Print ISSN: 2249 – 3492, Online ISSN: 2249 – 3506

International Journal of Research in Management, Sciences and Technology

Impact Factor: 6.361 www.thaavan.com

Issue - 14, Vol-07, pp. 31-39, Jul-Dec 2017
CLEAR International Journal of Research in Management, Sciences and Technology

RESEARCH ARTICLE

A STUDY ON THERMALLY COMFORTABLE INDIVIDUAL HOUSING UNITS IN LOW COST

1. Govindh.M.A, 2. Mohammed Hussen Yessuf

1. *Lecturer, Department of Civil Engineering, College of Engineering and Technology, Samara University, Semera, Afar, Ethiopia, Email: govindhmag@gmail.com*
2. *Lecturer(Head of the Department), Department of Civil Engineering, College of Engineering and Technology, Samara University, Semera, Afar, Ethiopia, Email: mdhussen2004@gmaill.com*

Article History:

Received 15th Nov- 2017

Received in revised form 28th Nov 2017

Accepted 20.12.2017

Published on 30.12.2017

Keyword: *thermal comfort, cost, environmental impact.*
.

Contact Author:
Govindh.M. A

Email: *govindhmag@gmail.com*

ABSTRACT

Every building material comes with some kind of environmental cost. Fundamentally, a function of a house is to provide protection from extreme natural climate factors such as extreme heat, rain, cold and strong wind. The internal environment of houses must be safe, comfortable and could withstand the pressures of external climate such as sunlight, rain and wind. Therefore, the internal climate must be taken care so that the conditions of internal environment donot react like the external environment of the house. Hence, in order to reach a desired level of thermal comfort, it has to meet the physiological criteria of the human body. Therefore, the planning and design of buildings that meet the criteria of thermal comfort depend on the climate of a particular space in order to achieve comfort that can be felt by humans, for them to do their daily activities. Buildings must be designed to accommodate a variety of activities, to fulfil the physical and mental needs and to assist in maintaining the health of the occupant.

INTRODUCTION

Thermal comfort is defined as the expression of an individual's satisfaction with the thermal environment and is assessed by subjective evaluation. Thermal comfort is affected by environmental factors such as air temperature, mean radiant temperature, air flow and relative humidity and by personal factors such as clothing and activity level. To understand how insulation works, it helps to have some knowledge of heat flow which involves three basic mechanisms: conduction, convection and radiation. Most common insulation materials work by slowing

residents in the developing world have brought the issue surrounding the sustainability of low income housing to the forefront. The correlations between population growth, climate change and energy efficiency in housing in these regions indicate that priorities need to be placed on planned future development.

The accessibility of affordable housing is limited by the socio-economic status of those who need it and the quality of the current stock of low income housing is characterised by technical inefficiencies and inappropriate design elements

Print ISSN: 2249 – 3492, Online ISSN: 2249 – 3506

International Journal of Research in Management, Sciences and Technology

Impact Factor: 6.361 www.thaavan.com

thus rendering it inadequate for day to day living. With concernsGrowing over urban liveability in these regions, priorities need to be placed on planned futuredevelopment.In hot weather, humans achieve thermal comfort by wearing lighter clothing, reducing activity level, opening windows for enhanced natural ventilation and air flow when the outdoor temperature is conducive, and using space cooling equipment such as fans and ACs.

When compared to developed countries, developing countries need to surmount larger barriers in attaining proper levels of indoor thermal comfort. Grappling with modest national resources, the disappearing use of traditional and indigenous housing and the pressing need to provide housing to hundreds of millions are some of these challenges. Just like basic heating of dwellings is considered a necessity and a basic human right in the western world, providing affordable thermal comfort. Ceiling fans, air coolers and ACs are constantly used to combat uncomfortable ambient conditions for a large part of the year in most places in India. However, relying only on active cooling leads to increased peak demands and overall energy consumption.

THERMAL PERFORMANCE BUILDING STANDARDS:

Thermal Performance Building Standards are regulations, which mandate for new and/or existing buildings to achieve a certain level of thermal performance. Thermal performance building standards can be applied at country, state, provinces or city level. In case of overlapping standards, the most stringent of them shall be considered.

TOOLS AND TECHNIQUES TO REDUCE COOLING LOAD IN BUILDINGS

Buildings can be lean in energy consumption if they are well designed and adhere to building energy codes. Good building design can reduce heat gains, thereby reducing cooling demand. Experts believe indoor air temperature can be lowered by up to 7°C in summer months by following shading, ventilation and insulation techniques.

Even in conditions with elevated indoor air temperatures above the classically defined comfort temperature range, establishing a low mean radiant temperature through methods that drain heat from the structure can satisfy thermal comfort requirements.

SHADING AND GLAZING

Shading reduces internal heat gain through coincident radiation. There are various methods to shade windows – overhangs, awnings, louvres, vertical fins, light shelves and natural vegetation. These can reduce cooling energy consumption by 10-20%. The shading mechanism can be fixed or movable (manually or automatically) for allowing varying levels of shading based on the sun's position and movement in the sky.

PROPERTIES OF INSULATION MATERIALS

Most common insulation materials work by slowing conductive heat flow and, to a lesser extent, convective heat flow. Radiant barriers, which are not classed as insulation products, and reflective insulation systems work by reducing radiant heat gain. To be effective, the reflective surface must face an air space.

To understand how insulation works, it helps to have some knowledge of heat flow which involves three basic mechanisms: conduction, convection and radiation. Conduction is themechanism seen when heat passes through materials, such as when a spoon placed in a hot cup
of coffee conducts heat, through its handle to our hand. Convection is in evidence when heat circulates through liquids and gases, and is why lighter, warmer air rises, and cooler, denser air sinks in our houses. Radiant heat travels in a straight line and heats anything solid in its path that absorbs its energy.

To maintain comfort, the heat lost in thewinter must be replaced by the heatingsystem, and the heat gained in thesummer must be removed by the coolingsystem. Properly insulating a home will reduce these losses and gains by providingeffective resistance to the heat flows.

IMPORTANT PROPERTIES OF INSULATION MATERIALS

Thermal insulation involves the reduction of heat transfer (the transfer of thermal energy between objects at different temperatures) between objects in thermal contact, or between objects within range of radiating influence. Thermal insulation can be achieved through specially engineered methods or processes, as well as by selecting suitable object shapes and materials.

The insulating capacity of a material is determined by its thermal conductivity, low

Print ISSN: 2249 – 3492, Online ISSN: 2249 – 3506

International Journal of Research in Management, Sciences and Technology

Impact Factor: 6.361 www.thaavan.com

thermal conductivity is equivalent to a high insulating capacity (R-value).In thermal engineering, and other important properties of insulating materials are: product density (ρ) sand specific heat capacity (c).

R-Value

An insulating material's resistance to conductive heat flow is measured, or rated, in terms of its thermal resistance or R-value; the higher the R-value, the greater its effectiveness as an insulator. The R-value depends on the type of insulation, its thickness and density. When calculating the R-value of a multi-layered installation, the R-values of the individual layers must be added together. Installing more insulation in a home increases the R-value, and, therefore, the resistance to heat flow. Insulation experts can determine the degree of insulation that is appropriate for any given climate.

THERMAL CONDUCTIVITY:

Thermal conductivity measures the ease with which heat can travel through a material by conduction, which is the main way that heat is transferred through insulation. Thermal conductivity is often termed the λ (lambda) value, or k value; and the lower the figure, the better the performance.

VAPOUR PERMEABILITY:

Vapour permeability is the extent to which a material permits the passage of water through it. It is measured by the rate of vapour transmission through a unit area of flat material of unit thickness, induced by a unit of vapour pressure difference between two specific surfaces, under specified temperature and humidity conditions.

SPECIFIC HEAT CAPACITY:

The specific heat capacity of a material is the amount of heat needed to raise the temperature of 1kg of the material by 1K (or by 1 °C). A good insulator has a higher specific heat capacity, meaning it takes time to absorb more heat before actually heating up (showing a temperature rise) and transferring the heat it has absorbed. High specific heat capacity is a feature of materials providing thermal mass or thermal buffering.

DENSITY:

The density refers to the mass per unit volume of a material and is measured in kg/m3. A high-density material maximizes the overall weight and is a feature of 'high' thermal diffusivity and 'high' thermal mass materials.

EMBODIED ENERGY

Though not a factor in the thermal performance of an insulation material, embodied carbon is a key concept when it comes to balancing the greenhouse gas emissions generated when producing a materialwith the emissions saved by the insulation over its lifetime. Embodied carbon is usually considered as the amount of carbon released asgas from the fossil fuels used to produce the energy needed for the extraction of raw material and its manufacture into a finished product.

THERMAL DIFFUSIVITY

Thermal diffusivity measures the ability of a material to conduct thermal energy relative toits ability to store it. Insulators have low thermal diffusivity. For example, metals transmit thermal energy rapidly (which is why they are cold to the touch) whereas wood is a slow transmitter. Copper has a thermal diffusivity of 98.8 mm^2/s, whereas that of wood is 0.082 mm^2/s. The variables described above are linked by the following equation:

Thermal diffusivity(mm^2/s) =

Thermal conductivity / density x specific heat capacity

TYPES OF INSULATION MATERIALS

In terms of energy efficiency, investing in high levels of insulation materials for use in a home is more cost-effective than investing in expensive heating technologies. It is worth taking the time to choose the right materials in the context of the design of the entire building.

Insulation is a key component of sustainable building design. A well-insulated home reduces energy bills and this, in turn, reduces the associated carbon emissions which are linked to global climate change. In terms of energy efficiency, investing in high levels of insulation materials for use in a home is more cost-effective than investing in expensive heating technologies. It is worth taking the time to choose the right materials in the context of the design of the entire building.

Insulation materials are used in roofs, walls and floors. Timber-framed homesrequire wall insulation in the form of batts(pre-cut sections that are designed to fit between stud walls), rolls or boards. Othertypes of construction, such as brick orconcrete, are insulated using spray foam,loose fill or rolls. It is far easier and cheaperto install insulation in the walls and

Print ISSN: 2249 – 3492, Online ISSN: 2249 – 3506

International Journal of Research in Management, Sciences and Technology

Impact Factor: 6.361 www.thaavan.com

floorsof a new-build home than to retrofit anexisting home. However, the insulation ofroofs is easily achieved in any home usingrolls or bags of loose fill material. A variety of available insulation materials, and their average R-values, is discussed below.

FIBREGLASS INSULATION MATERIALS

Fibreglass is the most commonly used insulation material of recent times. As a result of the way it is being produced, by weaving fine strands of glass intoan insulating material, fibreglass is able to minimize heat transfer. It is commonly used to produce two different types of insulation: blankets (batts and rolls) and loose fill, and it can also be found in the form of rigid boards and duct insulation.

MINERAL WOOL INSULATION MATERIALS

The term "mineral wool" refers to several different types of insulation. First, it may refer to glass wool, which is fibreglass that has been manufactured from recycled glass. Second, it may mean rock wool, which is a type of insulation made from basalt. Finally, it may also refer to slag wool which is produced from the slag generated by steel mills.

CELLULOSE INSULATION MATERIALS

Cellulose insulation is arguably one of the most eco-friendly forms of insulation. It is produced from recycled cardboard, paper and other similar materials, and is supplied in a loose form. Cellulose has an R-value between 3.1 and 3.7 per inch. Some recent studies on cellulose have shown that it may be an excellent product to prevent fire damage. As a result of its dense nature, cellulose contains virtually no oxygen. This lack of oxygen retards combustion, and therefore, helps to minimize the amount of damage that a fire could cause.

INSULATION FOR RESIDENTIAL HOUSING

Insulation acts as a barrier to heat flow and is essential for keeping homes warm in winter and cool in summer. A well-insulated and well-designed

home can provide year-round comfort, potentially cutting cooling and heating bills in half. This, in turn, reduces greenhouse gas emissions.

Insulation commonly works through a combination of two characteristics:

- The insulating material's natural capacity to inhibit the transmission of heat; and
- The use of pockets of trapped gas which act as natural insulators.

Gases possess poor thermal conduction properties, compared with liquids and solids; therefore, if they can be trapped, they make good insulation materials

GENERAL CONCEPTS FOR INSULATION OF RESIDENTIAL HOUSING

Insulation acts as a barrier to heat flow and is essential for keeping homes warm in winter and cool in summer. A well-insulated and well-designed home can provide year-round comfort, potentially cutting cooling and heating bills in half. This, in turn, reduces greenhouse gas emissions. Climatic conditions influence the appropriate level and type of insulation.

THE TWO GENERAL TYPES OF INSULATION

Insulation products come in two main categories — bulk and reflective — which are sometimes combined as a composite material. Bulk insulation is mainly provided in walls and roofing areas of houses, in order to resist the transfer of direct heat inside the house. The trapped air in the insulation materials restricts heat transfer by providing thermal resistance. For the most part, the thermal resistance remains the same, regardless of the direction of heat falling on the outside surface of the house. Bulk insulation could be provided using a large number of natural, as well as artificial materials, such as glass wool, wool, cellulose fibre, polyester and polystyrene. Most bulk insulation products have a defined R-value for a given thickness.

Reflective insulation mainly resists radiant heat flows as a result of its high reflectivity and low

Emissivity (ability to re-radiate heat). As this insulation works by reflecting heat, air flow and the angle at which the sun rays fall on the surface of the house also play an important role in overall insulation where reflective insulators are used. The thermal resistance of reflective insulation varies according to the direction of heat flows through it.

Print ISSN: 2249 – 3492, Online ISSN: 2249 – 3506

International Journal of Research in Management, Sciences and Technology

Impact Factor: 6.361 www.thaavan.com

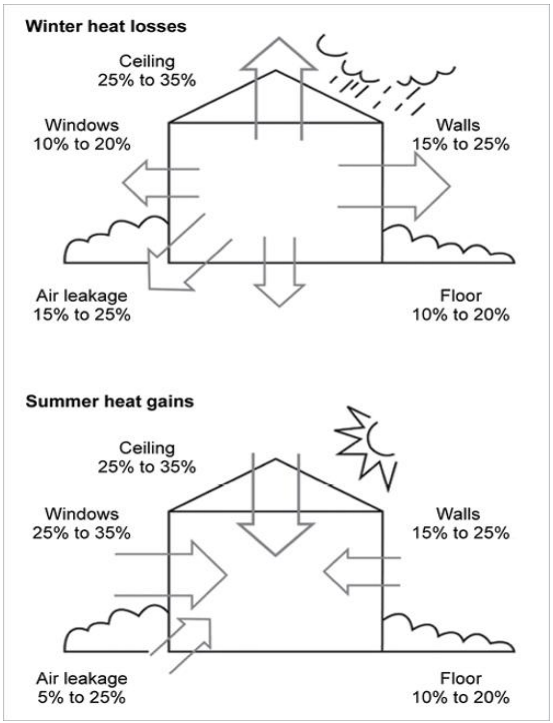

Fig Thermal heat losses and gains without insulation in a temperate climate

THE CONCEPT OF THERMAL COMFORT

Thermal comfort is a research aspect of the human's reaction towards climate effect on the human's body. Climate is defined as climate for a particular area that is determined by thecommon weather condition and its elements that include sunlight, temperature, air humidity, wind andprecipitation that affect the heat condition of a building.

Thermal comfort happens when the flow of heat in the human's thermal system is balanced with the body temperature, which is 37°C. Human's body adds or reduces heat through the skin, by conduction, convection, radiation from the air and the surrounding objects.

Thermal comfort has been defined in the ISO 7730 standards as a state of mind in which humanexpress the feel of satisfaction towards their thermal environment. This definition is accepted by
many, but it is not easy to convert it into a physical parameter for the comfort determination.

The compiled definitions above indicate that thermal comfort is a situation in which individualsfeel comfortable with the surrounding temperature, whether inside or outside the house without havingto change any weather elements or comfort aid tool at that time. It is also associated with climate andnon-climate factors, and will determine the balance between human body and its surroundings. At thislevel, one will be able to maintain the body's stability to quench the heat without perspiring.

COMFORT ZONE:

On the other hand, comfort zone is the range of a comfort heat condition. In this range, a suitablebalancing mechanism of human's body temperature is at a minimum level of activity. In thiscomfortable surrounding condition, the movement and feeling of human will reach their best level. Inthis zone, the body does not need to do any action to maintain heat balance.
Emerging Technology for Sustainable Development Congress (ETSDC 2014)

Table 1: Range of comfort zone for a few parts of the world

Research	Area	Range/Temperature
Fanger	-	20°C
Markham	United Kingdom	15.6°C – 24.5
Vernon & Bedford	-	13.2°C – 23.
Brooks	United Kingdom	14.5°C – 21.1
	United State of America	20.6°C – 26
	Warm humid climate	23.4°C – 29
Saini	Dry humid climate	31.1°C – 33
CIBSE Guide	Warm humid climate	25.5°C - 27°C

BUILDING INSULATION FOR COST EFFECTIVE ENERGY CONSUMPTION

A well-insulated building, whether commercial or residential, is both an energy-efficient and cost-efficient choice because it reduces the cost incurred by a heating or cooling system. Insulation relates to the prevention of the passing of thermal energy between two objects from a region of higher heat concentration to one of lower heat concentration and thereby

Print ISSN: 2249 – 3492, Online ISSN: 2249 – 3506

International Journal of Research in Management, Sciences and Technology

Impact Factor: 6.361 www.thaavan.com

maintaining the heat in a given area. A properly insulated building saves unnecessary wastage or gain of heat energy. More specifically, building insulation means the use of specific materials in a building in order to lower the heat loss that occurs in it.

IMPORTANT CONSIDERATIONS IN HOUSE INSULATION

The level of insulation required for a home or office depends on the design of the building, climate, personal preferences, available budget and energy costs. Selecting the strategy for the insulation of a building is based on considerations such as the modes of energy transfer that occur within it and the intensity and direction of energy flows. These may vary over the day and from one season to another. Therefore, to maximize the benefits that can be derived from insulation, the right design, combination of materials and building techniques must also be selected. Where a requirement has been identified to add insulation, the levels of existing insulation in the building should be determined before taking additional measures.

COMFORT:

Comfort has being said to be a state of satisfaction with something. It can be cause or matter of relief or satisfaction. It can also be said to be a state of ease, with freedom from pain and anxiety. It is the state of being pleased with something. Comfort is relative to individual purposes and needs, as what can be said to be comfortable for one individual might bring about the opposite for another. Previous studies on residential comfort have analysed many variables such as housing, neighbourhood, and user's characteristic as that which affects residential comfort. Building features, such as number of bedrooms, size and location of kitchen, designs and quality of housing units are strongly related to residential comfort. Being comfortable with a neighbourhood has been identified to be an important factor of housing comfort. These include neighbourhood facilities such as schools, clinics, shops and community hall.

CONCEPT OF RESIDENTIAL COMFORT

A resident's response to the environment says a lot about how comfortable the environment is and also determines the quality of life of the resident. A comfortable environment will attract more time in the building. Individuals' evaluations of housing and neighbourhood determine the way they respond to residential environment.

Resident satisfaction is not only an important component of individuals' quality of life but also determines the way they respond to residential environment. Theories on residential satisfaction are based on the notion that residential satisfaction measures the differences between households' actual and desired housing and neighbourhood situations. Housing satisfaction is a significant factor in the choice of housing since it is one of the factors that determine residents' quality of life.

HEALTH AND SAFETY PROBLEMS

Health is considered to be a state of optimal physical, mental and social well-being of a person and not merely the absence of disease and infirmity. This is considered as one of the most important factors when looking at the comfort of inhabitants in a building.

- Cleanliness
- Fire safety
- Safety from, criminals
- Public safety

- Poor design or construction of homes is the cause of most home accidents. In some European countries, they kill more people than do road accidents.
- Use of proper building materials and construction could prevent indoor pollutants or mould, causing asthma, allergies or respiratory diseases.
- About every tenth lung cancer case results from radon in the home. Appropriate design can prevent both exposure and the risk to health.

SUSTAINABLE LOW COST HOUSING

Sustainability is commonly defined as development that meets the needs of the present without compromising the ability of the future generation to meet their own needs. Sustainability is concerned with protecting environmental quality, enhancing social prosperity and improving economic performance. "A sustainable house is cost efficient over time, comfortable, cheap to maintain and complements our unique environments. Inevitably sustainability supports strongly making a house comfortable to its residents, future or present. As far as sustainability is concerned there is no basis for compromising the comfort of the residence in any way.

Print ISSN: 2249 – 3492, Online ISSN: 2249 – 3506

International Journal of Research in Management, Sciences and Technology

Impact Factor: 6.361 www.thaavan.com

The second phase of the definition without compromising the ability to meet those of the future is mostly referring to the environmental issues. Despite the development of new technologies to complement current practices in creating greener structures, sustainable buildings still are designed generally to achieve the objective of reducing the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources.
- Protecting occupant's health and improving employee productivity.
- Reducing waste, pollution and environmental degradation.

HOUSING DESIGN COMFORT:

Design is a word which can be related to different fields. Design a related to this paper will be concerned with the aspect of residential environment dwelling unit and the planning of their accommodation and of site layouts. Design stage of buildings usually carried out by architects with respect to the client's needs and aspiration of such
buildings.

Design comfort is a residents feeling of satisfaction with the way a building is planned to meet their needs and desires. It is not uncommon that a house buyer needs to remodel that dwelling unit even if it is just newly built and in prime condition. In view of the important role.Housing plays in the lives of residents, it is important for architects and planners to work together with residents of low cost houses to build a better perception of the needs of the Occupants.

- Function is the specific purpose or work that a design item must perform.
- Quality is the client's or user's needs, desires and expectations
- Cost is the total life cycle cost of the product.

MODULAR PLANNING

Standardization and dimensional co-ordination have been recognized to efficiency and economic construction. It is necessary to plain house on modular basis so that the dimension of structure will confirm to the standard dimensions of modular product without cutting and patching at site.

SHAPE OF HOUSE:

The shape of house as an important bearing on its cost of the construction due to the amount of outside wall and roof area required to in close given amount of space. The square is most economical shape since it provides the maximum amount of floor area with the list amount of wall area. Corner construction cost is more than standard wall construction due to extra expenditure in corner and increasing the length of wall with conclusion that the square and rectangular shaped plans are most costly shapes. Economy in construction can also be affected by building small 1&2 room house is rows on account of saving in more numbers of wallpaper from saving the construction cost the low houses are characterized by economy in land use

ROOM SIZE:

A definite saving cab is made in cost of constructing house by reducing the size of room. By paying proper attention to position of furniture, location of doors, the windows, size of room can be reduced without effect of the committee of experts for building work in their recent report has stated that minimal size of living room should be 120 sq. feet.

BASIC REQUIREMENT:

Before considering the designing of house it is described to study the basic requirement in house designing.

- Strength and stability
- Comfort and convenience
- Protection
- Resistance to moisture penetration
- Thermal insulation
- Durability
- Safety against fire

LIGHTING:

Lighting is considered as one of the basic needs in all building. It is highly prioritised in buildings. Lightings were really emphasized in new construction, and also namely as the physical environment that influences mental health, in addition lack of that will contribute to mental disorder. Lighting indicators includes

- Natural lighting
- Artificial lighting
- Quality of lighting

NATURAL LIGHTING:

Natural lightingis the sufficient distribution of daylight within the dwelling units. This is primarily achieved by introducing openings and placing them in places where light can easily pass through. Position and size of openings helps to optimize natural sunlight, through clever design positioning of glazing

Print ISSN: 2249 – 3492, Online ISSN: 2249 – 3506

International Journal of Research in Management, Sciences and Technology

Impact Factor: 6.361 www.thaavan.com

during the day such that heat gain is reduced in summer while heat loss is reduced in winter. Natural light should always be introduced into our designs. Daylight should never be taken for granted. This is especially so when we are trying to reduce our dependence on carbon fossil based electricity and when we need to calm down from our daily stresses.

Artificial lighting:

Artificial lightingis powered by electrical energy. It is a common feature these days to find artificial lightings everywhere in dwelling units such as in living room, bedrooms, toilets and even outside the building. Both natural lighting and artificial lighting were giving quality of lighting in dwelling units. It will influence both occupants' physical and mental fatigue.

THERMAL COMFORT:

When a person does not feel cold or hot and can maintain its body temperature with ease the person is said to be comfortable. Thermal comfort is defined in British Standard BS EN IS0 7730 as: that condition of mind which expresses satisfaction with the thermal environment ' This can be affected by various perceptions of the environment which includes radiant temperature, air temperature, relative humidity, air velocity, activity and clothing.

- Air temperature
- Air movements
- Humidity
- Radiation exchange with hot and cold surfaces
- Symmetry

AIR TEMPERATURE:

We human beings are warn-blooded in nature. As specie, we are biologically able to keep a constant body temperature of 37 degree centigrade, in spite of the temperature of the air around us. For us to be truly comfortable in our environment however, it is desirable that the temperature of the air around us is maintained at around 24^{o}C to 27^{o}C, depending upon what state we are either we are active or at rest. It is very important that this fact should be bore in mind when planning and constructing buildings for human habitation that a pleasing thermal environment is an important function of excellent building design.

AIR MOVEMENT:

Air Movement of air in a building affects the thermal comfort of occupants by influencing the rates of heat gain or loss through the building envelope and it determines whether good-quality indoor air will be present. The nature and magnitude of subsequent air movement in a building will be highly influenced on how an architect lays out a building, chooses materials, defines building details, and participates in the construction process. Air movement can induce significant heat exchange through the building envelope. A prerequisite to maintaining a healthy and comfortable condition is the supply of good-quality air to building spaces.

HUMIDITY:

This is another major contributing factor to body comforts. Extremely low humidity, contributes to the drying of respiratory passages which directly raises the possibility of respiratory illness and disease. It's being observed that harmful bacteria and virus grows best in, either high or low humidity. There has being cases of people who develop a particular ailment while staying in a particular environment, but discover that once they are out of the said environment the ailment's symptoms reduces drastically. Therefore making a house less humid as possible will go a long way in enhancing the good health and comfort of the people living in such houses.

ECONOMIC MEASURES TO CONTROL COST

The measures to be taken be the private and government agencies to economize the cost of the housing project are given below.

- The cost of land should be changed less making on attempt to reduce the development charges of organization concerned. The plan of house should be simple to minimal the length of wall and number of doors and windows.
- The use of scarier material like cement and steel should be reduced and specification should be slightly lower down to reduce the cost.
- The overhangs and decorative work using cement and steel should reduce.
- The build-up area of the house should also reduce without affecting the utility of building.

DURABILITY:

It is a quality cannot be assessed as briefly as those criteria discussed already. The laboratory investigations and short period test make it possible to distinguish new material and method which will be short lived from thus which are likely to lost reasonably well but any estimate

Print ISSN: 2249 – 3492, Online ISSN: 2249 – 3506

International Journal of Research in Management, Sciences and Technology

Impact Factor: 6.361 www.thaavan.com

of length of roof of latter must be problematical much may depend upon the maintenance between upon them. Thus the durability through house defined as the length of time over which it will remain or it can be made to remain efficient can be assessed by as estimate of the probable maintenance which will be necessary. The durability of a house is also dependent upon the practice of profound building construction.

SCOPE AND PURPOSE

- The impact of climate and temperature on health has been receiving increased attention in recentyears, partially related to the global climate change and the number of extreme weather events.
- This is also the case for the impact of low temperatures, which can be reduced through adequatehousing standards, heating systems and energy supply.

The agenda foresees to

- Present the evidence existing on the health impacts of low temperatures (in relation tohousing conditions, to the extent possible)
- Review and discuss policy responses and countermeasures in selected countries.

CONCLUSION:

From the review of various research papers, itcan be concluded that in traditional buildings aneffective passive and natural cooling system provides acomfortable thermal comfort in all seasons, which is notfound in modern building. Such solar passive techniques should be re engineered and re examined to incorporatewithin modern building forms and materials. Byincorporating with modified strategies according to localweather conditions, people can live in comfort with lessconsumption of electricity and air conditioning. This can provide a sustainable solution towards Energy efficient green buildings of future.

REFERENCES:

1. "Thermal insulationproperties and applications in housing technical manual"United Nations Industrial Development Organization
2. "Sustainable and Smart Space Cooling Coalition (2017)".New Delhi.
3. "Thermal performance improvements in low--income dwelling structures". This methodology has been prepared by South, South North with inputs from the Gold Standard Foundation.
4. "Comfort in low cost houses: theoritical framework development"Proceedings International Conference on Human Habitat & Environment
5. "Modern Housing Tranquillity in Malaysia from the Aspect of Thermal Comfort for Humid Hot Climate Zone", M.A. Baharum Department of Architecture, Faculty of Engineering & Built Environment, University Kebangsaan Malaysia,
6. "Low cost housing "Shaikh Ajim International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 03 | Mar -2017.
7. "A review of passive cooling architectural design interventions for thermal comfort in residential buildings "C.V. SUBRAMANIAN Department of Architecture, Periyar Maniammai University, Thanjavur, India
8. "Evolving opportunities for providing thermal comfort" Gail Brager, building research & information 2015.
9. "HOUSING, ENERGY AND THERMAL COMFORT" World Health Organization Regional Office for Europe. Scherfigsvej 8, DK-2100 Copenhagen, Denmark.
10. "Thermal Comfort of Residential Building in Malaysia atDifferent Micro-Climates"Asian Conference on Environment-Behaviour Studies Chung-Ang University, Seoul, S. Korea, 25-27 August 2014"Environmental Settings in the Era of Urban Regeneration"