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S. N. Nasir, W. O. Ismail, and S. Aziz



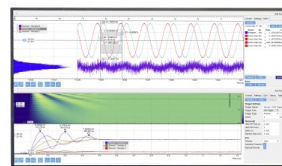
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# Information on Creating a Healthy Home Environment in Malaysia

S N Nasir<sup>1,a)</sup>, W O Ismail<sup>2,b)</sup> and S Aziz<sup>3,c)</sup>

<sup>1</sup>*Faculty of Architecture and Ekistics, Universiti Malaysia Kelantan, Kelantan, Malaysia.*

<sup>2</sup>*Faculty of Innovative, Design and Technology, Universiti Sultan Zainal Abidin, Terengganu, Malaysia.*

<sup>3</sup>*Faculty of Architecture and Ekistics, Universiti Malaysia Kelantan, Kelantan, Malaysia.*

Corresponding author: <sup>a)</sup>nuratirah.mn@umk.edu.my

<sup>b)</sup>woasaifuddin@unisza.edu.my

<sup>c)</sup>myyaarc@gmail.com

**Abstract.** Housing is one of the eight domains of the concept of age-friendly cities or environments of the World Health Organization (WHO). A healthy community ensures the availability of safe, decent, and affordable housing that supports the health of its occupants. Human spends more than 50 percent of his time inside the house, studies have shown that the built environment can affect human health. The unhealthy house can cause many diseases. Unhealthy houses increase the number of asthma, respiratory and skin allergies and lung diseases. Also accidents and domestic injuries are more in these houses. In addition unhealthy houses affect mental and social well-being such as: depression, isolation, stress and behavioral abnormalities. The “Healthy House” is not just designing healthy and hygienic shelter, but also includes complete physical, mental and social well-being in the house and the environment. Thus, the purpose of this paper is about information on creating a healthy home environment in Malaysia.

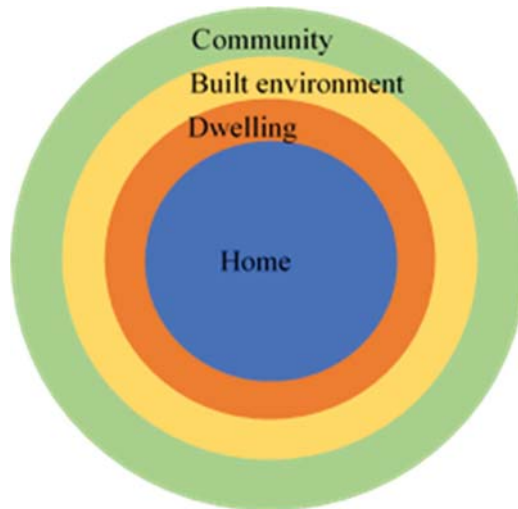
## INTRODUCTION

Based on WHO Housing and health guidelines (HHGL) Healthy housing is shelter that supports a state of complete physical, mental and social well-being. Healthy housing provides a feeling of home, including a sense of belonging, security and privacy. Healthy housing also refers to the physical structure of the dwelling, and the extent to which it enables physical health, including by being structurally sound, by providing shelter from the elements and from excess moisture, and by facilitating comfortable temperatures, adequate sanitation and illumination, sufficient space, safe fuel or connection to electricity, and protection from pollutants, injury hazards, mould and pests. Whether housing is healthy also depends on factors outside its walls. It depends on the local community, which enables social interactions that support health and well-being. Finally, healthy housing relies on the immediate housing environment, and the extent to which this provides access to services, green space, and active and public transport options, as well as protection from waste, pollution and the effects of disaster, whether natural or man-made.

According to the National Center for Healthy Housing (NCHH), a healthy home is housing that is designed, constructed, maintained, and rehabilitated in a manner that is conducive to good occupant health. Healthy housing is important for everyone, whether you own or rent your home. The Healthy Homes Coalition is especially concerned with how these threats impact children's health and wellbeing.

The World Health Organisation has stated that there are four interrelated dimensions that need to be considered when carrying out a housing analysis [8].

- First, the home including psychosocial, economic and cultural aspects produced by the occupants;
- Second, the dwelling in terms of its construction, materials and interior quality;
- Third, the immediate built environment including infrastructure and transportation;
- Forth: the community which relates to the social environment, characteristics of the residents and local community services.



**FIGURE 1.** The four dimensions of housing [8].

## **HOUSING IN THE CONTEXT OF A HEALTHY COMMUNITY**

Housing is a well-documented determinant of health, and the burden of disease associated with inadequate housing is large. Substandard housing impacts multiple dimensions of health, including chronic disease and mental health. For example, asthma is associated with improper mold abatement [10], pest infestations, and dampness [6], while exposure to toxins such as asbestos [3] and radon [4] can cause cancer. Exposure to lead in older housing continues to be a major concern, particularly with regard to the health of children [9], because of its known effects on brain development [5]. Mental health also is affected by housing. Housing of better structural quality has been shown to increase self-efficacy, optimism, and life satisfaction and to decrease anxiety and depression [8], while housing issues such as pest infestation, dampness, and cold have been correlated with poorer mental health [2].

Unfortunately, most communities in the United States face challenges in their housing sector that result in some individuals and families living in housing environments that are not optimally supportive of health. For example, many residences fail to meet key principles of healthy housing, including proper ventilation (both adequate fresh air and its distribution), moisture and mold control, proper maintenance, integrated pest management, avoidance of toxic chemicals and agents, safety (free of injury hazards), accessibility, cleanliness, and adequate lighting. These challenges are especially common among the poor and other vulnerable populations, but they may impact anyone in a community. Many residences have more than one health hazard, and some risk factors are directly linked [5]. For example, energy-inefficient housing is more prone to dampness and thus mold. As a result, multiple risk factors may have additive effects on health [8].

### **Housing Standards That Promote Health**

Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building’s life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. Green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment” [7].

Green building is the practice of building structures and using processes that are environmentally responsible and resource efficient throughout the life cycle of the building from the features of design, construction, operation, maintenance, renovation and deconstruction. Green buildings are designed to reduce the overall impact of the construction environment on human health and the natural environment.

A green building is a building that adopts an environmentally friendly concept throughout its life cycle including planning, design, construction, maintenance and demolition. Green buildings can have a positive impact on various aspects, including:

- Save costs in cost care
- Maintain health and increase productivity

- Reduce waste and prevent environmental pollution

In Malaysia, we have our own recognition system that takes into account climate as well as social, infrastructure and economic development in Malaysia. This system is called the Green Building Index (GBI). GBI was built by *Pertubuhan Arkitek Malaysia* (PAM) and Association of Consulting Engineers Malaysia (ACEM). GBI evaluates and recognizes green buildings based on six criteria:

- Efficient use of energy resources
- Water efficiency
- Quality of the indoor environment
- Site planning and management
- Materials and resources
- Innovation

Under each criterion there are various things that can be done to ensure that the building or residence is environmentally friendly. For example, for efficient use of electricity, a building or dwelling can reduce the heat accumulation received, or use natural light so that the use of lamps is not prolonged.

## HEALTHY HOME AND ENVIRONMENT

A healthy home environment may be just as important as eating healthy and exercising to prevent disease and stay energized and healthy. Homes are the four places where people live, work, sleep or even work, which is a big factor that determines your health.

The air quality of the person breathing in the home must be fresh and free of toxins. Particles such as bacteria, mites, dust and light dirt if resident in our homes can be harmful to health even if our body's immune system is strong [1]. It is important to understand that your home environment is one of the important elements that affect your overall health.

Following the current situation of the Covid-19 pandemic, no one thought that home conditions were a major factor in stopping the spread of the corona virus that was spreading recently. If you think logically, a dirty home condition can invite the reproduction of various types of germs. Therefore, home cleanliness is an important factor to prevent epidemic infections from occurring.

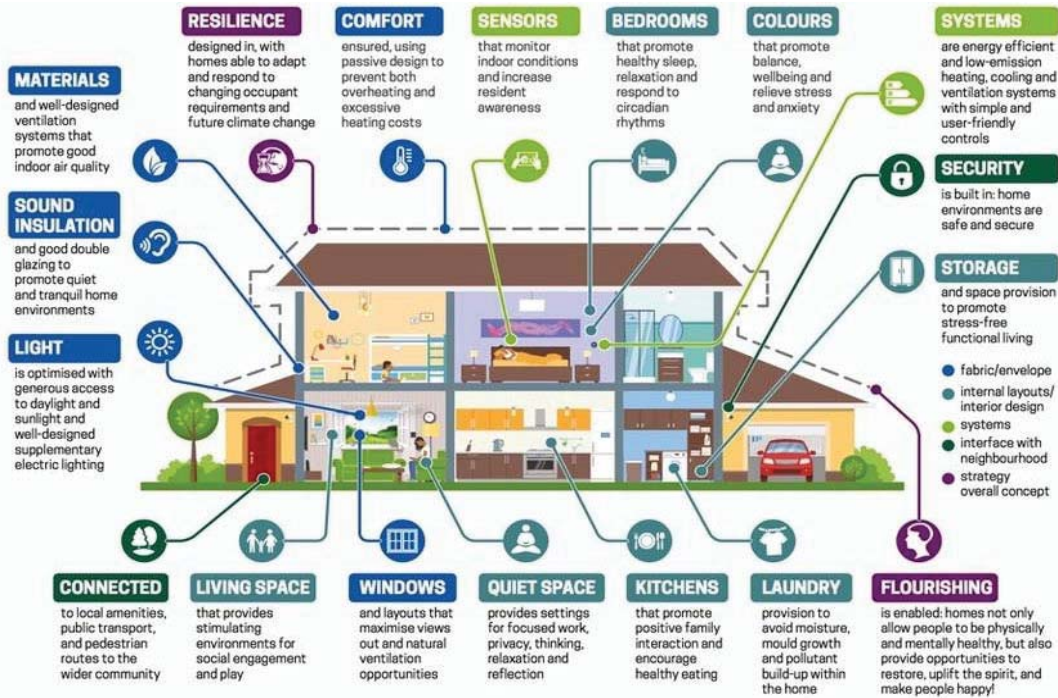


FIGURE 2. Summary of this thinking is the new report by the UK Green Building Council, Health and Wellbeing in Homes [1].

Those who do not clean the house regularly are at high risk of spreading the infection to other individuals, especially family members who also live in the same house. The more frightening thing is that the corona virus is easily transmitted to other individuals. Those living at home have the potential to become infected if there are individuals quarantined. This risk is multiplied if the cleanliness of the house is not maintained properly [10].

## ELEMENTS OF HEALTHY HOME

### Light

Light can enter the residence through several openings such as doors, roofs and windows. Through the openings as mentioned, we can get many benefits including good ventilation, direct sunlight and air can come in and out well. But there are also disadvantages if the opening is opened too long that the house can overheat in the summer, freeze in the winter without heating and mechanical cooling.

Windows are said to combine many properties not only as an open part of the wall but also as an element of the house that plays an important role. Good opening design can improve the well-being of the occupants, both physically and psychologically. Improper opening design can affect privacy, furniture layout, amount of light entry and heat loss [1].

### Indoor Air Quality

Indoor Air Quality (IAQ) refers to the air quality in and around buildings and structures, especially those related to the health and comfort of building and residential occupants. Understanding and controlling common pollution in the home can help reduce the risk of your internal health concerns. The health effects of indoor air pollutants may be experienced shortly after exposure or, possibly, many years later. There are many sources of indoor air pollution. This includes:

- Fuel burning equipment
- Tobacco products
- Various building materials and furniture such as insulation containing asbestos, flooring, upholstery or newly installed carpets as well as cabinets or furniture made from certain wood products
- Products for household cleaning and maintenance or personal care
- Central heating and cooling system and humidifier
- Excessive moisture
- External sources such as radon, pesticides and outdoor air pollution [1]

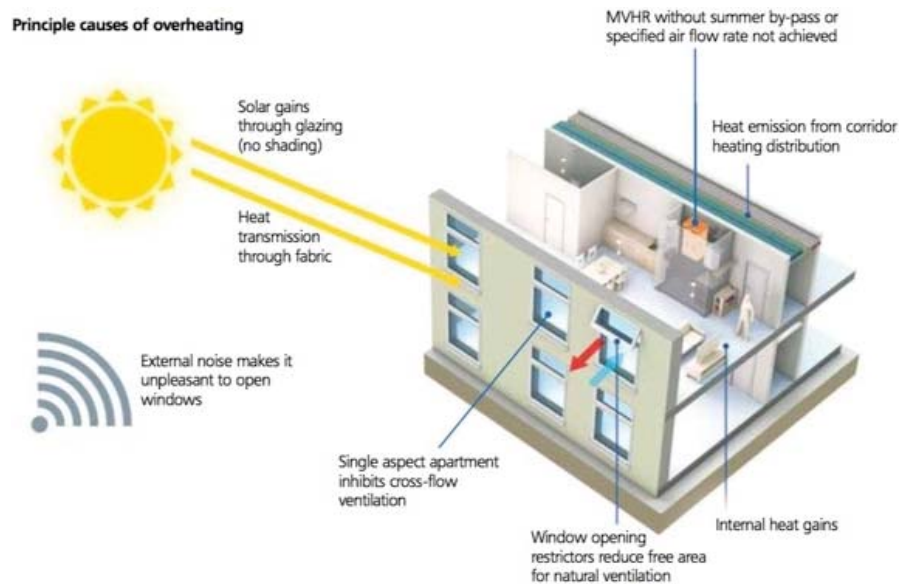


FIGURE 3. Thermal comfort of the house [1].



## Thermal Comfort

Thermal comfort is the efficiency and resilience of a home. The less heat is lost through building enclosures, the hotter it is, and the less heat will be lost from your body to the walls and windows. A more accurate reading of the air temperature to maintain a comfortable indoor environment is the mean radiant temperature (MRT) which is a measure that states the influence of surface temperature on the comfort of residential residents. A more functional measure of thermal comfort in a building or residence is operating temperature, which takes into account air temperature, average shining temperature and air velocity.

There are 4 ways thermal comfort can be achieved through good design, construction, and maintenance.

- Use a heating, ventilation, and air conditioning (HVAC) system that regulates the mean radiant temperature (MRT)
- Reduce leakage
- Design and build for occupant control
- Take care of the thermal environment, and make the necessary changes [1]

## Noise

Noise is a nuisance and can lead to loss of sleep, stress, and poor health. In order for a house to be comfortable, it must be designed so that the layout and structure remain noisy to an acceptable level and most activities can be done without undue interference from internal or external noise. To plan noise control, it is important to understand the potential source of noise, the type of noise, and how sound moves along the sound path.

The best results will come when acoustic performance is considered at the beginning of the design process and then followed accurately during construction. Developers and contractors need to understand the concept and avoid mistakes such as installing channels through a complete acoustic separation. Measures to control noise are handled at the source for example by determining quiet equipment. Where noise is uncontrollable, the effect can be reduced through a good combination of building design and layout that ensures, for example, that quiet building areas are far from noise sources, or that there is a buffer between sound and space and structural features such as walls and soundproof windows that limit air noise and impact [7].

## Design

Home design requires a kitchen that promotes healthy eating and family interaction. According to studies, eating together as a family on a regular basis has some positive effects. Dining together can be encouraged by making the dining room comfortable for example with good outdoor and day views and more accessible from the kitchen compared to the living room to encourage people to sit around the table than in front of the TV. These are some examples of healthy home elements. Space should be designed for facilities such as the number and age of home occupants and even the bedroom should be quiet where it encourages healthy sleep next to good health. A space should also be large enough to avoid congestion if there are many. Children need space to play, grow, and do homework for the home [1].

## BASIC PRINCIPLES OF HEALTHY HOUSING

Housing conditions can and should support good health. Principles provide a framework for describing the critical components of a healthy home are described below.

- Dry: Damp houses provide a nurturing environment for mites, roaches, rodents, and molds, all of which are associated with asthma.
- Clean: Clean homes help reduce pest infestations and exposure to contaminants.
- Pest-Free: Recent studies show a causal relationship between exposure to mice and cockroaches and asthma episodes in children; yet inappropriate treatment for pest infestations can exacerbate health problems, since pesticide residues in homes pose risks for neurological damage and cancer.
- Ventilated: Studies show that increasing the fresh air supply in a home improves respiratory health.
- Safe: The majority of injuries among children occur in the home. Falls are the most frequent cause of residential injuries to children, followed by injuries from objects in the home, burns, and poisonings.

- **Contaminant-Free:** Chemical exposures include lead, radon, pesticides, volatile organic compounds, PFAS, and environmental tobacco smoke. Exposures to asbestos particles, radon gas, carbon monoxide, and second-hand tobacco smoke are far higher indoors than outside.
- **Maintained:** Poorly maintained homes are at risk for moisture and pest problems. Deteriorated lead-based paint in older housing is the primary cause of lead poisoning, which affects some 535,000 U.S. children annually.
- **Thermally Controlled:** Tenants and homeowners are at risk for various health problems related to prolonged exposure to excessive heat or cold when their homes do not maintain adequate temperatures.
- **Accessible:** Modifications are often necessary in order for occupants to move safely in their homes. Lack of accessibility in and outside the home can result in reduced physical activity, trips, falls, isolation from family and friends, and poor mental health. New homes should be designed for the accessibility of all possible occupants, regardless of their age or mobility.
- **Affordable:** Households in which more than 30% of the income is spent on housing are considered to be cost burdened; if they spend more than 50% of their income on housing, they are considered severely cost burdened. High housing cost burden can lead to housing instability in the forms of difficulty paying rents or mortgages, evictions or foreclosures, frequent moves, overcrowding, living with relatives or friends, and homelessness. The high cost of housing can drive families into substandard housing, often in unsafe neighbourhoods, can lead to damaged credit, job loss, lack of nutritious food and adequate healthcare, and poor mental health [7].

## CHALLENGES OF CREATING A HEALTHY HOME

Without doubt, housing and health has received increasing interest by the public health community in recent years, and is now considered one of the major environmental, as well as social determinants of population health. This increasing interest follows two recent trends in public health sciences (the rising concern on indoor exposures as a public health risk, and the rediscovery of setting approaches to target health action) and is further enhanced by the report of the WHO Commission on the Social Determinants of Health which identified daily living conditions as a major cause of inequalities [8].

Public health actors interested in this field will have recognized that during the last decade, the availability of housing and health information and the publication of associated evidence have increased significantly. National reports, reviews and surveys have added to the evidence base as have sophisticated academic research work and contributions from international agencies such as UN and EU. Most of the work on the health relevance of housing seems to be contributed from health-focused actors who are increasingly aware of the negative health impacts of inadequate housing conditions. In contrast, there seems much less evidence generated from the typical “building-related” professions such as engineering, construction, architecture etc., who are in a better position to shape a healthy building stock than the public health actors. However, the wealth of available evidence provides various new opportunities to the housing and health community, as it enables a more detailed housing and health risk assessment, which must form the basis for adequate and targeted risk management on technical as well as policy level.

Based on the available evidence, we can identify and confirm a range of housing and health challenges that we need to tackle in the future. While climate change considerations drive the work on temperature extremes and energy consumption (in relation to indoor thermal comfort) as well as safety (in relation to natural disasters), we still face traditional issues related to crowding, hygiene and sanitation, and indoor air pollution (including asbestos, lead and radon). Home injuries—in many countries matching or exceeding the number of traffic injuries—have emerged as a paramount priority, while residential noise exposure has been defined as a re-emerging issue in many densely populated settlements. Increased attention has recently also been given to specific indoor pollutants such as dampness and mould, combustion of solid fuels, and the indoor use and emission of chemicals and products containing nanoparticles. The discussion of public smoking bans also brings about potential risks for children being increasingly exposed to “passive smoking” in homes of smokers, while the rising number of elderly residents calls for modification of the housing stock to match the needs of ageing societies characterized by a higher prevalence of physical and mental constraints.

Despite all evidence, the implementation of knowledge remains weak. Housing construction as well as rehabilitation still does not fully capitalize on the available theoretical knowledge, and transfer of this knowledge into action must be considered the housing and health challenge of our time. Indeed, we know enough to build better

homes, and we know enough to educate building producers, as well as building users on how to create, maintain and reside in healthier homes.

If we accept this challenge, the new priorities will not be related to risk factors anymore. Instead, they will be related to a number of issues described below.

- i. Housing quality: standards and minimum requirements need to be identified and translated into building codes to assure that any building, irrespective of size and cost, meets fundamental health protection criteria.
- ii. Inequalities: the distribution of housing quality is showing strong social gradients, with the most vulnerable population groups being most affected by inadequate housing conditions. Targeted research and action is necessary to disconnect poverty and social disadvantage from the experience of harmful housing conditions.
- iii. Health in all policies: Housing and health improvements highly depend on actions taken in non-health sectors such as urban planning, transport, social welfare, environment, and especially housing and construction. Increased collaboration between health and non-health sectors will be crucial for creating stocks of healthier housing.
- iv. Focus on rehabilitation: buildings are built for generations to come and built features are not easy to modify. More work needs to be invested in assuring that building renovation and rehabilitation, as currently taking place in relation to energy-saving measures, contributes to the provision of healthy housing. National rehabilitation campaigns offer a wide range of opportunities in that context.
- v. Applying “real-world” research: much of the evidence on housing and health is based on surveys documenting housing and health associations, while intervention studies, aiming at the assessment of health effects of building modifications, are rare. More large-scale natural experiments, based on housing projects undertaken in communities, are needed to document which housing changes can provide which health benefits.
- vi. Building regulations: housing and health is, to a large extent, the outcome of regulations. However, building codes and construction regulations are mostly based on experience in the building community than on health-based evidence. Reviews of such regulations and integration of health evidence are necessary.

If housing and health actors deal with these challenges constructively, and manage to better link the involved scientific communities to enable the integration of health aspects in the construction world, academic and scientific advances could be made in parallel with what we really seek for: the improvement of population health through better and equally distributed housing conditions.

## Healthy Housing Environment in Sustainable Design

Concepts such as sustainable development or sustainable design have emerged as a result of processes continuing for many years. The consequence of sustainable development is sustainable design based on the principles applied irrespectively of the adopted formal aesthetics. There are numerous lists of principles and methods of assessing the sustainability of individual structures, whole complexes or areas.



FIGURE 4. Different aspects in sustainable design of healthy housing environment.



Requirements that a healthy housing environment must meet in the context of human health are most comprehensively expressed in an inscription placed in the housing estate of Kirsta, near Stockholm in Sweden: You are not only to live here, but to feel good. When we evaluate a housing environment or a housing estate, we tend to say: it's so nice here or it's so beautiful here rather than it is so beautiful.

## CONCLUSION

This is an exciting time in the world of healthy housing. A large number of stakeholders, including consumers, architects, developers, government agencies, NGOs, and scientists, are becoming increasingly cautious in the construction of buildings, especially involving residential buildings which are closely linked to consumer health. A broader definition of healthy housing can also include housing affordability considerations. According to the World Health Organization, 4.3 million people die each year from exposure to household air pollution, and nearly 3 billion people still use unhealthy and unhealthy solid fuels for cooking and fuel. If the number of dwellings in the city continues to increase, problem prevention through proper planning and construction or retrofit will provide solutions to prevent new air quality and indoor environmental problems before they occur. Meanwhile, promoting and enhancing access to quality and timely information on the content and risks of chemicals in home building materials is crucial.

Features of a healthy home require adequate ventilation, lighting, and movement space as well as protection from noise and dirt. Here are some other features of a healthy home:

- Has a healthy and clean irrigation system facilities.
- The house building system must follow the correct construction standards so that the house can be free of dirt, dust, smoke and other materials that can affect health.
- The atmosphere of a healthy environment in the house is divided by taking into account factors such as layout in the house, the use of materials in home development, the shape and characteristics of a healthy home, structures and furniture that are not harmful to family members.
- A healthy home is a home that can minimize any accidents such as falls, poisoning or fire.

There are several strategies that facilitate protection and health when the community strives to meet housing needs in the event of any accident:

- Preserve and promote social relations for immediate response in short-term housing management and long-term redevelopment.
- Consider the need for access to health and social services during all phases of housing rehabilitation.
- Incentive the use of healthy or green criteria for redevelopment of homes, buildings, and surrounding areas.
- Involve community members, including representatives and supporters of vulnerable populations, in the development of post-disaster housing plans to ensure the needs of all community members are met [3].

As a caring individual, society need to know the importance of keeping home clean. Even if the corona virus does not occur, each individual has a responsibility to build a healthy home for their family.

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