Sustainable green inner-wall design for flexible floor plan

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Abstract. The rises of house price in the market is so drastic that it effects the younger generation nowadays especially young executives and young couples who could not afford to buy their first home. The factors that determine the house price presumably are the interior and exterior structural of the house itself. So to lessen the house price, we have to minimize the usage of wet construction thus the idea of having a sustainable green inner-wall implemented into the house with a flexible floor plan. This concept is user-friendly as it is built on needs and the ownership's affordability. They can design the interior of the house however they want with using minimal cost because it does not involve wet construction.

1. Introduction
The housing policy in Malaysia ensures that the low income groups and the middle income groups have access to adequate, affordable shelter and other related facilities. Various strategies and programmes were plan into action by the Government to serve the people better and so that different group of people can benefit from the housing sector. Such issues that will be included are the expansion facilities, introduction of appropriate incentives and instituting regulatory measure to ensure efficient housing development [1].

The sudden price change in the residential property market in Malaysia has affected the home ownership to some extent [2]. Several aspects that determine the house prices are; buildings' financial cost, legal costs, costs of financing agencies, advertising costs, site costs, financing costs and the most important part is the cost of construction itself [3]. One of the strategies to cut down the house price is by implementing a new housing concept thus this paper is to study how the sustainable green inner-wall design with flexible floor plan house can make it affordable to the middle income group of people that we are targeting.

2. Flexible Floor Plan
Housing that can adapt to the changing needs of the homeowners or users determines the definition of flexible housing and it is definitely a broad definition. The possibility of choosing different house layouts prior to occupation as well as ability to adjust one's housing over time is included in the definition. In addition to that, it comprises the potential to incorporate new technologies over time, to adjust to changing demographics, or even to completely change the use of the building from housing to something else [4].

Flexible housing actually gives the users control to design their own interior according to their life style and configuration. From the economic viewpoint, that type of housing would definitely sustain
the house value for a life time, avoid the cost in constructing, renovating and repairing [5]. Loo Chern Wah (2012) made a conclusion that flexible housing is less expensive to renovate rather than conventional built houses [6].

3. Alternate Inner-wall

Three category of inner wall:

Fixed wall

A fixed wall is a wall for the purpose of separating rooms, or dividing a room. It may be constructed with gypsum, bricks or blocks from clay, terra-cotta or concrete, reinforced, or hollow. Timber can also be used. This type of partition consists of a wooden framework either supported on the floor below or by side walls. Metal lath and plaster, properly laid, forms a reinforced fixed wall. Fixed walls constructed from fibre cement sheeting are popular as bases for tiling in kitchens or in wet areas like bathrooms. Plain or reinforced fixed walls may also be constructed from concrete, including pre-cast concrete blocks. Internal wall partitions also known as office partitioning is made using plasterboard (drywall), or varieties of glass. Toughened glass is a common option as it is feasible however there is also low iron glass better known as opti-white glass which increases light and solar heat transmission. Walls are constructed using beads and tracking which are either hung from the ceiling or fixed into the ground. The panels are inserted into the tracking and fixed. [7]

Wood paneling wall liners is intended for Sheet Metal, Blast Resistant and Fiberglass Shelters, and can be furnished in numerous styles and materials. With the addition of an optional 5/8 inch plywood sub-liner, this wall liner becomes suitable for mounting shelving, fixtures, enclosures and equipment. To complete the look and feel, paneling wall liners are trimmed with baseboards and corner molding.

Due to the ease of installation, familiarity, fire resistance, non-toxicity, and sound attenuation, gypsum wall board is universal in construction. Gypsum board consists of a thin layer of gypsum between two layers of heavy paper and is used or walls and ceilings in most buildings. Gypsum is a mineral found in sedimentary rock formations. It contains chemically combined water that is driven off as steam when subjected to high Temperatures. Gypsum wall board is the most common interior finish used in Canada and the United States. There are several types of gypsum board manufactured for specific purposes. New products are being developed and the industry is always changing. [8]

Figure 1. Modular Arts Interlocking, Rock Tiles (retrieved from www.modtiles.com/servlet/storefront):

a) Furniture wall

A wardrobe or cabinet does not only function as a place to store clothes or other things but it can also function as a divider between different spaces which can also be known as furniture wall. This type of wall could save the cost of building because it does not need to have a concrete wall and furniture separately. Aside from acting as a divider in between rooms, it can also separate space through zones or sections.
b) Multipurpose wall
Today most mobile and flexible wall system - the multipurpose wall - is making it possible to divide one room into several different ones and can separate one room into various small rooms. With movable walls it can divide a large room into a smaller one and turn it back into a large room again. Multipurpose wall can be a rolling, mobile, folding room divider which provide temporary walls in place of traditional non mobile products such as operable walls, accordion partitions, cubicles, pipe and drape, and shoji screens. They are sometimes folded and are on wheels enabling mobility and ease of storage. The Multipurpose wall partition has two full panel end members which provide support, rigidity, privacy and noise reduction. It can divide space quickly where non-mobile permanent room dividers may be unavailable or impracticable. They may also be used as a convenient sight divider to conceal door openings to restrooms, commercial kitchens and other backroom areas. [9].

4. Conclusion
The issue of the increase of high price over the years has been a burdened to the low and middle income groups. This is specifically true to those who have yet bought their first home and young executives who just graduated and started to work. The concept of implementing a sustainable green inner-wall with a flexible floor plan helps these people in a way that they can afford to buy their first home and the design evolves according to their needs and family growth. They could not afford to buy a house with a static floor plan because the nature of the interior of the house that uses the conventional method. Using this idea would definitely benefit both parties; the buyers and the developer.

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