

## Refunctioning Unused Containers: Cargotecture Concept on an Indonesian Library



With the green premise growing in popularity across the globe, more and more people are turning to cargo container structures for green alternatives. There are countless numbers of empty, unused shipping containers around the world just sitting on shipping docks taking up space. This movement of using cargo containers as a part of, if not the whole, building structure creates a term in architecture called Cargotecture. Containers are in many ways an ideal building material because they are strong, durable, stackable, cuttable, movable, modular, plentiful, and relatively cheap. Architects as well as laypeople have used them to build many types of buildings such as homes, offices, apartments, schools, dormitories, artists' studios, and emergency shelters.

However, Cargotecture applications in tropical countries may be tricky for they need further considerations for the sunlight and year-long heat exposures. Special treatments for thermal insulation done inside and outside are required. Instant application of insulation paint may be seen as a solution for exterior. As for the interior, another addition of layers for roof and wall system is extremely needed. Not only heat, high humidity in tropical countries may also be quite challenging due to rust issue for this metal based material.

### **Amin Library: Cargotecture and use of passive designs**

To respond to the green building trend, create an iconic building, and overcome the challenges, the idea to re-function unused containers in adaptive manners was applied to "Amin Library" in Batu, Malang, Indonesia. This unique facility located at Jl. Sultan Agung, Batu, Malang, East-Java, was built with cargo composition that resembles books that will open the children's eyes to the world the containers have traveled through before ending up as a library and polyclinic. This project aims at leveling the playing field by providing an educational facility with over 6,000 books and a small clinic, all for free. Each of the colored boxes is

attributed to a different function and a different book collection.

The adaptive manners are given for thermal insulation application in this non-profit library. Located in tropic highland, this fully metal material applied glass wool layer for its roof and wall system to reduce the heat gain to make a habitable library interior.

The interior walls and ceilings are all covered with glass wool underneath gypsum board application. The glass wool acts as a heat reduction system and enhances the acoustic performance to create a sedate library from outside noise. Moreover, carpets are added to the floor to reduce footsteps noises. Exterior wise, Amin Library had not applied any thermal insulation paint yet, but anti-rust coating was applied in response to high humidity and rainfall intensity on site.



Another passive design approach applied in Amin Library is the shading technique. Shading surfaces are creatively created from the cargo mass composition. These 8 colorful cargos, which represent 8 book collection categories, are stacked and supported in such a way so that on daylight they will provide shadowed areas for cargos underneath. The cargos are also tilted so that they are not perpendicular to the axis of the wind. The tilted composition is aimed to avoid direct heat exposure from the west and east façade because of the length of the site. The allocations of openings are also located along the long side of the cargos to gain maximum daylight. But yet, since the long side of the cargos tends to face the direct exposed heat, a canopy was installed for each exposed window to reduce heat gain but keep the daylight harnessed.

Cross ventilation is applied to several rooms of the library to make use of the wind provided on site and to keep the IAQ in good condition. However, this natural ventilation is not fully applied to all of the cargos in Amin Library. Some rooms that are needed to be kept quiet have exhaust fans and air conditioners installed inside and use inoperable window with proper sealant to keep the air tightness. These mechanical ventilations only operate during the day. At night, Amin Library optimizes the use of the cold weather in Batu, Malang. (AGB.com – ED)