ARATA ISOZAKI'S ARCHITECTURE AND HIS USE OF CERAMIC COVERINGS

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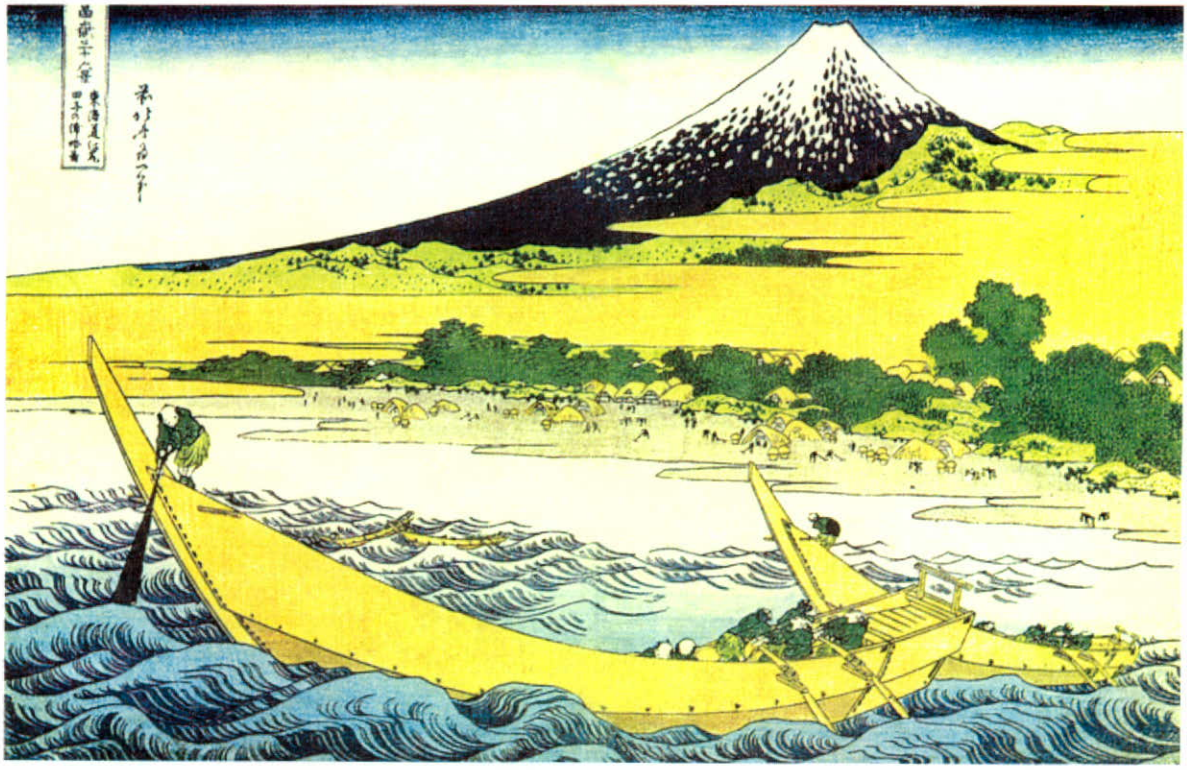
Japan

He studied architecture at the School of Science & Engineering at Waseda University.
In 1967 he joined Arata Isozaki & Associates.
In 1976 he became partner architect of Arata Isozaki & Associates.
In 1984 he was appointed director of Arata Isozaki & Associates España, S.A.
In 1988 he became director of "I Office".
In 1991 he was nominated as director of "Urban Factory".
He has actively participated in more than 60 important projects. Among those, the most outstanding ones are the following:

- *EXPO'70 in Osaka, Master Plan - Gunma Prefectural Museum of Fine Arts - Kamioka Town Hall - Tsukuba Centre Building - The Museum of Contemporay Art, Los Angeles - Amphitheatre at Togamura - San Jordi Sportshall - Palafolls Sports Pavilion - Kashi Twin Towers Project - Nagi Museum of Contemporary Art - International Place Complex in Shijuoka, etc.*

As invited lecturer, he has participated in various world congresses in order to comment on his most important projects, emphasizing those related to Architectural space in Japan, the Olympic Pavilion of Barcelona, the latest projects of Arata Isozaki & Associates, Nexus World, etc.



Katsushika Hokusai, polucrome xylograph of 36 views of Mount Fuji, from Tagonoura.

While the town house roof tiles metaphorically evoke the rippling waves of the sea amongst the great waves formed by the temple roofs, between them drifts the elongated ellipse of a clothoid-curved wall.

CONTENTS

1. INTRODUCTION

Architecture is an intellectual and cultural undertaking that makes use of various materials and techniques invented by man, in which an own language is created.

Architecture may exist on occupying a specific location. At the same time it produces a new relationship by taking into account its circumstances, e.g. if it is located in a field a geographic characteristic will be involved, whereas in a town the context will relate to urban life. Thus, if a building fits well into its surroundings, its existence can move the heart of the people. Moreover, it establishes a solid connection with cumulative culture and constitutes a basis for producing another new one.

We had been in touch with Barcelona since 1983, for a period of 10 years, regarding a plan to construct one of the Olympic facilities. However as architects we were brought up in the East, in Japan, with a totally different culture and climate. We therefore asked ourselves what we could contribute to a city that possesses a cultural tradition with a great personality, comprising world-renowned buildings from various memorable eras. We then realised the problems that one might encounter with a town and a culture when trying to plan a building abroad.

However the characteristics of this Olympic building were to be universal, crossing borders and going beyond geography and tradition, as it was also a festive, impartial venue for all the world. On the other hand, it was destined to be integrated in a part of the city, although it was to have general sports functions, and was also to serve for a long time after the Olympics, until ending its life cycle as all normal buildings. To satisfy this condition we needed to provide the building with a peculiarity of its own based on perennial cultural. This was the key issue in composing the Barcelona building design.

Three major concepts were involved in the planning process:

1) A form harmonising with the Barcelona Montjuic geography

2) Use of state-of-the-art technology

3) Adoption of techniques and materials used in Catalonia, respecting its tradition

These were implemented in the following building parts:

1) Rolling roof with a soft proportioning curve

2) "Panta Dome" system and mesh with a curved surface

3) Ceramic and zinc materials in the roof finish, large concrete panels and brickwork wall.

The Barcelona design was an assignment performed as though a complete cultural exchange were involved. State-of-the-art technology was employed, while at the same time keeping characteristics of the region, using local materials such as ceramic tiles. Despite the fact that it was in principle for us a kind of encounter with an unknown culture, we learnt a great deal in Catalonia and ended up constructing the Palau Sant Jordi, a building supported by many elements of our culture, although there was also something heterogeneous between both.

At ARATA ISOZAKI & ASSOCIATES our main approach to any project tends to be: "The response to its location". Hence buildings never exhibit the same shape but change. The choice of materials is the most important issue and we know that in our designs we often have the opportunity to select materials such as roofing tiles, ceramic tiles and other clay materials.

This conference describes some of our projects, particularly the Nara Convention Hall design in Japan, which is now nearing completion, setting out the process from design submission to the location of the construction.

2. GREAT PALAU SANT JORDI ROOF

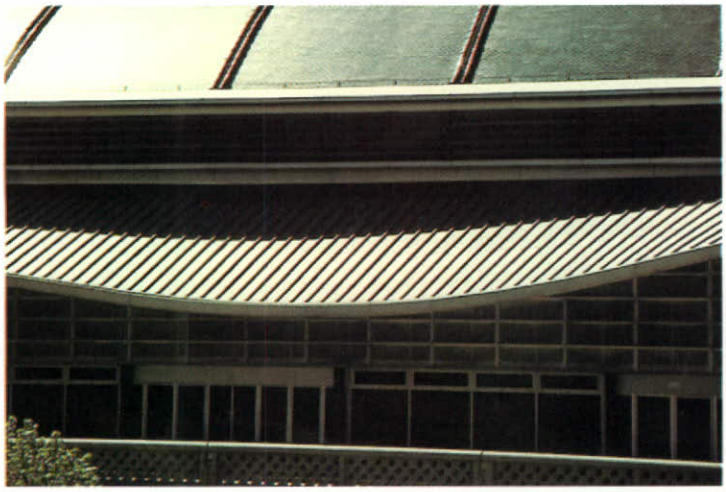
USE OF CERAMIC TILES ON THE GREAT ROOF AND CURVED SURFACE MESH STYLE ON THE MONTJUIC MOUNTAIN

Ceramic tiles were used on the main roof, and zinc tiles were employed on the low roof.

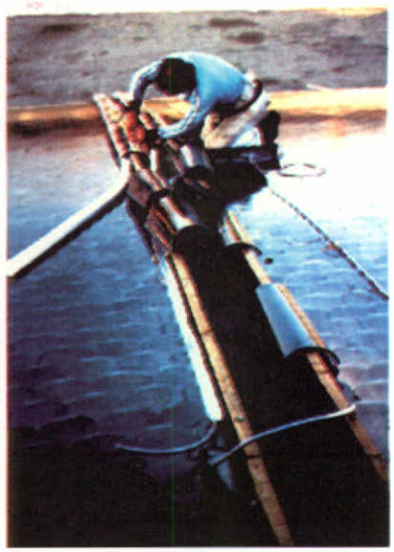
Illustrated catalogue with photographs of the tiles used by both architects.

The building was erected as one of the main facilities for the 1992 Barcelona Olympics. The roof has a more avant-garde style, using mesh with a curved surface. The "Panta Dome" system was used in constructing it. The articulated fringe of the mesh that served to put it into its definitive position later became a continuous skylight, providing zenithal lighting for the interior space, while also bestowing a sensation of lightness on the roof. The bottom of the work was closed with great panels of prefabricated concrete. The finishing materials employed were Spanish as were the construction techniques. The materials applied in the finish were zinc and ceramics produced in a factory in Castellón. In their selection process, the aesthetics of the bottom structure finish was taken into account.

Chipboard painted like ceramic tiling was used as a sample to test the size, shape and installation system.



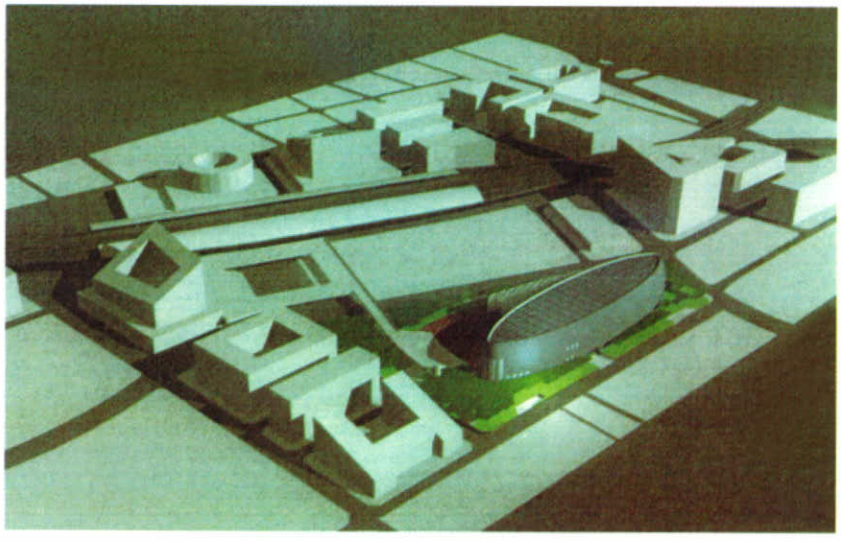
Great roof executed with tiles similar to the traditional Japanese ***Hiragawara****, produced at a ceramic factory in Castellón. The factory belongs to the same group of companies that in times gone by produced the materials that the architect Gaudí used in his buildings.*



State of the work.

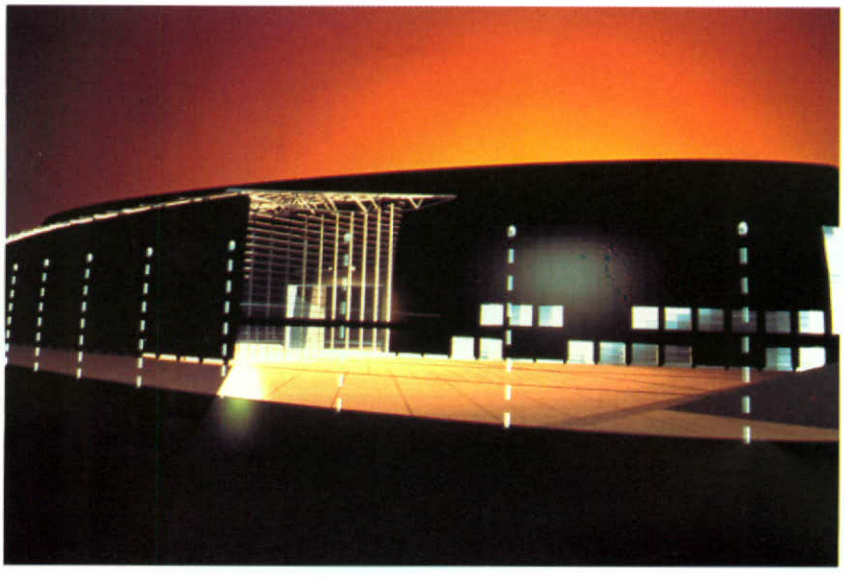
3. PROJECT SUBMITTED IN THE INTERNATIONAL COMPETITION FOR THE "NARA CONVENTION HALL" DESIGN

INTEGRATION IN THE HISTORIC URBAN FABRIC OF AN ISOLATED BUILDING



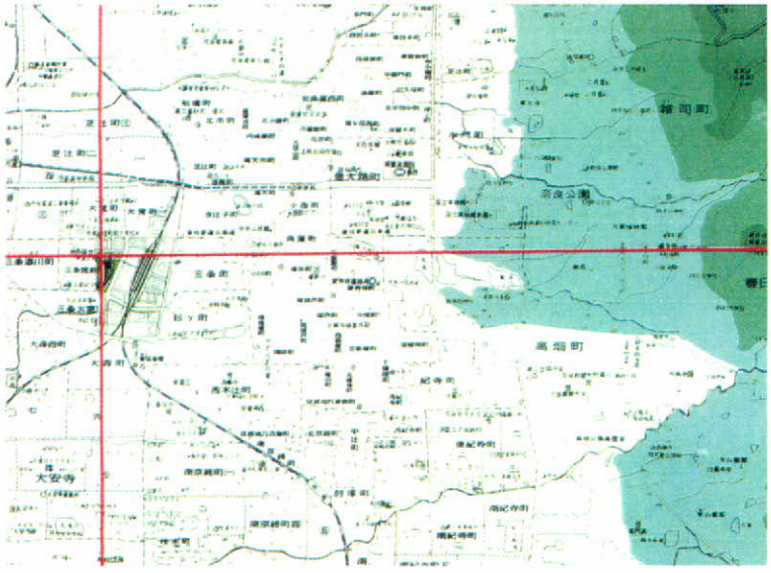
In the surroundings of the JR de Nara train station, still pending the conditioning of the town infrastructure, a plan called Silk Load Town 21" was implemented to develop the downtown area. In accordance with the line set out in the proposal, the Nara convention hall arises as the focal point of the plan. The design that is presented below was chosen in an international competition held in the spring of 1992, which invited designs for the project.

The unique profile produced by a sloping line towards the interior, following a clothoid curve and an elliptical ground plan, creates a volume that evokes the image of the great temple roofs, such as the *Todai-ji*. It was attempted to enhance the force of this symbol by seeking to harmonise it with the original town layout. The length axis of the building is located in accordance with the urban layout that still exists since the town's founding in the VIIIth century. The town of Nara was then called Heijo-kyo and was built according to a systematic layout known as *Jori*, of which rests can still be seen today. The railway line was subsequently superimposed in an accidental manner onto this original grid; and it is the rotation of this axis with regard to the pattern of the town, which forms the main part of the entrance to the Nara Convention Hall.



4. CONTEXT OF "THE ANCIENT TOWN OF NARA"

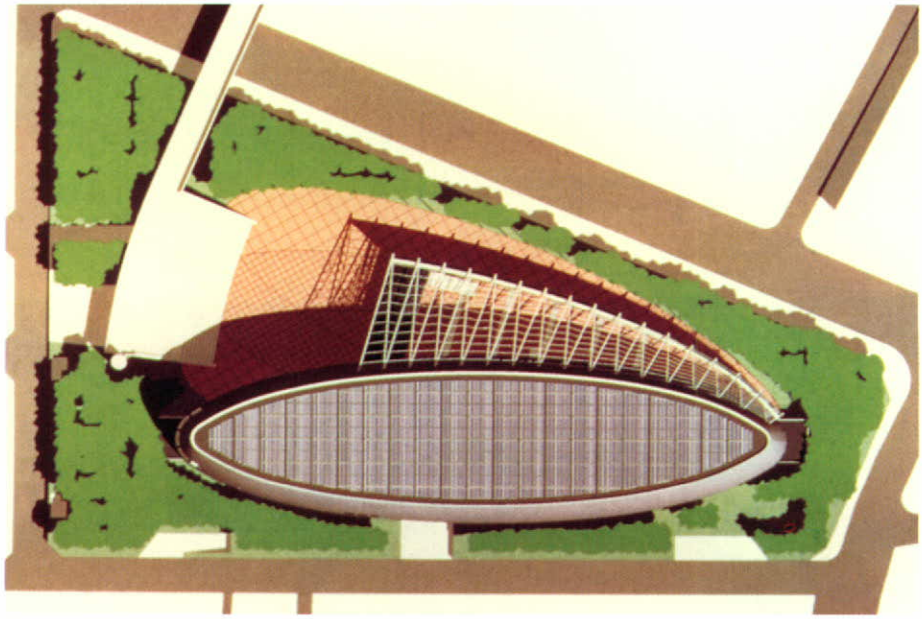
FEATURES OF THE LOCATION. BOTH ITS AXES



The Convention Hall is located on a triangular building site, as the result of the subsequent appearance of a street parallel to the JR railway line on the East/West and North/South mesh of the *Heijokyo-Jori* system. The decision was taken as to where to erect the Convention Hall by using these two directions as a reference. The main body of the building is elongated and elliptical, and lies on the North/South axis of the *Jori* layout, however the main entrance lobby area rotates with the new layout of the railway line.

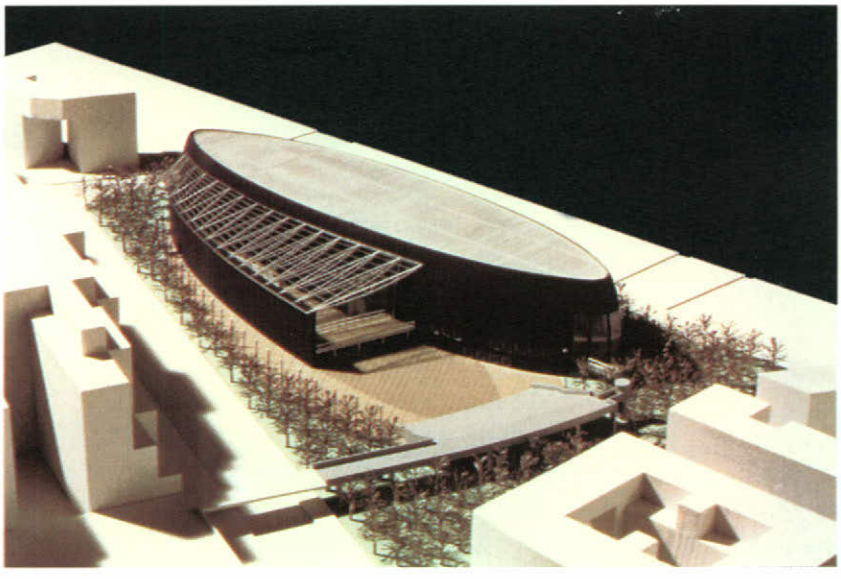
Of the roads that surround the building site, the eastern road located next to an urban park is the highest and gently slopes down towards the West, dropping two metres. Consequently, taking the level of the central part of the four-lane road as a horizontal base, a level of + 65.3 is obtained in the whole building site. The construction of the main elliptical building was projected on this horizontal base, with a view to positioning a free form as if an object were involved. In this way a great open space was obtained with regard to its surroundings.

In this open space various trees and plants will grow, except in the area of the multipurpose plaza, in which different types of cultural events will be held. The citizens going to the Hall from any point of the site will walk along paths flanked by trees. The access from the train station plaza to the lobby will go through the town park located at the north east end of the site, which functions at the same time as the main entrance from any point of the town. This route will be livened up by a festive atmosphere created by the multipurpose plaza and steps rising from a pedestrian platform as though an amphitheatre were involved.



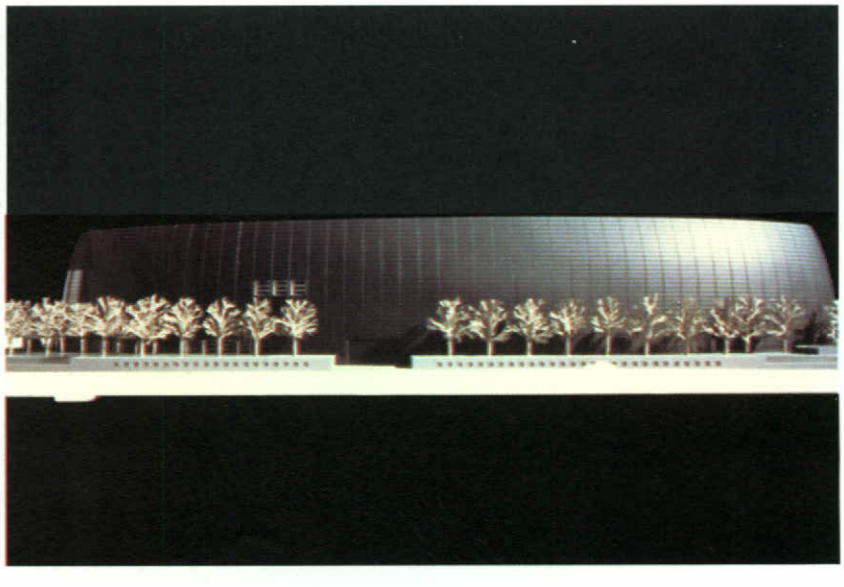
5. DIFFICULTIES OF FORMAL IDENTIFICATION BETWEEN ROOF AND WALL VIA THREE-DIMENSIONAL SHAPES

XXTH CENTURY REPRESENTATION: SPATIAL AND TEMPORAL SUCCESSION AS IN THE CASES OF ***MINAMI-DAIMON, TODAI-JI, TOSHODAI-JI*** *Y* ***YAKUSHI-JI*** *IN NARA AS A FORMER CAPITAL*



Following an architectural and town planning design for developing the station surroundings, a platform was designed in the train station plaza in response to the requirements set in the design competition, which involved providing a pedestrian platform as main entrance to a future convention hall.

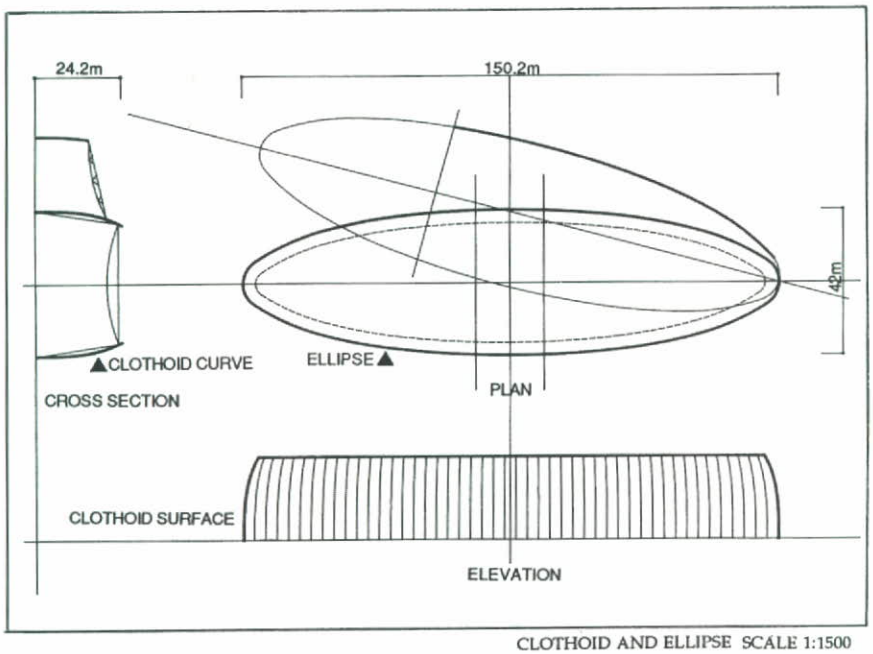
The 6-metre difference in level between the pedestrian platform and the convention hall is absorbed by the steps that form the amphitheatre mentioned before, which plays a key role in bestowing a festive atmosphere on the plaza leading to the lobby.



The profile of the great roof contains three halls and serves to provide a spatial and temporal continuation in the Nara urban structure, evoking the great roofs of *Todai-ji, Kofuku-ji* y *Toshodai-ji* and the silhouettes of the pagodas.

6. GEOMETRY OF THE GREAT ROOF / CLOTHOID CURVE AND ELLIPSE

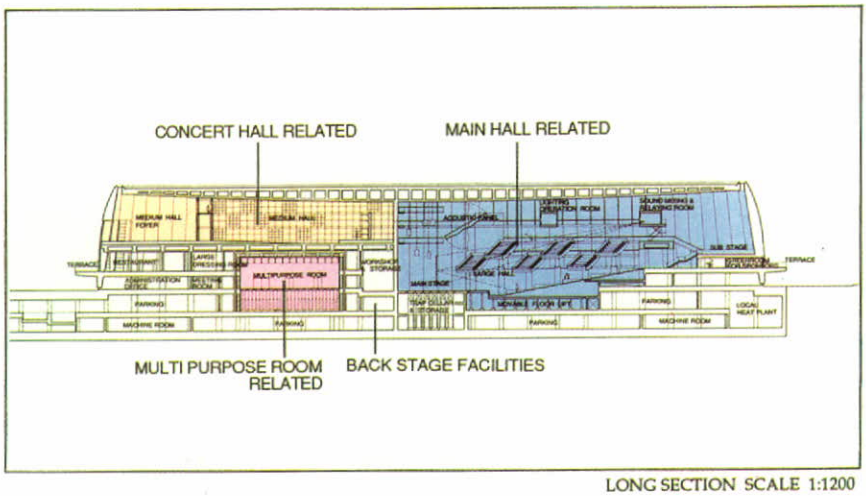
SEARCH FOR SYMBOLIC IMPACT IN ACCORDANCE WITH THE TOWN'S ORIGINAL URBAN LAYOUT



CLOTHOID AND ELLIPSE SCALE 1:1500

Through the great, clearly geometrical shape, it was sought to provide the construction with the necessary force to become a symbol on an urban scale by employing a clothoid curve and an ellipse in the design.

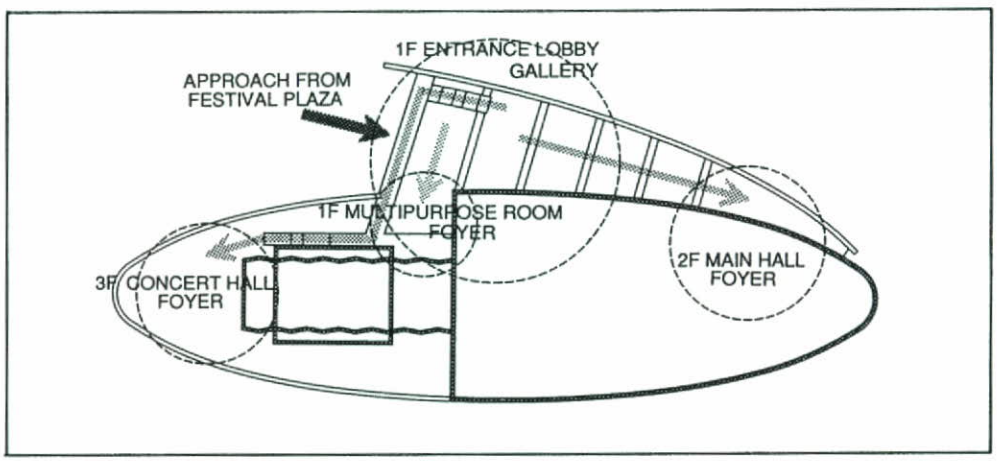
At the end of its development, the clothoid curve acquires a whirling shape, which ends at a certain point. In this work, part of the clothoid curve development is used, drawn in the profile of the prefabricated concrete wall. The lower part is perpendicular to the ground and takes on an inward-turning curve as it gains height. The use of the curve has no particular meaning, but has its practical logic in construction whenever one wishes to unite a roof and a wall in a special way. The building height is limited by town building regulations for the area and for this reason does not exceed 25 metres.



LONG SECTION SCALE 1:1200

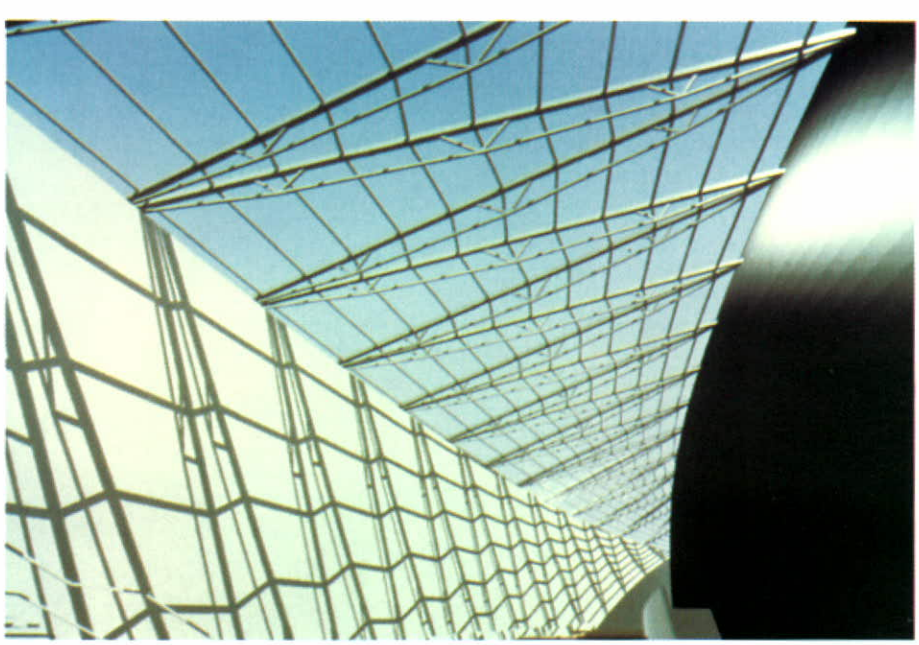
7. MAIN ENTRANCE

THE GLASS LOBBY ALLOWS CLEARLY VISUALISING THE ENTRANCE



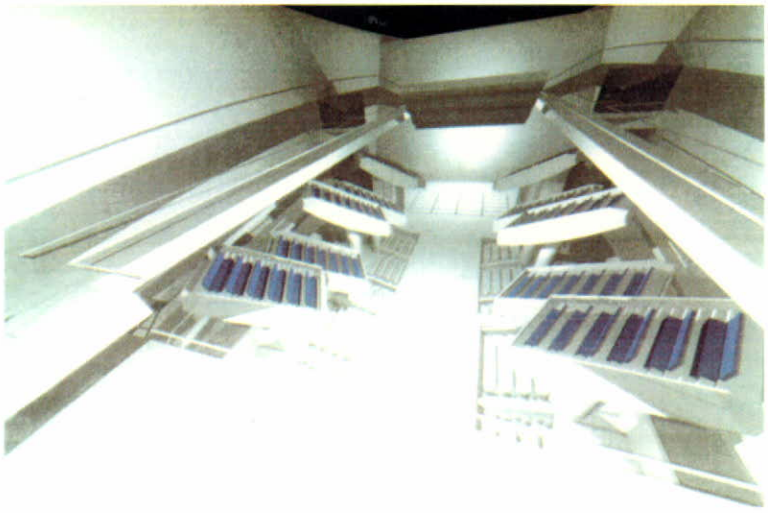
ACCESS TO THREE MAIN FACILITIES

The lobby is located between the space bound by the clothoid curve wall of the 25-metre-high main building, and the other 15-metre-high clothoid curve wall that opens on the floor and rises parallel to the road (following the direction of the railway line). The roof is completely made of glass, providing a light, open environment, and the flooring is designed with the same grid as in the plaza. The lobby's main purpose is that of being a starting point for the paths that will take the public to the main hall, the secondary hall or the multipurpose room. The foyer of the main hall lies on the first floor, at the south end of the main body, and is reached by climbing a gentle ramp located inside the lobby. Each of the floors can be used as an exhibition gallery. The foyer of the middle hall lies on the second floor, located at the south end of the main body, and is reached by a staircase from the lobby. The final result is a clear and easy layout of the different accesses to the various main areas, such as the main hall, secondary hall, or multipurpose room.



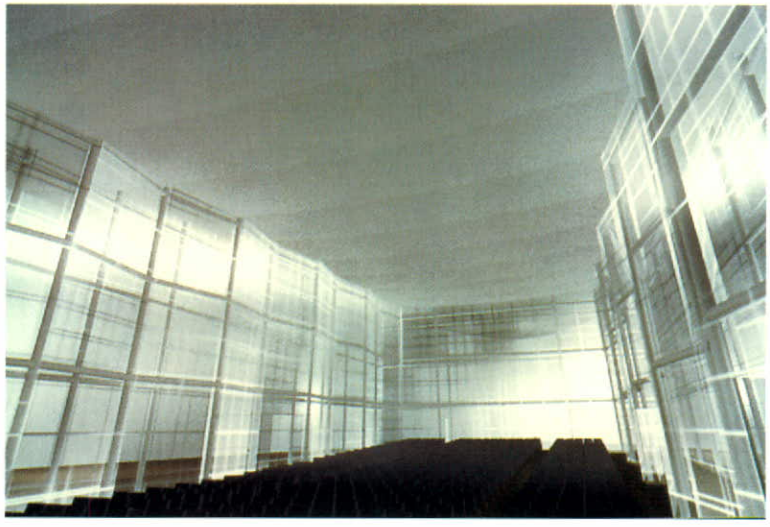
8. MAIN HALL AND SECONDARY HALL

THE MAIN HALL, DESIGNED AND BUILT IN RESPONSE TO THE CURRENT TREND OF FOCAL MULTIPLICITY
THE SECONDARY HALL, OR VISUALISATION OF FROZEN MUSIC



Main hall: an adaptable space as a multipurpose room.

A rotating system and the possibility of raising and lowering the proscenium wall, cutting the stage depth, serves to create an innovative, free theatre space that provides the room with an unedited perspective beyond the traditional relationship between spectators / actors and seats / stage. The stall seat floor is provided with trapdoors through which the actors can make their appearance. On the first floor, the platform used as the foyer becomes a false stage thanks to the rotating seat units. The sound and lighting are fitted with multiple focus regulating systems. Part of the stage mechanism remains on view. This whole set of characteristics allows enjoying a fully innovative theatre space.

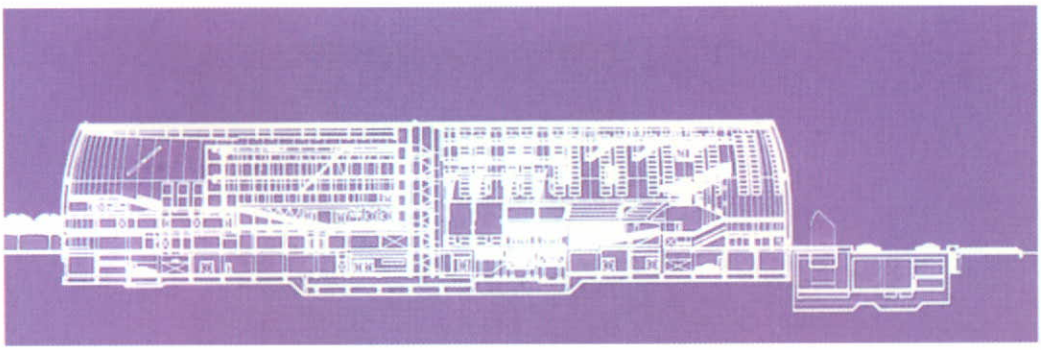


Middle hall:

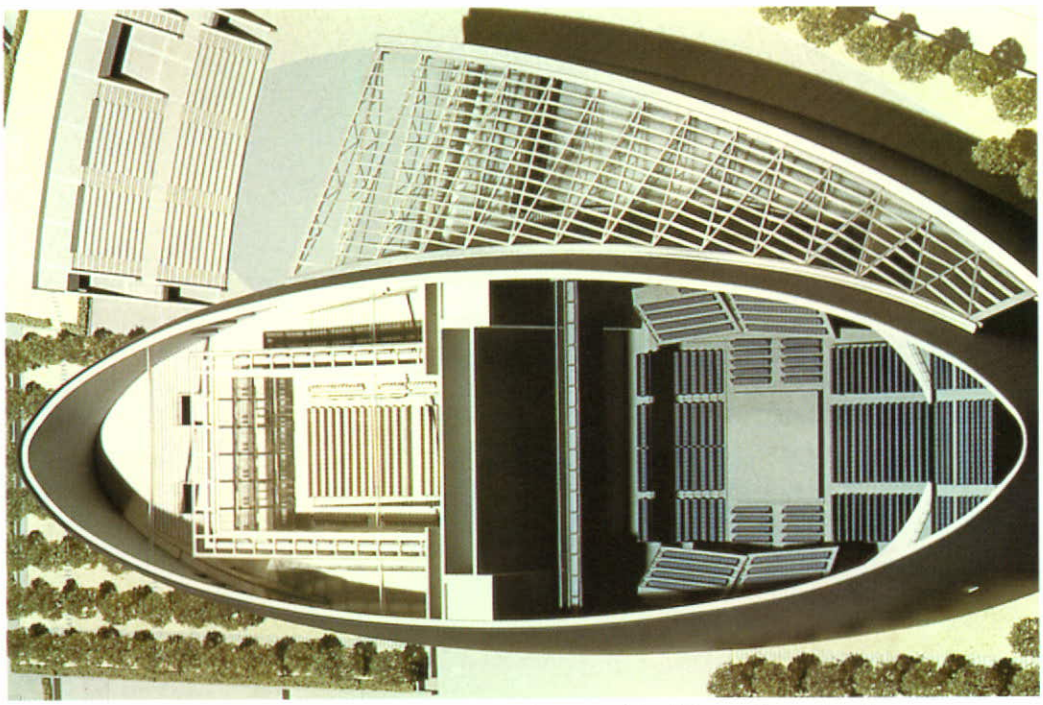
The double-glass walls separated by a corridor ensure total soundproofing on the one hand, and on the other visual continuity among the stall seat rows, thus yielding a perception of spatial unity in a "great envelope". This diaphanous urn, resembling "Cinderella's" transparent box of slippers, allows visualising the architectural work from outside the hall, as if it were frozen music.

9. DEVELOPMENT OF THE BASIC EXECUTION PLAN

FOCAL MULTIPLICITY BY A SIMPLE SEAT MOVEMENT

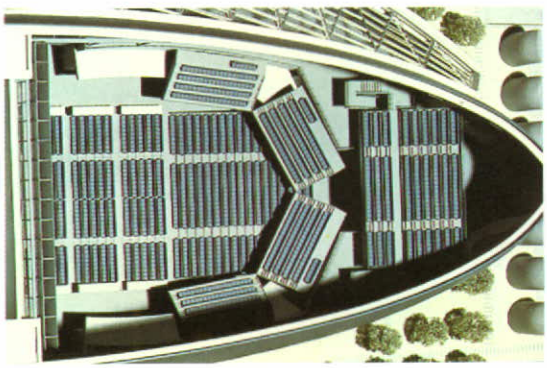


Left part, secondary Hall. Right, main Hall.



The stage in the main hall indicates the state of the "Centre-Stage Type".

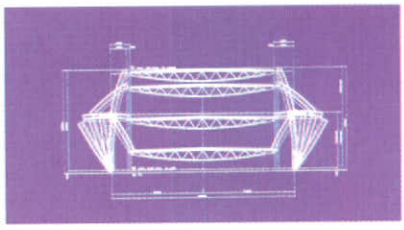
In the executive plan, the length of the ellipse was reduced by 10%, and the space in the basement was decreased to lower building costs although it kept one of the main concepts established in the requirements. The mechanism of the mobile seat driving system in the main hall was modified and simplified, to prioritise the visible conditions in the use of the "End-Stage Type".



Seat layout in the "End-Stage Type". The stage boxes on the first floor move on rails in a circle. The stall seats move by a compressed air bearing system. The proscenium has an elastic capacity and allows the stage depth to be adjusted.

10. SYSTEMATISING BUILDING PLANNING

ADOPTION OF THE "PANTA DOME" SYSTEM



The "Panta Dome" system was adopted for the construction, just as in the Palau Sant Jordi. The 3-metre wide, 12-metre high, prefabricated concrete panel units were to be joined and hoisted to a height of 24 metres by 32 hoisting cranes.

State of the building with the "Panta dome" system. It lasted 5 days, starting on 1 December 1997.

RIGHT. A trial run with two prefabricated concrete panels.

11. CURRENT STATE OF THE WORK

INSTALLING THE "PANTA DOME" AND ITS CHANGING SURROUNDING LANDSCAPE

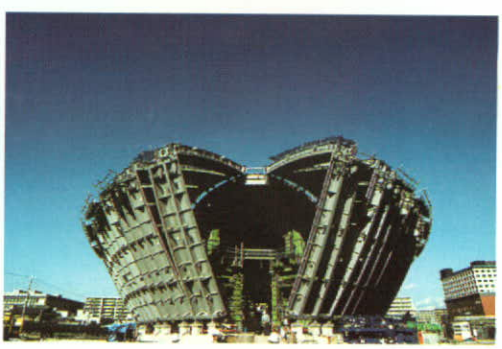
The walls that are raised change the everyday landscape in a very short space of time.

TOP. In the first stage a height of 12 metres was reached. The top of the wall is almost horizontal, as though it were a continuation of the roof. It looks structurally like an aircraft carrier. Each panel is separated from the other by a spacing at the top.

CENTRE. The top of the wall is slowly hoisted. In this intermediate position, even if it receives a horizontal thrust such as that of an earthquake, it will maintain its structural stability.

BOTTOM. Last stage. The panels are joined by their top and bottom articulation. After performing the operation the cranes located inside the building are withdrawn. The building is almost wholly closed, leaving two ends at the bottom as a work passage.

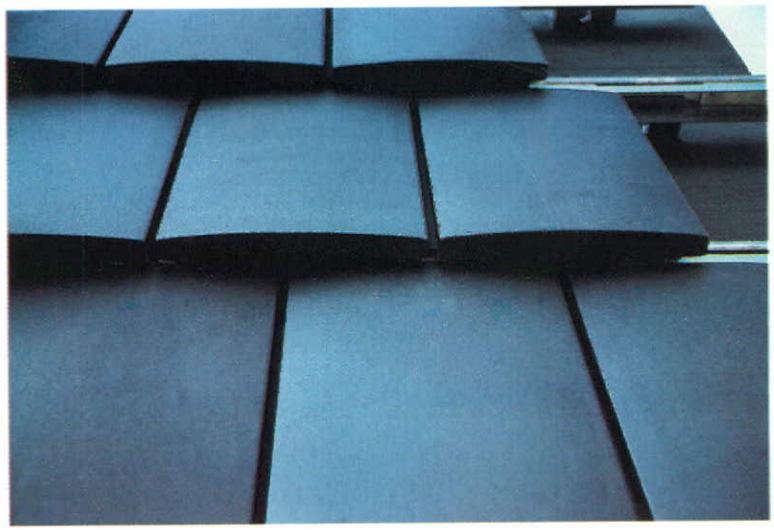


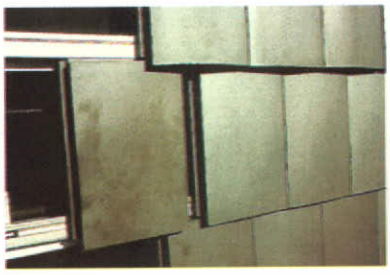



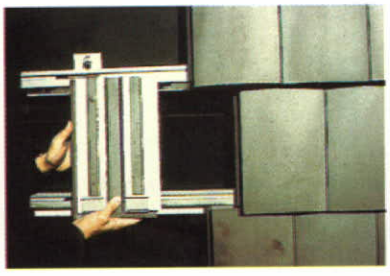


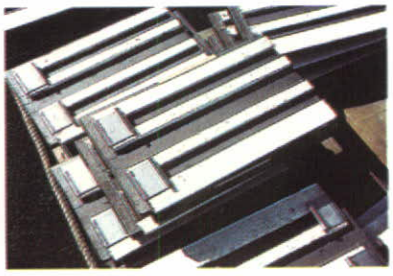
12. CERAMIC MATERIALS OF THE NARA CONVENTION HALL

EPIDERMIS OF THE NARA CONVENTION HALL USING STATE-OF-THE-ART TECHNOLOGY INSPIRED BY THE TRADITIONAL JAPANESE ROOF

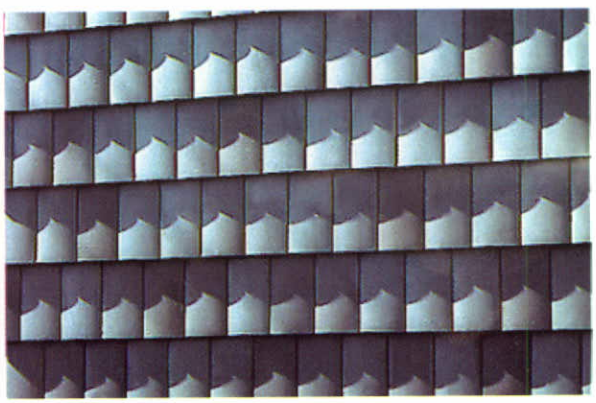








To cover the three-dimensional volume created by the clothoidal curve and ellipse, it is convenient to superimpose relatively small elements – like fish-scales – in this fashion facilitating installation and suppressing geometrical problems. This was done by employing specially designed ceramics, of an identical size to the Japanese tile. The dimensions of the material after installing it, not counting the rim, are 30 x 19 x 1.6 – 2.1 cm; the whole surface is covered with 5 variants. On top of the sealing sheet, stainless steel profiles are placed horizontally at 15-cm spacings. The tile is held by a metal hook fixed to the back, thus if the piece is damaged, replacement is easy and partial.



Shadow test using sunlight. The centre region of the tile has slightly convex design so that natural light will enrich its expression.

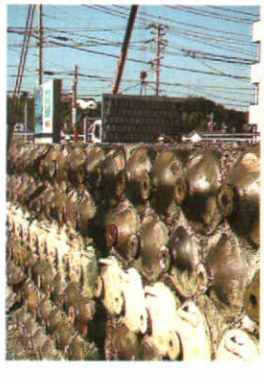
13. THE CERAMIC MATERIALS MANUFACTURING REGION: TOKONAME

TOKONAME: THE TOWN THAT PRODUCED 170,000 TILES FOR THE NARA CONVENTION HALL

The ceramic materials employed in the Nara Convention Hall were produced in Tokoname, a town traditionally devoted to the manufacture of ceramic building materials. The decision regarding tile colour and texture was taken after a series of experiments in a "tournée" type of kiln. The colour is not exactly that of smoked silver but rather a colour resembling that of old Japanese tiles. There is no absolute colour uniformity, slight differences in colour were permitted. The manufacturing process is fully automated and needs no control except at the end of the process where colours are sorted.

LEFT. Manufacturing process of the ceramic material used in the outside veneer of the Nara Convention Hall.

The town of Tokoname is one of the most important Japanese towns, and is renowned for its tile production. It had a great production capacity for large ceramic sizes, such as those of the great packings prepared for the pharmaceutical industry or construction pipes. One of the town's great aesthetic attributes is the fact that ceramic referents can be found at any point of the town in retaining walls and floorings. Up to 1970 coal was used in the manufacturing process, but its environmental impact led to a search for alternative sources such as those currently used: propane and the electric kiln, leaving the old stacks behind as simple emblems of the past.



14. EXPRESSION OF THE TILED ROOF IN TRADITIONAL JAPANESE ARCHITECTURE

TEMPLE ARCHITECTURE SYMBOLISM. THE FORM OF WORKING-CLASS HOUSE ROOF PROFILES EVOKES THE IMAGE OF A WATER SURFACE. THE ROOF AS A METAPHOR OF THE WAVE. A GREAT BUILDING AS THE SYMBOL OF OUR TIME, AS THE ALLEGORY OF A GIANT SHIP DRIFTING ON THE OCEAN

TOP LEFT. ***Shujakumon*** *reconstructed on the site of the Heijo-kyo ruins.*
TOP RIGHT.
Shibi*: bright finish on top of the roof.*

Toshodai-ji

The *Toshodai-ji* temple roof is one of the most emblematic ones in the town of Nara, and has a great volumetric force. It is built according to a style known as *Hongawara-buki*. The technique is based on superimposing *Marugawara* tiles with a half-moon shape, on top of the spaces left by the installation of the so-called *Hiragawara* tiles, which are flat with a slight curving tendency at the ends. This method was introduced in Japan in the VIth century with the advent of Buddhism from China and Kudara (today's Korea). The *Toshodai-ji* temple was built in Heijo-kyo about 100 years after the method's arrival. It is well known because it keeps to the primitive Japanese style. On the roof there are two trims that are currently the oldest ones preserved in Japan.

The *Kawarabuki* technique was essentially used in temples up to the XVIIth century. After this century its use spread to popular architecture. The creation of the *Sangawara* tile was the main reason, since it brought together the properties of two types of tile: the *Hiragawara* and the *Marugawara* tiles traditionally used in building temple roofs. The main virtue of this new type of tile was its ease of installation and its light weight. Owing to the fires occurring at that time (mainly because of the material used: bark), the use of *Sangawara* became popular, yielding roof profiles metaphorically resembling a rippling wave surface. This may contain an implicit desire to protect the houses against fire.

The great temples *Toshodai-ji*, *Todai-ji* y *Minami-daimon*, etc. stand out in the old town of Nara as if they were enormous ships floating on an ocean of ruffled waves. For this reason the Nara Convention Hall was designed as a continuation of its spatial and temporal surroundings.

Polychrome xylograph by Katsushika Hokusai. 36 views of Mount Fuji, from Bushu-Tamagawa, highlighting the rippling waves.

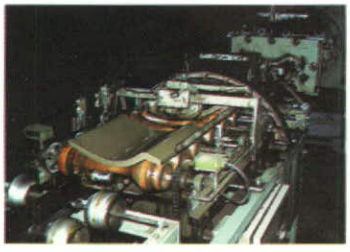
Roof with ***Sangawara*** *tiles.*

The working-class houses resemble the surface of a lake among the mountains.

15. AWAJI-SHIMA, A TRADITIONAL JAPANESE TILE PRODUCING REGION

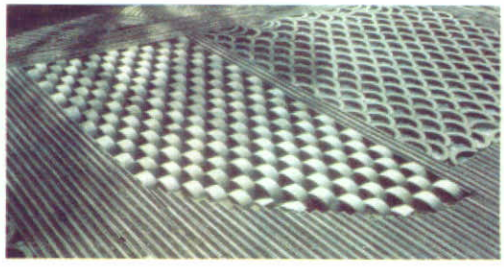
TWO TYPES OF MANUFACTURING: MODERN AND TRADITIONAL

Japanese roof tiles were formerly produced close to where the building took place, thus avoiding problems of transport. The result was the existence of numerous family companies spread over the whole country. Since 1970, for environmental reasons and also because of improvements in transport systems, productivity in this Region has risen significantly.



Automatic tile production process.

The island of Awaji-shima is currently one of the most productive areas of the whole country, exporting around 150,000,000 tiles a year, just considering the production of smoked silver tiles. The island has been well known since antiquity for its excellent clay production. Currently, thanks to technological upgrading, local industry is divided into factories with large productions and artist workshops in which special materials and works of art are treated, and medium-sized factories that are able to satisfy both types of demand. The manufacturing processes have extended to other fields with a view to producing new materials such as floor and wall tiles, owing to the drop in popular housing construction, which has also been the reason for the considerable decrease in the number of factories (200) in the region by almost half.



Experiment of a new creation using the same material as in roof tile manufacture.

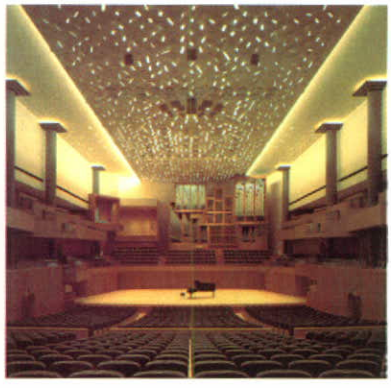
A special trim known as: ***Onigawara.***

16. EXAMPLES IN JAPAN

TATEYAMA MUSEUM / CERAMIC TILES FOR CLADDING AND FLOORING

The Museum is devoted to the "cult of the mountain", which flourished in bygone times in Tateyama, in the province of Toyama. The museum is divided into two parts: An exhibition pavilion that presents a general overview of this form of spiritual thought, and another that displays an audio-visual exposition of this particular religion. The exhibition pavilion lies in the centre of town, and the other, *Yobokan* on the outskirts, where there was formerly a chapel - *Onbado* - next to the town cemetery. As the two pavilions are separated, visitors are obliged to cross the town of Tateyama and can observe the beauty of the houses that are living samples of the museum. The outside of the pavilion walls is constructed with large ceramic pieces installed on edge. In the outer pavilions ceramic tiles were employed which were similarly installed.

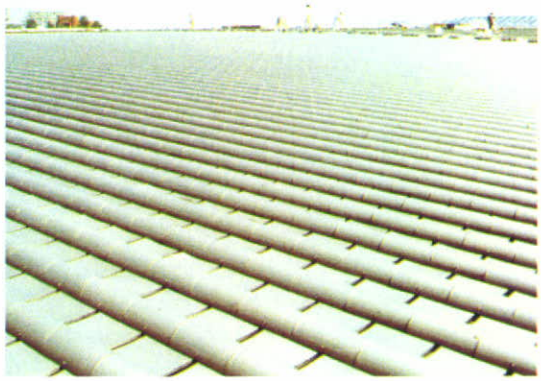
KYOTO CONCERT HALL / CERAMIC MATERIAL ON THE CYLINDRICAL OUTER WALL



This building consists of two halls with different functions: a large hall with a seating capacity for 1839 concertgoers is devoted to symphonic concerts. The other hall for 514 spectators is for chamber orchestras. Typologically speaking the large hall is a "Shoe Box" but can acquire the characteristic of a "Vineyard". The small hall has a cylindrical outer shape, while internally forming a hexagon that gains in width as it rises. On the ground floor there is the lobby whose entrance falls in a gentle slope to reach the small hall. The cylindrical building uses large pieces of curved ceramic materials to provide the outer shape. The use of tiles fits into the surroundings and harmonises with the urban environment. The outside walls are designed on the basis of different materials such as: stone, aluminium and glass panelling.

17. EXAMPLES IN JAPAN

B-COM PLAZA / TILES ON A HORIZONTAL ROOF



The almost horizontal roof of the congress and convention halls is covered with tiles installed on stainless steel sheeting that acts as a sealing, providing thermal and acoustic insulation, while keeping in harmony with the surrounding landscape.

The B-Com Plaza comprises four spaces, - a convention hall, congress hall, international conference hall and reception hall – and a tower. Each has its own geometrical shape: fan, horseshoe, cylinder and ellipse. The congress and convention halls are housed in an octahedral construction measuring 50 x 150 x 20 metres high, and its interstices act as a lobby and a foyer. The tower located at the western end of the plaza is shaped like the fragment of a great sphere.

LEFT:
Outer wall of the international conference hall showing tiling system.

RIGHT:
Inner wall built with fair face brick, used to improve the reverberation time.

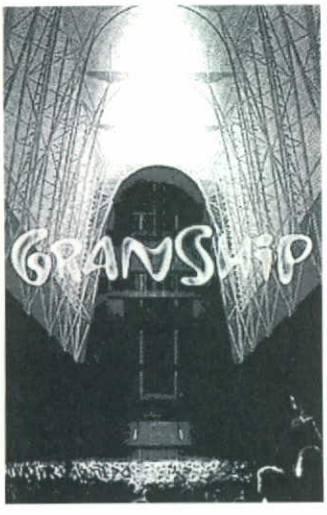
18. ANOTHER MATERIAL FOR BUILDING A THREE-DIMENSIONAL SURFACE

CASA DEL HOMBRE. LA CORUÑA

The walls of the "Casa del Hombre" are formed by a clothoid curve that rises facing the sea. In the beginning, its construction was planned using the same material that had been employed in the Palau Sant Jordi, although it was subsequently decided

to use slate, an autochthonous material in Galicia, one of the main slate producing regions. Galician slate has an exceptional quality and low cost, which is why the whole facade of the clothoid curve was built with prefabricated concrete panels, onto which grey-greenish coloured slate tiles were hung by iron fastenings. Another screen-shaped wall located at the back is made of granite blocks with light concrete reinforcement.

SHIZUOKA CONVENTION ARTS CENTER "GRAN SHIP"



Currently under construction. The work is expected to be completed by August 1998. There will be a main hall to hold 5000 spectators, a secondary hall for 1000, a theatre that can seat an audience of 400 and an international conference hall. The building is located next to the "bullet train" railway line linking Tokyo and Osaka. From a train window the building flashes by in less than 10 seconds. In response to this speed, it has been given an impacting shape in the form of an "enlarged ellipse", cut in half, capable of maintaining the different complicated programmes. The curved walls have a slate finish. The pieces were previously formed as panels in the same way as in La Coruña. The panels cut down building time. The dimensions of the large hall are quite similar to the main nave of the Sagrada Familia. The Valencian designer Xavier Mariscal is working on the sign design.