

# The first green diagnostic centre and laboratory building in Indonesia

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## ARTICLE INFO

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## ABSTRACT

Like every human activity, clinical laboratories produce a carbon foot-print which they have a societal obligation to reduce. The renovation or construction of a new laboratory provides an opportunity to achieve this. A new, environmentally-friendly diagnostic centre in the city of Surabaya, Indonesia, was recently constructed under the supervision of a LEED (Leadership in Energy and Environmental Design) - certified architect incorporating the three basic tenets of good environmental practices, i.e. to reduce, reuse and recycle. Sustainable practices that were adopted in the construction of the building involved its architectural features, the location and the construction materials used. The building has been designed for energy and water conservation in the long-term. The cost for these green features was an additional 30% compared to that of a conventional building. It is expected that this extra cost will be recouped in the long run through cost-savings.

## INTRODUCTION

All human activity consumes resources, leaves a carbon footprint and produces waste. The clinical laboratory is no exception to this rule and it impacts the environment in several ways. They therefore have a societal obligation to reduce their environmental impact. Laboratories may do so by adopting policies and activities that are sustainable and environmentally friendly. The construction of a new laboratory building or renovation of an existing one provides an excellent opportunity to make it environmentally-friendly with regard to the utilization of building materials and recurrent resources such as energy and water and waste production. (1)

LEED or Leadership in Energy and Environmental Design, is a green-building certification program that recognizes best-in-class building strategies and practices. It is the most widely recognized and used green-building program across the globe (2). The first green laboratory and diagnostic-centre building in Indonesia, the Grha Prodia, was opened on 14<sup>th</sup> March 2015 in the city of Surabaya. This centre performs an average of about 60,000 tests a month of which clinical chemistry, including urinalysis, accounts for about 43,000.

The building was designed and constructed under the supervision of a LEED-certified architect. LEED accreditation for the building is being sought. The three fundamental tenets of good environmental practices, namely, to reduce, reuse and recycle, underscored its design and construction. The building has also been designed to make the internal environment mentally conducive for the staff.

The sustainable practices that were adopted for this building have involved consideration of the following aspects:

- The location and features of the building;
- The construction materials used;
- Energy conservation;
- Water conservation.

The incorporation of green features to the building has resulted in a 30% increase to the overall cost compared to that without these features.

## LOCATION, BUILDING FEATURES

The key features of the building are stated in Table 1. The building has a recycling facility. Initially this will be for paper and plastics. It is located in one of the main arteries of Surabaya close to amenities such as banks, schools and

**Table 1** Building parameters

Feature	Parameter
Main orientation	north-south
External dimensions	18.75 by 56.45 metres
Floors (including ground floor)	11
Total gross square footage / gross floor area	4406.577 sqm
Total parking floor area	1.027,601 sqm
Total floor space (include basement parking)	5434.178 sqm

other facilities. This will enable the approximately 213 staff members to use these facilities without having to travel long distances and thereby reduce their carbon footprint. In addition clients and suppliers will also have easy access to the building. The parking lots are reserved for staff who car-pool. There are bicycle racks and three showers for staff who commute by bicycle.

### **Orientation and space**

The main axis of the building has an east-west orientation to reduce the heat from the sun. This means that most of the external surface area faces the north-south axis and is not directly exposed to the heat from the tropical sun. To further reduce the heat inside, the building has been constructed with sun-shading horizontal fins made from aluminum panels.

The building occupies 50% of the land area belonging to it. Of the remaining area surrounding the building, 41% has been turned into garden space, which is 3 m wide. This contrasts with the city requirement of 10% for green space for public buildings. The local species of grass and trees that make up the garden requires minimal maintenance. In addition, there is a roof top garden.

### **Indoor environmental quality**

The building has been designed such that 95% of all spaces that are regularly occupied have a view of the outside. This is important for eye and mental health, which should yield the consequent benefit of improved work performance. The top floor where meetings are held has glass walls on 3 sides with a view of the city.

## **BUILDING MATERIALS USED**

Recycled materials were used in the construction of the building. Most of the materials were manufactured in nearby regions. The envelope of the building contains rock-wool that provides

both thermal and sound insulation. The steel and aluminum used has recycled content; the latter was produced very close to the building. Fly-ash was used in the construction of the concrete structure. It is a recycled material composed of the fine particles which is one of the residues generated by coal combustion. Care was taken to ensure that the paint used had low volatile organic compounds (VOC) since organic compounds used in conventional paint have VOCs that are carcinogenic.

The waste materials generated during construction were glass, ferrous metals, non-ferrous metals, gypsum, concrete, wood, cardboard and plumbing fixtures. They were kept in separate bins and sold for recycling.

### **Floor covering**

The floor spaces that are carpeted use square tiles (50 x 50 cm) to permit replacement of the tiles in the event of damage or wear and tear. The tiles were made of 100% recycled materials. In areas where linoleum is used as in the laboratories, it is made from linseed oil. This is a rapidly renewable material that can be harvested and put to use for manufacturing in less than 10 years from planting. Both the linoleum and carpet tiles were imported.

## **ENERGY CONSERVATION FEATURES**

### **Natural lighting**

The rooms have been designed to maximize the use of natural light. The windows are adequately sized to allow the maximum amount of natural light to enter a room. All rooms in the building have windows with a view of the outside. The building is insulated with double-glass windows which have high-performance low-emissivity glass on the inside and tinted glass on the outside. With a window height of 3 meters, it is calculated that light can penetrate 6 meters into the space.

### **Lighting**

The building uses light-emitting diode (LED) lighting with motion sensors in every room which automatically switch off the lights when the rooms are not occupied. LED lighting is approximately 3 times more expensive than conventional lighting.

### **Air-conditioning**

The temperature inside the building is set by thermostat at 24° C. The air-conditioning uses a Variable Refrigerant Volume® (VRV) system from Daikin (Japan), a concept that is similar to inverter air-conditioners that are commonly available. The amount of cool air that is produced will depend on the number of persons in the room. The VRV system is 3 to 4 times more expensive compared to conventional air-conditioning systems.

## **WATER CONSERVATION MEASURES**

The city of Surabaya faces a water-shortage in the dry season and receives excessive rain that results in floods during the wet season. The building expects to obtain 42% of its water requirements from processed sewage and rain-water and will depend on the city for only 58% water supply. Rain-water will be harvested from the roof and stored in a tank with a 11,000-litre capacity which is located in the basement floor. The building contains a sewage treatment

plant. The water salvaged from the plant is used for the toilets and for watering plants.

### **Toilets**

All toilets have a dual-flow capability which use 4.5 and 3 L of water, respectively, per flush as against single-flow conventional toilets that use 6 L. The urinals in the building are of two types: waterless urinals for the staff and low-flow urinals for the public who may not be familiar with the former. All faucets have sensors that provide the same flow for less water. These water-saving devices are approximately 150% more expensive than the conventional ones but use 43 % less water.

## **CONCLUSION**

The construction of this green facility is recognition of the need for sustainable practices by laboratories. It is a visible act of corporate social responsibility that should yield intangible rewards in the future. It is expected that the additional cost of the building will be eventually recovered through lower energy costs and other sustainable practices.

## **REFERENCES**

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