent studies, passive wall constructions consume up to 90 percent less energy than traditional buildings (Wang et al., 2018). Passive walls have a longer lifespan than traditional ones, which means they require fewer repairs and improvements and have a smaller impact on the surrounding environment.

### Benefits and Barriers of Passive Walls

There are a lot of positive aspects associated with the use of passive walls, which are an alternative to conventional external walls that are better for the environment and use less energy (Yüksek and Karadayi, 2017). The reduction in the amount of money spent on electricity is a significant benefit. Installing passive walls provides a number of advantages, two of which are reduced costs for heating and chilling the home as well as a lower overall effect on the environment. In addition, passive walls make life easier for inhabitants of a building by contributing to the maintenance of a constant temperature and humidity level inside the building throughout the entire year (Santamouris and Vasilakopoulou, 2021).

Passive walls are constructed to last for decades without requiring significant maintenance, in addition to having a pleasant appearance from an ornamental standpoint. And finally, passive walls are constructed from biological materials that don't off-gas any harmful substances, which results in a more wholesome environment inside the building. In spite of these benefits, however, the widespread implementation of inactive barriers is still hampered by a few significant challenges (Misopoulos et al., 2019). One of the most significant challenges is represented by the typically high cost associated with them. It is possible that the original cost of installing passive walls will be more expensive than the cost of conventional wall systems. In addition, the construction and installation of passive walls could necessitate the use of specialised expertise, which would result in an increase in the cost of the task (Saud et al., 2022).

Another issue is that consumers, contractors, and managers all have a limited understanding of what passive walls are and how they work. Due to the low level of interest in these wall systems, their price may increase while their availability decreases. Last but not least, the need for local acquisition and the limited availability of native materials may have an impact on the scalability of passive walls (Natividade et al., 2022). Passive walls get good scores across the board for their friendliness to the environment, their ability to save energy, and the level of gratification they provide to residents. However, in order to promote their ubiquitous use in the building construction industry, it will be necessary to overcome barriers to acceptance such as the high cost, the need for instruction, and the limited supply of resources (Santamouris and Vasilakopoulou, 2021).

## Opportunities for Enhancing the Durable Exterior and Energy-Efficient Wall in the UK Construction Industry

A comparative study undertaken by Chippagiri et al. (2021) engrossed the energy and economic examination of conventional and prefabrication construction. As of the sustainability standpoint, the end merchandises that were industrialised were a bio-based resolution for its efficient influence on dense discarded administration. The developed end product led to the maintenance of an adiabatic atmosphere within the prototypical houses that can be unwavering as malleable to varied climate vicissitudes. Prefab construction economically can be deliberated costly for a sole unit which is due to expenses associated with the transport, moulds and manufacture that are of huge amounts for a sole component but can be alleviated when these prefab houses are built in giant figures.

The construction of external obstacles that are both energy-efficient and environmentally friendly is an absolute necessity in the United Kingdom. If the building's external is sealed up correctly, it is possible to reduce in half the amount of money that is spent on heating and chilling the building. This leads to reduced levels of energy utilisation as well as emissions caused by carbon dioxide. There are many different types of external wall systems that can be utilised to improve the energy efficiency of a structure. Some examples of these systems include trombe walls, double-skin facades, green wall systems, and PCM-enhanced walls (Assimakopoulos et al., 2020). Green building denotes both the construction and application of techniques that are ecologically conscious and resource-efficient all through the life sequence of a building: from design to planning, operation, construction, renovation, upkeep and demolition.

The concept of 3R has been proposed by architects which standards for "Reduce, Recycle and Reuse". The main purpose of this concept is to minimise the use of non-renewable properties and energy to minimise the impact on the atmosphere and to save energy, to reuse building products and building components as much as conceivable and reinforcing the refurbishment of old buildings while reusing some of its mechanisms. Many nations like the UK have implemented promotion and practices of green buildings that play a crucial role in architectural development. It demonstrates that building services denote ventilation, heating and air conditioning (HVAC) structures, encompassing lighting, water heating, control management and electrical systems. HVAC is a chief apprehension since individuals devote approximately 80% of their phase in buildings and systems of HVAC represent 51.0% and 47.7% of the energy expended in office and residential buildings correspondingly.

One of the strategies to minimise the impact of HVAC is through the use of smart controls and technologies. Utilising thermally effectual materials to enhance HVAC such as thermally vigorous building schemes and radiant ceilings for flexible building solutions is a key strategy to engage in energy-efficient HVAC systems (Natividade et al., 2022). Further, the influence of weather on building enterprise is impacted by the construction circumstances such as humidity, outside air temperature, wind speed and solar energy. The warming demand of buildings is linked with the variance in hotness outside and inside, nevertheless, it is contrariwise comparative to solar radiation. Factors such as the opening of windows and increased air infiltration can amplify heat consumption leading to greater energy expenditures.

Al-Tamimi (2022) performed an optimisation evaluation depending on DesignBuilder models, undertaking the yearly energy reserves as the main function and the strategy parameters were set as the thermal lining kind and its optimum width in a prototype sample villa. The consequences demonstrated that the extruded polystyrene XPS is the most cost-effective lining among conservative lining resources. The optimal lining layers result in the uppermost overall charge savings of 37.7% and 29.8% in hot-humid and hot-dry climates respectively. Enhancing the energy efficiency of prevailing public buildings depended on mechanical approaches such as air and lighting acclimatising systems and advancing smart building management systems. Though, elevating the efficacy of buildings by implementing the ideologies of retrofit and ordinary systems is more effective and easier for both prevailing and new buildings.

It was also noted that the material is highly sustainable and has long durability while at the same time offering simple assembling. The material can be assembled by three coatings of wood panels being stuck upright against one another under great pressure. The usage of CLT is extremely concerted in Europe which holds approximately 95% of the entire marketplace segment. There are varied advantages of using CLT as a construction material. The precise lifespan of a CLT-constructed building is unidentified since no building with the material has been in practice for more than forty years.

There are prevailing timber houses that have been in use for over seven hundred years and the aged of timber is well-known and researched. Traditional timber structures and current concrete frameworks have a computed epoch of hundred years and as of currently the only issue of CLT lifetime is the aging of the adhesive employed between the timber layers. The material’s airtightness is comparable to a conservative building substantial leading to a building with great energy efficacy, thereby creating it an appropriate construction material.

## Sustainability in the UK construction sector

According to Mavi et al., (2023), the global construction industry contributes an overall 13% of the gross domestic product (GDP). Also, construction and building account for the energy consumption of about 36% of the entire global energy and 39% of overall CO2 emissions. Therefore, it is not astonishing that sustainability is the current agenda within the construction industry among different associates such as the government, academic community, business organisations, practitioners etc. Massive stone edifices covered on the outside by a glass covering are known as trombe walls.

These walls have the ability to absorb heat from the sun during the day and then release it later in the day when the sun has set inside the building. Walls constructed using the double-skin method have two pieces of glass with an empty space in between each one. This separation provides protection, which in turn reduces the expenses of heating and ventilation. Green wall systems make use of vegetation as a means of fortification and air conditioning as an alternative to the conventional systems used for these functions. A substance that is capable of both collecting and dissipating heat is utilised in the construction of the walls of a PCM-enhanced structure.

Throughout this process, there is a need to consider different social, environmental and economic factors and the overall impact. The construction industry of the UK has helped in developing infrastructure and the overall quality of the people however the natural environment it is exploiting can't be ignored. Sustainability is not only about addressing environmental impact in fact it is regarding the enhancement of well-being of the surrounding community as well. Murtagh, (2019) has highlighted that considering the regulation and legislation proposed by the government effectively within construction projects in the UK can be considered a sustainable approach. In the UK planned construction projects with a lesser impact on the existing environment and community can be considered a sustainable approach. The three pillars of sustainability such as social, environmental and economical aspects are expected by every operating organisation in the UK.

The rules and regulations imposed by the government are expected to consider highly promoting sustainable construction approaches. There is huge pressure on the existing construction industry of the UK to change its existing conventional approach towards initiating more sustainable approaches. It is because the overall energy consumption is 50% in its building whereas carbon emission is about 50%. In addition to that consumption of water is about 12-16%, creating huge waste which is about 19% of the overall nation's waste materials. Therefore, there is a need of initiating sustainable construction right from engineering, planning, regulation procurement etc. Through, these approaches the above-identified flaws can be addressed and mitigated at the same time so that future generations in the UK can also enjoy natural resources and their benefits accordingly.

In the UK, it has been reported by Natividade, Cruz and Silva, (2022) that the operation and overall maintenance of buildings largely consume energy and emit carbon accordingly with a huge environmental impact. The existing buildings in the EU represent overall energy usage of 40% and emit 36% of greenhouse gases. Despite multiple alternatives, the rate of consumption and emission is increasing tremendously in the UK. Therefore, to tackle these entire challenges energy-efficient infrastructure can be developed considering a careful design and development of its overall structure. The above discussion can be supported and discussed by the findings of Shoubi et al., (2015) who have considered energy-efficient buildings as an approach to deal with negative environmental impact.

For instance, the thermal aspect of the overall construction of buildings can be considered since it is the major portion that consumes energy. The rate of the overall consumption of energy and emission of gases depends on the overall environmental circumstances and design of the buildings. Therefore, appropriate action is expected to enhance overall performance where thermal insulation can be used to minimise heating along with cooling loads. This will effectively help in lowering excessive emissions of harmful gases since it reduces overall energy consumption (Cabral and Blanchet, 2021).

The major consideration here is the heating and cooling based on the climatic circumstances, hence it becomes necessary to create constructive solutions that provide advantages in lowering overall energy consumption throughout the project lifecycle. The entire construction project is expected to plan and monitor thoroughly by project managers to encourage an effective and sustainable approach. A project manager is responsible for considering the building's impact on the surrounding environment, specifically the building's consumption of energy, during both the planning and implementation stages of the project. In this environment, passive walls offer a number of benefits, including a reduction in the ecological footprint of the structure and an increase in the building's lifespan.

## Assessing the practices for facilitating durable exterior and energy-efficient wall structures in the UK construction industry

Increasing the amount of energy efficiency that homes have can help alleviate fuel poverty in the United Kingdom and bring down the cost of energy. The policy on energy efficiency that the United Kingdom government has adopted acknowledges that increasing energy efficiency is essential for decarbonizing the economy, eradicating fuel poverty, cutting the cost of energy for households, ensuring reliable energy sources, reducing the need for additional power plants, and increasing the amount of output that businesses produce. As stated by Bournas (2018) formerly the economic and financial disaster, the construction of new housing buildings was amplifying supplementary more progressively than that of non-housing buildings.

Construction outputs continue to decline significantly in the construction industry. In addition, the overabundance of structures in some associate states has impeded the construction of new structures. In recent years, building envelope code requirements have increased substantially and continue to expand in scope. With each revision in the United Kingdom, the building envelope principles have been substantially enhanced, with an increased emphasis on energy maintenance. This necessitates the continuous development of novel materials with thermal lining to achieve the lowest possible thermal diffusion value. U-Value, also known as thermal conduction, is the rate of heat transmission through a structure as a result of the disparity in temperature across the structure. Installation standards and craftsmanship can have a substantial effect on thermal diffusion. If lining is improperly installed with chilly bridges and voids, thermal transmittance can be significantly higher than expected. Thermal transmittance takes into account heat loss due to convection, conduction, and radiation.

To provide assurance of a successful implementation, the application of quality control techniques is required. Regular maintenance of exterior wall systems is required to ensure their sustained efficacy. Before your items are returned to you, they will be inspected, cleaned, and repaired. To maximise the wall system's durability and performance throughout its entire lifecycle, the building's proprietors should devise a maintenance schedule and adhere to it as closely as feasible. If the construction industry in the United Kingdom adopted best practises for the design, installation, and maintenance of exterior wall systems, energy efficiency and durability could be significantly enhanced. This may result in substantial environmental and financial benefits for building owners and society as a whole. Moreover, this technique results in fewer accidents and less disruption to domestic residents during construction. Precast flat panel systems, flat slab construction, 3D volumetric modules, twin wall technology, precast cladding panels, mivan construction, prefab restroom units, and concrete floors and walls are the various varieties of MMC utilised in the construction industry.

As stated by Assimakopoulos et al. (2020) green walls denote the vertical resolutions of building components signified by the occurrence of vegetation and all aspects for facilitating its development. The advantageous tools of a green wall are the shading impacts from the plants, the insulation attained by substrate and plants, the cooling attained due to the evapotranspiration tools from the substrate and vegetation and the impact of variation of the wind. The perpendicular green schemes can be reflected an appropriate response to the adjustment between the cooling and heating requirements of a building, which is practically composed in certain climates like the Mediterranean. External wall systems are known as passive walls, and they are intended to decrease the amount of energy needed to heat and chill a structure.

In order to achieve high levels of energy efficiency, these systems generally employ high levels of insulation, hermetic construction, and passive solar design. When compared to conventional wall systems located on the exterior of a building, passive walls have the ability to substantially cut down on the amount of energy that is necessary to keep an interior space at a comfortable temperature. On the other hand, they might necessitate a larger starting expenditure on your part. The development of moisture and energy necessitates a risk management framework one which is assimilated all through all commercial activities and one which brands usage of the information of several shareholders.

The study has integrated the 4 C’s risk management framework entailing four different stages of valuation/planning, specification/mechanical design, installation/construction and use/handover (Hodgkin and Sasse, 2022). The risk organisation framework and procedure can be a beneficial mechanism to minimise the impact and likelihood of unanticipated significances in retrofit, leading to scalable and robust retrofit strategies and measures. The lack of prescriptive roles and the disjointed landscape of the UK construction industry require retrofit risk management procedures and adherence to PAS 2035 for government-subsided national retrofit projects (Alabid, 2022).

The layers of exterior wall can be pre-developed and implemented on the respective site directly. However, management of these exterior walls is difficult because of their complex nature and project managers are usually expected to select and make it implement them effectively with the appropriate method. For instance, the AHP method is one of the significant ones as it helps the project managers to implement exterior walls considering economic, environmental and social criteria.

According to Mayhoub et al., (2021), the Analytic Hierarchy Process (AHP) is one of the most used and shared methods and it is known for its multi-criteria decision-making approach and assists in solving issues when it comes to prioritising criteria. The selection and implementation of exterior walls altogether assist in managing scaling issues and different other sensible aspects of construction projects. Therefore, the project managers in different construction projects in the UK are suggested to initiate for AHP method considering sustainability a core aspect of development.

## Summary

The role that external obstacles play in the process of finding a solution to the energy challenge is an extremely important one. The majority of a building's energy is lost through its external walls, and having walls that are inefficient leads to an increase in the amount of money spent on utilities, an increase in the amount of pollution caused by greenhouse gases, and a less enjoyable environment. As a direct result of this, the planning and building of external walls have taken on an increasingly important role within the context of environmentally friendly architecture.

"Passive walls" are a cutting-edge method of constructing external walls that help cut down on electricity costs. These walls are constructed using organic materials and passive design principles, giving them the name "passive walls." These walls perform their function by restricting the amount of heat that can be transmitted through the wall system of the building, which in turn reduces the need for heating, ventilation, and air conditioning (HVAC) systems within the building itself. Conventional external wall systems, such as masonry or concrete, on the other hand, have inadequate insulation values and high thermal mass.

As a result, they require a greater amount of electricity to operate heating and cooling equipment. According to studies, passive walls can reduce energy consumption by as much as 90 percent when compared to traditional external walls, which makes them a practical solution to the problem of excessive energy consumption. It is imperative that passive walls be incorporated into the planning and construction of structures given the severity of the present energy crisis. Passive walls are walls that do not actively absorb or emit heat.

## Conclusion

The literature review demonstrates the use of energy-efficient and durable wall systems in the construction industry of the UK. The construction industry in the UK needs to increase the availability of exterior wall systems that are both energy-efficient and durable in order to meet the demand for more sustainable buildings and to reduce the amount of energy that is consumed. It is important that the building's exterior wall systems be constructed to maximise energy efficiency and durability. These systems should be customised to the building's intended use and the environmental circumstances. In order to achieve this goal, it is essential to make use of high-quality construction materials and techniques, as well as to pay painstaking attention to soundproofing, airtightness, and the management of dampness. Solutions for exterior walls will only continue to be effective over time if they are implemented properly.

It is recommended that the implementation be carried out by experienced technicians who are conversant with the applicable standards and best practises. The issue of energy consumption is something that project managers should be aware of and consider addressing by incorporating passive walls and other environmentally conscientious building practises into their work. This ensures that the structure will be constructed in a manner that is environmentally friendly, makes effective use of energy, and is beneficial to the climate, all while adhering to the timetable and budget that have been established for the project.

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