

Analysis of the Application of Eco Interior Design Concepts in Shipping Container Buildings: Case Study in Arbanat Restaurant Malang

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Abstract: Globally, more than seventeen million shipping containers are left for days in ports and keep piling up at the port since delivering empty shipping containers to their origin is considered cost-prohibitive. Therefore, Shipping container building is one of the buildings that apply eco-friendly and sustainable practices in this modern era. The Arbanat Restaurant is one of the interesting buildings made out of shipping containers in Indonesia since it was the first shipping container building in Indonesia. This research tried to scrutinize whether this building has already applied the sustainable principle. In this research, we use the descriptive qualitative methodology with analysis data using eco-interior theory. The result of this research showed that the Arbanat restaurant had applied sustainable principles, especially in eco-interior design with mild effort, which means that it was not fully optimal or ideal. It is categorized as the first: substantial effort on the part of space organization, lighting system, ventilation system, and indoor pollution. The second is a mild effort with material selection, electromagnetic emission, and indoor waste management. The last one was a common application on the part of water sanitation.


1 INTRODUCTION


Ecological and green design is an emerging topic broadly discussed in building environment-related fields (Aktas, 2013). In the field of interior study, this concept is also known as an eco-interior design (Kusumarini et al., 2011). It is an interior space concept that is considered environmentally friendly and energy-efficient. This concept is a part of the sustainable interior design concept (Jain, 2023), which could be attained by creating a design adaptive to activity changes, energy conservation, and efficient material management, in addition to thermal control and views to outdoor access (Winchip, 2011).

Today's design and construction activities must be ecological and sustainable approaches (Soegijanto, 2014). Sustainable design means that a design must respond to the environment; it is necessary to consider the natural resources that affect human beings in the future. One of the most critical aspects of this approach is the idea of sustainability, which

according to the World Commission on Environment and Development "must take into account the needs of the present without compromising the ability of future generations to meet their own needs (Papanek, 1995). Moreover, the building design must prioritize good planning comprehensively, which does not damage nature but can blend with nature itself (Alimin et al., 2021).

Shipping container building is one of the buildings that apply eco-friendly and sustainable practices in this modern era (Kiil, 2021). The shipping container has been reused as a part of urban architecture since it was introduced in the early 20th century (Schwarzer, 2013). Globally, more than seventeen million shipping containers are left for days in ports after their first shipping period (Gharehgozli, 2012). These shipping containers keep piling up at the port since delivering empty shipping containers to their origin is considered cost-prohibitive (Kuzmicz & Pesch, 2019). Therefore, using a shipping container as a building component or material could address this issue (Primasetra, 2019). Furthermore, turning

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shipping containers into buildings could significantly reduce the energy used during the construction process compared to the energy required for the common building (Haque et al., 2022).

Arbanat Restaurant is one of many buildings made out of shipping containers in Indonesia. This restaurant exhibits a more interesting and variative arrangement than other shipping containers in Indonesia, making it the first shipping container building in Indonesia mentioned in the well-known Southeast Asian architecture magazine, *Archinesia* vol.12 (ARCHINESIA 12, n.d.).

From an architectural perspective, Arbanat restaurant is categorized as a building that implements a sustainable concept for reusing shipping containers. Reusing shipping containers as a building structure is a reasonable practice of sustainability because most of its structures are made of recycled materials (El Messeidy, 2018). From the interior design perspective, there has yet to be a study reporting the ecological concept of Arbanat restaurant. Therefore, this study attempts to identify whether or not Arbanat restaurant's building has met the sustainability criteria, particularly its eco-interior aspects.

More specifically, this study aimed to see the implementation of the eco-interior design concept in Arbanat restaurant's shipping container building. The discussion of eco-interior design is necessary to introduce this concept to the public, especially designers, so they are more familiar with and apply it (Soegijanto, 2014). To this end, we scrutinized the object that has implemented ecological principles to see its implementation and classification of its application.

2 METHODS

This qualitative descriptive observed the interior of the service area in Arbanat restaurant and documented the area using a camera. An interview with the restaurant manager was also conducted to ensure data validity. Data were analyzed using eco-interior design concepts and parameters. The parameter was adapted from and developed based on Sustainable Housing in Indonesia (Larasati et al., 2007) by adjusting it to the eco-interior design context.

The eco-interior concept included: space organization, material selection, lighting system, ventilation, water sanitation, indoor pollution, electromagnetic emission, and indoor waste management (Kusumarini et al., 2011).

The finding of this study is presented as follows: first, we describe the interior design condition of Arbanat restaurant based on the eco-interior design concept. Second, we classify the implementation of the eco-interior design concept in Arbanat restaurant based on the eco-interior design parameters, which are classified into common application, mild effort, substantial effort, and ideal situation (Kusumarini et al., 2011). Common application refers to the implementation usually done by people without any specific reason to respond to environmental issues. The mild effort is an implementation done as a response to the environmental issue, yet it does not become the focus and has significant impacts. The substantial effort is an implementation done as a response to environmental issues, which is done deliberately and thoroughly and brings significant impacts. The ideal situation is an implementation consciously done to respond to environmental issues, which serve as a priority.

3 RESULTS

3.1 An Analysis of the Eco-Interior Design Concept in Arbanat Restaurant

Analysis of the application of the eco-interior design concept in Arbanat restaurant was carried out using an eco-interior design approach, namely in the aspects of spatial organization, material selection, lighting system, ventilation system, water sanitation, indoor pollution, electromagnetic emission, and indoor waste management.

3.1.1 Spatial Organization

Arbanat restaurant has three areas: private, service, and public areas. On its ground floor, a shipping container is placed diagonally, serving as the cashier room, service room, and restroom. Other shipping containers on this floor were arranged horizontally and served as kitchen, service, dining, and coffee shop areas. On the second and third floors, shipping containers were stacked in different positions from those on the ground floor. This arrangement aimed to break opinions that shipping containers should be stacked in parallel. Directions of these rooms were adjusted to the circulation flow, natural opening, and room accessibility. The rooms were set to have minimal, multifunctional properties. Each room used at least two 40ft shipping containers. The restaurant's

spatial organization was adjusted to the container shape and lengthwise arrangement.

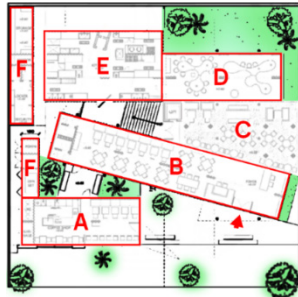


Figure 1: Spatial organization in Arbanat Restaurant's ground floor, consisting of coffee shop (A), service room-1 (B), semi-outdoor area (C), service room-2 (D), kitchen (E), and warehouse (F).

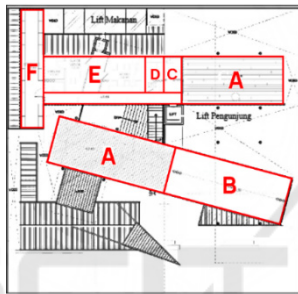


Figure 2: Spatial organization in Arbanat Restaurant's second floor, consisting of semi-outdoor area (A), service room-3 (B), restroom (C), praying room (D), office (E), and warehouse (F).

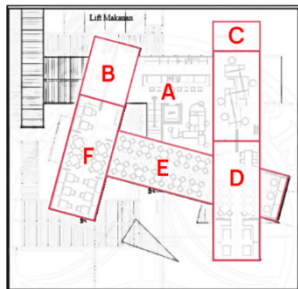


Figure 3: Spatial organization in Arbanat Restaurant's third floor, consisting of lounge (A), preparation room (B), restroom (C), service area-4 (D), semi-outdoor area (E), and service area-5 (F).

3.1.2 Material Selection

Shipping containers were used as the restaurant's wall and ceiling on the ground floor. However, some areas were covered by gypsum board. The floor was made using vinyl and ceramics. The interior materials were dominated by gypsum, wallpaper, wood, iron, and

high-pressure laminate. Some furniture was made from reclaimed wood from the restaurant's surroundings, which was finished using water-based (eco-friendly) and melamine-based (containing hazardous chemicals) materials.



Figure 4: Interior design of the coffee shop area in Arbanat Restaurant.



Figure 5: Interior design of the service room-1 in Arbanat Restaurant.



Figure 6: Interior design of the service room-2 in Arbanat Restaurant.

3.1.3 Lighting System

Arbanat restaurant is designed for energy efficiency and conservation. The containers were arranged following the sun's path. Small windows were also installed in every room to reduce the restaurant's electric power consumption. Energy conservation was done by optimizing natural light in every room and utilizing energy-saving lamps. The restaurant also attempted to reduce the sun's heat using plants placed around the building. However, this restaurant

has not used renewable energy sources and still has incandescent lamps in some areas.



Figure 7: Natural light in coffee shop area.



Figure 8: Natural light in service room-1.



Figure 9: Natural light in service room-2.

3.1.4 Ventilation System

The restaurant utilized both natural and mechanical ventilation. The former included the installation of ventilation and crossed building mass arrangement. Meanwhile, the latter was in the form of air conditioning (AC) and fans. The restaurant's energy conservation effort was made by limiting AC use. It was only turned on when customers came and during the hot weather. The restaurant also used energy-saving AC to ensure energy efficiency. The crossing

container arrangement, semi-outdoor area, and void were found to significantly affect the airflow to the centre of the building, thus reducing the heat.

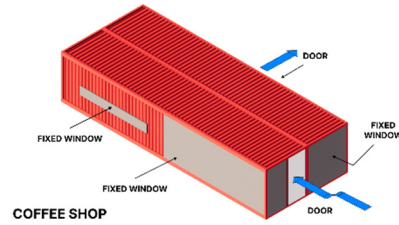


Figure 10: Ventilation and air circulation flow in coffee shop area.

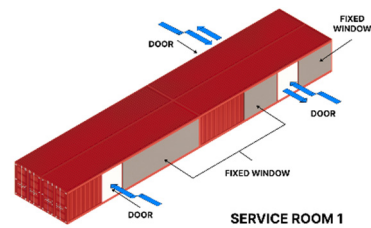


Figure 11: Ventilation and air circulation flow in service room-1.

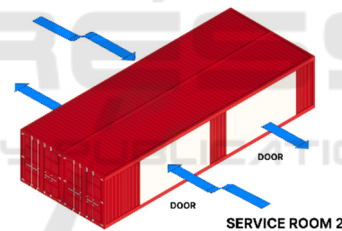


Figure 12: Ventilation and air circulation flow in service room-2.

3.1.5 Water Sanitation

The restaurant's water source was a deep well. The water was stored in a tank, filtered, and passed to the areas that needed water. The restaurant does not have a water conservation system such as rainwater collection and wastewater management. Arbanat restaurant used water for cooking, washing, toilets, and watering plants. There were two sewages: grey water and black water. The former was disposed to the public drainage, while the latter was disposed to the septic tank.

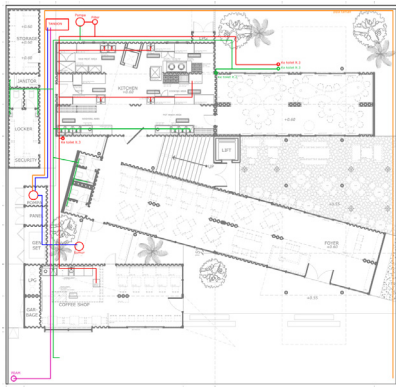


Figure 13: Water sanitation on the Arbanat Restaurant's ground floor.

3.1.6 Indoor Pollution

Arbanat restaurant used a natural ventilation system to minimize indoor air pollution. It also selected eco- and human-friendly finishing materials for several rooms. However, some rooms still used chemical finishing materials. The restaurant also maintained its hygiene to minimize indoor pollution by using Natural, non-hazardous cleaners. Arbanat restaurant did not have a noise pollution management system such as acoustic or noise control.



Figure 14: Void area in the center of Arbanat Restaurant.



Figure 15: Void area in the back of Arbanat Restaurant.

3.1.7 Electromagnetic Emission

Arbanat restaurant anticipated the radiation by using electrical grounding. The power cables were neatly inserted into PVC pipes to protect customers from electric shock potentials. The electrical use in the restaurant was also limited according to the service area needs.

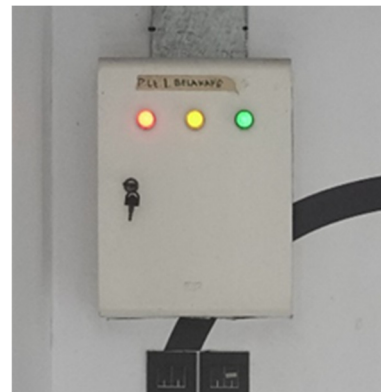


Figure 16: Electrical safety system in Arbanat Restaurant's ground floor.

3.1.8 Indoor Waste Management

The restaurant's waste was divided into two types: kitchen waste and food waste. The kitchen waste comes from the cooking activities in the kitchen, while the food waste refers to the customers' food leftovers. Each room was equipped with one type of trash bin without separation of organic and non-organic waste. The waste was collected in one place, separated into organic and nonorganic materials, and disposed to the public waste collection site.



Figure 17: Trash bin in Arbanat Restaurant's service room.

3.2 The Classification of Eco-Interior Design Concept Application in Arbanat Restaurant

Table 1: Common Application of Eco-Interior Design.

Aspects	Analysis
Spatial organization	The room adjustment with natural circulation and openings. (Substantial effort)
Material selection	Minimizing the use of common materials without ecological considerations. (Mild effort)
Lighting system	Using natural light during the day and using efficient lighting at night. (Substantial effort)
Ventilation system	Using energy-saving air conditioning, and optimizing air circulation while minimizing air conditioning use. (Substantial effort)
Water sanitation	Using conventional water sources and direct drainage. (Common application)
Indoor pollution	Adequate attention to the cause and effect of indoor pollution. (Substantial effort)
Electromagnetic emission	Minimal understanding of the electromagnetic issue. (Mild effort)

4 CONCLUSIONS

Based on the analysis result, applying the shipping container does not mean that building has already applied sustainable principle. In this research, the Arbanat restaurant has not completely applied the eco-interior design concept as part of sustainable principle. The restaurant’s application was divided into three categories: substantial, mild, and common efforts. A substantial effort was made for the spatial organization, lighting system, ventilation, and indoor pollution. A mild effort was made for material selection, electromagnetic emission, and indoor waste management. However, the restaurant’s water sanitation is considered to be a common application.

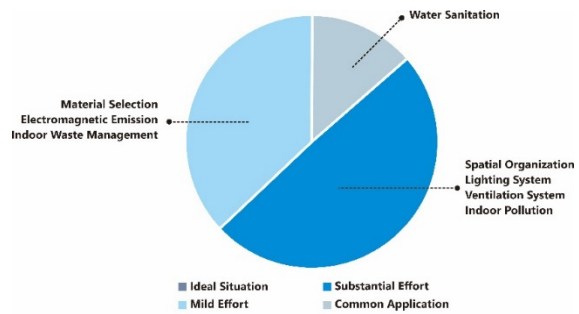


Figure 18: The classification of eco-interior concept in Arbanat restaurant.

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