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REGIONAL BRANCHES
 Sapporo, Sendai, Yokohama, Chiba, Omiya, Hachioji, Nagoya, Kobe, Kyoto, Takamatsu, Hiroshima and Fukuoka

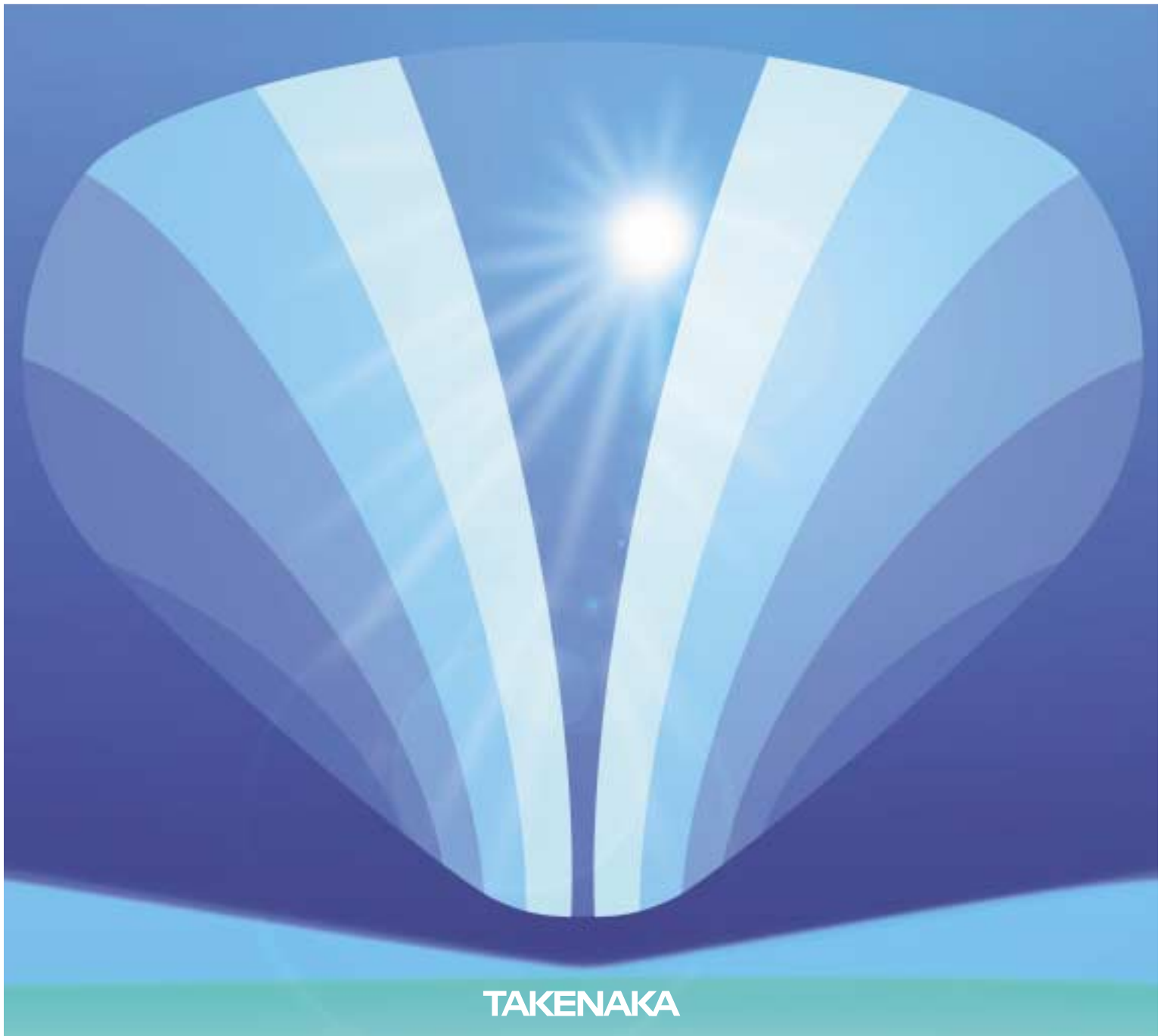
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DOME SPECIALISTS



TAKENAKA

Tokyo Dome

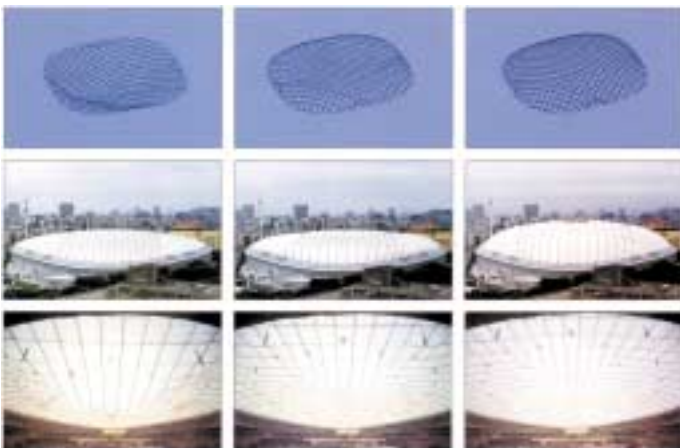
Constructed in 1988, Tokyo Dome is Japan's first all-weather large-scale dome built to host sports and other large events, utilizing a unique pneumatic membrane structure.

It is also a prominent Tokyo landmark.
(Span: 201 m, baseball seating capacity: 50,000)

Design: Nikken Sekkei, Takenaka Corporation
Construction: Takenaka Corporation

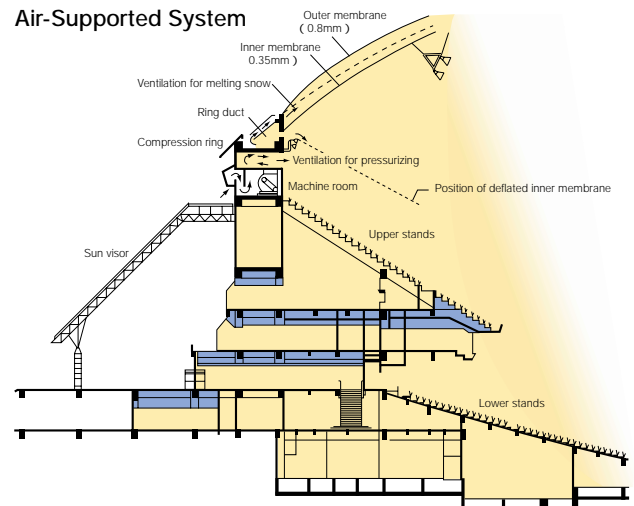


Roof Inflation



Unstable movements that occur during the transition from the stage when the roof membrane is not pressurized and through stages of inflation were verified through analysis and lab testings to ensure that precise operation and construction standards are met.

Air-Supported System



On the roof surface, 14 steel cables are employed crossing in two directions respectively. Double membrane coated with Teflon applied between the cables helps maintain sound-absorption and insulation efficiency. The internal air pressure is maintained at approximately 0.3 percent higher than the external air pressure in order to keep the membrane roof inflated.

Fukuoka Dome

Fukuoka Dome is Japan's first large-scale dome with retractable roof structure. Completed in 1993, it allows hosting sports events under natural sunlight as well as other large-scale indoor events.

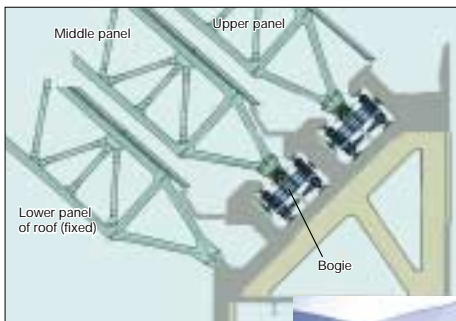
(Span: 222 m, baseball seating capacity: 48,000)

Design: Takenaka Corporation, Maeda Corporation
Roof Shape: PBK, WZMH
Construction: Takenaka Corporation (JV)



Retractable Roof

The titanium-coated roof comprises three layered fan-shaped panels, of which two rotate to open or close the roof in about 20 minutes.



Driving Mechanism

Movement of 4,000 tons of each roof panel is accomplished using circular rails built outside the roof circle directed by 24 bogies.



Nagoya Dome

Taking the neighboring residential environment into consideration, a single-layered lattice structure that maintains the dome's shape, and a highly sound-proof, efficient fixed roof structure are combined for the construction of Nagoya Dome. It is the world's largest single-layered lattice structure.

(Span: 187 m, baseball seating capacity, 40,500)

Supervision: Mitsubishi Estate
 Design: Takenaka Corporation
 Construction: Takenaka Corporation (JV)



Roof Raising



The roof which weighs 10,300 tons was raised with 72 computer-controlled jacks.

Various Patterns of Natural Lighting



Dome Support Technologies

The needs of large space where many people can gather and share inspirational moments may vary depending on the different characteristics of a country or region or different purposes of use.

Takenaka has been engaged in building a great number of domes satisfying these needs. Takenaka's dome building technologies such as highly creative large space building technology, high quality environment control technology and reliable building technology in proven applications are firmly established by the achievement of the building a number of domes.

We are committed to continue with our comprehensive dome building technologies in creating and realizing advanced comfortable dome space.

We believe architecture is a way of expressing our works.

"Turning dreams into reality" Takenaka Corporation

Acoustics

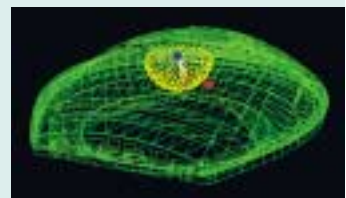
The sound clarity in a large space like a dome decreases mostly because of excessive reverberation, longpass echo and nonuniform sound pressure. To secure the sound clarity, the acoustic design is carried out by computer simulation and auralization, uniting the architectural acoustical design with the electro-sound design.

Auralization



The sound clarity of a dome at the design stage can be confirmed by the auralization.

Sound wave front simulation
 This enables visual time range recognition of sound emitted from the speakers and reflective sound paths.



Sound wave front
 Receiving point

Time: 70 [msec]
 Freq: 500 [Hz]

Sapporo Dome

Sapporo Dome is a large-scale versatile dome that permits hosting of a variety of events such as soccer matches on natural turf and baseball games in this snowy and cold region.

One characteristic of this dome is a soccer field, "Hovering Stage" that is designed to move between the indoor and outdoor arenas.

(Span: 229 m × 218 m, soccer seating capacity: 42,300)

Design: Hiroshi Hara + Atelier , Atelier BNK
Construction: Takenaka Corporation (JV)



Internal Facility Exchange

The Hovering Stage which was set up as an outdoor arena for a baseball game is moved straight into the indoor arena after the artificial turf is rolled up. The moving walls are opened, and the foldable stands are stored away. The soccer field is readied after the stage is moved at an angle of 90 degrees together with the rotating stands at the center of the indoor arena. Preparing the soccer field requires approximately five hours.

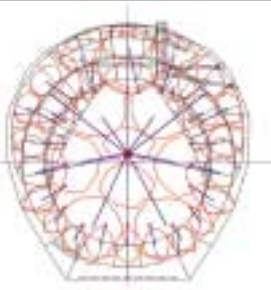


"Hovering Stage"

During movement, the Hovering Stage, which measures 85 meters by 120 meters in area, 1.38 meters in height and with a total weight of 8,300 tons, is supported 90 percent by air pressure and the remainder by wheels located at 34 locations while air is directed under it.

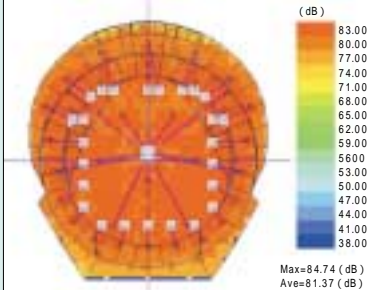


Cover area simulation

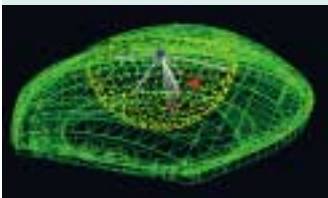


This determines optimum peaker system location.

Sound pressure level simulation



This assures that uniform sound pressure level in the field and around the spectator seating is maintained.



Time: 150 [msec]

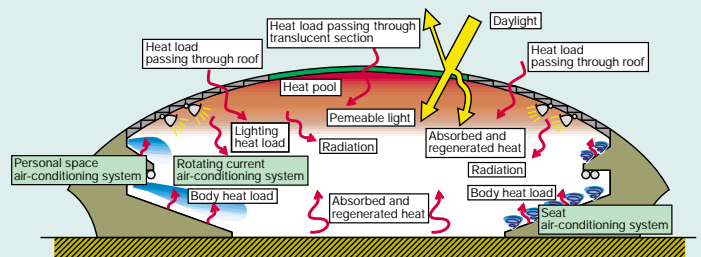


Time: 300 [msec]

Air-Conditioning

The dome's air-conditioning system has been built taking into consideration the shape of the dome, natural lighting, human body heat, and intended usage. It incorporates personal space air-conditioning, rotating current air-conditioning, and seat air-conditioning, as well as natural ventilation and body temperature control systems, providing the best in air-conditioning systems.

Dome heat loads and air-conditioning systems



Oita Stadium " Big Eye "

Oita Stadium was planned to be the athletic cultural center of Oita Prefecture. Its roof with a large opening is equipped for the roof to open and close in order to ensure sufficient turf sun exposure. (Span: 274 m, soccer seating capacity: 43,000)

Design: KT Group
(Kisho Kurokawa Architect & Associates,
Takenaka Corporation,
Satobene, Takayama Sogo Kogyo)
Construction: Takenaka Corporation (JV)



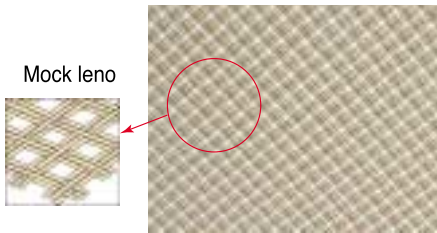
Retractable Roof

The roof runs on the seven arches, and it takes about 20 minutes for opening or closing.



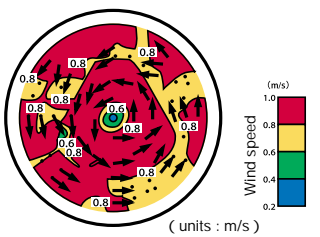
High-Translucent Membrane

A jointly developed innovative membrane material for retractable roof, "Mock leno" is made to realize twice the possible conventional translucency.



Lighting

Natural lighting plays an important role in dome construction. Tokyo Dome use membrane materials to soften natural light and create comfortable indoor space that is bright overall. Nagoya Dome features windows at the top of the dome with transparent screens that filter natural light.



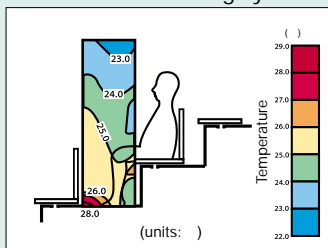
Rotating current air-conditioning system
Airflow created by rotating current lowers body temperature and increases the level of comfort.

Rotating current fan



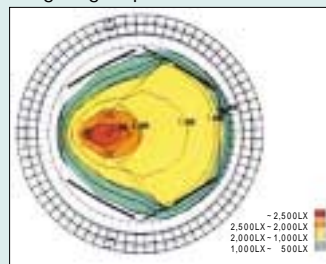
Fans located around the seats produce rotating air current.

Seat air-conditioning system



Air-conditioning from the step floor is very effective when the heater is on.

Lighting dispersion for baseball



Multipurpose domes need lighting that can be adapted for a variety of events. For example, baseball games need lighting that is concentrated on the inner field, whereas soccer games need a more even spread of light across the whole field.

Studying how balls are seen



Osaka Dome

Equipped with large-scale "Super Rings" and wall curtain, Osaka Dome is designed to accommodate various events offering a versatile dome space created as a variable space system. Adjacent to this dome is "Festa Mall," a commercial facility with a unique appearance.
 (Span: 167 m, baseball seating capacity: 48,000)



Super Rings and Wall Curtain

The inner shape can be changed according to the usage purpose.
 With the Super Rings, a circular ceiling is raised and lowered to alter the space for concerts and events by installing a wall curtain.



Design: Nikken Sekkei (Assisted by: Takenaka Corporation, Obayashi Corporation, Dentsu)
 Construction: Takenaka Corporation (JV)

Odate Jukai Dome

Odate Jukai Dome is a two-directional, oval-shaped, arched truss structure. It is 175 meters long and 153 meters wide with large section glued-laminated timber made from "Akita cedar." It is the largest wooden structure dome in the world.

Design: Toyo Ito & Associates, Architects, Takenaka Corporation
 Construction: Takenaka Corporation



Disaster Prevention

We create domes that meet the highest safety standards, by using a number of tests and simulations, and by fully researching the behavior of smoke and evacuation patterns.

Smoke flow test



Test confirming simulation.

Smoke flow simulation



Assuring safety with smoke simulation under the influence of outside air when the roof is open.

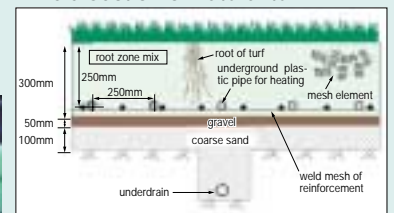


Water cannon
 Effective distance 100 meters.

Ground

Multipurpose grounds have diverse conversion equipment.
 The artificial turf is laid for baseball, and it is removed using a roller machine for events.

Field section of natural turf



Roller machine



Natural turf must be laid for international soccer matches, so various technologies are used, including retractable roof and movable field to keep sunlight for growth.
 Moreover, the world's first turf-growing technology with underground heating using buried pipes, has enabled evergreen turf even in winter.