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RESTRUCTURING OF THE PALAVELA AND CONSTRUCTION OF FIGURE SKATING AND SHORT-TRACK FACILITY

Ms. Gae Aulenti, architectural designer - "Palavela"

I. REMODELING OF THE PALAVELA AND CONSTRUCTION OF THE FIGURE SKATING AND SHORT TRACK RINK

1. Project Outline

Location: City of Turin Area Italia '61

Client: Agenzia Torino 2006

Head Manager of Procedure: Mr. Giorgio Fassinotti – Agenzia Torino 2006
with Mr. Andrea Conci

Contractor: **Temporary Partnership:**
Arnaldo De Bernardi (chief)
Gae Aulenti
SI.ME.TE. s.n.c.
Cesare Roluti
Silvio Basso
Matteo Filippi
Gian Carlo Gramoni
Francesca Quadri
Walter Peisino
Giuseppe Forte
INTEK s.r.l.

Design: **Architectural Design:**
Gae Aulenti
With Marco Buffoni, Vittoria Massa, Marco Zaccarini,
Uri Yeger, Aldo Moia, Roberto Scotta.
Lighting design consultant:
Piero Castiglioni and Nicoletta Rossi
Structures:
Arnaldo De Bernardi
Matteo Filippi
Walter Peisino (geologist)
Francesca Quadri

Plants:

INTEK S.r.l. – Francesco Crocitti, Enrico Rosati (thermo-fluid plants); Giuseppe Forte (electrical plants)

Interdisciplinary Coordination:

Silvio Basso

Cesare Roluti

Safety Coordinator:

Gian Carlo Gramoni

Supervision:

General Management:	G.Siniscalco (SI.ME.TE.)
Electrical Plant Supervision:	G. De Magistris
Thermo-fluid Plant Management:	
Intek s.r.l. (F. Crocitti, E. Rosati)	
Site Inspector:	M. Filippi
Safety Coordinator:	G. Gramoni

Temporary Business Partnership:

Maire Engineering S.p.A.

Impresa Rosso S.p.A.

Keltermica Cordero S.r.l.

2. Architectural Report

2.1. Design Objectives

For the cities and regions that have hosted the Olympic Games, this event has always represented an opportunity for reflection and analysis of the condition of their architecture, with consequent proposals for modification, expansion, and reconsideration of part of the built area and part of the plans for work on the city itself.

Remodeling of the Palazzo a Vela, which is necessary so that the structure satisfies the functional and safety requirements for hosting the Figure Skating and Short Track events during the Winter Olympic Games to be held in Turin in 2006, is intended to modify not only the building itself and its functions, but also the character of the structure. The Olympic event always triggers a process of requalification of parts of the territory and city, correlated with transformations and development of the infrastructures that remain, as a public "investment," in addition to the Olympic event itself.

The Palavela attracts special attention and wonder due to its formal character and size: the building, with a hexagonal base inscribed in a 150 meter diameter circle, is comprised by a vaulted reinforced concrete structure built on three arches that are rotated 120 degrees with respect to each other and anchored to the ground at three of the six vertices of the hexagon.

It is difficult to grasp the "limit" between architecture and engineering in this work. What strikes us here is the enormous interior space: we are confronted with an unusual form of architecture that resists division and fragmentation, a finite space whose power resides in its unity and almost abstract nature. It is definitely a city landmark, a genuine "monument."

The call for tenders defined two principal objectives: restoration of the Palavela and accommodation inside it for the Olympic specialties of Figure Skating and Short Track competition, with stands containing a total of 8,000-10,000 seats, ancillary and service spaces, and subsequent post-Olympic use of the facility as a polyvalent structure operated by the City of Turin, with construction of an intermediate slab floor to increase its functionality and versatility and permit its eventual division into two independent spaces.

The overall project also had to satisfy all functional, quality, and safety requirements during the Olympic as well as post-Olympic phases.

This project confronted us with two general and diametrically opposed considerations: construing the Palavela as a closed envelope with the consequent and necessary subdivision and fragmentation of the interior space into those intended for the required functions, or preservation of the spatial unit, with construction of a "building inside a building," with its own formal characteristics that are structurally independent from the existing vaults but depending on its geometry.

We decided that the second approach was the only feasible one given the architecture of the Palavela and respect for its characteristics. Any form of internal subdivision would have compromised perception of the vaults and their unity, contradicting the intentions of the original design.

We thus set ourselves the objective of leaving the reinforced concrete structure visible and recognizable, with it becoming an element of visual reference from inside and out.

The functional and distribution requirements of the tender, the need to have different entrances for the authorities and the public, the differentiated distribution of seating, the needs arising from post-Olympic use, the building operating costs (reduction of the interior volume), and the fire alarm and extinguisher requirements struck us as being in harmony with the decision to operate inside the Palavela with a new, finished, autonomous, and independent building.

The building is comprised of two adjoining structures with roofs at different levels and joined by a reticular roofing system.

The decision to construct the new stadium with roofs at different levels stems directly from the geometry of the existing vault, which makes it possible to achieve greater heights only at the central sections of the arches on which the vault is constructed.

Approaching its supports, increasingly limited heights are possible, and the plan must necessarily depart from them.

This results in an asymmetrical building in a building that has its own axial configuration, which engages in a dialogue with it and reveals different views from its different angles.

This asymmetry is particularly evident and also characterizes the interior of the stadium, where the two areas dedicated to the public and Olympic families are clearly distinguishable, being delimited by diagonal walls painted fire red that penetrate from outside.

People passing by on Via Ventimiglia see two different façades, characterized by corner, non-frontal views: an initial, more compact façade with a constant height, marked by the sequence of external stairs that are visible when moving from south to north along the road. But when passers-by are traveling from north to south, they see the complexity of the different volumes that comprise the north block and its relation with the wider structure of the public seating tiers.
The stadium is made of reinforced concrete, but we established a strong contrast between the central nucleus that is painted fire red and the projecting portions, which are left gray in order to imitate the effect that is usually achieved by the play of light and shade generated by the sun shining on buildings, which is instead blocked here by the vault.

2.2. Access to the Facility and External Distribution

The structure is sited in such a way as to assure access and maneuvering by rescue vehicles and the possibility of evacuation towards adjacent areas.
The exit routes are distributed along all four sides. Egress is assured by a walkway on the perimeter.
Access by service and rescue vehicles is also assured at the public entrance level (elevation +0.00) and the ice skating rink level (elevation -1.75) by means of a driveway with a maximum slop of 7%.

The points of access to and egress from the facility are determined by the subdivision into exit sectors envisaged for the public:
Public Sector 1
Public Sector 2
Athletes
Olympic Family and Media
Technical Facilities

Spectators going to Sectors 1 and 2 access the gated area of the facility from Via Ventimiglia.
The Sector 1 spectators access the facility at level 0.00 by surmounting the existing change in level with a dual system of symmetrical, stepped ramps paved in asphalt with stone curbs that channel the public towards the entrances.

A ramp for disable persons that is also directly accessible from Via Ventimiglia is provided on the south side of the stepped ramp.
A bridge entrance leads directly from Via Ventimiglia to the first level of the facility, at an elevation of + 4.00.
Sector 2 spectators reach the facility by passing through the road running perpendicular to Via Ventimiglia that crosses the southern side of the park adjoining the Palavela area.
The entrances for Athletes, the Olympic Family, the Media, and facility management are all located on the adjoining parking lot on the north side of the building.
The driveways are connected to the indoor parking lots of the area for a total of 40 cars and 27 minibuses.

A 3.50 meter wide asphalted ring road surrounds the building and connects the sectors. The outdoor areas not used for the driveways and parking lots are landscaped.
The area adjoining the building, delimited by the asphalted ring road, is paved with artificial stone slabs.
Three pools of water are planned for installation at the base of the three supporting points of the vault, with underwater spotlights being used to illuminate the vault. The pools also prevent the public from approaching the vault at its lowest points.

2.3. The Figure Skating and Short Track Building

The main structure of the two flanking structures that comprise the building was constructed with parallel MASONRY BAFFLES that contain the floor slabs and prefabricated seating tiers and articulate the main spaces, and with PERIMETER WALLS enclosing it.
The baffles are fabricated in exposed reinforced concrete and protected with a transparent acrylic paint finish. The enclosing perimeter walls are also fabricated in reinforced concrete and then painted with RAL 3013 red acrylic sealing paint.
Near the corners of the building, the external walls are angled by 45 degrees and penetrate the interior of the stadium, thereby defining the two main blocks: public tiers on one side and Olympic Family tiers on the other.

The stands, which have different widths and heights and are divided into sectors, with three tiers on the Olympic Family, Media, and Athletes side and three tiers on the public side for a total of 8,285 seats, with space for 50 disabled persons,

were constructed with exposed prefabricated cement components, except for the second tier of the public stands at a height of + 4.00, which instead consists of a temporary metal structure that can be removed in future to permit construction of the intermediate floor slab envisaged for multi-functional use of the building after the Olympics.

The roof consists of a steel reticular spatial structure with a maximum height of 3.40 meters. It is treated with zinc and traversed by metal catwalks with grilled walkways that accommodate the technical services for the large hall: the lighting system, sound broadcasting system, and scoreboard.

The roof is also crisscrossed by the ventilation ducts for the rink, covered in shiny sheet metal.

The sound absorbing and sound insulated roofing insulation at the top of the reticular structure is comprised of a sequence of two layers of sound insulation, air chamber, and external insulated panel in painted sheet metal for heat insulation.

The air recirculation ducts for the large hall run inside the roof insulation. On the side facing the hall, the acoustic panels are finished with perforated aluminum sheets. The ventilation exhaust intake ducts for the large hall run inside the roof insulation.

The other roofs of the building, specified at different heights, are normal flat roofs with insulation and waterproofing or structural glass with heat insulated aluminum frames.

A system for illuminating the vault of the Palavela is envisaged for the roofs.

2.4. Entrances and Functional Distribution

Public Sectors 1 and 2 on the ground floor are directly accessed from the large Hall envisaged on the south side, where, in addition to the lavatories and food services, spaces are planned for information services, sales, and a public first aid station. The first tier of the public sector is accessed directly from the hall through the vomitories positioned opposite the entrances along the main access and the side corridors.

The hall floors are paved in artificial stone.

The acoustical drop ceilings, which conceal the electric cable and air conditioning ducts and house the lighting, sound, and fire extinguishing systems, are made of perforated sheets of aluminum.

The lavatory floors and walls are covered in white 10 x 10 single fired tiles.
The same finishing is also envisaged on the top two floors.
Starting at an elevation of 0.00, the hall located at + 4.00 is accessed directly from the stairs located on the south end and from the diagonal stair located on the northeast. This hall is also accessible by means of the eight elevators for disabled persons and stretchers.
The entrance hall communicates directly with Via Ventimiglia by means of the planned bridge. The hall distributes the various accesses to the second tier of the stands and houses the same services planned for the ground floor.
The second floor is reached instead by means of the external stairs in reinforced concrete (south / southeast / southwest) and the eight elevators.
This floor will also be equipped with lavatories, a public first aid station, a food services storeroom and two food service areas positioned symmetrically inside the diagonal walls on the south and roofed with structural glass in heat-insulated aluminum frames.

The entrance for athletes and trainers passes through the two diagonal walls on the northeast corner that lead directly to the ice skating rink.
The entrance to the gymnasium is from the mixed zone, where journalists can interview athletes at the end of competition, with a glass roof, first aid station for athletes, and drug control station (Blue / Red Medical Station).
An interior corridor connected with the mixed zone distributes the service areas dedicated to the athletes: the six dressing rooms equipped with bathrooms, showers, massage / warm-up rooms, sauna, and trainers' dressing room.
The spaces dedicated to the athletes have rubber flooring, and the drop ceilings are made of plaster panels painted with white water based paint. The walls are painted white. The lavatories and showers are finished with single-fired white tiles. The drop ceilings of the mixed zone have perforated aluminum sheets instead.
A flight of rubber covered steps leads from the dressing room through the mixed zone to the ice skating rink.
The athletes can access the Olympic Family block at an elevation of + 4.00 from the main entrance. This block houses the press offices and interview rooms. A 200-seat stand is envisaged for athletes at the 0.00 level.

The entrances for the Olympic Family, the Media, ISU / Judges, and the public in the stands at the elevation of + 8.00 (sponsors, media, etc) planned for the north façade of the building lead to three large food service areas, enclosed by a

roof and external wall made of structural glass with dark green aluminum frames. The interior walls are made of plaster board with insulation and painted with white water based painted. The flooring is in artificial stone.

The Olympic Family representative offices are located adjacent to the media lounges and ISU – judges. These offices include the office of the ISU President and other offices connected with athletic activity, protocol, and scoring management.

Following these is a corridor that leads to the judges' dressing rooms, lavatories, and entrances to the Olympic Family and athletes' tiers.

The office zones adjacent to the lounges are divided by plaster board walls that can be removed after the Olympics in order to restore the single large spaces.

Two interior side stairs with a triangular plan and elevators for disabled persons lead from level 0.00 to the corridor lined with the media spaces: press room, interview room, and an open space office.

The press room will be equipped with 200 tables for the media, complete with online connections.

The walls dividing these spaces are made of plaster board painted with white water based paint, and these, just like the walls of the Olympic Family zone, can be removed subsequently to restore the single large space.

Plans call for raised flooring with square panels. The drop ceilings are in perforated aluminum sheets.

The corridor leads to two side zones reserved for the lavatories and technical plant spaces and media stand, which is to be equipped with 264 tables for journalists, complete with online connections.

The two staircases and elevators for disabled persons inside the towers lead from the ground floor to the + 8.00 level, which is glass roofed and equipped with lavatories for the public, a food service area, and dressing rooms and lavatories for the food service personnel.

The hall leads to the tiers at the + 8.00 level dedicated to the media, sponsors, etc.

As in the other areas, the hall flooring is in artificial stone.

The scoreboard and sound system operator booth are located on the sides of the stand at the + 8.00 level. At the + 11.08 level, two other spaces are planned for the lighting system operator and TV directors, in addition to two technical spaces.

2.5. Plant and Storeroom Management

The entrance to the facility management spaces is located on the northwest side of the building.

Two staff dress rooms are planned at the 0.00 level. The dressing room floor and walls are tiled and the drop ceiling has plaster panels.

The triangular stairwell next to the entrance leads to the facility management, security office, CED office, and workshop at the + 4.00 level.

A floating floor with rubber surface is planned for the offices, with white painted walls and drop ceilings with white painted plaster panels.

The storerooms, located on the northwest, are directly connected to the asphalted ring road planned for the exterior of the building, at a level of 0.00. The storerooms have driveway access.

The ice polishing machine storeroom is planned to be built next to the warehouse.

2.6. Characteristics of the Mechanical Plant

Plans call for the thermal fluid, water, and refrigeration plants necessary to satisfy the requirements of the sports complex, as follows: formation of the ice skating rink surface, air conditioning, production and distribution of hot and cold water for the lavatories, and fire sprinkler systems.

The primary sources of power necessary for operating the facilities are both thermal and electrical: the thermal energy is furnished by the city distance heating network through a substation that can provide about 5,000 kW of thermal energy at a maximum temperature of 70° C, with a plant return temperature limit of 55° C. Electric power, obtained from the transformer station serving the Palavela, with a capacity of about 2,000 kW, is mainly used to power the refrigeration units of the rink cooling plant and the air conditioning systems, in addition to other plants including the thermal substations, the central units of the air conditioning system, the dehumidification systems, and the fire extinguishing system.

Potable water is provided by the municipal distribution network, with a hook-up that guarantees a flow of about 50 liters a second.

The planning choices made to define the air conditioning plants were aimed at realizing the best conditions for the activities envisaged during the Olympic phase and the possibility of reconverting and modifying the facilities for different use of the

building at a later time. It will also be possible to move and reuse elsewhere the specific plants installed for the Olympics.

The air conditioning plants are independent for each different zone: tiers and stands; ice skating rink; media rooms; lounge; lavatories and spaces for the athletes, referees, and judges; technical offices and spaces.

The environmental conditions produced by the air conditioning plants will vary and be regulated independently for each zone, thereby satisfying the need to assure optimum conditions in each zone for the activity performed by its occupants. A suitable temperature for athletic activity (10-12° C) and a particularly low level of humidity can be guaranteed to prevent the formation of condensation and mist near the surface of the ice skating rink. The plant is comprised by two air conditioners with a chemical dehumidifier that can discharge up to 80,000 cubic meters per hour. In the seating tier zones, the air conditioning plant assures ventilation and temperature and humidity control and optimum levels for occupant comfort. The air conditioning outlets consist of grates incorporated in the tier structure, while the stale air is sucked out through ducts in the roof. The total flow of air channeled through the tiers is 240,000 cubic meters per hour.

Special attention was devoted during the design phase to the placement of the air conditioning plant components in respect of the architectural choices and noise emission control both inside and outside the Palavela. The 17 air conditioning units are positioned partly on the roof terraces of the building and partly in the technical service spaces under the tiers at a level below the rink level. All ducts and piping for the air conditioning plants are located in technical spaces or corridors inside the drop ceilings and are not visible, while the central refrigeration unit is located in a technical structure outside the building.

The plant for preparation and maintenance of the ice surface of the skating rink is comprised by a series of steel pipe coils laid in the sub-floor of the rink.

The ice can be several centimeters thick. It is formed and maintained by circulating a solution of water and glycol through the coils at a temperature of –12° / –8° C. The ice is formed by using distilled water. The temperature of the ice can be regulated according to the requirements of the sports activity.

Refrigeration is provided by two refrigeration units (one of which is a reserve unit) that can be activated on a parallel basis during formation of the ice to reduce the ice preparation times.