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Beginning in the 1930s in Southern Europe and spreading later in Latin America, a series of sport facilities were built in which the plastic and structural qualities of poured-in-place concrete were exploited to great visual and functional effect by architects like Pier Luigi Nervi (Florence Stadium, 1929-32; Palazzo dello Sport in Rome, 1958-59), Eduardo Torroja (Hippodrome of the Zarzuela, Madrid, 1932-33), or Carlos Raúl Villanueva (University Stadium, Caracas, 1949-52). All these buildings were part of a heroic period in the development of a Latin/Mediterranean approach and plastic understanding of concrete, which contrasted with the rationalist canons of the International Style. Pier Luigi Nervi's affirmation that every concrete structure constitutes "an organism within which all internal constraints are propagated and transmitted from a nervure to another" (1) is not without paralleling the overall structure of the human body. Many of the structures mentioned above were indeed characterized by long-span cantilevered roofs whose expression of internal forces cannot be dissociated from the athlete's muscles in tension.

Hilario Candela Less well known than its European and Latin American counterparts, but unique for its direct relation to a water stadium, the Marine Stadium Grandstand in Miami is a cast-in-place concrete 100-meter long building with an eight-section hyperbolic paraboloid roof (2). It is 33-meter wide with a cantilever of 20 meter over the stands; one third of the structure is built on piers into the water. Used for motorboat racing and various types of concerts on a floating stage, the 6566-seat grandstand was built at the edge of a Circus-Maximus-like water stadium, designed and landscaped to face the stands. Hilario Candela, a Cuban architect who worked with Max Borges in Havana (Tropicana Nightclub, 1951) and arrived in Miami in 1960 to join the firm of Pancoast-Ferendino-Grafton-Skeels-Burnham, designed the structure with the engineer Jack Meyer (from Norman Dignum Engineers). Closed in 1992, the grandstand has been inaccessible to the public and threatened by demolition. Registered in September 2009 on the World Fund Watch List, it has now been granted historic preservation status by the City of Miami but the integrity of its adjoining landscape remains under threat.

Hilario Candela's Marine Stadium epitomized further promises of a modern tropical urbanism and architecture that, using local techniques, materials, landscape and vastness of space, extolled Miami's regional culture, climate and natural environment. The stadium was the opening act for an intense period of creativity for the firm and for Candela as a lead designer, a period that culminated with the South Dade campus of the Dade Junior College from 1964 to 1967. Illustrated with original photographs and drawings, the proposed paper will analyze the building and its structural system; outline the research process leading to its designation, and the challenges posed by the necessary changes of use of the structure; analyze the role played by the concept of "ethnic identity" and its convergence with landscape and architecture preservation interests for the preservation of one of the rarest expression of genuine Cuban/Latin American architectonic modernist influences within the postwar architecture of Miami (3).

Hilari ande Miami Marin adiu 1964 Foto Ines Jus- Flick - reati mmo

The Stadium and its Designers

The Marine Stadium (240 acres of land and water) was the culmination of a series of proposals for the development of the publicly owned barrier island of Virginia Key, situated north of Key Biscayne on the northeastern edge of the Rickenbacker Causeway. The site became a major segment of a planned chain of parks, entertainment venues and public infrastructures that Dade County Parks Commissioner Charles Crandon envisioned and that was partially built between the Rickenbacker Causeway and Key Biscayne. In 1962, the City Commission hired the renowned Chicago firm Ralph Burke Engineers & Architects to study the feasibility of and develop a master plan for a marine stadium on Virginia Key (4). The report determined that there was no other facility of the type in the world, and that the local cultural and climatic conditions would make the stadium an economic and public success (5). The Virginia Key site was well protected from the winds and provided calm and safe waters for high-speed motorized boats as well as for regattas.

The project by Burke Engineers continued the Miami tradition of shaping geometric land out of the irregularly formed natural and artificial island in Biscayne Bay—like the Venetian Islands, Flagler Memorial Island, the Bay Harbor Islands. The amorphous edges of the western shores of Virginia Key were dramatically reconfigured in the shape of 5,300-foot long water stadium, oriented NW-SE. Along its northeastern shoreline, the engineers projected a pier-like structure, whereas the widened southern bank alongside the causeway included a grandstand, a floating stage for concerts, a series of boat slips, places for restaurants, beaches, and a large 4200-car parking area separating the stadium proper from the Rickenbacker Causeway.

As the water stadium was being built, the design for a seven-thousand-seat grandstand was commissioned to the firm of Pancoast, Ferendino, Grafton, Skeels and Burnham. Andrew Ferendino, an American graduate from University of Florida, and Hilario Candela, a young Cuban architect educated at Georgia Tech, were put in charge of the project (6). Hilario Candela, born in Havana in 1936, was educated at Georgia Tech in Atlanta where he had the opportunity to hear lectures by Pier Luigi Nervi and Felix Candela. While in school, Hilario collaborated in the summer with Max Borges, Jr., another graduate of Georgia Tech and the architect of the Tropicana Nightclub also known as *Arcos de cristal* (1952) in Havana, the elegant and organic structure made of light concrete shells that open up on the tropical skies and the luxurious nature (7). Following graduation, Candela returned to Cuba and joined SACMAG, a firm formed by two young architects Raúl Alvarez and Enrique Gutiérrez (a collaborator of Mies van der Rohe for the Bacardi office building planned for Santiago de Cuba and eventually unbuilt) with engineer Luis Saenz (8). During this short-lived collaboration, Hilario Candela met Felix Candela in 58-59 again, at the time that SACMAG was collaborating with the Spanish architect on the Bacardi warehouse in Mexico. In 1960, Hilario Candela left Cuba, following in the footsteps of his mentor Borges and the majority of Cuba's architectural avant-garde. SACMAG moved to Puerto Rico; in 1964 Enrique Gutiérrez designed the Bacardi Building on Biscayne Boulevard in Miami, a landmark of Miami modern architecture. In collaboration with Brazilian artist Francisco Brennand who designed the exterior walls of blue and white tiles, he developed a rare Miami case of the Latin American "synthesis of the arts." (9)

Working with Pancoast, Ferendino, Grafton, Skeels & Burnham—the largest and most "historic" firm in Miami—Candela was the first Cuban expatriate architect to make his mark on Miami. He was immediately involved in the design of large-scale public projects such as the North Miami campus of Miami Dade Junior College, built from 1960 to 1964. In a city marked by the intensive use of stucco on masonry, the

raw concrete used on the Miami Dade campus was both an aesthetic and a civic statement that reflected the public nature of the buildings and the international influences that the architects assumed in their design (10). Candela and Ferendino started to design the Marine Stadium grandstand in 1962. Like Burke Engineers and Architects in their original report, they immediately imagined the stadium as an image-making waterfront landmark that would also offer one of the most spectacular views over the developing downtown. One of their challenges was the shortsighted vision of the city administration, which pushed for a functional steel-frame structure. Candela and Ferendino eventually succeeded — with the collaboration of Norman Dignum Associates Engineers of Miami— in demonstrating the incipient prowess of poured-in-place concrete construction. Miami architects Weed-Russell-Johnson with New York structural engineers Amman and Whitney had pioneered the technique in their work on the National Airlines Nose Hangar (1959, now demolished) at Miami International Airport, but the bold and exquisitely detailed structure was far from the public eye (11).

The grandstand stadium is a cast-in-place concrete structure consisting of five primary structural systems. The foundations are concrete piles with pile caps supporting columns, grade beams, and a seawall; the ground-level structure is made up of grade beams and structural slabs-on-ground, part of which are on pilotis within the bay; the mezzanine-level structure contains slabs and pan joists generally supported by beams and columns but in some cases supported by hangers connected to the grandstand structure; the grandstand structure itself consists of vomitory and parapet walls, raker beams, tie beams, and columns supporting tread-and-riser seating slabs. As for the roof structure, the most iconic element of the building, it forms a dramatically cantilevered folded plate roof made up of eight hyperbolic paraboloid (hypar) shell units; each hypar shell unit is comprised of four smaller hypar-shells and is supported by three inclined columns, two at the back and one in the interior. Working with Candela, structural engineer Jack Meyer engineered each of the eight shapes as 20.2-meter-long cantilevering and 12.4-meter-wide varying depth beams, which have a back span of 10.5 m. Their formal complexity was such that Meyer eventually calculated the roof as a hybrid between a folded plate structure and a hyperbolic paraboloid (hypar) shell (12). According to Meyer, the roof was built using “three or four grades of concrete, all the way from lightweight concrete between the spines – the main part of the roof – and some extra high-strength, heavy-weight concrete further back toward the fulcrum... There were some extremely heavy reinforcing bars in those spines.” (13)

Beyond the roof itself—which, in Miami, represented a feat of local engineering and concrete craftsmanship—it is the overall articulation of the anchoring structure that gave a unique distinction and design to the Marine Stadium. Seen from the causeway, the eight folds suggested “the romance of the water” (14) and the structure expressed the movement of waves gently bathing the stadium’s shoreline. The low points of the waves were anchored to a series of V-shaped couples of slanted diagonal concrete columns, intersected by a tall and oblique beam that tied them all together and capped the grandstand seating itself. In a sculptural demonstration of concrete malleability, each V-structure was attached to the ground to a large oblique column that directly supported the grandstand. Together, the straight and inverted triangles of the structure created an elegant and mineral façade that alluded to the complex geometry of marine life. On the waterside, the waving roof thinned out gradually and morphed into a single structural line at the edge of the water. Seen obliquely from the sides of the stadium, the roofline combined with the straight line of the theater seating, completed a bold figure, which strongly suggested the open claw of the crustacean creatures common to Biscayne Bay. From under the roof on the spectators’ side, the structure formed a large-scale horizontal visor shading the view of the changing city skyline above the line of mangroves surrounding the water circus. Cuts in the seating arrangement around

the structural members allowed spectators to appreciate the full height of the oblique columns that were pushed as far back as possible to permit unobstructed views over the watercourse.

Pedestrian access for the almost seven thousand spectators was deceptively transparent and efficient. Two ramps led to the second floor balcony, which housed major concessions and connected to the distribution landing and its eight staircases on the waterside. The technical booth, suspended from the roof, was accessible via a catwalk. To facilitate traffic movement around the grandstand and to improve visibility to and from the water during a concert staged from the floating stage, the architects moved the structure over the water and used piers to support the bottom third of the seating into the bay. As a result, the whole grandstand appeared to glide over the water; it floated and was ready to leave shore like a traveling barge. A recent environmental analysis of the grandstand using BIM Energy Efficiency EcoTect Software has suggested that the roof design attained great environmental efficiency and maximized spectator comfort in the warm and humid tropical climate of Miami. More particularly, the analysis revealed that “the hyper shapes and their orientation on site provide effective shading and temperature control, as the designer Hilario Candela intended in the initial design.” (15)

The aftermath of Hurricane Andrew (1992)

In spite of some technical problems — early cracks appeared in the concrete roof, which Lester Grafton attributed to “skimping” of the budget by the city and unrealistic construction timelines — the construction was a success (16). Contractors were willing to experiment and with the help of the architects who built large-scale plaster models of the complex concrete articulations they succeeded in matching the best Latin American examples. In the 1960s, material cost was high and labor cost was low. The construction of the plywood formwork for the shell was handmade and custom tailored on site. Yet, the quality of the building was not recognized at the time of its inauguration in 1964. As always, the press concentrated on budgetary and management issues that plagued the building since its inception. Major pop concerts, which started on July 4, 1965 — 6,500 attendees in the stands and about five hundred in boats — eventually won the skeptics over.

The stadium was for three decades a spectacular setting for speedboat championship races and unforgettable evening concerts that included stars such as Ray Charles, Dave Brubeck, Gato Barbieri, and many others. In late August 1992, Key Biscayne and Virginia Key were badly hit by the largest hurricane on record to hit South Florida, Hurricane Andrew. Closed in September 18, 1992, following a biased reading by the City Commission of a positive engineering report, the grandstand was abandoned and threatened by demolition in the early 2000s. A public campaign for its preservation and reuse was successfully launched in 2008 by a new advocacy group, the Friends of the Marine Stadium (FMMS), in association with DoCOMOMO-US/FL (17). The next year, the stadium was registered as one of Eleven Most Endangered Sites and Buildings on the National Trust for Historic Preservation list. In 2009 as well, the grandstand was granted historic preservation status by the City of Miami but the integrity of its adjoining landscape has remained under threat. FMMS secured historic designation by Miami’s Historic Preservation and Environmental Board. Likewise, the World’s Monuments Fund named the Marine Stadium to its 2010 Watch List.

On April 6, 2010, Miami-Dade County Commissioners passed a resolution to allocate \$3-million to the stadium to start its historical preservation and return it as a venue for water sports and major concerts. On July 22, 2010, the Miami City Commission approved the Virginia Key Master Plan, which includes the Miami Marine Stadium. In January 2012, Miami Sports and Exhibition Authority (MSEA), a quasi-public

organization, approved a Memorandum of Understanding (MOU) and Resolution, the first step in the creation of a partnership between FMMS, MSEA and the Miami City Commission to restore and develop a reuse plan for the grandstand and the Marine Stadium. In March 2012, the Miami City Commission approved the MOU. Working with the Heat Group—a non-profit group associated with the basketball franchise in Miami—the Friends of Miami Marine Stadium must submit a business plan within six months and raise the full funding for the renovation (estimated at about 8 million dollars) within two years.

A Symbol of Ethnic Identity

Inscribed within Burke's brilliant piece of man-made landscape, Hilario Candela's and Andrew Ferendino's Marine Stadium grandstand epitomized further promises of a modern tropical urbanism and architecture that, using local techniques, materials, landscape and vastness of space, extolled Miami's regional culture, climate and natural environment. The stadium was the opening act for an intense period of creativity for the firm and for Candela as a lead designer, a period that culminated with the South Dade campus of the Dade Junior College from 1964 to 1967. There, Candela and his colleagues—the firm expanded six-fold in less than five years—produced a tropical modern, albeit somewhat brutalist, interpretation of Cuban and Latin American plazas using a mat/net strategy that was clearly inspired by the Freie Universität in Berlin (18). According to Candela, the campus buildings merged the “postwar modern building regionalist trends... exemplified by the work of Mies [Van der Rohe], and the expressive ‘concrete’ architecture widely popular throughout Latin-America and Brazil” (19). The Marine Stadium and the Miami Dade Junior campuses exemplified the culture of concrete that marked the 1960s decade in the city. Among the other structures representing this rich architectural period in Miami, one can mention the pioneering National Airlines Nose Hangar by Robert Law Weed (1959), the Dodge Island Port of Miami Terminal built by John Andrews in 1969 (unfortunately partially demolished), the Bal Harbor Mall by Weed-Johnson (from 1965), the free-standing band shells on Lincoln Road by Morris (1961), and also by Pancoast-Ferendino-Grafton the brutalist but elegant Mainmain Center for Child Development (1969).

There is no doubt that Latin American influences, and Cuban-Mexican ones in particular, were at work in this short-lived moment of Miami architecture. Even though all structures cannot be attributed to Hispanic-American designers, the role of Hilario Candela, with other Cuban-born architects such as Adolfo Albaisa (also part of the Pancoast-Ferendino-Grafton firm) cannot be overemphasized. In fact, one can argue that the long-in-doubt preservation of the Miami Stadium was eventually successful because of a series of factors that had to do with the role of activists such as Don Worth and his entourage (a major force in the second-wave of preservation in Miami Beach, particularly in regard to the Midcentury Modern heritage); the iconic value of a public building in a highly visible location on the bay, equally recognized by motorists, boaters and water users in a region where public structures have rarely reached the status of private ones. However, the most decisive one was the national identity of the main designer, Candela, and the Friends of the Marine Stadium used that fact adroitly within the complex politics of Miami and Dade County. For the last twenty-five years, Cuban immigrants or Cuban-American born in Miami have dominated the politics of the City of Miami. Manny Diaz, Mayor of Miami when the issue of the Marine Stadium surfaced in the public domain, was born in Miami. Equally critical was the role played by Cuban-born Jorge Hernandez, architect and University of Miami School of Architecture professor, and even more so by Hilario Candela himself, now retired from his firm. Against all odds in a city where architects tend to be politically passive, even in regard of their own works, Candela moved to the forefront

of the preservation efforts and was instrumental in convincing Miami's City officials as well as testifying multiple times about the architectonic but also politico-cultural value of the stadium for the Cuban community in particular and for the Miami community at large.

Until the mid-1930s, the Spanish-Mediterranean and the Art Deco styles had dominated the architecture of the city. They entirely disappeared after WWII to be replaced by various vernacular-modern trends and types derived from the new suburban paradigms that emphasized functionality and modernity. In various ways, from the most original to the most commercial, they reflected the postwar generation's desire for modern homes that expressed the optimistic, future-oriented mood of the times and that were adapted to a sub-tropical environment (20). From the late 1970s onwards, the impact of postmodernist theories reversed the course once again and favored the return of the Spanish-Mediterranean style, unfortunately bastardized and oftentimes applied to inappropriate building types. This trend paralleled other similar historicist movements in the United States but, in South Florida, one can assert that the socio-cultural and political role of Cuban Americans and other immigrants from Central America was instrumental in creating a tsunami tide, which washed away the memory of the 1950s-1960s decades. That Hispanic-American architects are now openly associated with the preservation of the best architecture of those decades is a hopeful sign for the future, as are the recent works of Herzog & DeMeuron in regard to a new culture of concrete in the city: the 1111 Lincoln Road mixed-use parking garage completed in 2010 and the new Miami Art Museum in construction in Downtown Miami and slated for completion in 2013.

bibliography

Sigrid Adriaenssens, Rosa Lowinger, Jorge Hernandez, et. al. "The Shells of the Miami Marine Stadium: Synergy between Form, Force and Environment",* article accessible on-line at the Friends of Marine Stadium website:<<http://www.marinestadium.org>>

notes

1

Pier Luigi Nervi, *Structures*, edited by G. & M. Salvadori (New York: F.W. Dodge Corporation, 1956), p. 101.

2

See the article by Ivan Marović, Civil Engineer, "Neglected Marine Structures – Miami Marine Stadium vs. Rijeka Torpedo Launch Pad Station," available on the Friends of the Miami Stadium website, <http://www.marinestadium.org/>. The author compares two waterfront structures with similar constructive characteristics but very different functions.

3

See Jean-François Lejeune, "Miami Marine Stadium," in Allan Shulman, ed., *Miami Modern Metropolis: Paradise and Paradox in Midcentury Architecture and Planning* (Miami Beach/Glendale CABass Museum of Art/Balcony Press: 2009), pp. 352-57. Also see in the same volume, Jean-François Lejeune, "City Without Memory: Planning the Spectacle of Greater Miami," pp. 34-59.

4

Ralph Burke, owner of the firm, was chief engineer of many notable Chicago projects, including the Chicago Subway, Grant Park Garage, Meigs Field, and O'Hare Airport. Ralph H. Burke, "Feasibility Study

and Master Plan for a Marine Stadium on Virginia Key, Miami" (Chicago: Burke Engineers & Architects, 1962).

5

The tradition of aquatic games and performances in Miami (boat racing and water skiing in particular) went back to the early years of the century when Miami Beach developer Carl Fisher constructed grandstands along Biscayne Bay and solicited the participation of Gar Wood, a famous speedboat racer of the 1920s.

6

Andrew Ferendino died in 1990.

7

Much of the information in this article is from an interview by the author conducted with Hilario Candela, 17 January 2005. On the Tropicana, see Eduardo Luis Rodriguez, *Havana Guide: Modern Architecture 1925-1965* (New York: Princeton Architectural Press, 2000). Max's brother, Enrique Borges was also an architect. The two brothers designed in association with Felix Candela the concrete shell of the mausoleum for the Nuñez-Gálvez family (1957).

8

SACMAG represents the first letters of the following partners: Saenz-Cancio-Martín-Alvarez-Gutiérrez, architects).

9

See Gray Read, "The Bacardi Building: Rum, Revolution and the Crafting of Identity," in Allan Shulman, op. cit., pp. 179-183; on the "synthesis of the arts" in Latin America see for instance the Proceedings of the Congresso Internacional Extraordinário de Críticos de Arte held in Brasília from 17-25 September 1959, republished in *Cidade Nove: Síntese das artes/Congresso Internacional Extraordinário de Críticos de Arte*, edited by Robert Segre and Silveira Lobo (Rio de Janeiro: UFRJ/FAU/Docomomo Rio, 2009).

10

See the interview with Hilario Candela by Jose Vasquez, Miami Dade Community College, November 2005 and published in "A Concrete Presence http://www.aconcretepresence.com/#!__page-0/overview."

11

See Antolin Garcia Carbonell, "Hemispheric Hub: Miami International Airport," in Allan Shulman, op. cit., pp. 159-165.

12

For the analysis of the structure, see Sigrid Adriaenssens, Rosa Lowinger, Jorge Hernandez, et. al., "The Shells of the Miami Marine Stadium: Synergy between Form, Force and Environment," article accessible on-line at the Friends of Marine Stadium website: <www.marinestadium.org>.

13

See Jack Meyer's interview in *Dwell*, April 21, 2011. Some sections of the shells were no more than 7.5 centimeters thick, with an average of 15 centimeters. To connect the eight sections, Meyer poured a posttensioned diaphragm beam on top of the entire structure. A common and advantageous feature in

folded plate structures, it is in fact unnecessary in hypar shells. Reportedly, Felix Candela visited the site and suggested to Hilario Candela that the diaphragm might be redundant.

14

Hilario Candela, interview by the author, 17 January 2005.

15

See Sigrid Adriaenssens, Rosa Lowinger, Jorge Hernandez, et. al., p. 4-5. Meyer's folded plate design for the roof has performed well in the long term. However, even though a further reduction of materials was possible, a certain degree of structural efficiency and thus an economy of construction materials were achieved.

16

"Stadium's Budget Forced Skimping," *Miami Herald*, 11 April 1964.

17

The association Friends of Miami Marine Stadium (FMMS) was formed on February 20, 2008.

18

See Gray Read, "A Center in the Middle of Nowhere: Miami-Dade Junior College South Campus," in Allan Shulman, op. cit., pp. 250-255.

19

Sigrid Adriaenssens, Rosa Lowinger, Jorge Hernandez, et. al., p. 3, quote from the interview with Hilario Candela by Jose Vasquez, Miami Dade Community College, November 2005 and published in *Concrete Presence* http://www.aconcretepresence.com/#!__page-0/overview.

20

See the exhibition at the Historical Museum of Southern Florida, *The Florida Home: Modern Living 1945-65* (June-December 2004), curated by Jean-Fran_ois Lejeune and Allan Shulman. Also see Allan Shulman, "The Tropical Home: Modernity and the Construction of Authenticity," in Allan Shulman, op. cit., 104-131.

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