

Glowing Transformations: Tadao Ando's Innovations in Hospital Architecture Through Light

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ABSTRACT

'This study is based on the use of reinforced concrete as common material of construction and expression to create openings for natural light by Tadao Ando and how that helps in changing, the overall perception of a space,

In pursuing this investigation, the study addresses three major objectives.

- To identify Tadao Ando's design philosophy and characteristic of natural visible inside these spaces.
- To understand the use of natural light to illuminate different spaces
- To explore the relation between the characteristics of natural light to the overall perception of the space,

It is necessary to take steps towards the development keeping in mind to save the environment. This study generates the awareness of using natural light inside the closed spaces. The outcome from this study can help designers in the use of natural light to design and articulate spaces.

'The methodology developed and tested in this study could form a basis for analysing other architect's use of natural light in public spaces like mall, museums, shopping arcades, etc. to look aesthetically good 'and natural creates very nice ambience inside these spaces, by use of natural light, the building can become more energy efficient and save electricity.

Ando's design presents the concept of the spirit of place and establishes the nature and soul of architecture. The creation of a situation is to enlighten people and enable them to understand the potential meaning, revealing a state of awareness. Ando's poetic space comprises a far-reaching clean and quiet meaning of Zen, providing people with a profound and moving experience, by simplifying all the complex elements, it intends to express several meanings with fewer composition elements, ensuring that the people's experience is not diminished. The space is composed of inanimate materials, but it is full of Vigor and vitality this allows people to have resonance in their minds and conduct an 'emotional dialogue. Ando writes his design concepts into a poem using paragraphs, sentences, and chapters by means of space, as well as the natural and cultural pursuits according to the base analyses.

1. INTRODUCTION

Ando's designs have ushered accurate and moving design concepts and themes by emulating delightful and moving feelings, which provide people with a good poetic experience and post-modern text connotations based on a comprehensive consideration of spatial themes. Tadao Ando has predominantly used space prototypes of different geometries in terms of space constitutions. With the rise of modernism in the early twentieth century, the design process in architecture went through a major transition, one that was to transform the character and ambience of the everyday spaces. Reinforced concrete, as a material of construction, offered structural advantages that brought in a host of possibilities to the design of different spaces. The plasticity of concrete was used to mould it into different shapes thus bringing new forms to be seen in modern architecture. In this homogeneous structural envelope, architects found new ways to carve out openings for light that could transform the quality of spaces inside a built form. Tadao Ando is the master architect who continued to work primarily with reinforced concrete as a material of construction and expression, in the late 20th century. Their emphasis was on improving the quality of spaces inside the buildings using natural light, as evident from most of the material published on their projects and their individual writings about architecture. Though the work of the architect spans across different continents, his projects depict new ways of controlling various effects of natural light in a similar vocabulary of architecture.

2. METHEDOLOGY

Research Objective

Literature Study

Data Analysis

Conclusion

3. LIGHT AND TADAO ANDO'S PHILOSOPHIES

Light, as a natural element plays the basic role in the architecture of Ando, among others. He employs a very poetic approach to the light and its presence in the world. Architecture which endeavours to slice off some of the omnipresent light, and sustain its presence in a fixed place, which has sought, through the ages, to carefully ensnare this light with all its vitality intact. Light gives, with each moment, new form to being and new interrelationship to things and architecture condensation and purification of the power of light. Japanese architecture has traditionally endeavoured, by means of its sensitive technology, to break light down to its individual particles. Ando had certain comers regarding light which summarized here with some expressions:

"Light is the origin of all beings."

"Striking the surface of things, light gives them depth."

"Light gives autonomy to things."

"Light the creator of relationship that constitute the world."

"Light continuously reinvents the world."

"Light gives, with each moment, new form to begin and new interrelationship to things."

"Light gives objects existence as objects."

Light can only be valued with the presence of darkness. Darkness is an important factor which tags along with light. Ando recognizes this and argues that due to advancement in modern construction techniques, the quality of light is degrading. With the new construction techniques, architects are using big openings for spaces which spoils the richness of light and also leads to excess transparency of the interior which in turn leads to "the death of space as surely as absolute darkness." Tadao Ando is a renowned Japanese architect known for his minimalist aesthetic, innovative use of materials, and incorporation of natural elements into his designs. His architectural philosophy is deeply influenced by Japanese culture, Zen Buddhism, and the concept of "Ma" (the Japanese idea of negative

space). Here are some key aspects of Ando's design styles and philosophies Minimalism, Ando's designs often feature clean lines, simple geometric forms, and a focus on essential elements. He believes in the beauty of simplicity and aims to create spaces that are serene and uncluttered. Use of Concrete is a signature material in Ando's work. He is known for his skillful manipulation of concrete, using it to create striking compositions and dramatic spatial effects. Ando often leaves concrete surfaces exposed, celebrating the material's raw texture and strength. Integration of Nature of designs frequently incorporate elements of nature, such as light, water, and landscape. He seeks to create harmony between the built environment and the natural world, often blurring the boundaries between indoor and outdoor spaces. Play of Light and Shadow is a crucial element in Ando's architecture. He carefully orchestrates natural light to create dynamic interplays of light and shadow within his spaces, enhancing the atmosphere and spatial experience. Relationship with Context pays close attention to the context of each project, whether it be the site's topography, climate, or cultural heritage. His designs are responsive to their surroundings, seeking to establish a sense of place and connection to the environment. Exploration of Spatial Experience, Ando is interested in how architecture influences human perception and experience. His designs often involve spatial sequences and circulation patterns that engage users on a sensory level, encouraging contemplation and introspection. Respect for Tradition and Craftsmanship, While Ando's work is characterized by modernist principles, he also draws inspiration from traditional Japanese architecture and craftsmanship. He values the importance of craftsmanship and often collaborates with skilled artisans to realize his designs. Spatial Hierarchy: Ando carefully designs spaces with a hierarchical arrangement, often leading users through a sequence of spaces with varying degrees of privacy and openness. His architecture creates a sense of progression and discovery, with each space offering a unique experience spatial clarity. He calculates proportions, dimensions, and angles to create compositions that are both visually striking and functionally efficient Contrast and Balance, Ando frequently employs contrast in his designs, juxtaposing elements such as light and shadow, solid and void, rough and smooth textures. These contrasts serve to highlight the beauty of each element while maintaining a sense of balance and harmony within the overall composition. Adaptive Reuse and Sustainability, in recent years, Ando has increasingly focused on sustainability and adaptive reuse in his projects. He advocates for the preservation and repurposing of existing structures, incorporating sustainable design principles such as passive heating and cooling, natural ventilation, and energy-efficient systems. Global Influence, while rooted in Japanese culture and aesthetics, Ando's work has garnered international acclaim and has influenced architects and designers around the world. His minimalist approach and thoughtful integration of nature have inspired a new generation of architects seeking to create timeless, culturally resonant spaces. Human-Centric Design, Ando has remained committed to designing architecture that prioritizes the needs and experiences of its users. He believes that architecture should serve as a backdrop for human activities and interactions, fostering connections between people and their environment. Lifelong Learning and Evolution, despite his stature in the architectural world, Ando continues to evolve and experiment with new ideas and techniques. He approaches each project as an opportunity for discovery and growth, constantly pushing the boundaries of design while staying true to his core principles.

Ando believed that three essential elements participate in the solidification of architecture (Ando 1990c, p. 15): first are real materials such as exposed concrete or unpainted wood which are commonly used by him in most of his works. The second one is 'pure geometry', based on platonic volumes or three-dimensional frames as present in the Pantheon. The last element is Nature; not nature as it is in the environment, which means raw nature, but "domesticated nature" (Ibid). With 'Domesticated' he wants to focus on his special and unique attitude towards nature and for him this means the man-ordered nature in which the elements of nature such as light, sky and water has been abstracted. Combining these three elements, according to Ando, results in stimulation of humans and manifestation of architecture. Ando, this integration of architecture and nature is a passive action. He does not intend to completely integrate nature with architecture so that architecture doesn't lose its uniqueness. This conflicts with the concept of organic architecture which focuses on having a deeper relation between nature and architecture. Also, it is completely different from the modern approach towards nature which used to deny it and harm it. It creates a resonating community of people, geometry, light, water, greenery, and other elements of architecture and nature, in an inter-layered complex (Ando 1993d, p. 148). When the building is in a place surrounded with natural

environment, he opens the building into nature to make an immediate confrontation with natural elements. In this case, the nature is most probably spotted in the interior areas. The courtyard is in fact the realm of the presence of nature.

4. TADAO ANDO'S DESIGN MODES

Tadao Ando's work enable people to experience a journey gestation, awareness and thinking by means of the practiced arrangement of path sequences such that the strength of metaphysical thinking could be experienced. The study interprets the syntax of Tadao Ando's place spirit design and the composition of aesthetics based on his experience in the construction of Kansai region of Japan; this study of his design aesthetics to capture the value and significance of his Ando's detail design mode to analyse, discuss, and establish the development vein and composition characteristics.

4.1 WATER TEMPLE OF BENFUSI

- **Composition Situation and Spirit of place**

Ando uses simple and low-key lines to form an image of an entrance by using a 3- meter rectangular fair-faced concrete wall. Following this wall, there is a circular as-cast-finish Mold curved wall, constituting the beautiful arcs of the square and curved walls. By walking along the curved walls, one's vision is suddenly widened at the turning point of the wall by an oval elegant lotus pond having a length of 40m and width of 30m. At the centre of the lotus pond, there is a line of stairs leading to an underground temple, which divides the pond into two areas.



Fig. 1 Simple and low-key lines formed entrance image.

- **Composition Syntax with “Water” Element**

In the Water Temple, the lotus pond forms the roof. The oval pond Symbolises birth and reminds, generation. The calm and elegant surface of surface of pond relaxes people’s minds, enables them to experience a deeper meaning of religion and providing them with profound inspiration in their souls.

- **Composition Syntax with "Light" Elements**

After entering the Buddhist temple, one can see the light-flowing image created by Ando. People's minds are purified by the ordinary world evinced by the white wall, leading into the ethereal world of the pond. The lights gradually become weak and dim as one walks down the stairs.

- **Material Characteristics and Composition Syntax of Detail Aesthetics**

The space sequence of the Water Temple is rich in dramatic effects, where the design technique of the - First Inflectional and - Then Modulational challenges the senses of the human organs.

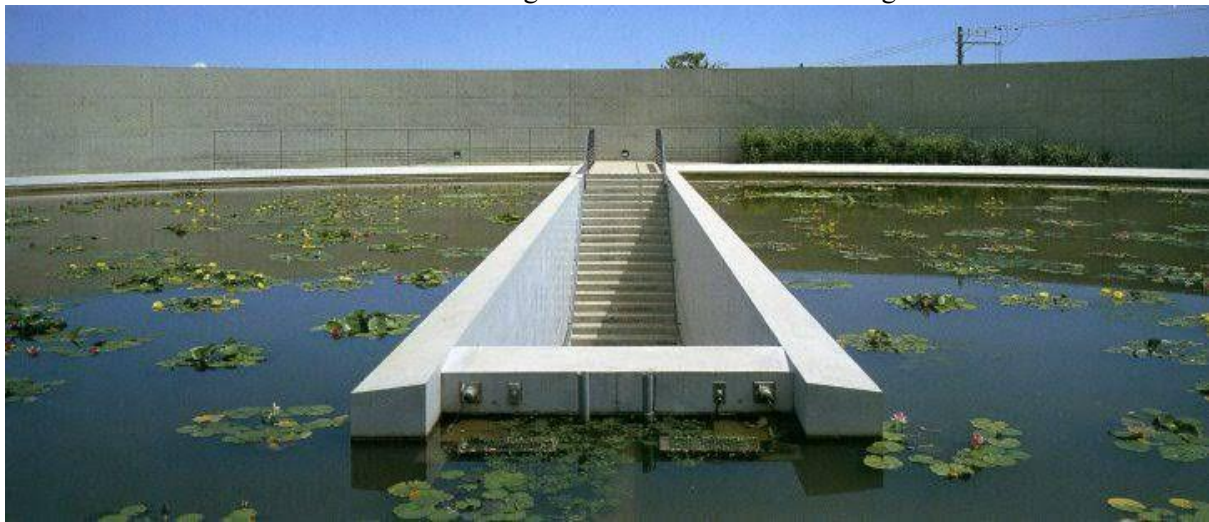


Fig. 2 A ladder leading to the Underground Temple.



Fig. 3The Red corridor under Lotus Ponds.

4.2 RYOTARO SHIBA MEMORIAL MUSEUM

- **Composition Situation and Spirit of Place**

In the Japanese-style residential area of Osaka, when one is walking into a small garden, going through a plant-filled trail, or passing a curved glass promenade with a sense of rhythm, it appears as if one is experiencing a section of a time-tunnel-like space sequence. It gives people a chance to get far away from secular blocks and enter into Ryotaro Shiba's spiritual world. After entering the memorial museum, a slab can be seen extending from the floor to the roof: the four sides constitute huge walls surrounded by books. The two-storey towering shelf creates a near-scared space atmosphere, making people feel they are standing in a temple in which a sea of books and shadows of lights are dancing in unison. In such a quiet and holy atmosphere, people can appreciate the vastness, feast on the available knowledge, and get infected by the Ryotaro Shiba-featured scholarly situation and flavour.

- **Composition Syntax with Garden Elements of "Sky, Light, and Plants"**

The memorial museum is located in a natural garden. Ando uses flower and trees to create an atmosphere of outdoor space with tall green trees as well as rape flowers (Ryotaro Shiba's favourite) planted in the surroundings. This creates a space allowing people to transcend into meditation. People can smell the sweetness of flowers, listen to the singing of birds, feel the movement of gentle breezes, and appreciate the sky and white clouds while sitting on the long bench made of as-cast-finish Molds or walk back and forth along the path to quietly enjoy the wispy rhythm and serene ambience.

- **Composition Syntax with "Light" Elements**

Ando uses the design of glass windows, allowing people to see the garden of Ryotaro Shiba's house from the outside of the memorial museum. Meanwhile, the bookshelf is illuminated by the light passing through the

opening of coloured windows. Such a secluded lighting design produces a serene and holy atmosphere, like the light of hope that emanated from Ryotaro Shiba.



Fig. 4 The Garden Path in Shiba Ryotaro Memorial.



Fig. 5 The Curved Class Promenade Have a Rhythmic Sense



Fig. 6 The Light can fall onto The Book Shelves through Windows

- **Material Characteristics and Composition Syntax of Detail Aesthetics**

The detailed dialogue syntax composed of glass and fair-faced concrete makes people feel the vastness and greatness of knowledge in a serene and holy atmosphere.

The curved corridor design at the entrance is like a space prelude having a beautiful rhythm of concrete walls and glass textures, as well as the delicate aesthetics of lights and shadows. The detail composition of the ramp at the indoor entrance has the perfect ratio - the glass windows are made using various types of old glass; in addition, the water-rippled handmade glass is combined with low-key as-cast-finish molds. This combination forms a transparent corner side view, which presents a detail aesthetic pattern based on a glass collage.



Fig. 7 The detailed Dialogue Syntax Glass and Fair-Faced Concrete.

4.3 AWAJI DREAM STAGE

- **Composition Situation and Spirit of Place**

The Awaji Dream Stage consists of several facilities such as the oval square, circular plaza, plant house (wonder star of the greenhouse), hyakudan-en garden, flower court, shell shore, outdoor theatre, etc., which create a space situation and art atmosphere comprising mathematical and philosophical concepts. This architecture provides people with the opportunity to meditate and think about the value and meaning of life while walking along these paths, like being in the vast universe. On the fair-faced concrete wall of the circular theatre, the shadow length of the sundial changes different times in the day, indicating the time as the sun moves. With a gentle breeze, soft lights and shadows, as well as the soft shadows in the water, people can appreciate the meaning of space and time in their lives.



Fig. 8 The Spaces Situation of Awaji Dream Stage

- **Composition Syntax with "Water" Elements**

Ando creates the space situation and conversion by using dynamic curtain waterfalls and quiet water space. In the hyakudanen garden, the multistep like running waterfall and the stair pool paved with shells reveals a beautiful image between the mountain and water, where people can listen to the sound of venting water and feel the passage of time. The Roman baths at the mountain corridor attract people to stop and contemplate with their quiet and sacred water space. The church of the Seal space is concealed under the mirror pool of the roof, and the mirror water space connects the upper and lower spaces, forming an image of a sea that allows the daylight to pass through the walls via the reflection interface of the water; this construct graceful cross-shaped lights and shadows for the - Church of the Sea.

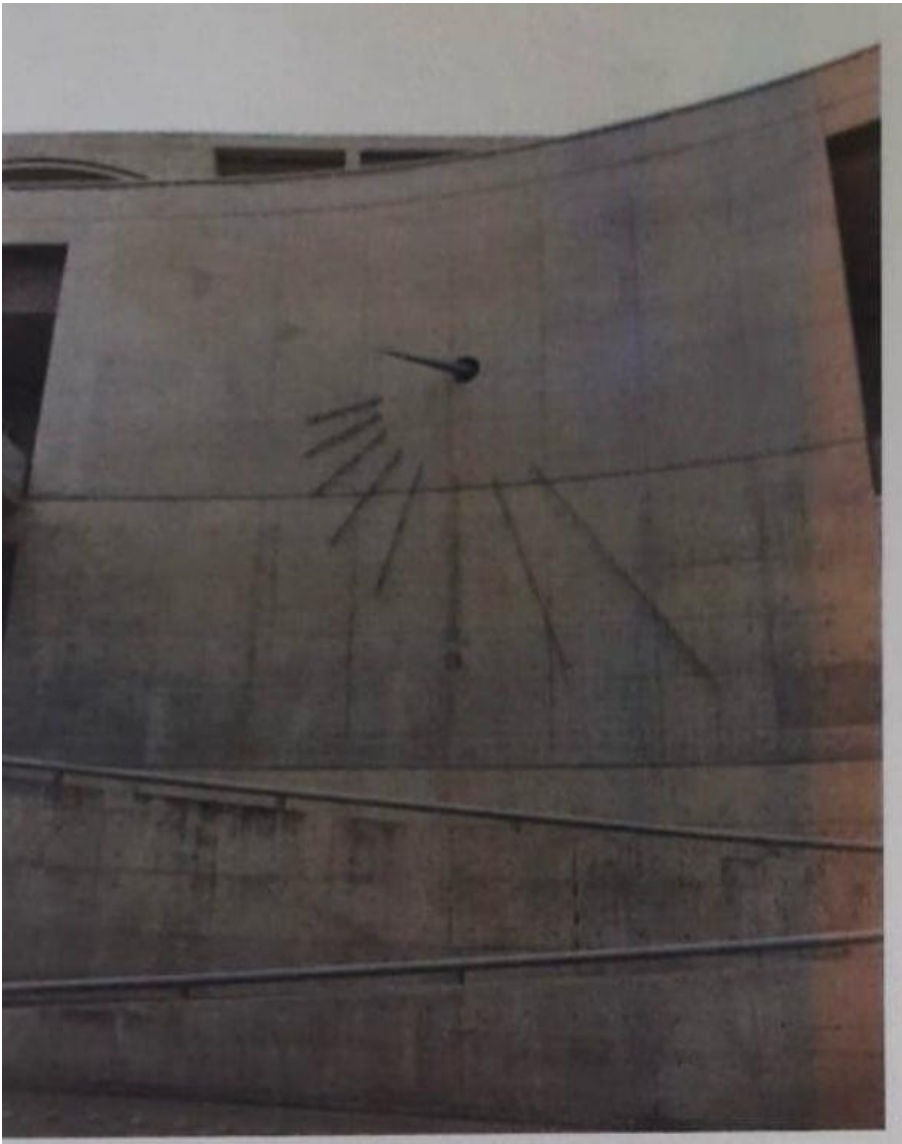


Fig. 9 The Sundial on Water Concrete Wall of Amphitheatre

- **Composition Syntax with "Light" Elements**

In the Church of the Seal design, daylight spills from above, revealing a quiet and sacred atmosphere of religion to the people. The lights between the mountain corridors pass through the pool, reflecting the rhythmic inverted images onto the as-cast-finish mold walls, forming fluctuating water and shadow aesthetics. The oval square creates changes in the light stand shadows. During daytime, the sundial on the fair-faced concrete wall reveals aesthetic changes in the lights and shadows.



Fig. 10 The Multi-Step like Running Waterfall

- **Material Characteristics and Composition Syntax of Detail Aesthetics**

In the space detail design, fair-faced concrete, glass, granite, and steel plates are used as the primary material to create simplicity and modesty. The shellfish shore is a shell pool paved with shells of 1 million hotates. Further, the mountain corridor is filled with shadows formed by opaque frosted glass. The oval square building comprises simple and rich straight lines and arcs. The detail design syntax provides cuboids, pyramids, cylinders, cones, spheres, and oval egg-shaped concrete walls combined with cylindrical cast-iron railings and floor coverings surfaced using stone chisels.

4.4 CHICHU ART MUSEUM

- **Composition Situation and Spirit of Place**

The Chichu art museum is constructed by keeping the earth and nature in mind, similar to a building embedded in the earth. Further, it is perfectly arranged with various types of large-scale works corresponding with the natural environment. Artworks and buildings are usually constructed based on the use of the fields provided by the natural ambience.

The entrance part is a channel constituted by two as-cast-finish mold walls. By entering the room, one can experience a cool feeling. Most of the buildings of the art museum are constructed underground, where natural lighting is used to illuminate the indoor works. In the museum, square, triangular and rectangular as-cast-finish concrete geometric walls are employed in combination with the usage of large rocks and boulders that are either rough or smooth, stimulating people's visual and sensory experiences. The space situation of the Chichu art museum is similar to a large underground air-raid-shelter space with a long and narrow channel leading to an underground space that ends in a concrete space with walls. On the concrete wall, there is a square opening used as a sunroof through which people can look up at the blue sky from the interior and appreciate the sun, blue sky and white clouds, as well as the quiet ambience. For the Monet lotus 100m in the museum, Ando has

created a calm atmosphere for appreciating pictures. There is a showroom San any artificial lighting, leading the visitors into a world of Monet's impression paintings with a gradually brightening halo.



Fig. 11 Chichu Art Museum

- **Composition Syntax with "Water" Elements**

Between the ticket services centre to the Chichu art museum, there is a pool in the Monet's garden where one can appreciate the lotus Monet's painting and feel the space-time atmosphere in which the painter was living. The water space in the pond reveals different features with the changing seasons. The horizontal belt-shaped window in the Chichu café house is shaped to imitate the effects of the sky and sea views. After walking out of the café house, the blue sky and white clouds are reflected in the sea, suddenly widening one's vision.

- **Composition Syntax with "Light" Elements**

In Monet's water lily galley, Tadao Ando creates a quiet artistic atmosphere so that the paintings can be appreciated. The darkroom space without any form of lighting takes visitors into the world of Monet's impression paintings. The uniform and soft natural lights pour down from the zenith, evoking frustration, and equanimity. This shows that Ando is also an accomplished artist capable of capturing lights and shadows, like that done by Monet. About the composition of lights and shadows in Monet's - Water Lily series, Walter De Maria's - Time/Timeless/No Time, I and James Turrell's - Open Sky and Open Field, even Ando uses natural lighting for art exhibition, making people shuttle back and forth between underground and open spaces and enabling them to appreciate the changes in lighting and aesthetics in buildings.

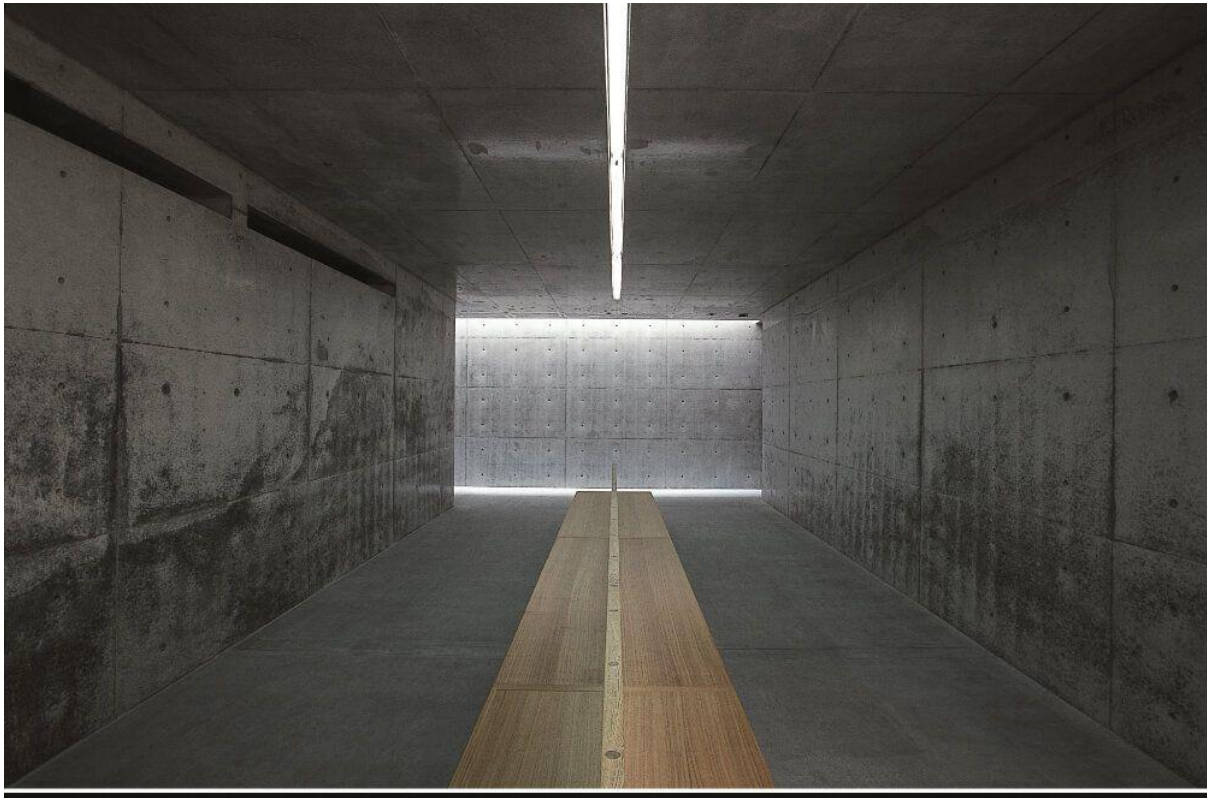


Fig. 12 Chichu Art Museum like a large Underground Air-Raid Shelter Space

- **Material Characteristics and Composition Syntax of Detail Aesthetics**

For reinforcing the fair faced concrete structured in the Chichu art museum, numerous lights and shadows are employed in the three – storey underground spaces to create a quiet artistic atmosphere. The thick concrete walls make people reminisce living in underground caves; the sound of moving steps is audible while walking through it. The huge as-cast-finish mold triangular high walls and rock gardens are Ando's modern interpretation of Japan's dry landscapes; the oblique line-like opening lighting the ramp creates a mysterious atmosphere; the pure white wall surface and white small squared marble floor in Monet's gallery enables the creation of gentle lights and shadows based on the use of lights refracted and reflected through the walls.

5. SCOPE OF FUTURE RESEARCH

The scope of future research on Tadao Ando's innovations in hospital architecture through light could encompass several dimensions, including but not limited to:

- **Architectural Design Analysis:** Conducting an in-depth analysis of Tadao Ando's architectural designs in hospital projects, focusing specifically on his innovative use of natural and artificial light.
- **Impact on Healing Environments:** Investigating the impact of Ando's architectural innovations on patient well-being, recovery rates, and overall experiences within healthcare facilities.
- **Sustainable Design Strategies:** Exploring the sustainability aspects of Ando's approach to integrating light into hospital architecture. This could involve analyzing the energy efficiency of lighting systems, daylighting

strategies, and the use of renewable materials to minimize environmental impact while maximizing the health benefits of natural light.

- **Technological Integration:** Examining the integration of emerging technologies, such as smart lighting systems and sensor-driven controls, in Ando's hospital designs to optimize light quality, adaptability, and user comfort.
- **Cultural and Contextual Considerations:** Investigating how Ando's use of light in hospital architecture reflects broader cultural, social, and contextual influences.
- **User-centred Design Evaluation:** Conducting user-centred evaluations and post-occupancy assessments of Ando's hospital projects to gather feedback from patients, staff, and visitors on their experiences with the lighting environment.
- **Interdisciplinary Perspectives:** Encouraging interdisciplinary collaboration between architects, lighting designers, healthcare professionals, psychologists, and other relevant stakeholders to explore the multifaceted impact of light on hospital architecture and patient care.
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