



# Are House Alterations Sustainable?

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## Abstract

House alterations have always been associated with sustainability for the future. However, a research at three low cost housing schemes in Shah Alam, Malaysia involving residences, housing contractors and neighbours showed that the construction activities or materials used caused problems and risks to social health, safety and the environment. These problems are related to lack of knowledge, skills and experiences in the building construction. Despite the presence of health and safety requirements, there remains a significant scope for improvement in Malaysia. From the findings, several recommendations are made to improve the living conditions for a sustainable future.

**Keywords:** low cost housing; safety and health risks; sustainable house alteration

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## **1.0 Introduction**

A house is one of the basic human needs that also protects and acts as a security as identified by Maslow (1943) and Max-Neef (1992) in the human theories of needs. However, changes in demographic and social needs of a growing family that requires more space or new up-to-date façade or as an investment have resulted in many house owners opting for alteration works to the existing house. This involves internal and sideways extensions either horizontally and vertically or upwards with complicated construction activities. Even though the construction activities are important to the existing building industry and house owner's needs, they must not compromise health, safety, productive environment and its surroundings but should contribute to sustainable development for the existing neighbourhood, communities and future generation.

## **2.0 Literature Review**

Governments of developing countries are committed to provide adequate, affordable low cost houses with acceptable quality to low income group as a basic social need. In the last few decades, many parts of the world were dominated with construction of new stocks of houses. Now, the trend of alteration on an existing stock has become more and more important. This should provide an opportunity to enhance the social, economic and environmental performance of the property and community as required in many sustainable development concepts. The project not only concerns the building parts but also the relationship among the houses, overall context and people.

According to Ebsen and Rambøll (2000) the acknowledgement of the need for a sustainable development arose for the first time in the 1970's, though the term was not used then. Several studies have suggested that sustainable alteration projects, besides serving the purpose of preserving and reusing the existing building and building areas, are intended to make owner and occupants more healthy, energy efficient and resource-effective, that connects more to the inhabitants. But there are several consequences to the natural environment and its surroundings due to physical and technical interventions that concern the inhabitants, their way of using spaces and their perception of their living space.

House alteration projects involve many activities such as preparation of basic design, demolition work, relocation and new installation of building structures and materials. For terrace housing, a new opening is required in order to convert small dwellings into larger units. Most of the time, walls or parts of walls have to be removed to accommodate the change in layout and building support systems to strengthen existing walls and floors. To suit the living patterns and densities of users, the house requires adequate circulation or a suitable access through proper rearrangement of spaces. Although the process is not as complicated as in multiple or high-rise building constructions, the total work should be carried out without deteriorating the quality of life, living conditions and the environment. Unfortunately, several studies have shown that these requirements are not followed up thoroughly in related building or safety regulations especially when concerning the public. Yet, human beings need to be the centre of concerns for sustainable development as according to Principle 1 of the Rio Declaration on Environment and Development (1992). They are entitled to a healthy and

productive life in harmony with nature that relates to social, economic and environmental pillars of sustainable development.

## **2.1 Why House Alteration?**

Several low cost houses have low space standards and small house area (Hanafi, 1999) which is less than 550m<sup>2</sup>. Thus, there is a pressing need to create more space for a growing family. People are also more exposed to up- to-date architecture and appealing interior design and many see their house as an opportunity for property investment. Studies have shown that these reasons are mainly due to the continuing high levels of demand for good quality dwellings and the comfort of being in familiar settings (Douglas, 2006). Nowadays, there is a tighter restriction on building properties on greenbelt areas and lesser buildable land for housing which cause new property prices to go up and skyrocket including an increase in the costs of materials and relocating charges.

People with low income do not want to live in houses labelled only for low income people, because then everybody knows that the persons living in these houses are poor (Ebsen and Rambøll, 2000). The effect of status is very important. Thus, many copy the designs of luxury houses and adapt them to their existing low cost houses. Due to some of these reasons, many people are still willing to stay in the same house and one of the options available is to alter the existing properties that are likely to remain popular in years to come.

## **2.2 What Are The Risks?**

Any alteration works should overcome or prevent adverse psychological and physiological reactions to occupants and stakeholders of the property. A poorly designed and executed works could inadvertently trigger problems. Low cost housing developments such as in Malaysia are of low quality due to ignorance and inadequate provisions in terms of built standards, layout arrangement, thermal comfort and quality materials as compared to other types of residential buildings (Hanafi, 1999). Evidence shows that the design of low cost houses often neglects indoor environment quality (Liang, 2009) and fails to meet human satisfaction in terms of indoor air quality, thermal comfort and noise quality (Asif, 2006 in Liang, 2009). Other common problems are inadequate environmental controls, poor siting of noisy or disruptive building activities and equipment next to the habitable areas.

Many owners and occupants still stay in the house during construction. Babies and small children are exposed to health and safety risks from demolished building materials such as asbestos ceiling and roof sheets, lead from paint, dust, heavy metals, sharp and heavy objects. Research has shown that children are affected even at a very low exposure level but currently there are no findings on the safe level of exposure. Small children, who play on floors, crawl on carpets and regularly place their hands in their mouths, are subjected to hazardous chemical and poisonous materials. Even floor carpets are identified as deep reservoirs for toxic compounds containing dangerous bacteria and asthma-inducing allergens no matter how regular the rugs are vacuumed.

Studies have also found that hazardous and inappropriate materials such as asbestos roof sheets and ceiling as well as lead from paint used at these low cost houses (Isnin, 2010) have major impact on the health and environment. Asbestos ceiling and roof sheets are

relatively inexpensive with desirable physical properties including strength and flexibility characteristics but they have the potential to cause serious health problems such as mesothelioma, lung cancer and asbestosis if the fibres are inhaled (Health and Safety Executive, 2010). House occupants' health risks increase with heavier and longer exposure time while construction workers who work directly on regular basis with the material or through contact are found to become ill. Asbestos also cause cancer to the worker's family as they come into contact with fibres from the worker's clothes or shoes (Health and Safety Executive, 2010).

Lead-based paint is another common major source of lead poisoning for occupants and workers. Research studies on lead toxicity in humans indicate that the current Occupational Safety and Health Act (OSHA) standards should prevent the most severe symptoms of lead poisoning, but these standards do not protect workers, occupants, family and their developing children from all of the adverse effects of lead. Scientific reports have indicated Malaysia's consumer paint samples have greatly exceeded the lead safety levels and it is not controlled (Clark, 2009). Lead can affect human's brains and developing nervous systems, causing reduced IQ, learning disabilities, and behavioural problems in children.

According to Agenda 21, the blueprint for action adopted at the Rio Earth Summit, there is a close relationship among health, the environment and development, as well as the need to improve health in order to achieve sustainable development. The combination of pollution, inadequate safety equipment for construction work, inappropriate methods of construction and wastage removal have also resulted in unhealthy living environments.

### 3.0 Methodology

This study is based on literature and field survey. The focus of the study was to determine the issues that affected the owners, neighbours and contractors during the house alteration construction activities. This study was carried out in three low cost terrace housing communities in Shah Alam, Selangor which were Sections 17, 18 and 19. The initial data were obtained from the local council Majlis Bandaraya Shah Alam (MBSA) to identify the number of house alteration projects, rules, regulations and information on the complaints made by neighbours. These data helped to determine the research basis and direction. Reviews of other work from the literature survey were done and became the backbone of this study.

Site observations were carried out to gather primary data to investigate and examine the construction activities and materials used. Secondly, interviews using a structured approach were conducted with 30 house owners, 90 neighbours and seven (7) contractors who were involved in construction and/or had recently completed construction. The objectives of the research were firstly, to enquire if the owners were satisfied with the work done and secondly, to comprehend if they were aware of the problems due to the works carried out. The respondents were also asked if permits and approvals were obtained prior to construction. Questions on privacy, safety, cleanliness, noise, parking space and aesthetic values were asked using simple, conversational language with fixed close-ended choice of answers (good, fair, poor). This method was adopted to ensure that the response to the questionnaire could be obtained right after the interview session ended and ensure that they really understood the questions.



Figure 3.1: (a) Original Design of Single Storey Low Cost Terrace Housing in Section 17, Shah Alam  
(b) Original Design of Double Storey Low Cost Terrace Housing in Section 18 and 19, Shah Alam

#### 4.0 Findings and Analysis

The terrace housing schemes at Section 17, 18 and 19 were developed in 1983 and 1984. The building elements and structure used the same construction materials and method of construction. From the findings, there were problems from the house alteration projects that affected not only the house owners but also their neighbours.

Table 4.1 exhibits the findings of 90 neighbours which assessed their satisfaction on house alteration works carried out at their neighbours' houses. 57% reported poor for neighbour's satisfaction on noise and parking space. 43% indicated poor for safety and aesthetic value whilst 14% showed poor on cleanliness. More than 57% of the respondents indicated fair for privacy, safety, cleanliness and aesthetic value. 43% indicated fair for noise and parking space. 14% responded good for privacy and cleanliness. However, none responded good for safety, noise, parking space and aesthetic value. Thus, interview sessions were carried out to find out the reasons for their satisfaction levels. These findings were then analysed and divided into several possible effects.

Table 4.1: Neighbours' Satisfaction Due to Alteration Work

NEIGHBOURS' SATISFACTION	GOOD	FAIR	POOR
Privacy	14	86	0
Safety	0	57	43
Cleanliness	14	72	14
Noise	0	43	57
Parking Space	0	43	57
Aesthetic Value	0	57	43

Source: Isnin and Ali, 2010

#### 4.1 Social and Environmental Implications

Based on the interviews and site observations, most neighbours claimed that their comfort and safety were affected creating insecure feelings and unguaranteed security because some of the workers intruded their properties without permission. It also disturbed neighbour's privacy. Evidence found that the improper wastage and debris removal had resulted in a less pleasant environment as per Figure 4.2. Harmful materials which are hazardous such as asbestos roof sheets, tins of paints were found illegally dumped at the back lanes and on grass areas while some even blocked the drainage water flow creating possible mosquito breeding grounds. Children were loitering near the debris of containers looking for objects that they might use for playing. Some sharp items were also found lying on the roadside. These have resulted in a less comfortable and peaceful environment in the housing area as referred to Figure 4.3. The roadways had become narrower and there was less space for parking due to congestion, debris and construction activities.

For the aesthetic value of the terrace houses, most works resulted in unpleasant architecture of the overall building façade in the housing vicinity and a non-uniformity of the building façade, and elevation including its structure. For example, roofs were different in colours, materials and shapes. Dominance caused by building height and volume differed significantly resulting in maximum overshadowing and loss of daylight at the neighbour's house. Defects were also found at the neighbour's house due to different height and ignored repair works due to the alteration works.



Figure 4.2: Waste Materials from Alteration Works Created Dirty Environment and Surroundings and May Have Contained Hazardous Materials. Debris of Containers Located at Unsuitable Areas and Exposed to Public  
Source: Isnin and Ali, 2010



Figure 4.3: Back Lane Dumping Areas and Limited Space for Parking Resulted in Safety, Security and Congestion Issues  
Source: Source: Isnin and Ali, 2010

## 4.2 Safety and Health Implications

Based from the observations, it was found that most of the workers in the three community sites were subjected to risk due to the lack of safety, improper methods of construction and exposure to hazardous building materials such as asbestos and solvents. All the workers had little or no protection on heights, and cutting of materials and were frequently exposed to high levels of asbestos fibres each working day, without proper safety construction equipment. Many of their activities involved dismantling activities that resulted in excessive levels of dust than comparable new- building schemes. Dust was generated from masonry work and facade renovations. Other activities such as cutting, drilling, grinding cementitious building materials and even sweeping the workplace were found to produce a lot of dust that were potentially very hazardous.

Dust inhalation is one of the most serious health risks in any alteration projects. Based on the occupational, safety and health requirements, appropriate mouth masks, safety goggles and gloves are required for this work because of their carcinogenic properties that are hazardous to the health. Unfortunately, majority of the workers interviewed were not provided with any safety equipment. Observations to other construction sites within the study area also revealed that many of the workers were not attired appropriately as according to the safety and health requirements.

Many workers were found to be smokers and some were smoking during work. Although smoking alone is hazardous to our health, studies show that smokers who are also exposed to main health hazards such as asbestos and solvents have an increased risk of lung cancer which is 50 to 55 times compared to a non-exposed, non-smoker (NIOSH-OSHA, 1980). From the interview, it was found that all the workers were unaware of the increased risk of cancer caused by their smoking habits in the construction site. All the respondents had never undergone a thorough medical check- up since working in the construction area, as according to them it was not required.

## 4.3 Complaints and Defects

Data gathered from the Building Department of MBSA revealed that there were complaints made by neighbours relating to building alteration works. Some of the complaints that were reported included excessive noise during works (e.g. drilling, breaking of brick walls); no approved permit from the local authority; waste disposal containers not provided and blocked roads; foul smell from the drains due to clogged construction debris; using playground as storage areas for materials and waste materials; house constructed more than two storeys; trespassing into neighbour's house without permission; and damaging of neighbour's property (e.g. roof leakage, landscape etc.).

Guidelines and regulations are required to be fulfilled to avoid affecting the neighbours as well as the surrounding environment. Basically, all these requirements are carried out to achieve Principle 15 of the Declaration of the United Nations Conference on The Human Environment (1972) that state: *"Planning must be applied to human settlements and urbanization with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits for all"*.

Further investigation was carried out at the respondents' houses to identify the defects. It was found that several similar defects were recorded. 82.21% of the defects were hairline cracks which were the most common visible defects. This defect appeared at the renovated houses and also at the neighbour's houses which affected the floor, ceiling, external and internal walls, staircase and partial wall at car porch as well as at the backyard of the terrace houses.

The second highest was dampness at the roofs of the terrace houses. This happened due to the inaccurate extension between the original roof structures and the new structures. This problem affected the neighbours' houses. Meanwhile, there were also other types of defects recorded such as sagging of roof, roof leakage, blocked view of doors and windows, and damaged landscape areas. These problems could have been the result of poor workmanship, defects on the materials, or the lack of protection during construction work that caused defects to either houses of property owners or the neighbours.

## **5.0 Conclusion**

Although this study may be limited to a small number of low cost terrace housing owners, the neighbours and small contractors to be totally reflective of the whole low cost housing alteration works, it has provided some useful insights to understand the effects not only to property owners but also to the neighbours, construction workers and surrounding areas.

Lack of proper construction processes and procedures in housing alteration projects may often bring problems to the house and surrounding area thus affecting the natural environment, health and quality of life. These issues are often raised as problems of uncontrolled development of housing alteration projects. Many have been reported to lack consideration on the social, environment and the wellbeing of people involved either directly or indirectly. The health and safety of workers, occupants and neighbours can be affected during the construction process. Thus, careful planning and implementation are required beginning from the design, selection of materials, working equipment, area and method of construction.

In developing countries such as Malaysia, occupational exposure to construction materials such as asbestos, lead and solvents are commonly unregulated and little monitoring of exposure is carried out. The potential for hazardous exposure during construction activity is well recognised such as from fumes and dust that pose an exceptional health hazard to construction workers as well as children and adults living nearby. It is important that problems and issues of property extension or even renovation works is understood to ensure each construction project complies with the safety standards and building by-laws.

Safety and health are major concerns for all involved in construction not only to the workers but also to the occupants and public at large especially children. Accidents not only reduce productivity but also damage the equipment and cause a financial loss. All the people concerned can also be harmed or lose their lives. Like any other construction projects, alteration works have more than the fair share of risks. Thus, some form of risk management is required to minimise or control the potential problems arising from unforeseen works and the occupation during works. A properly done house alteration is the best way of adding value not only to the property but also creating the least impact on the neighbouring property and on the street scene.



This could ensure that a sustainable alteration work can be achieved through proper planning and working methods without compromising social, economy, environment and health aspects to achieve a successful sustainable development.

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