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Environmental Planning and Evaluation of Office with Funnel Shaped Void

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Abstract

This paper shows the environmental planning and evaluation of an office with a funnel shaped void which was constructed in 2012 in Osaka, Japan. The design theme of this pharmaceutical company's office building was "an office for a healthy future"- architecture that is healthy for both the global environment and users. The design aimed at creating an office building with low energy consumption that makes maximum use of natural conditions. An open-air atrium stretching from the first basement level to the roof was provided in the center of the building. The building is also provided with greenery on upper floors, mist spraying equipment, natural ventilation windows, a terrace for relaxation, etc. in an effort to reduce energy consumption and create a healthy and appealing environment. This paper first explains the design conditions and concept of this office building, and then discusses the design approaches. Lastly, it evaluates the effect on the basis of the actual measurement data. The introduction of energy-saving technology achieved a significant reduction of the primary energy and CO_2 emissions throughout the building.

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Keywords: office; healthy; open-air atrium; use of daylight; use of natural wind

1. Introduction

Over the last decade, designing an energy efficiency building has become widespread. Along with the aging society, the awareness of health is growing progressively. For example, the WELL Building Standard, the world's first building standard focused exclusively on human health, was announced in September 2015. Office design for human health will become increasingly important in the future.

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We had a chance to design an office building for a pharmaceutical company. The building, constructed in 2012, is

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situated in Osaka, Japan. We designed the building to be healthy for both the global environment and users by building an open-air atrium. The aim of this paper is to describe the design approaches and the effect of the office building that is friendly to both the environment and health.

This paper first explains the design conditions and concept of this office building, and then discusses the design approaches. Lastly, it evaluates its effect on the basis of the actual measurement data.

2. Design Conditions

2.1. Site and Regulations

The site is located on the northwest corner of a highway interchange (Fig. 1). It offers good views to the east and south. There are district planning regulations on this district; the outer walls of buildings are required to set back 5 meters from the site boundary, and the horizontal projected area of the fourth and upper floor section is required to be less than 40% of the site area. In order to preserve the excellent views from the site and create an office building with low energy consumption that makes maximal use of natural conditions such as sunlight and natural wind, we designed an office with a big open-air atrium, instead of a high rise tower (Fig. 2).

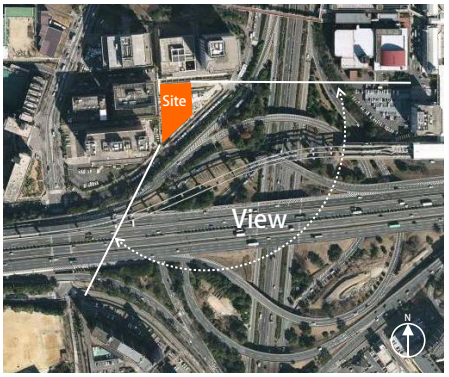

Fig. 1. aerial photo.

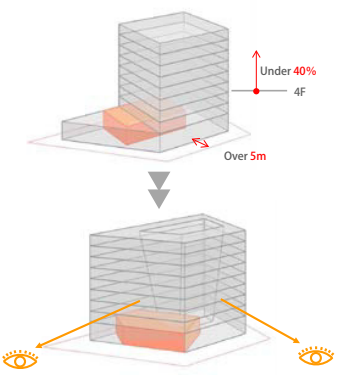

Fig. 2. diagram.

An open-air atrium stretching from the first basement level to the roof was provided in the center of the building, creating a boomerang shaped office layout that has brought about bright office spaces with magnificent views (Fig. 3) and besides has achieved effective use of the external light and outside air for energy saving. Consequently, this building was certified as the class S under CASBEE (Comprehensive Assessment System for Built Environment Efficiency), which is the highest rank in the environmental performance evaluation system in Japan. [1]

(a) (b)

Fig. 3. (a) south elevation; (b) bright office space.