POTENTIAL OF CONTAINER HOUSING IN THE PHILIPPINES[1]

by Josefina Santos de Asis[2]

ABSTRACT

While it is uncertain where the concept of Container Housing originated or who first thought of recycling shipping containers into structural shells of livable units, the fact remains that at present, it is a concept widely canvassed worldwide. Numerous examples may be found of utilizing this material as a stand-alone livable unit or used in combination as a Medium-Rise Building.

Advocates of utilizing this material as building block for construction have enumerated its positive qualities. However, it is important to note that shipping containers, as a livable space, is not a perfect material, particularly with its responsiveness to the hot-humid climate of the Philippines. Still, it is possible that the advantages of utilizing this unit outweigh any disadvantages.

The study investigates whether Container Housing is a feasible solution to the housing needs of the urban poor in the Philippine setting by comparing it with conventional Medium-Rise Housing. Comparison is focused on Engineering Issues, Thermal Comfort, Alteration Issues, and Tentative Construction Cost to be able to provide an overview on the performance of Container Housing when viewed against the conventional Medium-Rise Housing.

Keywords: Medium-Rise Housing, shipping containers, recycling, urban poor housing

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[1] Research Paper chosen as Finalist for Best Faculty Research, Research and Development Office, Technological Institute of the Philippines

[2] Graduate Student, Master of Architecture, Major in Housing, College of Architecture, University of the Philippines, Diliman; and
Faculty, Department of Architecture and Drafting Technology, Technological Institute of the Philippines

1.0 INTRODUCTION

In order to fully understand the concept of Container Housing in the Philippines, the concept must first be broken down into its two main components, namely: Container Housing and the Local Context (i.e. the Philippines) on which the study is being done.

Container Housing

While it is uncertain where the concept of Container Housing originated or who first thought of recycling shipping containers that have outlived their purpose in the shipping industry into structural shells of livable units, the fact remains that at present it is a concept that has been widely canvassed worldwide. Numerous examples may be found in the world wide web of utilizing this raw material both as a stand-alone livable unit and as a building complex similar to Medium-Rise Buildings with simple layouts.

Advocates of utilizing this particular material as a building block for construction have enumerated its positive qualities. Among others, the most common factors that have been noted are:

- By recycling shipping containers that are no longer usable for shipping purposes, thereby considered as 'junk', one may do his part in reducing the sources of pollution / eyesore that abound in local ports

- While these containers are no longer considered seaworthy, particularly in terms of transporting food, it is still structurally sound especially when provided with a good foundation

- In the light of lowering the construction cost and increasing the speed of construction, a shipping container has the advantage because basically, it already is a shell (i.e. it already has walls, floor, and ceiling)

- Since the material is actually considered as 'junk', one may purchase it at a relatively low price, thereby possibly lowering the total construction cost

However, it is important to note that shipping containers, as a livable space, is not a perfect material. Aside from the stigma usually applied to it due to its unsightly appearance (more particularly when it is already battered), the fact remains that it is a steel box which may be affected by moisture and is a good conductor of heat.

Also, while it is considered as an economical choice for other countries, it is yet to be verified whether the same holds true in third world countries like the Philippines.

However, should the initial cost of raw material be substantially low, Container Housing may prove to be a viable solution for the housing deficit with regards to the urban poor.

The Local Context

The next aspect that needs consideration is the local context or the setting on which the study is based. Because architectural solutions are not meant simply to be solution drawn on paper but actual structures located in a specific site and used by actual human beings, it is important to identify and understand this intended site and users.

Taking the concept of Container Housing as an example, while it is highly acceptable in other countries (i.e. mostly Western/European countries), it may not prove to be a viable solution for a third world country like the Philippines due to incompatibility with the local climate or local culture or the discrepancy in the definition of what is economical for these countries.

In particular, the hot-humid climate of the Philippines may prove fatal to this type of housing unit, especially if the unit proves to be difficult to ventilate naturally, since the urban poor are expected to employ only this type of ventilation with occasional aid from electric fans (i.e. air-conditioning units are not used to ventilate the unit). Also, since the country is prone to typhoons, a question arises on whether the structural stability of this type of unit can sustain typical wind speeds during typhoons and whether the frequent rains will not corrode the material.

The study was then conducted with the view that while there is a possibility that Container Housing may be a solution to the housing needs of the urban poor in some countries, whether or not the same solution is feasible for the Philippine setting, needs to be verified.

2.0 METHODOLOGY

On the initial stages of the study, the researcher identified that the intended housing typology to be studied is Medium-Rise Housing (MRH). The researcher then proceeded to identify the various parameters on which the conventional MRH and it equivalent Container Housing be subjected to. These parameters are as follows:

a. Engineering Details
- structural stability
- incorporation of utilities (i.e. electricity, water supply, waste management, etc.)
- response of raw material to some natural disasters (e.g. typhoon, floods, earthquake, etc.)

b. Thermal Comfort
- insulation methods
- alterations needed to make it more responsive in terms of natural ventilation

c. Alteration Issues
- methods and tools needed in making alterations

d. Tentative Construction Cost
- initial cost of raw material
- tentative cost of alterations done to make it habitable
- comparison with existing core housing projects for low-income groups

Upon establishment of these parameters, the researcher then analyzed the conventional MRH produced by the National Housing Authority (NHA) as well as foreign examples of Container Housing. While there are various examples of Container Housing in foreign countries (e.g. stand-alone units, mechanized units, container mansions, container buildings, etc), for the purposes of the study, focus was given only on those who utilized these shipping containers as a Medium-Rise Building (MRB).

To supplement this documentary analysis, the researcher then interviewed some key persons for their first-hand account on the potential of said material in construction.

Figure 1. Container Apartment along Ortigas Avenue Extension

One of the key persons interviewed is Mr. Cornelio Alfonso, a mechanical engineer, who bought some shipping containers in an auction and converted them into an apartment / room-for-rent complex. This apartment complex (Figure 1) is located along Ortigas Avenue Extension, Cainta, Rizal.

Another key person interviewed is Ms. Luchi Romero, a representative of ODD Cubes Incorporated, a trading company with offices in Malabon and a container yard in Navotas. The company deals with selling of used seaworthy shipping containers, as well as the manufacture of container offices or livable units.

From data gathered from these sources, the researcher then created a conceptual container housing unit and building, similar to the conventional MRH of NHA. This conceptual unit, together with the conventional unit, is then analyzed based on the parameters defined to gauge the performance of the conceptual unit.

3.0 FOREIGN EXAMPLES OF CONTAINER HOUSING

Numerous foreign examples of container housing have been analyzed for this study, some of which are discussed below.

CONTAINER CITY, London

Container City located on Trinity Wharf in the Docklands was a project of Urban Space Management, a real estate development and urban management firm.

Figure 2. Residential Unit at Container City I

The project started out with one complex of live/work studio apartments. The original plan was for a 3-storey building made up of recycled shipping containers to house 12 work studios. Shortly after it was finished in May 2001 (5 months of construction), a 4th floor was added to the building.

Due to the success of the project, additional complexes and similar projects have been established, namely Container City II (an extension of the original Container City), Riverside Buildings, Container Learn (additional classrooms for Tower Hamlets College) and Cove Park (an artist's retreat in Scotland's west coast).

Container City II (Figure 3), as an extension of Container City I, was a 5-storey building housing 22 studio units and was completed on 2002. It is connected to Container City I via walkways and is fully equipped with an elevator and full disabled access.

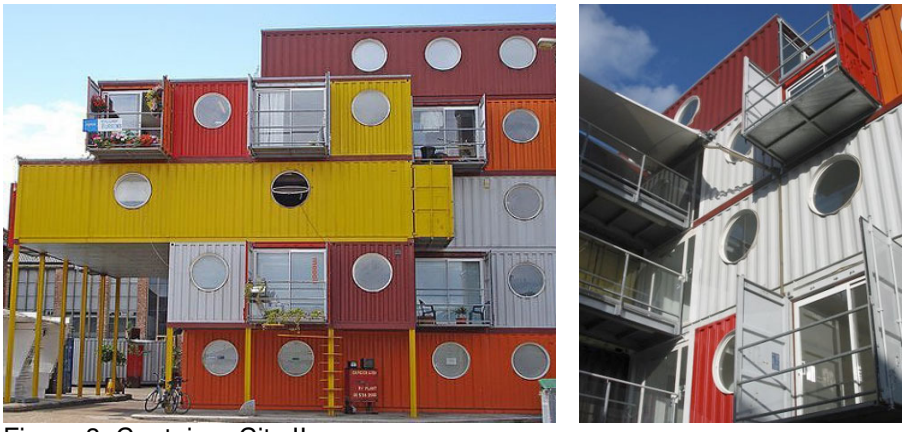

Figure 3. Container City II

The Riverside Building (Figure 4), overlooking the Thames and near the Container City, houses 22 offices. It is made up of 73 recycled shipping containers and took 8 days to construct.

Figure 4. Riverside Building

Figure 5. Cove Park Artist's Retreat

Cove Park Artist's Retreat (Figure 5), on the other hand, is set on 50 acres of Scottish countryside. The project started out with 3 recycled shipping containers but due to the popularity of the center, more units have been added afterwards.

STUDENT HOUSING PROJECT, Keetwonen, Amsterdam

Figure 6. Student Housing Project

Tempo housing designed this complex in 2006 in response to the need for student housing within the city. This 5-storey complex houses 1,000 students in units that are said to be well-insulated, surprisingly quiet and comfortable. Each unit is equipped with a balcony, bathroom, kitchen, and separate studying and sleeping rooms. The complex is also fully equipped with a centralized heating and high speed internet, as well as bike parking.

CONTAINER HOMES, Amsterdam

Perhaps due to the success of the student housing in Keetwonen, another housing project made up of recycled shipping containers sprang out of Amsterdam.

Figure 7. Container Homes in Amsterdam

GLOUCESTER GREEN: RENEW, RECYCLE, REJOICE by Fox and Fowle Architects

This project started when Mark E. Strauss, the principal and director of planning for Fox and Fowle Architects entered this piece for the national design competition sponsored by the Boston Society of Architects.

The team chose a 18.6 acre site located in central Gloucester and used about 3,000 units of 40'x8'x9.5' containers, stacked 8 high, to create 351 duplex loft-housing made up of 4 containers each, commercial spaces (including a hotel), civic/cultural space, and at-grade and below-grade parking.

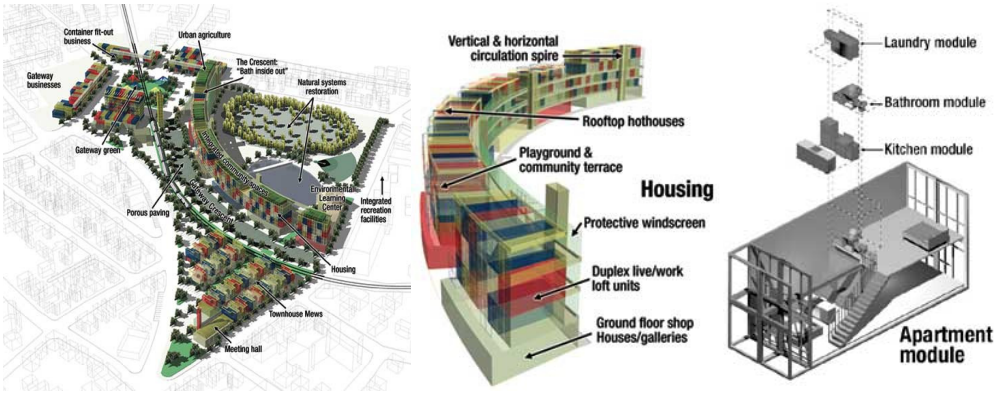

Figure 8. Gloucester Green

4.0 CONVENTIONAL MEDIUM-RISE HOUSING IN THE PHILIPPINES

According to the primer given by NHA regarding the Medium-Rise Housing Program, medium and high-rise housing projects in the Philippines began on 1953 with the Bagong Barangay Housing Project. Various projects and models succeeded this. MRBs that began as 3-storey models shifted to high-rise models (i.e. 7 storeys) in an attempt to provide a larger number of housing units. However, issues regarding maintenance and congestion that resulted to the deterioration of the MRBs led to the restriction on the number of storey to 4 or 5 as was seen in the subsequent MRBs constructed by NHA.

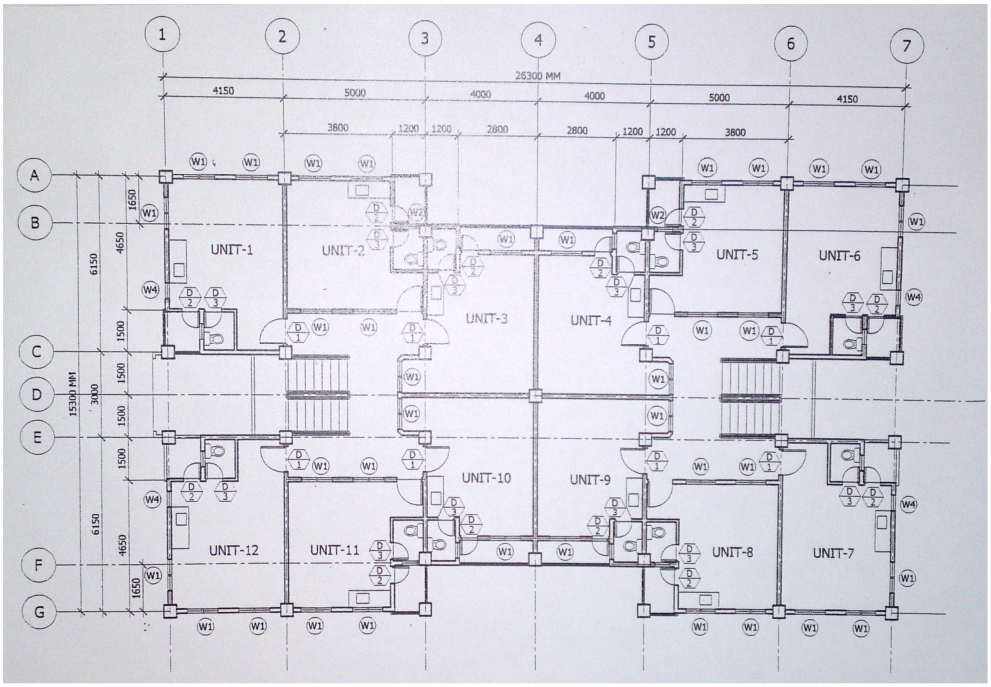

Figure 9. Typical Floor Plan of NHA MRH Model 1

By 1996, a 5-storey prototype MRB, labeled as Model 1, was adopted for almost all succeeding NHA MRB that was constructed. However, in instances when the size of the lot or the configuration of the lot cannot accommodate the said prototype, other MRH Models were created (i.e.

Models 2-4). To date, the design for NHA MRH Model 1 is undergoing revision to enable it to meet the requirements of LGUs better. However, NHA is yet to construct an MRH adhering to this revised plan.

In an earlier study done by the researcher regarding the NHA MRH in Karangalan Village, Pasig City (Figure 10), an example of NHA MRH Model 1, the modes of acquisition and current conditions were discussed.

Figure 10. NHA's MRH Project in Karangalan Village, Pasig City

This MRH is made up of ten 5-story building with units whose floor area varies from 22.50 sqm. (5.00 m. x 4.50 m) to 24.00 sqm. (4.00 m. x 6.00 m.). Units are offered to low-income families who have successfully submitted the requirements to the NHA office and have passed the financial screening test.

As a core housing project, units are sold with minimal finishes. While the exterior have been painted, the unit's interior is left unpainted (i.e. plastered cement finish). The kitchen countertop as well as the floor and walls (i.e. 1.20 m. high) of the T & B are finished with ceramic tiles.

As of May 31, 2004, the cheapest unit is priced Php 227, 000.00. This is a 22.50 sqm. unit located on the 5th floor. A ground floor corner unit with a floor area of 24.00 sqm., on the other hand, is the most expensive unit, priced at Php 469, 350.00. However in the flyer for the most recently finished NHA MRH project in Camarin, Caloocan, these units are priced at Php 275,000.00 and Php 475,000.00, respectively.

5.0 CONCEPTUAL CONTAINER HOUSING UNIT

Using the unit size and layout of the conventional MRH unit (i.e. 4.00 m x 6.00 m) as shown on Figure 11, the conceptual/prototype container housing unit may be constructed out of 2 units of 20' container (Figure 12). Each container has an external dimension of 20' x 8' and an internal dimension of 19'2" x 7'6". Translating these dimensions to the metric system, the conceptual container housing unit will have an approximate internal dimension of 5.55 m x 4.45 m.

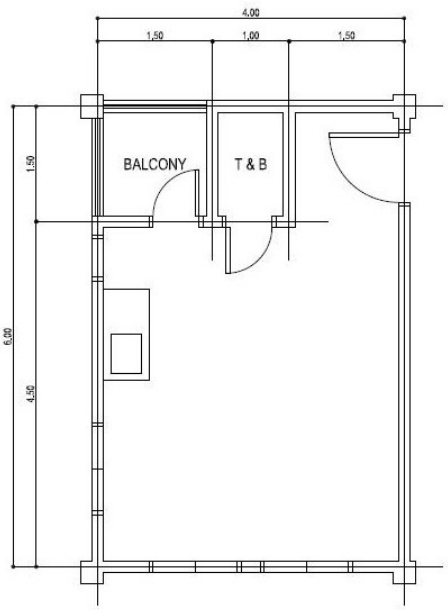

Figure 11. Plan of 24 sqm NHA MRH unit

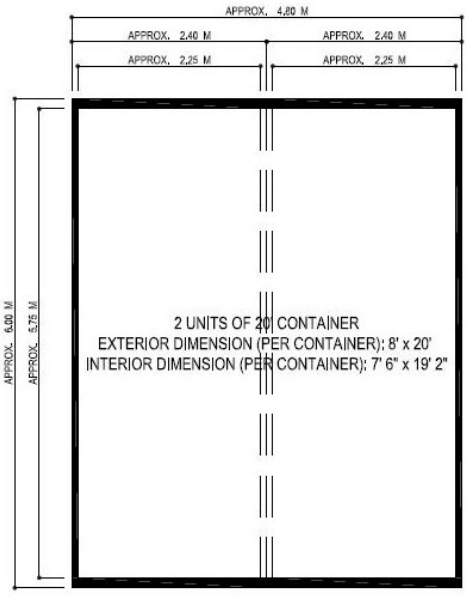

Figure 12. Equivalent Container Unit

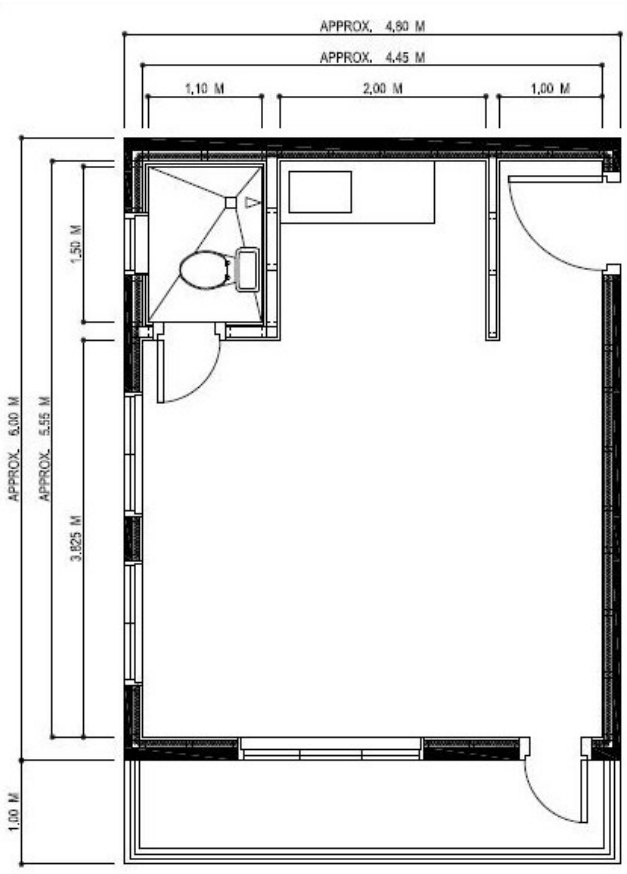

Figure 13. Equivalent Container Unit Plan

Following the unit layout of the conventional MRH unit, the conceptual unit may have the layout shown on Figure 13. The balcony, instead of being incorporated to the unit as was done in the conventional MRH unit, was segregated as an extension of the unit in this instance to minimize the cutting of the container shell for structural and economical reasons. This balcony may be welded to the unit, similar to what was done in the student housing project in Keetwonen, Amsterdam.

Following the layout of the conventional MRH wherein one stairway caters to a group of 6 units per floor (Figure 14), the conceptual container MRH may have the layout shown on Figure 15.

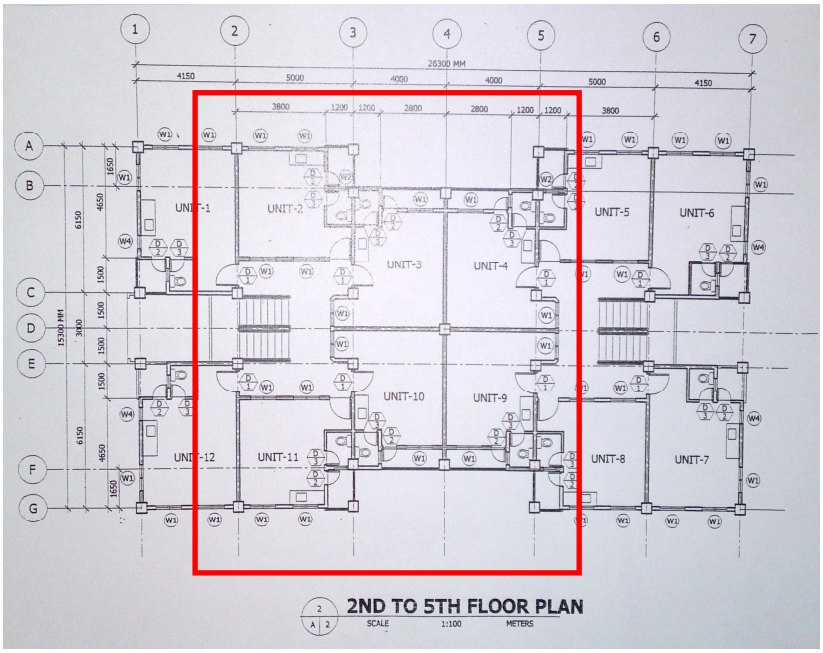

Figure 14. Per Storey Layout of Conventional NHA MRH

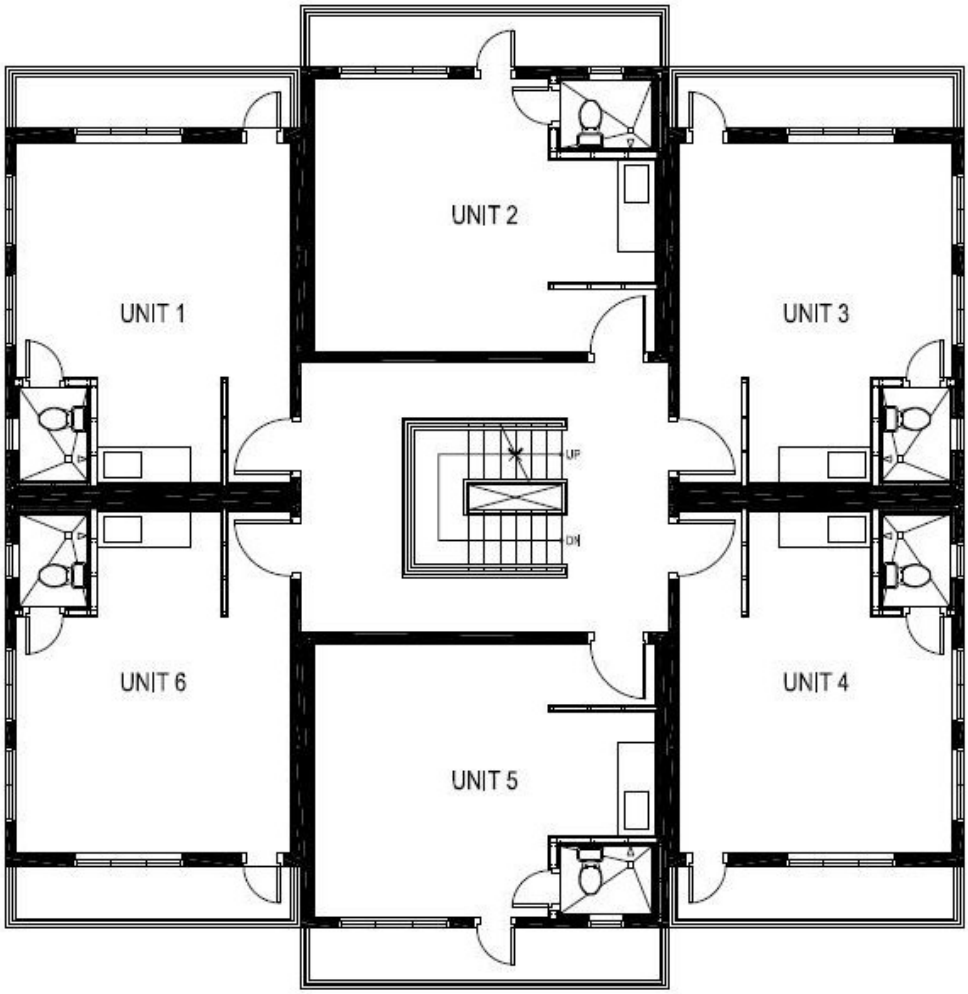

Figure 15. Equivalent Per Storey Layout in Container MRB

6.0 COMPARISON OF THE CONCEPTUAL CONTAINER HOUSING UNIT AND THE CONVENTIONAL MEDIUM-RISE HOUSING UNIT

To better gauge the performance of the conceptual container housing unit in comparison with the conventional MRH unit, a color-coding system is used wherein Green shall signify that the conceptual unit performs better in that category than that of the conventional unit; Yellow shall mean that their performance are relatively equal; and Red shall mean that the container housing unit has a lower performance or requires additional intervention in order to perform as well as that of the conventional unit.

All information listed in the succeeding tables are based on all document studied, as well as various interviews with key persons.

1. Engineering Details

	CONVENTIONAL MEDIUM-RISE HOUSING UNIT	CONCEPTUAL CONTAINER HOUSING UNIT
STRUCTURAL COMPONENTS	▪ requires sound structural design	▪ requires good footing ▪ needs to keep the posts and beams of the container intact
FLOOR LEVEL	▪ 5 stories high	▪ may be stacked up to 8 or 9 livable stories ▪ usually stacked 4 or 5 stories high
INCORPORATION OF UTILITIES	▪ pipelines are concealed beneath floor and wall finishes	▪ pipelines are either concealed by double walls or segregated to the exterior
RESPONSE TO NATURAL DISASTERS		▪ performs well in hurricane and earthquake-prone areas ▪ designed for harsh environments or circumstances brought by sea voyage ▪ does not respond well with ground moisture hence the need to be

		elevated

Table 1. Comparison (Engineering Details)

2. Thermal Comfort

	CONVENTIONAL MEDIUM-RISE HOUSING UNIT	CONCEPTUAL CONTAINER HOUSING UNIT
INSULATION METHODS	▪ no insulation required/applied	▪ requires insulation ▪ foreign contractors (Tampa Armature Works) sprays Supertherm Insulative Coating to handle heating & cooling ▪ for local contractors, ODD Cubes Inc. used double walls with fiberglass insulation while the container apartment in Ortigas used double walls with foam insulation
NATURAL VENTILATION ISSUES	▪ promotes cross-ventilation	▪ in the case of the container apartment in Ortigas, units on the 2nd floor are usually ventilated naturally ▪ possible reasons, aside from applied insulation, could be site intervention (i.e. vegetation)

Table 2. Comparison (Thermal Comfort)

3. Alteration Issues

	CONVENTIONAL MEDIUM-RISE HOUSING UNIT	CONCEPTUAL CONTAINER HOUSING UNIT
		▪ pre-cutting or initial alteration of units may be done in factory for a faster & cheaper option (mass production) ▪ if on site, oxy-acetylene

		welding / cutting are used ▪ ODD Cubes Inc. priced each cut at Php10,000.00

Table 3. Comparison (Alteration Issues)

4. Tentative Construction Cost

	CONVENTIONAL MEDIUM-RISE HOUSING UNIT	CONCEPTUAL CONTAINER HOUSING UNIT
	▪ as of May 31, 2004, 24 sqm. corner units are priced at Php 280,350.00 to Php 469,350.00, depending on the floor on which the unit is located ▪ Assuming a construction cost of Php 10,000.00 per sqm., the estimated construction cost of the said unit would be Php 240,000. ▪ Taking the 5th floor unit as an example, a difference of Php 40,350 between the assumed construction cost and the unit cost may be considered as the amount added on the unit to cover the construction costs of the common areas servicing the unit (e.g. stairs, hallways, parking, etc.)	▪ ODD Cubes Inc. sells a livable unit for Php360,000 ▪ <u>For on-site construction:</u> ▪ Mr. Alfonso bought 20' Class C containers for Php39,000 each. Thus, the 2-20' containers needed for the conceptual unit would cost Php78,000 ▪ As priced by ODD Cubes Inc., each fenestration on the unit cost Php10,000. Thus, the conceptual unit with 4 windows & 2 doors would have an additional expense of Php60,000 ▪ Considering the same amount needed for the construction of common areas servicing the unit (i.e. Php 40,350), that would leave Php 102,000.00 – Php 291,000.00 for other alterations needed (e.g. double walls, utilities, insulation, finishes, etc.)

Table 4. Comparison (Tentative Construction Cost)

Upon summarizing the results from the preceding tables, the study arrived at the following findings.

ENGINEERING DETAILS	▪ for a 5-storey building, the 2 housing types exhibit similar characteristics ▪ container housing units only requires the additional precautionary measure of elevating the unit above ground not only for flood reasons but also to keep the ground moisture from corroding the material
THERMAL COMFORT	▪ while both may be insulated by the same means (i.e. foam insulation), the conventional unit do not actually need this insulation while the container housing unit requires it
ALTERATION ISSUES	▪ the container housing unit have the option to be pre-fabricated for a faster, more exact, and cheaper construction (for mass production)
TENTATIVE CONSTRUCTION COST	▪ the container housing unit may be constructed for the same cost as that of the conventional housing unit

Table 5. Summary of Findings

7.0 CONCLUSIONS AND RECOMMENDATIONS

As demonstrated by the tables above, based on the categories on which the 2 housing types were investigated, Container Housing is a feasible solution for Low-Cost Housing in the Philippines or at least, it performs as well as that of a Conventional Medium-Rise Housing unit.

Also, analysis from the information gathered through the study indicates that the strongest feature of this type of material lie in (1) its capacity for speedy construction not only through prefabrication but also through the method of construction (i.e. lifting and stacking the units like 'Lego' blocks); and in (2) its capacity to be easily dismantled and transferred to a different site.

However, since the study done was mostly a Documentary Analysis, it is recommended that further studies be made, particularly that in gauging the actual performance of the unit through the construction of

a prototype unit. This will give a clearer insight on the performance of a Container Housing unit by generating actual or empirical data.

Also, to better gauge the effectiveness of this type of material for medium-term occupancy, structural testing of the unit may be required to arrive at a clearer data on the number of years that a shipping container may still be considered as structurally sound as a livable unit after it has been classified as being no longer seaworthy.

Furthermore, additional studies are needed to determine how receptive local regulations and building officials are to this type of construction as well as to what particular or additional rules and regulations are needed for this material and type of construction.

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