綠建築參訪心得

■ 窗戶充足採光
Windows optimal for lighting.

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Afterthoughts of a Tour

一、前言

（一）鑑於「節能減碳」已成為世界趨勢且目前政府亦將其列為重要政策之一，而在建築工程方向的節能減碳具體作法則落實於「綠建築」設計，我國政府部門前因應82年聯合國成立「永續發展委員會」後，於85年成立「行政院國家永續發展委員會」，並由行政院經建會將綠建築納入城鄉永續發展政策之林，正式宣示全面啟動綠建築方案。並由內政部建築研究所於88年公布「綠建築解說與評估手冊」，推動「綠建築標章」作為綠建築的識別標誌。

I. Introduction

(I) Due to the fact that "Energy saving and carbon dioxide emissions reduction" had become a world trend and an crucial current policy of the government, our architecture constructions has also implemented designs of "Green Building". Government sectors responded to the establishment of the "United Nations Commission on Sustainable Development" in the year 1993 by establishing the "National Council for Sustainable Development" in 1996. The Council for Economic Planning and Development of the Executive Yuan added Green Building into the city and rural sustainable development policies, formally declaring the activation of a comprehensive Green Building Project. The Architecture and Building Research Institute of the Ministry of The Interior proclaimed the "Evaluation Manual for Green Buildings in Taiwan" in 1999 and promoted the "Green Building Label" as the label for Green Building identification.

■ 爬藤木層架
Wooden frame with vines.

■ 圖書館外觀
The outer appearance of the library.

（二）台北市立圖書館-北投分館堪稱我國推行「綠建築」表率，該館於94年2月榮獲內政部綠建築9大指標候選證書，並榮獲2007年「臺灣建築獎」首獎，主體建築自然融入於北投清幽靜謐的環境中，還具有各項節能減碳相關應用，其中「生態保育及綠建築」等相關叢書亦為館藏典藏重點之一，本署後勤處為使同仁能實地瞭解綠建築的意義並親身體驗，特安排由副處長郭啟材率處內同仁以響應節能減碳之方式，搭乘大眾捷運前往這「綠意盎然」的生態圖書館。

二、參訪所見特色：

（一）結合當地地貌：

台北市立圖書館北投分館座落於林木茂密、生態環境豐富的北投公園內，是一座與自然環境相融合的生態建築，外觀彷彿一座大型高架樹屋；此外北投圖書館並與當地的溫泉博物館比鄰而居，森林中有公園，公園中有圖書館及博物館，再加上小溪及山林的環繞，讓人彷彿進入了另一個國度。

(II) The Beitou Branch of the Taipei Public Library is the icon of our Green Buildings; it was awarded the 9 Index of Green Building Certificate in February 2005, and first place in the "Taiwan Architecture Awards" in 2007. The main building combines into the serene natural environment of Beitou, equipped with various implementations for power saving and carbon dioxide emissions reduction. Their collection of books on "Ecological Protection and Green Building" is one of the most notable collection they posses. The Deputy Director, Guo Qi Cai, of the Logistics Department of Coast Guard Administration, Executive Yuan had especially arranged a trip by the Taipei MRT to the greenest eco-library in order to help colleagues fully understand and experience the meaning of Green Building and to encourage them in power saving and carbon dioxide emissions reduction.

II. Special Features

(I) Combined with the local environment:

The Beitou Branch of the Taipei Public Library is located in the abundant forestry and ecological environment of the Beitou Park. The building is an eco-building which blends into the natural environment and the exterior looks as though it is a large tree house. In addition, the Beitou Library is located near the local hot-springs museums. You will find that there is a park in the forest and the library and museums are in the park, along with the surrounding creeks and forestry, it feels like a whole new world.

（二）運用環保建材：

圖書館全館建材採用輕質化鋼構造與木構造，減少了混凝土的使用，進而降低建材之生產耗能與CO2排放，且相關建材均可回收再利用。對於建材木材構造部分除做白蟻防治與防水處理外，並使用生態塗料及免除不必要的裝修工程，以減少污染及有毒物質的釋放，避免影響人體健康。

（三）能源回收利用：

圖書館的屋頂採生態屋頂理念設計，設有太陽能光電板發電及較長之屋簷，除可生產電力外，並能利用屋簷陽台產生「深遮陽」效果，有效降低熱輻射進入室內，進而減少空調耗能而達到節能效果。另外屋頂採斜坡植栽設計，藉以涵養水分並將雨水自然流至預設的雨水回收槽，再利用回收水澆灌植栽及沖馬桶，達到綠化與減少水資源浪費。

(II) Eco-friendly building materials:

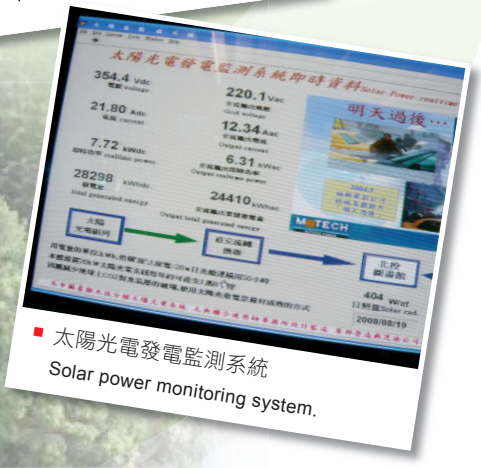
The library uses light steel and wood instead of concrete, which saves the energy and decreases the CO2 emissions produced in the production of building material. Both steel and wood could be recycled and reused. Other than termite prevention and water-proof processing, the wood uses eco-coating and avoids unnecessary fix-ups in order to reduce the release of polluted and toxic substances that are detrimental to health.

(III) Energy recycle and reuse:

The library roof was designed in accordance with the eco-roof concept with solar panels and extended eaves, which other than producing electrical power, can also be used to achieve better shading efficiency. Not only blocking UV from going inside, but also saves energy by decreasing the use of air conditioning. The roof slope is covered with plants, which helps preserve water and naturally leads the rain water to the designated recycling tank to be used in watering plants and flushing toilets, achieving both greening and water-saving results.

■ 鋼構及實木等環保建材
Green building materials such as steel and wood etc.

■ 利用大面積的屋簷及陽台適當遮蔽陽光
The use of wide eaves provides adequate shade on the balcony.



■ 太陽光電發電監測系統
Solar power monitoring system.

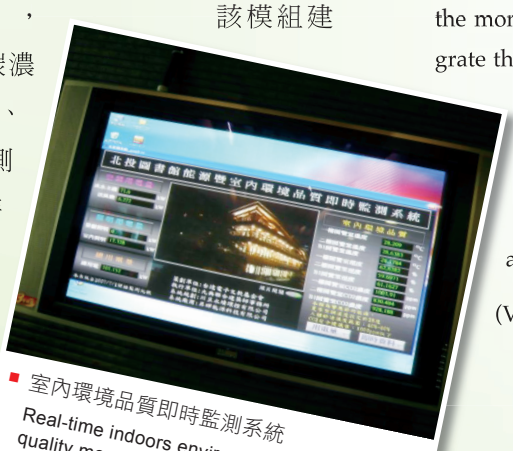
■ 太陽能面板及雨水回收槽
Solar panels and rain water recycling tank.

（四）溫暖閱讀空間：

圖書館由於位處樹林環繞的天然優勢，建築師特別利用挑高的空間與寬大的落地玻璃窗，營造溫暖的閱讀空間，和一般我們所認知圖書館最大不同之處就是視覺上一覽無遺的穿越性。書架的高度大約都在110公分以下，在瀏覽和取閱上也增加了更多的便利性。除了向大自然借光之外，每一層樓都設有戶外陽台的閱讀區，可臨溪望山望著戶外的景色，讓閱讀民眾在鳥語花香、綠意盎然的環境下盡情閱讀。

（五）環境監控管理：

北投圖書館與台達電文教基金會於96年7月起合作建置「無線室內環境品質監測模組系統」，該模組建有二氧化碳濃度、溫度、濕度感測器，可同時監測二氧化碳濃度及溫、濕度的變化。並透過無線網路結構，同時監測範圍內多點環境品質指數，再整合於液晶螢幕介面平台顯示及紀錄，同步透過電腦主機判斷，是否超過空氣品質標準值，以做為圖書館室內空氣品質改善依據，如二氧化碳過量時，館方可以採取開啟窗戶或是提高空調風量等方式因應。



■ 室內環境品質即時監測系統
Real-time indoors environmental quality monitoring system.

（六）落實日常節能：

圖書館在日常節能中，除一般設備（燈泡、馬桶、水龍頭等）均採購環保標章產品外，最大的特色就是採用挑高夾

(IV) A warm reading space:

The library is naturally advantaged due to its' location in the forest, architects especially used high ceilings and wide French windows to build a warm reading space. The greatest difference when compared to traditional libraries is the visual transparency everywhere around. The height of the bookshelves are no more than 110cm, making books easier to browse and more convenient to handle. Other than using natural lighting, every floor has its' own outdoors reading area on the balcony. Readers and visitors can take some time to enjoy the marvelous view of the mountain next to the creek, and indulge in reading whilst being in a natural environment of beautiful scenery.

(V) Environment monitoring and managing:

The Beitou Library cooperated with Delta Electronics Foundation in the establishment of the "Wireless indoors environmental quality monitoring module system" in July 2007, the system is equipped with CO2 concentration, temperature, and humidity sensors to monitor changes in the above three aspects at the same time. It is able to monitor the environmental quality index of different locations within the monitoring range through the wireless network, and then integrate the readings and records on screen. The computer mainframe will judge whether air quality standards were exceeded in order to improve the indoors air quality of the library. For example, when the amount of CO2 excesses, the library responses by opening windows or turning up the fan speed of air conditioning.

(VI) Energy saving put into effect:

In the library's daily energy saving, other than using eco-

■ 低高度書架引導陽光穿越
Lower bookcases for inducing sunlight throughout the library.

■ 綠建築圖書專區
The Green Building book collection.

■ 採用省電燈泡等環保標章產品
The use of eco-labeled products such as power-saving light-bulbs.

■ 浮力通風進氣孔
Buoyant ventilating inlet hole.

層的高低窗產生的「浮力通風」，再配合氣體交換機，讓室內空間產生空氣對流，除可將戶外清新的空氣引進館內外，亦可有效降低室內溫度約４℃，降低空調系統電力負荷，以有效節省電費。

三、個人心得：

（一）想像一棟圖書館，有潺潺的溪水圍繞，你可以坐在戶外，一邊看書、一邊享受林間微風的吹拂，或者你也可以在屋內搜尋，像是在知識的森林裡尋寶。一抬起頭，窗外樹影搖曳，靜靜地陪伴你渡過美好的閱讀時光。這樣的圖書館不是在夢中，也不在遙不可及的國外，它就坐落在你我都可以便利到達的台北市北投公園裡（距捷運新北投站步行約3分鐘路程）。

（二）在參訪這間圖書館中，感謝志工人員熱心介紹及導覽，分享這棟建築物相關節能設計理念，例如利用木造陽台深遮陽以及垂直的木格柵，讓太陽的熱能不會直接進入室內，達到節能的目的；或如整棟的光線給予，主要係由太陽光負責供給，除降低書架高度使光線穿透外，亦在各種適當處設置一盞小檯燈提供讀者以補光線的不足，藉由小燈替代大燈之觀念，以減少電費；再者利用自然通氣設備，引入戶外清新空氣、搭配室

label utilities (including light-bulbs, toilets, and faucets etc.), the main feature is in the adoption of high mezzanines and high-low windows to produce "Buoyancy Ventilation". Along with the ventilation machine, the indoor' produces air convection, not only inducing fresh air inside, but effectively lowering the room temperature by 4°C, reducing the AC system's electrical power burden and saving on electric bills.

III. Personal reflection

(I) Imagine a library surrounded by chirping creeks, where you can sit outside to read and enjoy the soft breeze of the forest at the same time. Also, you can also search indoors, as if searching for treasure in the forest of knowledge. Looking up, through the window there are swinging trees accompanying you through the joyful times of reading. The library of your dreams is real and located in Beitou Park in Taipei, just a MRT ride away. (A 3-minute walking distance from the New Beitou Station.)

(II) In the library tour visit, I would like to thank the volunteers that were very helpful in the introduction and guidance of the library, sharing relevant knowledge on the energy saving design concepts of the building, such as the wooden balconies, the shading, and the vertical wooden fencing, all of which blocks the heat of the Sun from directly going in to save energy. Or for instance sharing that the lighting of the building is mainly dependent on natural lighting, other than lowering the bookshelf heights to enable light penetration, lamps are also installed where needed to make up for insufficient lighting, substituting

內原木建材散發出來的香氣，建置優質閱讀世界等等，整棟建築物雖然係地下1層、地上2層之三樓建物，但處處可見「綠建築」精神的具體落實。

（三）回頭想想，自然與建設是環境破壞衝突的，木頭與書籍也是因果損耗對立的，但藉由這個圖書館的興建及經營，彷彿在這彼此矛盾的世界中告訴世人一個正確的解答，只要有心和詳實縝密的規劃，再堅定的朝目標一步步邁進，就可以建置一個優質共存的生活環境，達到各類衝突對立的最佳平衡點，不僅僅是這座圖書館，你我的生活空間也是如此。

（四）從小到大，一直都是認為書是用來閱讀的，但藉由這次的參訪行程，才驚覺原來書也是可以引導人休息的；雖然知道看書可以吸取不同的知識，但卻沒有想到倘佯在書海當中更可以豐富自己的心靈。相信每個人走進這座森林圖書館，除了獲取想獲得的知識外，更可讓每個人的心田獲得滿足，或許每個人到此感受到的、體驗到的、沉澱到的均不相同，但我相信來到這的每個人的心靈都是簡單、輕鬆和恬靜的，享受這個溫暖空間所帶來的小小幸福。

四、 結語

什麼是綠建築，綠建築係指在建築生命週期中（指由建材生產到建築物規劃、設計、施工、使用、管理及拆除之一系列過程），消耗最少地球資源，使用最少能源及製造最少廢棄物的建築物。簡而言之就是：生態、節能、減廢、健康的建築。這次的台北市立圖書館北投分館參訪行程，除了讓後勤處同仁實地感受台灣綠色建物的設計精神及其實踐外，相信對本處未來相關業務推展亦有所助益。

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big lights with small lights to save money in the electric bill. There is also the use of natural ventilation facilities which induces fresh air from outside, along with the natural smell of the wooden building material, both of which creates a world class reading space. Although the building is merely a 3-story building, but the implementation of the "Green Building" spirit can be seen throughout the whole building.

(III) I think the reason why nature contradicted with development is because of environmental destruction and the relationship between wood and books are contradicted as well. Through the establishment and operation of this particular library, I saw a solution to this contradicted world. When people set their hearts in doing the right thing and plan in detail their intentions, persisting to the end, they can establish a quality living environment while being in harmony with nature, thus finding the perfect balance point of all contradictions. This is true not only to the library's case, but also to our living spaces as well.

(IV) All my life, I thought books were only useful for reading, however, after this trip I surprisingly realized that books can also help people relax. Although reading is a way to obtain knowledge, the experience in being amidst all those books helped me even more by giving me spiritual fulfillment. I believe that anyone who comes to this library in the forest can obtain things beyond knowledge, and achieve spiritual fulfillment. The feelings and experiences of people differ, but the spirits of people are all alike. I know that anyone who comes here is a simple, relaxed, and serene soul, waiting to experience the happiness brought upon by this heart-warming space.

IV. Conclusion

What is Green Building? Green Building means the minimal consumption of the Earth's resources and energy, as well as minimal waste production in the architecture life cycle (the whole process of architecture from raw building materials to the planning, design, construction, use, management, and demolish.) In a brief saying that is an eco-friendly, energy-saving, waste-reducing, and healthy building. The tour of the Beitou Branch of the Taipei Public Library had gave the members of the Logistic Department a chance to truly experience the spirit of Taiwan Green Building design and implementation. I believe the trip will be of great help in the future development and promotion of relevant work.

(The author is currently with the article is a member of the Logistics Department)