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## **HALF FENCE: EVALUATING ITS USEFULNESS AND POTENCY IN PROVIDING THERMAL COMFORT AND SECURITY TO OCCUPANTS**

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### **ABSTRACT**

*This study examined half fence, evaluating its usefulness and potency in providing thermal comfort and security to occupants. It highlighted that half fence has gained traction in architectural and urban design circles for its multifaceted benefits, particularly in enhancing thermal comfort and providing security to occupants. Unlike full fences that create complete barriers, half fences are designed to allow visibility while maintaining a physical boundary. In the context of the study, several concepts were taken into consideration, such as fence, security, thermal comfort, types of half fence design and numerous others. The study noted that security in architectural design is a fundamental aspect of creating safe and functional spaces. A half fence, which typically extends only halfway up a boundary or partition, can influence security in various ways. The study further pinpointed the effect of half fence on security to include: visibility and surveillance, access control and physical barriers, psychological deterrence, among others. And the effect of half fence on thermal comfort included: psychological and perceptual effects, impact on airflow, shading and radiation, microclimate modification etc. The study concluded that by modulating microclimates around buildings, half fences contribute significantly to maintaining stable temperatures, thereby enhancing energy efficiency and reducing the dependence on artificial heating and cooling systems. One of the recommendations made was that urban planners and architects should ensure that the design and implementation of half fences consider the local climate to enhance thermal comfort.*

**Keywords: Half fence, Thermal Comfort, Security and Occupants**

### **Introduction**

Half fence has gained traction in architectural and urban design circles for its multifaceted benefits, particularly in enhancing thermal comfort and providing security to occupants. Unlike full fences that create complete barriers, half fences are designed to allow visibility while maintaining a physical boundary. This unique structure has proven effective in balancing the need for openness and enclosure, which is crucial in both residential and commercial settings. By

evaluating the usefulness and potency of half fences, they will be more understanding on how they contribute to occupant comfort and security.

Thermal comfort, the condition of mind that expresses satisfaction with the thermal environment, is significantly influenced by architectural elements such as fencing. Half fences can modulate the microclimate around buildings by reducing wind speeds and mitigating extreme temperatures. Anderson (2021) mentioned that these structures can help maintain more stable temperatures by providing windbreaks during colder months and allowing airflow during warmer periods. By enhancing thermal comfort, half fences can reduce the reliance on artificial heating and cooling systems, contributing to energy efficiency.

Security is another critical area where half fencing demonstrates its value. Traditional tall fences offer robust physical barriers but can create a sense of isolation and hinder visibility. In contrast, half fences provide a visible boundary that deters unauthorized access while maintaining visual connections with the surroundings. This balance enhances community safety as occupants can monitor activities around their property (Williams, 2018). The presence of a defined boundary can also have a psychological deterrent effect on potential intruders. This can enhance the sense of community and safety, as occupants can easily observe activities around their property (Jones, 2019). In addition to thermal comfort and security, half fences enhance the aesthetic appeal and value of properties. They can be designed to complement various architectural styles, adding elegance and modernity. The flexibility in materials and designs allows for creative expressions, making half fences an attractive choice for property owners and developers. This aesthetic enhancement can contribute to the psychological well-being of occupants by creating a harmonious living environment.

### **Concept of Fence**

A fence is a barrier, especially of wood or wire, for enclosing, bounding or protecting land. They are built in a variety of designs depending on environmental factors, target species, attractant, and productive system. Yoon (2023) defined fence as a vertical structure made of materials like wood, brick or cement and built at borderline to define territoriality by differentiating inner and outer space. This means that fences are built in one's residence to declare their ownership and to protect their property from any outside threat. The features of a fence include a vertical load bearing components such as poles and non-continuous structures such as, boards and wires spanning these components (Wilkinson, 2020). A fence may also include a living barrier like; Hedges which is used to obstruct or close a passage. Fences are aimed at restricting or preventing movement across boundaries.

Unlike roads, fences have vertical structure that imposes unique hazards and barriers for wildlife. Private landholders, including livestock growers, construct and maintain most fences which make them familiar with their location and structure. Fences are often built for protection. Farmers use fences to protect their productive lands from entrance of humans and animals. Fences serve to protect and manage resources, delineate land ownership, and define political boundaries. Fences are spatially extensive, creating vertical obstacles for wildlife to cross, and are constructed with varying degrees of permeability. When properly installed, fences prevent livestock depredation and crop losses. Fences are often erected to safeguard threatened species, sensitive habitats, or to manage vegetation objectives. They are increasingly used to keep wild and domestic animals off transportation corridors and guild them towards safe crossing (Jakes & Jones, 2018). These increases human safety, reduce wildlife mortality, and maintains connectivity for wildlife.

Fences are commonly understood as physical structures that are used to secure ownership right and protect properties from intrusions. However, there are mechanisms which can be described as non-physical. A fence could be metaphorical and social. Metaphorical fences do not involve installing physical structures. It requires the use of gardens of chillis, barriers of noise, guard dogs or biofences of scent from the faeces of territorial species to direct or inhibit their movements. On the other hand, Social fences involves institutions and organizational arrangements to close an area from access for animals and humans in which local people decide to close the areas for managing the land resources. People establish laws and regulations as part of their culture with traditional sanctioning mechanisms to control intrusion.

### **Concept of Half Fence**

Half fencing is the process of using a wide variety of materials depending on terrain, location and animals to delineate boundaries and keep animals in and out of an area. Fencing is increasingly used in wildlife conservation. Keeping wildlife segregated from local communities, while permitting wildlife access to the greater landscape matrix is a complex task. Half fencing also has many drawbacks, ranging from direct mortality, such as when animals entangle themselves while attempting to leave the fenced habitat Désormeaux, Davidson, Mwololo, Kisio & MacDonald (2016).

Half fence is a physical linear feature with vertical load-bearing components such as poles and non contiguous structures which includes boards, wires, rails, nettings spanning these vertical components. Odunlade, Adetunji & Ojo (2023) explained that, half fence is increasingly becoming a widely-used design feature within the built environment. Although the feature is not entirely new within the urban landscape, as most ancient cities especially in Africa, developed within walls. However, in more recent years, this built environment feature is the new urban reality as individualized forms of gated communities and fences within residential areas steadily replace the ancient city walls.

### **Concept of Security**

The term security is derived from the Latin noun securitas, which is a combination of two Latin words- Sine and Cura interpreted to mean without concern, without fear or without anxiety. Security in housing or building refers to the measures and practices implemented to protect a home from unauthorized access, theft, vandalism, and other potential threats. Ensuring the security of a house involves a combination of physical barriers, technological systems, and behavioral practices aimed at safeguarding the property and its inhabitants.

According to Meerts (2018) security refers to “a state of being free from danger or threat” (Oxford Dictionary). It can also be seen as a state of being free from many kinds of dangers and threats. Afolabi (2015) defined security as the presence of peace, safety, gladness and the protection of human and physical resources or absence of crisis or threats to human dignity, all of which facilitate development and progress of any human society. Security has to do with the process connected with assuaging any kind of threat to people and their precious values. Buzan asserts that security is about freedom from threat and ability of states to maintain independent identity and their position.

Afolabi (2015) further highlighted the types of security to include: human security (economic security, food security, health security, environmental security, personal security,

community security, political security), national security and international security. Security is usually thought to be encountered in the absence – or at least unlikeliness – of threats to a certain object. Security is protection from, or resilience against, potential harm (or other unwanted coercion). Beneficiaries (technically referents) of security may be persons and social groups, objects and institutions, ecosystems, or any other entity or phenomenon vulnerable to unwanted change. Security is concerned with confronting the challenges and threats to an individual of a state (Bien-Kacala and Serowanec, 2016).

### **Concept of Thermal Comfort**

Thermal comfort is a state of mind that expresses satisfaction with the surrounding environment. It is influenced by a range of environmental and personal factors and is a critical consideration in the design and operation of buildings, particularly in heating, ventilation, and air conditioning (HVAC) systems. Understanding thermal comfort involves considering how different variables interact to create a subjective sense of comfort or discomfort.

According to Emeter (2022) thermal comfort is a state of mind that is evaluated by subjective assessment and reflects satisfaction with the thermal environment. Thermal comfort can also be defined as a person's own awareness of the thermal atmosphere, and it is defined as a person's neutral feeling in relation to a given thermal environment, without sweating. David (2022) defined thermal comfort as a desirable or positive condition of mind a person experiences in relation to how warm or cold a person feels. Thermal comfort is the condition of mind that expresses subjective satisfaction with the thermal environment.

Furthermore, Kadioğlu and Toy (2021) defined thermal comfort as the ambient where people can feel comfortable. Thermal comfort is a complex concept, which can vary greatly from one individual to another. It is the feeling of well-being that people experience in a given space, a feeling influenced by various parameters such as temperature, humidity, air quality and insulation. Thermal comfort is when the people using a building do not experience any cold or hot feelings, that is, when humidity, temperature and air movement conditions are nice and adequate to the activity conducted there.

Thermal comfort mean feeling comfortable in an interior space which directly impacts people's mood. 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. Thermal comfort is the satisfaction and well-being of individuals in relation to their surrounding thermal environment.

Thermal comfort is mainly influenced by six variable factors which are needed to maintain a healthy balance in order to sustain the occupants' satisfaction with their surrounding environment. These factors include: air temperature, mean radiant temperature, air velocity, humidity, clothing level, physical activity level. Thermal Comfort refers to the personal subjective psychological condition that an individual feels about the environment in terms of temperature. It can also be determined objectively by measuring certain factors to predict how the majority of occupants will feel. Thermal comfort traditionally focuses on the interior environments of buildings (Chun, Kwok and Tamura, 2004; cited in Rupp, Vásquez, & Lamberts, 2015).

## Types of Half Fence Design

Half fence designs come in a variety of styles, each serving different purposes while providing an aesthetic appeal to properties. The choice of design often depends on the intended function, whether it's for security, privacy, or decorative purposes. Each type offers unique benefits and can be customized to suit specific needs and preferences. Here are the types of half fence design:

### 1. Brick Wall Fence



- The most common, traditional and largely used yard fencing is a brick wall. It is one of the preferred methods in residential colonies, particularly in India, rather in Asian and African countries.
- Brick and mortar are used for the same, and you can raise the wall's height according to your choice. Both low as well as high boundary walls are possible to build. It is all on your preference and choice. Many prefer to go for creepers to cover the part of brick wall fencing or make it colourful by getting painted with good quality exterior paint. You can also have a combination of brick wall with other options like iron fencing, barbed wire, etc.
- There are endless design opportunities in the brick wall. It is fire and weather resistant.
- The disadvantage of brick wall fencing is, it is difficult to relocate. It is an expensive affair, need a lot of money. Besides construction of your home, you have to spend hefty for building a brick boundary wall.

### 2. Stone Wall with Iron Fence



- Stonewall with iron fencing is a classy fencing type, and it gives a look of the fort to the home.
- You can get a stone wall raised up to the knee length and fence it with iron grills in your preferred design.

- Get the pillars built of stones, it balances the boundary wall, and it is sturdy enough. It is low maintenance and it is highly durable, and it stands firm in weather turbulence even.
- The iron fences require painting at periodic interval to stay saved from rusting. But the stones last for a lifetime almost.
- Due to the higher width needed, this too will reduce available land portion.

### 3. Precast Concrete Fence



- They are very popular nowadays.
- Precast concrete panels are shaped in the metal mould in factories.
- It's fast and easy to install, long-lasting (durable), and easy to maintain.
- Precast concrete fences are less expensive than wood fences in the long run.
- Various design options can be explored if there is a huge wall or else you will have to choose from the manufacturer's provided options, which may be limited.
- These panels are heavy in weight and need erection machinery with a skilled worker for installation.

### 4. Wood Fence



- Wooden fences are popular in the USA, Canada, etc. and particularly in semi-urban or rural areas.
- A durable wood fence adds a warm feeling to your home. It is available in pickets, panels, logs, lattice, and posts. If you have soft nose for privacy, go for panels.
- Always go for the best kind of wood that can withstand the weather variations. Get it season-proof and termite resistant, so that the issues of termites do not come, which otherwise may affect the life of the wood fence.

- Natural colour-treated wood is a good choice as it improves and enhances the appeal of the property.
- The cost of a wood fence depends upon the quality of wood and the thickness of the used planks, apart from the length and height of the same.
- You can grow vines to cover the pickets and lattice designs; colourful blossoms will add life to your fence.
- Pine, Fir or Spruce, Cedar, and Cypress are better options for making wood fences. There is a wide range of wood fence to choose from, and you can select the one that fits your needs and budget limitations.

## 5. Chain Linked Fence



- As the name suggests, chain linked fence is made up of links of galvanized steel that have been twisted together and fixed to upright Mild Steel / Galvanized Iron/ Concrete poles.
- It is an ultimate utility fence which is durable, affordable, and demands low maintenance. This type of fencing comes in ready-to-assemble parts and is easily worked in custom lengths and configurations.
- Chain linked fencing is easy to install than other types of fencing, and installation can be done fast.
- A chain link fencing does not provide much privacy as compared to wooden, vinyl or brick fencing but it performs other functions quite well. However, you can grow natural shrubs and vein to create privacy. You can also tie green nets for privacy.
- However, chain link fencing is not ideal from the security point of view. Most residential chain-link fences are 4-5 feet tall, and the chains themselves make the fence fairly easy to climb on. Thus, it only secures your property line, animals, etc.

## 6. Barbed Wire Fence



- Barbed wire fencing usually consists of two longitudinal wires twisted together to form cable and having wire barbs wound around either or both of the cable wires at regular intervals.
- It is not very attractive by look.
- It is perhaps the cheapest and easy to install fencing option.
- It is fixed on either precast cement poles or M.S. angles or channels.
- Thieves or animal trying to pass through or over barbed wire will suffer discomfort and possibly injury, however, there is no absolute bar.
- It cannot be installed in tall heights. You can also install it over the compound wall for advanced safety.
- It requires periodical maintenance.

## 7. Bamboo Fence



- Bamboo fencing is frequently used for partitions and fencing the yard.
- They come in individual freestanding fence panels or sheets, rolls and panels. You can use one that appeals you most and take care of your fancy requirements or fencing needs.
- Bamboo colour is not the same all around. Therefore, it gives a natural look. It has a shaded pattern and mostly look beautiful.
- If you want to cover for more privacy, go for bamboo sheets with negligible see-through effect.
- To increase the life span of bamboo, paint it with black tar. It will not rot, but its natural beauty may get compromised. However, you can try transparent protective colours.
- You can also get the bamboo rolls adjusted in a wooden frame in the top and bottom frame. It gives a clean look and increases the longevity of the fences. It is best for the places where you have to counter less rainfall because rain damage bamboos.
- It is not expensive, and you can enjoy being with nature.

### Effect of Half Fence on Security

Security in architectural design is a fundamental aspect of creating safe and functional spaces. A half fence, which typically extends only halfway up a boundary or partition, can influence security in various ways. While it may not offer the same level of deterrence as a full-height fence, its design and placement can still play a significant role in enhancing or compromising security. Below is the effect of half fence on security:

**Visibility and Surveillance:** One of the primary effects of a half fence on security is its impact on visibility. Half fences often provide partial barriers that can enhance visibility across a space. This

increased visibility can be advantageous for surveillance, allowing occupants or security personnel to monitor activity more effectively. According to Hsiao (2019), improved visibility can enhance security by enabling quicker detection of suspicious behavior or unauthorized access.

***Access Control and Physical Barriers:*** Half fences serve as physical barriers, though they may not offer the same level of deterrence as taller fences. While they can restrict casual access and delineate boundaries, they may not be sufficient to prevent determined individuals from crossing. While half fences can provide some level of access control, they are often less effective at deterring theft or intrusion compared to full-height fences. Combining half fences with other security measures, such as alarms or surveillance systems, can enhance their effectiveness.

***Psychological Deterrence:*** The presence of a half fence can contribute to psychological deterrence, albeit to a lesser extent than taller fences. The visible boundary can signal a restricted area and discourage casual intruders or trespassers. However, its effectiveness as a deterrent is often limited by its height and the perception of its security capability Wang & Li (2020) mentioned that while half fences may reduce the likelihood of opportunistic crime, they may not be as effective in preventing premeditated criminal activities.

***Integration with Other Security Measures:*** To enhance the security provided by a half fence, it should be integrated with other security measures. For instance, combining half fences with security lighting, cameras, and motion sensors can create a more comprehensive security system. The integration of multiple security features can compensate for the limitations of a half fence by increasing overall surveillance and response capabilities.

***Maintenance and Durability:*** The effectiveness of a half fence in maintaining security is also influenced by its maintenance and durability. Regular upkeep is essential to ensure that the fence remains intact and functional. Wear and tear, damage, or deterioration can compromise the fence's ability to act as a barrier or deterrent.

### **Effect of Half Fence on Thermal Comfort**

Thermal comfort refers to the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation. Various factors, such as clothing insulation, metabolic rate, air temperature, mean radiant temperature, air speed, and humidity, influence thermal comfort. Recently, architectural elements like half fences have gained attention for their potential impact on thermal comfort. Here are the effects of half fences on thermal comfort:

***Psychological and Perceptual Effects:*** The presence of a half fence can also impact thermal comfort from a psychological and perceptual perspective. The visual aspect of a half fence, such as its height and design, can influence how users perceive thermal comfort. A well-designed half fence that provides adequate shading and protection can enhance the feeling of comfort by creating a more controlled and pleasant environment. Conversely, a poorly designed half fence might lead to discomfort if it fails to provide sufficient protection or if it creates uneven thermal conditions

***Impact on Airflow:*** Half fences can significantly alter the wind patterns around a building. According to Yang (2018), strategic placement of half fences can direct airflow, enhancing ventilation and reducing the sensation of heat in outdoor spaces. By allowing a controlled passage of air, half fences help in mitigating the heat buildup, which is crucial during summer months.

**Shading and Radiation:** One of the critical functions of half fences is to provide partial shading. This shading effect can reduce the solar radiation that reaches building facades and outdoor areas. Li (2020) noted that half fences, particularly those integrated with vegetation, could lower the surface temperature of adjacent walls and floors, thereby improving thermal comfort. The shading provided by half fences can also protect outdoor seating areas, making them more comfortable for occupants.

**Microclimate Modification:** The ability of half fences to modify the microclimate is well-documented. Kim (2019) mentioned that half fences could create cooler microclimates by blocking direct solar radiation while allowing air circulation. This modification leads to a more comfortable thermal environment, especially in regions with high solar exposure.

**Material and Design Considerations:** The materials and design of half fences also play a crucial role in their effectiveness. Materials with high thermal mass, such as concrete or brick, can absorb and slowly release heat, contributing to thermal comfort during cooler evenings. On the other hand, lightweight materials like wood or metal may provide less thermal mass but can be designed to enhance airflow. Chen (2021) highlighted that the design, orientation, and material of half fences must be tailored to specific climatic conditions to optimize thermal comfort.

## Conclusion

Half fencing emerges as a versatile architectural solution that effectively balances the need for thermal comfort and security in residential and commercial properties. By modulating microclimates around buildings, half fences contribute significantly to maintaining stable temperatures, thereby enhancing energy efficiency and reducing the dependence on artificial heating and cooling systems. The ability of half fences to serve as windbreaks and facilitate airflow underscores their potential in optimizing thermal environments for occupants.

## Recommendation

1. Urban planners and architects should ensure that the design and implementation of half fences consider the local climate to enhance thermal comfort. In warmer climates, half fences should promote natural ventilation and airflow, reducing indoor temperatures and reliance on air conditioning. In cooler climates, designs should focus on providing windbreaks to reduce heat loss from buildings.
2. House owners and security consultants should ensure that half fences provide an effective balance between security and openness, contributing to a sense of safety without creating a fortress-like appearance.
3. Homeowners and landscape architects should ensure that the design of half fences prioritizes both thermal comfort and privacy for occupants. This can be achieved by strategically placing the fence to block harsh sunlight and wind, while also ensuring that it does not obstruct views or create a claustrophobic environment.

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